

K&K Audio

RAKK dac

Mark III

Raleigh Audio

Premium LVPS

Assembly and Installation Manual

Kit version

Use this manual with RAKK dac Mark III Low Voltage Power Supply

- Board version 1.0, which is marked on the board.
- Parts level A

Required Tools and Supplies

150 to 250 Watt soldering gun

35 to 50 Watt soldering iron

1/16" hex (Allen) wrench

5/64" hex (Allen) wrench

Cross-point screwdriver

Diagonal cutting pliers

Long-nose pliers

Wire stripper

Solder

Use the soldering gun only to solder the heatsink pins. Use the soldering iron for all other components.

Warnings and Cautions

Warning – This power supply contains high electrical voltage. Such high voltage is capable of causing injury or even death. If you are not experienced in working with high voltages, seek the assistance of someone who is.

Caution – Use only solder that is intended for electrical circuits. Do not use acid or corrosive flux of any kind.

Support

RAKK dac and its associated components are produced through the joint cooperation of K&K Audio and Raleigh Audio. You may contact us with questions on constructing this kit by sending an e-mail message to david@raleighaudio.com or kevin@kandkaudio.com

Power Requirements

The Input Module requires 120VAC fused at 200mA or 230VAC fused at 100mA.

The Output Module requires an input voltage of between 16VAC and 18VAC at 800mA.

Table of Contents

Assembly Instructions 3
 Output Module Assembly 4
 Input Module Assembly 8
 Final Assembly 10
Power Supply Installation 11
 LL1683 Transformer Wiring 11
 Input Module Wiring 12
 Output Module Wiring 14
Parts List (Level A) 16
 Output Module Parts 16
 Input Module Parts 18
Document version history 18

