

Confidential Information



Enhanced Music CD

Specification

Version 0.9

Tentative

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SONY

PHILIPS

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I. General**I.1 Scope**

This document gives the specification for Enhanced Music CD discs. The first Session of an Enhanced Music CD disc contains audio information according to the Red Book. As a consequence, existing CD Audio players can playback this first Session as a CD Audio disc. The second Session contains data files with content related to the Audio Tracks in the first Session. The data files in general will contain items like disc and track titles, lyrics, and background information on the music. Both textual information and, MPEG and JPEG coded, pictures can be stored in the second Session. The second Session will only be used by computer systems equipped with a CD ROM drive, or by special "Enhanced Music CD players".

In this document the description and the format for the data files and the directory structure required for every Enhanced Music CD disc is given.

I.2 Conformance

The Enhanced Music CD Specification conforms to the mandatory requirements specified in this document. All parts in this document are mandatory unless they are specially defined as recommended or optional or informative.

Enhanced Music CD also conforms to the applicable parts of the system descriptions or international standards that are listed below:

- CD Audio: Compact Disc Digital Audio, specified in the System Description Compact Disc Digital Audio ("Red Book"), N.V. Philips and Sony Corporation.
- CD-ROM: Compact Disc Read Only Memory, specified in the System Description Compact Disc Read Only Memory ("Yellow Book"), N.V. Philips and Sony Corporation.
- CD-WO: Compact Disc Write Once, specified in the System Description Recordable Compact Disc Systems Part II, Version 2.0 ("Orange Book"), N.V. Philips and Sony Corporation.
- Multisession Compact Disc, specified in the Multisession Compact Disc Specification, N.V. Philips and Sony Corporation.
- CD-ROM XA: Compact Disc Read Only Memory eXtended Architecture, specified in the System Description CD-ROM XA, N.V. Philips and Sony Corporation.
- ISO 646: Information processing - ISO 7-bit coded character set for information interchange. Ref. No. ISO 646 : 1983 (E).
- ISO 2022: Information processing - ISO 7-bit and 8-bit coded character sets - coded extension techniques. Ref. No. ISO 2022 : 1986 (E).
- ISO 3166: Codes for the representation of names of countries. Ref. No. ISO 3166 : 1988 (E/F).
- ISO 8859-1: Information processing - ISO 8-bit single byte coded graphic character sets. Part I: Latin alphabet No. 1. Ref. No. ISO 8859-1 : 1987 (E).
- ISO 9660: Information processing - volume and file structure of CD-ROM for information interchange. Ref. No. ISO 9660 : 1988 (E).
- ISO 10918: Information technology - Digital compression and coding of continuous-tone still images ("JPEG standard"). Ref. No. ISO IS 10918 : 1992 (E).
- ISO 11172: Information technology - Coding of moving pictures and associated audio for digital storage media up to about 1,5 Mbit/s ("MPEG-1 standard"). Ref. No. ISO 11172 : 1993 (E).
- General MIDI Specification: Musical Instrument Digital Interface (MIDI) File Format. Specified by the International MIDI Association (IMA).

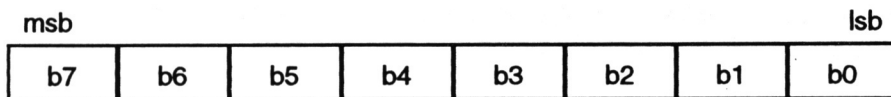
I.3 Conventions

Unless otherwise indicated, in this document the conventions used are as follows:

Bit ordering

The graphical representation of all multiple-bit quantities is such that the most significant bit (msb) is on the left and the least significant bit is on the right.

Figure I.1 Example of bit ordering for one 8 bits byte



The most significant bit is the bit with the highest bit position number.

Bit designation

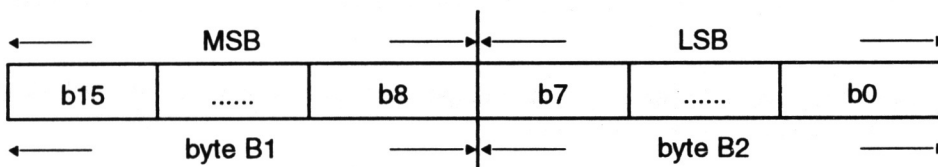
Bit#i denotes the bit with bit position i, according to Figure I.1.

Byte ordering

Quantities which require more than 8 bits for their representation are held in more than one byte on the disc. For all such quantities, the ordering of bytes on the disc is such that the Most Significant Byte (MSB) is first and the Least Significant Byte (LSB) is last.

Multiple-byte quantities are represented graphically such that the left-hand-most or upper-most byte is most significant and the right-hand-most or lower-most byte is least significant.

Figure I.2 Example of byte ordering for 2 bytes



The most significant byte is the byte with the lowest byte position number.

Byte designation

Byte#i denotes the byte with byte position i, according to Figure I.2.

Strings

Strings are always given between double quotation marks, p.e. "_____".

Hex

All Hexadecimal values are preceded by a \$. The most significant nibble is on the left, the least significant nibble is on the right.

Binary

All Binary values are preceded by a %. The most significant bit is on the left, the least significant bit is on the right. A Binary value is represented by a 0, 1 or x where x is a 0 or a 1.

