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First edition
2005-07

Multimedia home server systems – Interchangeable volume/file structure adaptation for broadcasting receivers –

Part 2: General recording structure

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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MULTIMEDIA HOME SERVER SYSTEMS – INTERCHANGEABLE VOLUME/FILE STRUCTURE ADAPTATION FOR BROADCASTING RECEIVERS –

Part 2: General recording structure

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International Standard IEC 62328-2 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this standard is based on the following documents:

FDIS	Report on voting
100/964A/FDIS	100/988/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

IEC 62328 consists of the following parts, under the general title *Multimedia home server systems – Interchangeable volume/file structure adaptation for broadcasting receivers*:

Part 1: General description and architecture

Part 2: General recording structure

Part 3: Broadcasting system specific recording structure - ISDB

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

Broadcast data in a transport stream can contain multiple associated objects. When that data is distributed on interchangeable storage media, for example, optical disks, the associated objects should be synchronized. Open distribution of the media requires that the data be adapted to a standardized volume and file structure, which should conform to the existing basic volume and file structure.

MULTIMEDIA HOME SERVER SYSTEMS – INTERCHANGEABLE VOLUME/FILE STRUCTURE ADAPTATION FOR BROADCASTING RECEIVERS –

Part 2: General recording structure

1 Scope

This part of IEC 62328 defines the volume and file structure required for interchanging multimedia data of a home server/broadcasting receiver, which consists of an AV stream with multiple associated objects.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62328-1: *Multimedia home service systems – Interchangeable volume/file structure adaptation for broadcasting receivers – Part 1: General description and architecture*

IEC 62328-3: *Multimedia home service systems – Interchangeable volume/file structure adaptation for broadcasting receivers – Part 3: Broadcasting system specific recording structure – ISDB*

ISO/IEC 646:1991, *Information technology – ISO 7-bit coded character set for information interchange*

ISO/IEC 10918-1:1994, *Information technology – Digital compression and coding of continuous-tone still images: Requirements and guidelines*

ISO/IEC 13818-2:2000, *Information technology – Generic coding of moving pictures and associated audio information: Video*

3 Definitions

For the purposes of this document, the following terms and definitions apply.

3.1
action
duration from start to end defined by a user or equipment

3.2
AV stream
recorded data in the MainTS stream file of PROGxxxx.PIF in this specification or the general meaning as multiplexed digital audio and video

3.3
AV stream sequence
sequence of AV stream(s) pointed by the orderly set of pointers to the part of a MainTS stream file

3.4
component
elementary stream contained in a TV programme

3.5
event
set of video and/or audio stream data and/or related objects, which together form a broadcasting service in the duration defined by a broadcaster

3.6
partial TS
TS derived from broadcasting TS by modifying PSI/SI and/or removing one or more elementary streams

3.7
programme
recorded TV programme compliant with this specification

3.8
programme reference(PGR)
pointer which references all or a part of AV stream in a programme

3.9
programme reference group(PGRG)
set of programme references or a set of programme reference groups

3.10
transport stream(TS)
system stream for broadcasting defined in ISO/IEC13818-1

3.11
TV programme
logical unit of TV broadcasting (event in digital TV service)

3.12
TVRS partial TS
partial TS recording format which complies with this specification

4 Abbreviations

For the purposes of this document, the following abbreviations apply.

ACU	Access unit
ALU	Allocation unit
AES	Advanced encryption standard
ATSC	Advanced television systems committee
BP	Byte position within a file starting with zero
CBC	Cipher block chaining
CCI	Copy control information
CD	Compact disc
DVD	Digital versatile disc
DES	Data encryption standard
DSM-CC	Digital storage media command and control

DVB	Digital video broadcasting
ES	Elementary stream
GOP	Group of pictures
HDD	Hard disk drive
IRV	International reference version
ISDB	Integrated services digital broadcasting
MO	Magneto-optical disk
MPEG	Moving picture experts group
PES	Packetized elementary stream
PGR	Programme reference
PGRG	Programme reference group
PID	Packet identifier
PSI	Programme-specific information
RBP	Relative byte position within a file starting with zero
RP	Recording packet
SI	Service information
STB	Set top box
TS	Transport stream
TU	Time unit
TVRS	TV recording format specific
UDF	Universal disk format

5 Notation

5.1 Numerical values

5.1.1 Decimal notation

A decimal number is represented as decimal digits 0 to 9.

5.1.2 Hexadecimal notation

A hexadecimal number is represented as hexadecimal digits 0 to 9 and A to F prefixed by the symbol “0x”.

5.1.3 Binary notation

A binary number is represented as binary digits 0 to 1 suffixed by the symbol “b”.

5.1.4 Bit string

A bslbf shall be recorded as bit string, left bit first.

5.1.5 Unsigned numerical value

A uimsbf shall be unsigned integer, most significant bit first.

6 General

6.1 Generic timestamp (GTS)

The structure of GTS is described in Table 1.

Table 1 – Structure of GTS

RBP	Length in bytes	Field name	Contents
0	1	TYPE and time zone	TTZ
1	1	Extended information	EI
2	1	Year (from 1900)	uimsbf
3	1	Month	uimsbf
4	1	Day	uimsbf
5	1	Hour	uimsbf
6	1	Minutes	uimsbf
7	1	Seconds	uimsbf

6.1.1 Type and time zone (RBP0)

The structure of TTZ is described in Table 2.

Table 2 – Structure of TTZ

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
L/G	TZ P/M	TZ Offset[3..0]				HF	**DSTF**

6.1.1.1 L/G (bit7) [bslbf]

If the local time is applied, the L/G bit shall be set to 1b. If the coordinated universal time (global time) is applied, the L/G bit shall be 0b.

6.1.1.2 TZ P/M (bit6) [bslbf]

If the local time is ahead of the coordinated universal time, the TZ P/M bit shall be set to 1b. If the local time is behind the coordinated universal time, the TZ P/M bit shall be 0b. If the L/G bit is 0b, this means that the coordinated universal time is applied – this bit shall be ignored.

6.1.1.3 TZ offset [3..0] (bit5-2) [uimsbf]

This 4-bit value specifies the offset, in hours, of the date and time of the day from the coordinated universal time. This offset is an absolute value.

6.1.1.4 HF (bit1) [bslbf]

If this HF bit is set to 1b, the TZ offset has a half-hour additional time. If this HF bit is set to 0b, the TZ offset has no additional time.

6.1.1.5 DSTF (bit0) [bslbf]

If this DSTF bit is set to 1b, the daylight saving time is applied by the time zone. If this DSTF bit is set to 0b, the standard time is applied by the time zone.

6.1.2 Extended information (RBP1)

The structure of EI is described in Table 3.

Table 3 – Structure of EI

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Day of week[2..0]			Reserved				

6.1.2.1 Day of week [2..0] (bit7-5) [uimsbf]

The day of the week is stored. The 3-bit interpretation is described in Table 4.

Table 4 – Day-of-week interpretation

Value	Interpretation
0x0	The day of week is not specified in this field
0x1	Sunday
0x2	Monday
0x3	Tuesday
0x4	Wednesday
0x5	Thursday
0x6	Friday
0x7	Saturday

6.1.2.2 Reserved (bit4-0) [bslbf]

These bits are reserved for future standardization and all bits shall be set to 0b.

6.1.3 Year (RBP2)

This field shall specify the year as an offset value from 1900.

6.1.4 Month (RBP3)

This field shall specify the month of the year as a number in the range 1 to 12.

6.1.5 Day (RBP4)

This field shall specify the day of the month as a number in the range 1 to 31.

6.1.6 Hour (RBP5)

This field shall specify the hour of the day as a number in the range 0 to 23.

6.1.7 Minute (RBP6)

This field shall specify the minute of the hour as a number in the range 0 to 59.

6.1.8 Second (RBP7)

This field shall specify the second of the minute as a number in the range 0 to 59.

6.2 Timestamp on AV stream (TSAVS)

The structure of TSAVS is described in Table 5.

Table 5 – Structure of TSAVS

RBP	Length in bytes	Field name	Contents
0	4	AV stream timestamp	AVTS

6.2.1 AV stream timestamp (RBP0)

The structure of AVTS is described in Table 6.

Table 6 – Structure of AVTS

bit31	bit30	bit29	bit28	bit27	bit26	bit25	bit24
Frame_Rate[3..0]				Number of frames[27..24]			
bit23	**bit22**	**bit21**	**bit20**	**bit19**	**bit18**	**bit17**	**bit16**
Number of frames[23..16]							
bit15	**bit14**	**bit13**	**bit12**	**bit11**	**bit10**	**bit9**	**bit8**
Number of frames[15..8]							
bit7	**bit6**	**bit5**	**bit4**	**bit3**	**bit2**	**bit1**	**bit0**
Number of frames[7..0]							

6.2.1.1 Frame rate[3..0] (bit31-28) [uimsbf]

The frame rate of the pointed AV stream is stored. The 4-bit interpretation is described in Table 7.

Table 7 – Frame rate interpretation

Value	Interpretation
0x0	Frame rate is NOT specified in this field
0x1	24/1,001 (23,976)Hz
0x2	24 Hz
0x3	25 Hz
0x4	30/1,001 (29,97)Hz
0x5	30
0x6	50
0x7	60/1,001 (59,94)Hz
0x8	60
0x9 - 0xF	Reserved

6.2.1.2 Number of frames [27..0] (bit27-0) [uimsbf]

This 27-bit value specifies the number of frames from the beginning of pointed AV stream.

6.3 Duration

The structure duration is described in Table 8.

Table 8 – Structure duration

RBP	Length in bytes	Field name	Contents
0	1	Day	uimsbf
1	1	Hour	uimsbf
2	1	Minutes	uimsbf
3	1	Seconds	uimsbf

6.3.1 Day (RBP0)

This field shall specify the day as a number in the range 0 to 255.

6.3.2 Hour (RBP1)

This field shall specify the hour of the day as a number in the range 0 to 23.

6.3.3 Minute (RBP2)

This field shall specify the minute of the hour as a number in the range 0 to 59.

6.3.4 Second (RBP3)

This field shall specify the second of the minute as a number in the range 0 to 59.

6.4 Dstring[n]

A Dstring[n] is a field where a string can be recorded. “n” in Dstring[n] is the unsigned integer and shall be the same as the value of character string field size. The character string field size shall be equal to n. The character set of the string is defined in the character set field. The structure of Dstring[n] is described in Table 9.

Table 9 – Structure of Dstring[n]

RBP	Length in bytes	Field name	Contents
0	1	Character set	uimsbf
1	3	Reserved	bslbf
4	2	Character string field size	uimsbf
6	2	Length of character string	uimsbf
8	n	Character strings	bslbf

6.4.1 Character set

The format of the character set is described in Table 10.

Table 10 – Interpretation of character set

Value	Character set
0x00-0xFF	The interpretation is specified in IEC 62328-3

6.4.2 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0×00.

6.4.3 Character string field size

Character string field size in bytes shall be stored in this field.

6.4.4 Length of character string

The length of character string in bytes shall be stored in this field.

6.4.5 Character strings

Character strings coded by the character set defined in character set field are stored.

6.5 Generic pointer position format

The structure of GPPF is described in Table 11.

Table 11 – Structure of GPPF

RBP	Length in bytes	Field name	Contents
0	4	Base position	BASEP
4	2	Offset position	uimsbf

6.5.1.1 Base position

The structure of BASEP is described in Table 12.

Table 12 – Structure of BASEP

bit31	bit30	bit29	bit28	bit27	bit26	bit25	bit24
Block_Length[2..0]			Number of blocks[28..24]				
bit23	**bit22**	**bit21**	**bit20**	**bit19**	**bit18**	**bit17**	**bit16**
Number of blocks[23..16]							
bit15	**bit14**	**bit13**	**bit12**	**bit11**	**bit10**	**bit9**	**bit8**
Number of blocks[15..8]							
bit7	**bit6**	**bit5**	**bit4**	**bit3**	**bit2**	**bit1**	**bit0**
Number of blocks[7..0]							

6.5.1.1.1 Block_Length [2..0] (bit31-29) [uimsbf]

The length of the block is stored. The 3-bit interpretation is described in Table 13.

Table 13 – Block_Length interpretation

Value	Interpretation
0x0	The block length is 1 byte
0x1	The block length is 192 bytes (size of RP packet)
0x2	The block length is 512 bytes (size of sector)
0x3	The block length is 2048 bytes (size of sector)
0x4	The block length is 6144 bytes (size of aligned unit)
0x5-0x7	Reserved

6.5.1.1.2 Num_of_Blocks [28..0] (bit28-0) [uimsbf]

The base position based on the block defined in the Block_Length field shall be stored. The base position in bytes equals the block length defined in the Block_Length field multiplied by the value of the Num_of_Blocks field.

6.5.1.2 Offset position

Offset bytes from the base position shall be stored.

6.6 Generic thumbnail pointer format

6.6.1 Long generic thumbnail pointer format

The structure of LGTPF is defined in Table 14.

Table 14 – Structure of LGTPF

RBP	Length in bytes	Field Name	Contents
0	1	Thumbnail type	TTYPE
1	1	Thumbnail compression type	uimsbf
2	2	Thumbnail horizontal size	uimsbf
4	2	Thumbnail vertical size	uimsbf
6	136	Thumbnail pointer location	Dstring[128]
142	6	Thumbnail pointer position	GPPF
148	4	Thumbnail pointer size	uimsbf
152	136	Thumbnail file location	Dstring[128]
288	8	File offset of target thumbnail	uimsbf
296	4	Length of target thumbnail	uimsbf

6.6.1.1 Thumbnail type (TTYPE)

The structure of TTYPE is described in Table 15.

Table 15 – Structure of TTYPE

Bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
V	NC	L/S	P/EF	**Reserved**			

6.6.1.1.1 V (bit7) [bslbf]

If the thumbnail is defined by either the pointer to an AV stream file or an external file, the V bit shall be set to 1b. If the thumbnail is not indicated, the V bit shall be set to 0b.

6.6.1.1.2 NC (bit6) [bslbf]

If a change of the thumbnail is prohibited by a user or the equipment, the NC bit shall be set to 1b. Otherwise, the NC bit shall be 0b.

6.6.1.1.3 L/S (bit5) [bslbf]

If the thumbnail format is the long generic thumbnail pointer format, this bit shall be set to 1b. If the thumbnail format is the short generic thumbnail pointer format, this bit shall be set to 0b.

6.6.1.1.4 P/EF (bit 4) [bslbf]

If the thumbnail is defined by the pointer to an AV stream file, the P/EF bit shall be set to 1b. If the thumbnail is stored by the part of an external file, the P/EF bit shall be set to 0b.

6.6.1.1.5 Reserved (bit 3-0) [bslbf]

These bits are reserved for future use and shall be 0b.

6.6.1.2 Thumbnail compression type

The interpretation of the thumbnail compression type is described in Table 16. This field is valid only when the thumbnail is indicated by an external file.

Table 16 – Thumbnail compression type interpretation

Thumbnail compression type	Interpretation
0x0	**The thumbnail compression type is not specified in this field**
0x1	**ISO/IEC 10918-1(JPEG)**
0x2	**MPEG2-I (video ES prefixed by a sequence header)**
0x3 - 0xFF	**Reserved**

6.6.1.3 Thumbnail horizontal size

The number of the horizontal pixels of the thumbnail shall be stored. This is not a display size but a size of the stored thumbnail.

6.6.1.4 Thumbnail vertical size

The number of the vertical pixels of the thumbnail shall be stored. This is not a display size but a size of the stored thumbnail.

6.6.1.5 Thumbnail pointer location

If the thumbnail is defined by the pointer to an AV stream file, the location of an AV stream file shall be stored in this field. The location identification rule described in 7.3 shall be applied. If the P/EF bit in the thumbnail type field is 0b, this field shall be ignored.

6.6.1.6 Thumbnail pointer position

If the thumbnail is defined by the pointer to an AV stream file, the start position of an AV stream file shall be stored in this field. The start point of an AV stream described in Annex C should be referred. If the P/EF bit in the thumbnail type field is 0b, this field shall be ignored.

6.6.1.7 Thumbnail pointer size

If the thumbnail is defined by the pointer to an AV stream file, the size in bytes shall be stored in this field. The size of an AV stream described in Annex C should be referred. If the P/EF bit in the thumbnail type field is 0b, this field shall be ignored.

6.6.1.8 Thumbnail file location

If the thumbnail is stored in an external file, the location of an external file shall be stored in this field. The location identification rule described in 7.3 shall be applied. If the P/EF bit in the thumbnail type field is 1b, this field shall be ignored. The example of an external thumbnail file format is described in Annex D.

6.6.1.9 File offset of target thumbnail

If the thumbnail is stored in an external file, the start position in bytes of an external file shall be stored in this field. If the P/EF bit in the thumbnail type field is 1b, this field shall be ignored.

6.6.1.10 Length of target thumbnail

If the thumbnail is stored by the part of an external file, the length in bytes shall be stored in this field. If the P/EF bit in the thumbnail type field is 1b, this field shall be ignored.

6.6.2 Short generic thumbnail pointer format (SGTPF)

The structure of SGTPF is defined in Table 17.

Table 17 – Structure of SGTPF

RBP	Length in bytes	Field name	Contents
0	1	Thumbnail type	TTYPE
1	1	Thumbnail compression type	uimsbf
2	2	Thumbnail horizontal size	uimsbf
4	2	Thumbnail vertical size	uimsbf
6	6	Thumbnail pointer position	GPPF
12	4	Thumbnail pointer size	uimsbf
16	8	File offset of target thumbnail	uimsbf
24	4	Length of target thumbnail	uimsbf

6.6.2.1 Thumbnail type

The interpretation of this field is described in 6.6.1.1.

6.6.2.2 Thumbnail compression type

The interpretation of this field is described in 6.6.1.2.

6.6.2.3 Thumbnail horizontal size

The interpretation of this field is described in 6.6.1.3.

6.6.2.4 Thumbnail vertical size

The interpretation of this field is described in 6.6.1.4.

6.6.2.5 Thumbnail pointer position

The interpretation of this field is described in 6.6.1.6.

6.6.2.6 Thumbnail pointer size

The interpretation of this field is described in 6.6.1.7.

6.6.2.7 File offset of target thumbnail

The interpretation of this field is described in 6.6.1.9.

6.6.2.8 Length of target thumbnail

The interpretation of this field is described in 6.6.1.10.

6.7 Mark entry format

6.7.1 Long mark entry format (LMEF)

The structure of LMEF is defined in Table 18.