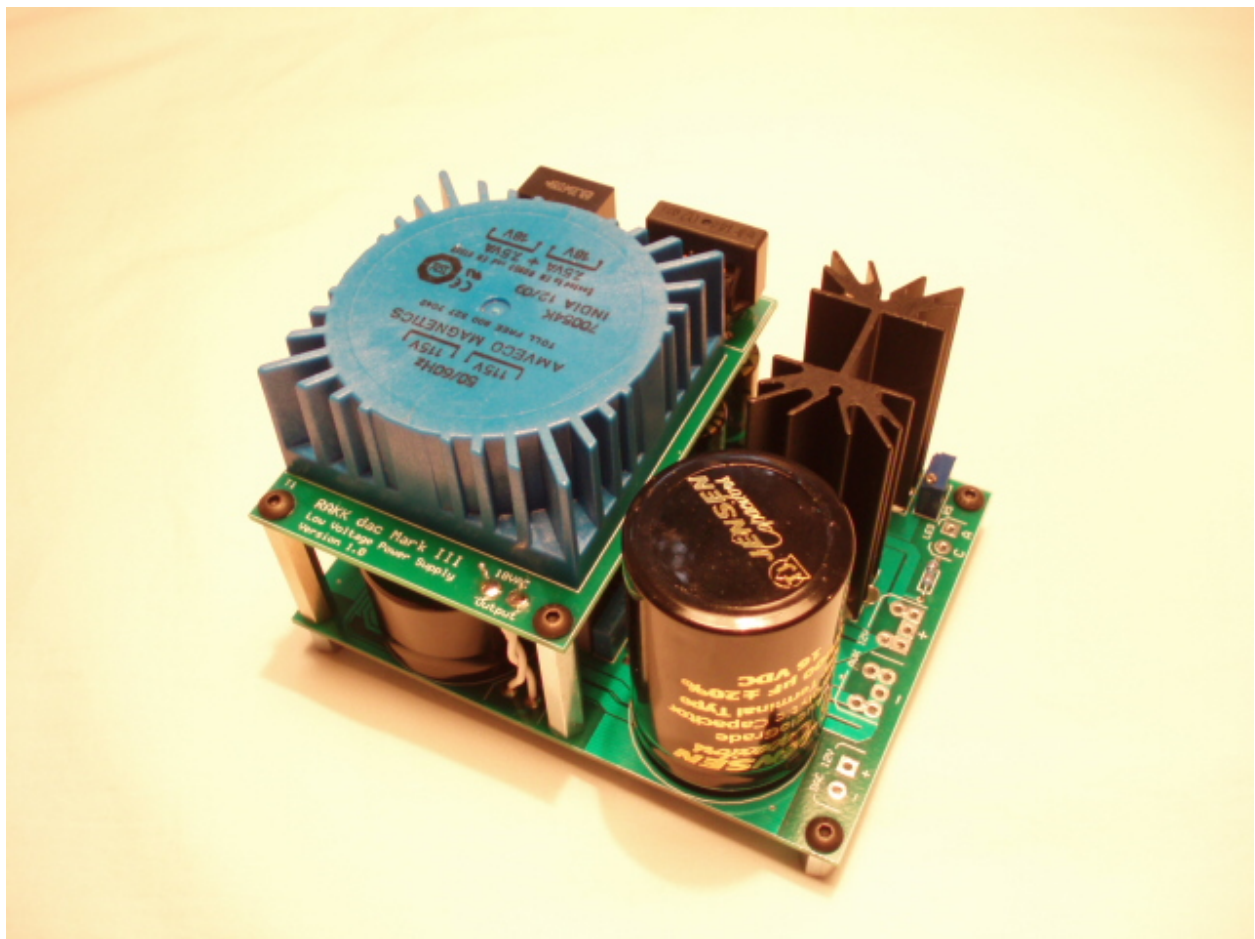
Assembly Instructions

Before you start, read through the instructions completely to the end. Inventory the kit contents to become familiar with the parts and to make sure you have everything.

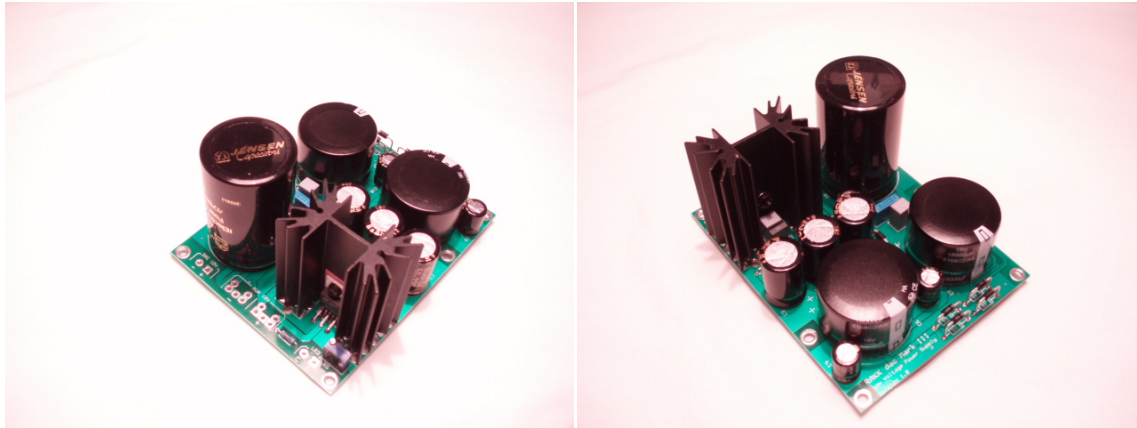
In the following steps you will populate the PC board. All of the components are mounted on the top of the board, which has the components labeled with white silkscreen.

Steps preceded with a “note” (♯) deal with components which must be oriented properly.

There two parts to the power supply—the Input Module and the Output Module. The Input Module takes the mains line voltage (120VAC or 230VAC) and produces 18VAC. The Output Module takes 16VAC to 18VAC and produces 12VDC. The Output Module can be powered from either the Input Module or a Lundahl LL1683 transformer. Thus, if you have an LL1683, you will not have an Input Module.



Output Module Assembly



Save the ends of the component leads that you cut to be used as jumpers on the Input Module.

1. Insert a 10K (brown, black, black, red, brown) resistor in the following two locations: R1 and R3.

Solder and trim the leads.

2. Insert a 115 Ω (brown, brown, green, black, brown bands) resistor in location R4. Solder and trim the leads.
-

♪

3. Insert a 1N4005 diode in location D5. Orient the diode such that the end of the diode with the stripe is closest to capacitor C11.

