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AES10-2020



## **AES Recommended Practice for Digital Audio Engineering — Serial Multichannel Audio Digital Interface (MADI)**

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# **AES Recommended Practice for Digital Audio Engineering — Serial Multichannel Audio Digital Interface (MADI)**

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**Audio Engineering Society, Inc.**

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## **Abstract**

This standard describes the data organization for a multichannel audio digital interface. It includes a bit-level description, features in common with the AES3 two-channel format, and the data rates required for its utilization. The specification provides for the serial digital transmission of 32, 56, or 64 channels of linearly represented digital audio data at a common sampling frequency within the range 32 kHz to 96 kHz, having a resolution of up to 24 bits per channel. The format makes possible the transmission and reception of the complete 28-bit channel word (excluding preamble) as specified in AES3, providing for the validity, user, channel status, and parity information allowable under that standard. The transmission format is of the asynchronous simplex type and is specified for a single 75- $\Omega$  coaxial cable point-to-point interconnection or the use of fibre-optic cables.

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## Foreword

[These forwards are not part of the *AES Recommended Practice for Digital Audio Engineering—Serial Multichannel Audio Digital Interface (MADI)*, AES10.]

### Foreword to original edition

This document was prepared as a result of a desire by four manufacturers of digital audio equipment to produce a common interface for serial transfer of digital multichannel audio in recording and broadcast studio applications. The benefit of such an interface is the simplification of multichannel digital audio equipment interconnection, commensurate with the obvious possibilities offered by the nature of the digitized audio signal. Throughout the development of the interface, the following intentions have been adhered to as faithfully as possible:

The documentation produced by the group shall enter the public domain as soon as feasibility of the interface is established.

- The interface itself shall be simple to engineer and use.
- The cost and simplicity of the interface shall be such that the benefits of its use shall be easily justifiable.
- The interface shall not depend on the existence of hardware or software the rights to which are owned by any one or more members of the group.

The following individuals have contributed to the document: P. Eastty, T. Fujisawa, C. Jenkins, A. Jubb, P. Lidbetter, R. Salter, D. Ward, and J. Wilkinson.

R. A. Finger, chair  
AES Standards Committee Working Group on Digital Input/Output Interfacing, 1989 September

### Foreword to second edition, 2003

This revision recognizes other uses to which the interface has been put, notably distributed routing and hence the increase in channels to the maximum of 64 at 48 kHz, the introduction of 96-kHz sampling in digital audio origination and the use of data transmission in the carrier system.

In this edition, figures 3 through 8 of AES10-1991 have been renumbered to figures 5 through 10. Clauses 2 through 6 of AES10-1991 have been renumbered to clauses 3 through 7, according to IEC guidelines.

This edition has been written by a writing group of SC-02-02. Contributors include R. Caine, C. Travis, R. Silfvast, and others.

J. Dunn, chair  
R. A. Finger, vice-chair  
SC-02-02 Working Group on Digital Input/Output Interfacing, 2002-09-23

### Foreword to third edition, 2008

This revision includes minor changes to conform to recent revisions of AES3 and AES5 and provides clarifications of sync reference signals and link transmission-rate tolerance, and references for 'NRZI' and the 4B5B coding scheme. The writing group included: R.Caine, C. Travis, M. Yonge,

J. Grant  
Chair, SC-02-02 Working Group on Digital Input/Output Interfacing, 2008-10-28

### Foreword to fourth edition, 2020

This revision includes minor changes to remove insensitive terms.

J. Grant  
Chair, SC-02-02 Working Group on Digital Input/Output Interfacing, 2020-11-27

**Note on normative language**

In AES standards documents, sentences containing the word “shall” are requirements for compliance with the document. Sentences containing the verb “should” are strong suggestions (recommendations). Sentences giving permission use the verb “may”. Sentences expressing a possibility use the verb “can”.

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# AES Recommended Practice for Digital Audio Engineering — Serial Multichannel Audio Digital Interface (MADI)

## 0 Patents

The Audio Engineering Society draws attention to patents concerning the functionality described in annex B. Those contemplating making use of this functionality should consider that any such use of sync symbols may be subject to patents. Applicable patents include GB2276796, US5487067 and JP7015458.

The AES holds no position concerning the evidence, validity and scope of these patent rights.

Attention is drawn to the possibility that some of the elements of this AES standard may be the subject of patent rights other than those identified herein. AES shall not be held responsible for identifying any or all such patent rights.

## 1 Scope

This standard describes the data organization and electrical characteristics for a multichannel audio digital interface (MADI). It includes a bit-level description, features in common with the two-channel format of the AES3, *AES Recommended Practice for Digital Audio Engineering — Serial Transmission Format for Linearly Represented Digital Audio Data*, and the data rates required for its utilization. The specification provides for the serial digital transmission over coaxial or fibre-optic lines of 28, 56, or 64 channels of linearly represented digital data at a common sampling frequency within the range of 32 kHz to 96 kHz having a resolution of up to 24 bits per channel. Only single-point to single-point interconnections from one transmitter to one receiver are supported.

## 2 Normative references

AES3-1992 (r1997) *AES Recommended Practice for Digital Audio Engineering -- Serial transmission format for two-channel linearly represented digital audio data*.

AES11-1997 *AES Recommended practice for digital audio engineering – Synchronization of digital audio equipment in studio operations*.

ISO/IEC 9314-3 (1990-12) *Information processing systems - Fibre Distributed Data Interface (FDDI) - Part 3: Physical Layer Medium Dependent (PMD)*. Geneva CH: International Electrotechnical Commission.

IEC 60169-8 (1978-01) *Radio-frequency connectors. Part 8: R.F. coaxial connectors with inner diameter of outer conductor 6.5 mm (0.256 in) with bayonet lock - Characteristic impedance 50 ohms (Type BNC)*. Geneva CH: International Electrotechnical Commission.

### NOTE 2010-02-19

A new multi-part revision of AES3 was published in 2009. Its technical content is intended to be identical to the relevant parts of the 2003 edition as amended by Amendment 5 (2008) and Amendment 6 (2008).