Confidential Information

SUPER AUDIO CD

Super Audio CD System Description

Part 3-General Copy Protection Specification

Version 2.1
Final
October 2007

SONY PHILIPS

COPYRIGHT

DISCLAIMER

The information contained herein is believed to be accurate as of the date of publication, however, neither Royal Philips Electronics, nor Sony Corporation will be liable for any damages, including indirect or consequential, from use of the System Description Super Audio CD or reliance on the accuracy of this document.

LICENSING

Application of the System Description Super Audio CD in both disc and equipment products requires a separate license from Philips.

CLASSIFICATION

The information contained in this document is marked as confidential and shall be treated as confidential according to the provisions of the Agreement through which the document has been obtained.

NOTICE

For any further explanation of the contents of this document, or in case of any perceived inconsistency or ambiguity of interpretation, or for any information regarding the Super Audio CD patent license program, please consult:

Philips Intellectual Property & Standards
Business Support, Bldg HTC 44,
High Tech Campus 44,
5656AE Eindhoven,
The Netherlands

E-mail: info.licensing@philips.com
Website: http://www.ip.philips.com

Table of Contents

Page

Table of Figures

Page

This page is intentionally left blank

1. General

1.1 Scope

This document describes the General Introduction and Specification of the Copy Protection part of the Super Audio CD system. The Super Audio CD System Description consists of three parts:

- Part 1, Physical Specification
- Part 2, Audio Specification
- Part 3, Copy Protection Specification

The Copy Protection Specification consists of 4 books:

- Part 3-General. Copy Protection Specification: General Introduction and Specification
- Part 3-Disc. Copy Protection Specification: Disc Specification
- Part 3-Player. Copy Protection Specification: Player Specification
- Part 3-LSI. Copy Protection Specification: LSI Circuit Specification

1.2 Main Features

Advanced copy protection system including:

- Physical Disc Mark
- Essential Super Audio CD Disc Mark
- Encryption
- Player Authorization

The copy protection system specified in this version of the Super Audio CD Specification is backwards compatible with the copy protection system specified in version 1.3 and earlier of the Super Audio CD Specification. Added copy protection system features are the Player Authorization system with encryption for Supplementary Data packets in the Audio Stream, for Bonus Tracks and for the content of the Extension Area.

1.3 References and conformance

Super Audio CD conforms to all mandatory requirements specified in this document. All parts in this document are mandatory unless they are specially defined as recommended or optional or informative.
Super Audio CD also conforms to the applicable parts of the System Descriptions or international standards that are listed below:

CD-DA	Compact Disc Digital Audio, specified in the System Description Compact Disc Digital Audio ("Red Book"), Royal Philips Electronics and Sony Corporation.
DTCP	Digital Transmission Content Protection Specification Version 1.4. See http://www.dtcp.com/.
HDCP	High-bandwidth Digital Content Protection System Specification Revision 1.2. See http://www.digital-cp.com/.
HDMI	High-Definition Multimedia Interface Specification Version 1.3. See http://www.hdmi.com/.
IEC 908	Compact disc digital audio system.
IEEE 1394	Standard for a High Performance Serial Bus. Ref. No. IEEE Std 1394-1995. Also see 1394 Trade Association, www.1394ta.org.

ISO/IEC 61883 Digital Interface for Consumer Audio/Video Equipment.

RFC 1321 The MD5 Message-Digest Algorithm, see www.ietf.org/rfc/rfc1321.txt.

Super Audio CD Part 1 Scarlet Book Part 1, Super Audio CD System Description, Physical Specification, Royal Philips Electronics and Sony Corporation.

Super Audio CD Part 2 Scarlet Book Part 2, Super Audio CD System Description, Audio Specification, Royal Philips Electronics and Sony Corporation.

Super Audio CD Part 3-General
Scarlet Book Part 3-General, Super Audio CD System Description, Copy Protection Specification: General Introduction and Specification, Royal Philips Electronics and Sony Corporation. (This book)

Super Audio CD Part 3-Disc
Scarlet Book Part 3-Disc, Super Audio CD System Description, Copy Protection Specification: Disc Specification, Royal Philips Electronics and Sony Corporation.

Super Audio CD Part 3-Player
Scarlet Book Part 3-Player, Super Audio CD System Description, Copy Protection Specification: Player Specification, Royal Philips Electronics and Sony Corporation.

Super Audio CD Part 3-LSI
Scarlet Book Part 3-LSI, Super Audio CD System Description, Copy Protection Specification: LSI Specification, Royal Philips Electronics and Sony Corporation.

S-DIAT Secure Digital Infrared Audio Transmission, S-DIAT, Version 1.0, May 2003. Information via wlsrsp@super-audiocd.com.

Super Audio CD - SAC Super Audio CD Secure Authenticated Channel, version 1.0. Information via au-superaudiocd-license@jp.sony.com

1.4 Definitions

The following definitions are used in this specification.

Approved Secure Interface
A connection between a source device and a sink device that is compliant with an Approved Secure Digital Interface Technology that is listed explicitly as an Approved Secure Digital Interface Technology in Annex D of the current version of the Super Audio CD Specifications Part 3-General.

Approved Secure Recorder
A Recorder which is in compliance with an Approved Secure Recording Technology that is listed explicitly as an Approved Secure Recording Technology in Annex E of the current version of the Super Audio CD Specification Part 3-General. For the purpose of clarity, this definition of Approved Secure Recorder shall only include applications that are in such compliance, and not non-compliant applications in the same device.

CCI Copy Control Information

Copy Control Information
: Information included on Super Audio CD discs that pertains to the number of copies and/or quality of such copies that may be made from permitted digital outputs from Super Audio CD players and connections from and within Integrated Super Audio CD Player/Recorders and that may include other fields.

Content Participant
: A record company which has entered into a Super Audio CD Content Participant Agreement with the Super Audio CD licensor.

Content Participant Agreement
: An agreement between Super Audio CD licensors and a Content Participant.

CPS
: Copy protection system.

Data Frame
: Data structure as defined in Super Audio CD Part 1 Section 4.2.2.

Device ID
: A 40 bit binary string that uniquely identifies a Super Audio CD player.

Device Key
: A 128 bit, Super Audio CD player-specific, cryptographic key.

EKB
: Enabling Key Block. A data structure on the Super Audio CD disc that enables authorized Super Audio CD players to play that Super Audio CD disc.

Hybrid Disc
: A Super Audio CD disc with a high-density layer and a CD-DA layer.

Industry Consensus Watermark
: The watermark technology defined as “ARIS/SOLANA-4C” in the SDMI Portable Device Specification, Part 1, Version 1.0 (July 8, 1999).

Integrated Super Audio CD Player/Recorder
: A hardware product that contains a Super Audio CD player and one or more Recorders in the same housing.

KIC
: Key Issuance Center. The KIC distributes Device IDs, Device Keys and EKBs. Information about the Key Issuance Center can be obtained from the Super Audio CD licensor.

List Of Tracks
: A list stored in non-volatile memory in the player, which contains the remaining number of copies allowed for Tracks that have been recorded, see section 4.7.3.3.

LSI
: Large Scale Integrated circuit.

Move
: The combined operation of (1) making a digital copy, and (2) deleting the original copy, or otherwise rendering the original copy entirely unusable, such that, at any point in time, only a single useable copy persists.

PDM
: Physical Disc Mark.

Player Authorization
: A Super Audio CD player is authorized to play a Super Audio CD disc if it is able to decode the EKB correctly.

Protected Source	A source of content for a Approved Secure Recorder reaching that recorder a) via an Approved Secure Digital Interface Technology, or b) from the HD layer of a Super Audio CD Disc via a tamper resistant connection within the same housing, in compliance with appropriate robustness rules.
PSP	Pit Signal Processing.
Recorder	An application capable of recording audio signals for the purpose of playing at a later time.
Reserved	All fields labeled Reserved are reserved for future standardization. All Reserved fields must be set to zero.
Screen	The detector for the Industry Consensus Watermark that is in general use on Super Audio CD Discs.
Sector	= Data Frame (≠ Physical Sector as defined in Super Audio CD Part 1 Section 4.2.7).
Secure Recorder	A Recorder that encrypts or controls access to recorded content in such a manner as to effectively limit further digital copying of that content, and is designed in accordance with a Secure Recording Technology that is explicitly listed, separate and apart from Approved Secure Recording Technologies, in Annex F of the current version of the Super Audio CD Specification Part 3-General.
Secure Audio Recording	A recording made by an Approved Secure Recorder of content from the HD layer of a Super Audio CD Disc.
Super Audio CD	The disc as defined in this specification.
Supplementary Data	Additional data multiplexed with the audio signal.
Text And Pictures	JPEG pictures, Sub_Pictures and encoded text stored in Supplementary Data and/or in the Extension Area.
TNO, tno	Track Number.
Track	A Track is a contiguous area on the disc with audio information and with one and the same Track number.
Track Number	A Track Number is the sequence number of a Track. The first Track Number in an Audio Area is one. The maximum number of Tracks in an Audio Area is 255.
Unlisted Recorder	A Recorder that is not an Approved Secure Recorder, and not a Secure Recorder.
WM	Watermark.

1.5 Conventions

In this version of the Super Audio CD Specification the conventions as described in this chapter are used.

