# MAYAH Communications White Paper

# MADI in Audio Codecs

**A short summary of the technical and historical aspects of the Multichannel Audio Digital Interface (MADI)**

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# 1 Introduction

## 1.1 What is MADI?

MADI stands for Multichannel Audio Digital Interface and is sometimes also referred to as AES 10 after the Audio Engineering Society that defined the characteristics of this particular interface format. Probably the greatest and most noteworthy aspect of MADI is the exceptionally high number of channels supported per line. This has allowed audio transmission companies like MAYAH Communications to create audio codecs that can handle ever greater numbers of channels and subcodecs per device. This then helps end users substitute an ever-increasing number of audio device with a single MADI-capable model.

The first MADI standard was defined in 1991 by the Audio Engineering Society. Updates followed in 2003 and 2008, with the 2003 revision defining MADI for up to 64 channels and support for 96 kHz "double rate" sampling. In 2013 MADI entered use in the field of audio codecs. MAYAH Communications launched the CENTAURI IV 5000, which supported up to 64 channels in and 64 channels out, and so became the first audio codec company to use MADI in their devices. The total number of channels a device supports can be expanded easily by adding additional MADI cards.

# 2 Technical Details

## 2.1 How MADI works

The data structure of MADI is divided into subframes, which is very similar to the structure used in AES3 subframes. The main difference lying in the absence of preamble area as MADI does not require one for synchronization. Within the 56 subframes that make up a single frame the bits are defined as follows:

| **Bit** | **Purpose** | |
|---|---|---|
| Bit 1 | Subframe activity | 0 = inactive, 1= active |
| Bit 2 | Subframe is A or B channel | 0 = A, 1 = B |
| Bit 3 | Start of a new channel status block | |

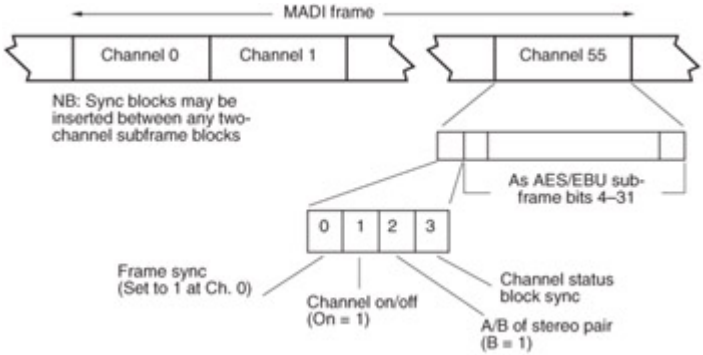


Fig. 1: MADI frame. Source: http://flylib.com/books/4/485/1/html/2/files/fig220_01.jpeg

The actual audio information is handled like in a two-channel interface, with each subframe containing the V, U, C and P bits from one audio channel and the audio sample. However, the channel code is handled differently and the link transmission rate is also made independent of the audio sampling frequency and number of channels involved.

## 2.2 MADI Tech Overview

| | |
|---|---|
| **Possible Connectors** | Coaxial cable, fiber-optic lines |
| **Sampling Frequencies** | |
| -for 28 channels | 64 kHz to 96 kHz |
| -for 56 channels | 32 kHz to 48 kHz |
| -for 64 channels | 32 kHz to 48 kHz |
| **Data Transfer Rate** | 100 MBit/s |
| **Used Data Rate** | ~50.12 MBit/s to ~96.77 MBit/s |
| **Synchronization** | uses independent master synchronization signal, according to AES3-1985 |

# 3 Sources and Further Reading

http://flylib.com/books/en/4.485.1.68/1/
http://www.urbancom.us/aes10-1991.pdf
http://www.tvtechnology.com/audio/0014/serial-multichannel-audio-digital-interface/199793