Table 18 – Structure of LMEF

RBP	Length in bytes	Field Name	Contents
0	1	Mark type	uimsbf
1	1	Flag	FLMEF
2	4	Element ID	uimsbf
6	4	Mark time	TSAVS or uimsbf
10	136	AV stream location	Dstring[128]
146	6	Mark position	GPPF
152	2	Offset time	uimsbf
154	2	PID	PIDPLUS
156	2	Reserved	bslbf
158	28	Mark representative thumbnail	SGTPF
186	136	Thumbnail file location	Dstring[128]
322	8	Mark placed timestamp	GTS
330	2	Reserved	bslbf

6.7.1.1 Mark type

The interpretation of the mark type is described in Table 19.

Table 19 – Mark type interpretation

Mark type	Interpretation
0x0	**Shall mean that this field has no meaning.**
0x1	**Resume mark**
0x2	**Book mark**
0x3 - 0xFF	**Reserved**

6.7.1.2 Flag

The structure of FLMEF is described in Table 20.

Table 20 – Structure of FLMEF

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
V	**Reserved**	IDTP	**PIDV**	Reserved	TS/F	PV	**MTV**

6.7.1.2.1 V (bit7) [bslbf]

If the mark structure is valid, the V bit shall be set to 1b. If the mark structure is invalid, the V bit shall be set to 0b.

6.7.1.2.2 Reserved (bit6)

These bits are reserved for the future use and shall be 0b.

6.7.1.2.3 IDTP (bit5) [bslbf]

If the ID referred by element ID field means PGR ID, the IDTP bit shall be set to 1b. If the ID referred by element ID field means PGRG ID, the IDTP bit shall be set to 0b.

6.7.1.2.4 PIDV (bit4) [bslbf]

If the selected PID value is stored in the PID field, the PIDV bit shall be set to 1b. Otherwise, the PIDV bit shall be 0b.

6.7.1.2.5 Reserved (bit3) [bslbf]

These bits are reserved for future use and shall be 0b.

6.7.1.2.6 TS/F (bit2) [bslbf]

If this bit is 1b, the timestamp is selected to count time in the mark time field and the offset time field. If this bit is 0b, the number of frames is selected to count time in the mark time field and the offset time field.

6.7.1.2.7 PV (bit1) [bslbf]

If the mark is defined by the pointer to an AV stream file, the PV bit shall be set to 1b. Otherwise, the PV bit shall be 0b.

6.7.1.2.8 MTV (bit0) [bslbf]

If the mark time field is valid, the MTV bit shall be set to 1b. If the mark time field is invalid, the MTV bit shall be 0b.

6.7.1.3 Element ID

The element ID to which the mark belongs is stored. The element ID is either PGR_ID or PGRG_ID. This depends on the IDTP bit in the flag field.

6.7.1.4 Mark time

If the MTV bit in the flag field is 1b, the mark time of AV stream sequence shall be stored. If the TS/F bit in the flag field is 1b, the contents of this field shall be “TSAVS”. If the TS/F bit in the Flag field is 0b, the contents of this field shall be “uimsbf” and the value, which represents the time from the beginning of the AV stream sequence, is counted by 45 000 Hz. If the MTV bit in the flag field is 0b, this field shall be ignored.

6.7.1.5 AV stream location

The location of the AV stream where the mark is placed may be stored. The location identification rule described in 7.3 shall be applied. If the PV bit in the flag field is 0b, this field shall be ignored.

6.7.1.6 Mark position

The mark position from the beginning of the AV stream file shall be stored. The start point of the AV stream described in Annex C should be referred. If the PV bit in the flag field is 0b, this field shall be ignored.

6.7.1.7 Offset time

If the TS/F bit in the flag field is 0b, the offset number of frames from the pointed by mark position field is stored. The start point of the AV stream described in Annex C should be referred. If the TS/F bit in the flag field is 1b, the offset time counted by 45 000 Hz shall be stored. If the PV bit in the flag field is 0b, this field shall be ignored.

6.7.1.8 PID

If the PIDV bit in the flag field is 1b, the PID and the PID type shall be stored. The format of this field, which is the structure PIDPLUS, is specified in Table 21. If the PIDV bit is 0b, this field shall be ignored.

Table 21 – Structure of PIDPLUS

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
PID_Type[2..0]			PID[12..8]				
bit7	**bit6**	**bit5**	**bit4**	**bit3**	**bit2**	**bit1**	**bit0**
PID[7..0]							

6.7.1.8.1 PID_Type [2..0](bit15-13) [uimsbf]

The type of PID shall be stored. The 3-bit interpretation is described in Table 22.

Table 22 – PID_Type interpretation

PID_Type	Interpretation
0x0	Shall mean that the type of PID is not specified
0x1	Video PID
0x2 – 0x7	Reserved

6.7.1.8.2 PID[12..0](bit12-0)[uimsbf]

The PID value shall be stored.

6.7.1.9 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

6.7.1.10 Mark representative thumbnail

The mark representative thumbnail may be stored. The structure of SGTPF is described in Table 17. If the MTNV bit in the Flag field is 0b, this field shall be ignored.

6.7.1.11 Thumbnail file location

If the thumbnail is stored by the part of an external file, the location of an external file shall be stored in this field. The location identification rule described in 7.3 shall be applied. If the P/EF bit in the thumbnail type field in mark representative thumbnail structure is 1b or the V bit in thumbnail type field in the mark representative thumbnail structure is 0b, this field shall be ignored.

6.7.1.12 Mark-placed timestamp

The timestamp in which the mark is placed is stored.

6.7.1.13 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

6.7.2 Short mark entry format (SMEF)

The structure of SMEF is defined in Table 23.

Table 23 – Structure of SMEF

RBP	Length in bytes	Field name	Contents
0	1	Mark type	uimsbf
1	1	Flag	bslbf
2	4	ID element	uimsbf
6	4	Mark time	TSAVS or uimsbf
10	6	Mark position	GPPF
16	2	Offset time	uimsbf
18	2	PID	uimsbf
20	2	Reserved	uimsbf
22	28	Mark representative thumbnail	SGTPF
50	8	Mark-placed timestamp	GTS
58	2	Reserved	bslbf

6.7.2.1 Mark type

The interpretation of this field is described in 6.7.1.1.

6.7.2.2 Flag

The interpretation of this field is described in 6.7.1.2.

6.7.2.3 Element ID

The interpretation of this field is described in 6.7.1.3.

6.7.2.4 Mark time

The interpretation of this field is described in 6.7.1.4.

6.7.2.5 Mark position

The interpretation of this field is described in 6.7.1.6.

6.7.2.6 Number of offset frames

The interpretation of this field is described in 6.7.1.7.

6.7.2.7 PID

The interpretation of this field is described in 6.7.1.8.

6.7.2.8 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

6.7.2.9 Mark representative thumbnail

The interpretation of this field is described in 6.7.1.10.

6.7.2.10 Mark-placed timestamp

The interpretation of this field is described in 6.7.1.11.

6.7.2.11 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7 File and directory

7.1 Composition of directories

A secure UDF format is used as the file system. The file structure is shown in Figure 1. The TVR_ROOT directory is the root directory of the TV recording format described in this specification. The PROG_SET.MGR file manages all recorded programmes. The EXT_PS.MGR file contains additional information related to recorded programmes. The RT_TVRS directory is the root directory for programmes stored by TV recording specific format.

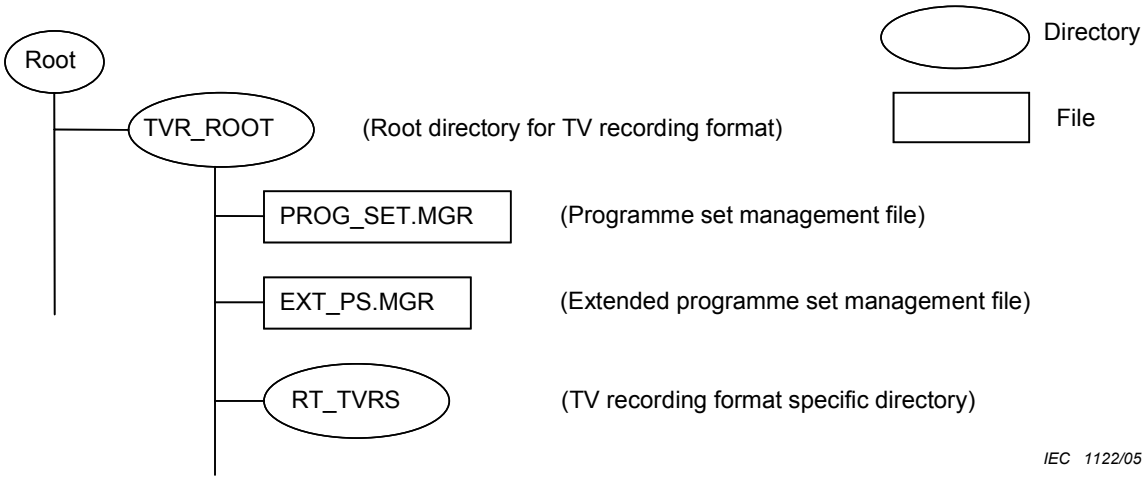


Figure 1 – File structure

7.1.1 Structure of programme reference (PGR)

The structure of PGR (Version1.0) has the fields described in Table 24.

Table 24 – Structure of PGR

RBP	Length in bytes	Field name	Contents
0	3	PGR identifier	bslbf
3	1	Reserved	bslbf
4	1	PGR version	VER
5	1	Reserved	bslbf
6	2	Length of PGR structure	uimsbf
8	4	PGR ID	uimsbf
12	1	PGR type	PGRTYPE
13	1	Content type	uimsbf
14	2	Reserved	bslbf
16	8	PGR created time	GTS
24	4	Reserved	bslbf
28	8	PGR last accessed time	GTS
36	4	Reserved	bslbf
40	48	Programme reference name	Dstring[40]
88	4	Link count	uimsbf
92	136	Recorded programme location	Dstring[128]
228	6	Start position	GPPF
234	2	Offset time	uimsbf
236	4	Reference start time	TSAVS
240	4	Reference duration	uimsbf
244	28	PGR representative thumbnail	SGTPF
272	136	Thumbnail file location	Dstring[128]
408	2	Number of total marks	uimsbf
410	1	Number of marks in PGR	uimsbf
411	1	Reserved	bslbf

412	**60**	**Mark(1)**	**SMEF**
472	**60**	**Mark(2)**	**SMEF**
532	**60**	**Mark(3)**	**SMEF**
592	**60**	**Mark(4)**	**SMEF**
652	**60**	**Mark(5)**	**SMEF**
712	**32**	**Each PGR specific area**	**PGRSA**

7.1.1.1 PGR identifier

This field shall contain “PGR” coded by ISO/IEC 646 IRV.

7.1.1.2 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.1.3 PGR version

This field shall be 0x10. It means the PGR structure is Version1.0. The structure of VER is described in Table 25.

Table 25 – Structure of VER

bit7	**bit6**	**bit5**	**bit4**	**bit3**	**bit2**	**bit1**	**bit0**
Major version				Minor version			

7.1.1.3.1 Major version (bit7-4) [uimsbf]

The major version of PGR shall be stored.

7.1.1.3.2 Minor version (bit3-0) [uimsbf]

The minor version of PGR shall be stored.

7.1.1.4 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.1.5 Length of PGR structure

This field describes the length of the PGR structure. This field shall be set to 744 in the case of Version1.0.

7.1.1.6 PGR ID

The unique PGR ID shall be written.

7.1.1.7 PGR type

The structure of PGRTYPE is described in Table 26.

Table 26 – Structure of PGRTYPE

bit7	**bit6**	**bit5**	**bit4**	**bit3**	**bit2**	**bit1**	**bit0**
V	Reserved					TS/F	**Part**

7.1.1.7.1 V (bit7)[bslbf]

If the PGR structure is valid, the V bit shall be set to 1b. If the PGR structure is invalid, the V bit shall be set to 0b.

7.1.1.7.2 Reserved (bit6-2) [bslbf]

These bits are reserved for future use and shall be 0b.

7.1.1.7.3 TS/F (bit1) [bslbf]

If this bit is 1b, the timestamp is selected to count time in the offset time field, the reference start time, and the reference duration field. If this bit is 0b, the number of frames is selected to count time in the offset time field and the reference duration field.

7.1.1.7.4 Part (bit0)

If part of the programme is referred by PGR, the part bit shall be one. If the whole of the programme is referred by PGR, the part bit shall be 0b.

7.1.1.8 Content type

If the programme is stored in the TVRS directory, the value of this field shall be copied from the programme identification type in the programme general information.

7.1.1.9 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.1.10 PGR created time

The PGR created time is stored.

7.1.1.11 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.1.12 PGR last accessed time

The last accessed time of the PGR is stored.

7.1.1.13 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.1.14 Programme reference name

The programme reference name field is used to describe the name of the PGR. The naming rule is not specified here.

7.1.1.15 Link count

The number of PGRG links shall be written.

7.1.1.16 Recorded programme location

The location of the programme file referenced by this PGR shall be stored. The location identification rule is described in 7.3.

7.1.1.17 Start position

The reference start position in bytes of the AV stream corresponding with the indicated programme by the recorded programme location shall be stored. The start point of the AV stream described in Annex C should be referred.

7.1.1.18 Offset time

If the TS/F bit in the flag field is 0b, the number of offset frames from the start position is stored. The start point of the AV stream described in Annex C should be referred. If the TS/F bit in the flag field is 1b, the offset time counted by 45 000 Hz shall be stored. If the part bit in the PGR Type field is 0b, this field shall be ignored.

7.1.1.19 Reference start time

If the TS/F bit in the flag field is 0b, the number of frames from the first frame of AV stream to reference start frames may be stored. If the TS/F bit in the flag field is 1b, the reference start time from the beginning of the AV stream counted by 45 000 Hz shall be stored.

7.1.1.20 Reference duration

If the TS/F bit in the flag field is 0b, the number of reference frames may be stored. If the TS/F bit in the flag field is 1b, the reference duration counted by 45 000 Hz shall be stored.

7.1.1.21 PGR representative thumbnail

The PGR representative thumbnail may be defined.

7.1.1.22 Thumbnail file location

If the thumbnail is stored by the part of an external file in the PGR representative thumbnail or mark representative thumbnail in the PGR structure, the location of an external file shall be stored in this field. The location identification rule described in 7.3 shall be applied.

7.1.1.23 Number of total marks

The number of total marks in the PGR shall be stored.

7.1.1.24 Number of marks in PGR structure

The number of marks in the PGR structure following the field shall be stored.

7.1.1.25 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.1.26 Mark(1)

Mark information may be stored. If the value of the number of marks in the PGR structure field is greater than, or equal to, 1, mark information shall be stored in this field. Otherwise, this field shall be ignored.

7.1.1.27 Mark(2)

Mark information may be stored. If the value of the number of marks in the PGR structure field is greater than, or equal to, 2, mark information shall be stored in this field. Otherwise, this field shall be ignored.

7.1.1.28 Mark(3)

Mark information may be stored. If the value of the number of marks in the PGR structure field is greater than, or equal to, 3, mark information shall be stored in this field. Otherwise, this field shall be ignored.

7.1.1.29 Mark(4)

Mark information may be stored. If the value of the number of marks in the PGR structure field is greater than, or equal to, 4, mark information shall be stored in this field. Otherwise, this field shall be ignored.

7.1.1.30 Mark(5)

Mark information may be stored. If the value of the number of marks in the PGR structure field is greater than, or equal to, 5, mark information shall be stored in this field. Otherwise, this field shall be ignored.

7.1.1.31 Each PGR specific area (PGRSA)

The structure of PGRSA is described in Table 27.

Table 27 – Structure of PGRSA

RBP	Length in bytes	Field Name	Contents
0	1	PGR specific area TYPE	uimsbf
1	31	PGR specific area TYPE specific field	

7.1.1.31.1 PGR specific area TYPE

This field represents the type of the PGR specific area.

Table 28 – PGR specific area TYPE interpretation

TYPE	Interpretation
0x00	Shall mean that the following PGR specific area TYPE specific field has no meaning
0x01	Shall mean that the PGR specific area TYPE is a TYPE 1
0x02	Shall mean that the PGR specific area TYPE is a TYPE 2
0x03	Shall mean that the PGR specific area TYPE is a TYPE 3
0x04 - 0xFF	Reserved

7.1.1.31.2 PGR specific area TYPE specific field

The structure of this field depends on the PGR specific area TYPE field.

7.1.1.31.3 TYPE 1 each PGR specific area

TYPE 1 each PGR specific area is defined in Table 29. TYPE1 is used for storing information related to the broadcasting programme (event). If the part bit of the PGR type field is 0b and the MetaDataTable is NOT used, TYPE1 each PGR specific area shall be applied. If the part bit of PGR type field is 0b and the MetaDataTable is used, TYPE1 each PGR specific area or TYPE3 each PGR specific area shall be applied.

Table 29 – Structure of TYPE1 PGRSA

RBP	Length in bytes	Field name	Contents
0	1	PGR specific area TYPE	uimsbf
1	1	Flag	FL1
2	2	Reserved	bslbf
4	8	Event start time	GTS
12	4	Duration	Duration
16	2	Network ID	uimsbf
18	2	Service ID	uimsbf
20	12	Reserved	bslbf

7.1.1.31.3.1 PGR specific area TYPE

The PGR specific area TYPE shall be 0x01.

7.1.1.31.3.2 Flag

The structure of FL1 is described in Table 30.

Table 30 – Structure of FL1

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved				E/A	CCI		**ECRYT**

7.1.1.31.3.2.1 Reserved (bit7-4)

These bits are reserved for future use and shall be 0b.

7.1.1.31.3.2.2 E/A (bit3) [bslbf]

If the unit of the programme is based on one event, the E/A bit shall be set to 1b. If the unit of the programme is based on one action, the E/A bit shall be set to 0b. If the programme is stored in the TVRS directory, the value of this field shall be copied from the E/A bit in the flag in programme general information.

7.1.1.31.3.2.3 CCI (bit2-1) [bslbf]

Copy control information is stored. The value of this field shall be copied from the corresponding field of programme information in PROGxxxx.PIF, which is pointed by this PGR.

7.1.1.31.3.2.4 ECRYT (bit0) [bslbf]

If the AV stream of the programme is encrypted, the ECRYT bit shall be 1b. If the AV stream is not encrypted, the ECRYT bit shall be 0b. The value of the ECRYT bit of the LI flag in the license information described in 7.2.2.4.1.3 may be copied in this bit.