1.5.1 Arithmetic and bit operations

a>>b	Right shift a over b bits. The new msb bits are set to '0'.
a<<b	Left shift a over b bits. The new lsb bits are set to '0'.
a | b	Bitwise OR of a and b.
a & b	Bitwise AND of a and b.
min(a,b)	Minimum value of a and b.
max(a,b)	Maximum value of a and b.
a mod b	Value of a modulo b.
trunc(a)	Value of a, rounded downwards.
roundup(a)	Value of a, rounded upwards.
| a |	Absolute value of a.
a==b	Evaluate if a is equal to b.
a!=b	Evaluate if a is not equal to b.
a=b	Variable a is set to the value of b.
a++	a = a + 1
a -= b	a = a – b
a += b	a = a + b
a^b	Bitwise Exclusive OR of a and b.

1.5.2 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 (lsb) is on the right. Figure 1-1 defines the bit position in a Byte.

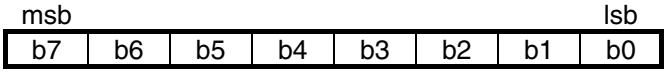

Figure 1-1 : Bit ordering in a Byte

1.5.3 Bit sequence

In all places where a bit sequence is used, a most significant bit first notation is used.

1.5.4 Byte position

The bytes in a series of n Sectors are successively numbered 0 .. n*2048-1. Figure 1-2 defines the Byte position (BP) in a series of n Sectors.

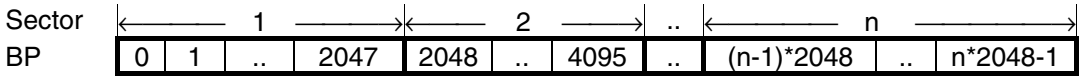

Figure 1-2 : Byte position in a series of n Sectors

1.5.5 Decimal notation

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.

1.5.6 Hex notation

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

1.5.7 Range

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

1.5.8 Until

Until is used in figures to indicate that for a structure Byte Positions are used upto (not including) a given value.
At Byte Position B1, the expression “until B2” specifies B2-B1 bytes. At Byte Position B1, the expression “until eos” specifies the number of bytes from B1 upto and including the last byte of the current Sector. Note that Byte Position is specified relative to the start of the current, or a previous, Sector.

1.6 Basic Types

In this version of the Super Audio CD Specification the Basic Types as described in this chapter are used.

1.6.1 Simple types

1.6.1.1 BsMsbf

Bit Sequence, Most Significant Bit First, must be interpreted as a Bit String.

1.6.1.2 Char

A one-byte character, encoded according to ISO 646. The NUL ($00) character is not allowed for Char.

1.6.1.3 Uint*n*

An n bit, binary encoded, unsigned numerical value.

1.6.1.4 Uint8

An 8 bit, binary encoded, unsigned numerical value. A Uint8 value must be recorded in a one-byte field.

2. Copy protection system

2.1 General

The Super Audio CD Copy Protection System (CPS) uses different tools to facilitate protection of copyrighted content. The Super Audio CD CPS has consequences for the Super Audio CD disc format and for the Super Audio CD player functionality and implementation. The Copy Protection Specification consists of 4 books:

- Part 3-General. Copy Protection Specification: General Introduction and Specification
- Part 3-Disc. Copy Protection Specification: Disc Specification
- Part 3-Player. Copy Protection Specification: Player Specification
- Part 3-LSI. Copy Protection Specification: LSI Circuit Specification

This book (Part 3-General) contains the introduction to the CPS and some general specifications. Part 3-Disc contains specifications required for Super Audio CD disc manufacturing. Part 3-Player contains specifications required for Super Audio CD player manufacturing. Part 3-LSI contains specifications for manufacturing key components for Super Audio CD players.

The Copy Protection Specification Super Audio CD Part 3 only covers the HD recorded layer of the Super Audio CD disc (see Super Audio CD Part 1 Section 4). Copy protection for the CD-DA layer of a Hybrid Disc (see Super Audio CD Part 1 Section 2) shall be according to the CD-DA specification.

2.2 Copy protection tools

2.2.1 Current copy protection tools

Current Copy Protection Tools are the CPS tools defined in this version of the Super Audio CD specification. The Current Copy Protection Tools make up the Current Super Audio CD CPS. The Current Copy Protection Tools are listed in Figure 2-1. Figure 2-1 indicates if a tool is mandatory (M) or optional (O) for the Super Audio CD disc format and for the Super Audio CD player. All Current Copy Protection Tools are mandatory both in discs and in players as indicated in Figure 2-1.

	Disc format	Player
PSP Physical Disc Mark (PSP-PDM)	M	M
Content encryption	M	M
Essential Super Audio CD Mark	M	M
Player Authorization	M	M

Figure 2-1 : Current Copy Protection Tools

Notes: In discs according to version 1.3 or lower of the Super Audio CD Specification, the presence of the Essential Super Audio CD Mark is optional.
In discs according to version 1.3 or lower of the Super Audio CD Specification, the EKB is not present and Player Authorization is not active.

2.2.1.1 PSP Physical Disc Mark

The PSP Physical Disc Mark (PSP-PDM) invisibly stores data on the disc. These data are required to decrypt the encrypted content. Processing of the PSP-PDM is a mandatory requirement for Super Audio CD players (see Super Audio CD Part 3-Player).

2.2.1.2 Content encryption

The following content must be encrypted (also see section 5.1):

- The Track Area of the 2-Channel Stereo Area and the Multichannel Area
- The Extension_Data
- Audio_CCI (see section 3.2) of all Area_TOCs

2.2.1.3 Essential Super Audio CD Mark

The Essential Super Audio CD Mark gives extra protection against reading by devices that do not conform to the System Description of Super Audio CD Part 3-Player by securing access to disc content (see Super Audio CD Part 3-Disc and Super Audio CD Part 3-Player). Decoding the Essential Super Audio CD Mark is a mandatory requirement for Super Audio CD players.

2.2.1.4 Player Authorization

Player Authorization gives extra protection against a potential security decrease in the Super Audio CD CPS. Player Authorization is arranged on the Super Audio CD disc by the EKB. Decoding of the EKB is a mandatory requirement for Super Audio CD players. Decoding of the EKB is specified in Super Audio CD Part 3-Player.

2.2.2 Future copy protection tools

Future versions of this specification may introduce new copy protection tools. Such tools will provide for upgrades to the Super Audio CD Copy Protection System. The Current Super Audio CD CPS includes some provisions for future upgrades to the system.

2.3 Copy protection system

2.3.1 Current copy protection system

An overview of the Current Super Audio CD Copy Protection System is given in Figure 2-2. The functionality of this system can be divided into four parts:

1. Disc access control using Essential Super Audio CD Mark
2. Content access control using PSP Physical Disc Mark (PSP-PDM), EKB and content encryption
3. Playback control using PSP-PDM
4. Player Authorization using EKB

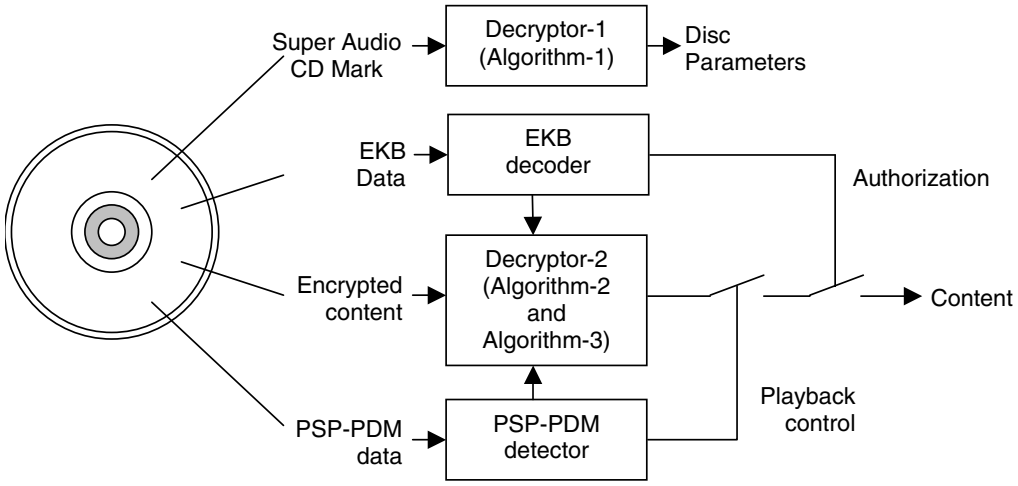

Figure 2-2: Super Audio CD Copy Protection System block diagram

2.3.1.1 Disc access control

The Essential Super Audio CD Mark hides to the player certain disc parameters. The disc parameters are only available after decryption using Algorithm-1. The Essential Super Audio CD mark gives extra protection against reading by non-compliant drives by securing access to disc content.

2.3.1.2 Content access control

Content in the Data Zone (see Super Audio CD Part 1 Section 4.3) may be encrypted. The PSP-PDM contains data required for decrypting the content using Algorithm-2. The EKB contains data required for decrypting the content using Algorithm-3.

2.3.1.3 Playback control

Every Super Audio CD disc must contain the PSP-PDM. A Super Audio CD player is not allowed to play a Super Audio CD (like) disc if it does not detect the PSP-PDM.

2.3.1.4 Player Authorization

If a Super Audio CD player is not able to decode the EKB from a Super Audio CD Version 2.0 or higher disc, the player is not authorized to play this disc.

2.3.2 Future copy protection system

Upgrades to the Current Super Audio CD CPS may be introduced in future versions of this specification.

