



**Federal Agencies  
Digitization Guidelines Initiative**

**DESCRIPTION OF MXF AS-07 SAMPLE FILES**

September 1, 2016

The FADGI Audio-Visual Working Group  
<http://www.digitizationguidelines.gov/audio-visual/>

## **Description of MXF AS-07 Sample Files**

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By the Federal Agencies Digitization Guidelines Initiative Audio-Visual Working Group

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## **WHAT IS THIS DOCUMENT?**

On behalf of the FADGI Audiovisual Working Group, the Library of Congress contracted with AVPreserve and their subcontractor EVS, especially Product Development Manager Valerie Popie, to create a set of graded sample files based on the AS-07 Application Specification as of June 2016

([http://www.amwa.tv/downloads/specifications/AS-07\\_Proposed\\_Application\\_Specification.pdf](http://www.amwa.tv/downloads/specifications/AS-07_Proposed_Application_Specification.pdf)). The files were reviewed by Oliver Morgan of Metaglug.

This document details the technical characteristics of both the source material and the four sets of sample files.

- **Golden files** include most - but not all - of the technical components detailed in the AS-07 specification. The components follow the defined rules and the files are well-formed and valid.
  - Constraints of time and other resources limited the degree to which this set of samples represents the entirety of the AS-07 specification. Among the omitted elements is embedded content integrity data. Users should be aware that this set of samples were "handmade" and do not represent the output of a factory-production system.
- **Silver files** are similar to Golden Files in their composition except they deviate from the defined rules in the AS-07 specification in minor ways.
- **Copper files** include more significant deviations from the AS-07 specification.
- **Lead files** contain fatal errors that compromise the integrity of the conformance to the AS-07 specification

## **GOLDEN FILES**

### **Sample #1 – Uncompressed Picture Essence**

#### **Sample 1: summary of video input and file output**

1. Source item has:

- 1.1. VITC with no problems
  - 1.2. Closed captions on line 21 (CEA-608)
  - 1.3. Box has handwritten notes on the back, organization scans, has scan available to embed
  - 1.4. Collections management database record exists, output as XML
  - 1.5. Transferred on SAMMA, XML file with process metadata exists
  - 1.6. Organization provides data for the manifest
2. MXF AS-07 file should have:
    - 2.1. Uncompressed picture essence:
      - 2.1.1. Raster: NTSC (720\*486i59.94).
      - 2.1.2. Codec: Uncompressed YCbYCr 8-bit.
      - 2.1.3. Wrapping: SMPTE ST384.
    - 2.2. Audio essence:
      - 2.2.1. 8 audio tracks (speakers in different language), Mono track, 24bits, 48 000Hz.
      - 2.2.2. Wrapping: ST382 – Broadcast Wave.
      - 2.2.3. The property “AS\_07\_Core\_DMS\_AudioTrackLayout” in “AS\_07\_Core\_DMS” shall be present.
    - 2.3. Master timecode:
      - 2.3.1. Present in Material Package, Top Level Source Package, GC System Item
      - 2.3.2. Labelling Timecode in Header Metadata shall be present (including DateTimeDescriptor and subdescriptor).
    - 2.4. Historical source timecode:
      - 2.4.1. Present in Top Level Source Package, Low Level Source Package, GC System Item.
      - 2.4.2. Labelling Timecode in Header Metadata shall be present (including DateTimeDescriptor and subdescriptor).
    - 2.5. Captions still in line 21
    - 2.6. Captions at CEA-608 in ANC packets
      - 2.6.1. Wrapping: SMPTE ST436 with appropriate essence descriptor.
    - 2.7. Captions converted to Timed Text
      - 2.7.1. Stored according to the SMPTE ST429-5 (File marked as OP1b).
    - 2.8. TIFF image of box
      - 2.8.1. Wrapped in GSP as binary data.
      - 2.8.2. An instance of “AS-07 GSP Binary Data Descriptive Metadata” for non-essence binary data shall be present.
    - 2.9. Collections management XML record:
      - 2.9.1. Wrapped in GSP as text-based data (SMPTE RP2057).
      - 2.9.2. Instance of “AS-07 GSP Text-based Data Descriptive Metadata” for non-essence text-based data.
    - 2.10. Manifest embedded:
      - 2.10.1. Wrapped in GSP as text-based data (SMPTE RP2057).
      - 2.10.2. Instance of “AS-07 GSP Text-based Data Descriptive Metadata” for non-essence text-based data.

