MADI

Multi Channel Audio Digital Interface

Development of the MADI-Interface was under leadership of Sony, Mitsubishi, SSI and Neve. Later it was standardised by the AES (Audio Engineering Society) as AES-10. This interface transmits up to 56 channels via 75 Ohm coax cable or alternatively through optical fibre cable.

Specifications

- 56 channels
- audio data up to 24 bit / 44.1kHz to 48 kHz (+12.5%)
- channel data are in 100% compatibility to the AES3 interface (channel status, user data)

Coax cable

- cable length: 50 m
- impedance: 75 Ohm (± 2 Ohm)
- levels: 300 600 mVpp (at 75 Ohm)

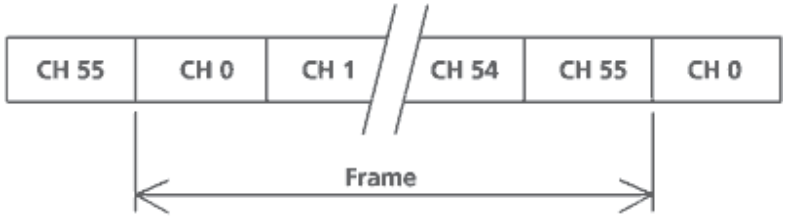
Optical cable

- cable length: up to 2 km
- wavelength: 1300 nm (invisible infrared)

Functionality

All MADI channels are transmitted synchronously, so bit clock and word clock of all channels have to be identical.

As with the AES/EBU the MADI interface structures data into subframes and frames. But here the frame consists of 56 subframes. Each subframe contains one of the 56 channels with it's audio and associated channel status and user data. Thus MADI can transmit 28 AES/EBU channel pairs.



Only difference to AES/EBU within a MADI subframe is significance of the first 4 bits. In contrast to AES/EBU, where these 4 bits contain the preamble, here they transmit the following:

Sync	Meaning	Remark
Bit 0	mark for channel 0	1 for fist channel, otherwise 0
Bit 1	channel on/off	active channels marked with 1
Bit 2	channel A/B	marking of a stereo channel (A = 0)
Bit 3	channel status . block sync	marks the start of a new channel status block (192 Bit)

MADI transmits with fixed data rate of 125 Mbit/s. On the other hand 56 channels with 32 bit/subframe and 48k subframes/s per channel result in a total data rate of 56* 32* 48 kbit/s = 86 Mbit/s. Taking into account the varipitch option, which allows sample rates to be increased up to 12.5% from it's nominal value, this results in a maximum bit rate of 97 Mbit/s. MADI uses a special bit coding scheme were 4 bits a represented by 5 bits. This coding scheme increases the data rate to 121 Mbit/s. Not used capacity is filed up with padding words which are used to channels synchronization purposes.

Not taking advantage from the varipitch option the number of audio channels can be augmented to 64 channels (98.304 Mbit/s). This is possible without leaving compatibility to the MADI transmission standard. Chaining up devices mastering the 64 channel operation mode with those just operating in the standard mode only 56 channels are available.

Figure:
Example for a bi-directional, 64 channel ADAT to MADI Interface.

If ever possible cabling between MADI devices is accomplished redundantly, which means two cables are installed instead of just one. This prevents from all 56 or even 64 channels to be lost in case of cable rupture. To enable the redundancy some devices dispose of two transmitter- and two receiver interfaces. In case of cable failure these devices switch automatically to the second line.

In comparison to other interfaces coding complexity of the MADI interface is clearly increased. Therefore as a rule this interface is encountered only in upper price range devices.

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