MCHSTREAMER KIT

MCHSTREAMER BOX

MCHSTREAMER LITE

MULTI-CHANNEL MULTI-PROTOCOL USB AUDIO INTERFACE

User Manual

Revision history

Revision	Description	Date
1.0	First public release	8 March 2019
1.0a	Added 3rd party logos	2 July 2019
1.1	Updated TDM timing diagram	30 November 2019
1.2	Corrections to installation paths	8 December 2019
1.3	Updated DSD pinouts, XP and Vista no longer supported	10 December 2019
1.4	TDM Clarifications	2 July 2020
1.5	Updated support link	6 July 2020
1.6	Combined with MCHStreamer Lite	24 January 2022
1.7	Added MCHStreamer Box	16 January 2024

miniDSP

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IMPORTANT INFORMATION

Please read the following information before use. In case of any questions, please contact miniDSP via the support portal at support.minidsp.com.

SYSTEM REQUIREMENTS - WINDOWS

- 1GHz or higher processor clock speed recommended / Intel® Pentium®/Celeron® family, or AMD K6®/AMD Athlon®/AMD Duron® family, or compatible processor recommended.
- 512 megabytes (MB) of RAM or higher recommended
- One free USB 2.0 port
- Microsoft• ® Windows® Win7/Win8/Win10

SYSTEM REQUIREMENTS – MAC OS X

- Intel Core Duo processor or greater
- 256 megabytes (MB) of RAM or higher recommended
- One free USB 2.0 port
- OS X 10.8 (Mountain Lion) or later, macOS 10.12 (Sierra) or later

DISCLAIMER/WARNING

miniDSP cannot be held responsible for any damage that may result from the improper use or incorrect configuration of this product. Please read this manual carefully to ensure that you fully understand how to operate and use this product, as incorrect use or use beyond the parameters and ways recommended in this manual have the potential to cause damage to your audio system.

Please also note that many of the questions we receive at the technical support department are already answered in this User Manual and in the online application notes on the miniDSP.com website. So please take the time to carefully read this user manual and the online technical documentation. Thank you for your understanding!

WARRANTY TERMS

miniDSP Ltd warrants this product to be free from defects in materials and workmanship for a period of one year from the invoice date. Our warranty does not cover failure of the product due to incorrect connection or installation, improper or undocumented use, unauthorized servicing, modification or alteration of the unit in any way, or any usage outside of that recommended in this manual. If in doubt, contact miniDSP prior to use.

FCC CLASS B STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Warning: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Notice: Shielded interface cable must be used in order to comply with emission limits.

Notice: Changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

CE MARK STATEMENT

The MCHStreamer has passed the test performed according to European Standard EN 55022 Class B.

A NOTE ON THIS MANUAL

This User Manual is designed for reading in both print and on the computer. If printing the manual, please print double-sided. The embedded page size is 8 1-2" x 11". Printing on A4 paper will result in a slightly reduced size.

For reading on the computer, we have included hyperlinked cross-references throughout the manual. In addition, a table of contents is embedded in the PDF file. Displaying this table of contents will make navigation much easier:

- In Adobe Reader on Windows, click on the "bookmarks" icon at the left. The table of contents will appear on the left and can be unfolded at each level by clicking on the "+" icons.
- In Preview on the Mac, click on the **View** menu and select **Table of Contents**. The table of contents will appear on the left and can be unfolded at each level by clicking on the triangle icons.

1 PRODUCT OVERVIEW

Thank you for purchasing a miniDSP *MCHStreamer* USB audio interface. The MCHStreamer is a flexible USB audio interface with a range of connectivity and protocol options for external devices, including optical (TOSLINK or ADAT), SPDIF, I2S, TDM, PDM, and DSD. There are three versions:

- The **MCHStreamer Kit** is a bare board that has a pair of optical ports that can be used for TOSLINK or ADAT I/O, a pair of headers for SPDIF I/O, and PCB headers that support several logic-level I/O data formats: I2S, TDM, PDM, and DSD.

- The **MCHStreamer Lite** is the same as the Kit version but lacks the optical and SPDIF inputs. Thus, it has an optical output port that can be used for TOSLINK or ADAT I/O, a header for SPDIF output, and PCB headers that support several logic-level input/output data formats: I2S, TDM, PDM, and DSD.

- The **MCHStreamer Box** is a boxed version that has a USB interface and two optical ports. (SPDIF and logic-level IO are not accessible.)

The MCHStreamer can be used in several modes by loading different firmware:

- TOSLINK optical stereo in and out (Kit and Box) or TOSLINK optical stereo out (Lite), 44.1 to 192 kHz

- SPDIF stereo in and out (Kit) or SPDIF stereo out (Lite), 44.1 to 192 kHz

- 8 ADAT channels at 44.1 and 48 kHz) or 4 ADAT channels at 88.2 and 96 kHz, with automatic conversion to logic-level I2S. MCHStreamer Kit and Box support input and output while MCHStreamer Lite supports output only.

- I2S 8-channel in and out, 8 kHz to 384 kHz (Kit and Lite)

- DSD stereo and 8-channel out at DSD64, DSD128 and DSD256 (Kit and Lite)

- TDM input and output up to 96 kHz, up to 24 channels (Kit and Lite)

- PDM 16-channel input with automatic conversion to logic-level I2S (Kit and Lite)

Most firmware versions include files with two different IDs. If two MCHStreamers are to be connected to the same computer, make sure that each has firmware with a different ID.

Typical applications for the MCHStreamer include hi-fi systems and recording studios. The Kit and Lite versions can be built into multichannel DACs, ADCs and digital audio interfaces, with connection via the I2S headers.
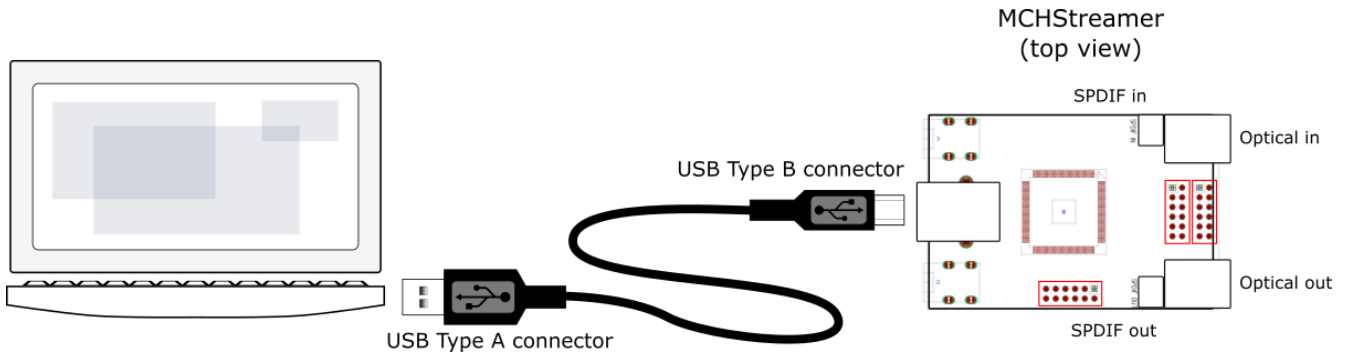
A note on terminology

In this manual, the term "MCHStreamer" will be used to refer to all versions, while the terms "MCHStreamer Kit," MCHStreamer Box" and "MCHStreamer Lite" refer to the specific version.
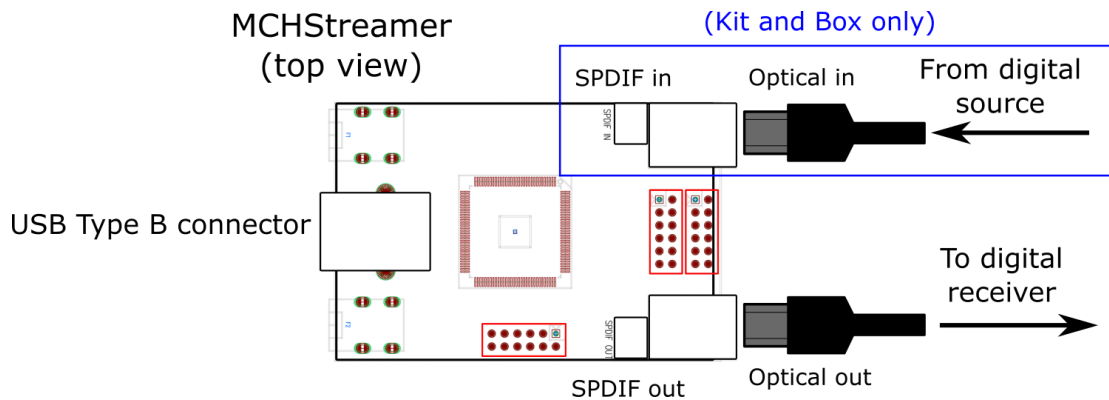
2 CONNECTIVITY

2.1 USB (ALL VERSIONS)

Connect as shown. The USB port provides power and computer connectivity.

2.2 OPTICAL (ALL VERSIONS)

The optical ports support TOSLINK or ADAT, depending on the firmware loaded.
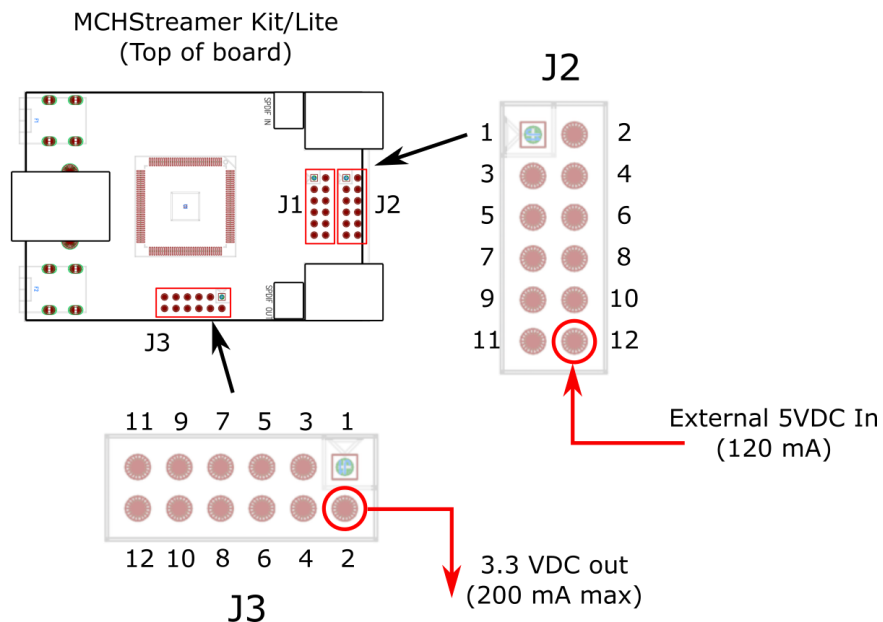
2.3 SPDIF (KIT AND LITE)

The SPDIF I/O is accessed with a pair of two-pin headers adjacent to the optical ports. These are normal consumer-level (0.5V) lines, so additional circuitry for level shifting is not required. Note however that these lines are not galvanically isolated.
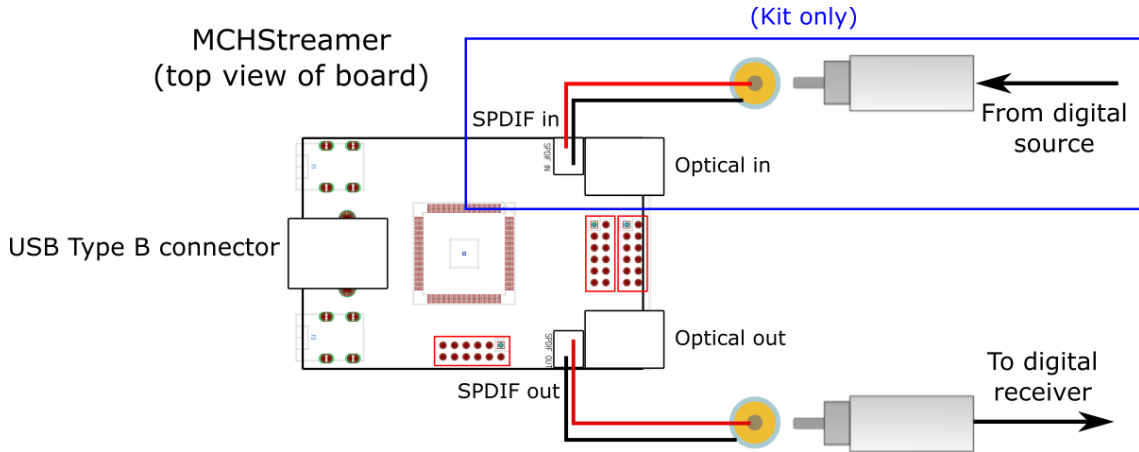
2.4 EXTERNAL POWER (KIT AND LITE)

External 5V DC power can be connected to the MCHStreamer Kit and Lite versions via pin 12 of J2. This pin is connected with a "diode-or" connection to the power line from the USB port. Supplying 5V DC to this pin will therefore ensure that the MCHStreamer board remains powered on even when no USB device is connected. The MCHStreamer board consumes no more than 120 mA from this pin, plus any additional current draw required for pin 2 of J3.