This page is intentionally left blank

3. TOC structure

This section extends Section 3.2.1.2.8.1 'Track_Attribute' and section 3.2.9.3 'Audio_CCI' of the TOC structure description of Super Audio CD Part 2.

3.1 Track_Attribute

In discs according to this version of the Super Audio CD specification, all 4 bits of the Track_Attribute (see Super Audio CD Part 2 Section 3.2.1.2.8.1) must be set to 0.

3.2 Audio_CCI

Audio_CCI contains Copy Control Information for all Tracks in the current Audio Area. The format of Audio_CCI is defined in Figure 3-1.

```
                                          # bytes     format         value
Audio_CCI(){
   Hash_Code                              16          BsMsbf
   Audio_CCI_Data()                       4080        Audio_CCI_Data
}
```

Figure 3-1 : Syntax of Audio_CCI

3.2.1 Hash_Code

Hash_Code must be calculated as the MD5 hash (see RFC 1321) over Audio_CCI_Data.

3.2.2 Audio_CCI_Data

The format of Audio_CCI_Data is defined in Figure 3-2.

```
                                        # bytes       format          value
Audio_CCI_Data(){
   for (tno=1; tno<=N_Tracks; tno++)
   {
       CCI_1()[tno]                       16          CCI_1
   }
   Reserved                            until 4080     Uint8           0
}
```

Figure 3-2 : Syntax of Audio_CCI_Data

3.2.2.1 CCI_1

CCI_1[tno] contains Copy Control Information for Track[tno]. The syntax of CCI_1[tno] is defined in Figure 3-3.

```
                                        # bytes       format       value
CCI_1()[tno]{
   Count_A[tno]                          1           Uint8
   Count_S[tno]                          1           Uint8
   Count_U[tno]                          1           Uint8
   CCI_Flags()[tno]                      2           CCI_Flags
   Reserved                             11           Uint8          0
}
```

Figure 3-3 : Syntax of CCI_1

3.2.2.1.1 Count_A

Count_A[tno] contains the maximum number of protected digital copies of Track[tno] allowed on Approved Secure Recorders with a quality level defined by Q_A[tno] (see chapter 3.2.2.1.4.1). A value of 255 means that an unlimited number of copies is allowed with a quality level defined by Q_A[tno]. The value zero is not allowed for Count_A[tno]. Also see section 4.7.3.

3.2.2.1.2 Count_S

Count_S[tno] contains the maximum number of protected digital copies of Track[tno] allowed on Secure Recorders with a quality level defined by Q_S[tno] (see chapter 3.2.2.1.4.2). A value of 255 means that an unlimited number of copies is allowed with a quality level defined by Q_S[tno]. The value zero is allowed for Count_S[tno]. Also see section 4.7.3.

3.2.2.1.3 Count_U

Count_U[tno] contains the maximum number of digital copies of Track[tno] allowed on Unlisted Recorders with a quality level defined by Q_U[tno] (see chapter 3.2.2.1.4.3). A value of 255 means that an unlimited number of copies is allowed with a quality level defined by Q_U[tno]. The value zero is allowed for Count_U[tno]. Also see section 4.7.3.

3.2.2.1.4 CCI_Flags

CCI_Flags[tno] defines audio signal quality limitations and Move permissions for Track[tno]. The syntax of CCI_Flags[tno] is defined in Figure 3-4. Also see section 4.7.3.

```
                                          # bits        format        value
CCI_Flags()[tno]{
   Q_A[tno]                                  1          BsMsbf
   Q_S[tno]                                  1          BsMsbf
   Q_U[tno]                                  1          BsMsbf
   Move_A[tno]                               1          BsMsbf
   Move_S[tno]                               1          BsMsbf
   Move_U[tno]                               1          BsMsbf
   Reserved                                 10          Uint10          0
}
```

Figure 3-4 : Syntax of CCI_Flags

For the purpose of the definitions of Q_A, Q_S and Q_U, CD Quality means, with respect to Linear PCM, that the number of audio channels is two or less, that the sampling frequency is not greater than 48 kHz, and that the quantization bit level is not greater than 16 bits; and with respect to non Linear PCM, that the number of audio channels is two or less, and a quality level which is perceptually equivalent to "CD Quality" as defined for Linear PCM.

3.2.2.1.4.1 Q_A

Q_A[tno] defines the audio quality level for the copies allowed by Count_A[tno]. A value of zero for Q_A[tno] means that maximum Count_A[tno] copies in CD Quality are allowed on Approved Secure Recorders. A value of one for Q_A[tno] means that maximum Count_A[tno] copies with unlimited DSD quality are allowed on Approved Secure Recorders.

3.2.2.1.4.2 Q_S

Q_S[tno] defines the audio quality level for the copies allowed by Count_S[tno]. A value of zero for Q_S[tno] means that maximum Count_S[tno] copies in CD Quality are allowed on Secure Recorders. A value of one for Q_S[tno] means that maximum Count_S[tno] copies with unlimited DSD quality are allowed on Secure Recorders.

3.2.2.1.4.3 Q_U

Q_U[tno] defines the audio quality level for the copies allowed by Count_U[tno]. A value of zero for Q_U[tno] means that maximum Count_U[tno] copies in CD Quality are allowed on Unlisted Recorders. A value of one for Q_U[tno] means that maximum Count_U[tno] copies with unlimited DSD quality are allowed on Unlisted Recorders.

3.2.2.1.4.4 Move_A

Move_A[tno] defines if it is allowed or not to Move the copies made according the definition of Count_A[tno]. A value of zero for Move_A[tno] means that a Move is not allowed for the content of Track[tno]. A value of one for Move_A[tno] means that a Move is allowed for the content of Track[tno].

3.2.2.1.4.5 Move_S

Move_S[tno] defines if it is allowed or not to Move the copies made according the definition of Count_S[tno]. A value of zero for Move_S[tno] means that a Move is not allowed for the content of Track[tno]. A value of one for Move_S[tno] means that a Move is allowed for the content of Track[tno].

3.2.2.1.4.6 Move_U

Move_U[tno] defines if it is allowed or not to Move the copies made according the definition of Count_U[tno]. A value of zero for Move_U[tno] means that a Move is not allowed for the content of Track[tno]. A value of one for Move_U[tno] means that a Move is allowed for the content of Track[tno].

This page is intentionally left blank

4. Super Audio CD Player

This section gives specifications concerning copy protection requirements of Super Audio CD players.

A Super Audio CD Player is a device or a combination of devices able to play back content from a Super Audio CD disc.

A Super Audio CD Player can be either a stand-alone product or an Integrated Product.

A Super Audio CD Player Sub-unit is a functional part of a Super Audio CD Player such as a Super Audio CD-drive, a PSP-PDM detector plus an EKB decoder plus a content decryption unit, a DSD-processing unit, a DSD-DA-converter, whether or not in its own housing.

An Integrated Product is a combination of any one or more Super Audio CD Player Sub-Units which are interconnected by Super Audio CD Player Sub-unit interfaces. Transmission of digital content originating from HD Layer content on Super Audio CD Player Sub-Unit interfaces is permitted only when all separate sub-units putting together Super Audio CD functionality are connected under the conditions set forth in Section 4.2. Any reference or provision in this Section 4 with respect to Integrated Product shall not affect the obligations pertaining to a stand-alone Super Audio CD Player.
An Integrated Product must comply, as a whole, with the Super Audio CD copy protection specification, including, but not limited to, Section 4.2 of this Part.
HD Layer DSD and DST content, Text And Pictures content and HD Layer content mean the content of, or originating from, any high-density layer of a Super Audio CD Disc.

4.1 CD Layer of a Hybrid Disc

For a Super Audio CD Player playing the CD Layer of a Hybrid Disc, copy protection shall be in accordance with the copy protection as applied to CD-DA.

4.2 Digital interface for HD Layer content

No external digital output from a Super Audio CD player or Super Audio CD Player Sub-unit other than: (a) the Approved Secure Digital Interfaces as defined in section 4.2.2, or (b) the output as permitted in section 4.2.4 is allowed for the transfer of HD Layer DSD content, HD Layer DST content and Text And Pictures content.

HD layer content shall only be transferred through a digital connection to any analog or digital recording device in the same housing as the Super Audio CD Player if both the digital connection and the recording device obey the rules and definitions in sections 4.6 and 4.7.3.

The transfer of HD layer content through a digital connection to another device (including without limitation a recording device or any Super Audio CD Player sub-unit) in a separate housing is an “external digital output” and must comply with the first paragraph of this Section 4.2. A Super Audio CD Player Sub-unit interface that is a digital connection to another Super Audio CD Player Sub-unit in a separate housing is an “external digital output” and must comply with (a) of the first paragraph of this Section 4.2 – that is, it must comprise an Approved Secure Digital Interface as defined in section 4.2.2 or be inoperable such that no HD Layer content may be transferred over it.

4.2.1 Super Audio CD Computer Sub-Units

A Super Audio CD Computer Sub-Unit can be either a Super Audio CD Drive Sub-Unit as defined in section 4.2.1.1 or a Super Audio CD Host Sub-Unit as defined in section 4.2.1.2.

4.2.1.1 Super Audio CD Drive Sub-Unit

A Super Audio CD Drive Sub-Unit is a Super Audio CD Player Sub-Unit, which minimally contains:

- A player implementation of Super Audio CD Part 1.
- The EKB decoder and the Super Audio CD Mark decoder.
- The Super Audio CD LSI, see section 6.
- An approved Super Audio CD Drive Interface as digital output, see Annex D.2.

