PLDS Automotive

CUSTOMER COMMUNICATION INTERFACE SPECIFICATION

CDM – M10 CAv3

Accepted
Version 10.0r0D

Revision History

Version	Date	Change description	Status
10.0	2012-03-30	- Based on sheet 193 version 7.0 2012-03-30	Accepted

Table of contents

1 References and standards

- [1] Functional specification of CDM-M10 CAv3 mechanism, sheet 190
- [2] Application Notes of CDM-M10 CAv3
- [3] Customer specification of CDM-M10 CAv3 mechanism, sheet 591
- [4] Specification of EBU, Subtitling data exchange format, TECH.3264-E February 1991

2 Acronyms

0x..	value is shown in hexadecimal format
1 frame	1/75 sec
A2DP Sink	Advanced Audio Distribution Profile
AAC	Advanced Audio Coding
ADTS	Audio Data Transport Stream
ADPCM	Adaptive Differential Pulse Code Modulation
AG	Audio Gateway
API	Application Programming Interface
ASCII	American Standard Code for Information Interchange
AUX	Auxiliary input
AVRCP CT	Audio/Video Remote Control Profile, Controller
AVRCP TG	Audio/Video Remote Control Profile, Target
BCD	binary coded decimal
BE	Big Endian
BOM	Byte order mark
BT	Bluetooth ™
BW	backward
CA	compressed audio
CAV	constant angle velocity
CBR	constant bit rate
CD	compact disc
CD-CA	Compressed Audio CD (data CD with compressed Audio files on it)
CD-DA	Digital Audio CD (normal CD)
CDDB	Compact Disc Database
CDM-M8 CAv3	compact disc mechanism model 8 compressed audio version 3
CDM-M10 CAv3	compact disc mechanism model 10 compressed audio version 3
CLV	constant linear velocity
CRQ	communication request
CRST	mechanism reset line (including communication reset)
dec	decimal
DTMF	Dual tone multi frequency
EIAJ	Electronic Industries Association of Japan ☞ JEITA
FW	forward
GAP	Generic Access Profile
GB	Guojia Biaozhun (*national Standard)*
GIF	Graphics Interchange Format
hex	hexadecimal
HFP	Handsfree Profile
HSP	Headset Profile
I^2C	inter-integrated circuit (bus)
I^2S	inter-ic sound (digital audio output)
ID3	info tag for MP3-files
iPod	Portable Media Player,™ of Apple Inc.
ISO	International organization for standardization
JEITA	Japan Electronics and Information Technology Industries Association

JPEG	Joint Photographic Experts Group
JTAG	Joint Test Action Group
L2CAP	Logical Link Control and Adaptation Protocol
LBA	logical block address
LE	Little Endian
LSB	least significant byte
LUN	Logical Unit Number
MDB	Media Decoder Board
ML	Media Library
MMC	Multimedia Card
MP3	MPEG – Layer 3 (compressed audio format), abbreviation of ISO MPEG Audio Layer 3
MP4	container for audio, video, text data; that might contain supported AAC encoded audio data
MSB	most significant byte
NAVPTR	Navigation Pointer
OPP	Object Push Profile
OSTA	Optical Storage Association
PB	Phonebook
PBAP PCE	Phonebook Access Profile, Client Equipment
PCM	Pulse Code Modulation
PIN	Personal Identification Number
PNG	Portable Network Graphics
ReqID	requirement identification, for PLDS internal traceability use only
S/P-DIF	Sony/Philips digital interface format
SCL	serial clock line
SCO	Synchronous Connection
SDA	serial data line
SD-card	secure digital memory card
SI	by NAVPTR Selected-Item
SIM	Subscriber Identity Module
sint16	signed integer 16bit
SLC	Service Level Connection
SMS	Short Message Service
SSP	Secure Simple Pairing
TA	traffic announcement
tbd	to be defined
UART	Universal Asynchronous Receiver Transmitter
UDF	Universal disc format
UCS	Universal character set
UID	Unique Identifier
uint8	unsigned integer 8bit, range 00 … FF hex
uint16	unsigned integer 16bit range 0000 …. FFFF hex
uint32	unsigned integer 32bit range 0000 0000 ….FFFF FFFF hex
URL	uniform resource locator
USB	universal serial bus
UTF	Unicode transformation format
V1	servo supply voltage
V2	digital voltage supply
VBR	variable bit rate
WD	by NAVPTR defined Working-Directory
WMA	Windows Media Audio (compressed audio format)
WPL	Windows Media Play-List
x	within tables indicates “supported”
-	within tables indicates “not supported”

3 Definition

The supported devices are described by the product notation.
Example:
CDM-M10 4.11/5 XXXX XXXX describes the supported devices

Table 3-1: Overview of notation

#	notation	supported device			
		USB	SD-card	iPod	BT
1	XXXX	no	no	no	no
2	UXXX	yes	no	no	no
3	XSXX	no	yes	no	no
4	XXIX	no	no	yes	no
5	XXXB	no	no	no	yes

4 Purpose

The purpose of this document is to describe the communication of the PLDS CDM-M10 CAv3 / MDB10 play-back module in a way that a software developer of the application/car radio (I^2C master) is able to create the corresponding software work products.
Additional information and examples are provided by [2]. Supported devices and features are described by [3].