The MCHStreamer board can supply external circuitry with 3.3 V from pin 2 of J3. The maximum current draw allowed on this pin is 200 mA.

2.5 LOGIC-LEVEL I/O (KIT AND LITE)

2.5.1 Overview

In addition to the optical and SPDIF interfaces described above, the MCHStreamer Kit and Lite circuit boards provide a wealth of different data formats as logic-level signals:

- I2S, or Inter-IC Sound, is used to carry PCM digital audio between digital chips (ICs) and circuit boards. The MCHStreamer board provides up to 8 channels of I2S input and 8 channels of I2S output.
- TDM, or Time domain multiplexing, is a format used by some ADC and DAC chips to carry multiple channels on a single data line. This can reduce layout complexity and/or allow a greater number of channels.
- PDM, or Pulse density modulation, is commonly used by microphone arrays to efficiently carry a large number of channels at relatively low sample rates.
- DSD, or Direct Stream Digital™, is a high-rate single-bit modulation and storage scheme that is used by some audiophile ADCs and DACs. It is used to play back DSD files.

Please note that logic-level connectivity is intended for professional engineers or **advanced** DIY users only. You will need the knowledge to understand digital clocking and wiring and have access to the equipment necessary to be able to debug any issues you may run into. (While miniDSP always tries to help its customers, it is infeasible for us to debug your circuit and wiring for you.)

Be sure to take the following precautions when designing your logic-level interface and wiring:

General usage notes

- Unbuffered lines must be kept short to ensure clock and data integrity.
- If driving longer lines, buffers may be required for the clock signals (MCLK, LRCLK, and BLCK).
- Observe correct grounding and shielding, and keep analog and digital grounds separated.
- Ensure that the clock frequencies and ratios as listed on later pages are compatible with connected circuits.

Clock master

The MCHStreamer board always operates as clock master – that is, the clock lines are always outputs. The connected circuitry must therefore use the clocks provided by the MCHStreamer board.

3.3V logic level

All lines use a 3.3V logic level. Ensure that connected circuits use a compatible level (1.8V, for example, will not work).

2.5.2 Headers and pinouts

The MCHStreamer board has three 12-pin headers for logic-level I/O, as shown in Figure 1 below. Most data lines are on header J1, while J2 carries auxiliary signaling and GPIO lines reserved for future enhancement. J3 is used only for PDM format. Two cables terminated with suitable (2x6, 2mm pitch) 12-pin headers are supplied with the MCHStreamer boards.

Table 1 lists the default pinouts. Note that these vary with the specific firmware loaded. See Section 3 for full details.

All lines are 3.3V logic levels. Connected circuits must use a compatible logic level.
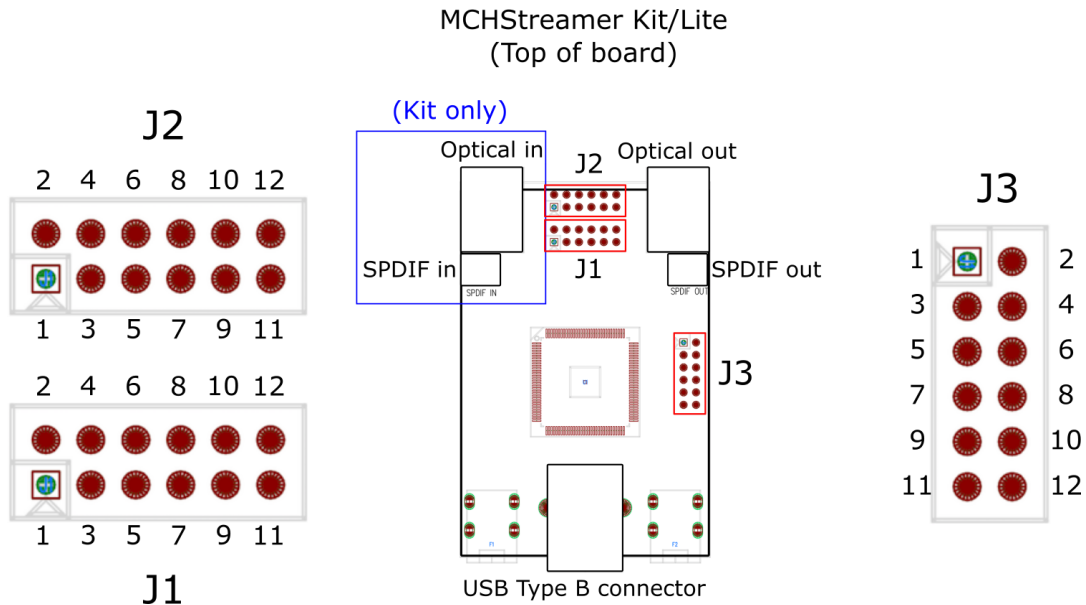

Figure 1. MCHStreamer Kit and Lite board layout

Table 1. Sample pinouts (See Section 3 for details)

J1 (I2S mode)		J2		J3	
Pin	Description	Pin	Description	Pin	Description
1	I2S data OUT Ch 1&2	1	Ground (GND)	1	GND
2	I2S data IN Ch 1&2	2	NC	2	3.3V
3	I2S data OUT Ch 3&4	3	Ground (GND)	3	PDM 1-2
4	I2S data IN Ch 3&4	4	NC	4	PDM 3-4
5	I2S data OUT Ch 5&6	5	NC	5	PDM 5-6
6	I2S data IN Ch 5&6	6	GPIO (future)	6	PDM 7-8
7	I2S data OUT Ch 7&8	7	GPIO (future)	7	PDM 9-10
8	I2S data IN Ch 7&8	8	RST (negative low)	8	PDM 11-12
9	Master clock (MCLK OUT)	9	GPIO (future)	9	PDM 13-14
10	Bit clock out (BCLK)	10	GPIO (future)	10	PDM 15-16
11	Ground (GND)	11	Ground (GND)	11	PDM CLK
12	I2S frame sync (LRCLK)	12	5V external power	12	PDM CLK2

2.5.3   I2S

2.5.3.1   Clocks

I2S has three clock lines. These clocks are always **outputs**. The connected circuitry must therefore be set to run in slave mode and accept its clocks from the MCHStreamer board.

MCLK   The master clock for both playback and recording. This pin is always an output. Connected circuitry can choose whether or not to use it.

LRCLK   The frame synchronization clock, also known as the word clock. This clock is equal to the sampling frequency (Fs) of the audio signal. This pin is always an output.

BCLK   The bit clock (also known as shift clock or system clock). This is always equal to 64 x Fs. This pin is always an output.

Table 2 summarizes the relation between the clocks. Be sure to double-check that connected circuitry will accept the clocks at the frequencies and ratios listed.

Table 2. I2S clocks

Sample rate (LRCLK)	Master clock (MCLK)	Bit clock (BCLK)	MCLK/LRCLK	BCLK/LRCLK
8 kHz	24.576 MHz	512 kHz	3072	64
11.025 kHz	22.5792 MHz	705.6 kHz	2048	64
12 kHz	24.576 MHz	768 kHz	2048	64
16 kHz	24.576 MHz	1024 kHz	1536	64
32 kHz	24.576 MHz	2.048 MHz	768	64
44.1 kHz	22.5792 MHz	2.822 MHz	512	64
48 kHz	24.576 MHz	3.072 MHz	512	64
88.2 kHz	22.5792 MHz	5.6448 MHz	256	64
96 kHz	24.576 MHz	6.144 MHz	256	64
176.4 kHz	22.5792 MHz	11.2896 MHz	128	64
192 kHz	24.576 MHz	12.288 MHz	128	64
352.8 kHz	22.5792 MHz	22.5792 MHz	64	64
384 kHz	24.576 MHz	24.576 MHz	64	64

2.5.3.2 Timing

Each I2S data line carries two audio channels. The MCHStreamer uses up to four lines for input data and four lines for output data, depending on the firmware loaded. Input lines are always treated as 24-bit, while output lines can be 16-, 24- or 32-bit. The I2S data format and timing is shown in Figure 2 (only channels 1-4 shown).
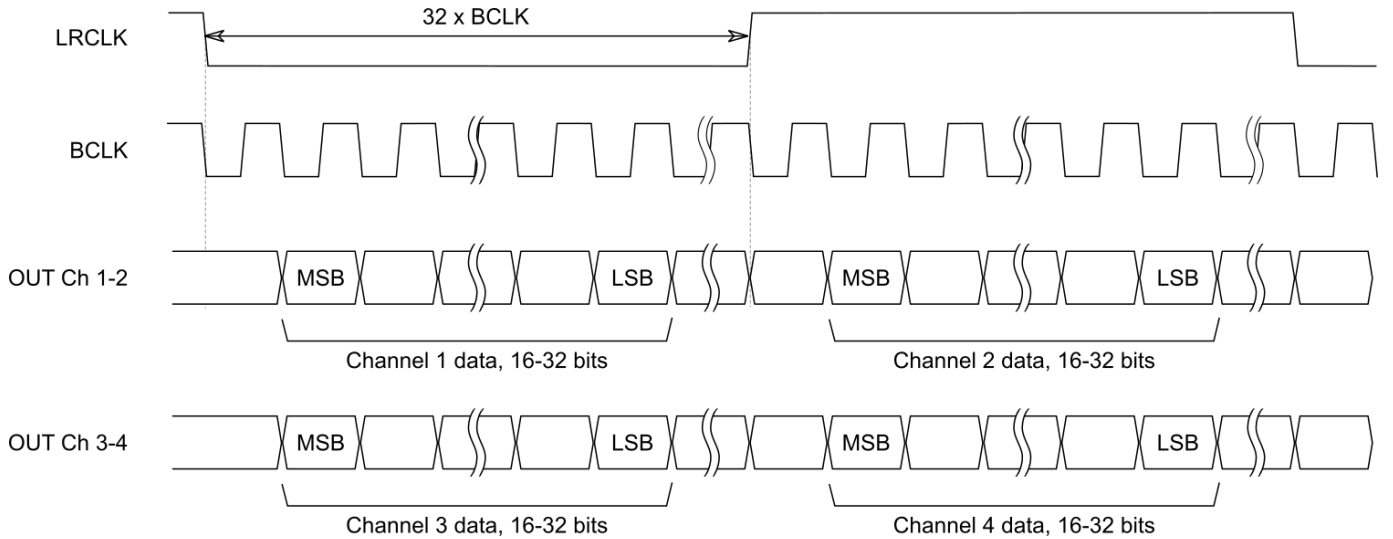

Figure 2. I2S timing

2.5.4   TDM

2.5.4.1   Clocks

TDM has three clock lines. These clocks are always **outputs**. The connected circuitry must therefore be set to run in slave mode and accept its clocks from the MCHStreamer board.

MCLK   The master clock for both playback and recording. This pin is an output only.

FSYNC   The frame synchronization clock. This clock is equal to the sample rate and corresponds to eight 32-bit words. This pin is an output only.

BCLK   The bit clock (also known as shift clock or system clock). This is always equal to 256 x Fs. This pin is an output only.

BCLK (inv)   This is the inverted BLCK, which is required by some TDM hardware. This pin is an output only.

Table 3 summarizes the clocks for the supported sample rates. Be sure to double-check that connected circuitry will accept the clocks at the frequencies listed.

Note that 96kHz is only supported for the TDM8 and TDM16 firmware. TDM24 only supports 44.1/48kHz due to bandwidth limitations of the USB protocol.

