

**K&K Audio**

# **RAKK dac Mark II**

**Raleigh Audio**

## **USB to SPDIF Converter Installation Manual**

## Kit version

Use this manual with the MiniUSB version 1.0 of the USB to SPDIF Converter.

## 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

The RAKK USB to SPDIF Converter is based on the MiniDSP Streamer, which we have adapted for use with the RAKK dac. The USB to SPDIF Converter is intended to be used in conjunction with the RAKK dac Mark III digital board or other DAC that has an SPDIF input.

For the best performance possible, the SPDIF interface must be isolated from the circuitry in the DAC that it is attached to. There are two interfaces which must be isolated: power and signal. For the power, we have chosen to provide a separate 5V supply which is isolated from the other power supplies in the RAKK dac system. For the signal, we have chosen to provide an isolated SPDIF interface on the RAK dac Mark III for this purpose. If you are interfacing to a DAC that does not have an isolated I2S interface, then there is a possibility of a ground loop in the system which may cause noise: for example buzzes or hums.

The board is provided completely assembled, ready for installation.

## Assembly Instructions

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The USB to SPDIF converter digital board is provided completely assembled. However, a transformer must be installed on the RAKK dac.

Install a Lundahl LL1572 in the location on the RAKK dac that you have chosen to support the USB to SPDIF interface.

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## Installation Instructions

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The RAKK USB to SPDIF board is intended to be mounted to the back panel of the enclosure. These instructions assume that the USB to SPDIF board will be used with the RAKK dac Mark III.

The connection between the RAKK dac and the USB to SPDIF board has a plus and a minus (+/-) polarity. The connection will be made with a twisted pair, with the signal being the + polarity and reference being the – polarity.

For these instructions, violet/black will be assumed for the signal twisted pair and red/black will be assumed for the power twisted pair.

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1. Complete the assembly of the RAKK dac Mark III and the USB to SPDIF power supply.
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2. Position the USB to SPDIF board, the RAKK dac and the power supply where they will be mounted but do not secure them in place yet.
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3. Measure the distance between the interface on the USB to SPDIF board and the power supply.

Prepare a red/black twisted pair, the length that you measured.

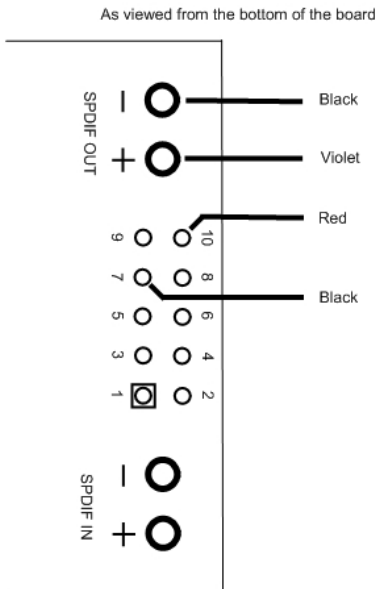
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4. Measure the distance between the interface on the USB to SPDIF board and the interface on the RAKK dac.

Prepare a violet/black twisted pair, the length that you measured.

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Refer to the diagram below for connections between the RAKK USB to SPDIF board and its power supply.



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5. Install the red/black twisted pair. Solder the red wire to pad 10 and the associated black wire to pad 7 on the USB to I2S board.

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6. Solder the other end of that red/black twisted pair to the 5Volt output of the power supply. Solder the red wire the + pad and the black wire to the - pad.

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7. Install the violet/black twisted pair. Solder the violet wire to the + pad of the SPDIF OUT and the associated black wire to the - pad.

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8. Solder the other end of that violet/black twisted pair to the RAKK dac input that you have chosen to use. Solder the violet wire the + pad and the black wire to the - pad.

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9. Refer to the Grounding section below and, if needed, install a wire between the (–) pad of the power supply and the chassis at the point where the green-wire safety ground is connected to the chassis.
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10. Mount the boards in their locations and secure them in place.
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## Grounding

The USB is used to interconnect a variety of devices in many different ways. No single grounding scheme is most effective in all cases; thus you may need to experiment to determine the most effective grounding for your system. As a general guideline, devices fall into two categories for grounding – grounded devices and ungrounded devices.

In the first category are devices like tower computers and media devices which plug into mains power with a three-prong cord. The chassis of these devices are connected to mains safety ground, and this ground is carried through the USB connections to other devices that are attached to the USB interface.

When the RAKK USB to SPDIF Convertor is used in this environment, it picks up its ground from the attaching device, such as the computer. In this case, to ensure galvanic isolation, there must be **no** connection between the negative (–) terminal of the RAKK USB to SPDIF Convertor 5V power supply and the negative (–) terminal of the RAKK dac 12V power supply.

In the second category are devices like media devices which plug into mains power with a two-prong cord and laptop computers. The chassis of these devices are not connected to mains safety ground, and thus there is no ground to be carried through the USB connections to attaching devices.

When the RAKK USB to SPDIF Convertor is used in this environment, since there is no ground to be picked up from the attaching device (laptop), the RAKK USB to SPDIF Convertor must be grounded from the RAKK dac chassis. To accomplish this, a wire should be installed between the negative (–) terminal of the RAKK USB to SPDIF Convertor 5V power supply and the chassis at the point where the mains green-wire safety ground is attached to the chassis.

## Document version history

<b>Version</b>	<b>Description</b>
1.0	Original document
2.0	(this document) Original supporting the MiniDSP version of the USB to SPDIF Convertor