5 Validity

This document is valid for all CDM-M10 CAv3 versions and only describes the functionality of this product without pointing to options that might be available in the future.
This document is valid for the software version shown on the front page.

6 Hardware Interface

The descriptions within this chapter only contain general information that is interesting from the software developer's point of view.
The application interface between the car radio and the CDM-M10 CAv3 mechanism consist of:

- the power interface V1, V2, GND
- the control interface CRST
- the communication interface CRQ, I^2C
- the data- or audio interface S/P-DIF, I^2S, EIAJ or analogue audio (customized)
- the insert sensor switch line (SENS_I) for CD insertion detection

For details regarding the hardware interface, number of supported elements of devices and so on, see customer specification document [3].

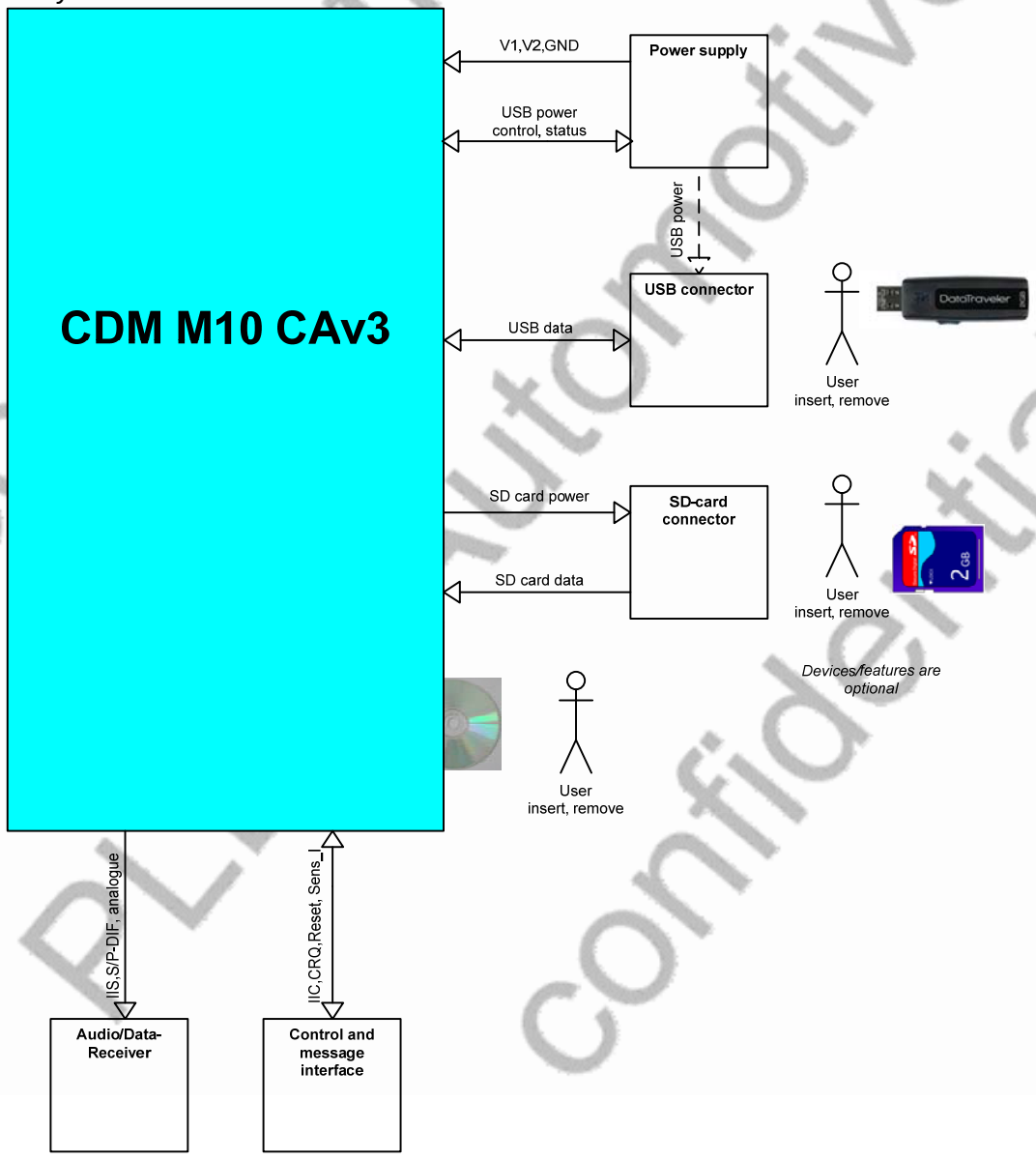
Functionality of the application interface:

- The CRST line is used to reset the CAv3 by the application.
- The SCL and SDA lines represent the I²C bus communication within a single master – slave architecture. The master functionality is provided by the radio and the slave is the CD mechanism.
- The Communication Request line (CRQ) requests a data transfer from the mechanism to the radio. The radio can choose if it polls this line (recommended sample period < 20 ms) or use the negative edge of this line to generate an interrupt. CRQ is active low for maximal 500ms; afterwards CRQ line is released and the message is lost. CRQ goes low, first time after release of reset, within 3 seconds.
  ReqID: CIS/GE001
- The CRQ line is released when the mechanism detect that it is addressed to forward a message.
  ReqID: CIS/GE002
- If the I²C communication is not finalized within 500ms (start to stop condition on I²C bus), the I²C interface is reset and the received data is ignored, messages are not repeated.
  ReqID: CIS/GE003
- The insert sensor is a switch in the mechanism, which detects the insertion of a CD media.