Solder and trim the leads.

4. Insert a 1 Ω (brown, black, black, silver, brown) resistor in location R6.

Solder and trim the leads.

5. Insert the 10nF capacitor in location C13.

Solder and trim the leads.



6. Insert a MBR150 diode in each of the following four locations: D1, D2, D3 and D4. Position the diodes such that their bodies are raised 1/4 inch off of the board. Orient the diodes such that the end with the stripes is closest to the edge of the board containing the 18VAC pads.

Solder and trim the leads.

7. Insert the blue 10K potentiometer in location R5.

Solder and trim the leads.

There is a thin PC board trace that runs around the pins of capacitor C2, resistor R2 and regulator U1. Be very careful that the component lead and its solder pad remains isolated from the thin trace when you solder the component.

8. Insert a 100nF capacitor in two locations: C2 and C12.

Solder and trim the leads.

9. Insert the 1.21M Caddock resistor in location R2. Position the resistor such that the top of the resistor is level with the top of capacitor C2.

Solder and trim the leads.



10. Insert a 100 μ F, 16V Black Gate capacitor in location C9. Orient the capacitor such that the negative lead (marked on side) is closest to capacitor C6.

Solder and trim the leads.



11. Insert a 100 μ F, 16V Black Gate capacitor in location C10. Orient the capacitor such that the negative lead (marked on side) is closest to capacitor C7.

Solder and trim the leads.



12. Insert a 100 μ F, 16V Black Gate capacitor in location C11. Orient the capacitor such that the negative lead (marked on side) is closest to diode D5.

Solder and trim the leads.



13. Insert a 220 μ F, 50V Black Gate capacitor in location C3. Orient the capacitor such that the negative lead (marked on side) is closest to the heatsink.

Solder and trim the leads.



14. Insert a 220 μ F, 50V Black Gate capacitor in location C4. Orient the capacitor such that the negative lead (marked on side) is closest to the heatsink.

Solder and trim the leads.



15. Insert a 220 μ F, 50V Black Gate capacitor in location C5. Orient the capacitor such that the negative lead (marked on side) is closest to the heatsink.

Solder and trim the leads.



16. Insert an 18,000 μ F, 16V capacitor in location C6. Orient the capacitor such that the negative lead (marked on side) is closest to diode D3.

Solder the leads.



17. Insert an 18,000 μ F, 16V capacitor in location C7. Orient the capacitor such that the negative lead (marked on side) is closest to diode D1.

Solder the leads.



18. Mount the LT3080 (marked on body) regulator on the heatsink. Orient the regulator such that the tab is against the heatsink. Insert an insulator between the LT3080 and the heatsink. Secure with a screw, lockwasher and a nut, using an insulating bushing on the screw, and tighten loosely. Insert the heatsink and regulator in its location adjacent to U1.

Using a soldering gun, solder the two pins of the heatsink.

19. Straighten the LT3080 regulator and moderately tighten the screw.

20. Solder and trim the leads on the LT3080 regulator.

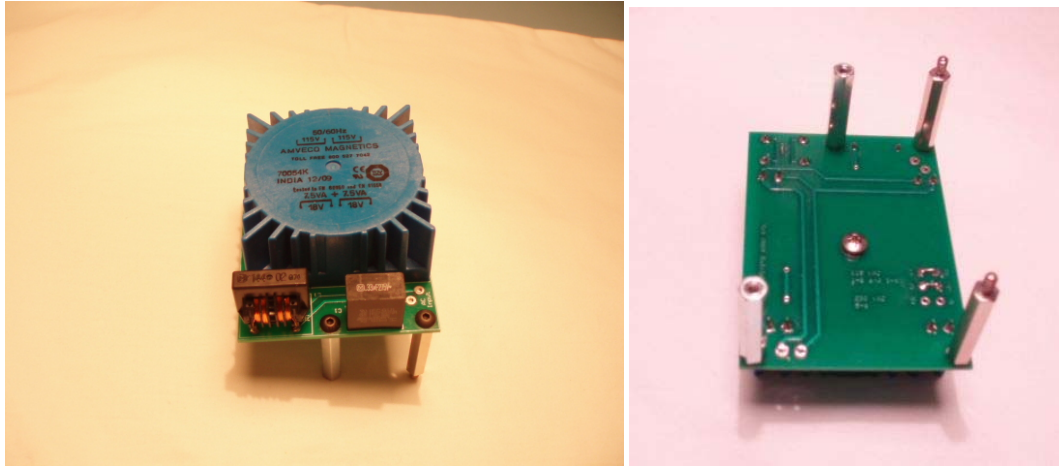
21. Insert a 47,000 μ F, 16V Jensen capacitor in location C8.

