

Recommendation ITU-R BS.1873-1

(05/2023)

BS Series: Broadcasting service (sound)

Serial multichannel audio digital interface for broadcasting studios

Foreword

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P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

***Note:** This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.*

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RECOMMENDATION ITU-R BS.1873-1

Serial multichannel audio digital interface for broadcasting studios

(Question ITU-R 130-3/6)

(2010-2023)

Scope

This Recommendation specifies a serial multichannel sound digital interface to be used in broadcasting studios. The specification includes the data organization and electrical characteristics for the serial digital transmission of linearly represented digital data at a common sampling frequency over coaxial or fibre-optic lines.

Keywords

Multichannel Audio Digital Interface, MADI, multichannel stereophonic sound system, advanced sound system

The ITU Radiocommunication Assembly,

considering

- a) that a significant number of sound channels are generally used for sound programme production in broadcasting studios;
- b) that there is a need to interconnect multichannel sound signals between various pieces of digital sound equipment in broadcasting studios;
- c) that it is advantageous for all the equipment to use the same interface connections,

recognizing

- a) that Recommendation ITU-R BS.775 – Multichannel stereophonic sound system with and without accompanying picture, specifies one universal multichannel stereophonic sound system with three front channels and two rear/side channels together with an optional low frequency effects (LFE) channel;
- b) that Recommendation ITU-R BS.2051 – Advanced sound system for programme production, specifies advanced sound system with loudspeaker configurations of up to 24 audio channels that can support channel-based, object-based and scene-based input signals or their combination with metadata;
- c) that Recommendation ITU-R BS.2125 – A serial representation of the Audio Definition Model, specifies a serial form of the Audio Definition Model (ADM) that is audio-related metadata for advanced sound systems;
- d) that Recommendation ITU-R BS.1738 – Identification and ordering of 4 and 8 track audio channels carried on international contribution circuits, specifies allocations of up to eight multiple audio signals on international contribution circuits;
- e) that Recommendation ITU-R BS.2102 – Allocation and ordering of audio channels to formats containing 12-, 16- and 32-tracks of audio, specifies allocations of up to 32 multiple audio signals on international contribution circuits;
- f) that Recommendation ITU-R BS.647 – A digital audio interface for broadcasting studios, specifies the digital interface for the serial digital transmission of two channels of linearly represented digital sound data used in production for sound and television broadcasting;

g) that Recommendation ITU-R BS.646 – Source encoding for digital sound signals in broadcasting studios, defines the digital sound format used in production for sound and television broadcasting;

h) that Recommendation ITU-R BS.2143 – Transport method for non-Pulse-Code Modulation audio signals and data over digital audio interfaces for programme production and exchange, specifies the transport method for non-PCM audio signals and data including a serial representation of the Audio Definition Model,

recommends

1 that the interface described in Annex 1 should be used as a serial multichannel sound digital interface in broadcasting studios;

2 that compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words “shall” or some other obligatory language such as “must” and the negative equivalents are used to express requirements. The use of such words shall in no way be construed to imply partial or total compliance with this Recommendation.

Annex 1

Serial multichannel audio digital interface (MADI)

1 Introduction

This Annex specifies the data organization and electrical characteristics for a multichannel audio digital interface for broadcasting studios. It includes a bit-level description, features in common with the two-channel format of Recommendation ITU-R BS.647 and the data rates required for its utilization. The specification provides for the serial digital transmission over coaxial or fibre-optic lines of 56 or 64 channels of linearly represented digital data at a common sampling frequency within the range of 32 kHz to 48 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.

The interface specified here is primarily intended to be used at 48 kHz as this is the recommended sampling frequency for use in broadcasting studios according to Recommendation ITU-R BS.646.

2 Terminology

For the purpose of this specification the following definitions of terms apply.

2.1 Audio sample data

Audio signal that has been periodically sampled, quantized, and digitally represented in 2's complement form.

2.2 Channel

Set of audio sample data related to one signal accompanied by other data bits transmitted in any one period of the source sampling frequency.

2.3 Two-channel format

Bit, block, and subframe structure (fewer preambles) of the Recommendation ITU-R BS.647 serial transmission format for linearly represented digital audio data.

2.4 Frame

Sequence of 64 or less (typically 56) subframes designated using numbers 0 to 63, each carrying audio sample and related data that are transmitted in one sample period, with the start of a frame beginning with the first bit of subframe 0.

2.5 Link

Connection between a single serial multichannel digital audio transmitter and a single multichannel digital audio receiver.

2.6 Sync symbol

Decoder synchronization symbol.

2.7 MADI

Multichannel audio digital interface.

2.8 NRZI (Non-return to Zero, Invert on Ones)

A technique in which a polarity transition represents a logical “1” (one). The absence of a polarity transition denotes a logical “0” (zero).

3 Format

This specification provides for the serial digital transmission over coaxial or fibre-optic lines of 56 or 64 channels of linearly-represented digital data at a common sampling frequency within the range of 32 kHz to 48 kHz having a resolution of up to 24 bits per channel. See Fig. 1.