SMPTE REGISTERED DISCLOSURE DOCUMENT

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e-VTR MXF Interoperability Specification

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1 Scope

This document provides details of the implementation of the e-VTR from Sony. The MXF files created by this device are fully compliant with the MXF. The ability of the e-VTR to receive MXF files have some constraints resulting from storage issues that result from the need to retain compliance with the type D-10 tape format specification. In conjunction with the referenced Standards, this RDD is intended to provide sufficient information enabling a developer to construct MXF files that will be compatible with the e-VTR.

2 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this registered disclosure document. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this registered disclosure document are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

SMPTE 356M-2001, Television — Type D-10 Stream Specifications — MPEG-2 4:2:2P @ ML for 525/60 and 625/50

SMPTE 377M-2004, Television — Material Exchange Format (MXF) — File Format Specification (Standard)

SMPTE 378M-2004, Television — Material Exchange Format (MXF) — Operational Pattern 1A (Single Item, Single Package)

SMPTE 379M-2004, Television — Material Exchange Format (MXF) — MXF Generic Container

SMPTE 385M-2004, Television — Material Exchange Format (MXF) — Mapping SDTI-CP Essence and Metadata into the MXF Generic Container

SMPTE 386M-2004, Television — Material Exchange Format (MXF) — Mapping Type D-10 Essence Data to the MXF Generic Container

3 Introduction

The e-VTR supports the following specific body format and MXF operational pattern.

Essence Container	Generic Container D10
Operational Pattern	#1a

When recording and reproducing on tape, e-VTR records and reproduces not only audio/visual data but also MXF file header.

In this case, the MXF header is directly recorded on tape without parsing, and the reproduced MXF header from tape is directly transmitted. If e-VTR changes the attributes of the file after receiving it, e-VTR will overwrite the existing MXF header with a new header when transmitting.

The e-VTR can make a new file from the recorded data in a specified area. In this case, MXF header will be created when transmitting.

4 Encoding Specification

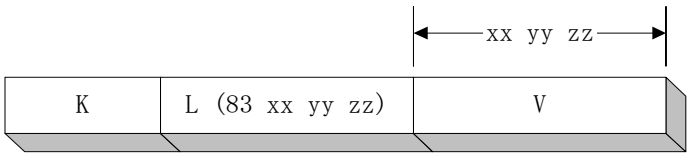
The e-VTR creates a minimal, but compliant, MXF file according to SMPTE 356M, SMPTE 377M, SMPTE 378M, SMPTE 379M, SMPTE 385M, and SMPTE 386M.

4.1 KLV Structure

The MXF file is based on KLV structure which comprises of 16 byte UL key, length and value.

Length is BER (basic encoding rules) encoded.

The MXF file transmitted by the e-VTR uses 4 byte BER encoded length in the style of “83 xx yy zz”.



All MXF components are aligned to 512 byte boundaries by using the fill item, as specified in SMPTE 386M.

4.2 File Header Structure

In case the MXF header is not recorded on tape or the recorded MXF header is invalid, the e-VTR will create a minimal, but sufficient MXF header with the sets as shown below.

Header Partition	Header Partition				
	Fill Item				
Header Metadata	Primer				
	Preface				
	Identification				
	Content Storage	Essence Container Data			
		Material Package	Time Code Track	Time Code Sequence	Time Code Component
			Picture Track	Picture Sequence	Picture Component
			Sound Track	Sound Sequence	Sound Component
		File Package	Multiple Descriptor	CDCI Descriptor	Sound Essence Descriptor
			Time Code Track	Time Code Sequence	Time Code Component
			Picture Track	Picture Sequence	Picture Component
			Sound Track	Sound Sequence	Sound Component
	Fill Item				
Index Table	Index Table				
	Fill Item				

4.3 File Body Structure

The e-VTR supports only the type D-10 format with the generic container as the MXF body.

The frame structure comprises a system item, a picture item, and a sound item and the length of each is defined.

Interleave (1 Frame)	System Item	System Metadata Pack
		Package Metadata Set
		Fill Item
	Picture Item	Picture Set
		Fill Item
	Sound Item	Sound Set
		Fill Item

4.4 File Footer Structure

The file footer will be 0x200 fixed length (including the fill item) and created each time for transmission.