ReqID: CIS/GE004

- If the application is operating in polling mode and no message is available, the data forwarded to the application is set to 0xFF. This is the case until a stop condition is detected.
  ReqID: CIS/GE006
- If the application read more byte than defined by the number of bytes, the mechanism set this data to 0xFF.
  ReqID: CIS/GE007
- A message is a data sequence between a start and stop condition on the I^2C bus. The master generates a start condition and a slave address with read bit set (slave address and least significant bit set = *message*). During the transmission of the slave address the master controls the data line (SDA). After receiving the slave address, the slave takes over the control of the data line (SDA) for every byte, while the master will continue sending clock pulses (SCL) during the whole message. Every data byte needs to be acknowledged by the master. With not-acknowledge, followed by a stop condition, the master stops the transmission.
  ReqID: CIS/MS100

Picture 6-1: System interfaces



7 Basic command information

The application controls the CDM –M10 CAv3 using commands and the mechanism reports information using messages.

The commands are divided into these parts:

- function commands
- device navigation commands
- configuration commands
- request commands

8 Basic message information

The module evaluates messages in different conditions.

An appropriate message is evaluated and transmitted under the following conditions:

- reset release
- end of initialization
- request for transition
- transition of mechanism is finalized
- message as feedback on a command
- play or search mode

9 Communication to the mechanism

Table 9-1: Overview of opcodes used for commands and messages

communication group	code [hex] [1)]	remarks	return message/remark
Function commands	10 to 2F	commands to impact the mode of the mechanism	Module state
Configuration commands	30 to 3F	commands to change the attributes of the mechanism	no return message provided, § 9.3, Configuration
Navigation commands	50 to 6F	commands to set navigation pointer, §9.7Device navigation commands	requested information
Request commands	80 to 9F	commands to request information, §Request commands	requested information
Messages of mechanism	40 to 9F	automatic messages and requested messages, §10, Messages from the mechanism	see §10.2, for detailed information
Service commands and messages	D0 to FF	service commands and messages for software development and testing	not for customer use or partly otional
Not valid	all other and undefined values in the areas shown above	all undefined values of the command byte will be ignored and the mechanism will not change the mode or behavior	no change of module state; status=unknown command

ReqID: CIS/GE005

[1)]: Unused code areas might be used for new options and/or customized functionality.

9.1 Format and overview of commands

A command is a data sequence between a start- and stop-condition generated by the I^2C bus master.
It is required to have at least 8 ms between two commands (time between stop-condition and start-condition).

Table 9-2:: Format of I^2C command

communication		value	generated by
I²C format	application		
Start condition		-	master
Slave address (SLA+W)		30 hex	master, acknowledged by slave
Data bytes according this specification	Command byte	10 hex ...FE hex	
	1. parameter byte	see command description	
	...	- ” -	
	last parameter byte	- ” -	
Stop condition		-	master

2 Parameter used for commands and messages

In any case where parameters exceeds the size of one byte, the order of parameters is defined as MSB - > LSB.

A parameter out of the defined range is responded by the message illegal_command.
ReqID: CIS/FC101

Table 9-3: Parameter

#	name	format	description			remark
1.	abs. time	uint8, uint8, uint8	absolute minutes, absolute seconds, absolute frames			Minute value can exceed 59(dec) At play-back of CA, the content is not relevant.
2.	bit-rate	uint16	kbit rate [kbit/s]			Only valid at CBR
3.	cd-text language	uint8	refer §12.3 ;CD text language code			
4.	check sum	uint8	check sum calcuted on I^2C message			refer §10.1Format of messages
5.	ctrl+addr	uint8	Bitfield according red book			At CA play-back only Index bit is valid.
			bit	name	description	
			0	index	0: pause 1: play-back	
			5	copy-right	0: track is protected 1: track is not protected 0/1: toggle protected	The bit is reported as read from subcode for the time information message
			764		000: no pre-emphasis 001: pre-emphasis 010: data track, uninterrupted recorded 011: data track Incremental recorded	
6.	compression type	uint8	data source type			
			bit	name	description	
			3210	type	0001: MP3	
			3210	type	0010: WMA	
			3210	type	0100: AAC	
			3210	type	1000: PCM	CD-DA, bit rate is set to 1411(dec)/0x0583 kBit/s Setting used for iPod device as well
			654	reser-ved		
			7	BR-type	0: CBR 1: VBR	Only for CBR the bit rate value is defined VBR only for MP3,WMA,AAC support PCM is always linked to CBR.
7.	device-id	uint8	device addressing / source selection			see also § 11.1, LUNs The number of supported sources is adjusted to the customer requirements The general device-id is relevant for all devices. A command related to an unsupported device or undefined device-id is rejected.
			value		device	
			0x00 0x01 0x02 0x04		0000: general device ID (message only) CD device USB device SD-card device	