4.2.1.2 Super Audio CD Host Sub-Unit

A Super Audio CD Host Sub-Unit is a Super Audio CD Player Sub-Unit, which minimally contains:

- A player implementation of Super Audio CD Part 2.
- When required (see section 4.7.3.3), the List Of Tracks, according to the rules and definitions in section 4.7.3.3.
- An approved Super Audio CD Drive Interface as digital input, see Annex D.2.

4.2.2 Approved Secure Digital Interfaces

Annex D defines all Approved Secure Digital Interface Technologies that are allowed to be used for the transport of content originating from the HD Layer of a Super Audio CD disc. Approved Secure Digital Interface Technologies will be approved according to the procedures and criteria described in Annex A and Annex A.1.

4.2.3 Transmission of multi-channel content via Secure Digital Interfaces

When transferring 5-channel audio content from the HD layer via a Secure Digital Interface, a Super Audio CD Player and/or a Super Audio CD Player Sub-unit shall transmit audio originating from Super Audio CD channels 1, 2, 3, 4 and 5 as Left, Right, Center, Left Surround and Right Surround, respectively. When transferring 6-channel audio content from the HD layer via a Secure Digital Interface, a Super Audio CD Player and/or a Super Audio CD Player Sub-unit shall transmit audio originating from Super Audio CD channels 1, 2, 3, 4, 5, and 6 as Left, Right, Center, LFE, Left Surround and Right Surround, respectively. That means, for example, that it is not allowed to output Super Audio CD channels 1 (Left) and 2 (Right) as Left Surround and Right Surround on any digital output.

4.2.4 Transmission of HD Layer Content in CD Audio Quality or less formats via Digital Interfaces

Except as otherwise provided in section 4.2.3, a Super Audio CD player or Super Audio CD Player Sub-unit may transmit HD Layer Content in CD Audio Quality or less formats via Digital Interfaces at a rate not exceeding real time speed.
For the purpose of this section the output signal from a Super Audio CD player that is in “Fast Forward” or “Fast Reverse” mode is defined as being at real time speed. “Fast Forward” and “Fast Reverse” are playback modes that are designed and implemented solely for the purpose of rendering and not recording and that render such signal incompletely, distorted and in uncorrectable form only.
The copy management information shall be set, embedded and transmitted as corresponding to copying prohibited (e.g. “Copy never” or “No more copy”).
Transmission of HD Layer content in CD Audio Quality or less formats means audio data transmission of Linear PCM format in which information must be sampled at no greater than 48kHz and no more than 16 bits, or such information in compressed audio formats, where in either case the transfer bit rate via Digital interface must be no greater than 768, 000bps (Bits Per Second) per Channel.

4.3 Analog Audio Interface for HD Layer Content

No external analog output from a Super Audio CD Player or Super Audio CD Player Sub-Unit may transfer HD Layer content at a rate exceeding real time speed. For the purpose of this section the output signal from a Super Audio CD player that is in "Fast Forward" or "Fast Reverse" mode is defined as being at real time speed. "Fast Forward" and "Fast Reverse" are playback modes that are designed and implemented solely for the purpose of rendering and not recording and that render such signal incompletely, distorted and in uncorrectable form only.

Transfer of HD Layer content, through an analog connection to any analog or digital recording device in the same housing as the Super Audio CD Player or in a separate housing with any Super Audio CD Player Sub-unit, is only allowed if all of the following conditions are fulfilled:

- (a) the transfer and any recording is made at a rate that does not exceed real time speed; and
- (b) the Super Audio CD Player, including all Super Audio CD Player Sub-units and all recorders in the same housing, is constructed in a manner that assures that only a single copy of such content, on a track-by-track basis with respect to tracks identified by ISRC number or comparable track identifier, is made in the same Super Audio CD Player, including all Sub-units and any recording device in the same housing as any Sub-unit, during any memory cycle; and
- (c) such copy is not greater than two channels; and
- (d) data other than the audio signal of the HD Level content, such as track names and table of contents, is excluded from the transfer and does not accompany it in any manner.

For the purposes of this section,

(1) data "accompanies" the audio signal of HD Level content if it is coordinated with, or conveyed in any manner intended to operate with or be utilized with the recorded audio signal; and

(2) "memory cycle" and clause (b) of this Section 4.3 mean that the Super Audio CD Player must provide effective memory for tracks, memory may be limited to no less than 500 (five hundred) tracks, only after such memory capacity is exceeded will any track identifier be deleted from memory, the track copied least recently will be deleted from memory, and tracks not deleted from memory will not be copied.

Note that it is contemplated that this provision will be revised to further constrain recordings made from analog connections.

4.4 Hard-copy output for Text And Pictures

This section defines the rules for hard-copy outputs of Text And Pictures data stored on a Super Audio CD disc. Printing the Text And Pictures content of a Super Audio CD disc is allowed.

4.5 Analog Video Interface for HD Layer content

This section defines the rules for analog video outputs that carry Text And Pictures data stored on a Super Audio CD disc. Analog Video Interfaces for Super Audio CD Players are allowed.

4.6 Digital recording of HD Layer content

It is not allowed to record audio content originating from the HD Layer of a Super Audio CD disc other than according to the rules and definitions in this section 4.6. Currently it is not allowed to record Text And Pictures content originating from the HD Layer of a Super Audio CD disc.

4.6.1 Approved Secure Recording Technologies

Approved Secure Recording Technologies shall mean a recording technology that is compliant with an Approved Secure Recording Technology listed in Annex E. Annex E defines all Approved Secure Recording Technologies that are allowed to be used for the recording of content originating from the HD Layer of a Super Audio CD disc. Approved Secure Recording Technologies will be approved according to the procedures and criteria described in Annex B. No such technologies have been defined in this version of the specification.

4.6.2 Secure Recording Technologies

Secure Recording Technologies shall mean a recording technology that is compliant with a Secure Recording Technology listed in Annex F. Annex F defines all Secure Recording Technologies that are allowed to be used for the recording of content originating from the HD Layer of a Super Audio CD disc.
It is allowed to record audio content originating from the HD Layer of a Super Audio CD disc to Secure Recorders only if the Secure Recorder is in compliance with the rules defined in section 4.7.3; this rule only applies to recording via a digital connection to any analog or digital recording device in the same housing as the Super Audio CD Player. No Secure Recording Technologies have been defined in this version of the specification.

4.6.3 Unlisted Recorders

It is allowed to record audio content originating from the HD Layer of a Super Audio CD disc to Unlisted Recorders only if the Unlisted Recorder is in compliance with the rules defined in section 4.7.3; this rule only applies to recording via a digital connection to any analog or digital recording device in the same housing as the Super Audio CD Player.

4.7 Super Audio CD Player Compliance and Robustness Rules

4.7.1 PSP-PDM detection and content decryption

A Super Audio CD Player shall only play a Super Audio CD disc after the player has detected the presence of a valid PSP-PDM. If a valid PSP-PDM is not detected, the Super Audio CD player shall not play that disc.

4.7.2 EKB decoding and content decryption

A Super Audio CD player shall only play a Super Audio CD Version 2.0 or higher disc after the player has decoded the EKB correctly. If the EKB is not found on a Super Audio CD Version 2.0 or higher disc, or if the EKB is not decoded correctly, the player shall not play that disc.

4.7.3 CCI Compliance Rules

This section 4.7.3 defines the CCI compliance rules for Super Audio CD players. The purpose of CCI is to control copying of the DSD and/or DST content originating from the HD Layer of a Super Audio CD disc.

In case of Super Audio CD Computer Sub-Units, the CCI compliance rules as specified in this section 4.7.3, and all sub sections, shall be implemented in the Super Audio CD Host Sub-Unit. In case of Super Audio CD Computer Sub-Units, the Super Audio CD Drive Sub-Unit shall transfer the decrypted content of the Sectors containing Audio_CCI unmodified to the Super Audio CD Host Sub-Unit via an approved Super Audio CD Drive Interface.

Before interpreting the CCI values from a Super Audio CD disc, Super Audio CD Host Sub-Units shall calculate the MD5 hash over Audio_CCI_Data and compare the result with Hash_Code, see section 3.2.1. If the calculated MD5 hash and the value of Hash_Code are not equal, the Super Audio CD Host Sub-Units shall apply the Default CCI values to all Tracks of this Super Audio CD disc.

4.7.3.1 Default CCI values

If Track_List_3 is not present in the Track Area of a Super Audio CD disc, the Super Audio CD player shall apply the default CCI settings to all Tracks in that Track Area, also see section 3.2. The default CCI settings are:

Count_A = 1; Count_S = 0; Count_U = 0;
Q_A = 0; Q_S = 0;Q_U = 0;
Move_A = 0; Move_S = 0; Move_U = 0;

4.7.3.2 Transfer of CCI to recorders

This section 4.7.3.2 defines the rules for transferring the CCI of the DSD or DST content of the Audio Tracks to recorders.
Copy Never means that it is not allowed to make any copy of the DSD or DST content of Track[tno].
Copy Freely means that it is allowed to make an unlimited number of copies of the DSD or DST content of Track[tno] with an audio quality as indicated by the relevant Q_A, Q_S or Q_U values.
Copy One Generation means that only one generation of copies of the DSD or DST content of Track[tno] is allowed with an audio quality as indicated by the relevant Q_A, Q_S or Q_U values.