Decimal

All Decimal values are preceded by a blank space or the range indicator (..) when included in a range. The most significant digit is on the left, the least significant digit is on the right.

Units of measure

1K denotes 1024 units. 1k denotes 1000 units.

Range

Constant_1..Constant_2 or (Constant_1..Constant_2) denotes the range from and including Constant_1 up to and including Constant_2, in increments of 1.

Ordering within tables

The items within a table are contiguous, starting with the top line from the left to the right item, then the next line from the left to the right item, and so on, down to and including the bottom line from the left to the right item.

Multiplication

Multiplication of two values is denoted by a *.

Sector

Wherever the word "Sector" is used in this document it has the identical meaning as the word "Block" in the CD-ROM system description.

Sector, Subcode address

All Sector addresses and Subcode time codes are represented in the form mm:ss:ff. The Minutes field is represented by "mm", the Seconds field is represented by "ss", the Blocks (Sector) or Frames (Subcode) field is represented by "ff".

I.4 Definitions

Session	An area on a disc consisting of a Lead-In Area followed by a Program Area and a Lead-Out Area is called a Session.
Single Session disc	If a disc contains one Session, this disc is called a Single Session disc.
Multisession disc	If a disc contains more than one Session, this disc is called a Multisession disc.
Track	A Track is a contiguous area on the disc with one and the same Track Number.
Audio Track	An Audio Track ¹ is a Track that contains CD Audio information according to the Red Book.
Data Track	A Data Track is a Track that contains Sectorized data according to the Yellow Book.
CD-ROM XA Track	A CD-ROM XA Track is a Data Track that contains Sectors in the Mode 2 Form 1 and/or 2 format according to the CD-ROM XA specification.
Data Session	A Data Session is a Session of which the first Track in the Program Area is a Data Track.
CD-ROM XA Session	A CD-ROM XA Session is a Session of which the first Track in the Program Area is a CD-ROM XA Track.
Audio Session	An Audio Session is a Session of which all Tracks in the Program Area are Audio Tracks.
MSF format	The Sector Address and Subcode-Q Channel time codes are encoded in the MSF format. The MSF format is a 6 digit BCD encoded number, the first (most significant) two digits contain the Minutes fraction, the next two digits contain the Seconds fraction and the last (least significant) two digits contain the Frames fraction of the Subcode time code or the Sector Address.
Relative Sector Address	The Relative Sector Address of a Sector is equal to the Sector Address minus the TOC value of the first Track of the Session in which the Sector is located.

¹ An Enhanced Music CD disc can contain maximum 98 Audio Tracks in the first Session. The total number of Tracks in the two Sessions equals 99.

Registration Office

The Registration Office for the Genre Code (see chapter III.3.2.5.3.6) and for the Vendor_ID (see chapter III.6) is:

Recording Industry Association of America (RIAA)

1020 Nineteenth St., N.W., Ste. 200

Washington, D.C. 20036

USA

Attn: CD-Plus Registry

Fax.: +1 202 775 7253

II. Disc specification and data format

The mechanical and physical properties and the data format of an Enhanced Music CD disc are according to the Multisession Compact Disc specification. An Enhanced Music CD disc can be a read-only disc or a CD-R disc.

An Enhanced Music CD disc is a Multisession disc with two Sessions. The first Session is an Audio Session, the second Session is a CD-ROM XA Session.

II.1 Logical Addressing

Logical Sector Addresses on an Enhanced Music CD disc are calculated in the same way as is defined in the Multisession CD Specification, this means that the following formula is used:

$$\text{LSA} = 4500 * \text{PSA}[\text{mm}] + 75 * \text{PSA}[\text{ss}] + \text{PSA}[\text{ff}] - 150$$

In which:

LSA = Logical Sector Address.

PSA = Physical Sector Address in mm:ss:ff. The PSA of a Sector is the header address of this Sector.

PSA[mm] = mm fraction of the Physical Sector Address.

PSA[ss] = ss fraction of the Physical Sector Address.

PSA[ff] = ff fraction of the Physical Sector Address.

This formula means that an Enhanced Music CD disc has one address space that starts at zero at the beginning of the disc.