Solder the leads.

All components should now be installed on the board. Check that all leads are soldered and that there are no “solder bridges” that connect things that should not be connected. Pay particular attention to the guard trace that runs around pins on U1, R2 and C2.

Input Module Assembly

Skip this section if you do not have an Input Module.



1. Remove the transformer from the board and set it aside.

2. Insert the 0.33 μ F, 275V (marked on body) capacitor in location C1.

Solder and trim the leads.

3. Insert the common-mode choke in location L1.

Solder the leads.

♪

4. Insert the transformer, T1, in its location. Note that it can be oriented only one way. Secure the transformer with a M4 x 8mm screw.

Solder all eight pins.

5. Wire the transformer for your mains line voltage.

For 100VAC:

Connect pad 1 to pad 2

Connect pad 3 to pad 4.

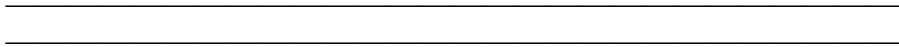
For 120VAC:

Connect pad 1 to pad 2

Connect pad 3 to pad 4.

For 230VAC:

Connect pad 5 to pad 6.



Final Assembly

Skip this section if you do not have an Input Module.

1. Mount the two 1.25" standoffs that have two female ends on the bottom of the Input Module and secure with 6-32 screws. Install one in the hole between capacitor C1 and choke L1, and the other in the hole at the corner next to the 18VAC pads.
-

2. Mount the two 1.25" standoffs that have a male threaded end in the remaining two corners on the bottom of the Input Module and secure with 6-32 screws.
-

3. Set the Input Module on top of the Output Module such that the standoffs align with four holes on the Output Module. The male ends of two standoffs will go through the two holes in the corners of the Output Module. Secure the other two standoffs with 6-32 screws.
-

4. Install a 3/8" standoff as a nut on the threaded end of each of the two 1.25" standoffs.
-

5. Install the remaining two 3/8" standoffs on the bottom, in the corners of the Output Module and secure with 6-32 screws.
-

6. Cut the 3.5" piece of wire in half, strip 1/4" from all ends, tin the ends and twist the two wires together. Install the pair of wires between the 18VAC pads on the Input Module to the 18VAC pads on the Output Module.
-
-

Power Supply Installation

We have found that the vast majority of problems experienced with the RAKK dac and its associated components are traced back to incorrect installation, particularly ground loops and faulty grounding. Do not trust your intuition—rather, follow these instructions—we know that they work.

The heatsink becomes quite warm. Therefore, sufficient natural air convection must be provided.

In the following steps all wires should be soldered.

LL1683 Transformer Wiring

Skip this section if you do not have an LL1683 transformer.

Refer to the LL1683 data sheet for these instructions.

These instructions assume that one winding, pins B1 and B6, is used for filament power. The other three low-voltage windings will be wired in series to provide 17VAC.

If you are using the LL1683 with a RAKK Active Output, you should use a 500mA fuse.

1. Remove any and all wires from pins B2, B3, B4, B5, B7 and B8.

If any of these pins were used for a LED power-on indicator, the LED will be moved to the 12V power supply.

Note: If you have a RAKK Active Output, pins B1 and B6 are used for filament power.