7.1.1.31.3.3 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.1.31.3.4 Event start time

If the programme is stored in the TVRS directory, the value of this field may be converted from the value of the event start time field in the broadcasting TV programme information.

NOTE The timestamp format of this field is different from that of broadcasting TV programme information. Conversion of the timestamp is needed.

7.1.1.31.3.5 Duration

If the programme is stored in the TVRS directory, the value of this field may be converted from the duration field in the broadcasting TV programme information.

NOTE The duration format of this field is different from that of broadcasting TV programme information. Conversion of the duration is needed.

7.1.1.31.3.6 Network ID

If the programme is stored in the TVRS directory, the value of this field shall be copied from the transport stream ID field or network ID field in broadcasting TV programme information.

7.1.1.31.3.7 Service ID

If the programme is stored in the TVRS directory, the value of this field shall be copied from the service ID field in broadcasting TV programme information.

7.1.1.31.3.8 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.1.31.4 TYPE 2 each PGR specific area

If the part bit of the PGR type field is 1b, the TYPE 2 each specific area shall be used. TYPE 2 each PGR specific area is defined in Table 31.

Table 31 – Structure of TYPE 2 PGRSA

RBP	Length in bytes	Field name	Contents
0	1	PGR specific area TYPE	uimsbf
1	1	Flag	FL2
2	1	Start location ID	uimsbf
3	1	End location ID	uimsbf
4	4	Access unit info start field number	uimsbf
8	2	Start offset time	uimsbf
10	4	Access unit info end field number	uimsbf
14	2	End offset time	uimsbf
16	4	Allocation unit info start field number	uimsbf
20	4	Time unit info start field number	uimsbf
24	8	Reserved	bslbf

7.1.1.31.4.1 PGR specific area TYPE

PGR specific area TYPE shall be 0x02.

7.1.1.31.4.2 Flag

The structure of FL2 is described in Table 32.

Table 32 – Structure of FL2

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved				TS/F	TSI_Type[2..0]		

7.1.1.31.4.2.1 Reserved (bit7-4)

These bits are reserved for future use and shall be 0b.

7.1.1.31.4.2.2 TS/F (bit3)[bslbf]

If this bit is 1b, the timestamp is selected to count time in the start offset time field and the end offset time field. If this bit is 0b, the number of frames is selected to count time in the start offset time field and the end offset time field.

7.1.1.31.4.2.3 TSI_Type[2..0] (bit2-0)[uimsbf]

The type of time search information is described. The interpretation is described in Table 33.

Table 33 – TSI type interpretation

TSI_Type	Interpretation
0x00	Shall mean that this field has no meaning
0x01	Access unit information
0x02	Allocation unit information
0x03	Time unit information
0x04-0x07	Reserved

7.1.1.31.4.3 Start location ID

The start location ID shall be stored. The location ID is basically defined as the last two digits of the time search related stream name. If the TSI_Type is 0x01 and the target file name is the “AccessUnitInfo” stream file, which is the main access unit information file, the start location ID shall be 1. If the TSI_Type is 0x01 and the target file name is the “AccessUnitInfo_N” stream file, where N is a decimal number coded by ISO/IEC 646 IRV containing 2 digits, the start location ID shall be N. If the TSI_Type is 0x02 and the target file name is the “AllocationUnitInfo” stream file, which is the main allocation unit information file, the start location ID shall be 1. If the TSI_Type is 0x02 and the target file name is the “AllocationUnitInfo_N” stream file, where N is a decimal number coded by ISO/IEC 646 IRV containing 2 digits, the start location ID shall be N. If the TSI_Type is 0x03 and the target file name is the “TimeUnitInfo” stream file, which is the main time unit information file, the start location ID shall be 1. If the TSI_Type is 0x03 and the target file name is the “TimeUnitInfo_N” stream file, where N is a decimal number coded by ISO/IEC 646 IRV containing 2 digits, the start location ID shall be N.

7.1.1.31.4.4 End location ID

If the TSI_Type is 0x01, the end location ID shall be stored. Otherwise, this field shall be ignored. If the TSI_Type is 0x01 and the target file name is the “AccessUnitInfo” stream file, which is the main access unit information file, the start location ID shall be 1. If the TSI_Type is 0x01 and the target file name is the “AccessUnitInfo_N” stream file, where N is a decimal number coded by ISO/IEC 646 IRV containing 2 digits, the start location ID shall be N.

7.1.1.31.4.5 Access unit info start field number

The access unit table, described in 8.3.5.1 of IEC 62328-1 should be referred. If the TSI_Type field is 0x01, the ACUT_Row_Number, defined in 8.3.5.1 of IEC 62328-1, corresponding to the reference start time field in the PGR structure shall be described in this field. Otherwise, this field shall be ignored.

7.1.1.31.4.6 Start offset time

The access unit table, described in 8.3.5.1 of IEC 62328-1, should be referred. If the TSI_Type field is 0x01 and the TS/F bit in the flag field is 0b, the number of offset frames from the frame number pointed by the access unit info start field number shall be stored. If the TSI_Type field is 0x01 and the TS/F bit in the flag field is 1b, the offset time from the timestamp of the frame pointed by the access unit info start field number, which is counted by 45 000 Hz, shall be stored. Otherwise, this field shall be ignored.

7.1.1.31.4.7 Access unit info end field number

The access unit table, described in 8.3.5.1 of IEC 62328-1, should be referred. If the TSI_Type field is 0x01, the ACUT_Row_Number, defined in 8.3.5.1 of IEC 62328-1, corresponding to the sum of the value of the reference start time and the number of reference frames field in the PGR structure shall be described in this field. Otherwise, this field shall be ignored.

7.1.1.31.4.8 End offset time

The access unit table, described in 8.3.5.1 of IEC 62328-1, should be referred. If the TSI_Type field is 0x01 and the TS/F bit in the flag field is 0b, the number of offset frames from the frame number pointed by the access unit info end field number shall be stored. If the TSI_Type field is 0x01 and the TS/F bit in the flag field is 1b, the offset time from the timestamp of the frame pointed by the access unit info start field number, which is counted by 45 000 Hz, shall be stored. Otherwise, this field shall be ignored.

7.1.1.31.4.9 Allocation unit info start field number

The allocation unit table, described in 8.3.5.2 of IEC 62328-1, should be referred. If the TSI_Type field is 0x02, the ALUT_Row_Number, defined in 8.3.5.2 of IEC 62328-1, corresponding to the reference start time field in the PGR structure shall be described in this field. Otherwise, this field shall be ignored.

7.1.1.31.4.10 Time unit info start field number

The time unit table, described in 8.3.5.3 of IEC 62328-1 should be referred. If the TSI_Type field is 0x03, the TUT_Row_Number, defined in 8.3.5.3 of iec 62328-1, corresponding to the reference start time field in the PGR structure shall be described in this field. Otherwise, this field shall be ignored.

7.1.1.31.4.11 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.1.31.5 TYPE 3 each PGR specific area

If the part bit of PGR type field is 0b and the MetaDataTable is used, TYPE3 each PGR specific area may be applied. TYPE 3 each PGRG specific area is defined in Table 34.

Table 34 – Structure of TYPE3 PGRSA

RBP	Length in bytes	Field Name	Contents
0	1	PGR Specific Area TYPE	uimsbf
1	31	Reserved	bslbf

7.1.1.31.5.1 PGR specific area TYPE

The PGRG specific area TYPE shall be 0x03.

7.1.1.31.5.2 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.2 Structure programme reference group (PGRG)

The structure of PGRG is described in Table 35.

Table 35 – Structure of PGRG

RBP	Length in bytes	Field Name	Contents
0	4	PGRG identifier	bslbf
4	1	PGRG version	VER
5	1	Reserved	bslbf
6	2	Length of PGRG structure	uimsbf
8	4	PGRG_ID	uimsbf
12	1	PGRG type	PGRGTYPE
13	3	Reserved	bslbf
16	8	PGRG created time	GTS
24	4	Reserved	bslbf
28	8	PGRG last accessed time	GTS
36	4	Reserved	bslbf
40	8	PGRG list modified time	GTS
48	4	Reserved	bslbf
52	48	Programme reference group name	Dstring[40]
100	4	Link count	uimsbf
104	4	Reference duration	uimsbf
108	136	PGRG recorded location	Dstring[128]
244	300	PGRG representative thumbnail	LGTPF
544	1	Reserved	bslbf
545	1	Resume mark element ID type	RMETYPE
546	4	Resume mark element ID	uimsbf
550	2	Number of bookmarks in mark table	uimsbf
552	32	Each PGRG specific area	PGRGSA

7.1.2.1 PGR identifier

This field shall contain “PGRG” coded by ISO/IEC 646 IRV.

7.1.2.2 PGRG version

This field shall be 0x10. This means that the PGRG structure is Version1.0. The structure of VER is described in Table 36.

Table 36 – Structure of VER

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Major version				Minor version			

7.1.2.2.1 Major version (bit7-4) [uimsbf]

The major version of PGRG shall be stored.

7.1.2.2.2 Minor version (bit 3-0) [uimsbf]

The minor version of PGRG shall be stored.

7.1.2.3 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.2.4 Length of PGRG structure

This field describes the length of PGR structure. This field shall be set to 584 in the case of Version 1.0.

7.1.2.5 PGRG ID

The unique PGRG ID shall be written.

7.1.2.6 PGRG type

The structure of PGRGTYPE is described in Table 37.

Table 37 – Structure of PGRGTYPE

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
V	Reserved					TS/F	**S/G**

7.1.2.6.1 V (bit7) [bslbf]

If the PGRG structure is valid, the V bit shall be set to 1b. If the PGRG structure is invalid, the V bit shall be set to 0b.

7.1.2.6.2 Reserved (bit6-2)[bslbf]

These bits are reserved for future use and shall be 0b.

7.1.2.6.3 TS/F (bit1) [bslbf]

If this bit is 1b, the timestamp is selected to count time in the reference duration field. If this bit is 0b, the number of frames is selected to count time in the reference duration field.

7.1.2.6.4 S/G (bit0) [bslbf]

If the elements of the PGRG are treated as one sequence such as digest play, the S/G bit shall be set to 1b. If the elements of the PGRG are treated as a group of elements, the S/G bit shall be 0b.

7.1.2.7 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.2.8 PGRG created time

The PGRG created time is stored.

7.1.2.9 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.2.10 PGRG last accessed time

The last accessed time of the PGRG is stored.

7.1.2.11 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.2.12 PGRG list modified time

The last modified time of the PGRG list stored in the PGRG recorded location is stored.

7.1.2.13 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.2.14 Programme reference group name

The programme reference group name field is used to describe the name of the PGRG. The naming rule is not specified here.

7.1.2.15 Link count

The number of PGRG links shall be written.

7.1.2.16 Reference duration

If the TS/F bit in the Flag field is 0b, the number of reference frames shall be stored. It corresponds to the sum of the number of reference frames of each element. If the TS/F bit in the flag field is 1b, the reference duration counted by 45 000 Hz shall be stored. It corresponds to the sum of the number of the presentation timestamp of each element.

7.1.2.17 PGRG recorded location

The location, which is recorded elements of the PGRG, shall be stored. The location identification rule described in 7.3 shall be applied.

7.1.2.18 PGRG representative thumbnail

The PGRG representative thumbnail may be defined.

7.1.2.19 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.2.20 Resume mark element ID type

The structure of RMETYPE is described in Table 38.

Table 38 – Structure of RMETYPE

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved							IDTP

7.1.2.20.1 Reserved (bit7-1)

These bits are reserved for future use and shall be 0b.

7.1.2.20.2 IDTP (bit0)[bslbf]

If the element ID referred by the resume mark element ID field means PGR ID, the IDTP bit shall be set to 1b. If the element ID referred by the resume mark element ID field means PGRG ID, the IDTP bit shall be set to 0b.

7.1.2.21 Resume mark element ID

The element ID of the resume mark shall be stored.

7.1.2.22 Number of bookmarks in MarkTable

The number of bookmarks in MarkTable shall be stored.

7.1.2.23 Each PGRG specific area (PGRGSA)

The structure of PGRGSA is described in Table 39.

Table 39 – Structure of PGRGSA

RBP	Length in bytes	Field Name	Contents
0	1	PGRG Specific Area TYPE	uimsbf
1	31	PGRG Specific Area TYPE Specific Field	

7.1.2.23.1 PGRG specific TYPE

This field represents the type of the PGRG specific area and is described in Table 40.

Table 40 – PGRG specific area TYPE interpretation

TYPE	Interpretation
0x0	Shall mean that the following PGRG specific area TYPE specific field has no meaning
0x1	Shall mean that the PGRG specific area TYPE is TYPE 1
0x2-0xFF	Reserved

7.1.2.23.2 PGRG specific area TYPE specific field

The structure of this field depends on the PGRG specific area TYPE field.

7.1.2.23.3 TYPE 1 each PGRG specific area (PGRGSA)

TYPE 1 each PGRG specific area is defined in Table 41.

Table 41 – Structure of TYPE1 PGRGSA

RBP	Length in bytes	Field name	Contents
0	1	PGRG specific area TYPE	uimsbf
1	31	Reserved	bslbf

7.1.2.23.3.1 PGRG specific area TYPE

The PGRG specific area TYPE shall be 0x01.

7.1.2.23.3.2 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.3 Composition of PROG_SET.MGR

7.1.3.1 Outline of PROG_SET.MGR

The PROG_SET.MGR file shown in Figure 2 manages all PGRs and PGRGs. The PGReferences stream file is one of the named streams of the PROG_SET.MGR and a list of the PGR structure is stored. The PGRGroups stream file is also one of the named streams and a list of the PGRG structure is stored. The PROG_xxxxxxxx stream file is also one of the named streams. The elements of a certain PGRG are stored. The PGRG_BASE is an instance of PGRG_xxxxxxxx stream file. All recorded programmes are stored as a list.

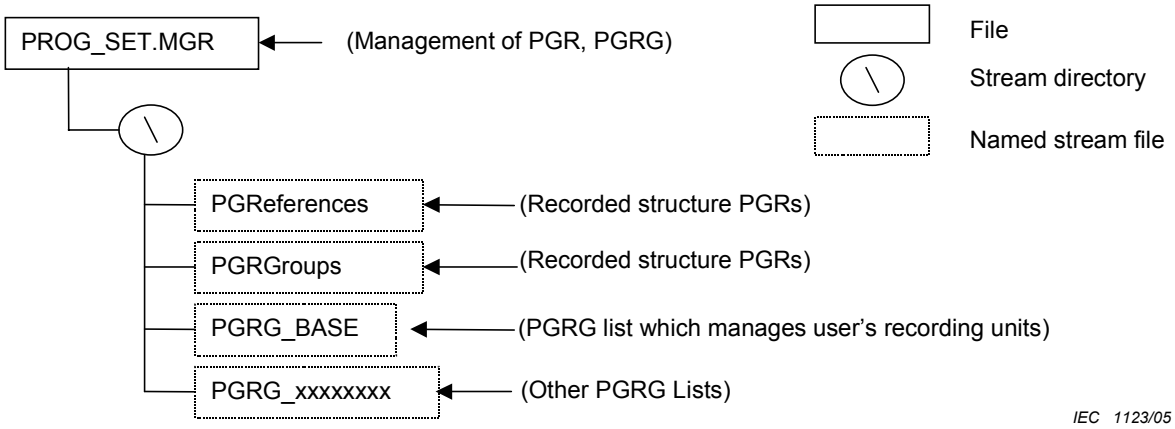


Figure 2 – PROG_SET.MGR

7.1.3.2 Structure of PROG_SET.MGR File (programme set management file)

The PROG_SET.MGR file is composed of "User interface entry information", "PGR general information" and "PGRG general information" as shown in Table 42.

Table 42 – Structure of PROG_SET.MGR

User interface entry information
PGR general information
PGRG general information

7.1.3.2.1 User interface entry information

The structure of the user interface entry information is described in Table 43.

Table 43 – Structure of user interface entry information

RBP	Length in bytes	Field Name	Contents
0	4	Last accessed UIE PGRG_ID	uimsbf
4	4	Number of UIE PGRG	uimsbf
8	4	UIE PGRG_ID(1) for PGRG_BASE	uimsbf
12	4	UIE PGRG_ID(2)	uimsbf
		.....	
4*(n+1)	4	UIE PGRG_ID(n)	uimsbf

7.1.3.2.1.1 Last accessed UIE PGRG_ID

The last accessed UIE PGRG_ID shall be stored.

7.1.3.2.1.2 Number of UIE PGRG

The number of UIE PGRG shall be stored. The value shall be greater than, or equal to, 1. The PGRG_BASE the PRGR ID of which is 0 always exists.

7.1.3.2.1.3 UIE PGRG_ID(1) for PGRG_BASE

The value shall be 0.

NOTE The PGRG_ID of PGRG_BASE is 0.

7.1.3.2.1.4 UIE PGRG_ID(2) ... UIE PGRG_ID(n)

The number "n" shall be the value of the number of the UIE PGRG field. UIE PGRG_ID shall be stored.

7.1.3.2.2 PGR general information

PGR general information is described in Table 44.

Table 44 – PGR general information

RBP	Length in bytes	Field name	Contents
0	4	Number of PGR	uimsbf
4	1	PGRGI flag	PGRGIF
5	1	Minimum PGR version	VER
6	1	Maximum PGR version	VER
7	1	Reserved	bslbf
8	4	Maximum PGR ID	uimsbf
12	136	PGR recorded location	Dstring[128]
148	4	Reserved	bslbf

7.1.3.2.2.1 Number of PGR

The number of PGR stored in the PGR recorded location shall be stored. The value shall be greater than, or equal to, 0.

7.1.3.2.2.2 PGRGI flag (PGRGIF)

The structure of PGRGIF is described in Table 45.

Table 45 – Structure of PGRGIF

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved					VMIV	VMAV	**VMAID**

7.1.3.2.2.2.1 Reserved (bit7-3)

These bits are reserved for future use and shall be 0b.

7.1.3.2.2.2.2 VMIV (bit2) [bslbf]

If the minimum PGR version field is valid, the VMIV bit shall be set to 1b. Otherwise, the VMIV bit shall be set to 0b.

7.1.3.2.2.2.3 VMAV (bit1) [bslbf]

If the maximum PGR version field is valid, the VMAV bit shall be set to 1b. Otherwise, the VMAV bit shall be set to 0b.

