

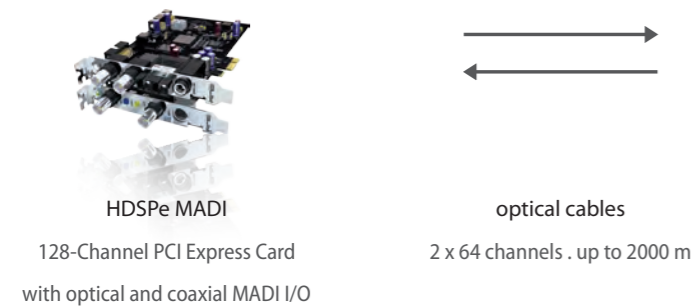
What is MADI?

MADI - **M**ultichannel **A**udio **D**igital **I**nterface - is the Pro Audio Industry standard for multichannel audio. MADI is the perfect solution for the transmission of multiple digital audio channels, avoiding the technical problems of the standard multicore cables: too short, aging, high weight, stray pick-up, cable loss, cumbersome handling.

On the contrary MADI: All signals within one optical or coaxial cable. Only two MADI cables will interface a full 64-channel application, a stage, a theatre, or a conference hall.

MADI users can benefit from cost savings and lower maintenance on the overall installation. MADI solutions combine the same basic functionality with improved flexibility over a much smaller cable as a conventional multi-core snake.

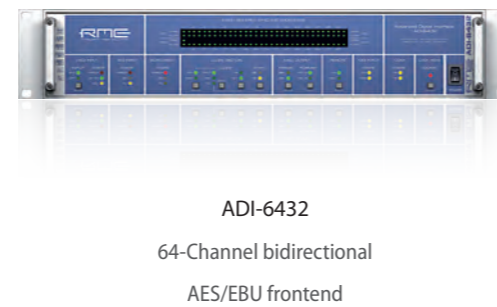
Example . Digital Multicore



MADI today. The MADI standard was defined by the AES (Audio Engineering Society). Many factors have influenced the increasing importance of MADI in professional audio production systems. These include an overall growth in the use of digital audio equipment, and the ever increasing demand for greater numbers of audio channels in large productions. Modern surround sound production has also raised the requirements of multi-channel applications. Today MADI is an attractive and convenient interface technology, as it provides the *simplest* method of transmitting audio channels sample-accurate over long distances. The balance between operating distances, installation costs and overall maintenance is exemplary.

MADI is *the* solution for the special pro audio requirements.

A thin cable transmits up to **64** audio channels - lossless - over distances of up to **2000** meters!



Theory. Technically, MADI keeps AES/EBU 24-bit signals in serial. Time Division Multiplexing is used to fit all audio channels into a single cable. MADI is unidirectional, providing a 'point-to-point' interface between a source and a destination. The MADI format is capable of transmitting up to 64 audio channels at standard sample rates of 44.1 or 48 kHz on a standard 75 Ohms coaxial cable or an optical fibre cable. MADI can also be used to transmit high sample rate audio signals. The 64-channel mode allows for a maximum sample rate of 48 kHz, corresponding to 32/16 channels at 96 kHz/192 kHz.



RME Micstasy . High-End Mic/Line Preamp and AD converter with MADI I/O

One cable for all channels. MADI provides a convenient method of transmitting multiple audio channels more efficiently. MADI signals can be transmitted by two cable types:

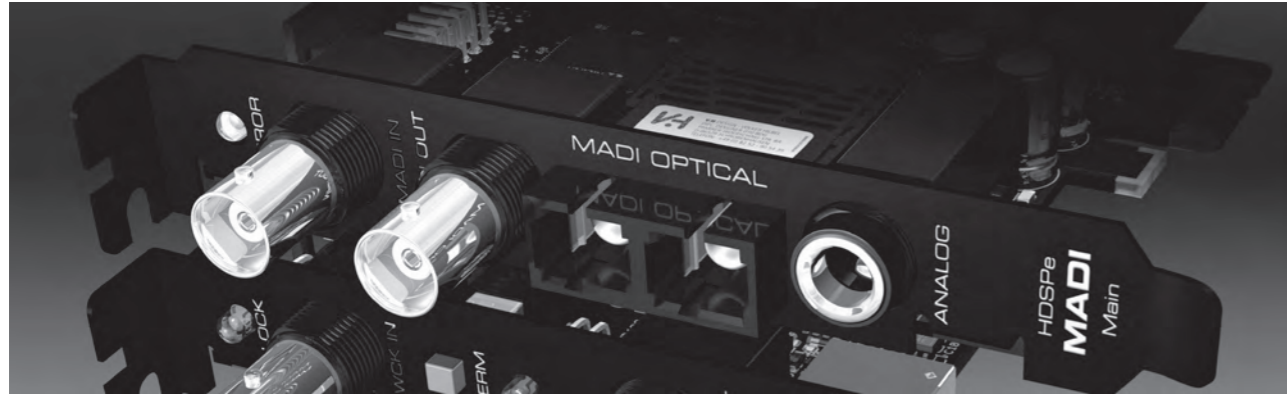
- Coaxial, max. 100 m (75 Ohms, BNC)
- Optical fibre glass, max. 2000 m (62.5/125 μ , standard network technology)

Traditional multi-pair snakes for different applications in live, studio and installation have been an audio-standard for years and still are. The more channels are needed the more a snake becomes invaluable. The use of a snake, especially in mobile applications or on the road, does not become more reliable as the time goes by. It will get hoisted, coiled and often stomped on by the crowd. Under stress conditions there often might not be any time to analyze a fault and fix it. In most cases a faulty snake becomes obsolete and has to be replaced completely. Even if money does not matter – problems occurring on a 64-channel snake can hardly be controlled.

Practice. Integrating MADI solutions into an audio network not only increases more than just reliability. The setup and cabling is simple, too. Routings are remote controllable without any physical switching or swapping of connections. Patchbays become more and more obsolete in the overall system. Especially when dealing with different acts, performances or shows, MADI simplifies and speeds up any configuration changes. MADI saves time and therefore costs.

In modern production systems - from manageable home studio setups to complex concert hall installations - MADI is used as the multi-channel link between mixing consoles, DAWs, multi-track recorders and other digital outboard gear in large scale digital audio routing systems, or to transmit digitised microphone and line signals from a stage box to a theatre or studio mixing console.

The MADI standard is supported by many pro audio manufacturers: Euphonix, Merging, Lawo, YAMAHA, Stagetec, Studer, DiGiCo/Soundtracs, Fairlight, GENEX, Innovason, Otari, Publison, Soundscape, Jünger, Sony, Cadac, Axon, AMS/ Neve and others.



RME has developed innovative technologies to make MADI products even more useful and attractive. RME brought the MADI technology to perfection and made it affordable as well.

The RME product range includes converters and preamps for analog, the common digital formats AES/EBU and ADAT, a MADI router, a MADI Bridge and PCI (Express) solutions for Windows and Mac computers. The traditional MADI standard was usefully enhanced by RME with the included MIDI and RS232 transmission. A special redundancy mode (Safe Input Mode) guarantees a secure operation.

The RME MADI Premium Line products and the ADI series front-end devices combine different audio standards such as AES/EBU, ADAT and TDIF into one MADI audio system. Any MADI installation will remain an open system, easily expandable, using RME devices or products from any other major pro audio brand. Please study our examples for simple and complex MADI application setups on the last pages of this brochure.

The cost-effective solution: A flexible analog multichannel connection includes different components: Multicore cable - circuit connectors - breakout box - stagebox - signal splitter. Such a system is usually very expensive. A RME MADI system for 64 audio channels in a simple setup includes two 19" devices (e.g. ADI-648) and a fibre glass connection cable - not more. The cost for such a MADI system includes extensive audio signal processing options, like routing, splitting, merging, plus MIDI in MADI, remote control of all devices and redundancy.

Integrating RME MADI solutions into an audio network not only increases reliability. The setup and cabling is simplified too.

MADI . Made by RME saves time and therefore saves costs. In older buildings, expanding existing cable networks (for more or bigger multi-snakes) can be a major cost factor, or even physically impossible. The low maintenance associated with a MADI installation, compared to analog solutions, saves money and increases reliability.