#	name	format	description			remark
8.	first byte of medium information	uint8	Media content description			Bitfield
			bit	name	description	
			0	audio tracks	0: not existing 1: existing	
			1	data tracks	0: not existing 1: existing	
			2	MP3 files	0: not existing 1: existing	
			3	WMA files	0: not existing 1: existing	
			4	AAC files	0: not existing 1: existing	Contains m4a as well
			5	other supported audio files	0: not existing 1: existing	Other files where play-back is supported (e.g. iPod files)
			67	reser-ved		
9.	directory #	uint16	directory number			On messages reffering to a play-lists, the most significant bit is set
10.	jump-time	uint8	defines the jump distance between play-back periods at search			The resolution is defined by frames * 8 steps. The range of this parameter is 8…255 (08..FF hex) frames * 8. A a range of 853…27200ms is defined. At search backward, this parameter has to exceed the value of the play-time *(ms based)* to ensure the functionallity.
11.	linear song #	uint16	linear song number			
12.	loader_state	uint8	current state of loader 0x00: Not available 0x10: No Media 0x20: Eject 0x40: Inserted 0x60: Error 0x80: Power up, release reset, initialization (temporary state)			If a transition is in progress, the most significant bit of the loader_state is set. During a transition the actual loader_state is undefined. The lower nibble of the player_state byte is used for customer options. Whenever this message is received the module has executed a reset cycle and has to be reinitialized

#	name	format	description	remark
13.	loader_event	uint8	Event on loader	
			Standard events, range 0x00…0xbf	
			0x00: no status (available) 0x10: Automatic insertion 0x20: Insert by user 0x40: Pushback by user 0x60: Hardwired eject 0x70: Media removed, No media	no deviation from expected transition detected
			issue occurred, caused by mechanism, range 0xC0…0xCF	values that are not explicit described may occur; the error-handling has to be done as according to this range
			0xC2: loader switch evaluation error, illegal switch combination detected 0xC3: loader switch evaluation error, floating switch information detected 0xC4: unexpected stop switch signal, stop switch open during play-back	
			issue caused by user invention or mechanism range 0xD0…0xDF	values that are not explicit described may occur; the error-handling has to be done as according to this range
			0xD0: loader insert error1, insertion failed between insert and eject position of loader 0xD1: loader insert error2, insertion failed between eject and stop position of loader 0xD2: loader eject error, eject failed between stop and eject position of loader 0xD3: loader eject error, recovery on eject position failed (eject at eject) 0xD4: unsupported media identified	behaviour on other commands related to this device is undefined
			issue caused by the application, range 0xE0…0xEF	values that are not explicit described may occur; the error-handling has to be done as according to this range
			0xEF: illegal command	command not defined *or* parameter out of range/missing *or* can't be executed at current module state or impossible configuration or information net yet available
14.	M:S:F	uint8, uint8, uint8	Absolute time position on the CD	A plausibility check on the requested absolute M:S:F position is not done, the application is responsibel to choose values in a correct range. The minuimum time that can be addressed is 2 seconds. If a postion < 2 seconds is request, this value is set to 2 seconds.
15.	major and minor software #	uint8, uint8, uint8, uint8 n*uint8	Major; 0x2E (“.”); Minor; release identifier, feature-identification (for internal use only)	Range 1…127 (dec)
16.	Module ID	uint8, uint8	CDM M10 CAv3 module identification First byte : 0x31 on M10, 0x38 on M8 Second byte: 0x33	
17.	np-distance	uint16	This parameter defines the number of next/previous executions based on the setting of the np-mode parameter.	This parameter operates in a range from 1...0xFFFF.

#	name	format	description	remark
18.	np-mode	uint8	This parameter defines the basic on which the Next/Previous command is executed. Empty directories, are skipped and do not impact the distance. 0x01: Next track/file 0x02: Next directory 0x03: Next chapter 0x04: Next play-list 0x81: Previous track/file 0x82: Set NAVPTR to first file of previous directory 0x83: Previous chapter 0x84: Previous play-list	 Supported on iPod audio-book only to be applied on file-system only, currently the value of the np-distance parameter is ignored Supported on iPod audio-book only
19.	none	-	no parameter in use, not part of command, implemented in document only for easy reading	
20.	# CA songs	uint16	Number of available CA files on this media	For the number of CA and iPod files, all files with the extension *.mp3, *.wma, *.aac and *.m4a are taken into account, if enabled by configuration.
21.	# CD-DA tracks	uint8	Number of available CD-DA tracks on this media	
22.	# directories	uint16	Number of directories, evaluated on this media	
23.	# other files	uint16	Number of other files, evaluated on this media	Files where audio play-back is not supported
24.	# play-lists	uint16	Number of play-lists, evaluated on this media	For the number of play-list, all extension M3U, ASX, WPL and PLS are taken into account, if enabled by configuration.
25.	# data track	uint16	Number of data-tracks, evaluated on this media	Includes recorded CD-DA files on device recording memory (device-id)
26.	# of songs	uint16	#- of songs	Within current WD
27.	# of songs in play-list	uint16	#- of songs within play-list	Subdirectories within play-list are ignored at all
28.	# of subdirectory	uint16	number of subdirectory	Within current WD, on first level
29.	# byte reported from configuration array	uint8	number of byte from configuration array	
30.	offset MM:S:F	uint16, uint8, uint8	Offset within track/song, MM: minutes S: seconds F: frames (1/75 sec)	At CA -If the offset is defined in a way that it exceeds the end of the song, play-back will start at the beginning of the next song or the end of playrange is reported. At CD-DA + data track -If the offset exceeds the length of the addressed track, play-back start at the calculated position within the next track(s) or the end of playrange is reported. Offset range definition for seconds is 0…59 (dec) for frames is 0…74 (dec)
31.	offset_end MM:S:F	uint16, uint8, uint8	Offset within track/song, MM: minutes S: seconds F: frames (1/75 sec)	Same as offset MM:S:F, additionally the value MM = 0xFFFF and S= 0xFF and F= 0xFF will set the pause position to the end of the selected song
32.	offset song #	uint16	Offset within play-list by number of songs,	If this parameter is set to zero in coherence with the function command “Pause@ play-list + offset (song number) + offset within track/file (MM:S:F)”, only the content of the selected play-list is evaluated, the evaluation of song related parameter is skipped