7.1.3.2.2.2.4 VMAID (bit0) [bslbf]

If the maximum PGR ID field is valid, the VMAID bit shall be set to 1b. Otherwise, the VMAID bit shall be set to 0b.

7.1.3.2.2.3 Minimum PGR version

If the VMIV bit in the PGRGI flag is 1b, the minimum PGR version stored in the PGR recorded location shall be stored. If the VMIV bit in the PGRGI flag is 0b, the value of this field is ignored. The structure of the version is described in Table 25.

7.1.3.2.2.4 Maximum PGR version

If the VMAV bit in the PGRGI flag is 1b, the maximum PGR version stored in the PGR recorded location shall be stored. If the VMAV bit in the PGRGI flag is 0b, the value of this field is ignored. The structure of the version is described in Table 25.

7.1.3.2.2.5 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.3.2.2.6 Maximum PGR ID

If the VMAID bit in the PGRGI flag is 1b, the maximum PGR_ID stored in the PGR recorded location shall be stored. If the VMAID bit in the PGRGI flag is 0b, the value of this field is ignored.

7.1.3.2.2.7 PGR recorded location

The location of the file in which all the PGRs are recorded shall be stored. The location identification rule described in 7.3 shall be applied. The value of this field shall be "./PROG_SET.MGR:PGReferences".

7.1.3.2.2.8 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.3.2.3 PGRG general information

PGRG general information is described in Table 46.

Table 46 – PGRG general information

RBP	Length in bytes	Field name	Contents
0	4	Number of PGRG	uimsbf
4	1	PGRGGI flag	PGRGGIF
5	1	Minimum PGRG version	VER
6	1	Maximum PGRG version	VER
7	1	Reserved	bslbf
8	4	Maximum PGRG ID	uimsbf
12	136	PGRG recorded location	Dstring[128]
148	4	Reserved	bslbf

7.1.3.2.3.1 Number of PGRG

The number of PGRG stored in the PGRG recorded location shall be stored. The value shall be greater than, or equal to, 1. The PGRG_BASE the PRGR ID of which is 0 always exists.

7.1.3.2.3.2 PGRGGI flag (PGRGGIF)

Table 47 – Structure of PGRGGIF

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved					VMIV	VMAV	**VMAID**

7.1.3.2.3.2.1 Reserved (bit7-3)

These bits are reserved for future use and shall be 0b.

7.1.3.2.3.2.2 VMIV(bit2)[bslbf]

If the minimum PGRG version field is valid, the VMIV bit shall be set to 1b. Otherwise, the VMIV bit shall be set to 0b.

7.1.3.2.3.2.3 VMAV(bit1)[bslbf]

If the maximum PGRG version field is valid, the VMAV bit shall be set to 1b. Otherwise, the VMAV bit shall be set to 0b.

7.1.3.2.3.2.4 VMAID(bit0)[bslbf]

If the maximum PGRG ID field is valid, the VMAID bit shall be set to 1b. Otherwise, the VMAID bit shall be set to 0b.

7.1.3.2.3.3 Minimum PGRG version

If the VMIV bit in the PGRGGI flag is 1b, the minimum PGRG version stored in the PGRG recorded location shall be stored. If the VMIV bit in the PGRGGI flag is 0b, the value of this field is ignored. The structure of the version is described in Table 25.

7.1.3.2.3.4 Maximum PGRG version

If the VMAV bit in the PGRGGI flag is 1b, the maximum PGRG version stored in the PGRG recorded location shall be stored. If the VMAV bit in the PGRGGI flag is 0b, the value of this field is ignored. The structure of the version is described in Table 25.

7.1.3.2.3.5 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.3.2.3.6 Maximum PGRG ID

If the VMAID bit in the PGRGGI flag is 1b, the maximum PGRG_ID stored in the PGRG recorded location shall be stored. If the VMAID bit in the PGRGGI flag is 0b, the value of this field is ignored.

7.1.3.2.3.7 PGRG recorded location

The location of the file in which all PGRGs are recorded shall be stored. The location identification rule described in 7.3 shall be applied. The value of this field shall be "./PROG_SET.MGR:PGRGroups".

7.1.3.2.3.8 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.3.3 Structure of PGReferences stream file (programme references stream file)

A list of PGR structures is stored. The structure of PGReferences is described in Table 48.

Table 48 – Structure of PGReferences

BP	Length in bytes	Field name	Contents
0	744	PGR information (1)	PGR
744	744	PGR information(2)	PGR
		.....	
744*(n-1)	744	PGR information(n)	PGR

7.1.3.3.1 PGR information(1 – n)

The structure of PGR is described in Table 24.

7.1.3.4 Structure of PGRGroups stream file (programme reference groups stream file)

A list of PGRG structures is stored. The structure of PGRGroups is described in Table 49.

Table 49 – Structure of PGRGroups

BP	Length in bytes	Field name	Contents
0	584	PGRG information(1) for PGRG_BASE (1)	PGRG
584	584	PGRG information(2)	PGRG
		.....	
584*(n-1)	584	PGRG Information(n)	PGRG

7.1.3.4.1 PGRG information (1) for PGRG_BASE

The structure of PGRG is described in Table 35. The following restriction shall be applied.

7.1.3.4.1.1 PGRG_ID field in PGRG_BASE

PGRG_ID shall be 0x0.

7.1.3.4.1.2 PGRG recorded location field in PGRG_BASE

The location identification rule described in 7.3 shall be applied. The value of this field shall be "./PROG_SET.MGR:PGRG_BASE".

7.1.3.4.2 PGRG Information (2 - n)

The structure of PGRG is described in Table 35.

7.1.3.5 Structure of PGRG_xxxxxxxx stream file including PGRG_BASE stream file

A list of elements of each PGRG, which is stored in the PGRGroups stream file is stored. The PROG_BASE stream file is an instance of the PROG_xxxxxxxx stream file. The naming rule of "xxxxxxxx" is described in 7.4.1. The structure of PGRG_xxxxxxxx stream file is described in Table 50.

Table 50 – Structure of PGRG_xxxxxxxx stream file

BP	Length in bytes	Field name	Contents
0	1	Flag	FLPGRG
1	1	Reserved	bIsbf
2	2	Number of elements(=n)	uimsbf
4	4	Element ID (1)	uimsbf
		.....	
4*n	4	Element ID(n)	uimsbf

7.1.3.5.1 Flag

The structure of FLPGRG is described in Table 51.

Table 51 – Structure of FLPGRG

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved							TYPE

7.1.3.5.1.1 Reserved (bit7-1)

These bits are reserved for future use and shall be 0b.

7.1.3.5.1.2 TYPE (bit0)

If the elements are PGR, the TYPE bit shall be set to 1b. If the elements are PGRG, the TYPE bit shall be set to 0b.

NOTE The mixture of PGR and PGRG as elements of a certain PGRG is prohibited.

7.1.3.5.2 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.3.5.3 Number of elements

The number of elements following this field shall be stored. The value (n) shall be greater than, or equal to, 0.

7.1.3.5.4 Element ID (1 – n)

The PGR ID shall be stored if the TYPE bit in the flag field is 1b. The PGRG ID shall be stored if the TYPE bit in the flag field is 0b.

7.1.4 Composition of EXT_PS.MGR(extended programme set management file)

7.1.4.1 Outline of EXT_PS.MGR

The EXT_PS.MGR file manages programme-related stream files and is shown in Figure 3. The MetaDataTable stream file is one of the named streams of the EXT_PS.MGR and a list of metadata in programmes is stored. The MarkTable stream file is also one of the named streams and a list of marks in programmes is stored. Other stream files may exist.

NOTE The naming rule and the stream name length of "xxxxxxxx" is not given in this specification.

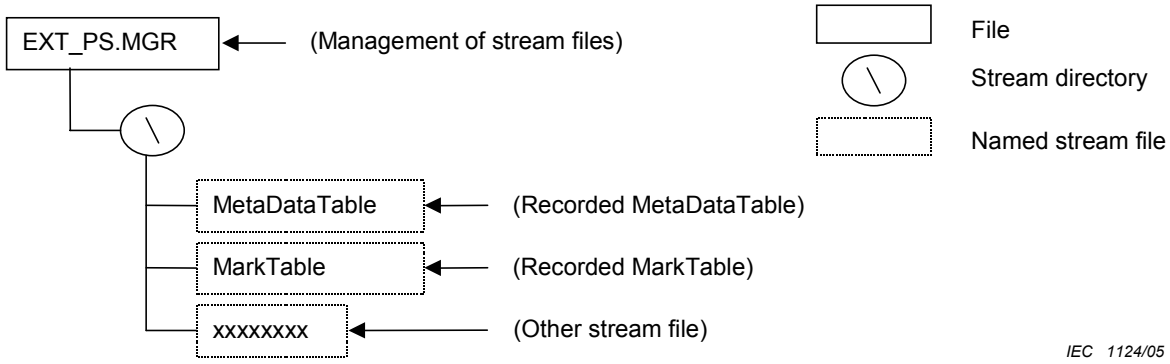


Figure 3 – EXT_PS.MGR

7.1.4.2 Structure of EXT_PS.MGR File (extended programme set management file)

The structure of EXT_PS.MGR is described in Table 52.

Table 52 – Structure of EXT_PS.MGR

BP	Length in bytes	Field name	Contents
0	4	Number of extended information(=n)	uimsbf
4	176	Extended information (1) for MetaDataTable	EI
180	176	Extended information (2) for MarkTable	EI
		.....	
4+176*(n-1)	176	Extended information (n)	EI

7.1.4.2.1 Number of extended information

The number of extended information following this field shall be stored. The value (n) shall be greater than, or equal to, 2.

7.1.4.2.2 Extended information(1) for MetaDataTable

Extended information(1) is mandatory for MetaDataTable. The structure of EI is described in Table 53. The following restrictions shall be applied.

7.1.4.2.2.1 File type field in MetaDataTable

The file type field in the MetaDataTable shall be set to 0x0000.

7.1.4.2.2.2 IDTP bit of flag field in MetaDataTable

The IDTP bit of the flag field in the MetaDataTable shall be set to 0b. This means that the ID referred by the related element ID field is PGRG ID.

7.1.4.2.2.3 Related element ID field in MetaDataTable

The value of the related element ID field in the MetaDataTable shall be 0x0.

7.1.4.2.2.4 Extended info recorded location field in MetaDataTable

The location identification rule described in 7.3 shall be applied. The value of this field shall be "./EXT_PS.MGR:MetaDataTable".

7.1.4.2.2.5 Each extended info specific area field in MetaDataTable

TYPE 1 each extended info specific area shall be applied.

7.1.4.2.3 Extended information(2) for MarkTable

Extended information(2) is mandatory for MarkTable. The structure of EI is described in Table 53. The following restrictions shall be applied.

7.1.4.2.3.1 File type field in MarkTable

The file type field in MarkTable shall be set to 0x0001.

7.1.4.2.3.2 IDTP bit of flag field in MarkTable

The IDTP bit of flag field in MarkTable shall be set to 0b.

7.1.4.2.3.3 Related element ID field in MarkTable

The value of the related element ID field in MarkTable shall be 0x0.

7.1.4.2.3.4 Extended info recorded location field in MarkTable

The location identification rule described in 7.3 shall be applied. The value of this field shall be "./EXT_PS.MGR:MarkTable".

7.1.4.2.3.5 Each extended info specific area field in MarkDataTable

TYPE 1 each extended info specific area shall be applied.

7.1.4.2.4 Extended information(3 - n)

The structure of EI is described in Table 53.

7.1.4.3 Structure of extended information (EI)

The structure of EI has the following fields.

Table 53 – Structure EI

RBP	Length in bytes	Field name	Contents
0	2	File type	uimsbf
2	1	Flag	FLEI
3	1	Reserved	bslbf
4	4	Related element ID	uimsbf
8	136	Extended info recorded location	Dstring[128]
144	32	Each extended info specific area	EISA

7.1.4.3.1 File type

The structure of EI is described in Table 54.

Table 54 – File type of structure EI

File Type	Interpretation
0x0000	Metadata type described in 7.1.4.4
0x0001	Mark type described in 7.1.4.5
0x0002-0xFFFF	Reserved

7.1.4.3.1.1 File type field in MetaDataTable

The file type field in MetaDataTable shall be set to 0x0000 (described in 7.1.4.4).

7.1.4.3.1.2 File type field in MarkTable

The file type field in MarkTable shall be set to 0x0001 (described in 7.1.4.5).

7.1.4.3.2 Flag

The structure of FLEI is described in Table 55.

Table 55 – Structure of FLEI

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved							IDTP

7.1.4.3.2.1 Reserved (bit7-1)

These bits are reserved for future use and shall be 0b.

7.1.4.3.2.2 IDTP (bit0) [bslbf]

If the ID referred by the related element ID field means PGR ID, the IDTP bit shall be set to 1b. If the ID referred by the related element ID field means PGRG ID, the IDTP bit shall be set to 0b.

7.1.4.3.3 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.4.3.4 Related element ID

The element ID related for this extended information shall be stored. The element ID is PGR_ID or PGRG_ID. This depends on the IDTP bit in the flag field.

7.1.4.3.5 Extended info recorded location

The location which is recorded extended information shall be stored. The location identification rule described in 7.3 shall be applied.

7.1.4.3.6 Each extended info specific area (EISA)

The structure of EISA is described in Table 56.

Table 56 – Structure of EISA

RBP	Length in bytes	Field name	Contents
0	1	Extended info TYPE	uimsbf
1	31	Extended info TYPE specific field	

7.1.4.3.6.1 Extended info TYPE

This field represents the type of the PGRG specific area. The interpretation is described in Table 57.

Table 57 – Extended info TYPE interpretation

TYPE	Interpretation
0x00	Shall mean that the following extended info TYPE specific field has no meaning
0x01	Shall mean that the extended info TYPE specific area is a TYPE 1
0x02-0xFF	Reserved

7.1.4.3.6.2 Extended info TYPE specific field

The structure of this field depends on Extended Info TYPE field.

7.1.4.3.6.3 TYPE 1 each extended info specific area

TYPE 1 each extended info specific area is defined in Table 58.

Table 58 – Structure of TYPE1 EISA

RBP	Length in bytes	Field name	Contents
0	1	Extended info TYPE	uimsbf
1	31	Reserved	bslbf

7.1.4.3.6.3.1 Extended info TYPE

Extended info TYPE shall be 0x01.

7.1.4.3.6.3.2 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.1.4.4 MetaDataTable stream file

MetaDataTable may be used for users to retrieve desired programmes from storage. It may be used to make programme reference groups. Metadata which are useful for retrieval may be extracted from stored programmes.

7.1.4.4.1 Structure of MetaDataTable stream file

The structure of MetaDataTable is described in Table 59.

Table 59 – Structure of MetaDataTable

RBP	Length in bytes	Field name	Contents
0	4	Number of MetaData entry (=n)	uimsbf
4		MetaData entry (1)	MDE
		MetaData entry (2)	MDE
		.....	
		MetaData entry (n)	MDE

7.1.4.4.1.1 Number of MetaData entry

The number of the MetaData entry following this field shall be stored. The value (n) shall be greater than, or equal to, 0.

7.1.4.4.1.2 MetaData entry (1 – n)

The structure of MDE is described as follows.

7.1.4.4.2 Structure MDE (MetaData entry)

The structure of MDE is described in Table 60.

Table 60 – Structure of MDE

RBP	Length in bytes	Field name	Contents
0	1	MDE TYPE	uimsbf
1	1	Version	VER
2	2	Length of MDE structure (=n)	uimsbf
4	n	MDE TYPE specific area	

7.1.4.4.2.1 MDE TYPE

This field represents the MDE Type specific area. The interpretation of MDE TYPE is described in Table 61.

Table 61 – MDE TYPE interpretation

MDE TYPE	Interpretation
0x0	Shall mean that the following MDE TYPE specific field has no meaning
0x1-0xFF	The interpretation is specified in IEC 62328-3

7.1.4.4.2.2 Version

The version of the MetaData entry shall be stored. The structure of the version is described in Table 25.

7.1.4.4.2.3 Length of MDE structure

The length of the MDE structure in bytes shall be stored in this field.

7.1.4.4.2.4 MDE TYPE specific area

The structure of this field depends on the MDE TYPE field.

7.1.4.5 MarkTable stream file

The MarkTable shall be used for users or equipments to put marks. Two kinds of mark – resume mark and bookmark – can be defined.

NOTE Five marks can be defined in each PGR or PGRG. The MarkTable may be used if more than 5 marks are defined.

The structure of the MarkTable is described in Table 62.

Table 62 – Structure of MarkTable

RBP	Length in bytes	Field name	Contents
0	4	Number of resume mark entry(=n)	uimsbf
4	4	Number of book mark entry(=m)	uimsbf
8	332	Resume mark entry (1)	LMEF
340	332	Resume mark entry (2)	LMEF
		.....	
8+332*(n-1)	332	Resume entry (n)	LMEF
8+332*n	332	Bookmark entry(1)	LMEF
8+332*(n+1)	332	Bookmark entry (2)	LMEF
		.....	
8+332*(m+n-1)	332	Bookmark entry (m)	LMEF

7.1.4.5.1 Number of resume mark entry

The number of the resume mark entry shall be stored. The value (n) shall be greater than, or equal to, 0.

7.1.4.5.2 Number of bookmark entry

The number of the bookmark entry shall be stored. The value (m) shall be greater than, or equal to, 0.

7.1.4.5.3 Resume mark entry (1 – n)

The structure of LMEF is described in Table 18.

7.1.4.5.4 Bookmark entry (1 – n)

The structure of LMEF is described in Table 18.

7.1.4.6 Other stream files

Other stream files may exist. The naming rule and the structure is NOT defined in this specification.

7.2 File composition of the RT_TVRS directory

7.2.1 RT_TVRS directory

Programmess may be recorded in the RT_TVRS directory. The example of the structure under the RT_TVRS directory is shown in Figure 4. A PROGxxxx.PIF file including several named stream files corresponds to a programme. (The letter x in a PROGxxxx.PIF means decimal digit from 0 to 9 coded by ISO/IEC 646 IRV.) A TVPROxxx directory shall be defined under the RT_TVRS directory. (The letter x in a TVPROxxx means decimal digit from 0 to 9 coded by ISO/IEC 646 IRV.) A PROGxxxx.PIF shall be defined under a TVPROxxx directory. The naming rule of the directory and file name is defined in 7.4.2.