2. Install the following wires on the transformer:

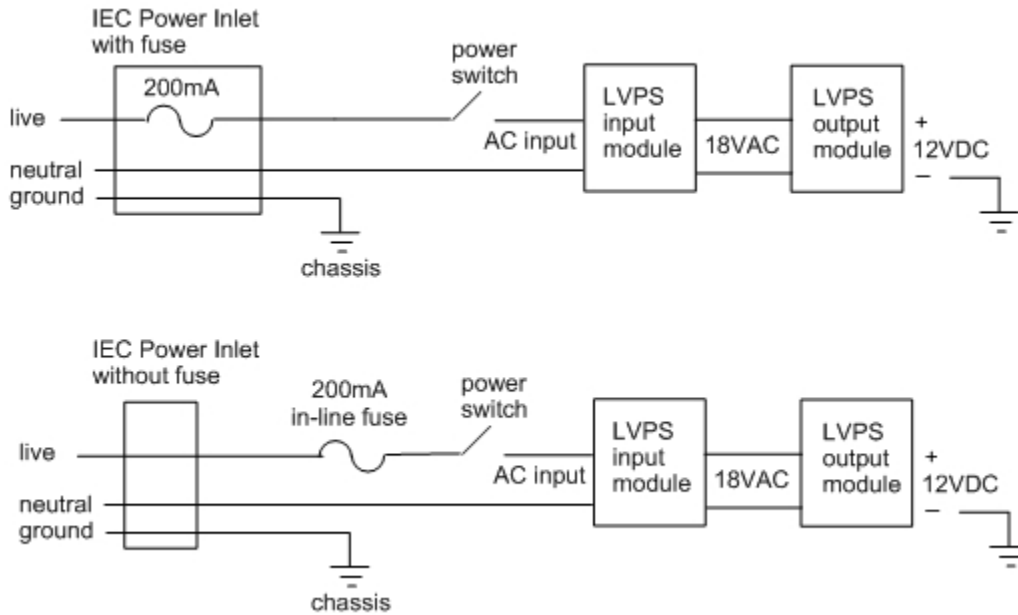
Connect pin B2 to pin B4

Connect pin B3 to pin B5

Input Module Wiring

Skip this section if you do not have an Input Module.

If you have an Input Module, you will need to have a fuse. You may use a power connector with an integrated fuse or the in-line fuse holder provided. The following drawing shows both options. The fuse should be 200mA if the mains voltage is 120VAC and 100mA if the mains voltage is 230VAC. The drawing shows 120VAC mains.



1. If you have an Input Module and an IEC Power Inlet with a fuse, run a twisted-pair of wires from the power switch and IEC Power Inlet to the “**AC Input**” pads on the power supply Input Module. You will not use the in-line fuse holder.

If you have an Input Module and an IEC Power Inlet without a fuse, you will need to install the in-line fuse holder that is provided. The in-line fuse holder should be installed between the power inlet and the power switch.

Otherwise, skip the next five steps.

2. Place the in-line fuse holder in its position and cut the leads to the proper length.

3. The fuse holder leads are very thick and will be reduced in size.
 - Strip about ½” insulation from each end and fan the wire strands out.
 - Cut off about one-half of the strands where the wire meets the stripped insulation.
 - Twist together the remaining strands.
 - Tin the end by melting a little solder into the twisted strands.
-

4. Connect one fuse holder lead to the “live” pin of the IEC Inlet.
-

5. Connect the other fuse holder lead to the power switch.
-

6. Run a twisted-pair of wires from the power switch and IEC Power Inlet to the “**AC Input**” pads on the power supply Input Module.
-

Output Module Wiring

1. If you do not have an Input Module, and are using an LL1683, run a twisted-pair of wires from pins B7 and B8 on the LL1683 to the “**16VAC to 18VAC**” pads on the power supply Output Module.
-

If you do not have an Input Module, and are using a transformer different than the LL1683, note that the Output Module requires a transformer that provides a minimum of 16VAC and a maximum of 18VAC at a minimum of 14 Volt-Amperes.