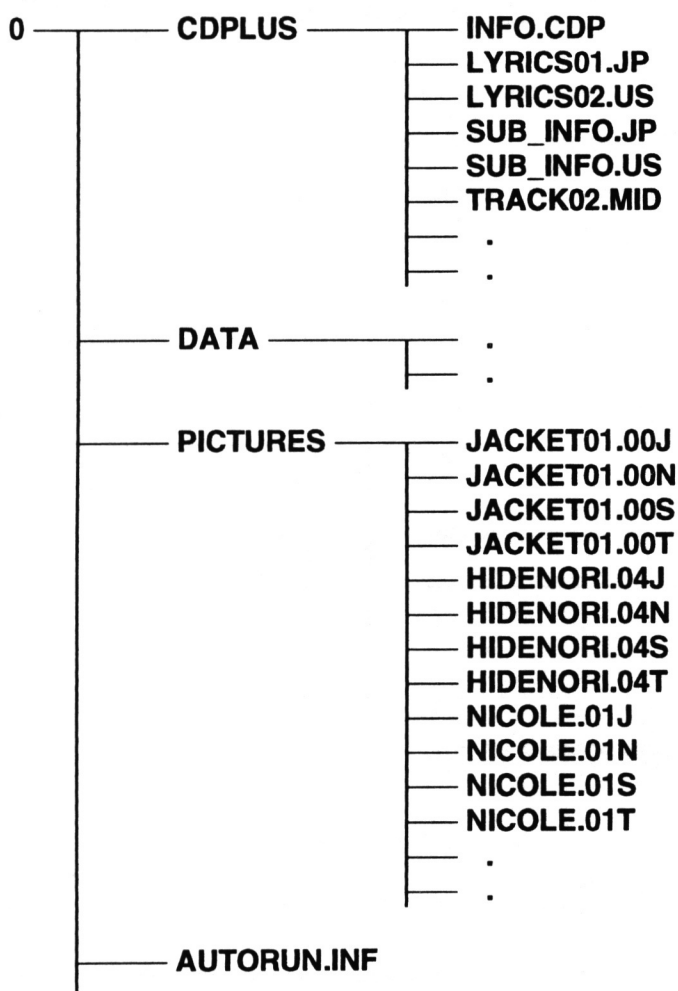
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III. Directory Structure

The second Session of an Enhanced Music CD disc contains the ISO 9660 file system according to the CD-ROM XA specification. Sector 16 of the second Session contains the Primary Volume Descriptor of the disc. The address of Sector 16 of a Session is obtained by adding 00:00:16 to the TOC value of the first Track in the Program Area of this Session.

The required directories for an Enhanced Music CD disc are: Root directory 0, "CDPLUS" and "PICTURES". Other files and directories may exist outside the required Enhanced Music CD directory structure. Figure III.1 gives an example of the file structure for an Enhanced Music CD disc. Additional files can exist within the directories shown. The version number of all files must be "1", in this document the file version numbers are not shown.

Figure III.1 Example of the directory structure



III.1 Primary Volume Descriptor (PVD)

The PVD is fully according to the CD-ROM XA Specification.

If and only if a CD-I Application Program is available on the disc, then the System Identifier field of the PVD contains "CD-RTOS CD-BRIDGE" padded with space characters, and the Application Identifier field of the PVD must contain the Path Name of CD-I Application Program.

III.2 Root Directory 0

This is the Root directory of the disc. It may contain further directories or files in addition to those shown in Figure III.1.

III.3 CDPLUS Directory

The CDPLUS directory is a required sub-directory of the Root and has the reserved name "CDPLUS". The required files in the CDPLUS directory are: INFO.CDP and minimal one of the files SUB_INFO.cc (see chapter III.3.2).

III.3.1 INFO.CDP file

The required file INFO.CDP is located in the CDPLUS directory and has the reserved name "INFO.CDP". INFO.CDP contains among others, the Enhanced Music CD system identification, the Album Identification and pointers to the SUB_INFO.cc files.

INFO.CDP has a fixed size of one Sector and is located at Sector 75 of the second Session. The address of Sector 75 of a Session is obtained by adding 00:01:00 to the TOC value of the first Track in the Program Area of this Session. The detailed layout of INFO.CDP is given in Figure III.2.

Figure III.2 Layout of INFO.CDP

Byte position	Size (Bytes)	Field name	Content
1 to 8	8	System Identifier	"CD_PLUS "
9 to 12	4	Specification Version Number	"0090"
13 to 28	16	Album Identification	ISO 646 characters
29 to 30	2	Number of Volumes in Album	numerical value
31 to 32	2	Album Set Sequence Number	numerical value
33	1	Number of Countries	numerical value = P
34 to 48	15	Reserved	\$00
49 to 58	10	CC_Group 1	
..	
49+(P-1)*10 to 58+(P-1)*10	10	CC_Group P	
59+(P-1)*10 to 2048	2000- 10*P	Reserved	\$00

III.3.1.1 System Identification

This field contains "CD_PLUS", followed by a space character, coded in ISO 646.

III.3.1.2 Specification Version Number

This field contains the version number of the Enhanced Music CD specification used for the disc, encoded with digits from the ISO 646 character set. The first two digits contain the Major Version Number, the last two digits contain the Minor Version Number.

For discs according to this Enhanced Music CD Version 0.9 specification, the Major Version Number is "00" and the Minor Version Number is "90".

III.3.1.3 Album Identification

This ISO 646 encoded string contains the Album Identification as defined by the publisher. It is recommended to encode the Universal Product Code (UPC) of the International Article Numbering Association EAN in this field, encoded in ISO 646 and padded at the end with space characters.

III.3.1.4 Number of Volumes in Album

This two byte binary coded number specifies the total number of discs (Volumes) in an Album. An Album is a set of discs.

III.3.1.5 Album Set Sequence Number

This two byte binary coded number specifies the ordinal number of the Volume in the Album.

III.3.1.6 Number of Countries

This one byte binary coded number specifies number of CC_Groups in INFO.CDP. The maximum value of Number of Countries is 200, the minimum value is 1.