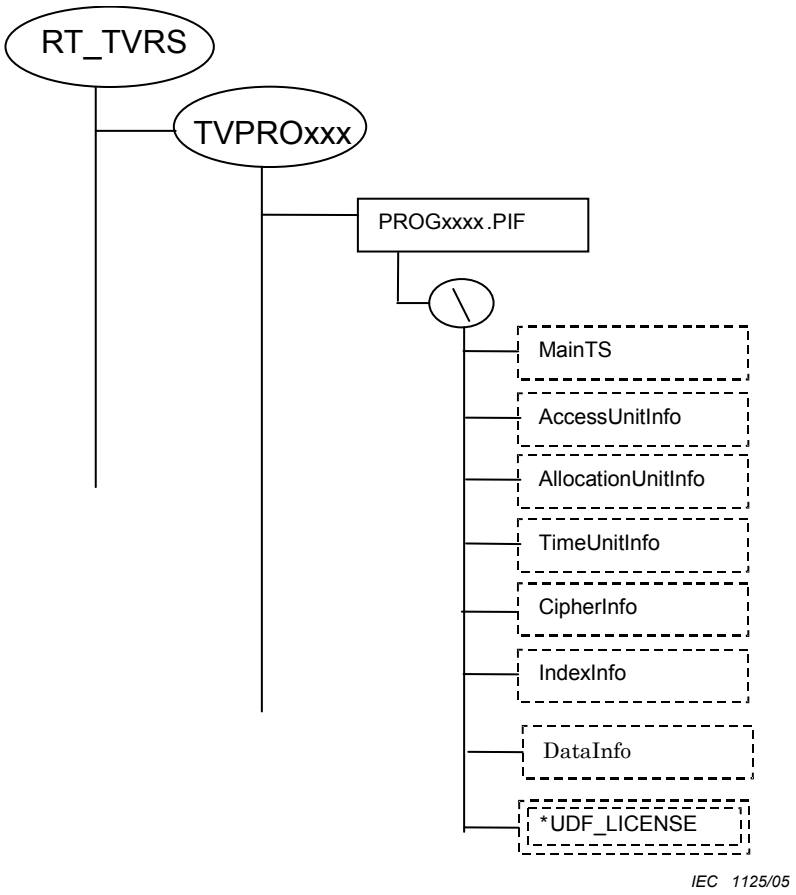


Figure 4 – RT_TVRS directory

7.2.2 PROGxxxx.PIF file

A PROGxxxx.PIF is a file managing several named streams. This file consists of five kinds of information as shown in Figure 5.

Programme management header
Programme information
Time search information
License information
OtheriInformation

IEC 1126/05

Figure 5 – Structure of PROGxxxx.PIF

7.2.2.1 Programme management header in PROGxxxx.PIF file

The structure of the programme management header in the PROGxxxx.PIF file is described in Table 63.

Table 63 – Structure of programme management header

RBP	Length in bytes	Field name	Contents
0	4	Programme identifier	bslbf
4	1	Programme version	VER
5	3	Reserved	bslbf
8	4	Time search information start address	uimsbf
12	4	License information start address	uimsbf
16	4	Other information start address	uimsbf
20	44	Reserved	bslbf

7.2.2.1.1 Programme identifier

This field shall contain “PROG” coded by ISO/IEC 646 IRV.

7.2.2.1.2 Programme version

This field shall be 0x10. This means the programme structure is Version 1.0. The structure of the version is described in Table 25.

7.2.2.1.3 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.2.2.1.4 Time search information start address

This field describes the start address of the time search information from the first byte of this PROGxxxx.PIF file.

7.2.2.1.5 License information start address

This field describes the start address of the license information from the first byte of this PROGxxxx.PIF file.

7.2.2.1.6 Other information start address

This field describes the start address of the other information from the first byte of this PROGxxxx.PIF file.

7.2.2.1.7 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.2.2.2 Programme information in PROGxxxx.PIF file

Information that is related to a TV programme and is often referred by users is stored in programme information. Programme information consists of four kinds of information shown in Figure 6.

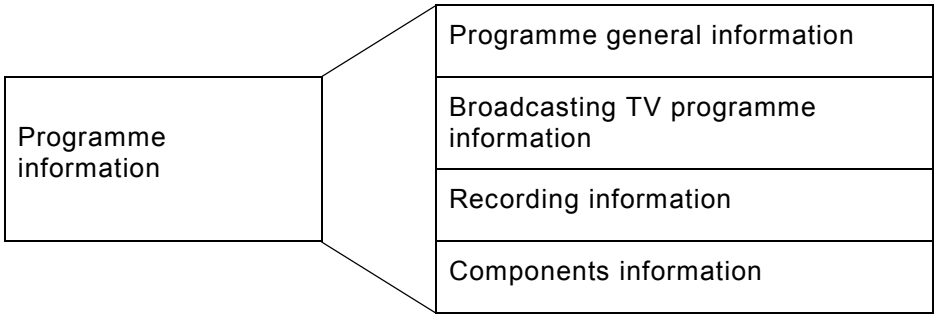


Figure 6 – Structure of programme information

7.2.2.2.1 Programme general information in programme information

The structure of programme general information is described in Table 64.

Table 64 – Structure of programme general information

RBP	Length in bytes	Field name	Contents
0	4	Programme information length	uimsbf
4	1	Programme identification type	uimsbf
5	1	Recorded stream type	uimsbf
6	1	Service type	uimsbf
7	1	Flag	FLPGI
8	136	Stream recorded location	Dstring[128]
144	4	Broadcasting TV programme information start address	uimsbf
148	4	Recording information start address	uimsbf
152	4	Components information start address	uimsbf

7.2.2.2.1.1 Programme information length

This field describes the total length of programme information in bytes.

7.2.2.2.1.2 Programme identification type(PI_TYPE)

This field describes the type of programme. The programme identification type defines the type of recorded AV stream. The interpretation of the programme identification type is described in Table 65.

Table 65 – Programme identification type interpretation

PI_ TYPE	Interpretation
0x0	Shall mean that the following PI_TYPE specific field has no meaning
0x1-0xFF	The interpretation is specified in IEC 62328-3

7.2.2.2.1.3 Recorded stream type

This field describes the recorded stream type of AV stream. The interpretation of the recorded stream type is described in Table 66.

Table 66 – Recorded stream type interpretation

Recorded stream type	Interpretation
0x00	Shall mean that the recorded stream type has no meaning
0x01	Shall mean that the recorded stream type is a sequence of recording packets defined in Annex A, and the TYPE1 RP header defined in A.3.1 is applied
0x02	Shall mean that the recorded stream type is a sequence of recording packets defined in Annex A, and the TYPE2 RP header defined in A.3.2 is applied.
0x03-0xFF	Reserved

7.2.2.2.1.4 Service type

This field describes the service type of the broadcasting TV programme. The interpretation of the service type is described in Table 67.

Table 67 – Service type interpretation

Service type	Interpretation
0x00	Shall mean that the service type has no meaning
0x01-0xFF	The interpretation is specified in IEC 62328-3

7.2.2.2.1.5 Flag

The structure of FLPGI is described in Table 68.

Table 68 – Structure of FLPGI

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved							E/A

7.2.2.2.1.5.1 Reserved(bit7-1)

These bits are reserved for future use and shall be 0b.

7.2.2.2.1.5.2 E/A(bit0)

If the unit of the programme is based on one event, the E/A bit shall be set to 1b. If the unit of the programme is based on one action, the E/A bit shall be set to 0b.

7.2.2.2.1.6 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.2.2.2.1.7 Stream recorded location

The location where AV stream is recorded shall be stored. The location identification rule described in 7.3 shall be applied in this field. The value of this field shall be "./PROGxxxx.PIF:MainTS".

7.2.2.2.1.8 Broadcasting TV programme information start address

This field describes the start address of the broadcasting TV programme information from the first byte of this programme information.

7.2.2.2.1.9 Recording information start address

This field describes the start address of the recording information from the first byte of this programme information.

7.2.2.2.1.10 Component information start address

This field describes the start address of the component information from the first byte of this programme information.

7.2.2.2.2 Broadcasting TV programme information (BTVPI)

The structure of BTVPI is described in Table 69.

Table 69 – Structure of broadcasting TV programme information

RBP	Length in bytes	Field name	Contents
0	1	BTVPI TYPE	uimsbf
1	3	Length of broadcasting TV programme information	uimsbf
4		BTVPI TYPE Specific Field	uimsbf

7.2.2.2.2.1 BTVPI TYPE

This field represents the type of the BTVPI TYPE. The interpretation of BTVPI TYPE is described in Table 70.

Table 70 – BTVPI TYPE interpretation

BTVPI TYPE	Interpretation
0x0	Shall mean that the following BTVPI TYPE specific field has no meaning
0x1-0xFF	The interpretation is specified in IEC 62328-3

7.2.2.2.2.2 Length of broadcasting TV programme information

This field describes the length of broadcasting TV programme information. The value of this field depends on the BTVPI TYPE and its structure.

7.2.2.2.2.3 BTVPI TYPE specific field

The structure of this field depends on the BTVPI TYPE and its structure.

7.2.2.2.3 Recording information

The structure of recording information is described in Table 71.

Table 71 – Structure of recording information

RBP	Length in bytes	Field Name	Contents
0	8	Recording start time	GTS
8	4	Recording duration	Duration
12	4	Reserved	bslbf

7.2.2.2.3.1 Recording start time

This field describes the start time of the recording programme in accordance with the time given by the system clock. If the E/A bit of the flag field in programme general information is 1b, which means the unit of the programme is based on one event, this value shall be between the start time of the recorded TV programme and the end time as the summation of the start time and the duration of the recorded TV programme.

7.2.2.2.3.2 Recording duration

This field describes the recording duration of this programme in accordance with the time given by the system clock. If the E/A bit of the flag field in programme general information is 1b, which means the unit of the programme is based on one event, this value shall be less than, or equal to, the duration of the TV programme subtracted by the subtraction between the start time of the recording start time and the start time of the TV programme.

7.2.2.2.3.3 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.2.2.2.4 Component information (COMPI)

The structure of COMPI is described in Table 72.

Table 72 – Structure of component information

RBP	Length in bytes	Field name	Contents
0	1	COMPI TYPE	uimsbf
1	3	Length of component information	uimsbf
4		COMPI TYPE specific field	

7.2.2.2.4.1 COMPI TYPE

This field represents the type of the COMPI TYPE. The interpretation of the COMPI TYPE is described in Table 73.

Table 73 – COMPI TYPE interpretation

COMPI TYPE	Interpretation
0x0	Shall mean that the following COMPI TYPE specific field has no meaning
0x1-0x7F	Reserved for country specific TYPE
0x80-0xFF	Reserved

7.2.2.2.4.2 Length of component information

This field describes the length of component information in bytes. The value of this field depends on COMPI TYPE.

7.2.2.2.4.3 COMPI TYPE specific field

The structure of this field depends on COMPI TYPE and its structure.

7.2.2.3 Structure of time search information in PROGxxxx.PIF

Information that is related to time search is stored in time search information. Three kinds of time search information, which are access unit information, allocation unit information and time unit information, can be defined. A map used for time search is stored in a certain stream file. Management information of the map including the location of the stream file is stored in time search information. The structure of time search information is described in Table 74.

Table 74 – Structure of time search information

RBP	Length in bytes	Field name	Contents
0	1	TSI flag	TSIF
1	1	Number of ACUIEs	uimsbf
2	1	Number of ALUIEs	uimsbf
3	1	Number of TUIEs	uimsbf
4	140	Access unit information entry (1)	ACUIE
		.....	
4+140*(m-1)	140	Access unit information entry (m)	ACUIE
4+140*m	140	Allocation unit information entry (1)	ALUIE
		.....	
4+140*(m+n-1)	140	Allocation unit information entry (n)	ALUIE
4+140*(m+n)	140	Time unit information entry (1)	TUIE
		.....	
4+140*(m+n+p-1)	140	Time unit information entry (p)	TUIE

7.2.2.3.1 TSI flag (TSIF)

The structure of TSIF is described in Table 75.

Table 75 – Structure of TSIF

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved							ACMTP

7.2.2.3.1.1 Reserved(bit7-1)

These bits are reserved for future use and shall be 0b.

7.2.2.3.1.2 ACMTP(bit0)[bslbf]

If the timestamp of the AccessUnitMap is based on the PTS (presentation timestamp), the ACMTP bit shall be set to 1b. If the timestamp of the AccessUnitMap is based on the ATS (arrival timestamp) of the first byte of RPAUP described in Figure C.3, the ACMTP bit shall be set to 0b. If the value of Number of ACUIEs field is 0, the ACMTP bit shall be ignored.

7.2.2.3.2 Number of ACUIEs

The number of access unit information entries shall be stored.

7.2.2.3.3 Number of ALUIEs

The number of allocation unit information entries shall be stored.

7.2.2.3.4 Number of TUIEs

The number of time unit information entries shall be stored.

7.2.2.3.5 Access unit information entry (1 – m)

The access unit information entry shall be stored. The structure of ACUIE is described in Table 76.

7.2.2.3.6 Allocation unit entry (1 – n)

The allocation unit information entry shall be stored. The structure of ALUIE is described in Table 80.

7.2.2.3.7 Time unit entry (1 – p)

The time unit information entry shall be stored. The structure of TUIE is described in Table 81.

7.2.2.3.8 Structure of access unit information entry (ACUIE)

Table 76 – Structure of ACUIE

RBP	Length in bytes	Field name	Contents
0	1	Component tag	bslbf
1	1	FLAG	FLACUIE
2	2	PID	PIDPLUS2
4	136	ACUM recorded location	Dstring[128]

7.2.2.3.8.1 Component tag

The component tag value of the selected elementary stream corresponding to AccessUnitMap may be stored. If the value of this field is 0xFFFF, this field shall be ignored.

7.2.2.3.8.2 Flag

The structure of FLACUIE is described in Table 77.

Table 77 – Structure of FLACUIE

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved							PIDV

7.2.2.3.8.2.1 Reserved (bit7-1)

These bits are reserved for future use and shall be 0b.

7.2.2.3.8.2.2 PIDV (bit0)[bslbf]

If the selected PID value is stored in the PID field, the PIDV bit shall be set to 1b. Otherwise, the PIDV bit shall be 0b.

7.2.2.3.8.3 PID

If the PID bit in the flag field is 1b, PID and the PID type shall be stored. The format of this field, which is the structure PIDPLUS2, is specified in Table 78. If the PID bit is 0b, this field shall be ignored. The stream PID corresponding to AccessUnitEntries stored in the file, the location of which is indicated in the ACUM recorded location field, may be stored.

Table 78 – Structure of PIDPLUS2

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
PIDF	PID_Type[1..0]		PID[12..8]				
bit7	**bit6**	**bit5**	**bit4**	**bit3**	**bit2**	**bit1**	**bit0**
PID[7..0]							

7.2.2.3.8.3.1 PIDF(bit15)[bslbf]

If the value of PID corresponding to AccessUnitEntries has changed in the recorded stream, this flag may be set to 1b. Otherwise, this flag shall be 0b.

7.2.2.3.8.3.2 PID_Type[1..0](bit14-13)[uimsbf]

The type of PID shall be stored. The 2-bit interpretation is described in Table 79.

Table 79 – PID_Type Interpretation

PID_Type	Interpretation
0x0	Shall mean that the type of PID is not specified
0x1	Video PID
0x2 – 0x3	Reserved

7.2.2.3.8.3.3 PID[12..0](bit12-0)[uimsbf]

The PID value corresponding to the first AccessUnitEntry stored in the file, the location of which is indicated in the ACUM recorded location field, shall be stored.

7.2.2.3.8.4 ACUM recorded location

The location where the AccessUnitMap is recorded shall be stored. The location identification rule described in 7.3 shall be applied in this field. The value of this field shall be "./PROGxxxx.PIF:AccessUnitInfo". If the plural access unit information file exists, the value of this field except the main access unit information file shall be "./PROGxxxx.PIF:AccessUnitInfo_02", ..., "./PROGxxxx.PIF:AccessUnitInfo_N", where N is a decimal number coded by ISO/IEC 646 IRV containing a maximum of 2 digits.

7.2.2.3.9 Structure of allocation unit information entry (ALUIE)

Table 80 – Structure of ALUIE

RBP	Length in bytes	Field name	Contents
0	4	Size of ALU	uimsbf
4	136	ALUM recorded location	Dstring[128]

7.2.2.3.9.1 Size of ALU

The size of the AllocationUnit shall be stored. The unit of this field is the aligned unit (6144 bytes) described in Annex A.

7.2.2.3.9.2 ALUM recorded location

The location where AllocationUnitMap is recorded shall be stored. The location identification rule described in 7.3 shall be applied in this field. The value of this field shall be "./PROGxxxx.PIF:AllocationUnitInfo". If the plural allocation unit information file exists, the value of this field except for the main allocation unit information file shall be "./PROGxxxx.PIF:AllocationUnitInfo_02", ..., "./PROGxxxx.PIF:AllocationUnitInfo_N", where N is a decimal number coded by ISO/IEC 646 IRV containing a maximum of 2 digits.

7.2.2.3.10 Structure of time unit information entry (TUIE)

Table 81 – Structure of TUIE

RBP	Length in bytes	Field name	Contents
0	4	Time unit	uimsbf
4	136	TUM recorded location	Dstring[128]

7.2.2.3.10.1 Time unit

Time intervals of the time unit shall be stored. The value is in units of 0,1 s. If the time interval is 1 s, the value shall be 10.

7.2.2.3.10.2 TUM recorded location

The location where the TimeUnitMap is recorded shall be stored. The location identification rule described in 7.3 shall be applied in this field. The value of this field shall be "./PROGxxxx.PIF:TimeUnitInfo". If the plural time unit information file exists, the value of this field except for the main time unit information file shall be "./PROGxxxx.PIF:TimeUnitInfo_02", ..., "./PROGxxxx.PIF:TimeUnitInfo_N", where N is a decimal number coded by ISO/IEC 646 IRV containing a maximum of 2 digits.

7.2.2.4 Structure of license information in PROGxxxx.PIF

Information that is related to cipher and cryptography is stored in cipher information. The structure of cipher information has the following fields and is described in Table 82.

Table 82 – Structure of license information

RBP	Length in bytes	Field name	Contents
0	1	LI flag	LIF
1	1	Rights management specification identifier	uimsbf
2	4	RMS specific information	bslbf
6	1	Cipher algorithm TYPE	uimsbf
7	1	Cipher algorithm sub-TYPE	uimsbf
8	1	Encrypted area on AV stream	uimsbf
9	1	Cipher block chaining TYPE	uimsbf
10	2	Reserved	bslbf
12	136	CI recorded location	Dstring[128]

7.2.2.4.1 LI flag (LIF)

The structure of LIF is described in Table 83.

