

**raleigh
audio**

**USB to I2S
Converter**

Installation Manual

Version

Use this manual with the M2TOEM version 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

USB to I2S Converter and its associated components are produced by Raleigh Audio. You may contact us with questions by sending an e-mail message to support@raleighaudio.com

Table of Contents

Introduction	3
I2S Interface	3
TTL I2S Interface	3
LVDS I2S Interface	4
Power Requirement	4
Software Drivers.....	4
Back Panel Layout.....	5
Installation Instructions	6
Grounding.....	7
Document version history	8

Introduction

The USB to I2S Converter is based on the M2TOEM board, 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 IV 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 8V 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 IV 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 USB to I2S Converter 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 I2S Standard does not specify a physical interface and there are many different interfaces used. We provide a choice of two interface types; a standard TTL version and a standard LVDS version, one of which must be specified at order time.

TTL I2S Interface

The standard TTL version is designed to plug directly into the RAKK dac's I2S Input 4. It should be chosen when this adapter is the only one attached to the Input 4. The interface is implemented with a standard 3.3V logic family and is designed to operate into standard 3.3V or 5V logic families.

The interface is carried on a standard 10-pin digital ribbon cable with a connector on the end. The pin assignments are as follows:

pin 2	+BCK
pin 3	-BCK
pin 4	+LRCK
pin 5	-LRCK
pin 6	+Data
pin 7	-Data
pin 8	+MCLK (note)
pin 9	-MLCK (note)
pins 1, 10	USB to I2S Converter ground (not used for inter-board grounding)

Note: MCLK is not needed, nor is it used for the RAKK dac. Available on special order.

LVDS I2S Interface

The standard LVDS version is designed to plug into a RAKK I2S Receive board, which in turn is connected to Input 4 of the RAKK dac. This version should be chosen whenever two or three I2S interfaces are desired. Refer to the I2S Interface Products manual for further information on this interface.

The interface is carried on a standard 14-pin digital ribbon cable with a connector on the end. The pin assignments are as follows:

pin 9	+BCK
pin 8	-BCK
pin 5	+LRCK
pin 6	-LRCK
pin 12	+Data
pin 11	-Data
pin 2	+MCLK (note)
pin 14	-MLCK (note)
pin 1	reserved
pins 3, 4, 7, 10, 13	USB to I2S Converter ground (not used for inter-board grounding)

Note: MCLK is not needed, nor is it used for the RAKK dac. Available on special order.

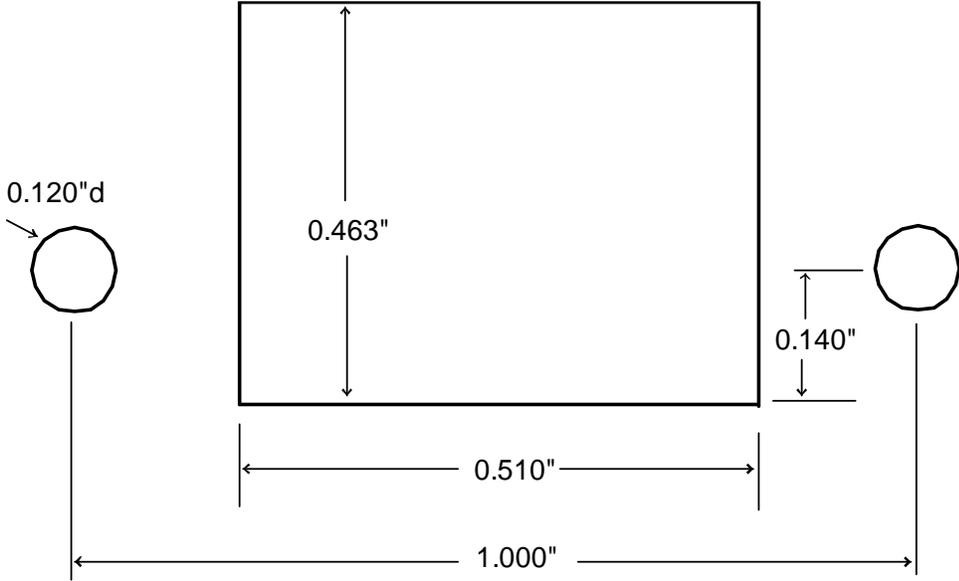
Power Requirement

The USB to I2S Converter requires 8V at 100mA.

Software Drivers

The USB to I2S Converter needs software drivers when used with Windows, Mac, or Unix operating systems. Go to [this page](#) and click on the “Drivers” tab.

Back Panel Layout



Note that this layout is slightly different from that of earlier designs. If you are upgrading from an earlier RAKK USB adapter, reverse the mounting brackets such that the end of the bracket that is now attached to the adapter board will be the end mounted to the panel.

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 IV.

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

2. Position the USB to I2S Converter, the RAKK dac and the power supply where they will be mounted but do not secure them in place yet.
-

3. Measure the distance between the interface on the USB to I2S Converter and the interface on the RAKK dac (I2S Receive board).

If the I2S ribbon cable was not cut to the required length at order time, you may optionally cut the cable to length and install a new cable connector. Do not re-use the original connector. (You may choose to test everything to make sure it works, and then re-terminate the cable)

Plug the cable into the RAKK dac (I2S Receive board)

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

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

Connect this twisted pair to the USB adapter and power supply, observing polarity.

5. 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.
-

6. Mount the boards in their locations and secure them in place.
-

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 Converter 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 Converter 5V power supply and the negative (-) terminal of the RAKK dac 10V (and 5V) 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 Converter is used in this environment, since there is no ground to be picked up from the attaching device (laptop), the RAKK USB to I2S Converter 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 Converter 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	Original supporting the MiniDSP version of the USB to I2S Converter
3.0	Original supporting the M2TOEM version of the USB to I2S Converter
3.1	Added mounting information
3.2	(this document) Added Sooftware driver information