

**raleigh
audio**

Mark IV

Low Voltage Power System

Installation Manual

Use this manual with the Raleigh Audio Mark IV Low Voltage Power System

Warnings and Cautions

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

Support

You may contact us with questions on constructing this kit by sending an e-mail message to support@raleighaudio.com

Power Requirements

The Power Supply requires 120VAC at 100mA or 230VAC at 50mA.

The Regulator requires an input voltage of between 5VAC and 7VAC at 6VA-to-12VA depending upon the load.

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Introduction

The Low-Voltage Power System includes of two families of supplies: Premium and Standard. In each of the families there is a regulator which may be used with a power transformer and a stand-alone regulated power supply which may be powered with Mains power. Both the Regulators as well as the power supplies can be programmed to provide any value of low voltage.

The Standard family of supplies is intended to provide adequate power for the Standard version of the DAC and its adapters.

The Premium family of supplies is intended to provide superb power for the Premium version of the DAC and its adapters.

The power supplies may be powered from 115VAC or 230VAC and the output current capability depends upon the output voltage. The current capability of the regulators depends upon two factors – the input voltage and the output voltage. The example below assumes that the regulator is powered from a Lundahl LL1683 transformer.

Supply	condition	volt	current
Regulator	LL1683 – 6.6VAC winding		mA
		12	200
		10	300
		8	430
		5	710
		3.3	1000
	LL1683 – 5.2VAC winding		
		12	15
		10	100
		8	200
		5	450
		3.3	550
Power Supply			
	12	235	
	10	385	
	8	530	
	5	830	
	3.3	1000	

Powering suggestions using the LL1683 transformer

Two or three power supplies (RAKK dac plus one adapter)

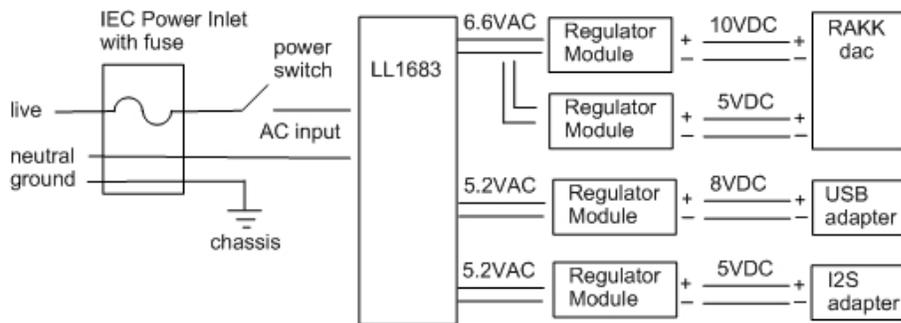
Each power supply should be on a separate winding.

- For RAKK dac “10V” (LL1683 6.6VAC winding)
- LVPS Regulator set to 10V (1.0M Rset)
- For RAKK dac “5V” (LL1683 5.2VAC winding)
- LVPS Regulator set to 5V (499K Rset)
- For USB Adapter “8V” (LL1683 5.2VAC winding)
- LVPS Regulator set to 8V (820K Rset)
- For I2S Receive board (LL1683 5.2VAC winding)
- LVPS Regulator set to 5V (499K Rset) or
- For Active Output Relay
- LVPS Power Supply set to 12V (1.2M Rset)

Four Power Supplies (RAKK dac plus USB adapter and I2S Receive board with Switch)

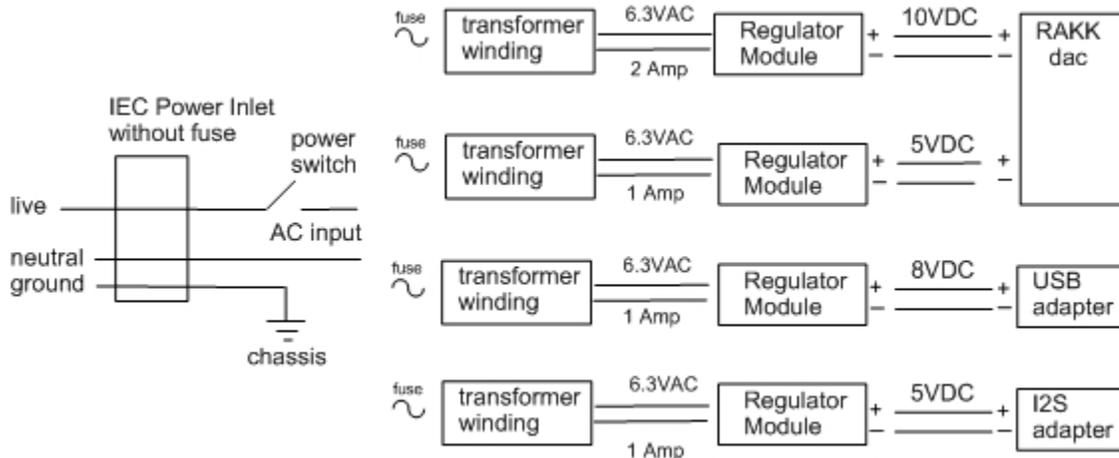
Same as the above except that the two RAKK dac power supplies are powered from a single 6.6VAC winding.