Table 83 – Structure of LIF

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
VA	Reserved					ECRYT	PTP

7.2.2.4.1.1 VA (bit7)[bslbf]

If the following CI recorded location field is invalid, the VA bit shall be set to 0b. Otherwise, the VA bit shall be set to 1b. If the VA bit is 0b, it means that the AV stream is not encrypted and there is no cipher information file and license information file.

7.2.2.4.1.2 Reserved(bit6-2)

These bits are reserved for future use and shall be 0b.

7.2.2.4.1.3 ECRYT (bit1)[bslbf]

If the AV stream is encrypted, the ECRYT bit shall be set to 1b. If the AV stream is NOT encrypted, the ECRYT bit shall be set to 0b. If the VA bit is 0b, the ECRYT bit shall be set to 0b.

7.2.2.4.1.4 PTP (bit0)[bslbf]

If the following CI recorded location field points to the cipher information file, the PTP bit shall be set to 1b. This means that the plural application licenses exist in the license information file. If the following CI recorded location field points to the license information file, the PTP bit shall be set to 0b. This means that only one application license exists in the license information file.

7.2.2.4.2 Rights management specification identifier (RMSI)

This field assumes to represent the rights management specification applied to the AV stream.

The interpretation of RMSI is described in Table 84.

NOTE Organizations may register their own rights management way.

Table 84 – Rights management specification identifier interpretation

RMSI	Interpretation
0x00	Shall mean that the rights management specification is not specified in this field
0x01-0xFF	Reserved

7.2.2.4.3 RMS specific information

The interpretation of this field depends on the value of the rights management specific identifier. If the value of the rights management specification identifier is 0x00, this field shall be ignored.

NOTE Each organization may define this field in order to identify the type of rights management way which the application layer needs to know.

7.2.2.4.4 Cipher algorithm TYPE (CATYPE)

The cipher algorithm applied to an AV stream may be specified. The interpretation of the CATYPE is described in Table 85.

Table 85 – Cipher algorithm interpretation

CATYPE	Interpretation
0x00	Shall mean that cipher algorithm is not specified in this field
0x01	Shall mean that no algorithm is applied
0x02	Shall mean that triple DES is applied
0x03	Shall mean that AES is applied
0x04-0xFF	Reserved

7.2.2.4.5 Cipher algorithm sub-TYPE

This field specifies the subtype of the cipher algorithm. The structure of this field is described in Table 86.

Table 86 – Structure of CASTYPE

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Key length			CATYPE specific			Vendor specific	

7.2.2.4.5.1 Key length(bit7-5)[uimsbf]

This 3-bit value specifies the key length of the cipher. The interpretation is described in Table 87. If the value of the cipher algorithm type is 0x02, which means that triple DES is applied, the value of this field shall be 1. If the value of the cipher algorithm type is 0x03, which means that AES is applied, the value of this field shall be 2 or 3 or 4.

Table 87 – Key length interpretation

Key length	Interpretation
0	Shall mean that key length is not specified in this field
1	Shall mean that key length is 64 bits
2	Shall mean that key length is 128 bits
3	Shall mean that key length is 192 bits
4	Shall mean that key length is 256 bits
5 - 7	Reserved

7.2.2.4.5.2 CATYPE specific(bit4-2)[uimsbf]

The structure of this field depends on the cipher algorithm type. If the value of the cipher algorithm type is 0x02, which means that triple DES is applied, the following TYPE 1 interpretation shall be applied. Otherwise, this field may be ignored. TYPE 1 interpretation is described in Table 88.

Table 88 – TYPE 1 interpretation

CATYPE specific	Interpretation
0	Shall mean that 1 key is used
1	Shall mean that 2 keys are used
2	Shall mean that 3 keys are used
3 - 7	Reserved

7.2.2.4.5.3 Vendor specific(bit1-0)[uimsbf]

The interpretation of this field is NOT defined in this specification. The interpretation of this field may be defined by each vendor.

7.2.2.4.6 Encrypted area on AV stream

The encrypted area on the AV stream may be specified. The interpretation of the encrypted area on the AV stream is described in Table 89.

Table 89 – Encrypted area on AV stream interpretation

EAAV	Interpretation
0x00	Shall mean that the encrypted area on the AV stream is not specified in this field
0x01	Shall mean that the whole AV stream is NOT encrypted
0x02	Shall mean that the RP header (4 bytes) and the header of the TS packet (4 bytes) shall not be encrypted. If the enc_flag bit of RP header is 1b, the payload of the TS packet (184 bytes) shall be encrypted. If the enc_flag bit of RP header is 0b, the payload of the TS packet (184 bytes) shall NOT be encrypted
0x03	Shall mean that the RP header (4 bytes) and the header of the TS packet (4 bytes) shall not be encrypted. If the enc_flag bit of RP header is 1b, the beginning of the payload of the TS packet (176 bytes) shall be encrypted and the rest of the payload of the TS packet (8 bytes) shall not be encrypted. If the enc_flag bit of RP header is 0b, the payload of the TS packet (184 bytes) shall NOT be encrypted
0x04	Shall mean that the RP header (4 bytes) and the header of the TS packet (4 bytes) shall not be encrypted. If the enc_flag bit of RP header is 1b, the beginning of the payload of the TS packet (168 bytes) shall be encrypted and the rest of the payload of the TS packet (16 bytes) shall not be encrypted. If the enc_flag bit of RP header is 0b, the payload of the TS packet (184 bytes) shall NOT be encrypted

Table 89 *(continued)*

EAAV	Interpretation
0x05	Shall mean that the RP header (4 bytes) and the header of the TS packet (4 bytes) shall not be encrypted. If the enc_flag bit of RP header is 1b, the beginning of the payload of the TS packet (160 bytes) shall be encrypted and the rest of the payload of the TS packet (24 bytes) shall not be encrypted. If the enc_flag bit of RP header is 0b, the payload of the TS packet (184 bytes) shall NOT be encrypted
0x6-0xF	Reserved
0x10	Shall mean that whole AV stream is encrypted
0x11-0xFF	Reserved

7.2.2.4.7 Cipher block chaining TYPE

The cipher block chaining type may be specified. The interpretation of the CBC type is described in Table 90.

Table 90 – CBC type interpretation

CBCType	Interpretation
0x00	Shall mean that the CBC type is not specified in this field
0x01	Shall mean that the CBC mode is NOT used
0x01	Shall mean that the payload of a TS packet (184 bytes) is the unit of CBC. The RP header (4 bytes) and the header of TS packet (4 bytes) shall not be encrypted
0x02	Shall mean that the beginning of payload of a TS packet (176 bytes) is the unit of CBC. The RP header (4 bytes) and the header of TS packet (4 bytes) and the rest of payload of a TS packet (8 bytes) shall not be encrypted
0x03	Shall mean that the beginning of payload of a TS packet (168 bytes) is the unit of CBC. The RP header (4 bytes) and the header of TS packet (4 bytes) and the rest of payload of a TS packet (16 bytes) shall not be encrypted
0x04	Shall mean that the beginning of payload of a TS packet (160 bytes) is the unit of CBC. The RP header (4 bytes) and the header of TS packet (4 bytes) and the rest of payload of a TS packet (24 bytes) shall not be encrypted
0x05-0x0F	Reserved
0x10	Shall mean that 512 bytes are the unit of CBC
0x11	Shall mean that 2 048 bytes are the unit of CBC
0x12	Shall mean that 6 144 bytes are the unit of CBC
0x13-0xFF	Reserved

7.2.2.4.8 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.2.2.4.9 CI recorded location

The location identification rule described in 7.3 shall be applied in this field. If the VA bit of the LI flag field is 1b and the PTP bit of the LI flag field is 1b, the location where the cipher information file is recorded shall be stored. The value of this field shall be "./PROGxxxx.PIF:CipherInfo". If the VA bit of the LI flag field is 1b and the PTP bit of the LI flag field is 0b, the location where the license information file is recorded shall be stored. The value of this field shall be "./PROGxxxx.PIF:*UDF_LICENSE".

7.2.2.5 Structure of other information in PROGxxxx.PIF

Two kinds of information that is related to index and data sent by the DSM-CC section are stored in other information. The structure of other information has the following fields and is described in Table 91.

Table 91 – Structure of other information

RBP	Length in bytes	Field name	Contents
0	1	OI flag	OIF
1	3	Reserved	bslbf
4	136	II recorded location	Dstring[128]
140	136	DI recorded location	Dstring[128]

7.2.2.5.1 OI flag (OIF)

The structure of OIF is described in Table 92.

Table 92 – Structure of OIF

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
VAI	VAD	Reserved					

7.2.2.5.1.1 VAI(bit7)[bslbf]

If the following II recorded location field is invalid, the VAI bit shall be set to 0b. Otherwise, the VAI bit shall be set to 1b. If the VAI bit is 0b, this means that the content has no index information.

7.2.2.5.1.2 VAD(bit6)[bslbf]

If the following DI recorded location field is invalid, the VAD bit shall be set to 0b. Otherwise, the VAD bit shall be set to 1b. If the VAD bit is 0b, this means that the programme has no data information.

7.2.2.5.1.3 Reserved(bit5-0)

These bits are reserved for future use and shall be 0b.

7.2.2.5.2 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.2.2.5.3 II recorded location

The location where the index information file is recorded shall be stored. The location identification rule described in 7.3 shall be applied in this field. The value of this field shall be "./PROGxxxx.PIF:IndexInfo".

7.2.2.5.4 DI recorded location

The location where the recorded data information file is recorded shall be stored. The location identification rule described in 7.3 shall be applied in this field. The value of this field shall be "./PROGxxxx.PIF:DataInfo".

7.2.3 Time search related stream file

Three kinds of time search information – access unit information, allocation unit information and time unit information – are defined. The stream file name of the main access unit information shall be “AccessUnitInfo”. If the plural access unit information file exists, the name of these files except the main access unit information file shall be “AccessUnitInfo_02”, ..., “AccessUnitInfo_N”, where N is a decimal number coded by ISO/IEC 646 IRV containing a maximum of 2 digits. The stream file name of the main allocation unit information shall be “AllocationUnitInfo”. If the plural allocation unit information file exists, the name of these files except the main allocaion unit information file shall be “AllocationUnitInfo_02”, ..., “AllocationUnitInfo_N”, where N is a decimal number coded by ISO/IEC 646 IRV containing a maximum of 2 digits. The stream file name of the main time unit information shall be “TimeUnitInfo”. If the plural time unit information file exists, the name of these files except for the main time unit information file shall be “TimeUnitInfo_02”, ..., “TimeUnitInfo_N”, where N is a decimal number coded by ISO/IEC 646 IRV containing a maximum of 2 digits.

7.2.3.1 AccessUnitInfo and AccessUnitInfo_xx stream file

Access unit information is recorded for random access functionality. The access unit may be an MPEG I-picture. The structure of the AccessUnitInfo stream file is described in Table 93.

Table 93 – Structure of AccessUnitInfo stream file

BP	Length in bytes	Field name	Contents
0	4	Number of ACUE (=m)	uimsbf
4	14	Access unit entry (1)	ACUE
		.....	
4+14*(m-1)	14	Access unit entry (m)	ACUE

7.2.3.1.1 Number of ACUE

The number of the access unit entry shall be stored.

7.2.3.1.2 Access unit entry (1 – m)

The access unit entry shall be stored. The structure of ACUE is described in Table 94.

7.2.3.1.3 Structure of access unit entry (ACUE)

The structure of ACUE has the following fields and is described in Table 94.

Table 94 – Structure of ACUE

RBP	Length in bytes	Field name	Contents
0	4	ACU timestamp	uimsbf
4	6	ACU start position	GPPF
10	1	ACU type	ACUTP
11	3	ACU size	uimsbf

7.2.3.1.3.1 ACU timestamp

The ACU timestamp shall be stored. The value counted by 45 000Hz is stored.

7.2.3.1.3.2 ACU start position

The ACU start position shall be stored.

7.2.3.1.3.3 ACU type

The structure of ACUTP is described in Table 95.

Table 95 – Structure of ACUTP

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved				S	G	PTYPE	

7.2.3.1.3.3.1 Reserved(bit7-4)

These bits are reserved for future use and shall be 0b.

7.2.3.1.3.3.2 S(bit3)[bslbf]

If a sequence header of MPEG precedes the access unit, the S bit shall be set to 1b. Otherwise, the S bit shall be set to 0b. If the S bit is 1b, the ACU start position shall indicate the first byte of an RP packet including the first byte of sequence header.

7.2.3.1.3.3.3 G(bit2)[bslbf]

If a GOP header of MPEG precedes the access unit, the G bit shall be set to 1b. Otherwise, the G bit shall be set to 0b. If the G bit is 1b and the S bit is 0b, the ACU start position shall indicate the first byte of a RP packet including the first byte of GOP header.

7.2.3.1.3.3.4 PTYPE(bit1-0)[uimsbf]

PTYPE bits specify the picture type of access unit. The interpretation is described in Table 96.

Table 96 – PTYPE interpretation

PTYPE	Interpretation
0	Shall mean that picture TYPE specific is not specified
1	MPEG I picture
2	MPEG P picture
3	Reserved

7.2.3.1.3.4 ACU size

The ACU size may be stored. The unit is not a byte but an RP packet.

7.2.3.2 AllocationUnitInfo and AllocationUnitInfo_xx stream file

The allocation unit information is recorded for allocation-based time search. The structure of the AllocationUnitInfo stream file is described in Table 97.

Table 97 – Structure of AllocationUnitInfo stream file

BP	Length in bytes	Field name	Contents
0	4	Number of ALUE (=m)	uimsbf
4	8	Allocation unit entry (1)	ALUE
		.....	
4+8*(m-1)	8	Allocation unit entry (m)	ALUE

7.2.3.2.1 Number of ALUE

The number of the allocation unit entry shall be stored.

7.2.3.2.2 Allocation unit entry (1 – m)

The allocation unit entry shall be stored. The structure of ALUE is described in Table 98.

7.2.3.2.3 Structure of allocation unit entry (ALUE)

The structure of ALUE has the following fields and is described in Table 98.

Table 98 – Structure of ALUE

RBP	Length in bytes	Field name	Contents
0	4	ALU start timestamp	uimsbf
4	4	ALU end timestamp	Uimsbf

7.2.3.2.3.1 ALU start timestamp

The ALU start timestamp shall be recorded. ALU start means the first byte of ALU. The value counted by 45 000 Hz shall be stored.

7.2.3.2.3.2 ALU end timestamp

The ALU end timestamp shall be recorded. ALU end means the last byte of ALU. The value counted by 45 000 Hz shall be stored.

7.2.3.3 TimeUnitInfo and TimeUnitInfo_xx stream file

Time unit information is recorded for time base search. The structure of the TimeUnitInfo stream file is described in Table 99.

Table 99 – Structure of TimeUnitInfo stream file

BP	Length in bytes	Field name	Contents
0	4	Number of TUE (=m)	uimsbf
4	6	Time unit entry (1)	TUE
		.....	
4+6*(m-1)	6	Time unit entry (m)	TUE

7.2.3.3.1 Number of TUE

The number of the time unit entry shall be stored.

7.2.3.3.2 Time unit entry (1 – m)

The time unit entry shall be stored. The structure of TUE is described in Table 100.

7.2.3.3.3 Structure of time unit entry (TUE)

The structure of TUE has the following fields.

Table 100 – Structure of TUE

RBP	Length in bytes	Field name	Contents
0	6	TU position	GPPF

7.2.3.3.3.1 TU position

The TU start position shall be stored.

7.2.4 CipherInfo stream file

The CipherInfo stream file indicates the correspondence between the AV stream and the licenses. The structure of the CipherInfo stream file is described in Table 101.

Table 101 – Structure of CipherInfo stream file

BP	Length in bytes	Field name	Contents
0	1	CI flag	CIF
1	3	Reserved	bslbf
4	4	Number of LERE (=m)	uimsbf
8		License effective range entry (1)	LERE
		.....	
		License effective range entry (m)	LERE

7.2.4.1 CI flag

The structure of the CI flag is described in Table 102.

Table 102 – Structure of CIF

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved					LETYPE		

7.2.4.1.1 Reserved(bit7-3)

These bits are reserved for future use and shall be 0b.

7.2.4.1.2 LETYPE(bit2-0)[uimsbf]

The interpretation of license effective TYPE for the following license effective range entries is described in Table 103.

Table 103 – LETYPE interpretation

LETYPE	Interpretation
0x0	Shall mean that the license effective TYPE is not specified
0x1	Shall mean that the license is effective all components
0x2	Shall mean that the license is effective only one or some component(s)
0x3	Shall mean that the license is effective only one or some component group(s)
0x4 - 0x7	Reserved

7.2.4.2 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.2.4.3 Number of LERE

The number of the license effective range entry shall be stored.

7.2.4.4 License effective range entry (1 – m)

The license effective range entry shall be stored. The structure of LERE is described in Table 104.

7.2.4.5 Structure of license effective range entry (LERE)

Structure LERE has the following fields.

Table 104 – Structure of LERE

RBP	Length in bytes	Field name	Contents
0	1	Flag	LFLAG
1	1	Reserved	uimsbf
2	2	Length of LERE structure	uimsbf
4	6	License effective start position	GPPF
10	6	License effective end position	GPPF
16	136	License recorded location	Dstring[128]
152	4	License start position	uimsbf
156	2	License length	uimsbf
158	1	LEEL_ID(1) or reserved	uimsbf
159	1	LEEL_ID(2) or reserved	uimsbf
		...	
4*n	1	LEEL_ID(a) or reserved	uimsbf

7.2.4.5.1 LFLAG

The structure of LFLAG is described in Table 105.

Table 105 – Structure of LFLAG

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved				Number of LEELIDs			

7.2.4.5.1.1 Reserved(bit7-4)

These bits are reserved for future use and shall be 0b.

7.2.4.5.1.2 Number of LEELIDs(bit3-0)[uimsbf]

If the LETYPE is 0x2 or 0x3, this 4-bit is valid. Otherwise, this 4-bit shall be ignored. The number of license effective element IDs stored in the LEEL_IDs field is stored. If the value of LETYPE in the CI flag described in Table 101 is 0x2, the LEEL_IDs correspond to component_tags. If the value of the LETYPE is 0x3, the LEEL_IDs correspond to the component_group_id.