#	name	format	description	remark
33.	origin byte	uint8	ID3 tag, CD-text and WMA ID origin byte 0x00: unknown 0x30: ISO-646, ASCII 0x31: ISO8859-1 0x32: UCS-2-LE/UTF-16-LE 0x33: UCS-2-BE/UTF-16-BE 0x34: UTF-8 0x36: UCS-2-MB-BE/UTF-16-MB-BE (missing BOM) 0x37: Music Shift – JIS Kanji	UTF-8 is used for self generated strings as well and for ML on Top-Level navigation
34.	other file #	uint16	other file number	
35.	path	up to 253 Byte	CAv3 internal information about the path	Binary data. For set to path use data content only (between message ID and check sum).
36.	parent directory #	uint16	parent directory number	

#	name	format	description	remark
37.	player_event	uint8	event on player	values that are not explicit described may occur; the error-handling has to be done as according to this range
			Standard events, range 0x00…0x9f	
			0x00: no status (available)	no deviation from expected transition detected
			0x20: Begin of play-range	
			0x30: End of play-range	
			0x80: End of mount, file system is not evaluated completly	this player_event is provided once if mount is done, in the case that the file content of the device is larger than the internal space reserved for the file system or the file system information is not available completely.
			issue occurred, caused by media and/or mechanism, range 0xA0…0xAF	
			0xA0: radial error/tracking lost	
			0xA1: pll lock error/sub code timeout error	
			0xA2: jump (seek) error	
			0xA3: focus diode adjustment failed (radial tracking error adjustment failed)	
			0xA4: radial (tracking) diode adjustment failed	
			0xA5: central diode adjustment failed	
			issue occurred, caused by media, range 0xB0…0xBF	
			0xB0: TOC reading failed	
			0xB1: CA decoding error (unexpected file content)	by this message the content of the support file system is not impacted
			0xB2: calibration jump failed	
			0xB3: focus error	
			0xB4: HF error	
			0xB5: power bad condition on media supply voltage detected / communication error	
			0xB7: I/O read error	
			0xB8: play-list parsing failed	
			0xB9: USB read error	
			0xBA continuity of time-information reporting interrupted	due to recoveries, messages are not reported frequently (e.g. time information is not update every second)
			0xBC: WMA song rejected	Optinal r0B and r0D WMA 9.2 identified or WMA bitrate above threshold
			issue caused by mechanism, range 0xC0…0xCF	
			0xC0: sledge error/home switch not operating	
			0xC1: spindle (turn table) motor error	
			0xC5: CD decoder hardware/chip error	
			issue caused by the application, range 0xE0…0xEF	
			0xEF: illegal command	command not defined *or* parameter out of range/missing *or* can't be executed at current module state or impossible configuration

#	name	format	description	remark
38.	player_state	uint8	state of player 0x00: Not available 0x30: Stop 0x40: Pause 0x50: Play 0x60: Search 0x80: Power up, release reset, Initialization (temporary state)	If a transition is in progress, the most significant bit of the player_state is set. During a transition the actual player_state is undefined. The lower nibble of the player_state byte is used for customer options. Whenever this message is received the module has executed a reset cycle and has to be reinitialized
39.	play-list #	uint16	play-list number	
40.	play-time	uint8	defines the play-back time, between jump periods at search	The resolution is defined by frames * 2 steps. The range of this parameter is 8…127 (08..7F hex) frames * 2. By this a range of 213…3387ms is defined. The most significant bit defines the search direction, if zero search forward, else search backward.
41.	relative-directory #	uint16	number of the directory relative to its parent directory (WD)	The parameter 0x0000 selects the directory where the NAVPTR is actually pointing to as WD. If this parameter is used in coherence with play-lists, the behavior is related to play-lists instead of directories.
42.	rel. time	uin16, uint8, uint8	relative minutes, relative seconds relative frames	Position within current track/file A new time information is prepared under the following conditions - after executing a jump (new function command) - at track/file change - at change of relative seconds of track/decoded file - in single speed operation at every second change a new message is setup or whenever the iPod provides a new time information - in double speed operation at every two second change a new message is setup The rel. time is related to the track/file that is currently in play-back.
43.	sample-rate	uint16	sample rate [Hz]	at play-back of CD-DA tracks the sample rate is defined as 44.100kHz (0xAC44)
44.	second byte of medium information	uint8	Media content description	Bitfield is part of message

bit	name	description	
0	copy	0: not prohibited 1: prohibited	Digital copy ..
1	reser-ved		
2	TOC read	0: not readable 1: readable	First TOC information
3	FS eval	0: no 1: yes	Media content evaluated
45		reserved	
6	Multi-session	0: no 1: yes	
7	Open Ms	0: no 1: yes	Open multi session

