

**K&K Audio**

# **RAKK dac**

## **Mark III**

**Raleigh Audio**

# **Assembly and Installation Manual**

## Kit version

Use this manual with RAKK dac Mark III v 1.0, 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

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](mailto:david@raleighaudio.com) or [kevin@kandkaudio.com](mailto:kevin@kandkaudio.com)

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## Introduction

There are three components to a system using the RAKK dac: The RAKK dac Mark III digital board, an output board and a power supply. There are also other boards for optional attachment to the I2S interface. This manual addresses the assembly and installation of the RAKK dac Mark III digital board. The assembly and installation of the other boards is addressed in manuals provided for those products.

The majority of the circuitry of the RAKK dac Mark III 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 and two optional potentiometers. 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 I2S interface is connected to the optional I2S Adapter board by six wires.

The SPDIF inputs will also accept AES/EBU signals. This is handled by using an alternate input transformer.

There is the provision for attaching two optional LEDs of your choice to the board. One LED indicates that the DAC circuitry is muted; the other LED indicates that the SPDIF circuitry has locked on a signal. There is also the provision to install optional potentiometers to control the intensity of the LEDs.

## I2S Interface

The I2S interface is galvanically isolated from the circuitry and ground on the RAKK dac board. Therefore all six wires must be connected for proper operation. The interface is designed to interface with 3.3V or 5V logic families.

### **I2S Interface Specifications:**

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

## Assembly Instructions

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For the following three steps, depending on our stock availability, for SPDIF operation, either a Lundahl LL1572 or an equivalent Newava S22160 transformer will be provided. For AES/EBU operation, a Lundahl LL1574 transformer will be provided.

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

Solder the leads.

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

Solder the leads.

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

Solder the leads.

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4. 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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5. Install the optional LED dimmer potentiometers in locations R1 and R2.

Solder the leads.

Note: Neither the Mute LED, nor the Lock LED are used in the Extreme RAKK dac, so you do not need to install a potentiometer in locations R1 or R2 if you are building an Extreme RAKK dac.

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## Install the RAKK dac Board

**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.

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

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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.

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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.

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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.

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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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2. If you choose to use the optional “Lock” and “Mute” LEDs, connect the wires from them to the RAKK dac. 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 LEDs don’t light, switch the “A” and “C” leads.
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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.

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3. 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.

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4. Wire Input 2 (if used.)

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

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5. Wire Input 3 (if used.)

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

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6. If you have an optional I2S Interface Adapter, refer to the installation instructions in that manual.
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7. 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 supply, connect the +12V and Ground pads on the RAKK dac to the respective points on your power supply.

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

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8. Secure the RAKK dac in place.
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## Document version history

Version	Description
1.0	Original document
1.1	Clarified instructions for Extreme RAKK dac.
1.2	This document. Document only update. Clarified AES/EBU use.