7.2.4.5.2 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.2.4.5.3 Length of LERE structure

The length of the LERE structure shall be stored. The length depends on the value of the license effective type field. If the value of the LETYPE in the CI Flag described in Table 101 is 0x1, the value of this field shall be 164. The value of this field shall be a multiple of 4 bytes.

7.2.4.5.4 License effective start position

The license effective start position in bytes in the AV stream file shall be stored. The start point of the AV stream described in Annex C should be referred.

7.2.4.5.5 License effective end position

The license effective end position in bytes in the AV stream file shall be stored.

7.2.4.5.6 License recorded location

The location where the license file is recorded shall be stored. The location identification rule described in 7.3 shall be applied in this field. The value of this field shall be "./PROGxxxx.PIF:*UDF_LICENSE".

7.2.4.5.7 License start position

The license start position in bytes in the license file shall be stored.

7.2.4.5.8 License length

License length in bytes shall be stored.

7.2.4.5.9 LEEL_ID(1) or reserved

If the value of LETYPE in the CI flag described in Table 101 is 0x2, and the value of the number of LEELIDs bits in the flag field is greater than, or equal to, 1, the component_tag value shall be stored in this field. If the value of LETYPE is 0x3, and the value of the number of LEELIDs bits in the flag field is greater than, or equal to, 1, the component_group_id value shall be stored in this field. If the value of LETYPE bits is 0x1, this field is a reserved field and the value shall be 0x00.

7.2.4.5.10 LEEL_ID(2) or reserved

This field is valid only if the value of the number of LEELIDs bits in the flag field is greater than, or equal to, 2. If the value of LETYPE in the CI flag described in Table 101 is 0x2, and the value of the number of LEELIDs bits in the flag field is greater than, or equal to, 2, the component_tag value shall be stored in this field. If the value of LETYPE is 0x3 and the value of the number of LEELIDs bits in the flag field is greater than, or equal to, 2, the component_group_id value shall be stored in this field. If the value of the number of LEELIDs bits in the flag field is less than 2, this field is a reserved field and the value shall be 0x00.

7.2.4.5.11 LEEL_ID(a) or reserved

If the value of LETYPE in the CI flag described in Table 101 is 0x2, and the value of the number of LEELIDs bits in the flag field is greater than, or equal to, ‘a’, a component_tag value shall be stored in this field. If the value of LETYPE is 0x3, and the value of the number of LEELIDs bits in the flag field is greater than, or equal to, ‘a’, a component_group_id value shall be stored in this field. If the value of the number of LEELIDs bits in the flag field is less than ‘a’, this field is a reserved field and the value shall be 0x00.

7.2.5 IndexInfo stream file

Indexes that are sent by the vendor are recorded for such as video distribution service. The structure of the IndexInfo stream file is described in Table 106.

Table 106 – Structure of IndexInfo stream file

BP	Length in bytes	Field name	Contents
0	4	Number of IERE (=m)	uimsbf
4	420	Index effective range entry (1)	IERE
		.....	
4+420*(m-1)	420	Index effective range entry (m)	IERE

7.2.5.1 Number of IERE

The number of the index effective range entry shall be stored.

7.2.5.2 Index effective range entry (1 – m)

The index effective range entry shall be stored. The structure of IERE is described in Table 107.

7.2.5.3 Structure of index effective range entry (IERE)

The structure of IERE has the following fields and is described in Table 107.

Table 107 – Structure of IERE

RBP	Length in bytes	Field name	Contents
0	108	Index descriptor	Dstring[100]
108	300	Index representative thumbnail	LGTPF
408	6	Index effective start position	GPPF
414	6	Index effective end position	GPPF

7.2.5.3.1 Index descriptor

The index descriptor may be stored.

7.2.5.3.2 Index representative thumbnail

The index representative thumbnail may be stored. The structure of LGTPF is described in Table 14.

7.2.5.3.3 Index effective start position

The index effective start position in the AV stream file shall be stored. The start point on the AV stream described in Annex C should be referred.

7.2.5.3.4 Index effective end position

The index effective end position in the AV stream file shall be stored.

7.2.6 DataInfo stream file

Data carousel change points may be recorded. The structure of the DataInfo stream file is described in Table 108.

Table 108 – Structure of DataInfo stream file

BP	Length in bytes	Field name	Contents
0	4	Number of DCE (=m)	uimsbf
4	6	Data change entry (1)	DCE
		.....	
4+6*(m-1)	6	Data change dntry (m)	DCE

7.2.6.1 Number of DCE

The number of the data change entry shall be stored.

7.2.6.2 Data change entry (1 – m)

The data change entry shall be stored. The structure of DCE is described in Table 109.

7.2.6.3 Structure of data change entry (DCE)

The structure DCE has the following fields.

Table 109 – Structure DCE

RBP	Length in bytes	Field name	Contents
0	6	Data change position	GPPF

7.2.6.3.1 Data change position

The data change start position in bytes in the MainTS stream file shall be stored. The start point on the data stream described in Annex C should be referred.

7.2.7 MainTS stream file

If the recorded stream type in programme general information is 0x01, the TS packet prefixed by the RP header, which is called recording packet and described in Annex A, shall be recorded. The aligned unit described in Annex A shall be the minimum recording unit. The TVRS partial TS may be encrypted. The DIT should not be included at the top and middle of the stream. Two DITs may exist at the end of the stream.

7.2.8 *UDF_LICENSE secure stream file

Licenses including decrypt keys and usage rules are recorded. This named stream is defined in secure UDF. More than one application license may be recorded. The structure of the *UDF_LICENSE stream file is described in Table 110.

Table 110 – Structure of *UDF_LICENSE stream file

BP	Length in bytes	Field name	Contents
0	32	Implementation identifier	EntityID
32	4	License stream type	uimsbf
36	4	Number of license records	uimsbf
40	88	Reserved	bslbf
128		License record	LR

7.2.8.1 Implementation identifier

The implementation identifier shall be stored.

NOTE For more information on the proper handling of this field, see 2.1.5 of UDF.

7.2.8.2 License stream type

This field shall be set to one. This means that the license stream is a Type1 license stream defined in 5.6.2 of secure UDF.

7.2.8.3 Number of license records

This field shall be set to 0x1.

NOTE One license record which may contain multiple of application licenses.

7.2.8.4 Reserved

All bytes shall be set to 0x00.

NOTE This field is reserved by the secure UDF specification.

7.2.8.5 License record

The license record shall be stored. The structure of LR is described as follows.

7.2.8.6 Structure of license record (LR)

The structure of LR has the fields described in Table 111.

Table 111 – Structure LR

RBP	Length in bytes	Field name	Contents
0	4	Record length	uimsbf
4	4	Number of APL(=m)	uimsbf
8	4	APL length(=n)	uimsbf
12	4	APL start position(=p)	uimsbf
16	p-16	Reserved	bslbf
p	(m*n)	Application licenses	bslbf

7.2.8.6.1 Record length

This field shall contain the length of this license record in bytes. It shall be multiple of four bytes.

NOTE Sentence from secure UDF document.

7.2.8.6.2 Number of APL

The number of application licenses shall be stored.

7.2.8.6.3 APL length

The length of application licenses in bytes shall be stored. They shall be multiple of four bytes.

7.2.8.6.4 APL start position

The start position of the application licenses field in relative byte number from the first byte of structure LR shall be stored. The relative byte number starts from 0.

7.2.8.6.5 Reserved

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

7.2.8.6.6 Application licenses

This field shall contain application licenses. The structure of the application license is not defined in this specification.

7.3 Location indication rule

7.3.1 Overview

In this standard, when specifying file name and stream name, the associated location is denoted using a Dstring[n] structure. The following restrictions and rules apply to this Dstring[n] structure.

7.3.2 Restrictions and rules

7.3.2.1 Restriction concerning the character set field

The character set used in the character set field shall employ 0x10.

7.3.2.2 Restriction concerning the valid length field

The number of effective characters is to be entered in the valid length field.

7.3.2.2.1 Rules concerning the character string field

7.3.2.2.1.1 Absolute path notation

Specification of an absolute path shall begin with “/TVR_ROOT”, the root directory of this standard.

7.3.2.2.1.2 Relative path notation

When specifying a relative path, the current position is the directory where the file holding location information is stored. Specification of a relative path shall begin with “./” or “../”, where “./” indicates the same level directory and “../” indicates the parent directory.

7.3.2.2.1.3 Stream notation

The separator between the main file and a stream uses “:”. The main file and streams are considered to be on the same level directory. A stream is specified in the form [main file name]:[stream-name], where “[ ]” shows a place holder.

7.4 Naming rule

7.4.1 Naming rule for PGRG_xxxxxxxx stream files of PROG_SET.MGR file

PGRG_00000001, ..., PGRG_N, where N is a decimal number coded by ISO/IEC 646 IRV containing a maximum of 8 digits.

7.4.2 Directory and naming rule for PROGxxxx.PIF files

TVPRO directories shall be placed in the RT_TVRS directory, which is the root directory of programme files defined in this specification. The naming rule of TVPRO directories is as follows.

- The number of letters of the TVPRO directory name is 8.
- The first five letters shall be “TVPRO” coded by ISO/IEC 646 IRV.
- The last three letters shall be the number from 100 to 999 coded by ISO/IEC 646 IRV. The number from 000 to 099 shall be reserved for future standardization.

PROG files, which are programme files defined in this specification, shall be placed in TVPRO directory. The naming rule of the PROG files is described as follows.

- The number of letters of the PROG file is 8.
- The number of letters of the suffix of PROG file name is 3.
- The first four letters shall be “PROG” coded by ISO/IEC 646 IRV.
- The last four letters shall be the number from 0001 to 9999 coded by ISO/IEC 646 IRV. The number from 0000 shall be reserved for future standardization.

The suffix of PROG file name shall be “PIF” coded by ISO/IEC 646 IRV.

Figure 7 shows an example of the naming.

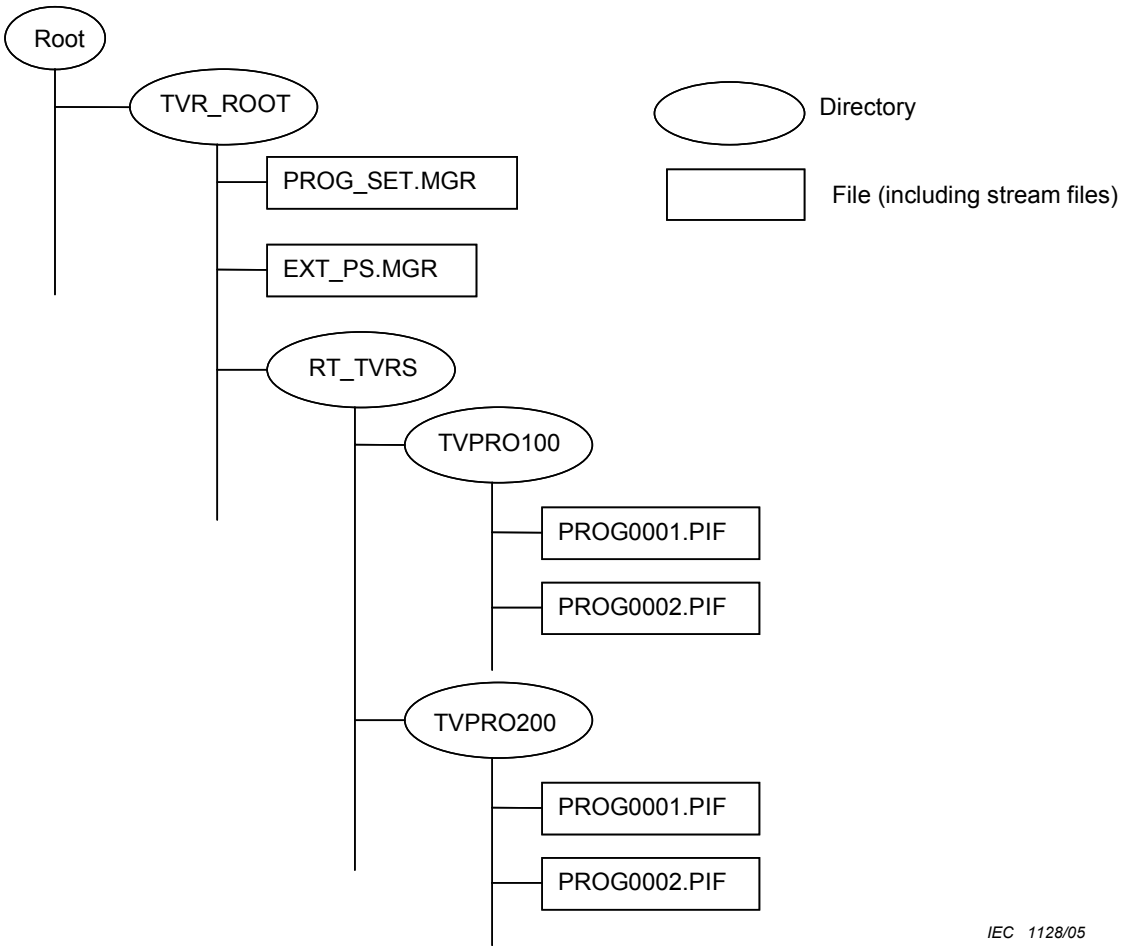


Figure 7 – Examples of files and directories

Annex A
(normative)

Main TS stream file structure and its allocation

A.1 Recording packet

The MPEG2 transport stream packet is composed of a 4-byte header and a 184-byte payload as shown in Figure A.1.

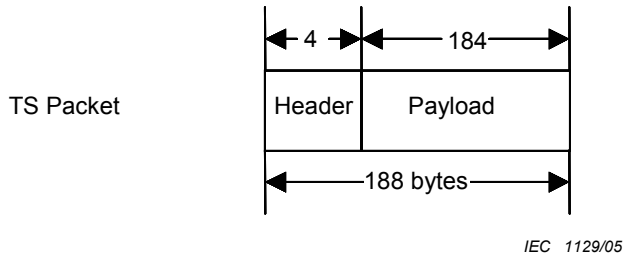


Figure A.1 – Transport stream packet

The recording packet is defined as a 4-byte RP header and a 188-byte TS packet as shown in Figure A.2. The structure of the RP header is defined in Clause A.3.

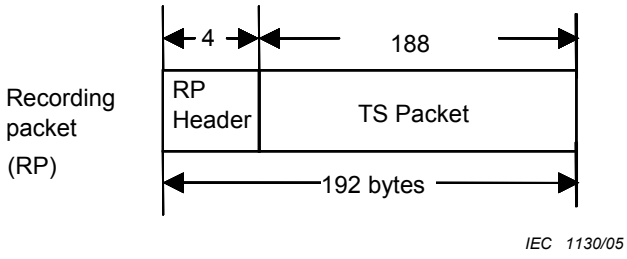


Figure A.2 – Recording packet

A.2 Aligned unit

The aligned unit is defined as 8 recording packets as shown in Figure A.3. It corresponds to 3 sectors if the physical sector size is 512 bytes such as MO or HDD.

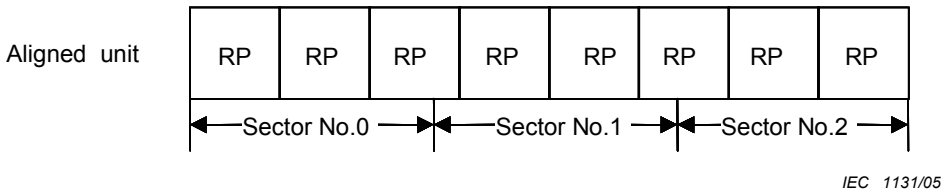


Figure A.3 – Aligned unit

The allocation unit is defined as a multiple of the aligned units shown in Figure A.4.

Figure A.4 – Allocation unit

A.3 Structure of RP header

A.3.1 TYPE1 RP header

The structure of TYPE1 RP header is shown in Figure A.5.

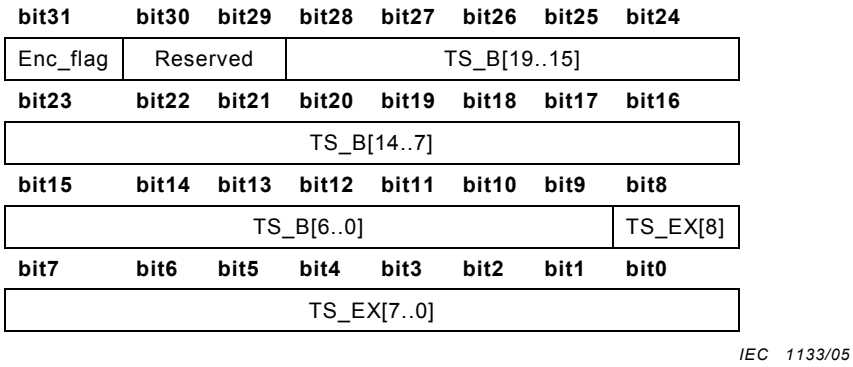


Figure A.5 – Structure of TYPE1 RP header

A.3.1.1 Enc_flag(bit31)[bslbf]

The Enc_flag indicates whether payload in the following TS packet is encrypted or not. If the following payload in the TS packet is encrypted, this bit shall be 1b. If the following payload in the TS packet is not encrypted, this bit shall be 0b. The value of this field is valid when the value of the cipher block chaining TYPE field of license information in PROGxxxx.PIF is 0x02 or 0x81. Otherwise, this field shall be ignored.

A.3.1.2 Reserved(bit30-29)[bslbf]

These bits are reserved for future use and shall be 0b.

A.3.1.3 TS_B(bit28-9)[uimsbf]

TS_B indicates the base timestamp of the TS packet. The arrival timestamp of the first byte of the TS packet measured by 90 000 Hz shall be recorded.

A.3.1.4 TS_EX(bit8-0)[uimsbf]

TS_EX indicates the extension timestamp of the TS packet. The arrival timestamp of the first byte of TS packet measured by 27 000 000 Hz shall be recorded.

A.3.2 TYPE2 RP header

The structure of TYPE2 RP header is shown in Figure A.6.

RBP	Length in bytes	Field name	Contents
0	4	TS	uimsbf

IEC 1134/05

Figure A.6 – Structure of TYPE2 RP header

A.3.2.1 TS

TS indicates the timestamp of the TS packet. The arrival timestamp of the first byte of the TS packet measured by 27 000 000 Hz shall be recorded.