**Source files used to create Sample 1**

The following table describes the source files used to create the sample file #1.

Sources / Video (with CC in line 21) / Audio	"SourceMediaSamples\nara_AVI_with_Captions\95-ak-30-excerpt.avi"
CEA608	Shall be created from line21. Done.
TIFF image (box)	"SourceMediaSamples\nara_AVI_with_Captions\1_in_open_reel_box.tiff"
TimedText	"SourceMediaSamples\nara_AVI_with_Captions\SMPTEETT.xml"
Collections management XML	"SourceMediaSamples\nara_AVI_with_Captions\95-ak-30-excerpt-CollectionManagementMetadata.html"
Manifest.xml	Created by EVS.

**File Description**

This section contains the description of the file #1 (as07\_sample1-gf-unc-2.4.mxf).

### General

- OP-1b frame wrapped.
- The HMD (Header Metadata) is closed & complete.
- An 8K filler is present after the HMD.
- The RIP is present.
- The KAG size is 1.
- The essence is present in a single body partition.
- The full index table is present in a body partition before the essence.
- A SMPTE ST436 ancillary data track is present with CEA-608 in CDP (extracted from the line 21 of the video essence).

### Video

- Raster: NTSC (720\*486i59.94)
- Codec: Uncompressed YCbYCr 8-bit
- Wrapping: ST384
- A CDCI descriptor is present.

### Audio

- 8 audio tracks (speakers in different language):
  - Mono track
  - 24bits
  - 48000Hz
- Wrapping: ST382 – Broadcast Wave

### Ancillary

- Wrapping: ST436 – ancillary data packets
  - The “ANC Packets Descriptor” is present

### Timecode

- Master timecode: MP (Material Package), TLSP (Top Level Source Package) of the video, audio and ancillary package, System Item, LLSP (Low Level Source Package).
- VITC historical source timecode in the TLSP of the video, audio and ancillary package, System Item and LLSP.
- Track number are set according to the AS-07 specification (In TLSP, the track number for the master timecode track is 1, track number for historical timecode track is 0)
- The DateTimeDescriptor is present.
  - The “essence container” property is set to “00.00.00.00.00.00.00.00.00.00.00.00.00.00.00.00”.
- The TimecodeLabelSubDescriptor are presents in the sample file.
  - DateTime Symbol: we use “Master”, “Historical”, “Sys\_1”, “Sys\_0”.
- The essence trackID is not present in the Appendix C.4 but is mentioned in chapters 6.4.3.2.1.1 and 6.4.3.2.1.2.
- Using the ULs now defined in the AS-07 specification of June 2016:

Item Name	Item UL
TimecodeLabel Subdescriptor	060e2b34.027f0101.0d0e0101.07040100
DateTime Symbol	060e2b34.01010101.0d0e0101.07040101
DateTime ChannelID	060e2b34.01010101.0d0e0101.07040103
DateTime Essence Track Id	060e2b34.01010101.0d0e0101.07040102
DateTime Description	060e2b34.01010101.0d0e0101.07040104

### DMS-1 AS-07 Core Framework

- An “AS\_07\_GSP\_DMS\_Object” is present.

- “AS\_07\_GSP\_DMS\_Object”, "AS\_07\_DMS\_Identifier" and "AS\_07\_Core\_DMS\_Device" are using the ULs defined in the AS-07 specification of June 2016.

Item Name	Item UL
DMS_AS_07_GSP_DMS_Framework	060e2b34.04010101.0d010701.07020100
AS_07_DMS_IdentifierRole	060e2b34.01010101.0d0e0101.07010303
AS_07_DMS_IdentifierType	060e2b34.01010101.0d0e0101.07010304
AS_07_Core_DMS_Device	060e2b34.027f0101.0d0e0101.07010200
AS_07_DMS_Identifier	060e2b34.027f0101.0d0e0101.07010300

- The required properties of “AS\_07\_Core\_DMS” are presents.
- The property “AS\_07\_Core\_DMS\_AudioTrackLayout” is set to the ‘AS07\_AUDIO\_LAYOUT\_UNKNOWN’ UL.
- AS\_07\_Core\_DMS\_PictureFormat is defined to “forbidden”
- AS\_07\_Core\_DMS\_ShimName is defined to “SD Baseband shim”.