4.7.3.2.1 Transfer to Approved Secure Recorders and/or Approved Secure Digital Interfaces

This section 4.7.3.2.1 defines copy control rules when sending the DSD or DST content of Track[tno] to an Approved Secure Recorder and/or to an Approved Secure Digital Interface.

4.7.3.2.1.1 Copy Never

If the Count_A value for Track[tno] as stored in the List Of Tracks (see section 4.7.3.3) is equal to zero, the Super Audio CD player shall treat the DSD or DST content of Track[tno] as Copy Never.
It is not allowed to send the DSD or DST content of an Audio Track with Copy Never status to an Approved Secure Recorder.
It is allowed to send the DSD or DST content of an Audio Track with Copy Never status to an Approved Secure Digital Interface only if the Approved Secure Digital Interface does not permit copying, or if the Copy Never status can be transferred via the Approved Secure Digital Interface.

4.7.3.2.1.2 Copy Freely

If Count_A for Track[tno] is equal to 255, the Super Audio CD player shall treat the DSD or DST content of Track[tno] as Copy Freely.
It is allowed to send the DSD or DST content of an Audio Track with Copy Freely status to an Approved Secure Recorder only if the Q_A status can be transferred to this Approved Secure Recorder.
It is allowed to send the DSD or DST content of an Audio Track with Copy Freely status to an Approved Secure Digital Interface only if the Q_A status can be transferred via the Approved Secure Digital Interface.

4.7.3.2.1.3 Copy One Generation

If the Count_A value for Track[tno] as stored in the List Of Tracks (see section 4.7.3.3) is greater than zero and less than 255, the Super Audio CD player shall treat the DSD or DST content of Track[tno] as Copy One Generation.
It is allowed to send the DSD or DST content of an Audio Track with Copy One Generation status to an Approved Secure Recorder only if the Copy One Generation status and the Q_A status and the Move_A status can be transferred to this Approved Secure Recorder.
It is allowed to send the DSD or DST content of an Audio Track with Copy One Generation status to an Approved Secure Digital Interface only if the Approved Secure Digital Interface does not permit copying, or if the Copy One Generation status and the Q_A status and the Move_A status can be transferred via the Approved Secure Digital Interface.

4.7.3.2.2 Transfer to Secure Recorders

This section 4.7.3.2.2 defines copy control rules when sending the DSD or DST content of Track[tno] to a Secure Recorder.

4.7.3.2.2.1 Copy Never

If Count_S for Track[tno] is equal to zero or if the Count_S value for Track[tno] as stored in the List Of Tracks (see section 4.7.3.3) is equal to zero, the Super Audio CD player shall treat the DSD or DST content of Track[tno] as Copy Never.
It is not allowed to send the DSD or DST content of an Audio Track with Copy Never status to a Secure Recorder.

4.7.3.2.2.2 Copy Freely

If Count_S for Track[tno] is equal to 255, the Super Audio CD player shall treat the DSD or DST content of Track[tno] as Copy Freely.
It is allowed to send the DSD or DST content of an Audio Track with Copy Freely status to a Secure Recorder only if the Q_S status can be transferred to this Secure Recorder.

4.7.3.2.2.3 Copy One Generation

If the Count_S value for Track[tno] as stored in the List Of Tracks (see section 4.7.3.3) is greater than zero and less than 255, the Super Audio CD player shall treat the DSD or DST content of Track[tno] as Copy One Generation.
It is allowed to send the DSD or DST content of an Audio Track with Copy One Generation status to a Secure Recorder only if the Copy One Generation status and the Q_S status and the Move_S status can be transferred to this Secure Recorder.

4.7.3.2.3 Transfer to Unlisted Recorders

This section 4.7.3.2.3 defines copy control rules when sending the DSD or DST content of Track[tno] to an Unlisted Recorder.

4.7.3.2.3.1 Copy Never

If Count_U for Track[tno] is equal to zero or if the Count_U value for Track[tno] as stored in the List Of Tracks (see section 4.7.3.3) is equal to zero, the Super Audio CD player shall treat the DSD or DST content of Track[tno] as Copy Never.
It is not allowed to send the DSD or DST content of an Audio Track with Copy Never status to an Unlisted Recorder.

4.7.3.2.3.2 Copy Freely

If Count_U for Track[tno] is equal to 255, the Super Audio CD player shall treat the DSD or DST content of Track[tno] as Copy Freely.
It is allowed to send the DSD or DST content of an Audio Track with Copy Freely status to an Unlisted Recorder only if the Q_U status can be transferred to this Unlisted Recorder.

4.7.3.2.3.3 Copy One Generation

If the Count_U value for Track[tno] as stored in the List Of Tracks (see section 4.7.3.3) is greater than zero and less than 255, the Super Audio CD player shall treat the DSD or DST content of Track[tno] as Copy One Generation.
It is allowed to send the DSD or DST content of an Audio Track with Copy One Generation status to an Unlisted Recorder only if the Copy One Generation status and the Q_U status and the Move_U status can be transferred to this Unlisted Recorder.

4.7.3.3 Storage of Count_A, Count_S and Count_U

This section 4.7.3.3 defines the storage and maintenance of the Count_A, Count_S and Count_U values. Every Super Audio CD player with either one or more internal recorders or one or more Approved Secure Digital Interfaces that allow recording shall store and maintain in non-volatile memory a List Of Tracks. The List Of Tracks shall allow storage of identifiers for Audio Tracks with the associated Count_A and/or Count_S and/or Count_U values as required by this section.

Identification of the Audio Tracks shall be based on unique disc and track properties, for instance a combination of the Album_Catalog_Number (see Super Audio CD Part 2 section 3.1.1.2.3) and the ISRC (see Super Audio CD Part 2 section 3.2.4.2), or a hash of the Master TOC and the Track Number of the Audio Track.

The storage space for the List Of Tracks shall allow minimum 500 Audio Tracks. Only after the storage space for the List Of Tracks is exceeded, it is allowed to delete any track identifier with the associated Count_A and/or Count_S and/or Count_U values from the List Of Tracks. If the storage space for the List Of Tracks is exceeded, only the track identifier with the associated Count_A and/or Count_S and/or Count_U values stored least recently will be deleted from the List Of Tracks.

4.7.3.3.1 Count_A

In case the value of Count_A for Track[tno] is not equal to 255, and the content of Track[tno] will be transferred to an Approved Secure Recorder, the Super Audio CD player shall execute the following actions in the order of appearance:

1. If the List Of Tracks does not contain a value of Count_A for Track[tno], the player shall copy the content of the Count_A field for Track[tno] into the List Of Tracks.
2. If the stored value of Count_A is not equal to zero, allow recording, otherwise do not allow recording.
3. If the stored value of Count_A is not equal to zero, decrement the stored value of Count_A by one.

4.7.3.3.2 Count_S

In case the value of Count_S for Track[tno] is not equal to zero or 255, and the content of Track[tno] will be transferred to a Secure Recorder, the Super Audio CD player shall execute the following actions in the order of appearance:

1. If the List Of Tracks does not contain a value of Count_S for Track[tno], the player shall copy the content of the Count_S field for Track[tno] into the List Of Tracks.
2. If the stored value of Count_S is not equal to zero, allow recording, otherwise do not allow recording.
3. If the stored value of Count_S is not equal to zero, decrement the stored value of Count_S by one.

4.7.3.3.3 Count_U

In case the value of Count_U for Track[tno] is not equal to zero or 255, and the content of Track[tno] will be transferred to an Unlisted Recorder, the Super Audio CD player shall execute the following actions in the order of appearance:

1. If the List Of Tracks does not contain a value of Count_U for Track[tno], the player shall copy the content of the Count_U field for Track[tno] into the List Of Tracks.
2. If the stored value of Count_U is not equal to zero, allow recording, otherwise do not allow recording.
3. If the stored value of Count_U is not equal to zero, decrement the stored value of Count_U by one.

4.7.4 Robustness Requirements

4.7.4.1 PSP-PDM detection, EKB decoding, Player Authorization and decryption

The terms of this Section 4.7.4.1 shall apply to licensee's Super Audio CD Players and Super Audio CD Player Sub-units to the extent that they implement PSP-PDM detection, EKB decoding, Player Authorization and decryption.

Licensee's Super Audio CD Player and Super Audio CD Player Sub-unit implementations shall, pursuant to Section 4.7.4.1.1 and Section 4.7.4.3, be clearly designed in a manner that would effectively frustrate each of the following:

- attempts to defeat the copy protection functions related to PSP-PDM detection, EKB decoding, Player Authorization and decryption;
- attempts to discover confidential Super Audio CD decryption keys;
- attempts to discover highly confidential information in the form of PSP-PDM signal processing, Player Authorization and Super Audio CD decryption algorithms;
- attempts to discover and/or change confidential Super Audio CD Player Device Keys;
- attempts to change the Super Audio CD Player Device ID.

4.7.4.1.1 Implementation requirements

Licensee's Super Audio CD Player and Super Audio CD Player Sub-unit implementations shall conform to the following requirements:

- PSP-PDM detection, EKB decoding (partly), Player Authorization and decryption functionality shall solely be implemented in hardware, in one single LSI.

4.7.4.2 Super Audio CD Mark detection and processing

The terms of this Section 4.7.4.2 shall apply to licensee's Super Audio CD Players and Super Audio CD Player Sub-units to the extent that they implement Super Audio CD Mark detection and processing.

In an Integrated Product a Super Audio CD Player Sub-unit performing Super Audio CD Mark detection and processing shall only transfer HD Layer content to the Super Audio CD Player Sub-unit implementing Super Audio CD decryption.