Table 3. TDM clocks

Sample rate	Frame Sync (FSYNC)	Master clock (MCLK)	Bit clock (BCLK)
44.1 kHz	44.1 kHz (one short)	22.5792 MHz	11.2896 MHz
48 kHz	48 kHz (one short)	24.576 MHz	12.288 MHz
88.2 kHz	88.2 kHz (one short)	22.5792 MHz	22.5792 MHz
96 kHz	96 kHz (one short)	24.576 MHz	24.576 MHz

2.5.4.2 Timing

Each TDM data line carries eight audio channels. The MCHStreamer uses up to three lines for input data and up to three lines for output data, depending on the firmware loaded. Input lines are always treated as 24-bit, while output lines can be 24- or 32-bit. The TDM data format and timing is shown in Figure 3.
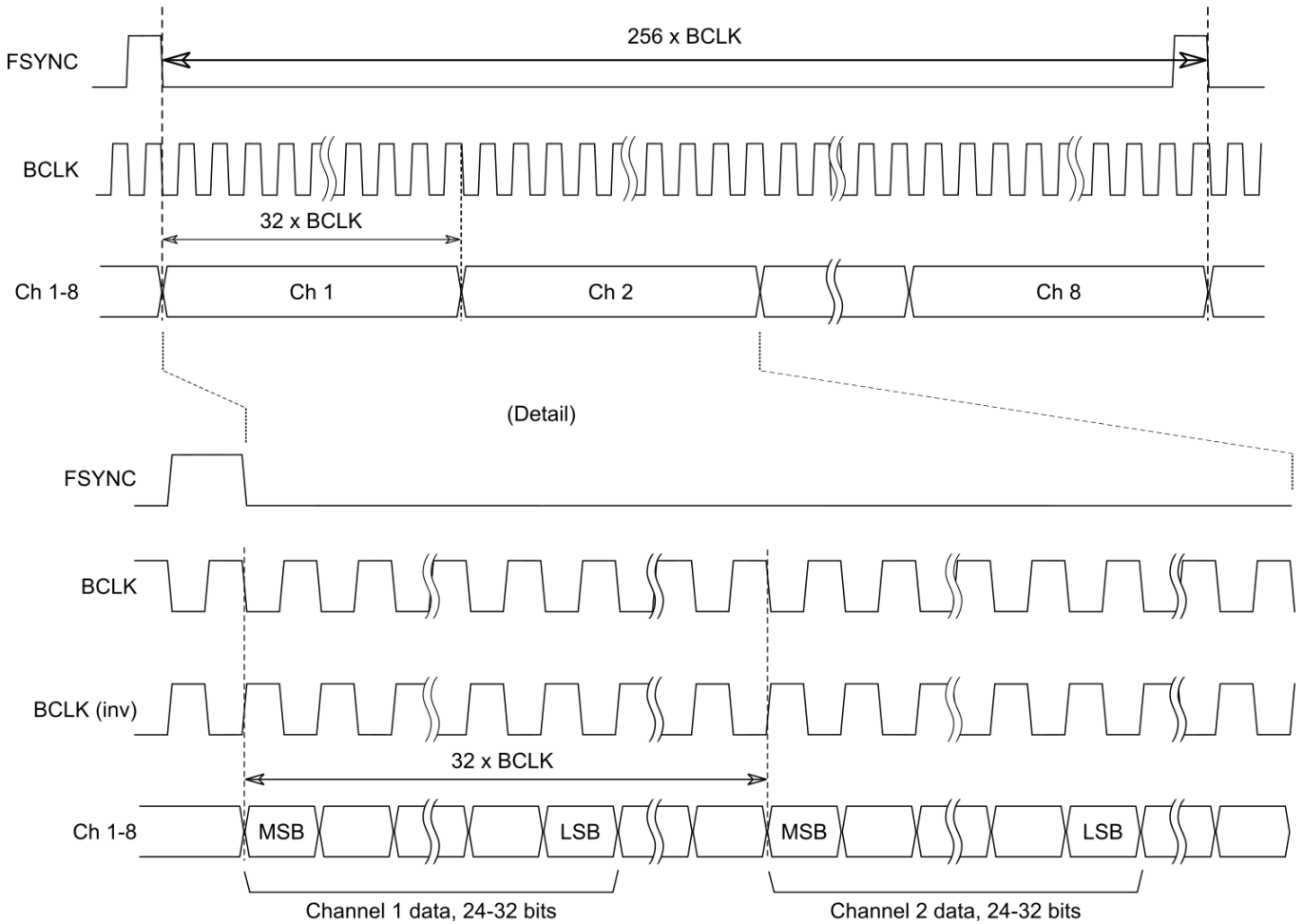

Figure 3. TDM timing

2.5.5 PDM

2.5.5.1 Clocks

PDM has a single clock, which is duplicated on two output lines (PDM_CLK and PDM_CLK2). These clocks are always **outputs**. The connected circuitry must therefore be set to run in slave mode and accept its clocks from the MCHStreamer board.

PDM CLK/CLK2   The bit clock. Data for the left channel is taken on the falling edge and data for the right channel is taken on the rising edge.

Table 4 summarizes the clocks for the supported effective sample rates. Be sure to double-check that connected circuitry will accept the clocks at the frequencies listed.

Table 4. PDM clocks

Sample rate	PDM_CLK	PDM_CLK2
8 kHz	3.072 MHz	3.072 MHz
11.025 kHz	2.8224 MHz	2.8224 MHz
16 kHz	3.072 MHz	3.072 MHz
32 kHz	3.072 MHz	3.072 MHz
44.1 kHz	2.8224 MHz	2.8224 MHz
48 kHz	3.072 MHz	3.072 MHz

2.5.5.2 Timing

Each PDM input data line carries two audio channels. The left and right channels are clocked as shown in Figure 4 (only channels 1-4 shown). Input data is always presented to the computer as a 24-bit word. There are eight input data lines, for a total of 16 audio channels.
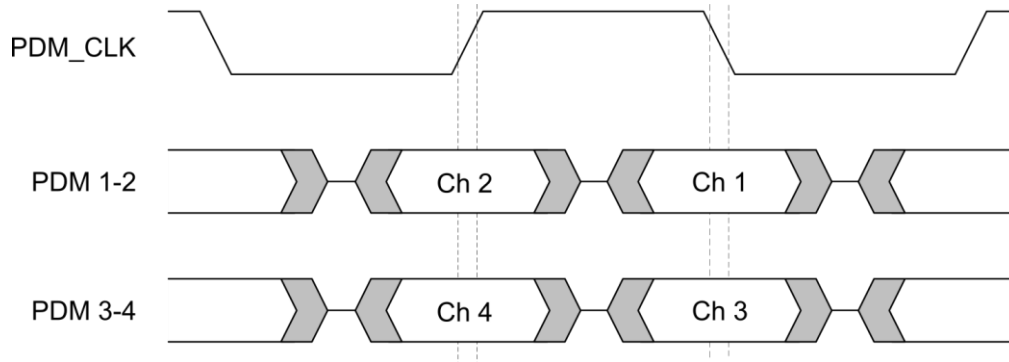

Figure 4. PDM timing

2.5.6 DSD

2.5.6.1 Clocks

DSD has two clock lines. These clocks are always **outputs**. The connected circuitry must therefore be set to run in slave mode and accept its clocks from the MCHStreamer board.

MCLK   The master clock for both playback and recording. This pin is an output only.

BCLK   The bit clock. This clock corresponds to the bit rate of the DSD signal i.e. 64 x 44100 Hz for DSD64, and so on.

Table 5 summarizes the clocks for the supported data rates. Be sure to double-check that connected circuitry will accept the clocks at the frequencies listed.

Table 5. DSD clocks

DSD rate	MCLK	BCLK
DSD64	22.5792 MHz	2.8224 MHz
DSD128	22.5792 MHz	5.6448 MHz
DSD256	22.5792 MHz	11.2896 MHz

2.5.6.2 Timing

Each DSD output line carries a single channel modulated at the bit clock rate. The clock and data timing are illustrated in Figure 5 (only channels 1 and 2 shown).
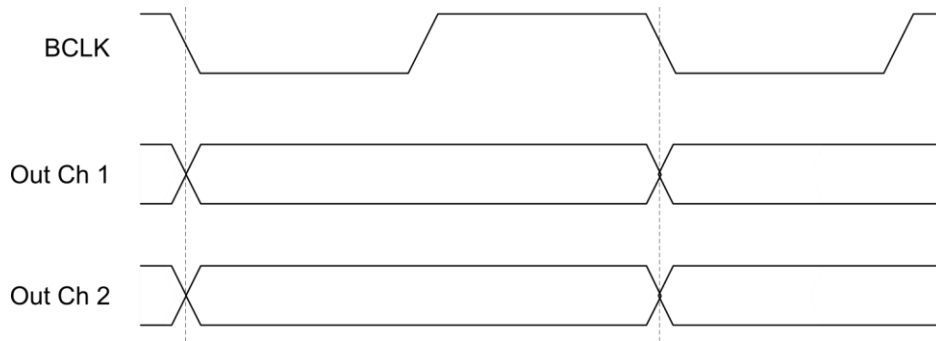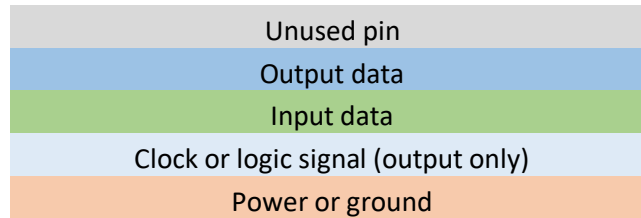

Figure 5. DSD timing

3 FIRMWARE VERSIONS

This section provides the signal flow and pinouts for all firmware versions. See Sections 4.3 and 5.2 for information on loading firmware. The pinout tables are color-coded to aid in identifying the type of signal:

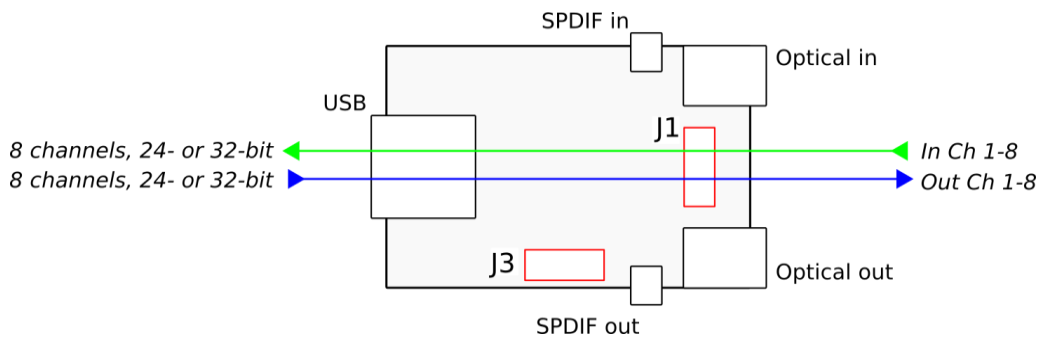| |
|---|
| Unused pin |
| Output data |
| Input data |
| Clock or logic signal (output only) |
| Power or ground |

3.1 ALLRATE (KIT AND LITE)

Figure 6. AllRate firmware signal flow

The AllRate firmware supports 8 channels of input and output over I2S. All possible sample rates are supported, from 8 to 384 kHz (see page 27). The optical and SPDIF ports are not used.

Table 6. AllRate firmware pinouts

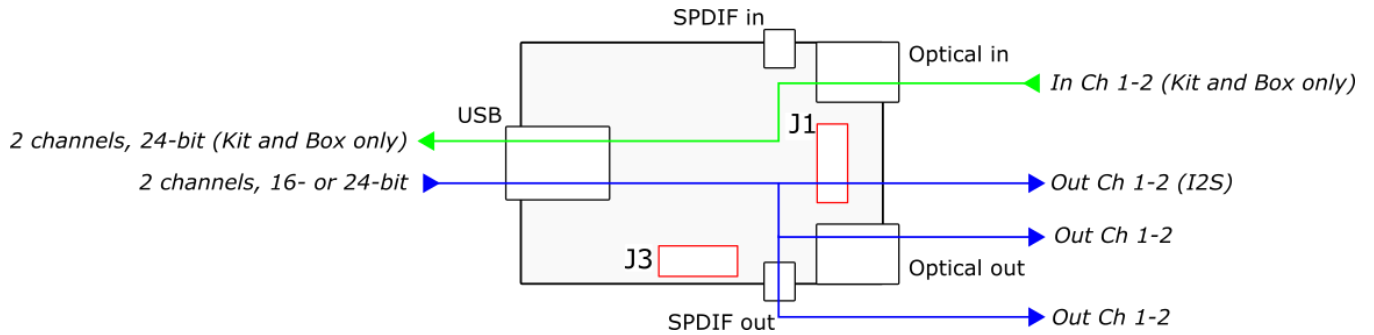| J1 pin	
1	Out Ch 1-2
2	In Ch 1-2
3	Out Ch 3-4
4	In Ch 3-4
5	Out Ch 5-6
6	In Ch 5-6
7	Out Ch 7-8
8	In Ch 7-8
9	MCLK
10	BCLK
11	GND
12	LRCLK

3.2 TOSLINK_Only (Kit, Box and Lite)

Figure 7. TOSLINK_Only firmware signal flow

MCHStreamer Kit and Box

The TOSLINK_Only firmware supports two input channels and two output channels at 44.1, 48, 88.2, 96, 176.4 and 192 kHz. The input channels are received on the optical input as TOSLINK and made available to the computer over USB. The two output channels from the computer are sent to J1 as I2S, the optical output and the SPDIF output.

By default, the MCHStreamer Kit or Box uses its internal clock source. If a TOSLINK input is provided, the UAC2 Control Panel (Windows) or Audio MIDI Setup (Mac) can select that input as the clock source. In that case, the I2S clocks will be synthesized from that clock source.

MCHStreamer Lite

The TOSLINK_Only firmware supports two output channels at 44.1, 48, 88.2, 96, 176.4 and 192 kHz. These channels are sent to J1 as I2S, the optical output and the SPDIF output.