III.3.1.7 Reserved

All bytes in these fields have the value \$00 and are reserved for future standardization.

III.3.1.8 CC_Group P

This ten byte field contains the Country Code, the location and the size of a SUB_INFO.cc file. CC_Group P is defined in Figure III.3.

Figure III.3 Layout of a CC_Group in INFO.CDP

Byte position	Size (Bytes)	Field name	Content
N to N+1	2	Country Code	ISO 3166 Country Code, ISO 646 characters
N+2 to N+5	4	Location of SUB_INFO.cc file	Relative Sector Address
N+6 to N+9	4	Size of SUB_INFO.cc file	Binary Number

III.3.1.8.1 Country Code of SUB_INFO.cc file

This two byte string contains the ISO 3166 Alpha-2 Country Code for the SUB_INFO.cc file referenced from this CC_Group, encoded in capitals from the ISO 646 character set. The value of this string is equal to the file name extension cc of the referenced SUB_INFO.cc file. Each Country Code can appear maximum one time in INFO.CDP.

Examples of valid Country Codes are:

US	USA
JP	Japan
NL	Netherlands

III.3.1.8.2 Location of SUB_INFO.cc file

This four byte binary number contains the Relative Sector Address of the SUB_INFO.cc file that is referenced from this CC_Group.

III.3.1.8.3 Size of SUB_INFO.cc file

This four byte binary number contains the size in bytes of the SUB_INFO.cc file that is referenced from this CC_Group.

III.3.2 SUB_INFO.cc file

A SUB_INFO.cc file is a variable length data structure that contains supplemental information for the disc and for the Audio Tracks on the discs.

The files SUB_INFO.cc are located in the CDPLUS directory and have the reserved name "SUB_INFO.cc". The Country Code cc is encoded as a string with a fixed length of two characters. The Country Code is the Alpha-2 code as is defined in ISO 3166, encoded in capitals from the ISO 646 character set. The detailed layout of SUB_INFO.cc is given in Figure III.4.

Figure III.4 Layout of SUB_INFO.cc

Byte position	Size (Bytes)	Field name	Content
1 to 8	8	File Identifier	"SUB_INFO"
9 to 12	4	Specification Version Number	"0090"
13 to 44	32	Escape Sequences	String
45 to 46	2	Number of Info Packets	Numerical value = P
47 to ..		Info Packet 1	
.. to ..		Info Packet P	

III.3.2.1 File Identifier

This field contains "SUB_INFO" coded in ISO 646.

III.3.2.2 Specification Version Number

This field contains the version number of the Enhanced Music CD specification used for the disc, encoded with digits from the ISO 646 character set. The content of this field is identical to the contents of the Specification Version Number field in INFO.CDP.

III.3.2.3 Escape Sequences

This field specifies one or more escape sequences according to ISO 2022. The Escape Sequences designate the G0 and optionally the G1, G2 and G3 graphic character set to be used in an 8-bit environment according to ISO 2022. The Escape Sequences are used to interpret the character Strings contained in the Info_Packets.

These escape sequences conform to ISO 2022, except that the ESCAPE character is omitted from each escape sequence when recorded in this field. The first or only escape sequence begins at the first byte of the field. Each successive escape sequence begins at the byte in the field immediately following the last byte of the preceding escape sequence. Any unused byte positions following the last escape sequence must be set to \$00.

A special escape sequence is used for Shifted JIS Kanji, JIS Roman and JIS Katakana. The special Escape Sequence is:

<ESC>%S (= \$1B, \$25, \$53) : Shifted JIS Kanji with JIS Roman[14] and JIS Katakana[13].
Numbers in between square brackets ([and]) are the ISO 2022 registration numbers.

If the <ESC>%S escape sequence is used, then it is not allowed to use other escape sequences for columns 8 to 15 of the code table (the C1 and GR).

If all bytes in the field are set to \$00, ISO 646 is used to interpret the text Strings in the Info_Packets.

III.3.2.4 Number of Info_Packets

This two byte binary number contains the total number of Info_Packets contained in this file. The value zero is not allowed for the Number of Info_Packets field.

III.3.2.5 Info_Packet P

The layout of an Info_Packet is given in Figure III.5. Info_Packets are grouped in Info_Packet Groups. An Info_Packet Group starts with a Track Identifier Packet, followed by other Info_Packets that refer to the same Audio Track. The Info_Packet Groups must be stored in ascending order of the Track Identifier. There can be maximum one Info_Packet Group per Audio Track. The Info_Packet Group with Track Identifier "00" being the first Info_Packet Group in the file, refers to the whole disc. Each Info_Packet is contained in an even number of bytes.

The first picture (see chapter III.3.2.5.3.5) in Info_Packet Group 0 must be JACKET01, if the JACKET02 picture is available then it must be the second picture in Info_Packet Group 0.

Figure III.5 Layout of Info_Packet P

Byte position	Size (Bytes)	Field name	Content
N	1	Info_Packet ID	Numerical value
N+1	1	Info_Packet Data Length	Numerical value = M
N+2 to N+M+1	M	Info_Packet Data	
N+M+2	0 or 1	Padding	\$00

III.3.2.5.1 Info_Packet ID

The definition of the Info_Packet Header byte is given in Figure III.6. Within an Info_Packet Group, the Info_Packets are stored in ascending order of the Info_Packet Header byte.