Licensee's Super Audio CD Player and Super Audio CD Player Sub-unit implementations shall, pursuant to Section 4.7.4.3, be clearly designed in a manner that would effectively frustrate each of the following:

- attempts to defeat the copy protection functions related to Super Audio CD Mark detection and decryption;
- attempts to discover the confidential Super Audio CD Mark decryption key;
- attempts to discover highly confidential information in the form of Super Audio CD Mark decryption algorithms.

4.7.4.3 Robustness properties

(a) Licensee's Super Audio CD Player and Super Audio CD Player Sub-unit implementations shall be designed in a manner which ensures that the characteristics set forth in Sections 4.7.4.1 and 4.7.4.2.
- cannot be defeated or circumvented using general purpose tools or equipment that are widely available at a reasonable price, such as screwdrivers, jumpers, clips and soldering irons, or using specialized electronic tools that are widely available at a reasonable price, such as eeprom readers and writers. Such tools shall not include either (A) professional tools or equipment, such as logic analyzers, chip disassembly systems, or in-circuit emulators or (B) specialized devices or technologies that are designed and made available for the purpose of bypassing or circumventing the technologies set forth in this Copy Protection Specification ("Circumvention Devices");
- can only with difficulty be defeated or circumvented using professional tools or equipment, such as logic analyzers, chip disassembly systems, or in-circuit emulators, but not including either professional tools or equipment that are made available on the basis of a non-disclosure agreement or Circumvention Devices.

(b) Licensee's Super Audio CD Player and Super Audio CD Player Sub-unit implementations also shall:
- protect decryption (key) data, the PSP-PDM detection algorithm, the Super Audio CD decryption algorithms, the Super Audio CD Device Keys, and the EKB decoding and Player Authorization algorithms against being revealed without explicit and proper authorization by designing Super Audio CD Players and Super Audio CD Player Sub-units so that the PSP-PDM data as well as decoded EKB data is not available outside integrated circuits;
- not carry decrypted DSD or DST data and/or Text And Pictures data on a user accessible bus. A user accessible bus means a data bus which is designed for end user upgrades or access such as PCI, PCMCIA, or Cardbus, but not memory buses, CPU buses, and similar elements of a device's internal architecture;
- Prevent any user from having ready access to exposed internal components such as switches, wires, connectors or jumpers by which the copy protection technologies set forth in this Copy Protection Specification can be circumvented.

(c) Licensee's Integrated Product shall, pursuant to Section 4.7.4.3, be clearly designed in a manner that would effectively frustrate attempts to defeat the integration of Super Audio CD Player Sub-units.

4.7.4.4 Compliance

Notwithstanding any other requirement in this Section 4.7.4, Super Audio CD Player implementations satisfy the terms of Sections 4.7.4.1, 4.7.4.2 and 4.7.4.3 at any particular point in time if the characteristics set out in Section 4.7.4.1 and 4.7.4.2 and the designs set out in Section 4.7.4.3 can be circumvented at that time only by methods that would effectively disable Licensee's Super Audio CD Players (i.e. by disabling or removing the primary functions of such Super Audio CD Players).

4.8 Industry Consensus Watermark

Every Super Audio CD Player licensee must, when selecting among technological implementations for Super Audio CD Players, take commercially reasonable care (taking into consideration the reasonableness of the cost of implementation, as well as the comparability of their technical characteristics, of applicable commercial terms and conditions, and of their impact on recorded works and on the effectiveness and visibility of the Industry Consensus Watermark) that Super Audio CD Players and components thereof do not strip, obscure, or alter the value of the Industry Consensus Watermark used for Super Audio CD Discs; and Company shall not knowingly market, promote, advertise or distribute or knowingly cooperate in the marketing, promotion or advertising of products or components thereof for the purpose of stripping, obscuring or altering the value of the Industry Consensus Watermark used for Super Audio CD Discs.

For the avoidance of doubt, above paragraph shall not prevent Super Audio CD Players from incorporating standard audio processing features including but not limited to fade-in, fade-out, level control, dynamic range compression, pitch control, digital crossover, noise reduction for the purpose of removing hiss or other artifacts of analog recording, noise shaping as part of sigma delta modulation of DSD data, fast-forward, fast-reverse, slow-forward, slow-reverse, reverse-playback, compression to standard widely used formats, decompression of DST, channel mixing, equalization, and down sampling, provided that Every Super Audio CD Player licensee shall take commercially reasonable care in the selection of an implementation of such feature to ensure that such features do not strip, alter the value of the watermark or, obscure with the Industry Consensus Watermark.

5. Super Audio CD Disc

This section extends Section 2 'Disc Layout' of Super Audio CD Part 2.

5.1 Content encryption

Figure 5-1 defines which Areas (see Super Audio CD Part 2 section 2.2) must contain encrypted data, which Areas must never contain encrypted data, and which Areas on the disc optionally may contain encrypted data. The encryption of information in parts of the disc not mentioned in Figure 5-1 is optional.

Area		**Data encryption**
File System Area		Never
DTCP Area		Never
EKB1 Area		Never
Master_TOC Area		Never
Rev TOC Area		Never
2-Channel Stereo Area	Area TOC-1, Area TOC-3	Partly[1]
	Track Area	Mandatory
	Area TOC-2, Area TOC-4	Partly[1]
Multi Channel Area	Area TOC-1, Area TOC-3	Partly[1]
	Track Area	Mandatory
	Area TOC-2, Area TOC-4	Partly[1]
Extension Area	Extension TOC	Never
	Extension Data	Mandatory
EKB2 Area		Never
Revocation Data Area		Optional
Extra Data Area		Optional

Figure 5-1: Area Encryption Permissions

[1] The sectors containing Audio_CCI are mandatory encrypted. All other sectors of the Area TOC must not be encrypted.

This page is intentionally left blank

6. Super Audio CD LSI

A Super Audio CD Player shall implement PSP-PDM detection, EKB decoding, Player Authorization and content decryption functionality. For LSI implementation purposes a description of the PSP-PDM detection, EKB decoding (partly), Player Authorization and content decryption functionality will be provided by the Super Audio CD licensor in the form of an IC description language. This description will be called IP-Pack.

6.1 LSI implementation and IP-Pack use requirements

The following requirements shall be obeyed for implementation of PSP-PDM detection, EKB decoding, Player Authorization, and content decryption functionality in an LSI and for the use of the IP-Pack:

- PSP-PDM detection, EKB decoding (partly), Player Authorization, and content decryption functionality shall only be implemented using an IP-Pack provided by the Super Audio CD licensor.
- The complete IP-Pack functionality shall be implemented in one single LSI.
- The only signals from an IP-Pack that are allowed as output signals of the LSI, are the signals that are specified as outputs in the IP-Pack.
- It is strictly prohibited to reverse engineer or analyze an IP-Pack.
- The requirements as given in Part 3-LSI for a specific IP-Pack shall be obeyed.

Annex A: Requirements for Approved Secure Digital Interfaces (Informative)

This Annex contains requirements for Approved Secure Digital Interfaces to be used with Super Audio CD players.
The Criteria for Approval of a technology as Secure Digital Interface Technology include:

(i) The technology must enable secure transmission of content of the HD layer of a Super Audio CD disc including, but not limited to, encryption of the content during transmission and authentication between the two sides of the Approved Secure Interface.
(ii) The technology must enable transportation of the CCI encoded on the HD layer of a Super Audio CD disc.
(iii) With respect to audio content the technology is a) permitted to be used only for audio that is not extracted or created by a user and is offered for commercial purposes; or, alternatively b) if the technology is used for other types of audio, the technology must effectively ensure that the content to be carried is authorized by the content owner to be carried on such technology. For the purpose of this section, the term “user” means user of a licensed product.
(iv) The technology must impose robustness rules which are no less stringent than those in the Super Audio CD System.
(v) The technology must be accompanied by enforcement mechanisms no less favorable to Content Participant than those with respect to Super Audio CD, including third party beneficiary rights.
(vi) The technology must not approve a recording technology or permit recording without authorization by the Super Audio CD Licensors that such recording technology constitutes an Approved Secure Recording Technology pursuant to the provisions hereof; provided that the technology may permit recording by a recorder that is not an Approved Secure Recorder if CCI set by the Content Participant explicitly so permit.
(vii) The technology must be proprietary and must be licensed under fair and reasonable, non-discriminatory terms and conditions to content participants and licensees and on terms (other than financial terms) that are no less favorable to Content Participants than those with respect to Super Audio CD, taking into account as a whole all of the provisions thereof. For purposes of the preceding sentence, terms to be considered shall include without limitation: change management, scope of non-asserts licenses and/or grant backs (including treatment of affiliates with respect thereto) and term of agreement or license. In the event that such technology requires financial payment from content owner(s), then such technology may be approved hereunder only to the extent that such technology may be bypassed, turned off or otherwise not used at the content owner’s election, and the content owner must be offered such right of election.
(viii) The technology must provide for the right of a content owner to seek revocation in the event the security elements of an individual source device or sink device have been cloned or lost, stolen, intercepted or otherwise misdirected, or made public or disclosed without authority.
(ix) The technology must prevent the distribution of content over the Internet or otherwise outside of a household without authorization of the right holder.
(x) The technology shall not impose any restrictions or mandates as to how specified types of content or business models may be treated by content owners (i.e. encoding rules) and shall not permit copies in derogation from the copy state specified by the content owner; provided that if such technology does not enable such copy state as is specified by the content owner, then, in such case, such technology shall instead impose a more restrictive copy state. (By way of example, if “copy once” is specified by the content owner but such status is unavailable, then “copy never” may be utilized.)
(xi) If, at the time such technology is presented for approval hereunder to be listed as an Approved Secure Digital Interface Technology, such technology has itself already approved one or more recording technology(ies), then such technology can be approved hereunder as an Approved Secure Digital Interface Technology only when such recording technology(ies) are also approved as an Approved Secure Recording Technology in the Super Audio CD System pursuant to the provisions herein.
(xii) The technology must be subject to agreements described in Annex C(B).
(xiii) When considered together and taken as a whole, approved technologies hereunder shall not detract from effective protection of Super Audio CD content.