45.	song #	uint16	number of the song relative to its parent directory	Addressing of linear-song numbers is done by setting the directory # to zero.
46.	song-length	uint16, uint8, uint8	length of current track/song, minutes , seconds, frames	
47.	Start address within configuration array	uint8	position within configuration array	

#	name	format	description	remark
48.	string and terminator	n*uint8	string of byte representing UTF8 character and a terminationbyte (0x00)	Maximum configured number of byte, independent if the last byte(s) are representing a character. See also [2]. In case of no information available an empty string (values set to zero) is reported.
49.	temperature value	uint8	>0 n <65 (dec), <= 60°C always 0°C >60°C to <=95°C in steps of one °C temperature value >95°C always 95°C	60°C=140°F ; 95°C=203°F ; delta of 1°C=1.8°F If the temperature drops below the threshold, a message temperature under threshold (data byte set to 0) is generated once.
50.	type information	uint8	type information of track/song 0x00: information not available 0x10: Type is referring to media descriptor, media is CD 0x11: Type is referring to media descriptor, media is USB or connected via USB 0x12: Type is referring to media descriptor, media is SD-card or connected via SD-card 0x13: Type is referring to media descriptor, media is iPod 0x14: Type is referring to media descriptor, media is recording memory 0x18: Type is reffering to volume descriptor 0x20: Type is referring to CD-DA track 0x21: Type is referring to CD-data track 0x28: Type is reffering to recorded CD-DA track 0x30: Type is referring to directory 0x40: Type is referring to M3U a play-list 0x41: Type is referring to PLS play-list 0x42: Type is referring to ASX play-list 0x43: Type is referring to WPL play-list 0x50: Type is referring to file marked as MP3 0x52: Type is referring to file marked as AAC / m4a 0x55: Type is referring to file marked as WMA 0x5F: Type is referring to other type of file, or iPod songs	
51.	unique identifier of medium	13*uint8	Unique medium identifier of CD, USB and SD device	The content of this message on other devices than CD, USB and SD, is undefined. On CD the “CDDB_” string is followed by 4 Bytes (8digits) showing the calculated CDDB value and the remaining data bytes are representing the checksum of the file-system. On USB and SD devices a unique identifier is provided, This identifier is taking the evaluated file system into account.

9.3 Configuration commands

The configuration of the CDM-M10 CAv3 can be done in steps or in a sequence.
One configuration array is in use for all devices and independent from the media content.
Configuration of the mechanism can be done from the first final module state (most significant bit cleared) onwards. At start-up after reset the default values, as shown at §9.4, Configuration array, are used.
Configuration options are partly adjusted to customer requirements.

All configuration changes, except Define_file_support, content_of_file_system and iPod configuation, will be active when the mechanism receives the next function command, as defined by § 9.6,Function commands.
To activate changes in the Define_file_support and content_of_file_system configuration, the function command mount has to be used. The iPod configuration is changed on the fly, when confirmed by the device.
The mechanism does not check the plausibility of the configuration array content.
If values are selected that violates the defined ranges, these values are not changed. This can be checked by the application by reading the configuration.
Configurations or parts of a configuration, which are described as reserved, have to be set to zero, if part of the write configuration array.

Table 9-4: Options to write/read configuration values

ReqID	function command	opcode [hex]	parameter	description	for detailed description see §	return message
CIS/WC001	Write configuration	3C	1) address 2) length 3) conf-bytes	Write configuration array	9.3.1	none
CIS/WC002	Read configuration	9F	1) address 2) length	Read configuration array	9.3.2	Module configuration
CISWFC003	Reset configuration array	3F	none	Reestablish default settings	9.3.3	none

9.3.1 Write configuration

By using this command the application is able to modify the configuration partly or at all. The behaviour is defined by parameter. If the write position exceeds the defined range of the configuration array these bytes are ignored.

Table 9-5: Format of write configuration command

subject	opcode [hex]	description
Write configuration	3C	Command identifier
address	00…	Specifies the address to write
length	1…	Specifies the number of following byte(s), to write from the specified address onwards
First configuration byte	xx	Value to write to specified address
… Last configuration byte	xx	Value to write to specified address + length

9.3.2 Read configuration

By using this command the application is able to read the configuration partly or at all. The behaviour is defined by parameter.

Table 9-6: Format of read configuration command

subject	Opcode [hex]	description
Read configuration	9F	Command identifier
address	00…	Specifies the address to read
length	1…	Specifies the number of following byte(s), to read from the specified address onwards

9.3.3 Reset configuration array

To reinstall all default configuration settings this command can be used.