Footer Partition	Footer Partition
	Fill Item

5 Description of e-VTR Implementation

5.1 Receiving an MXF File

1	The Essence Container (AV) data and MXF header will be recorded on tape as received.
2	If the status of the data is regarded as one of the conditions in sub clause 5.1.1, the MXF Header will not be recorded.
3	The Header Partition Pack and the Header Metadata of the received MXF Header is directly recorded to tape and transmitted from tape without parsing.
4	The Index Table of the received MXF Header is directly recorded to tape without parsing. If the Edit Unit Byte Count value is different from the size of Edit Unit in the body, the value will be corrected when transmitting.
5	If the status of the data is regarded as one of the conditions in sub clause 5.1.2, the MXF recording will be aborted.
6	The Type D-10 compressed signal will be recorded directly whether or not in accordance with the specified compression rates of 30M, 40M and 50M. When transmitting, the compression ratio is set by the VTR internal settings.

5.1.1 Status and conditions for not recording the MXF header

1-1	When MXF version is 1.1 (Note1), and Partition Status is “Open Partition =1”.
1-2	When MXF version is 1.2 (Note2), and Partition Status is other than “Closed Complete =4”.
2	The total data length of the header is greater than 256KB (256KB-24B precisely).

Notes:

1 "MXF version 1.1" is equal to Pro-MPEG draft version V10.
2 "MXF version 1.2" is equal to Pro-MPEG draft version V11 and to the SMPTE standard.

5.1.2 Status and conditions for aborting an MXF recording

1	File Header	The UL is not the Header Partition Metadata Key.
2	Header Partition	The "KAG" value is other than "512".
		"Index Byte Count" value is "0" which means no Index Table.
		Format or TV system (525/625) in "Essence Containers" is not supported by the e-VTR.
		Primer Set UL not found where expected.
		Index Table Set UL not found where expected.
3	Index Table	"Edit Unit Byte Count" value is "0" which means variable frame length.
4	KLV coding is not correct.	
5	Incorrect UL or undefined UL present in the Essence Container.	
6	Any file containing Body Partitions or a Random Index pack.	

5.2 Transmitting the MXF File

1	If the MXF header of the specified file was recorded on tape, the reproduced MXF header will be transmitted without any processing. If e-VTR changes the attributes of the file after receiving it, e-VTR will make the MXF header invalid.
2	If the MXF header of the specified file was not recorded on tape, or if it was invalid, the e-VTR will overwrite the existing MXF header with new Metadata for transmission according to policies (1),(2) and (3). (1) e-VTR will create an MXF header according to the specification V.1.2. (2) In case where TC is continuous and the transfer mode is other than SITE REPF, the Partition Status will be set to "Closed Complete", and the "duration" property in the Header Metadata will be set to the appropriate value. (3) In case where TC is discontinuous or corrupted; or the transfer mode is SITE REPF, the Partition Status will be set to "Closed Incomplete", and the "duration" property in the Header Metadata will be set to '-1'. (To restore timecode of a cut out file, a "SITE FSIZ" command has to be issued before the file transfer)
	If the Header metadata is newly created, the Package UID of File Package and Material Package will also be created as new.
	"Generation UID" of Identification will be created.
	The "Company Name" and "Product Name" properties of the Identification set will be set to "SONY" and "eVTR".
	The following private UID will be used for "Product UID" of Identification. 06 0e 2b 34 04 01 01 06 0e 06 01 20 01 01 01 00
3	In case the Menu inside e-VTR for D-10 compression ratio is set to the value other than "default value of 50M", e-VTR will re-encode the reproduced signal and transmit it with the specified compression ratio.