Figure III.6 Info_Packet ID definition

Info_Packet ID	Description	Content of Info_Packet Data
\$00	Reserved	
\$01	Track Identifier	Two character String containing the Track Number. "00": whole disc; "01": Track 1; "nn": Track nn
\$02	Album Title	String
\$03	UPC	String
\$04	ISBN	String
\$05	Copyright	String
\$06	Title	String
\$07	Notes	String
\$08	Principal Artist	String
\$09	Secondary Artist	String
\$0A	Composer	String
\$0B	Original Composer	String
\$0C	Creation Date	Date_String, "yyyymmdd"
\$0D	Publishing Date	Date_String, "yyyymmdd"
\$0E	Publisher	String
\$0F	ISRC	String
\$10 to \$1F	Reserved	
\$20	Intro lyrics	String
\$21	Lyrics	Relative Sector Address & Size
\$22 to \$2F	Reserved	
\$30	Still Picture	Picture_Packet Data
\$31 to \$3F	Reserved	
\$40	MIDI data file	Relative Sector Address & Size
\$41	Genre Code Group	Maximum four Genre Codes, 2 byte binary number each
\$42	Tempo	1 Byte binary number. Tempo in beats per minute. 0=undefined.
\$43	Key	Key_Code, 1 byte binary number.
\$44 to \$FF	Reserved	

III.3.2.5.2 Info_Packet Data Length

This one byte binary number contains the length in bytes of the Info_Packet Data field. If the Info_Packet Data Length is equal to 255, then the next Info_Packet is a Continuation Packet. A Continuation Packet has the same Info_Packet ID as the preceding Info_Packet. Zero Info_Packet Data Length is allowed. It is recommended to use zero length Info_Packets only in case of termination of continued Info_Packets with a total length being a multiple of 255.

III.3.2.5.3 Info_Packet Data**III.3.2.5.3.1 Track Identifier**

The Info_Packet Data field, of the Info_Packets with the description "Track Identifier" in Figure III.6, contains a character String with the Track Number of an Audio Track, encoded in ISO 646 as a 2 digit decimal number with leading zero. Track Identifier "00" means that the Info_Packets in this Info_Packet Group refer to the whole disc.

III.3.2.5.3.2 String

The Info_Packet Data field of the Info_Packets that are labelled "String" in Figure III.6, contain a character String with a maximum length of 255 characters. Zero length Strings are allowed. A line break is identified by character \$0D.

III.3.2.5.3.3 Date_String

The Info_Packet Data field of the Info_Packets that are labelled "Date_String" in Figure III.6, contain a character String with a maximum length of 255 characters. Zero length Strings are allowed. A line break is identified by character \$0D. The first eight characters of the String contain a date value encoded as "yyyymmdd", in which "yyyy" contains the year encoded as a four digit number, "nn" contains the month encoded as a 2 digit number with leading zero, and "dd" contains the day encoded as a 2 digit number with leading zero.

III.3.2.5.3.4 Relative Sector Address & Size

The layout of the Info_Packet Data field of the Info_Packets that are labelled "Relative Sector Address & Size" in Figure III.6, is defined in Figure III.7.

Figure III.7 Sector Address & Size Data field

Byte position	Size (Bytes)	Field name	Content
N+2	4	Relative Sector Address	Binary number
N+6	4	File size in Bytes	Binary number

Relative Sector Address

This four byte binary number gives the Relative Sector Address of the first Sector of the file that contains the corresponding picture.

File Size in Bytes

This four byte binary number gives the length in bytes of the file that contains the corresponding picture.

III.3.2.5.3.5 Picture_Packet Data

The layout of the Info_Packet Data field of the Info_Packets that are labelled "Picture_Packet Data" in Figure III.6, is defined in Figure III.8.

In one Picture_Packet Data field, one picture in four different versions is referenced. The four different versions are: one Small, one Normal and one Large size MPEG-1 picture (NTSC or PAL), and one JPEG picture. For the definition of the picture formats, see chapter III.4.

Figure III.8 Picture_Packet Data field

Byte position	Size (Bytes)	Field name	Content
N+2	1	Picture Format & Size 1	
N+3	1	Reserved	\$00
N+4	4	Relative Sector Address 1	Binary number
N+5	4	File size in Bytes 1	Binary number
N+6	1	Picture Format & Size 2	
N+7	1	Reserved	\$00
N+8	4	Relative Sector Address 2	Binary number
N+9	4	File size in Bytes 2	Binary number
N+10	1	Picture Format & Size 3	
N+11	1	Reserved	\$00
N+12	4	Relative Sector Address 3	Binary number
N+13	4	File size in Bytes 3	Binary number
N+14	1	Picture Format & Size 4	
N+15	1	Reserved	\$00
N+16	4	Relative Sector Address 4	Binary number
N+17	4	File size in Bytes 4	Binary number

Picture Format & Size Q

This one byte binary encoded number specifies the format and/or the size of the picture referenced in this Data field. The values of this field are defined in Figure III.9.