Table 7. TOSLINK_Only firmware pinouts

J1 pin	
1	Out Ch 1-2
2	—
3	—
4	—
5	—
6	—
7	—
8	—
9	MCLK
10	BCLK
11	GND
12	LRCLK

![miniDSP logo]

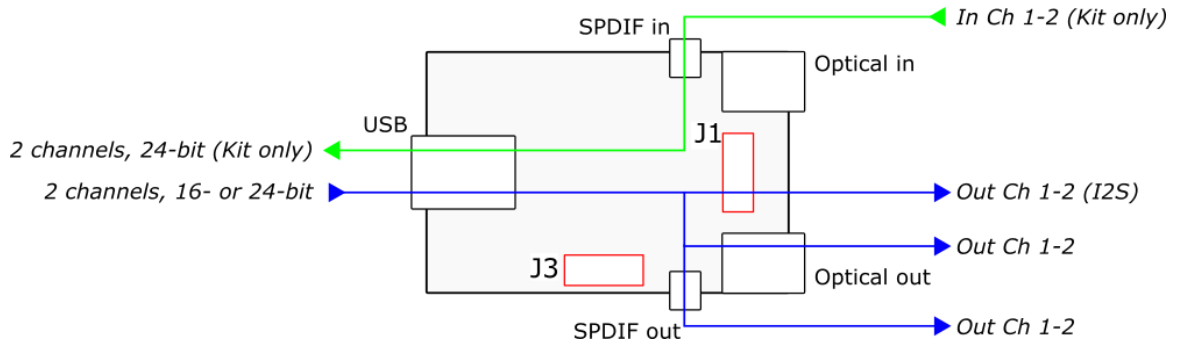## 3.3 SPDIF_ONLY (KIT AND LITE)

Figure 8. SPDIF_Only firmware signal flow

MCHStreamer Kit

The SPDIF_Only firmware supports two input channels and two output channels at 44.1, 48, 88.2, 96, 176.4 and 192 kHz. The input channels are received on the SPDIF input and made available to the computer over USB. The two output channels from the computer are sent to J1 as I2S, the optical output and the SPDIF output.

By default, the MCHStreamer Kit uses its internal clock source. If an SPDIF input is provided, UAC2 Control Panel (Windows) or Audio MIDI Setup (Mac) can select that input as the clock source. In that case, the I2S clocks will be synthesized from the received clock.

MCHStreamer Lite

The SPDIF_Only firmware supports two output channels at 44.1, 48, 88.2, 96, 176.4 and 192 kHz. The two output channels from the computer are sent to J1 as I2S, the optical output and the SPDIF output.

Table 8. SPDIF_Only firmware pinouts

J1 pin	
1	Out Ch 1-2
2	—
3	—
4	—
5	—
6	—
7	—
8	—
9	MCLK
10	BCLK
11	GND
12	LRCLK

![miniDSP logo]

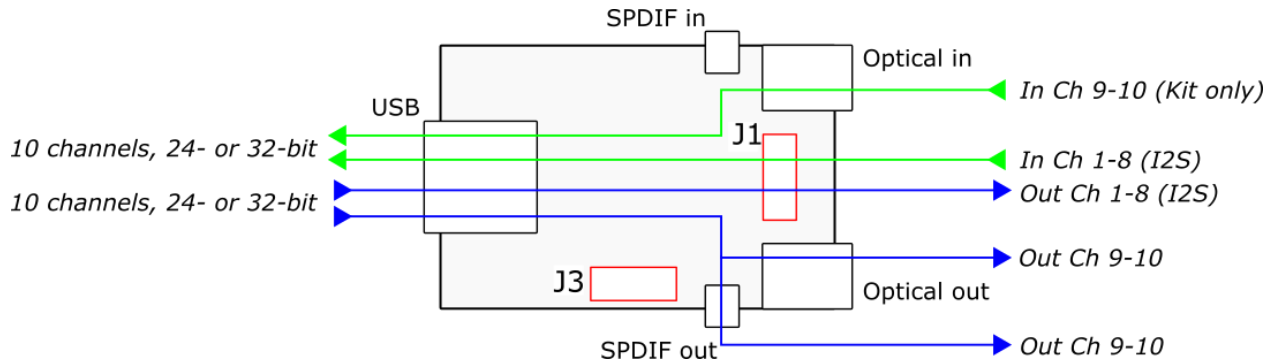## 3.4 I2S_TOSLINK (KIT AND LITE)

Figure 9. I2S_TOSLINK firmware pinouts

MCHStreamer Kit

The I2S_TOSLINK firmware supports ten input channels and ten output channels at 44.1, 48, 88.2, 96, 176.4 and 192 kHz. Input channels 1-8 are received on J1 as I2S and input channels 9-10 are received on the optical input as TOSLINK. Output channels 1-8 from the computer are send to J1 as I2S while output channels 9-10 are sent to both the optical output and the SPDIF output.

By default, the MCHStreamer Kit uses its internal clock source. If a TOSLINK input is provided, UAC2 Control Panel (Windows) or Audio MIDI Setup (Mac) can select that input as the clock source. In that case, the I2S clocks will be synthesized from the received clock.

MCHStreamer Lite

The I2S_TOSLINK firmware supports eight input channels and ten output channels at 44.1, 48, 88.2, 96, 176.4 and 192 kHz. Input channels 1-8 are received on J1 as I2S. Output channels 1-8 from the computer are send to J1 as I2S while output channels 9-10 are sent to both the optical output and the SPDIF output.

Table 9. I2S_TOSLINK firmware pinouts

J1 pin	
1	Out Ch 1-2
2	In Ch 1-2
3	Out Ch 3-4
4	In Ch 3-4
5	Out Ch 5-6
6	In Ch 5-6
7	Out Ch 7-8
8	In Ch 7-8
9	MCLK
10	BCLK
11	GND
12	LRCLK

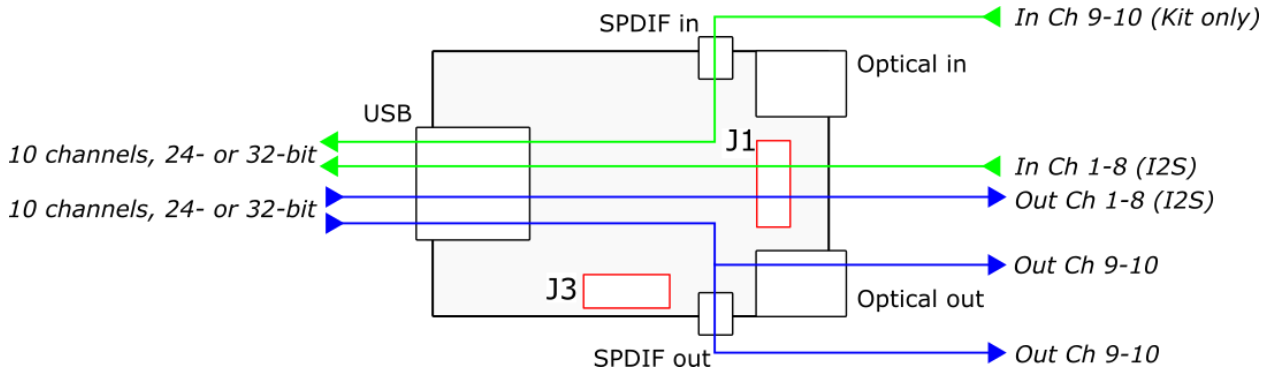![miniDSP logo]

3.5 I2S_SPDIF (KIT AND LITE)

Figure 10. I2S_SPDIF firmware signal flow

MCHStreamer Kit

The I2S_SPDIF firmware supports ten input channels and ten output channels at 44.1, 48, 88.2, 96, 176.4 and 192 kHz. Input channels 1-8 are received on J1 as I2S and input channels 9-10 are received on the SPDIF input. Output channels 1-8 from the computer are send to J1 as I2S while output channels 9-10 are sent to both the optical output and the SPDIF output.

By default, the MCHStreamer Kit uses its internal clock source. If an SPDIF input is provided, UAC2 Control Panel (Windows) or Audio MIDI Setup (Mac) can select that input as the clock source. In that case, the I2S clocks will be synthesized from the received clock.

MCHStreamer Lite

The I2S_SPDIF firmware supports eight input channels and ten output channels at 44.1, 48, 88.2, 96, 176.4 and 192 kHz. Input channels 1-8 are received on J1 as I2S. Output channels 1-8 from the computer are send to J1 as I2S while output channels 9-10 are sent to both the optical output and the SPDIF output.

Table 10. I2S_SPDIF firmware pinouts

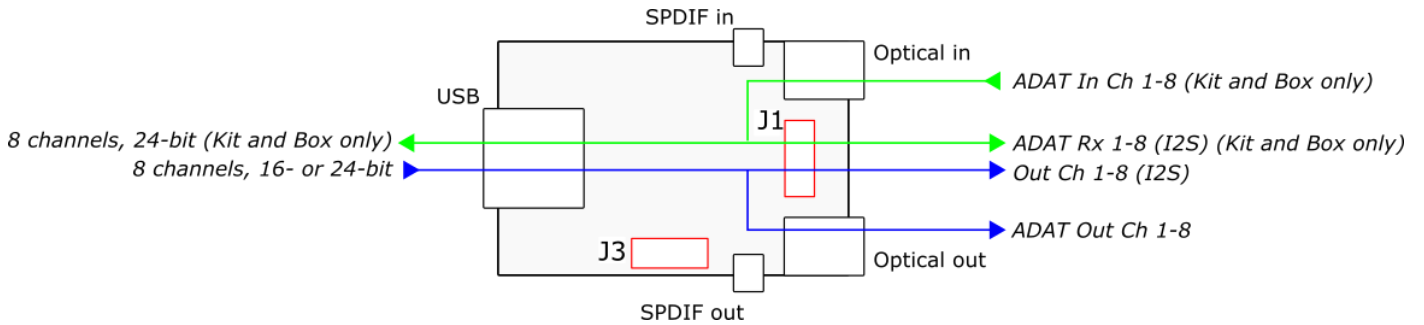| J1 pin	
1	Out Ch 1-2
2	In Ch 1-2
3	Out Ch 3-4
4	In Ch 3-4
5	Out Ch 5-6
6	In Ch 5-6
7	Out Ch 7-8
8	In Ch 7-8
9	MCLK
10	BCLK
11	GND
12	LRCLK

3.6 ADAT (KIT, BOX AND LITE)

Figure 11. ADAT firmware signal flow

MCHStreamer Kit and Box

At 44.1 and 48 kHz, the ADAT firmware receives 8 channels on the optical input and mirrors these in I2S format on J1. The inputs are available to the computer over USB. Eight output channels from the computer are transmitted as ADAT on the optical output and as I2S on J1.

At 88.2 and 96 kHz, only 4 channels are received and transmitted. (Although the USB interface will state 8 channels, only the first four can be used.)

By default, the MCHStreamer Kit or Box uses its internal clock source. If an ADAT input is provided, UAC2 Control Panel (Windows) or Audio MIDI Setup (Mac) can select that input as the clock source. In that case, the I2S clocks will be synthesized from the received clock.

MCHStreamer Lite

At 44.1 and 48 kHz, eight output channels from the computer are transmitted as ADAT on the optical output and as I2S on J1.

At 88.2 and 96 kHz, only 4 channels are transmitted. (Although the USB interface will state 8 channels, only the first four can be used.)

Table 11. ADAT firmware pinouts

J1 pin	
1	ADAT Rx 1-2
2	Out 1-2
3	ADAT Rx 3-4
4	Out 3-4
5	ADAT Rx 5-6[*]
6	Out 5-6[*]
7	ADAT Rx 7-8[*]
8	Out 7-8[*]
9	MCLK
10	BCLK
11	GND
12	LRCLK

[*] Channels 5 to 8 are active only at 44.1 and 48 kHz.

![miniDSP logo]
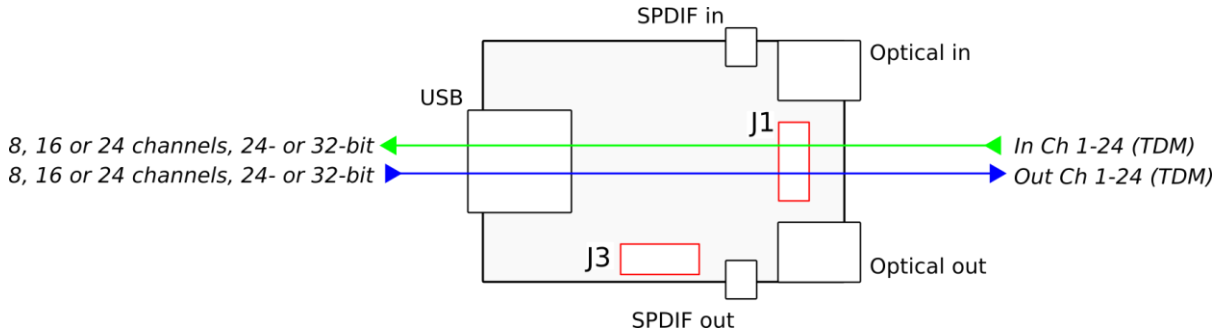
3.7 TDM (KIT AND LITE)

Figure 12. TDM firmware signal flow

The TDM firmware supports 8, 16, or 24 input and output channels, depending on the loaded firmware. Supported sample rates are 44.1, 48, 88.1 and 96 kHz for 8 and 16 channels, and 44.1 and 48 kHz for 24 channels. See page 13 for waveforms and clock timing. Each active data line on J1 carries 8 channels.

