

RAKK dac
Mark IV

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Mark IV

Assembly
and
Installation
Manual

version

Use this manual with RAKK dac Mark IV v 2.0, which is marked on the board.

Required Tools and Supplies

35 to 50 Watt soldering iron
Diagonal cutting pliers
Long-nose pliers
Wire stripper
Solder

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

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Introduction

While the RAKK dac Mark IV appears superficially to be similar to its predecessor, the RAKK dac Mark III, in reality it is the result of many months design, testing and experimentation. This effort has resulted in an increase in the sonic performance not imagined possible before the onset of the project.

The majority of the circuitry of the RAKK dac Mark IV digital board is in surface mount components that are already installed on the board. You will personalize the board by mounting one or more transformers that are needed if you have SPDIF or AES/EBU inputs. The board has provisions for four inputs - three SPDIF inputs and one I2S input. You may choose to use any or all of them. Selection of which input is active is accomplished by controlling the connection between two pads on the board. There is a transformer associated with each SPDIF input. SPDIF input jacks are mounted off-board and connected to the board with a twisted pair of wires. The SPDIF inputs will also accept AES/EBU signals. This is handled by using an alternate input transformer.

A “Lock” (+ active) pad is provided to indicate when the input circuitry is locked onto an attached SPDIF or AES/EBU signal. This signal is used in a recording studio to show that a particular input device is in fact attached and operating. It is of little use in the home listening environment since it is on whenever a transport is selected.

I2S Interface

Physical Specifications:

The I2S interface has a 10-pin ribbon cable connector with the following signals:

Pin 2 BCT +
Pin 3 BCT -
Pin 4 LRCK +
Pin 5 LRCK -
Pin 6 Data +
Pin 7 Data -

An adapter board is available to attach discrete wires to the interface.

The I2S interface is galvanically isolated from the circuitry and ground on the RAKK dac board. Therefore all six input signals must be connected for proper operation.

Electrical Specifications:

The interface is designed to interface with 3.3V or 5V logic families.

Input impedance = $465\Omega, \pm 25\Omega$

Absolute maximum input pulse amplitude = 5V

Minimum input pulse amplitude for logical 1 = 2.3V

Maximum input pulse amplitude for logical 0 = 0.2V

Differences: Mark III to Mark IV

Power:

While the Mark III had a single 12V power input, the Mark IV has separate power supplies for the digital circuitry and analog circuitry. Refer to the powering section below for details.

Analog Output Current:

The RAKK dac Mark IV has double the output current (+6dB) than the Mark III. This means that if all of the support circuitry is left untouched, that the output voltage will be double that of the Mark III. Alternately, the support circuitry (for example, the I/V resistors) can be reduced by one-half to achieve the same analog output voltage.

Physical size:

The RAKK dac Mark IV is larger than the RAKK dac Mark III.

The RAKK dac Mark III measures 5.2" by 2.85".

The RAKK dac Mark IV measures 6.6" by 2.80".

However, the mounting holes are the same for both devices.

Assembly Instructions

For the following three steps:

For SPDIF operation, a Lundahl LL1572 transformer will be provided.

For AES/EBU operation, a Lundahl LL1574 transformer will be provided.

Inputs 1, 2 and 3 referred to in the following steps are used for SPDIF or AES/EBU.

- If you have chosen to use Input 1, insert a transformer in location T1.

Solder the leads.

- If you have chosen to use Input 2, insert a transformer in location T2.

Solder the leads.

- If you have chosen to use Input 3, insert a transformer in location T3.

Solder the leads.

- If you are using only a single input, install a jumper wire between the Input Select pad for that input and the adjacent “**com**” pad.
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Install the RAKK dac Board

If you are assembling an Extreme RAKK dac, use the instructions in that manual rather than these instructions.

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.

In the following steps all wires should be soldered.

Complete the assembly of all of the boards in the system before proceeding with this installation.

If you are planning to mount a Passive Output board or an I2S attachment board to the RAKK dac, now would be a good time to do that. Refer to the installation instruction in the appropriate manual.

Place the RAKK dac in the location where it will be mounted but do not secure it in place. Rather, leave it loose so that it will be easy to attach the wires.

If you have more than one input, you will need to select which input is active. The five pads along the edge of the board that are labeled “Input Select” control which input is selected. When the “**com**” pad is connected to the numbered pad associated with an input, that input is selected. For example, if the “**com**” pad is connected to the “**2**” pad, then input 2 is selected.

You will need a select switch that has at least as many positions as you wish to select.

1. If you have more than one input, connect a wire for each input from the select switch to the “**Input Select**” pads on the RAKK dac board. Connect a wire between the operate contact of the switch and the “**com**” pad.
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In the steps below, you are instructed to connect the input jacks to the board. Both pins of an input jack **must** be connected to the board as directed. An input jack is galvanically isolated from the rest of the circuitry by the transformer and circuit ground is not a reference for the input jack.

2. Wire Input 1 (if used.)

If you have an RCA jack: Connect Input 1 to the RCA jack with a twisted pair of wires. Connect the “+” pad to the center pin of the RCA jack. Connect the “-” pad to the shell of the RCA jack.

If you have a BNC jack: Connect Input 1 to the BNC jack with a twisted pair of wires. Connect the “+” pad to the center pin of the BNC jack. Connect the “-” pad to the shell of the BNC jack.

If you have an XLR jack: Connect Input 1 to the XLR jack with a twisted pair of wires. Connect the “+” pad to pin 2 of the XLR jack. Connect the “-” pad to pin 3 of the XLR jack. Connect pin 1 of the XLR jack to the chassis.

3. Wire Input 2 (if used.)

Using the instructions for input 1 (above,) connect Input 2 to its jack with a twisted pair of wires.

4. Wire Input 3 (if used.)

Using the instructions for input 1 (above,) connect Input 3 to its jack with a twisted pair of wires.

5. If you have an optional I2S Interface Adapter, refer to the installation instructions in that manual.

6. Follow the directions in the installation section of the power supply and output board manuals to connect them to the RAKK dac board.

If you have your own power supplies, connect the “+” and “-” 5V and 10V pads on the RAKK dac to the respective points on your power supplies.

If you have your own output board, connect the R+, R-, L+, L- and REF pads on the RAKK dac to that board.

8. Secure the RAKK dac in place.
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Powering the RAKK dac Mark IV

The RAKK dac Mark IV requires two separate power supplies: a 5V for the digital electronics and a 10V for the analog electronics. The two supplies should be dedicated to the RAKK dac and not shared with other electronics.

Mark III LVPS Modules can be “recycled” to provide power, however best results will be obtained by using the Mark IV LVPS Regulator module.

Refer to the RAKK LVPS Mark IV Manual for more detail.

Digital power:

The digital power requirement is 5VDC at 100mA.

Analog Power:

The analog power requirement is 10VDC at 275mA. Early versions of the board were labeled “12V” and this is a maximum that should be used. 10VDC is preferable.

Grounding:

The “+” and “-” for each supply should be attached only to the RAKK dac. The power supply “-” pads should not be connected to ground or the chassis. The ground reference for the RAKK dac is acquired from the “REF” pad.

Document version history

Version	Description
1.0	Original document
1.1	Added explanation of “Lock”
1.2	Moved power supply information to the LVPS manual
1.3	Updated power information.