Figure III.9 Picture Format & Size definition

Value	Definition
0	Variable size, JPEG
1	Small NTSC, 176x112 (HxV), MPEG-1
2	Normal NTSC, 352x240 (HxV), MPEG-1
3	Large NTSC, 704x480 (HxV), MPEG-1
4	Small PAL, 176x144 (HxV), MPEG-1
5	Normal PAL, 352x288 (HxV), MPEG-1
6	Large PAL, 704x576 (HxV), MPEG-1
7..255	Reserved

Relative Sector Address Q

This four byte binary number gives the Relative Sector Address of the first Sector of the file that contains the corresponding picture.

File Size in Bytes Q

This four byte binary number gives the length of the file that contains the corresponding picture. MPEG pictures are stored in Form-2 Sectors, for this reason the encoded length of an MPEG picture is equal to 2048*(Number of Sectors used by the file). JPEG pictures are stored in Form-1 Sectors, the encoded length of a JPEG picture is equal to the actual number of bytes used by the picture file.

III.3.2.5.3.6 Genre Code

The Genre Code Group consists of maximum four Genre Codes, each Genre Code being a 2 byte binary number. The Genre Codes are defined in Figure III.10, Genre Codes 0..32767 are defined in this document, Genre Codes 32768..65535 must be registered at RIAA (see chapter I.4).

Figure III.10 Genre Code definition

Genre Code	Meaning
0	Not used
1	Not defined
2	Adult Contemporary
3	Alternative Rock
4	Childrens Music
5	Classical
6	Contemporary Christian
7	Country
8	Dance
9	Easy Listening
10	Erotic
11	Folk
12	Gospel
13	Hip Hop
14	Jazz
15	Latin
16	Musical
17	New Age
18	Opera
19	Operetta
20	Pop Music
21	RAP
22	Reggae
23	Rock Music
24	Rhythm & Blues
25	Sound Effects
26	Sound Track
27	Spoken Word
28	World Music
29..32767	Reserved
32768..65535	Registration by RIAA

III.3.2.5.3.7 Key_Code

The Key_Code is a one byte binary number that defines the main key used for the Audio Track. Figure III.11 gives the definition of the Key_Codes.

Figure III.11 Key_Code definition

Key_Code	Definition
0	Undefined
1	C major
2	G major (1 #)
3	D major (2 #)
4	A major (3 #)
5	E major (4 #)
6	B major (5 #)
7	F# major (6 #)
8	F major (1 b)
9	Bb major (2 b)
10	Eb major (3 b)
11	Ab major (4 b)
12	Db major (5 b)
13	Gb major (6 b)
14..32	Reserved
33	A minor
34	E minor (1 #)
35	B minor (2 #)
36	F# minor (3 #)
37	C# minor (4 #)
38	G# minor (5 #)
39	D# minor (6 #)
40	D minor (1 b)
41	G minor (2 b)
42	C minor (3 b)
43	F minor (4 b)
44	Bb minor (5 b)
45	Eb minor (6 b)
46..255	Reserved

III.3.2.5.4 Padding

The Padding field is only used if the Info_Packet Data Length M is an odd number. This optional one byte field is set to \$00.

III.3.3 LYRICSnn.cc file

The files LYRICSnn.cc are located in the CDPLUS directory and have the reserved name "LYRICSnn.cc". Each file with lyrics text for Audio Track nn in the language for country cc, is represented by a file LYRICSnn.cc. The value of nn is the Track Number of the Audio Track, encoded in ISO 646 as a 2 digit decimal number with leading zero. The Country Code cc is encoded as a string with a fixed length of two characters. The Country Code is the Alpha-2 code, as is defined in ISO 3166, encoded in capitals from the ISO 646 character set. The layout of LYRICSnn.cc is given in Figure III.12.

Figure III.12 Layout of LYRICSnn.cc

Byte position	Size (Bytes)	Field name	Content
1 to 8	8	File Identifier	"LYRICS "
9 to 12	4	Specification Version Number	"0090"
13 to 44	32	Escape Sequences	String
45 to 46	2	Number of Lyrics Packets	Numerical value = P
47 to ..		Lyrics_Packet 1	
.			
.. to ..		Lyrics_Packet P	

III.3.3.1 File Identifier

This field contains "LYRICS", followed by two space characters, coded in ISO 646.

III.3.3.2 Specification Version Number

This field contains the version number of the Enhanced Music CD specification used for the disc, encoded with digits from the ISO 646 character set. The content of this field is identical to the contents of the Specification Version Number field in INFO.CDP.

III.3.3.3 Escape Sequences

For the definition of the Escape Sequences field for the Lyrics_Packets, see chapter III.3.2.3.

III.3.3.4 Number of Lyrics_Packets

This two byte binary number contains the total number of Info_Packets contained in this file. The value zero is not allowed for the Number of Lyrics_Packets field.

III.3.3.5 Lyrics_Packet P

The layout of a Lyrics_Packet is given in Figure III.13. The Lyrics_Packets must be stored in ascending order of the MSF Time Code. Each Lyrics Packet must be contained in an even number of bytes.

