



Recommendation ITU-R BT.1305-1
(03/2010)

**Digital audio and auxiliary data as ancillary
data signals in interfaces conforming
to Recommendations ITU-R BT.656
and ITU-R BT.799**

BT Series
Broadcasting service
(television)



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RA	Radio astronomy
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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 BT.1305-1*

**Digital audio and auxiliary data as ancillary data signals
in interfaces conforming to Recommendations ITU-R BT.656
and ITU-R BT.799**

(Question ITU-R 39/6)

(1997-2010)

Scope

This Recommendation defines the mapping rules for the carriage of an AES/EBU bit stream as defined in Recommendation ITU-R BS.647 over horizontal ancillary data space of serial digital interfaces conforming to Recommendation ITU-R BS.656 and ITU-R BT.799. The data carried in the bit stream may be two channels of periodically sampled and linearly represented digital audio data, or other data formatted to fit the payload space of the AES/EBU bit stream.

The ITU Radiocommunication Assembly,

considering

- a) that many countries are installing digital television production facilities based on the use of digital video components conforming to Recommendations ITU-R BT.601 and ITU-R BT.656;
- b) that there exists the capacity within a signal conforming to Recommendation ITU-R BT.656 for additional data signals to be multiplexed with the video data signal;
- c) that there are operational and economic benefits to be achieved by the multiplexing of ancillary data signals with the video data signal;
- d) that the operational benefits are increased if a minimum of different formats are used for ancillary data signals;
- e) that ancillary data signals embedded in the serial interface is already in widespread use;
- f) that Recommendation ITU-R BS.647 specifies an interface (commonly known as the Audio Engineering Society/European Broadcasting Union (AES/EBU) interface) for the serial transmission of two channels of digital audio and auxiliary signals,

recommends

- 1 that, for the inclusion of digital audio and auxiliary data as ancillary data signals in interface signals conforming to Recommendations ITU-R BT.656 and ITU-R BT.799, the specification in Annex 1 should be used;

* Radiocommunication Study Group 6 made editorial amendments to this Recommendation in 2007 in accordance with Resolution ITU-R 44.

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

Digital audio and auxiliary data as ancillary data signals

1 Introduction

This specification defines the mapping of digital audio and auxiliary data conforming with Recommendation ITU-R BS.647, the signal may also contain non PCM data, and associated control information into the ancillary data space of serial digital video conforming to Recommendations ITU-R BT.656 and ITU-R BT.799. Non-PCM data may be present as part of the AES/EBU bit-stream payload.

Audio sampled at 48 kHz and clock locked (isochronous) to video is the preferred implementation for intra-studio applications. As an option, this specification supports AES/EBU audio at isochronous or asynchronous sampling rates from 32 to 48 kHz.

The minimum, or default, operation of this specification supports 20 bits of audio data as defined in § 3.5. As an option, this specification supports 24-bit audio or 4 bits of AES/EBU auxiliary data as defined in § 3.10.

This specification provides a minimum of 2 audio channels and a maximum of 16 audio channels based on available ancillary data space. Audio channels are transmitted in pairs combined, where appropriate, into groups of 4. Each group is identified by a unique ancillary data ID.

Several modes of operation are defined, identified by letter suffixes to facilitate convenient identification of interoperation between equipment with various capabilities. The default form of operation is 48 kHz isochronous audio sampling carrying 20 bits of AES/EBU audio data and defined in a manner to ensure reception by all equipment conforming to this specification.

2 References

- Recommendation ITU-R BT.656: Interface for digital component video signals in 525-line and 625-line television systems operating at the 4:2:2 level of Recommendation ITU-R BT.601.
- Recommendation ITU-R BS.647: A digital audio interface for broadcasting studios.
- Recommendation ITU-R BT.799: Interface for digital component video signals in 525-line and 625-line television systems operating at the 4:4:4 level of Recommendation ITU-R BT.601.
- Recommendation ITU-R BT.1364: Format of ancillary data signals carried in digital component studio interfaces.

3 Definitions

The following definitions apply to terms used in this Recommendation:

3.1 AES/EBU audio

All the data, audio and auxiliary information, associated with an AES/EBU bit stream is defined by Recommendation ITU-R BS.647.

3.2 AES/EBU frame

Two AES/EBU subframes, one with audio data for channel 1 followed by one with audio data for channel 2.

3.3 AES/EBU subframe

All data associated with one AES/EBU audio sample for one channel in a channel pair.

3.4 Audio control packet

An ancillary data packet occurring once in a field and containing data used in the operation of optional features of this specification.

3.5 Audio data

23 bits: 20 bits of AES/EBU audio associated with one audio sample, not including AES/EBU auxiliary data, plus the following 3 bits: Sample Validity (V-bit), Channel Status (C-bit), User Data (U-bit).

3.6 Audio data packet

An ancillary data packet as defined in Recommendation ITU-R BT.1364 containing audio data for one or two channel pairs (two or four channels). An audio data packet may contain audio data for 1 or more samples associated with each channel.

3.7 Audio frame number

A number, starting at 1, for each frame within the audio frame sequence. For the example in § 3.8 the frame numbers would be 1, 2, 3, 4, 5.

3.8 Audio frame sequence

The number of video frames required for an integer number of audio samples in isochronous operation. As an example: the audio frame sequence for isochronous 48 kHz sampling in a 525-line (29.97 frame/s) system is 5 frames and for a 625-line (25 frame/s) system is 1 frame.

3.9 Audio group

Consists of one or two channel pairs which are contained in one ancillary data packet. Audio groups are numbered 1 through 4. Each audio group has a unique ID as defined in § 12.2.

3.10 Auxiliary data

4 bits of AES/EBU audio associated with one sample defined as auxiliary data by Recommendation ITU-R BS.647. The 4 bits may be used to extend the resolution of audio samples.

3.11 Channel pair

Two digital audio channels, generally derived from the same AES/EBU audio source.

3.12 Extended data packet

An ancillary data packet containing auxiliary data corresponding to, and immediately following, the associated audio data packet.

3.13 Sample pair

Two samples of AES/EBU audio as defined in § 3.1.

3.14 Isochronous audio

Audio is defined as being clock isochronous with video if the sampling rate of audio is such that the number of audio samples occurring within an integer number of video frames is itself a constant integer number, as in the following examples:

Audio sampling rate (kHz)	Samples/frame, 29.97 frame/s video	Samples/frame, 25 frame/s video
48.0	8008/5	1920/1
44.1	147147/100	1764/1
32.0	16016/15	1280/1

NOTE 1 – The video and audio clocks must be derived from the same source since simple frequency synchronization could eventually result in a missing or extra sample within the audio frame sequence.

4 Overview and levels of operation

4.1 Configurations

Audio data derived from one or more AES/EBU frames and one or two channel pairs is configured in an audio data packet as shown in Fig. 1. Generally, both channels of a channel pair will be derived from the same AES/EBU audio source, but this is not essential. The number of samples per channel contained in one audio data packet will depend on the distribution of the data in a video field. As an example, the ancillary data space in some television lines may carry three samples, some may carry four samples. Other values are possible.

NOTE 1 – Some existing equipment may transmit other sample counts, including zero. Receiving equipment should handle correctly sample counts from zero to the limits of ancillary data space.