#### ***SMPTE Timed Text (TT)***

- Wrapped in a data essence track based on ST 429-5.
  - It is own top level source package is present.
  - The TimedTextDescriptor is present.
  - Timed text essence container label used as well as timed text essence element used.

#### ***TIFF***

- Wrapped in a GSP based on SMPTE ST 410.
- “AS\_07\_GSP\_BD\_DMS\_Framework” framework present in the file.
- AS\_07\_DMS\_IdentifierValue for Generic Stream Partition is defined with the Generic Stream Partition streamID value.
- The property TextMIMEMediaType of the AS\_07\_GSP\_DMS\_Object (from table 7 of the RP 2057:2011) is defined to empty string.

#### ***Collection management XML***

- Wrapped in a GSP as non-essence text based.
- “AS\_07\_GSP\_TD\_DMS\_Framework” framework present in the file.
- AS\_07\_DMS\_IdentifierValue for Generic Stream Partition is defined with the Generic Stream Partition streamID value.

#### ***Manifest***

- Wrapped in a GSP as non-essence text based.
- “AS\_07\_GSP\_TD\_DMS\_Framework” framework present in the file.
- AS\_07\_DMS\_IdentifierValue for Generic Stream Partition is defined with the Generic Stream Partition streamID value.

## **Sample #2 – JPEG 2000**

### ***Sample 2: summary of video input and file output***

1. Source item has:
  - 1.1. VITC with no problems
  - 1.2. Intermittent LTC
  - 1.3. Collections management database record exists, output as XML
  - 1.4. Transferred on SAMMA, XML file with process metadata exists
  - 1.5. Organization provides data for the manifest
2. MXF AS-07 file should have:

- 2.1. Lossless JPEG 2000 picture essence
  - 2.1.1. Raster: NTSC (720\*486i59.94).
  - 2.1.2. Codec: JPEG 2000 Broadcast Profile Multi tile reversible 7 in Lossless.
  - 2.1.3. Wrapping: SMPTE ST422 – I1.
- 2.2. Audio essence
  - 2.2.1. 8 audio tracks (speakers in different language), Mono track, 24bits, 48 000Hz.
  - 2.2.2. Wrapping: ST382 – Broadcast Wave.
  - 2.2.3. The property “AS\_07\_Core\_DMS\_AudioTrackLayout” in “AS\_07\_Core\_DMS” shall be present.
- 2.3. Master timecode:
  - 2.3.1. Present in Material Package, Top Level Source Package, GC System Item.
  - 2.3.2. Labelling Timecode in Header Metadata shall be present (including DateTimeDescriptor and subdescriptor).
- 2.4. Historical source timecode VITC
  - 2.4.1. Present in Top Level Source Package, Low Level Source Package, GC System Item.
  - 2.4.2. Labelling Timecode in Header Metadata shall be present (including DateTimeDescriptor and subdescriptor).
- 2.5. Historical source timecode LTC:
  - 2.5.1. Present in Top Level Source Package, Low Level Source Package, GC System Item.
  - 2.5.2. Labelling Timecode in Header Metadata shall be present (including DateTimeDescriptor and subdescriptor).
- 2.6. Historical source timecode LTC in discontinuities:
  - 2.6.1. The source file does not contain any discontinuities, we will create some manually.
  - 2.6.2. Present in Top Level Source Package, Low Level Source Package, GC System Item.
  - 2.6.3. Labelling Timecode in Header Metadata shall be present (including DateTimeDescriptor and subdescriptor).
- 2.7. Collections management XML record:
  - 2.7.1. Wrapped in GSP as text-based data (SMPTE RP2057).
  - 2.7.2. Instance of “AS-07 GSP Text-based Data Descriptive Metadata” for non-essence text-based data.
- 2.8. SAMMA XML record:
  - 2.8.1. Wrapped in GSP as text-based data (SMPTE RP2057).
  - 2.8.2. Instance of “AS-07 GSP Text-based Data Descriptive Metadata” for non-essence text-based data.
- 2.9. Manifest embedded:
  - 2.9.1. Wrapped in GSP as text-based data (SMPTE RP2057).
  - 2.9.2. Instance of “AS-07 GSP Text-based Data Descriptive Metadata” for non-essence text-based data.