- The USB adapter and I2S Receive board should have separate supplies, each powered from a separate 5.2VAC winding.
- The “12V” input to the I2S Receive board with Switch should be powered from the 10V RAKK dac supply.



Powering suggestions using generic 6.3VAC power transformers

- For RAKK dac “10V”
- LVPS Regulator set to 10V (1.0M Rset)
- For RAKK dac “5V”
- LVPS Regulator set to 5V (499K Rset) or
- For USB Adapter “8V”
- LVPS Regulator set to 8V (820K Rset) or
- For I2S Receive board
- LVPS Regulator set to 5V (499K Rset)
- The “12V” input to the I2S Receive board with Switch should be powered from the 10V RAKK dac supply.
- For Active Output Relay
- LVPS Regulator set to 12V (1.2M Rset)



This picture shows an example using Regulators.

Any low-voltage power transformer may be used as long as it provides adequate voltage and current outputs. The 6.3VAC shown in the diagram is approximate and may be anywhere between 6VAC and 7VAC for the Regulator powering the RAKK dac 10V input; and anywhere between 5VAC and 7VAC for the other Regulators. 6.3VAC is readily available. The currents shown are minimum capabilities – your transformer may be capable of providing more current.

Each output should be served by a separate transformer winding. The winding may be on a separate transformer, or on a multi-output transformer. If a multi-output transformer is chosen, it should be rated for independent use of the secondary windings (rather than just series-connected or parallel-connected.) The Hammond 266L12B is an example of such a transformer. There should be no unused windings.

Each transformer should have its own time-delay fuse. Use 50mA for 230VAC power and 100mA for 115VAC power.

Powering suggestions using Low Voltage Power Supplies

- For RAKK dac “10V”
- LVPS Power Supply set to 10V (1.0M Rset)
- For RAKK dac “5V”
- LVPS Power Supply set to 5V (499K Rset)
- For USB Adapter “8V”
- LVPS Power Supply set to 8V (820K Rset)
- For I2S Receive board
- LVPS Power Supply set to 5V (499K Rset)
- The “12V” input to the I2S Receive board with Switch should be powered from the 10V RAKK dac supply.
- For Active Output Relay
- LVPS Power Supply set to 12V (1.2M Rset)

Power System Installation

The output current capability depends upon the output voltage selected and the input AC voltage and current. For example, if the input voltage is 5VAC, the output current available at 12V DC is limited and the voltage may drop. This may be acceptable for some applications such as providing power to relays because the specified voltage is nominal and a regulated voltage is not required.

The following sections will provide instructions for wiring the low voltage power system.

In order to preclude ground loops, each power supply is galvanically isolated from the other power supplies. Three important rules (with specific exceptions) are followed:

- First, two Regulators cannot share an input AC – rather, each is fed by its own transformer winding. The only exception is that the two Regulators that are powering the RAKK dac may share a single 6.6VAC winding on the LL1683
- Second, two loads (RAKK dac or adapter) cannot share a Regulator or Power Supply – rather, each load has a separate Regulator or Power Supply. There are two exceptions:
 - A TOSLINK adapter may share the “12V Regulator with the RAKK dac. (This may be 10V)
 - A Three-Input I2S Adapter may receive its 12V input from the Regulator that is powering the RAKK dac. (This may be 10V)
- Third, there are no ground connections anywhere in the power system – rather, each separate power supply will pick up a ground from its load. These are very different grounds and must not be mixed.

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.

These instructions assume that you are installing Regulators. In the following steps all wires should be soldered.