A.1 Requirements for Approved Secure Rear Loudspeaker Interfaces (a subset of Secure Digital Interface Technologies)

This Annex contains requirements for Approved Secure Digital Rear Loudspeaker Interfaces to be used with Super Audio CD players.
The Criteria for Approval of a technology as Secure Digital Rear Loudspeaker Interface Technology include:

(i) The interface may only transmit content from Audio Channel 4 (Left Surround if N_Channels is equal to 5, or LFE if N_Channels is equal to 6), Audio Channel 5 (Right Surround if N_Channels is equal to 5, or Left Surround if N_Channels is equal to 6), and/or Audio Channel 6 (Right Surround if N_Channels is equal to 6) from the HD Layer Content of a Super Audio CD disc and shall not transmit content from Audio Channel 1 (Left), Audio Channel 2 (Right) and/or Audio Channel 3 (Center) of such a Super Audio CD Disc.

(ii) The technology may not allow or facilitate recording in any manner, and shall ensure that all content transmitted is treated as "Copy Never".

(iii) The technology must enable secure transmission of content of the HD layer of a Super Audio CD disc including, but not limited to, encryption of the content during transmission and authentication between the two sides of the Approved Secure Interface.

(iv) With respect to audio content the technology is a) permitted to be used only for audio that is not extracted or created by a user and is offered for commercial purposes; or, alternatively b) if the technology is used for other types of audio, the technology must effectively ensure that the content to be carried is authorized by the content owner to be carried on such technology. For the purpose of this section, the term "user" means user of a licensed product.

(v) The technology must impose robustness rules which are no less stringent than those in the Super Audio CD System.

(vi) The technology must be accompanied by enforcement mechanisms no less favorable to Content Participant than those with respect to Super Audio CD, including third party beneficiary rights.

(vii) The technology must not approve a recording technology or permit recording.

(viii) The technology must be proprietary and must be licensed under fair and reasonable, non-discriminatory terms and conditions to content participants and licensees and on terms (other than financial terms) that are no less favorable to Content Participants than those with respect to Super Audio CD, taking into account as a whole all of the provisions thereof. For purposes of the preceding sentence, terms to be considered shall include without limitation: change management, scope of non-asserts licenses and/or grant backs (including treatment of affiliates with respect thereto) and term of agreement or license. In the event that such technology requires financial payment from content owner(s), then such technology may be approved hereunder only to the extent that such technology may be bypassed, turned off or otherwise not used at the content owner's election, and the content owner must be offered such right of election. License of the technology to licensees shall terminate at the same time as the approval of such technology expires according to the Note at the end of this Annex A.1.

(ix) The technology must prevent the distribution of content over the Internet or otherwise outside of a household without authorization of the right holder.

(x) The technology shall not impose any restrictions or mandates as to how specified types of content or business models may be treated by content owners (i.e. encoding rules).

(xi) The technology must be subject to agreements described in Annex C(B).

(xii) When considered together and taken as a whole, approved technologies hereunder shall not detract from effective protection of Super Audio CD content.

(xiii) The technology must transmit content of the HD layer of a Super Audio CD disc at a rate that does not exceed real time speed, except for "Fast Forward" or "Fast Reverse" mode. "Fast Forward" and "Fast Reverse" are playback modes that are designed and implemented solely for the purpose of rendering and not recording and that render such signal incompletely, distorted and in uncorrectable form only.

(xiv) The technology must enable transmission of content of the HD layer of a Super Audio CD disc to rear and/or LFE loudspeakers only. It shall not allow transmission of HD layer of a Super Audio CD disc to other devices, including but not limited to recorders and computers.

Note: This Annex A.1 expires at a certain date, after which (a) no technology shall be approved under the criteria in this Annex A.1, and (b) all approval of Approved Secure Rear Loudspeaker Interfaces under the criteria in this Annex A.1 shall expire. After such expiration date, Licensees shall not manufacture Licensed Products with an interface approved according to this criteria A1. Such expiration date shall be the earlier of either (a) 18 month after a wireless interface capable of transmitting HD Layer content of a Super Audio CD disc, including those originating from Super Audio CD Channels 4, 5 and 6, is approved as an Approved Secure Digital Interface under the criteria as set forth in Annex A, or (b) January 1, 2009. If no wireless interface capable of transmitting HD Layer content of a Super Audio CD disc is approved in accordance with Annex A by July 1, 2007, extension of the date in (b) may be considered.

Annex B: Requirements for Approved Secure Recording Technologies (Informative)

This Annex contains requirements for Approved Secure Recording Technologies to be used for recording of HD Layer content of Super Audio CD discs.

The Criteria for the Approval of a technology as Secure Recording Technology include:

(i) The technology must enable secure recording of content from the HD layer of a Super Audio CD disc including, but not limited to, encryption of the content.

(ii) The technology must specify the detection of and compliance with CCI, including updating the CCI to reflect any copy made.

(iii) The technology must impose robustness rules which are no less stringent than those in the Super Audio CD System.

(iv) The technology must be accompanied by enforcement mechanisms no less favorable to Content Participant than those with respect to Super Audio CD, including third party beneficiary rights.

(v) The playback equipment for Secure Audio Recordings must not allow a digital output that is not Approved Secure Interface in the Super Audio CD System or is otherwise not allowed in the Super Audio CD System.

(vi) The technology must provide for the right of content owner to seek revocation in the event the security elements of an individual Approved Secure Recorder have been cloned or lost, stolen, intercepted or otherwise misdirected, or made public or disclosed without authority.

(vii) If the input signal for recording does not come from a Protected Source, the Approved Secure Recorder must either block recording of the input signal, or the Approved Secure Recorder must screen the input signal with a Screen.

(viii) The technology must specify and require compliance with the copy control information that is detected by the Screen in content from a non-Protected Source.

(ix) If the Screen detects a copy-one-generation status in content from a non-Protected Source, the Approved Secure Recorder must encrypt the recording and digital copy control information must be set to prevent further copying. Updating of the watermark information may be required.

(x) If, at the time such technology is presented for approval hereunder to be listed as an Approved Secure Recording Technology, such technology has itself already approved one or more digital interface technology(ies), then such recording technology can be approved only when the output is also approved as an Approved Secure Digital Interface Technology in the Super Audio CD System pursuant to the provisions herein.

(xi) The technology shall not impose any restrictions or mandates as to how specified types of content or business models may be treated by content owners (i.e. encoding rules) and shall not permit copies in derogation from the copy state specified by the content owner; provided that if such technology does not enable such copy state as is specified by the content owner, then, in such case, such technology shall instead impose a more restrictive copy state. (By way of example, if “copy once” is specified by the content owner but such state is unavailable, then “copy never” may be utilized.)

(xii) The technology must be proprietary and must be licensed under fair and reasonable, non-discriminatory terms and conditions to content participants and licensees, and on terms (other than financial terms) that are no less favorable to Content Participants than those with respect to Super Audio CD, taking into account as a whole all of the provisions thereof. For purpose of the preceding sentence, terms to be considered shall include without limitation: change management, scope of non-asserts licenses and/or grant backs (including treatment of affiliates with respect thereto) and term of agreement or license. In the event that such technology requires financial payment from content owner(s), then such technology may be approved hereunder only to the extent that such technology may be bypassed, turned off or otherwise not used at the content owner’s election, and the content owner must be offered such right of election.

(xiii) The technology must be subject to agreements described in Annex C(B).

(xiv) When considered together and taken as a whole, approved technologies hereunder shall not detract from effective protection of Super Audio CD Content.

Annex C: Additional Requirements for Secure Digital Interface and Secure Recording Technologies (Informative)

The requirements for Approved Secure Digital Interfaces to be used to transport signals originating from the HD Layer of Super Audio CD discs are given in Annex A.
The requirements for Approved Secure Digital Recording technologies to be used for recording signals originating from the HD Layer of Super Audio CD discs are given in Annex B.

In order to insure that Approved Secure Digital Interface (including Secure Rear Loudspeaker Interface Technologies) and Approved Secure Recording Technologies will continue to meet the Criteria which allowed their approval:

(A) Super Audio CD licensors will in good faith consider disapproving and removing from the applicable list any Approved Secure Digital Interface Technology (including Secure Rear Loudspeaker Interface Technologies) ("ASDI") and Approved Secure Recording Technology ("ASR") if the ASDI enables recording of content from the HD layer of a Super Audio CD Disc by a technology that has not been approved as Approved Secure Recording Technology in the Super Audio CD System, or an ASDI or ASR fails to continue to meet any of the approval Criteria; and

(B) as additional mandatory Criteria for Approval, the proprietor of each interface and recording technology must be
   (i) subject to agreements to remain compliant with such Criteria directly with the Super Audio CD licensor, with Content Participant having express, effective third party beneficiary rights to enforce such agreements or
   (ii) subject to such agreements with Content Participant.