Table 9-7: Format of reset configuration array command

subject	opcode [hex]	description
Reset configuration	3F	Command identifier

9.4 Configuration array overview

ReqID	configuration option	addr. [hex]	length [byte]
CIS/ CA001	reserved	00	1
CIS/ CA002	play-range	01	1
CIS/ CA003	data output mode	02	3
CIS/ CA004	reserved	05,06	2
CIS/ CA005	scan mode	07	1
CIS/ CA006	loader option	08	1
CIS/ CA007	reserved	09	1
CIS/ CA0018	reserved	0A	1
CIS/ CA008	data output speed	0B	1
CIS/ CA009	iPod config	0C	1
CIS/ CA010	metadata message length	0D	1
CIS/ CA011	CD-text priority language	0E,0F,10	3
CIS/ CA020	reserved	11	1
CIS/ CA021	Skip WMA 9.2, File-system sorting, Single session mode, Suppress ROM data evaluation	12	1
CIS/ CA022	reserved	13	1
CIS/ CA023	Skip high bitrates of WMA	14	1
CIS/ CA012	Reserved	15,16,17,18,19	5
CIS/ CA013	output data providing mode	1A	1
CIS/ CA014	Reserved	1B	1
CIS/ CA015	play-list	1C	1
CIS/ CA016	artificial pause	1D	1
CIS/ CA019	Reserved	1E	1
CIS/ CA017	reserved	1F	1

The intention of reserved configuration bytes is to extend the options later on, use 0x00 to write these bytes to ensure that further extensions do not impact your application.

9.5 Configuration array in detail

9.5.1 Configuration array, play-range

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA002	play-range	x	x	x	x	01		1		default value: 0x00 play-range of iPod is controlled by the device
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	Define criteria to finalize play-back, multi-session handling See [2] for examples.
	Play until end/beginning of media [1) 2) 4)]							**0**	**0**	
	Play until end/beginning of current track/file [4)]							0	1	
	Play until end/beginning of directory [3) 4)]							1	0	Subdirectories are not included
	Behavior undefined							1	1	
	Reserved			**0**	**0**	**0**	**0**			
	Multi session support-mode		**0**							0:disabled; 1:enabled evaluation of is done at next mount
	Reserved	**0**								

[1)]: play-back range includes all directories
[2)]: at play-back of play-list these configuration is defined as, play until end of play-list
[3)]: play-back of play-list is not supported by these play-ranges
[4)]: at a change of play-position, the play-range is adapted to the new position

9.5.2 Configuration array, data output mode

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA003	data output mode	x	x	x	x	02		1		default value: 0x04
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	To change the data_output_configuration play-back has to be interrupted by the application.
	Mute digital output, by data zero							**0**	**0**	Continuously output signal, data is set to zero
	Mute digital output, by high-z signal							0	1	High impedance in conjunction with Hardware assembly
	Mute digital output, by low signal							1	0	Low (GND)
	Reserved							1	1	Do not use
	Analogue output enable				0	0	0			
	S/P-DIF output enable				**0**	**0**	**1**			
	I^2S output enable				0	1	0			Second data output mode parameter is evaluated
	EIAJ output enable				0	1	1			Second data output mode parameter is evaluated
	Reserved				1	x	x			
	Audio or Data - output		**0** 1 0 1	**0** 0 1 1						audio, automatic de-emphasis, interpolation and hold, fade-in / fade-out, validity bit true on interpolation and hold audio, automatic de-emphasis, interpolation and hold, fade-in / fade-out, validity bit false on interpolation and hold data, no de-emphasis, interpolation and hold, fade data, no de-emphasis, interpolation and hold, fade
	Attenuation	**0**								0:disabled; 1:enabled (12dB)

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA003	data output mode	x	x	x	x	03		1		default value: 0x00
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	Detailed configuration of I^2S/EIAJ output
	I^2S/EIAJ output 16 bit frame length							**0**	**0**	
	I^2S/EIAJ output 24 bit frame length							0	1	
	I^2S/EIAJ output 32 bit frame length							1	0	
	Reserved							1	1	
	I^2S/EIAJ alignment of data						**0**			0: left alignment, 1: right alignment
	I^2S/EIAJ first bit out					**0**				0: least significant bit out first, 1: most significant bit out first
	Reserved	**0**	**0**	**0**	**0**					

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA003	data output mode	x	x	x	x	04		1		default value: 0x00
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	
	Reserved	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	

9.5.3 Configuration array, scan mode

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA005	scan mode	x	x	x	x	07		1		default value: 0x00
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	Enable/disable scan time window 0: disabled
	Scan time			**0**	**0**	**0**	**0**	**0**	**0**	Range of 1…63 (1…0x3F) seconds, in a resolution of 1 second. Based on relative time of track/file. If the selected scan time is longer than the track/file length, the scan time is reduced to the track/file length. If scan is enabled after passing the defined scan time, play-back start at the beginning of the next/track file, with respect to the definition of the play range.
	Reserved	**0**	**0**							

9.5.4 Configuration array, loader option

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA006	loader option	x	-	-	-	08		1		default value: 0x3A
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	Enable/disable autoload and loader recovery 0: disabled
	Autoload time window					**1**	**0**	**1**	**0**	Select autoload time in a range from 1…15 (0…0x0F) seconds. 0: autoload off.
	Number of recoveries			**1**	**1**					Number of internal loader recoveries. See §12.1.6, Loader recovery at insert error detection and §12.1.7, Loader recovery at eject error detection.
	Reserved	**0**	**0**							