Annex B
(informative)

Location notation example

Consider, for example, a programme Information file named “/TVR_ROOT/RT_TVRS/TVPRO100/PROG0101.PIF” and a location indication field named TS recorded location in the programme general information of that programme information file.

A stream name specified in this field by an absolute path would have the form “/TVR_ROOT/RT_TVRS/TVPRO100/PROG0101.PIF:MainTS”.

When specifying location by a relative path, the current directory would be “/TVR_ROOT/RT_TVRS/TVPRO100/” since this location information is recorded in “PROG0101.PIF”.

Specification of a stream name by a relative directory would therefore have the form “./PROG0101.PIF:MainTS.” In this case, the value of the valid length field would be 21.

NOTE The stream here is denoted not simply as MainTS but rather as PROG0101.PIF:MainTS in compliance with the rule specifying stream-specification format as [main file name]:[stream-name], where “[]” shows a place holder.

Annex C
(informative)

Relationship between pointer and stream

C.1 Start point on AV stream

When the pointer to TVRS partial TS points a certain frame of AV stream, the following points need to be considered.

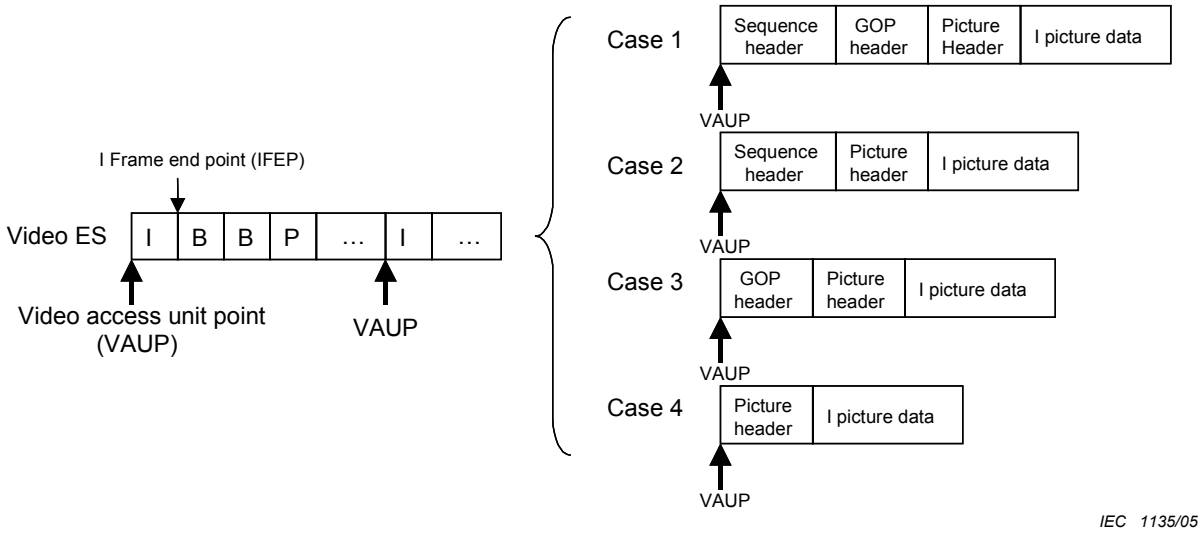
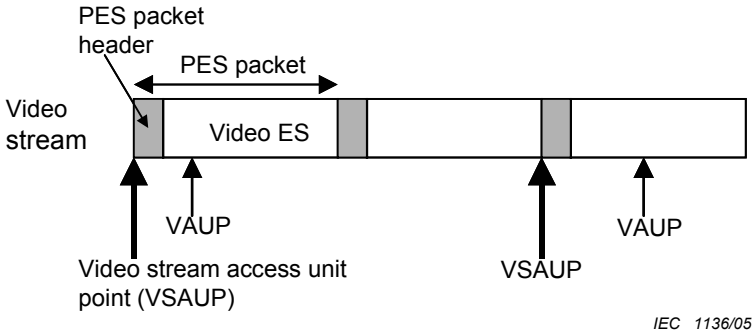


Figure C.1 – Access unit point of video ES

The start point for random access of video ES is defined as the video access unit point (VAUP) and shown in Figure C. 1. In the case of MPEG2, the first byte of I picture is treated as the VAUP. If the sequence header is prefixed to the I picture, the first byte of the sequence header is treated as the VAUP (Case1 or Case 2 in Figure C.1). If the only GOP header is prefixed to the I picture, the first byte of the GOP header is treated as the VAUP (Case 3). If the I picture has no sequence header and GOP header, the first byte of the picture header is treated as the VAUP (Case 4).



In the case of a video PES stream, the video stream access unit point (VSAUP) is defined as the first byte of the PES packet in which the VAUP is included.

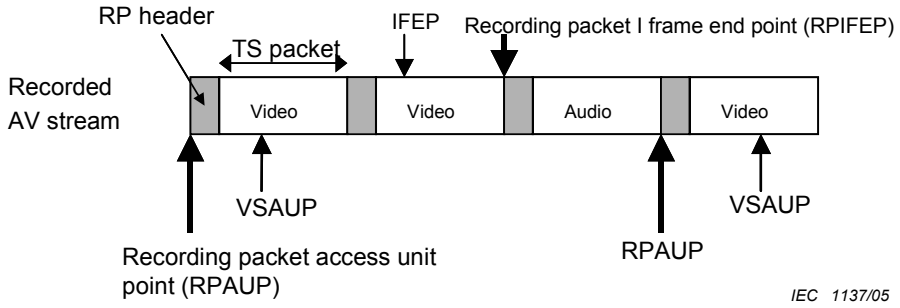


Figure C.2 – Access unit point of recording packet

In the case of the transport stream, the first byte of the TS packet in which VSAUP is included is treated as access unit point. In this specification, the recording packet, which is based on storage format, is defined as 4-byte RP header and 188-byte TS packet described in Annex A. In the case of a recording packet, the recording packet access unit point (RPAUP) is defined as the first byte of the RP packet in which VSAUP is included.

When the pointer to TVRS partial TS points random access point of video stream, RPAUP is the recommended point.

C.2 Start point on data stream

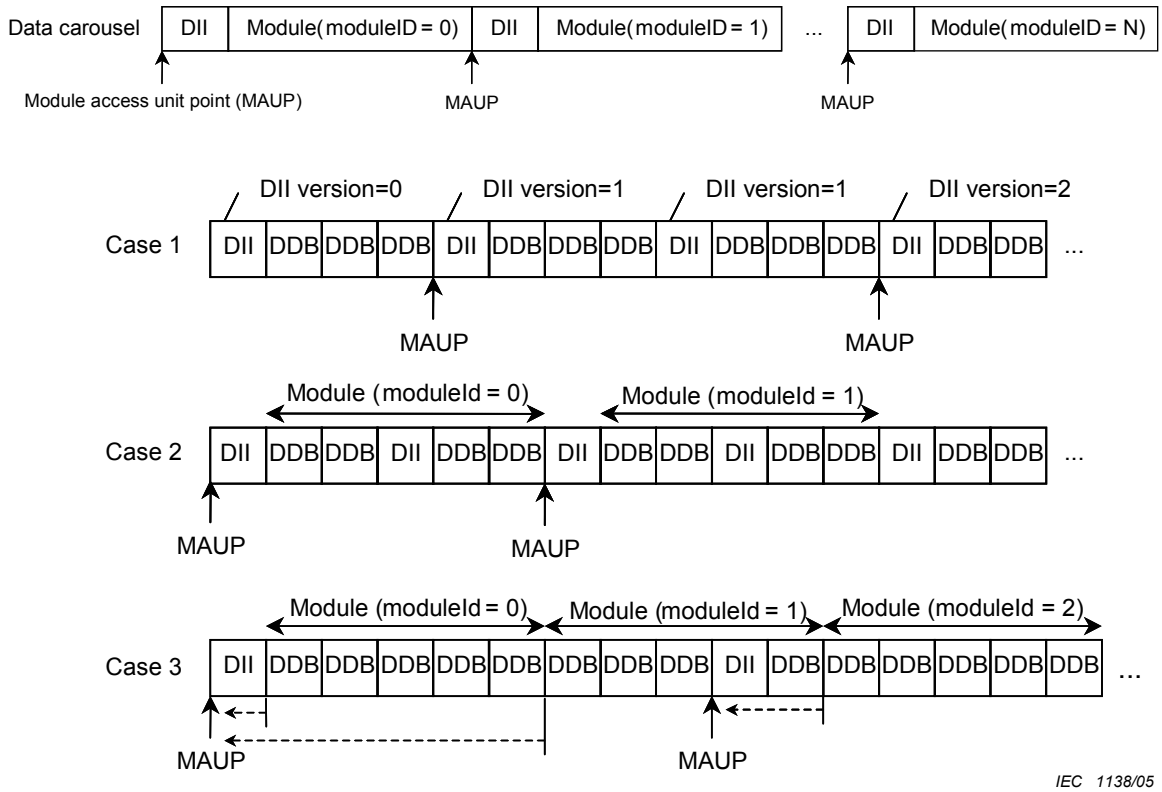


Figure C.3 – Module access unit point

The start point for random access of data carousel is defined as module access unit point (MAUP) and shown in Figure C.4. MAUP points the first byte of DII, which indicates a renewed module in data carousel. In detail, the following rules may be applied. The first case is that MAUP points the first byte of DII which is renewed transaction_id (DII version). Case 1 of Figure C.4 is the case. The second case is that MAUP points the first byte of DII, which is not renewed transaction_id (DII version) and is placed immediately before a module. Cases 2 and 3 of Figure C. 4 is the case.

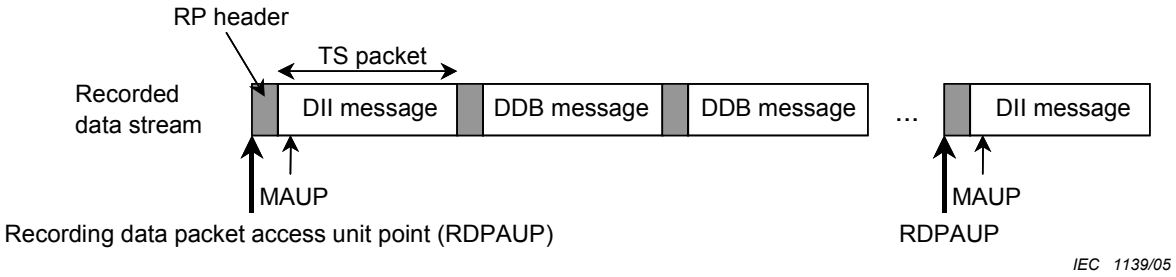


Figure C.4 – Recording data packet access unit point

In the case of the transport stream, the first byte of the TS packet in which MAUP is included is treated as the access unit point. In this specification, the recording packet, which is based on storage format, is defined as 4-byte RP header and 188-byte TS packet described in Annex A. In the case of the recording packet, the recording data packet access unit point (RDPAUP) is defined as the first byte of the RP packet in which MAUP is included.

When the pointer to TVRS partial TS points random access point of data stream, RDPAUP is the recommended point.

C.3 Referred length on AV stream

In the case of video ES, the meaningful referred length is the following two cases. One is that only I frame is referred. In Figure C.1, the length from VAUP to IFEP corresponds to the referred length. The other is that the set of frames are referred. The length from one VAUP to another VAUP corresponds to the referred length.

In the case of the RP packet, the meaningful referred length is the following two cases. One is that only I frame is referred. In Figure C.3, the length or the number of packets from RPAUP to RPIFEP corresponds to the referred length. The other is that the set of frames are referred. The length or the number of packets from one RPAUP to another RPAUP corresponds to the referred length.

C.4 Mark representation

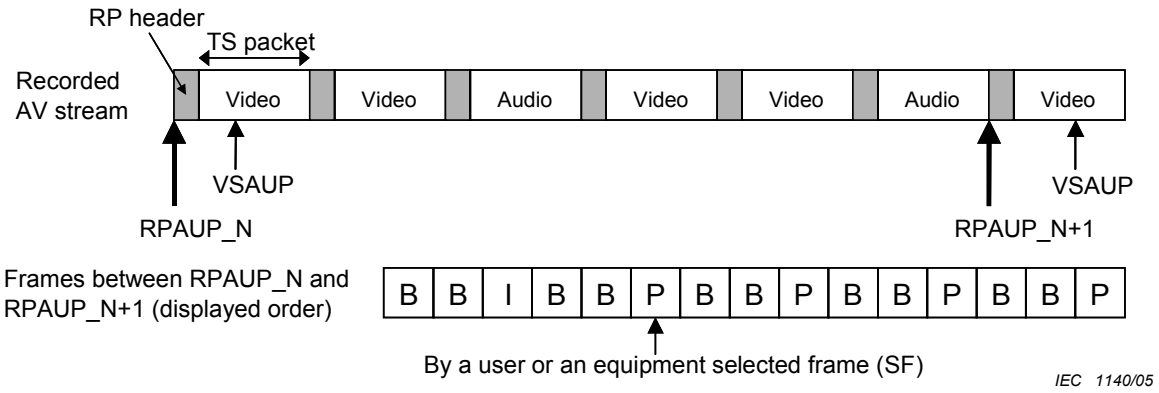


Figure C.5 – Relationship between mark point and AV stream

The relationship between mark point by a user or equipment is described in Figure C.6. The structure of the AV stream between RPAUP_N and RPAUP_N+1, which are access unit points, and the displayed order of frames between RPAUP_N and RPAUP_N+1 are described. When a user or equipment marks a certain frame, the corresponding access unit point and the offset time (timestamp or the number of frames) are stored. The offset time shall be counted by displayed order of the selected GOP. If the offset time is counted by timestamp, the timestamp of the first displayed frame shall be 0. If the number of frames is used, the value of the first displayed frame shall be 0. In Figure C.6, the corresponding access unit point is RPAUP_N and the offset time, in this case the number of frames selected, is 5.

Annex D
(informative)

Example of an external thumbnail file structure

D.1 Overview of external thumbnail file structure

The example of an external thumbnail file structure is described here. Plural thumbnails can be stored. The structure is described in Figure D.1.

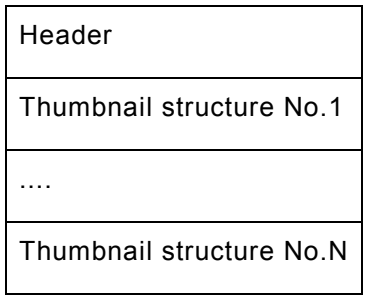


Figure D.1 – External thumbnail file structure

D.2 Structure of header

The structure of the header is described in Table D.1.

Table D.1 – Structure of header

RBP	Length in bytes	Field name	Contents
0	4	Thumbnail file identifier	bslbf
4	1	Thumbnail file version	VER
5	1	Flag	ETFL
6	4	Length of block size	uimsbf
10	4	Number of thumbnail structure	uimsbf
14	4	Number of valid thumbnail structure	uimsbf

D.2.1 Thumbnail file identifier

The words “TNFL” coded by ISO/IEC 646 IRV shall be described.

D.2.2 Thumbnail file version

This field shall be 0x10. This means that the programme structure is Version 1.0.

D.2.3 Flag

The structure of ETFL is described in Table D.2.

Table D.2 – Structure of ETFL

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Reserved							VB/C

D.2.3.1 Reserved(bit7-1)

These bits are reserved for future use and shall be 0b.

D.2.3.2 VB/C(bit0)

If the length of each thumbnail structure is the same, which means the structure length is constant, the VB/C bit shall be set to 0. If the length of each thumbnail structure is a multiple of block size, which defined in length the block size field, the BV/C bit shall be set to 1b.

D.2.4 Length of block size

If the V/C bit is 1b, the length of the block size shall be stored. If the V/C bit is 0b, the length of the thumbnail structure shall be stored.

D.2.5 Number of thumbnail structure

The number of the thumbnail structure following the header shall be stored.

D.2.6 Number of valid thumbnail structure

The number of the valid thumbnail structure following the header shall be stored. The thumbnail structure, the value of the link count field which is not equal to 0, is defined as the valid thumbnail structure.

D.3 Thumbnail structure

Table D.3 – Structure of thumbnail

RBP	Length in bytes	Field name	Contents
0	1	Link count	uimsbf
1	1	Data format	FMT
2	6	Reserved for RMP	bslbf
8	4	Thumbnail data field length (= a)	uimsbf
12	4	Thumbnail data length	uimsbf
16	a	Thumbnail data	bslbf

D.3.1 Link count

The number of the link count from the generic thumbnail structure shall be stored.

D.3.2 Data format

Table D.4 – Structure of FMT

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
ENC	BK	Reserved			DataType[2..0]		

D.3.2.1 ENC(bit7)[bslbf]

If the thumbnail data is encrypted, this bit shall be set to 1b. If the thumbnail data is NOT encrypted, this bit shall be set to 0b.

D.3.2.2 BK(bit6)[bslbf]

If the thumbnail data is broken, this bit shall be set to 1b. Otherwise, this bit shall be set to 0b.

D.3.2.3 Reserved(bit5-3)

These bits are reserved for future use and shall be 0b.

D.3.2.4 DataType(bit2-0)[uimsbf]

The interpretation of DataType is described in Table D.5.

Table D.5 – DataType interpretation

DataType	Interpretation
0x0	DataType is not specified in this field
0x1	ISO/IEC 10918-1(JPEG)
0x2	MPEG2-I (video ES prefixed by sequence header)
0x3 - 0x7	Reserved

D.3.3 Reserved for RMP

This field shall be reserved for future standardization and all bytes shall be set to 0x00.

D.3.4 Thumbnail data field length

The length of the thumbnail data field shall be stored.

D.3.5 Thumbnail data length

The length of the thumbnail data in the thumbnail data field shall be stored. The value may correspond to that of the thumbnail data field length.

D.3.6 Thumbnail data

The contents depend on the data format.

Bibliography

The following documents have served as references in the preparation of this standard.

Universal Disk Format (UDF) Specification, Revision 2.01, OSTA, 2000-03
<http://www.osta.org/specs/pdf/udf201.pdf>

Secure UDF Specification, Revision 1.00, OSTA, 2002-2
<http://www.osta.org/specs/pdf/SecureUDF_1_00.pdf>

JIS/TR X 0040:2001 Security Extension to Universal Disk Format (UDF)

Federal Information Processing Standards Publication 197, Advanced Encryption Standard (AES) <http://www.itl.nist.gov/fipspubs/>

Federal Information Processing Standards Publication 46-3, Data Encryption Standard (DES) <http://www.itl.nist.gov/fipspubs/>

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