RME MADI products provide optical and coaxial MADI connectors. The coaxial cable allows for transmission distances of up to 100 meters. The MADI fibre cable connection even allows for transmission distances of up to 2000 meters. The cables used are standard in high-speed computer network technology. There are many applications where long distance audio transmission is required: multi-room production facilities, outside broadcast venues, live venues etc. The optical interface is much more interesting due to its complete galvanic separation. 'MADI optical': The cables have an internal fibre of only 50 or 62.5 µm diameter and a coating of 125 µm. The plugs used are an industry standard, called SC. The cables are available as a duplex variant (2 cables being glued together) or as a simplex variant (1 cable).

The transmission uses the multi-mode technique, which supports cable lengths of up to almost 2000 meters. Due to the wave-length of the light being used (1300 nm), the optical signal is invisible to the human eye. Road-proven MADI-optical cables with cable drums are also available. Ask your Premium Line Dealer for the special AudioAG/ALVA-Cableware program.

MADI Cable Drum by ALVA
100/150/300 m professional 4-fibre SC to SC optical multicore for MADI - on stage, broadcast and TV.



RME MADI Technologies

MIDI & RS232 integration in MADI networks. RME MADI products not only transmit 64 audio channels with a single line, but also MIDI signals (exception: MADI Bridge and MADI Converter). Be it remote control or sequencer applications, MIDI data entering at the physical MIDI input is carried along with the MADI data packages.

At the other end of the MADI line, the data can be collected at the MIDI output for another RME MADI device. Technically, every single MADI channel includes several additional bits, containing various information (Channel Status). RME ensures full audio data compatibility by utilizing the so often unused User Bit within the MADI stream to transmit the MIDI data. The same way serial data is carried along with the MADI data packages. Serial data transmission is supported by ADI-642, ADI-6432 and DMC-842.

Remote Controlling via MIDI. All RME MADI devices can be remote controlled via MIDI, using their own well documented protocol. All units can be programmed with their own ID, providing a separated remote control of multiple devices via a single MIDI channel. Via MIDI the complete device status is read and set.

The HDSP TotalMix™ software for the HDSP/HDSPe cards includes complete MIDI remote control by standard MIDI commands and the widely-used Mackie Protocol. More information is published in the product manuals.

Remote Control Software. RME provides a free Windows and Mac software to control all 19" MADI devices. **MIDI Remote** can use any existing MIDI port within the system to perform remote control and status requests of all devices. The software provides both a front-panel like operation and an extended Matrix display. Most appealing is the combination with a HDSP MADI card, offering a direct control of RME Premium Line devices via MADI. The remote control software then uses a virtual MIDI port of the card that directly sends and receives MIDI data via MADI. Furthermore, the protocol is open and fully documented, to allow for custom remote control software projects and applications.

Redundancy. RME MADI devices have the SM-I (Safe Mode-Input) feature to switch automatically between the optical and coaxial port if one of the cables or connections are disconnected by mistake, or are even corrupted.

Worldwide Use. RME Premium Line uses internal switching power supplies. This technology offers several advantages over standard linear regulated power supplies, like worldwide operation with any voltage between 100 and 240 Volts, 50 or 60 Hz. Additionally it is short-circuit-proof, has an integrated line filter, is fully regulated against voltage fluctuations, and suppresses mains interference. The high efficiency factor keeps the units cool. RME's high frequency design eliminates mechanical hum and induced ground loops.



The final of the Soccer Champions' League in May 2007 between Liverpool and Milan at the former Olympic stadium in Athens was broadcast to an estimated 1.2 billion viewers worldwide. A RME full duplex MADI configuration interconnected four broadcast points within the stadium, covering a total distance of about 400 meters with optical MADI cables!

The project was a collaboration of the music services company "Logothetis Music" (also RME's exclusive dealer for Greece) and "Astarti TV Productions" on behalf of NOS (Netherlands Broadcasting Corporation). The sound quality outcome was very pleasing for both collaborators and the ease of setting up as well as the reliability of the system justified RME products and the Logothetis Music crew for their choice. Let's note, though, that the company is already using a fully digitized MADI-DAW system for live and recording applications with great success.