5.3 UL Code List

Following is the list of UL codes used for e-VTR on transmission. In some cases, the values may be masked with a MASK value to allow variations of input as shown below:

Header Partition	MASK	00 00 00 00 00 00 00 00 00 00 00 00 00 07 00
	Closed Incomplete	06 0e 2b 34 02 05 01 01 0d 01 02 01 01 02 02 00
	Closed Complete	06 0e 2b 34 02 05 01 01 0d 01 02 01 01 02 04 00
Operational Pattern	MASK	00 00 00 00 00 00 00 00 00 00 00 00 00 08 00
	#1a	06 0e 2b 34 04 01 01 01 0D 01 02 01 01 01 09 00
Essence Container	MASK	00 00 00 00 00 00 00 00 00 00 00 00 03 00 07 00
	525 / 50M	06 0e 2b 34 04 01 01 01 0d 01 03 01 02 01 02 01
	525 / 40M	06 0e 2b 34 04 01 01 01 0d 01 03 01 02 01 04 01
	525 / 30M	06 0e 2b 34 04 01 01 01 0d 01 03 01 02 01 06 01
	625 / 50M	06 0e 2b 34 04 01 01 01 0d 01 03 01 02 01 01 01
	625 / 40M	06 0e 2b 34 04 01 01 01 0d 01 03 01 02 01 03 01
	625 / 30M	06 0e 2b 34 04 01 01 01 0d 01 03 01 02 01 05 01
Fill Item	MASK	00 00 00 00 00 00 00 03 00 00 00 00 00 00 00 00
		06 0e 2b 34 01 01 01 02 03 01 02 10 01 00 00 00
Structural Metadata	Primer	06 0e 2b 34 02 05 01 01 0d 01 02 01 01 05 01 00
	Preface	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 2f 00
	Identification	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 30 00
	Content Strage	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 18 00
	Essence Container Data	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 23 00
	Material Package	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 36 00
	File Package	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 37 00
	Multiple Descriptor	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 44 00
	CDCI Essence Desc.	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 28 00
	Sound Essence Desc.	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 42 00
	Timecode Definition	06 0e 2b 34 04 01 01 01 01 03 02 01 01 00 00 00
	Picture Definition	06 0e 2b 34 04 01 01 01 01 03 02 02 01 00 00 00
	Sound Definition	06 0e 2b 34 04 01 01 01 01 03 02 02 02 00 00 00
	Track	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 3b 00
	Sequence	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 0f 00
	Component	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 11 00
	Timecode12MComponent	06 0e 2b 34 02 53 01 01 0d 01 01 01 01 01 14 00
Index Table Segment		06 0e 2b 34 02 53 01 01 0d 01 02 01 01 10 00 00
System Item	System Metadata	06 0e 2b 34 02 05 01 01 0d 01 03 01 04 01 01 00
	Mask	00 00 00 00 00 00 00 00 00 00 00 00 00 00 f f
	Package Metadata	06 0e 2b 34 02 43 01 01 0d 01 03 01 04 01 02 xx
Picture	Mask	00 00 00 00 00 00 00 00 00 00 00 00 00 00 7f
		06 0e 2b 34 01 02 01 01 0d 01 03 01 05 01 01 00
Sound	Mask	00 00 00 00 00 00 00 00 00 00 00 00 00 00 7f
		06 0e 2b 34 01 02 01 01 0d 01 03 01 06 01 10 00
Footer Partition	Closed Complete	06 0e 2b 34 02 05 01 01 0d 01 02 01 01 04 04 00

There is a legacy base of e-VTR MXF files that use a different Fill item key. This key has the value 06.0e.2b.34.01.01.01.01.03.01.02.10.01.00.00.00. MXF decoders should be able to recognize both Fill item keys.

5.4 Body Size

The body size for transmission varies with the compression ratio as follows:

System	Item	Ratio	Sector (512)	Bytes (dec)	Bytes (hex)
525	Edit Unit	50M	510	261120	3FC00
		40M	428	219136	35800
		30M	347	177664	2B600
	System	-	1	512	200
	Video	50M	408	208896	33000
		40M	326	166912	28C00
		30M	245	125440	1EA00
	Audio	-	101	51712	CA00
625	Edit Unit	50M	611	312832	4C600
		40M	513	262656	40200
		30M	416	212992	34000
	System	-	1	512	200
	Video	50M	489	250368	3D200
		40M	391	200192	30E00
		30M	294	150528	24C00
	Audio	-	121	61952	F200