Note that the power supply has two 12V outputs:

- The “**DAC 12V**” output has additional filtering and isolation and should be used to power only the RAKK dac.
 - The “**AUX 12V**” output may be used as needed for other 12V power.
-

2. Connect a twisted-pair of wires from the “**DAC 12 V +**” and “**DAC 12 V -**” pads on the Output Module to the power input pads on the RAKK dac. Connect the “**DAC 12 V +**” pad to the “**+**” pad on the RAKK dac and connect the “**DAC 12 V -**” to the “**Ground**” pad on the RAKK dac.
-

3. Connect a twisted-pair of wires from the “**AUX 12 V +**” and “**AUX 12 V -**” pads on the Output Module to other devices needing 12V. Observe the note below on grounding.
-

4. If you have a power-on indicator LED that you want to power, connect the wires from it to the “**LED**” pads on the Output Module. Observe polarity: the LED cathode should go to the “**C**” pad and the LED anode should go to the “**A**” pad. LED polarity can be confusing: If the LED does not light, switch the “**A**” and “**C**” leads. Note that the LED intensity is controlled by the adjustable resistor R5.
-

5. If you have a RAKK dac Passive Output stage, connect a wire from the “**AUX 12V -**” pad on the Output Module to the chassis at the point where the Mains safety ground is connected to the chassis.
-

6. If you have a RAKK dac Passive Output stage, connect any other ground or common point that you may have in the system, for example output jacks, to the chassis at the point where the Mains safety ground is connected to the chassis.
-

When your system is completely wired, there should be only a single connection or path between any of the “-” pads on the Output Module and system ground or the chassis.

None of the loads connected to the “**LED C**” pad or “**AUX 12V -**” pad should also be connected to system ground at the load end.

If you have a RAKK dac Passive Output stage, the only path to system ground and the chassis should be the wire connected from the “**AUX 12V -**” pad on the Output Module to the chassis.

If you have a RAKK dac Active Output stage, the only path to system ground should be from the “**REF**” pad on the Active Output board to the “**REF**” pad on the RAKK dac (internally connected to the “**12V -**” pad) to the “**DAC 12V -**” pad on the Output Module.

Parts List (Level A)

Output Module Parts

Designator	Part	Description	Qty
U1	LT3080 regulator	5-pin TO220	1
D1-D4	Diode, MBR150	Cylinder, value marked on body	4
D5	Diode, 1N4005	Cylinder, value marked on body	1
C13	Capacitor, 10nF, 250V	Small blue rectangle	1
C2, C12	Capacitor, 100nF, 63V	Small grey square	2
C3-C5	Capacitor, 220 μ F, 50V	Black Gate, black, radial, cylinder	3
C6, C7	Capacitor 18,000 μ F, 16V	electrolytic, black, radial, cylinder	2
C8	Capacitor, 47,000, 16V	Jensen 4-pole electrolytic, black, radial, cylinder	1
C9-C11	Capacitor 100 μ F, 16V	Black Gate, black, radial, cylinder	3
R1, R3	Resistor, 10K	Brown, black, black, red, brown bands	2
R2	Resistor, 1.21M	Caddock, value marked on body	1
R4	Resistor, 115 Ω	Brown, brown, green, black, brown bands	1
R5	Potentiometer, 10K	Blue rectangle, marked Y103	1
R6	Resistor, 1 Ω	Brown, black, black, silver, brown bands	1

Designator	Part	Description	Qty
The following parts are provided for the Output Module (cont.)			
	PC board	Version 1.0	1
	Heatsink	2" tall	1
	Insulating bushing	Small black cylinder	1
	Insulator, heatsink	Thin pink rectangle	1
	Screw	4-40 x 3/8	1
	Nut,	4-40	1
	Lock washer	4-40	1
	Wrench, hex, 1/16	For 4-40 screw	1

Input Module Parts

Designator	Part	Description	Qty
	PC board	Version 1.0	1
T1	Transformer, 18VAC	Large Blue rectangle	1
C1	Capacitor 0.33 μ F, 275V	Large, black, rectangular	1
L1	Common mode Choke, 144-02	Looks like a small transformer With four pins	1
	Fuse holder	Cylinder with wire on each end	1
	Fuse, 200mA	cylinder	1
	Standoff, 1.25" Female/female		2
	Standoff, 1.25" Male/female (note)	Note: the 1.25" Male/female standoffs have a 3/8" standoff installed on the male end to prevent damage. Leave the two standoffs screwed together until you are ready to use them.	2
	Standoff, 3/8" Female/female (note)		4
	Screw	6-32 x 1/4"	12
	Wrench, hex, 5/64"	For 6-32 screw	1
	Screw	M4 x 8mm, for mounting the transformer	1
	Wire, #20		3.5"

Document version history

Version	Description
A.1	Original document