Note that the inverted BLCK, if required, is on J3, not on J1.

Note that 96kHz is only supported for the TDM8 and TDM16 firmware. TDM24 only supports 44.1/48kHz due to bandwidth limitations of the USB protocol.

Table 12. TDM firmware pinouts

J1 pin	TDM8	TDM16	TDM24 (44.1/48k)
1	Out Ch 1-8	Out Ch 1-8	Out Ch 1-8
2	In Ch 1-8	In Ch 1-8	In Ch 1-8
3	—	Out Ch 9-16	Out Ch 9-16
4	—	In Ch 9-16	In Ch 9-16
5	—	—	Out Ch 17-24
6	—	—	In Ch 17-24
7	—	—	—
8	—	—	—
9	MCLK	MCLK	MCLK
10	BCLK	BCLK	BCLK
11	GND	GND	GND
12	FSYNC	FSYNC	FSYNC

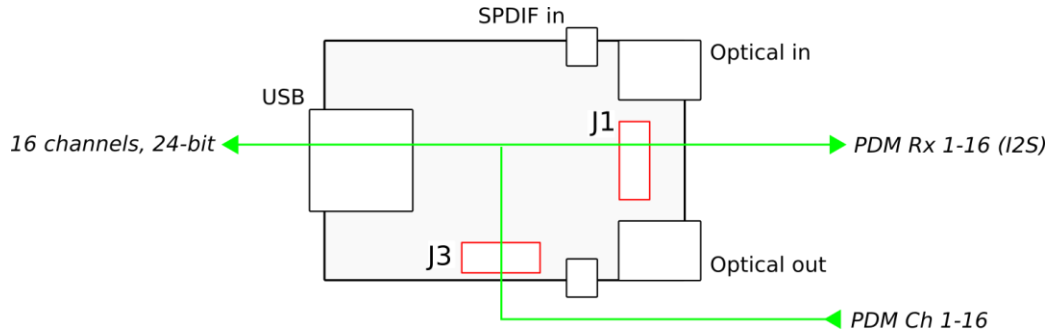| J3 pin	TDM8	TDM16	TDM24
11	BCLK (inv)	BCLK (inv)	BCLK (inv)

3.8 PDM (KIT AND LITE)

Figure 13. PDM firmware signal flow

The PDM firmware supports 16 input channels at 8, 11.025, 12, 16, 32, 44.1 and 48 kHz. PDM input data is received on J3, with two channels per physical data line as described on page 15. These 16 channels are mirrored in I2S format on J1 and are also received by the computer over USB.

Table 13. PDM firmware pinouts

J1 pin		J3 pin	
1	PDM Rx 1-2	1	GND
2	PDM Rx 9-10	2	3.3V
3	PDM Rx 3-4	3	PDM 1-2
4	PDM Rx 11-12	4	PDM 3-4
5	PDM Rx 5-6	5	PDM 5-6
6	PDM Rx 13-14	6	PDM 7-8
7	PDM Rx 7-8	7	PDM 9-10
8	PDM Rx 15-16	8	PDM 11-12
9	MCLK	9	PDM 13-14
10	BCLK	10	PDM 15-16
11	GND	11	PDM CLK
12	LRCLK	12	PDM CLK2

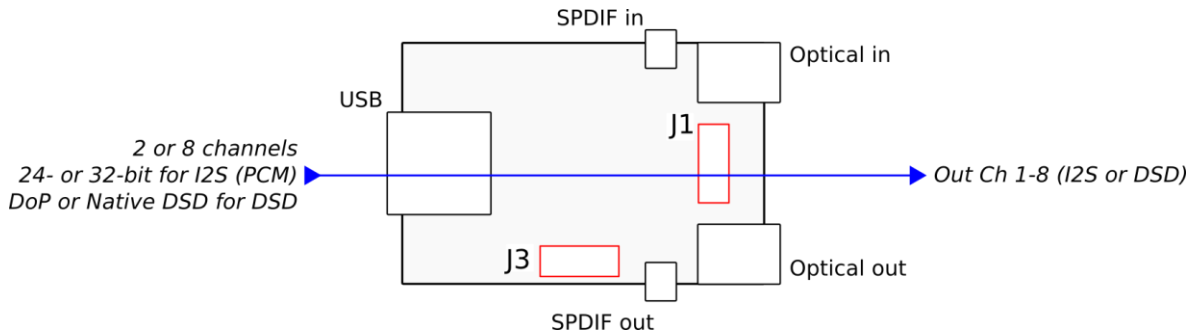![miniDSP logo]

3.9   DSD (KIT AND LITE)

Figure 14. DSD firmware signal flow

There are two versions of the DSD firmware, one supporting stereo output and one supporting 8-channel output. Each operates in two modes: I2S and DSD.

- If the computer (via the music player program) sends PCM data, PCM data in I2S format is output on J1. See pages 11 and 12 for clock and timing information. As usual for I2S, two channels are multiplexed onto each physical pin. In PCM mode, sample rates from 44.1 to 384 kHz are supported. Pin 8 of J1 outputs logic-level 0.

- If the computer (via the music player program) sends DSD data either in native DSD format or DoP (DSD over PCM), then bitstream outputs are provided on J1, with each physical pin carrying a single channel. Native DSD supports DSD64, DSD128 and DSD256 rates while DoP supports DSD64 and DSD128. See page 16 for clock and timing information. Pin 8 of J1 outputs logic-level 1.

On Windows, the music player program will typically have a setting to enable either DoP or DSD bitstream output via the miniDSP ASIO driver. On Mac, native DSD is not supported, so the music player will need to be set to send DoP when playing DSD files.

Table 14. DSD firmware pinouts

J1 pin	PCM mode		DSD mode	
	0i2o_DSD	0i8o_DSD	0i2o_DSD	0i8o_DSD
1	Out Ch 1-2	Out Ch 1-2	Out Ch 2	Out Ch 2
2	—	—	—	Out Ch 6
3	—	Out Ch 3-4	—	Out Ch 3
4	—	—	—	Out Ch 7
5	—	Out Ch 5-6	—	Out Ch 4
6	—	—	—	Out Ch 8
7	—	Out Ch 7-8	—	Out Ch 5
8	Logic 0	Logic 0	Logic 1	Logic 1
9	MCLK	MCLK	MCLK	MCLK
10	BCLK	BCLK	BCLK	BCLK
11	GND	GND	GND	GND
12	LRCLK	LRCLK	Out Ch 1	Out Ch 1

3.10 SAMPLE RATE SUMMARY

Sample Rate	SPDIF_Only	TOSLINK_Only	I2S_SPDIF	I2S_TOSLINK	ADAT	TDM 8	TDM 16	TDM 24
44100	Y	Y	Y	Y	Y	Y	Y	Y
48000	Y	Y	Y	Y	Y	Y	Y	Y
88200	Y	Y	Y	Y	Y[1]	Y	Y	
96000	Y	Y	Y	Y	Y[1]	Y	Y	
176400	Y	Y	Y	Y				
192000	Y	Y	Y	Y				

Sample Rate	AllRate	0i2o_DSD (PCM)	0i8o_DSD (PCM)	0i2o_DSD (DSD)	0i8o_DSD (DSD)	PDM
8000	Y					Y
11025	Y					Y
12000	Y					Y
16000	Y					Y
32000	Y					Y
44100	Y	Y	Y			Y
48000	Y	Y	Y			Y
88200	Y	Y	Y			
96000	Y	Y	Y			
176400	Y	Y	Y			
192000	Y	Y	Y			
352800	Y	Y	Y			
384000	Y	Y	Y			
DSD64				Y	Y	
DSD128				Y	Y	
DSD256				Y[2]	Y[2]	

---

[1] 4 channels only at 88.2 and 96 kHz.
[2] DSD256 is supported for native DSD only. DoP (DSD over PCM) is not supported for this rate.

4 INSTALLATION AND CONFIGURATION – WINDOWS

For use with Windows, the miniDSP driver must be installed. In addition, depending on your application, you may need to load different firmware into the MCHStreamer.
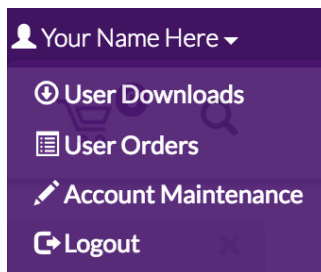
4.1 DOWNLOAD

If you purchased your product directly from miniDSP, your software will be available from the User Downloads section of the miniDSP website when your order ships. You will need to be logged into the website with the account you created when purchasing to access the download.

If you purchased your product from a miniDSP dealer, you will receive a coupon together with the product. Redeem this coupon and select the Plugin Group "MCHStreamer" at the link below:

* https://www.minidsp.com/support/redeem-coupon

The User Downloads link is visible from the dropdown menu at the top right of the website page:

Navigate to the **USB Audio Drivers** section and download the zip file under the heading **MCHStreamer**. Unzip the downloaded file by right-clicking on it and selecting "Extract All...".

4.2 USB DRIVER INSTALLATION

The USB driver enables Windows to stream audio to the MCHStreamer. In addition, it installs a control panel to help manage the MCHStreamer.

To install the driver, the MCHStreamer **must** be connected to the computer by USB. Go to the **Drv_DFU\WinDrv** folder of the installation download and double-click on the installer:

* **miniDSP_UAC2_v4.82.0_2020-06-09_setup.exe**

 (The version number embedded in the filename may be different.)

We recommend accepting the default installation location. Once the driver installation completes, click the **Finish** button.

The Windows PC may not be able to communicate properly with the MCHStreamer if you did not have the MCHStreamer connected by USB when you ran the installer. If that is the case, you will need to uninstall the driver, connect the MCHStreamer and run the installer again.

4.3 LOADING FIRMWARE

The MCHStreamer has the I2S_TOSLINK firmware loaded when shipped. If this is not suited for your application, you will need to load a different firmware version.

To load a different firmware version:

1. Connect the MCHStreamer to your computer via USB (if not already connected).
2. Navigate to the **Drv_DFU\WinDrv\miniDSP_UAC2_DFU_Win** folder of the software download.
3. Double-click on the **miniDSPUAC2Dfu.exe** program to run it:
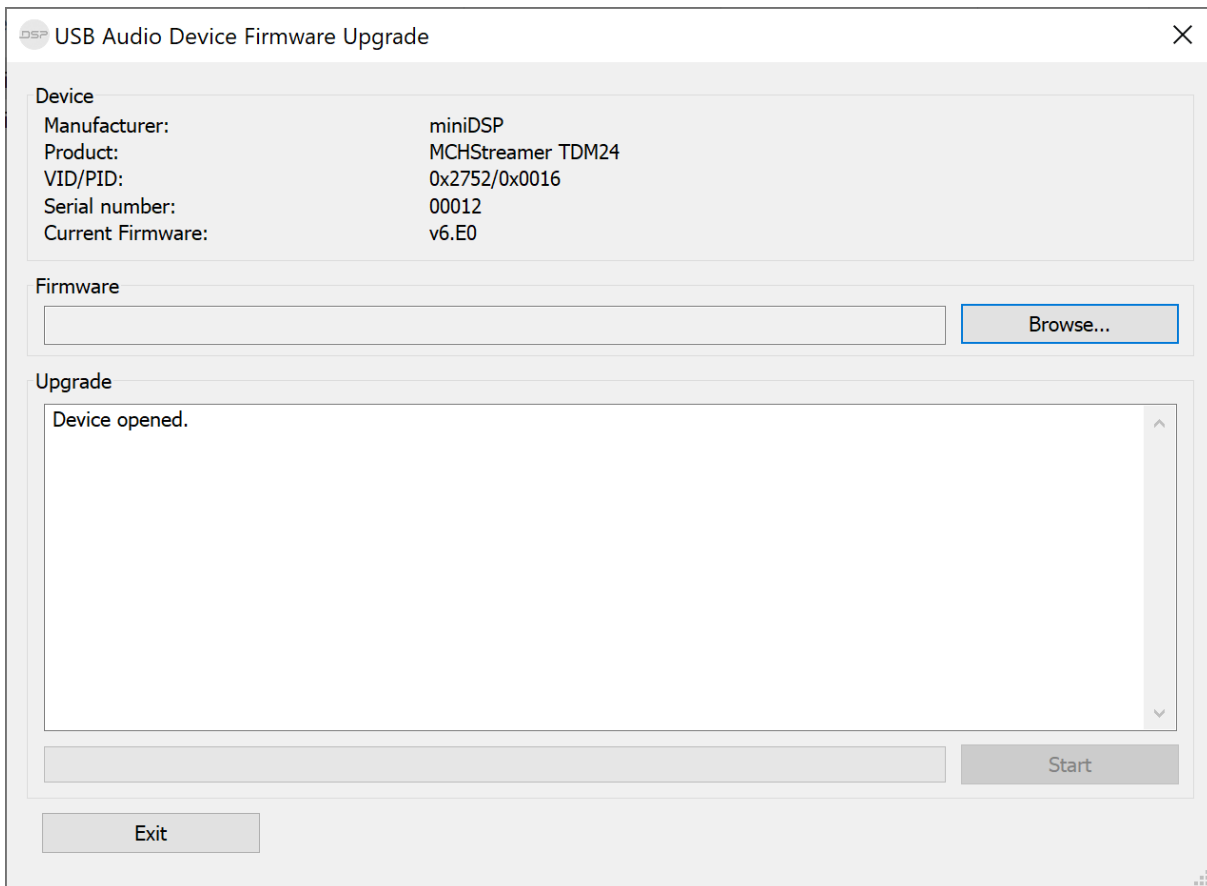
4. Click on the **Browse** button and navigate to the plugin download folder and then the **Firmware** folder. Select the most suitable firmware file according to your application. See Section 3.