Annex D: Approved Secure Digital Interface Technologies (Normative)

This Annex contains the definition of all Approved Secure Digital Interface Technologies that are allowed on Super Audio CD players and on Super Audio CD Player Sub-Units.
Note that this Annex D is subject to revision that may:
(a) withdraw the approval of any Approved Secure Digital Interface Technology as a permitted digital output,
(b) add additional or other permitted digital outputs, and/or
(c) permit parameter settings other than those specified in this Annex D.

The Revocation Data Area can contain revocation information for Approved Secure Digital Interfaces. Figure D-1 contains the list of assigned Revocation_IDs (see Super Audio CD Part 2 section 3.5).

Revocation_ID	Approved Secure Interface Technology
0	Not used
1	DTCP
2	S-DIAT
3	Denon Digital Link
4	HDCP
5	Super Audio CD-SAC
6 .. 65535	Reserved

Figure D-1 : Assigned values of Revocation_ID

D.1 Super Audio CD Player Interfaces

D.1.1 DTCP

Understanding that DTCP for Super Audio CD will meet the criteria described in Annex A, DTCP for Super Audio CD is hereby deemed approved as an Approved Secure Digital Interface Technology solely for purposes of rendering. For avoidance of doubt, DTCP for Super Audio CD is not currently approved for purposes of recording and may be approved for said purpose solely to the extent that such recording is performed by a Super Audio CD Approved Secure Recording Technology as defined in Annex E. Only DTCP mapped on IEEE1394 (see section D.1.1.1) is allowed as Approved Secure Digital Interface Technology.

D.1.1.1 IEEE1394

An external digital output using IEEE 1394 without all copy protection and other attributes of DTCP is not permitted. On a permitted interface the copy management parameter specification of Super Audio CD in DTCP must be used to transfer copy management information. The Super Audio CD specific copy management parameters on the digital interface are Track_Attribute and Track_Copy_Management. The value of Track_Attribute on the digital interface shall be copied from Track_Attribute in the TOC (See Section 3.1). Under this version of the specification, the contents of Track_Copy_Management (see the IEEE 1394, ISO/IEC 61883 and DTCP specifications) shall be set to $00 $00 $00 $00 $00 $00. These parameter settings indicate that no copies are allowed according to this version of the specification.

D.1.2 Secure Digital Infrared Audio Transmission, S-DIAT

The digital interface technology known as "Secure Digital Infrared Audio Transmission, S-DIAT", Version 1.0, dated May 2003, is approved according to Annex A.1 as an Approved Secure Rear Loudspeaker Interface for the purpose of rendering audio originating from Audio Channel 4 (Left Surround if N_Channels is equal to 5, or LFE if N_Channels is equal to 6), Audio Channel 5 (Right Surround if N_Channels is equal to 5, or Left Surround if N_Channels is equal to 6) and/or Audio Channel 6 (Right Surround if N_Channels is equal to 6) from the HD Layer content of a Super Audio CD disc. License information can be obtained by sending a request to the following email address: wlsrsp@super-audiocd.com

Super Audio CD licensees shall cease to use S-DIAT, Version 1.0, dated May 2003, at the earlier of either (a) 18 months after a wireless interface capable of transmitting HD Layer content of a Super Audio CD disc, including those originating from Super Audio CD Channel 4 (Left Surround if N_Channels is equal to 5, or LFE if N_Channels is equal to 6), Channel 5 (Right Surround if N_Channels is equal to 5, or Left Surround if N_Channels is equal to 6) and/or Channel 6 (Right Surround if N_Channels is equal to 6), is approved as an Approved Secure Digital Interface under the criteria as set forth in Annex A, or (b) January 1, 2009. If no wireless interface capable of transmitting HD Layer content of a Super Audio CD disc is approved in accordance with Annex A by July 1, 2007, extension of the date in (b) may be considered.

D.1.3 Denon Digital Link

The digital interface technology known as "Denon Digital Link Copy Protection Technology, DDLCPT", Version 1.0, is approved according to Annex A as Approved Secure Digital Interface Technology for the purpose of rendering audio originating from the HD Layer of a Super Audio CD disc. License information can be obtained from:

Denon, Ltd.
c/o DDLCPT Group
Engineering Department
1-1, Oikuboyama
Shirakawa-shi
Fukushima 961-0838
Japan

D.1.4 HDCP

The digital interface technology known as HDCP is approved according to Annex A as an Approved Secure Digital Interface Technology solely for purpose of rendering. Only HDCP mapped on HDMI as defined below is allowed as Approved Secure Digital Interface Technology.

An external digital output using HDMI without all copy protection and other attributes of HDCP is not permitted. Output to HDMI devices without their Supports_AI = 1 (see HDMI) is not permitted. On a permitted interface the copy management parameter specification of Super Audio CD in HDCP must be used to transfer the copy management information from the Super Audio CD disc. The Super Audio CD Specific copy management parameters on the digital interface are stored in an ACP Packet with ACP_Type = 3 (see HDMI). The content of CCI_1 (see section 3.2.2.1) must be transmitted within the ACP Packet.

D.2 Super Audio CD Drive Interfaces

D.2.1 Super Audio CD Secure Authenticated Channel (Super Audio CD - SAC)

The digital interface technology known as “Super Audio CD Secure Authenticated Channel” or “Super Audio CD - SAC” version 1.0, is approved according to Annex A as Approved Secure Digital Interface Technology.
Super Audio CD - SAC is a technology for interfacing Super Audio CD enabled optical drives (Super Audio CD Drive Sub-Units) with trusted software and/or hardware components in a PC (Super Audio CD Host Sub-Units). License information can be obtained by sending a request to the following e-mail address: au-superaudiocd-license@jp.sony.com.

Annex E: Approved Secure Recording Technologies (Normative)

This annex contains the definition of all Approved Secure Recording Technologies that are allowed to record content from the HD Layer of a Super Audio CD disc.

No Approved Secure Recording Technologies are defined in this version of the specification.

Annex F: Secure Recording Technologies (Normative)

This annex contains the definition of all Secure Recording Technologies that are allowed to record content from the HD Layer of a Super Audio CD disc.

No Secure Recording Technologies are defined in this version of the specification.

This page is intentionally left blank.

List of Changes

Changes from "Super Audio CD System Description Part 3-General, Version 2" to "Super Audio CD System Description Part 3-General, Version 2.1"

The change from Super Audio CD Part 3-General Version 2 to Super Audio CD Part 3-General Version 2.1 is:

- Section 4.2 "Transmission of HD Layer Content in CD Audio Quality or less formats via Digital Interfaces" has been added
- Annex D.1.3 with the approved Denon Digital Link interface has been added.
- Annex D.1.4 with the approved HDCP interface has been added.
- Annex D.2.1 with the approved Super Audio CD-SAC interface has been added

Unless stated otherwise, the section and figure numbers in the following list refer to the numbers found in Version 2.1.

Section	Version 2	Version 2.1	Remarks
1.3	--	HDCP ...	HDCP added.
1.3	--	HDMI ...	HDMI added.
1.3	--	Super Audio CD-SAC …	Super Audio CD-SAC added.
4.2	No external digital output from a Super Audio CD player or Super Audio CD Player Sub-unit other than the Approved Secure Digital Interfaces as defined in section 4.2.2 is allowed for the transfer of HD Layer DSD content, HD Layer DST content and Text And Pictures content.	No external digital output from a Super Audio CD player or Super Audio CD Player Sub-unit other than: (a) the Approved Secure Digital Interfaces as defined in section 4.2.2, or (b) the output as permitted in section 0 is allowed for the transfer of HD Layer DSD content, HD Layer DST content and Text And Pictures content.	Due to new interface specification in section 4.2.4
4.2	A Super Audio CD Player Sub-unit interface that is a digital connection to another Super Audio CD Player Sub-unit in a separate housing is an "external digital output" and must comply with the first paragraph of this Section 4.2 – that is, it must comprise an Approved Secure Digital Interface as defined in section 4.2.2 or be inoperable such that no HD Layer content may be transferred over it.	A Super Audio CD Player Sub-unit interface that is a digital connection to another Super Audio CD Player Sub-unit in a separate housing is an "external digital output" and must comply with (a) of the first paragraph of this Section 4.2 – that is, it must comprise an Approved Secure Digital Interface as defined in section 4.2.2 or be inoperable such that no HD Layer content may be transferred over it.	Due to new interface specification in section 4.2.4
4.2.4	---	4.2.4 Transmission of HD Layer Content in CD Audio Quality or less formats via Digital Interfaces	New interface requirements

Section	Version 2	Version 2.1	Remarks
Annex D Fig. D-1	--	3 Denon Digital Link	Denon Digital Link added.
Annex D Fig. D-1	3..65535 Reserved	4..65535 Reserved	Denon Digital Link added.
Annex D.1.3	--	D.1.3 Denon Digital Link ...	Denon Digital Link added.
Annex D Fig. D-1	4..65535 Reserved	6..65535 Reserved	HDCP added.
Annex D.1.3	--	D.1.3 Denon Digital Link ...	Denon Digital Link added.
Annex D.1.4	--	D.1.4 HDCP ...	HDCP added.
Annex D.2.1	--	D.2.1 Super Audio CD-SAC...	Super Audio CD-SAC added.