Figure III.13 Layout of Lyrics_Packet P

Byte position	Size (Bytes)	Field name	Content
N+1	1	Lyrics_Packet Length	Numerical value = M+4
N+2 to N+4	3	Lyrics Display Time	Relative MSF Time Code
N+5 to N+M+4	M	Lyrics String	String
N+M+5	0 or 1	Padding	\$00

III.3.3.5.1 Lyrics_Packet Length

This one byte binary number contains the length in bytes of all bytes following this field in the Lyrics_Packet.

III.3.3.5.2 Lyrics Display Time

These three bytes contain the Relative MSF Time Code at which the Lyrics String is intended to be displayed. The Relative MSF Time Code is equal to the Relative Time as is encoded in Subcode Channel-Q.

III.3.3.5.3 Lyrics String

The Lyrics String field contains a character String with a maximum length of 255 characters. Zero length Strings are allowed. A line break is identified by character \$0D.

III.3.3.5.4 Padding Byte

The Padding byte field is only used if the Lyrics String length M is an odd number. This optional one byte field is set to \$00.

III.3.4 TRACKnn.MID file

The files TRACKnn.MID are located in the CDPLUS directory and have the reserved name "TRACKnn.MID". Each file with MIDI data for Audio Track nn is represented by a TRACKnn.MID file. The value of nn is the Track Number of the Audio Track, encoded in ISO 646 as a 2 digit decimal number with leading zero. The MIDI files must conform to the General MIDI Specification.

III.4 PICTURES Directory

The PICTURES directory is a sub-directory of the Root and has the reserved name "PICTURES". The MPEG pictures that are referenced from the files SUB_INFO.cc (see chapter III.3.2) are stored in this directory. All MPEG pictures must be encoded in three sizes (Small, Normal and Large in one of NTSC or PAL). All pictures must be encoded in both MPEG and JPEG format. Minimum the JACKET01 picture files must be available in the PICTURES directory.

III.4.1 MPEG Still Picture Files

Each MPEG Still Picture file contains one still picture. MPEG Still Picture Files are located in the PICTURES directory. The Picture Size and file names for the MPEG still picture files are given in Figure III.14. The coding parameters and Sector format for the MPEG Still Picture Files are given in chapter IV. MPEG Still Picture files are stored in Form-2 Sectors.

Figure III.14 MPEG Still Picture sizes and file names

Still picture type	Picture size	File name
Small Size NTSC	176 x 112	*.nnN
Normal Size NTSC	352 x 240	*.nnT
Large Size NTSC	704 x 480	*.nnS
Small Size PAL	176 x 144	*.nnP
Normal Size PAL	352 x 288	*.nnA
Large Size PAL	704 x 576	*.nnL

The string nn in the file name extension is equal to the Track Number of the Audio Track the Still Picture is related to. Pictures that are general for the disc have a value of nn equal to zero. Two file names are reserved for the general identification of the disc, the so called front jacket picture "JACKET01" and the rear jacket picture "JACKET02".

III.4.2 JPEG Still Picture Files

Each JPEG Still Picture file contains one still picture. JPEG Still Picture Files are located in the PICTURES directory. The file name extension for the JPEG still picture files is ".nnJ" in which nn is equal to the Track Number of the Audio Track the Still Picture is related to. JPEG files are stored in Form-1 Sectors.

III.5 DATA Directory

The optional DATA directory is a sub-directory of the Root and has the reserved name "DATA". It is recommended to store additional data files in the DATA directory and sub-directories of it.

III.6 AUTORUN.INF file

The required file AUTORUN.INF is an ISO646 encoded text file located in the Root directory and has the reserved name "AUTORUN.INF". AUTORUN.INF contains lines of text which refer to the executable programs for various computer platforms and other computer platform specific items.

The file AUTORUN.INF is divided into Vendor_Group sections. A Vendor_Group section starts with a one line Vendor_ID, followed by zero or more vendor specific lines. The Vendor_ID consists of a '[' character followed by a Vendor_String, followed by a ']' character, followed by a line delimiter. The line delimiter used in this file is \$0D, \$0A. Vendor_Strings are not case sensitive.

To review the list of registered Vendor_IDs or to register a new Vendor_Group, please contact the Registration Office. The Registration Office for the Vendor_IDs is given in chapter I.4.

Figure III.15 gives an example of the content of AUTORUN.INF.

Figure III.15 Example of AUTORUN.INF

Content
<pre>[autorun] open=cdplus.exe icon=cdplus.ico ; In this example, the open command is used and specified by the specific operating ; system vendor to define a method to start the application "cdplus.exe" and create an icon ; for that application using the file "cdplus.ico". [....]</pre>

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IV. MPEG Still Picture Data Format

An MPEG still picture file can contain only one MPEG-1 stream with one Intra picture.

1 MPEG still picture file = 1 stream =
System_header + 1 sequence + iso_11172_end_code

1 sequence = Sequence_header + 1 GOP(1 Intra picture) + sequence_end_code

IV.1 Sequence definitions

IV.1.1 Sequence_header

The Sequence_header for MPEG still picture sequence is defined in Figure IV.1. The vbv_buffer_size is equal to the size of the encoded Still Picture, rounded up to a multiple of 2048 bytes.