**Source files used to create sample 2**

The following table describes the source files used to create the sample file #2.

Sources Video / Audio	"SourceMediaSamples\LC Complete record\419637.mxf"
Timecode discontinuities	Timecode discontinuities will be created manually.
Collections management XML	"SourceMediaSamples\1899xxx_MAVIS_redacted.xml"
SAMMA XML	"SourceMediaSamples\419638_SAMMAdata_redacted.xml"
Manifest.xml	Created by EVS.

**File Description**

This section contains the description of the file #2 (as07\_sample2-gf-jpeg2000-2.4.mxf).

**General**

- OP-1a frame wrapped.
- The HMD (Header Metadata) is closed & complete.
- An 8K filler is present after the HMD.
- The RIP is present.
- The KAG size is 1.
- The essence is present in a single body partition.



- AS\_07\_Core\_DMS\_ShimName is defined to “SD Baseband shim”.

#### ***SAMMA XML***

- Wrapped in a GSP as non-essence text based.
- “AS\_07\_GSP\_TD\_DMS\_Framework” framework present in the file.
- AS\_07\_DMS\_IdentifierValue for Generic Stream Partition is defined with the Generic Stream Partition streamID value.

#### ***Collection management XML***

- Wrapped in a GSP as non-essence text based.
- “AS\_07\_GSP\_TD\_DMS\_Framework” framework present in the file.
- AS\_07\_DMS\_IdentifierValue for Generic Stream Partition is defined with the Generic Stream Partition streamID value.

#### ***Manifest***

- Wrapped in a GSP as non-essence text based.
- “AS\_07\_GSP\_TD\_DMS\_Framework” framework present in the file.
- AS\_07\_DMS\_IdentifierValue for Generic Stream Partition is defined with the Generic Stream Partition streamID value.

#### ***Silver Files***

### **Sample #3 – JPEG 2000 Profile 2**

#### ***Sample 3 Summary***

- Based on the golden JPEG 2000 file #2
- ISO 15444-1:2004 JPEG 2000 instead of ISO 15444-1:2004/AMD3

#### ***File Description***

The file #3 (as07\_sample3-sf-jpeg2000-2.4.mxf) has the same description as the golden file #2 except it contains Profile 2 JPEG 2000 coding (The picture essence coding in the CDCI descriptor is different than the golden file #2).

#### ***Copper Files***

### **Sample #4 – No Manifest**

#### ***Sample 4 Summary***

- Based on the golden Uncompressed file #1
- No manifest file

#### ***File Description***

The file #4 (as07\_sample4-cf-unc-2.4.mxf) has the same description as the golden file #1 except it does not contain the manifest: there is no GSP present to store the manifest as well as the associate descriptive static track in this file.

### **Sample #5 - Invalid Partitioning**

#### ***Sample 5 Summary***

- Based on the golden JPEG 2000 file #2
- Essence in the header partition and the Index table in the footer

### ***File Description***

List of differences between the sample #2 and the sample #5 (as07\_sample5-cf-jpeg2000-2.4.mxf):

- Essences are in the header partition
- The essence is not partitioned over multiple partitions.
- The complete index table is in the footer partition (Index Table Segments that compose one Complete Index Table follow Essence Container Segments that they index).

### ***Lead Files***

## **Sample #6 – Invalid Timecode**

### ***Sample 6 Summary***

- Based on the golden JPEG 2000 file #2
- Typical timecode implementations (without AS-07 constraints: only 1 timecode in MP, in SP and one occurrence in the system item).
- ST385 system item

### ***File Description***

Here are the differences between the sample #2 and the sample #6 (as07\_sample6-lf-jpeg2000-2.4.mxf):

- The Master Package, Top Level Source Package and Low Level source package only contains one timecode track.
- The track number of each timecode track is set to 0.
- SMPTE ST 385 system items are present.

## **Sample # 7 – No RIP**

### ***Sample 7 Summary***

- Based on the golden Uncompressed file #1
- No RIP

### ***File Description***

The file #7 (as07\_sample7-lf-unc-2.4.mxf) has the same description as the golden file #1 except it does not contain the random index pack (RIP) at the end of the file.