5. Click on the **Start** button.

6. You will get a progress bar as upgrade proceeds:
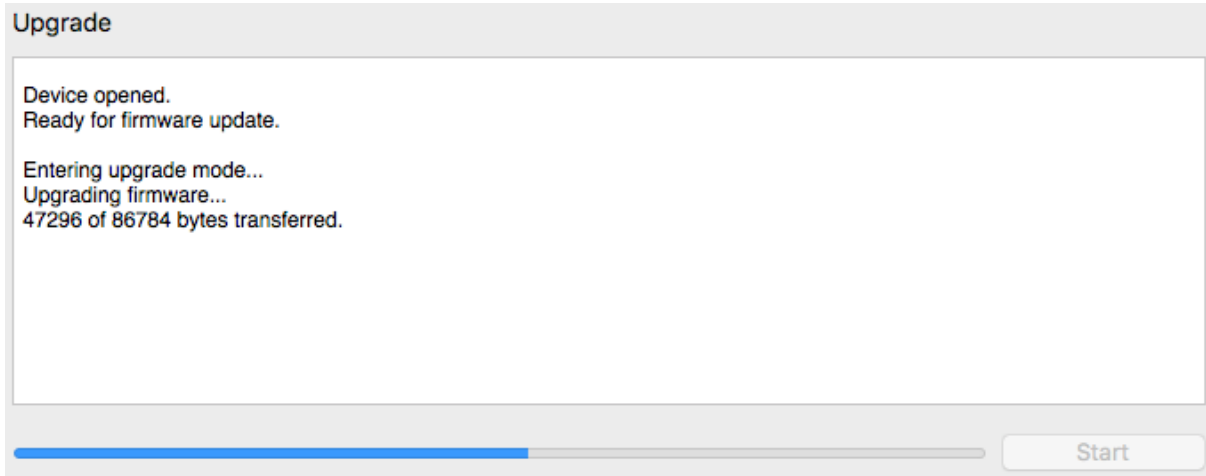
7. When it completes, you will see a message that the upgrade completed successfully:
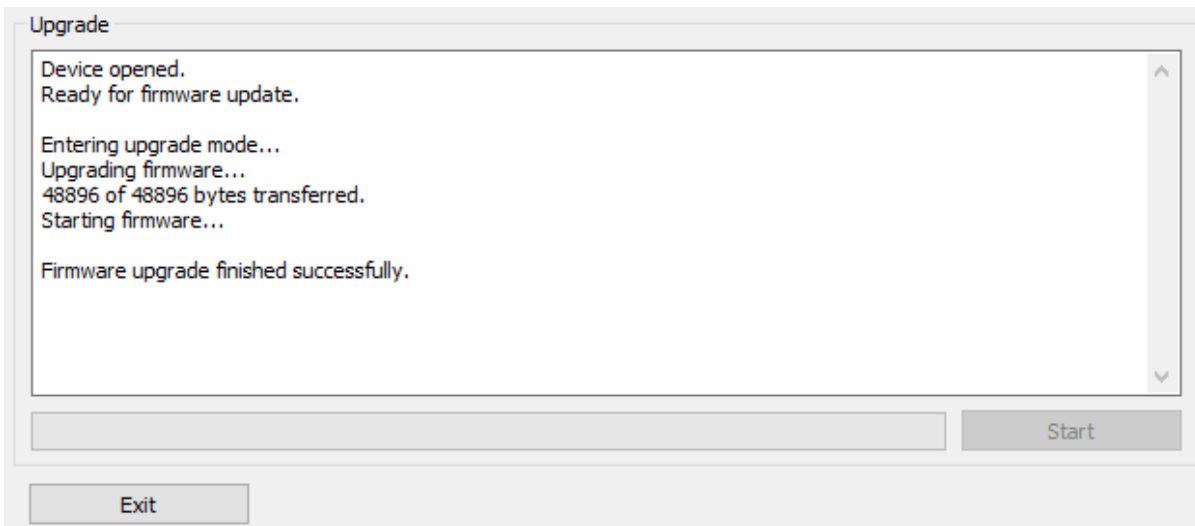

8. Click on **Exit**.

9. That's it! You're done. You can now use your MCHStreamer with the new firmware.

4.4 UAC2 CONTROL PANEL

To configure the MCHStreamer, open the **miniDSP UAC2 Control Panel** (from Start Menu -> miniDSP Ltd). It has several tabs.
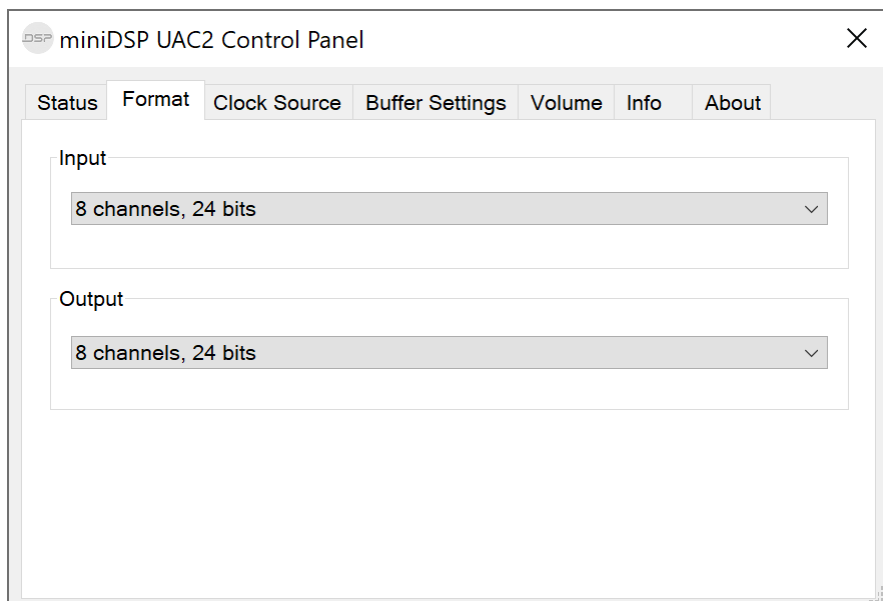
STATUS

This tab shows the current sample rate of the MCHStreamer. This setting cannot be changed in the Control panel, but simply reflects the current sample rate of the MCHStreamer.
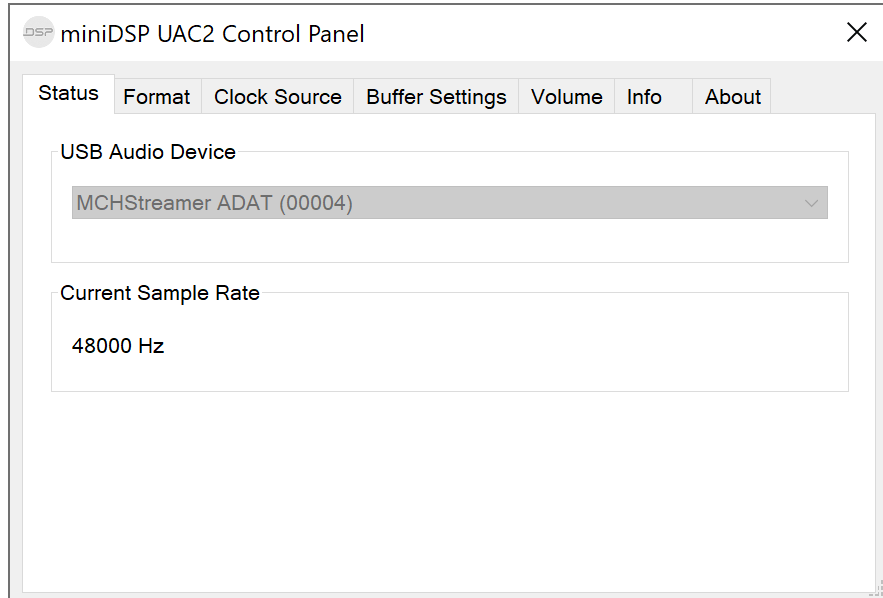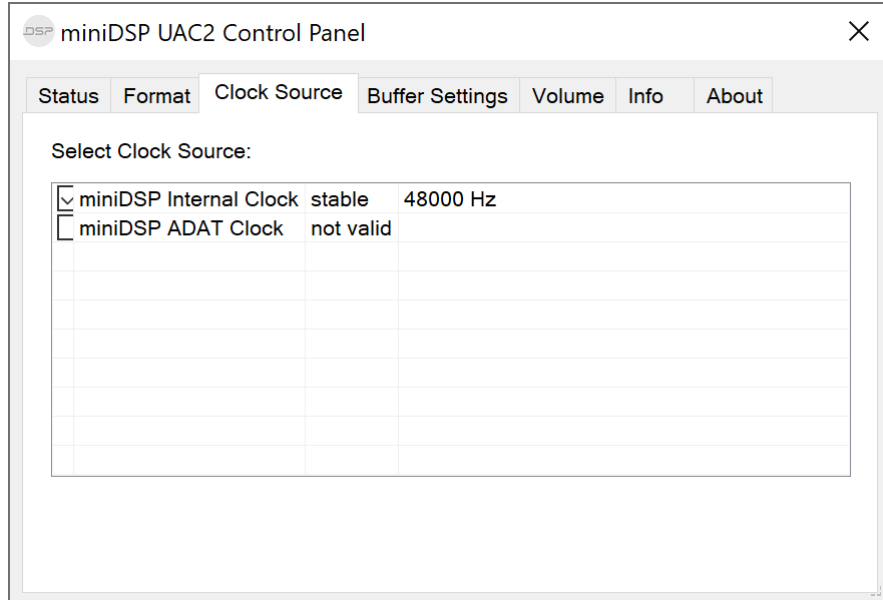

FORMAT

This tab is present in firmware versions that allow a choice of different formats (for example, 24- or 32-bit output).
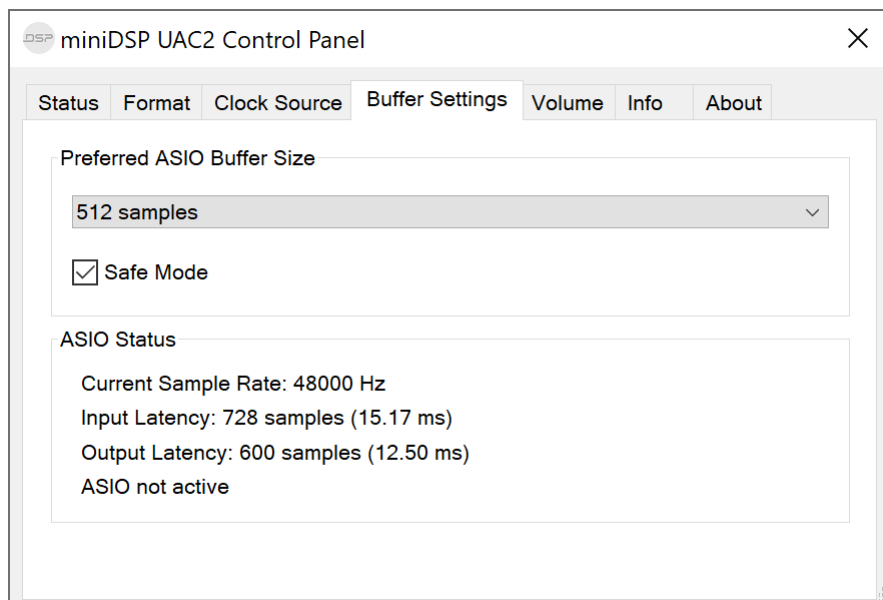
CLOCK SOURCE

