K&K Audio

RAKK dac
Mark III

Raleigh Audio

USB to I2S Converter

Installation Manual

Version 2.0

Kit version

Use this manual with the MiniUSB version 1.0 of the USB to I2S 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 or kevin@kandkaudio.com

Table of Contents

Introduction

The RAKK USB to I2S Converter is based on the MiniDSP Streamer, which we have adapted for use with the RAKK dac. The USB to I2S Converter is intended to be used in conjunction with the RAKK dac Mark III digital board or other DAC that has an I2S input.

For the best performance possible, the USB 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 I2S 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.

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 implemented with a standard 3.3V logic family and is designed to operate into standard 3.3V or 5V logic families.

Specifications:

Absolute minimum load impedance = 200Ω
Nominal output pulse amplitude = 3.0V

Installation Instructions

The RAKK USB to I2S board is intended to be mounted to the back panel of the enclosure. These instructions assume that the USB to I2S board will be used with the RAKK dac Mark III.

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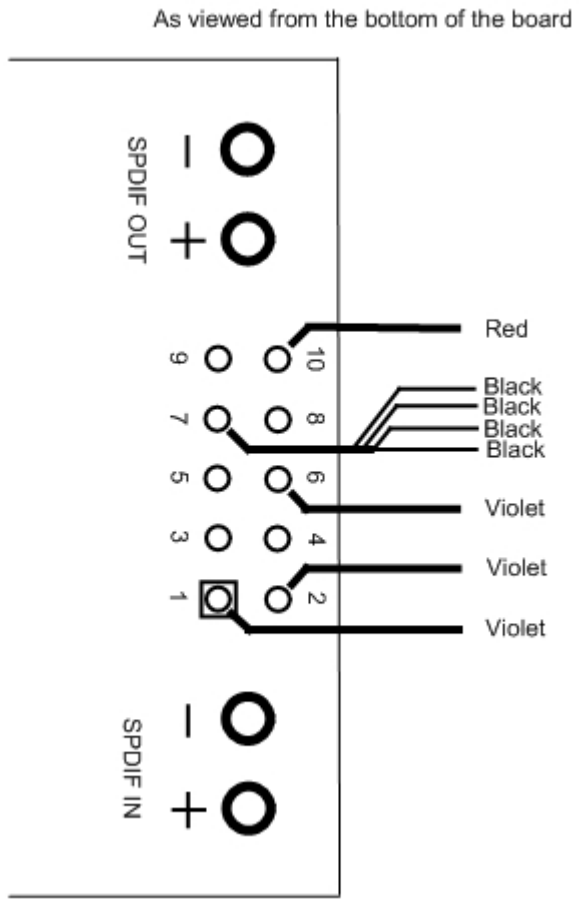
1. Complete the assembly of the RAKK dac Mark III and the USB to I2S power supply.

Refer to the diagram below for connections between the RAKK USB to I2S board and the RAKK dac.



Pads of interest:
Pad 1, BCK
Pad 2, LRCK
Pad 6, Data
Pad 7, Ground
Pad 10, +5V

Each of the connections to the RAKK dac has a plus and a minus (+/-) polarity. The connections will be made with twisted pairs, with the signal being the + polarity and Ground being the – polarity.

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

You will be connecting four wires to pad 7, Ground. To facilitate this, you will form a loop of wire and connect it to pad 7, with the wires attached to the loop.

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2. Position the USB to I2S 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 I2S board and the interface on the RAKK dac.

   Prepare three violet/black twisted pairs, each being the length that you measured.

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4. Measure the distance between the interface on the USB to I2S board and the power supply.

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

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5. Form a loop on the end of a short piece of solid wire (trimmed from a component lead.) The loop should be large enough to accept four wires.

   Insert the solid wire loop into pad 7 on the USB to I2S board and solder it in place.

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6. Connect the black wires of the four twisted pairs into the loop on pad 7.

   Solder the four black wires in place.

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7. Solder one of the violet wires to pad 1 on the USB to I2S board.

   Solder the other end of that twisted pair to the BCK pads on the RAKK dac. Solder the violet wire the + pad and the associated black wire to the – pad.

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8. Solder another of the violet wires to pad 2 on the USB to I2S board.

   Solder the other end of that twisted pair to the LRCK pads on the RAKK dac. Solder the violet wire the + pad and the associated black wire to the – pad.

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9. Solder the last violet wire to pad 6 on the USB to I2S board.

   Solder the other end of that twisted pair to the DATA pads on the RAKK dac. Solder the violet wire the + pad and the associated black wire to the – pad.

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10. Solder the red wire to pad 10 on the USB to I2S board.

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

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11. 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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12. 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 I2S 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 USB to I2S 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 I2S Convertor is used in this environment, since there is no ground to be picked up from the attaching device (laptop), the RAKK USB to I2S Convertor must be grounded from the RAKK dac chassis. To accomplish this, a wire should be installed between the negative (–) terminal of the USB to I2S 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

Version	Description
1.1	Original document
2.0	(this document) Original supporting the MiniDSP version of the USB to I2S Convertor