Figure IV.1 Sequence_header fields for Still Pictures

MPEG field name	NTSC	PAL
sequence_header_code	\$000001B3	\$000001B3
horizontal_size (Small size)	176	176
horizontal_size (Normal size)	352	352
horizontal_size (Large size)	704	704
vertical_size (Small size)	112	144
vertical_size (Normal size)	240	288
vertical_size (Large size)	480	576
pel_aspect_ratio	(CCIR601 525 lines)	(CCIR601 625 lines)
picture_rate	(29.97 Hz)	(25 Hz)
vbv_buffer_size		
constrained_parameter_flag	%0	%0
bit_rate	\$3FFFF (variable)	\$3FFFF (variable)

IV.1.2 Picture header

The Picture header for all MPEG still pictures is defined in Figure IV.2.

Figure IV.2 Picture header definition

MPEG field name	Value
picture_start_code	\$00000100
temporal_reference	%0000000000
picture_coding_type	%001 (Intra-Picture)
vbv_delay	\$FFFF (variable)

IV.2 Sector format

An MPEG still picture only contains MPEG Video Sectors, empty sectors are not allowed. One MPEG Video Sector contains only one MPEG-1 Pack and has a subheader as defined in Figure IV.3. A Pack can contain only one Video Packet, except first sector and the last sector of a sequence. The first sector of an MPEG still picture file contains one Pack with the System_header followed by a Padding Packet. In general, the last sector of an MPEG still picture file contains one Video Packet, followed by one Padding Packet for filling the remaining space, followed by the iso_11172_end_code. The iso_11172_end_code must be contained in the last 4 bytes of the sector, as a consequence the pack data size of the last sector is equal to 2308 (2324-12-4) bytes. Padding Packets are only allowed in the last and in the last but one sector.

Figure IV.3 Subheader definition

Field name	Value
File Number	\$01
Channel Number	\$01
Submode	%x110001x
Coding Information (System_header)	\$0F
Coding Information (Small size Still)	\$1F
Coding Information (Normal size Still)	\$2F
Coding Information (Large size Still)	\$3F

Sectors containing the last byte of the sequence_end_code of a still picture (last sector) has the EOR bit set to one. The Sectors containing the iso_11172_end_code have both the EOR and the EOF bit set to one. All other sectors of a still picture file have the EOR and the EOF bit set to zero.

IV.2.1 Pack_header

The Pack_header for all MPEG Video sectors is defined in Figure IV.4. The general format of a MPEG Video Sector is given in Figure IV.5.

Figure IV.4 Pack_header fields

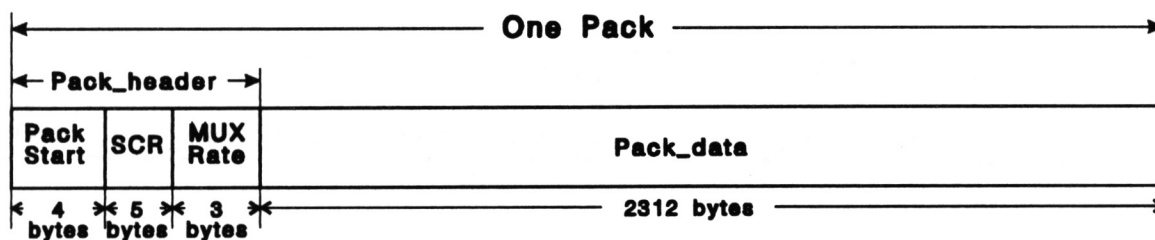
MPEG field name	Value
pack_start_code	\$000001BA
system_clock_reference	$SCR(i) = C + i * 1200$
mux_rate	3528 (= 2352 * 75 / 50)

in which: *i* is the index number of the Sector in the Sequence; the first Sector of a Sequence has index number zero.

C is a constant; it is recommended to apply *C* equals to zero.

1200 is derived from the nominal 90 kHz system clock and the nominal 75 Hz Sector delivery rate.

Figure IV.5 General MPEG Video Sector format



IV.2.2 System_header

The content of the System_header for an MPEG still picture is defined in Figure IV.6.

Figure IV.6 System_header content

MPEG field name	Value
system_header_start_code	\$000001BB
rate_bound	3528
audio_bound	0
fixed_flag	%0
CSPS_flag	%0
system_audio_lock_flag	%1
system_video_lock_flag	%1
video_bound	1
stream_id	\$E1
STD_buffer_bound_scale	%1
STD_buffer_size_bound (Small and Normal size)	46
STD_buffer_size_bound (Large size)	Integer part of $((\text{encoded picture size} + 1023) / 1024)$

IV.2.3 Packet_header

The Packet_header for MPEG still picture packets is defined in Figure IV.7. Both the Packet_header and the Packet_data must use an even number of bytes.

Figure IV.7 Packet_header content

MPEG field name	Value
packet_start_code_prefix	\$000001
stream_id	\$E1
packet_length	
STD_buffer_scale	1
STD_buffer_size (Small and Normal size)	46
STD_buffer_size (Large size)	Integer part of $((\text{encoded picture size} + 1023) / 1024)$
presentation_time_stamp	
decoding_time_stamp	PTS - (picture duration)

The PTS of a still picture must be equal to the time just after the sequence_end_code of the picture data.

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