This tab allows you to select the clock source of the MCHStreamer: internally generated by the MCHStreamer and selected by the computer, or generated from the TOSLINK, ADAT, or SPDIF input. Note that the MCHStreamer Lite version can use only the internal clock source.

miniDSP UAC2 Control Panel	✕

| Status | Format | **Clock Source** | Buffer Settings | Volume | Info | About |

Select Clock Source:

|			
☑ miniDSP Internal Clock	stable	48000 Hz	
☐ miniDSP ADAT Clock	not valid		

BUFFER SETTINGS

The buffer settings are for those looking to optimize buffering and latency settings of the MCHStreamer. Note that changing these settings may result in unstable operation since such changes are dependent on the resources of the PC. For example, the lowest buffer size may require high amounts of CPU and memory, and may not work on some machines. If you do not require lowest latency, we recommend that you stay at the default safe settings.

miniDSP UAC2 Control Panel	✕

| Status | Format | Clock Source | **Buffer Settings** | Volume | Info | About |

Preferred ASIO Buffer Size

512 samples ⌄

☑ Safe Mode

ASIO Status

Current Sample Rate: 48000 Hz

Input Latency: 728 samples (15.17 ms)

Output Latency: 600 samples (12.50 ms)

ASIO not active

VOLUME

This tab contains a master volume control and individual level controls. There are two popup windows, for input and for output.
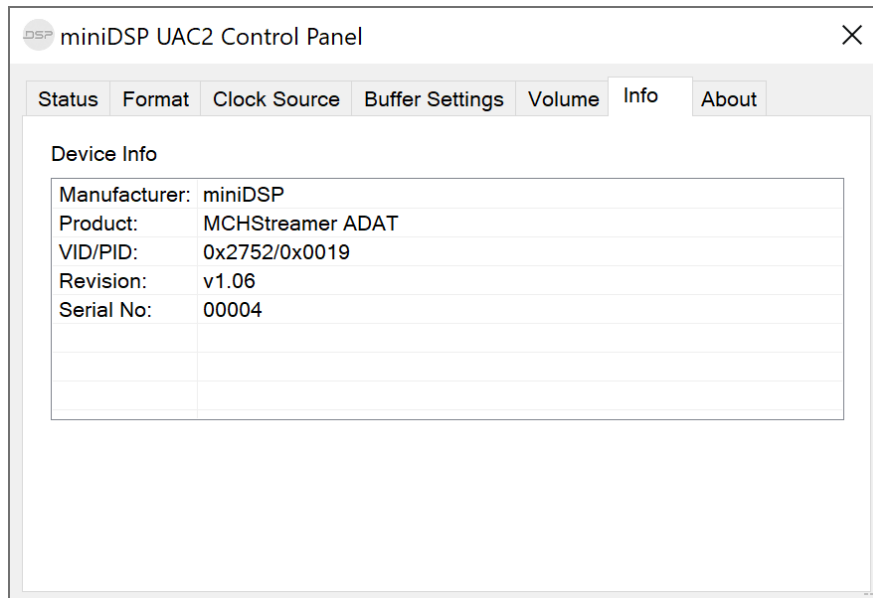
o   To reset the master volume control or a pair of channels to 0 dB (no attenuation), click the **0dB** button.

o   To mute all channels, click the speaker icon above "Master".

o   To mute a pair of channels, click the speaker icon above the label.

o   To control volume separately for each channel, click on the "Link" icon to turn it off.
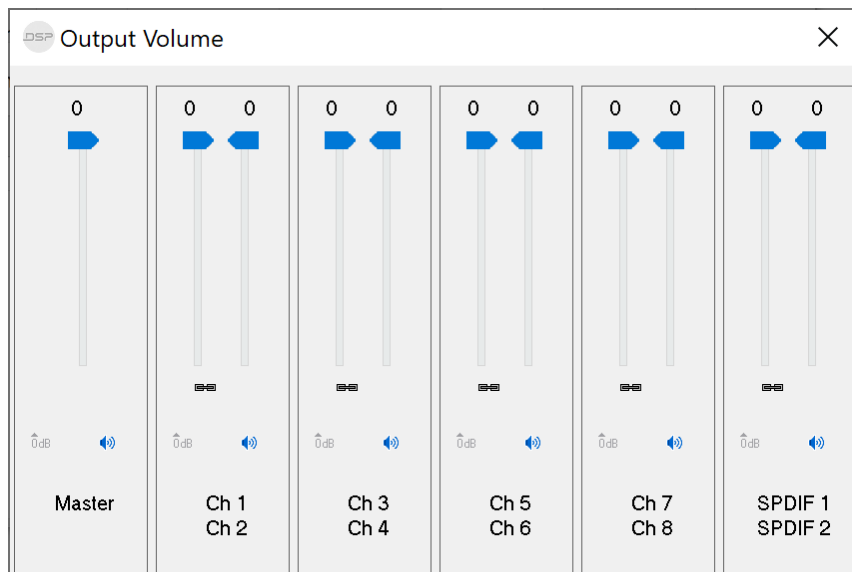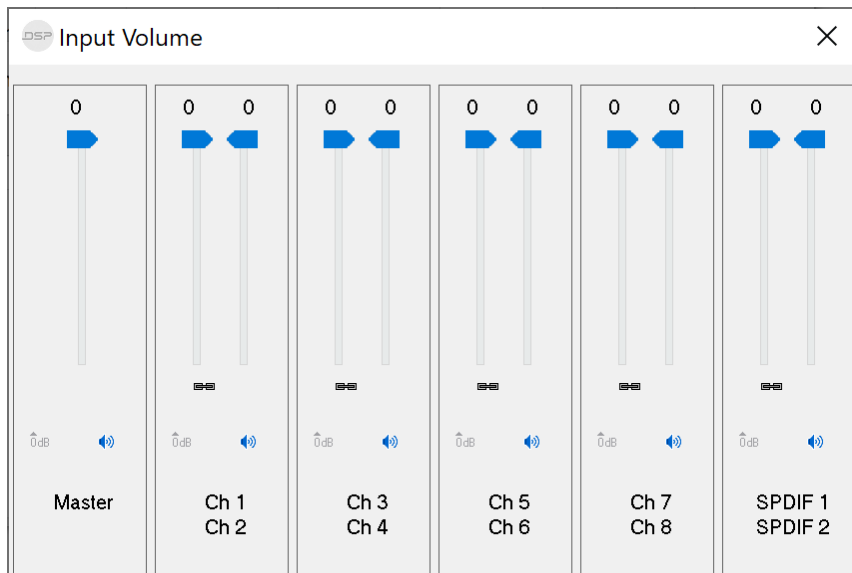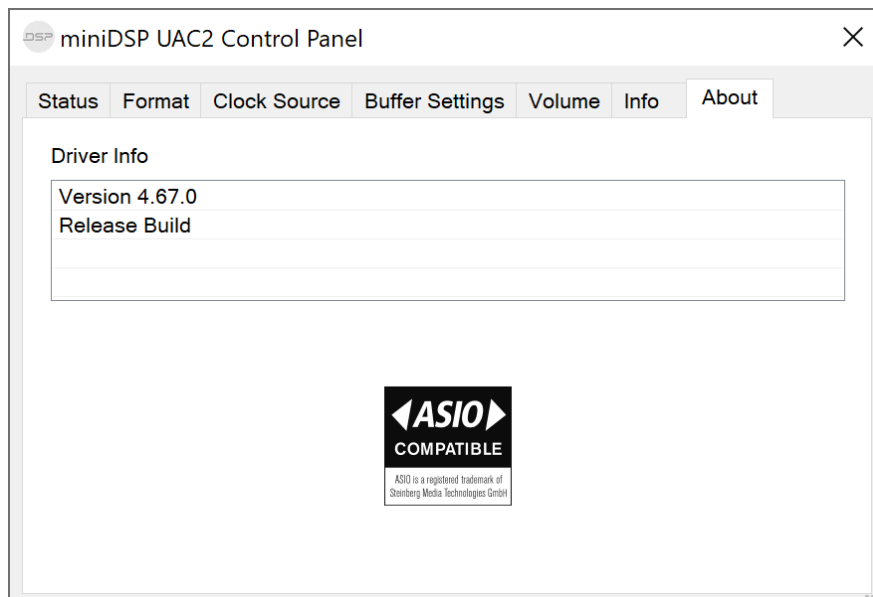
INFO

This pane shows information about the MCHStreamer.

ABOUT

5 INSTALLATION AND CONFIGURATION – MAC OS X

Mac OS X / macOS has native support for USB Audio class 2.0 devices, so no driver installation is required. However, depending on your application, you may need to load different firmware into the MCHStreamer.
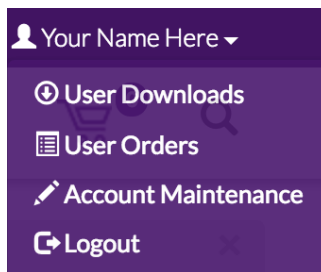
5.1 DOWNLOAD

If you purchased your product directly from miniDSP, your software will be available from the User Downloads section of the miniDSP website when your order ships. You will need to be logged into the website with the account you created when purchasing to access the download.

If you purchased your product from a miniDSP dealer, you will receive a coupon together with the product. Redeem this coupon and select the Plugin Group "MCHStreamer" at the link below:

* https://www.minidsp.com/support/redeem-coupon

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Navigate to the **USB Audio Drivers** section and download the zip file under the heading **MCHStreamer**. Unzip the downloaded file by double-clicking on it.
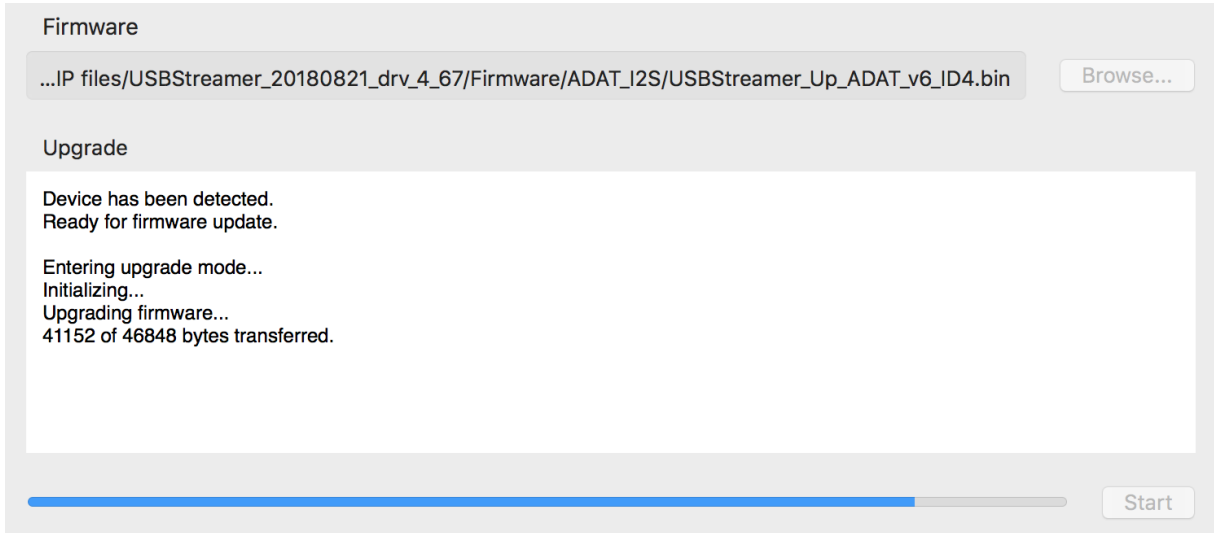
5.2 LOADING FIRMWARE

The MCHStreamer has the I2S_TOSLINK firmware loaded when shipped. If this is not suited for your application, you will need to load a different firmware version.
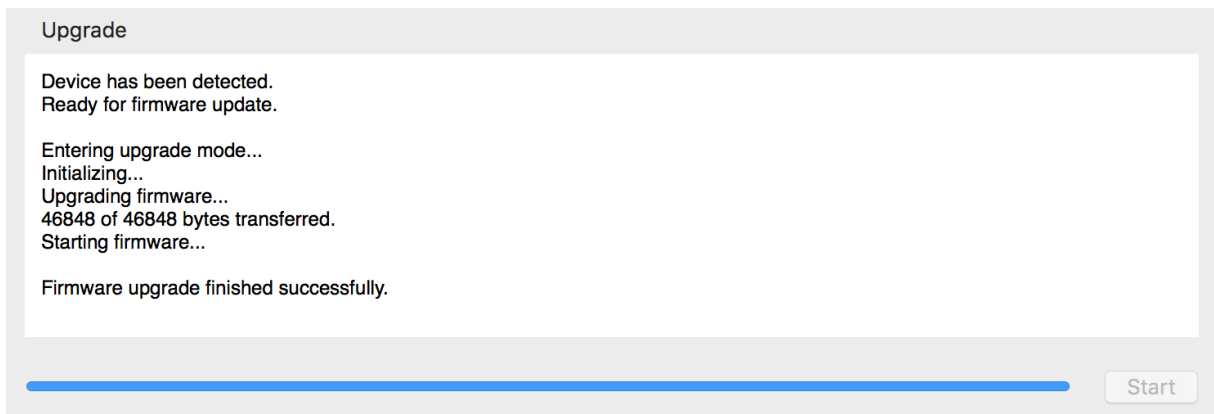
To load firmware:

1. Connect the MCHStreamer to your computer via USB (if not already connected).
2. Navigate to the **Drv_DFU/Mac** folder of the software download.
3. Unzip the file miniDSP_USBDFU_v2.20.0_DSK_macOS.zip by double-clicking on it. (The version number v2.20.0 may change.)
4. Navigate into the unzipped folder, then DfuApp -> miniDSP_USBDFU_(more here). Double-click on the **miniDSP USB DFU.app** program to run it:
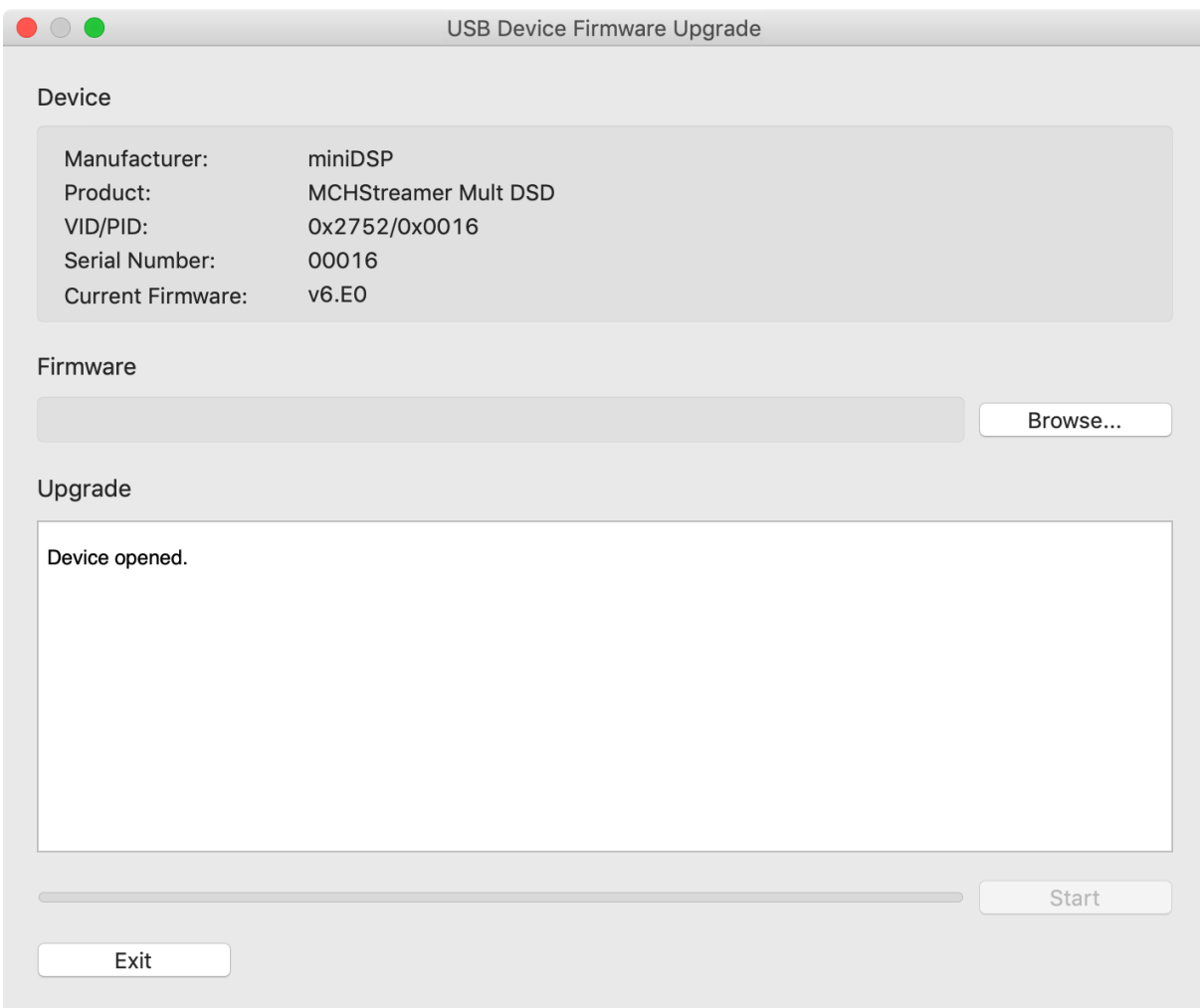
5. Click on the **Browse** button and navigate to the plugin download folder and then the **Firmware** folder. Select the most suitable firmware file according to your application. See Section 3.

6. Click on the **Start** button.

7. You will get a progress bar as the upgrade proceeds:

Firmware

...IP files/USBStreamer_20180821_drv_4_67/Firmware/ADAT_I2S/USBStreamer_Up_ADAT_v6_ID4.bin   Browse...

Upgrade

Device has been detected.
Ready for firmware update.

Entering upgrade mode...
Initializing...
Upgrading firmware...
41152 of 46848 bytes transferred.

Start

8. Once the firmware upgrade completes, you will see a message that the upgrade completed successfully:

Upgrade

Device has been detected.
Ready for firmware update.

Entering upgrade mode...
Initializing...
Upgrading firmware...
46848 of 46848 bytes transferred.
Starting firmware...

Firmware upgrade finished successfully.

Start

9. Quit the **miniDSP USB DFU** application.
10. That's it! You're done. You can now use your MCHStreamer with the new firmware.

5.3 CONFIGURATION IN AUDIO MIDI SETUP

Open the program **Audio MIDI Setup** (in **Applications**->**Utilities**). Click on the MCHStreamer device that appears in the list on the left. This will display the input and output channels that the loaded firmware provides. The **Format** drop-down menu will show the supported bit depths and sample rates.
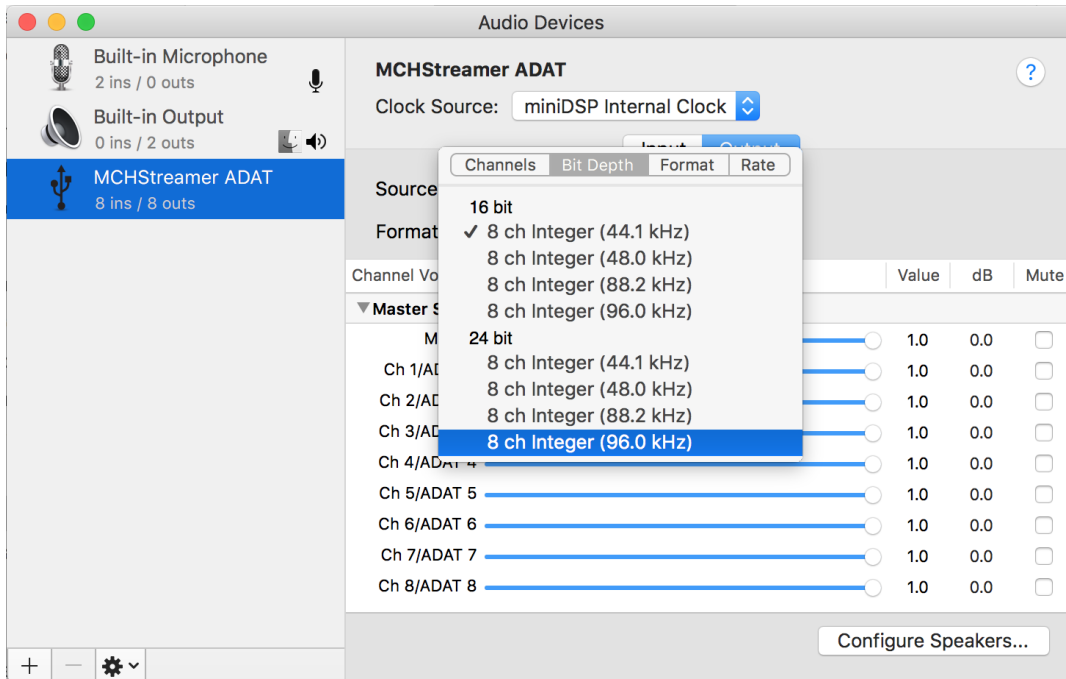

By default, the sample rate clock of the MCHStreamer is internally derived. In the case of the MCHStreamer Kit and Box versions, it can also derive the clock from the optical input by using the **Clock Source** selector:
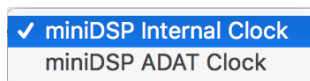
(A TOSLINK or ADAT capable firmware must be loaded for this to work.)

The ADAT, I2S_SPDIF, I2S_TOSLINK, PDM, and TDM firmware are provided in two separate firmware files, each of which has a different USB ID. This enables two MCHStreamer devices to be connected at the same time.

For example, if more than eight ADAT channels are required, use two MCHStreamers and load firmware with different IDs into each. (That is, load ID4 into one MCHStreamer and ID5 into the other.) Depending on the specifics of your system setup (DAW, external hardware, etc.), you can then create a 16-channel aggregate device in Audio MIDI Setup:
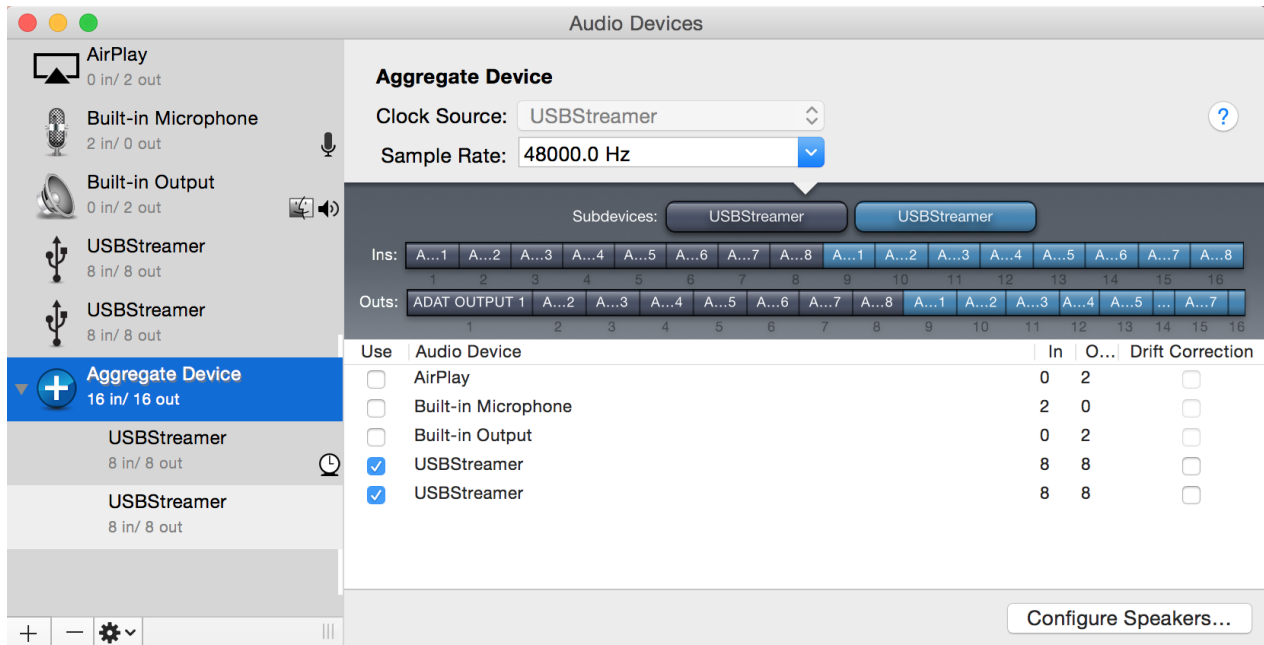
6 ADDITIONAL INFORMATION

6.1 SPECIFICATIONS

Computer connectivity   USB 2.0, USB Audio Class 2 compliant

Driver   Mac OS X: no driver required

Windows: driver provided

Audio resolution and   See Section 3 of this manual.
sample rate

Power supply   USB-powered. Optional 5VDC power supply on 12-pin header J2 (Kit and Lite).

Dimensions (H x W x D)   13 x 40 x 62 mm (Kit and Lite)

24 x 64 x 67.4 mm (Box)

6.2 OBTAINING SUPPORT

1. Check the forums on miniDSP.com to see if this issue has already been raised and a solution or solutions provided.

2. Contact miniDSP via the support portal at support.minidsp.com with:

    a. The product information including OS version and version of driver installed (for Windows).

    b. A clear explanation of the symptoms you are seeing.

    c. A description of the troubleshooting steps you performed and the results obtained.