Wiring the Low Voltage Power System with an LL1683 Transformer

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

An LL1683 can support up to four Regulators.

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 are available to support Regulators.

If you are using the LL1683 with a RAKK Active Output:
You should use a 500mA fuse on your power input for 120VAC.
You should use a 315mA fuse on your power input for 230VAC.

10V may be used and is preferred anywhere 12V is mentioned in the instructions below.

1. Remove any and all wires from pins B2, B3, B4, B5, B7 and B8 of the LL1683.
Note: If you have a RAKK Active Output, pins B1 and B6 are used for filament power.

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

2. Set all of the Regulators in their places but do not secure them yet.
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3. Install a twisted pair of wires from transformer pins B4 and B7 (6.6VAC) to the **“5VAC to 7VAC AC Input”** pads on the Regulator which is to be used to power the **“10V”** pads on the RAKK dac.
-

4. Install a twisted pair of wires between the **“DC Output”** pads on this Regulator and the **“10V”** pads on the RAKK dac. Observe polarity – that is, connect the **“-”** pad to the **“-”** pad and **“+”** pad to the **“+”** pad.
-

5. If you have a RAKK TOSLINK to SPDIF adapter, install a twisted pair of wires from the **“10VDC Output”** pads on the Regulator and the **“12V”** pads on the TOSLINK adapter. Observe polarity.
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6. If you have less than four Regulators, install a twisted pair of wires from transformer pins B3 and B8 (5.2VAC) to the **“5VAC to 7VAC AC Input”** pads on the Regulator which is to be used to power the **“5V”** pads on the RAKK dac.

If you have four Regulators, install a twisted pair of wires from transformer pins B4 and B7 (6.6VAC) to the **“5VAC to 7VAC AC Input”** pads on the Regulator which is to be used to power the **“5V”** pads on the RAKK dac. In this case, the two Regulators that are powering the RAKK dac are sharing the same transformer winding. Observe the same “polarity” for the two AC inputs.

7. Install a twisted pair of wires between the **“DC Output”** pads on this Regulator and the **“5V”** pads on the RAKK dac. Observe polarity – that is, connect the **“-”** pad to the **“-”** pad and **“+”** pad to the **“+”** pad.
-

Skip the next two steps if you do not have an I2S Adapter.

8. If pins B3 and B8 have not been used, install a twisted pair of wires from transformer pins B3 and B8 (5.2VAC) to the 5VAC to 7VAC **“AC Input”** pads on the Regulator which is to be used to power the I2S adapter.

If pins B3 and B8 have been used, install a twisted pair of wires from transformer pins B2 and B5 (5.2VAC) to the 5VAC to 7VAC **“AC Input”** pads on the Regulator which is to be used to power the I2S adapter.

9. Install a twisted pair of wires from the **“DC Output”** pads on this Regulator to the **“5V”** pads on the I2S Adapter. Observe polarity.
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Skip the next two steps if you do not have a USB Adapter.

10. Install a twisted pair of wires from transformer pins B2 and B5 (5.2VAC) to the 5VAC to 7VAC **“AC Input”** pads on the Regulator which is to be used to power the USB adapter.
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11. Install a twisted pair of wires from the **“DC Output”** pads on this Regulator to the **“8V”** pads on the USB Adapter. Observe polarity.
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12. Secure all of the Regulators to the chassis.
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Non-standard Power Input Installation Instructions

If you do not have RAKK Power Supplies, and are using transformers other than the LL1683, adapt the instructions above for your transformers.

Additional Grounding Instructions

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, it should exhibit the following grounding characteristics:

- If you have a RAKK dac Passive Output stage, the only path between the system ground and the chassis should be the wire connected from the “**chassis**” pad on the 5V Regulator to the chassis. This is with jumper “A” in place and R5 replaced with a jumper.
- If you have a RAKK dac Active Output stage, the only path between the system ground and the chassis should be the wire connected from the “**COM**” pad on the Active Output to the chassis.
- When the power cable is installed, and the power cables of all attaching devices are installed, with all the adapter cables being installed to the attaching devices, there should be a connection or path between the “-” pad on any Regulator to the “-” pad on any other Regulator.

Document Version History

Version	Description
3.0	Updated for Mark IV use.
3.1	Fixed typos, added example using generic transformer
3.2	clarification of grounding for a Passive Output
4.0	(this document) Updated to include Power Supplies