9.5.5 Configuration array, data output speed

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA008	data output speed	x	x	x	x	0B		1		default value: 0x00
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	Speed of output interface, that is forwarding data to the application. The settings of the data output mode are not taken into account. The turntable speed is not impacted by this configuration. To change the data_output_configuration play-back has to be interrupted by the application.
	speed								**0**	0: CLV / 1* speed 1: CLV / 2* speed (undefined behaviour at Audio mode)
	Reserved	**0**	**0**	**0**	**0**	**0**	**0**	**0**		

9.5.6 Configuration array, iPod configuration

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA009	iPod config	x	x	x	x	0C		1		default value: 0x00
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	The iPod shuffle setting is evaluated at connection of the device and can be configured by the application. If the requested change is confirmed by the device, settings are done as requested (application has poll this byte for confirmation).
	Shuffle off							**0**	**0**	
	Shuffle songs							**0**	**1**	
	Shuffle albums							**1**	**0**	
	Reserved							**1**	**1**	
	Reserved			**0**	**0**	**0**	**0**			
	Repeat Off	**0**	**0**							
	Repeat song	**0**	**1**							
	Repeat all	**1**	**0**							
	Reserved	**1**	**1**							

9.5.7 Configuration array, metadata message length

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA010	metadata message length	x	x	x	x	0D		1		default value: 0x10
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	Configure the maximum number of byte, provided as message for metadata, see [2].
	Number of byte	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	Range of 1…128 (1…0x80)

9.5.8 Configuration array, CD-text priority languages

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA011	CD-text priority language	x	-	-	-	0E,0F, 10		3		default value: 0x00, 0x00, 0x00
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	If none of the priority languages match to the content of the media, the default behavior, first language on media is used.
	Byte of first priority language, address 0x0E	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	See §12.3, CD text language code for languages
	Byte of second priority language, address 0x0F	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
	Byte of third priority language, address 0x10	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	

9.5.9 Skip WMA 9.2

use single session mode, if audio track detected
suppress mixed mode CD support, if audio track detected
file-system sorting

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA021	Skip WMA 9.2, Single session mode, Suppress ROM data evaluation, File-system sorting	x	x	x	-	12		1		default value: 0x00
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	
	Reserved				**0**		**0**	**0**	**0**	
	Skip WMA version 9.2					**0**				0:disabled; 1:enabled
	Single session mode, if audio track is detected			**0**						0:disabled, use configuration as defined by Multi session support-mode ; 1:enabled evaluation is done on next mount
	Suppress ROM data evaluation, if audio track is detected		**0**							0:disabled; 1:enabled evaluation is done on next mount
	File-system sorting	**0**								0:disabled; 1:enabled

9.5.10 Configuration array, skip high WMA bitrates

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA023	Skip high WMA bitrates	x	x	x	-	14		1		default value: 0 Value is defined in kByte/s [hex]
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	
	Skip WMA bitrates above	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0: do not skip any bitrate >0: skip every wma song with a bitrate above the defined threshold

9.5.11 Configuration array, output data providing mode

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA013	output data providing mode	x	x	x	x	1A		1		default value: 0x00 restriction on iPod support !
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	This configuration must be done prior the data is provided by the mechanism on the digital outputs. This setting does not impact CD-DA play-back. To change the data_output_configuration play-back has to be interrupted by the application.
	Audio mode (block decoded, C3 error corrected and CA decoded)							**0**	**0**	Block-decoding and C3 error correcting is done on CD device only
	Reserved							0	1	
	File transfer mode (block decoded, C3 error corrected, in case of no blockdecoded source –raw data is provided)							1	0	Do not use for iPod device
	Reserved							1	1	
	Reserved	**0**	**0**	**0**	**0**	**0**	**0**			

9.5.12 Configuration array, file support

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA014	file support	x	x	x	-	1B		1		default value: 0x17 (0x37 r09)
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	Configuration must be done prior first mount. File extensions that are disabled, are not part of the file system message. If this configuration is modified, the content of the media has to be be re-evaluated by a file-system evaluation. Afterwards the application has to address a new play position.
	CD-DA support								**1**	0: not part of file system; 1: part of file system
	MP3 support							**1**		0: not part of file sytsem; 1: part of file system
	WMA support						**1**			0: not part of file sytsem; 1: part of file system
	CD-data track support					**0**				0: not part of file sytsem; 1: part of file system
	AAC (m4a) support				**1**					0: not part of file sytsem; 1: part of file system
	Reserved			**0**						
	Other file extensions than mentioned above		**0**							0: not part of file system; 1: part of file system
	Suppress empty folder	**0**								0: do not suppress empty folder within reported file-system; 1: suppress empty folder within reported file-system

9.5.13 Configuration array, play-list

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA015	play-list	x	x	x	x	1C		1		default value: 0x00
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	If this configuration is modified, the content of the media has to be re-evaluated (mount).
	Play-list support on/off	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0: no play-list support; >0: play-list support enabled

9.5.14 Configuration array, artificial pause

ReqID	configuration option	CD	USB	SD	iPod	addr. [hex]		length [byte]		remark
CIS/ CA016	artificial pause	x	x	x	-	1D		1		default value: 0x32 (2 seconds)
	bit	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	An artificial pause is applied between two files.
	artificial pause length	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**0**	The pause is defined in frames*3 (1/75*3 sec).The range is 0 …. 10.2 seconds. At search forward or search backward or scan no pause is added.

.6 Function commands

All function commands will be responded by a message, except when the command is overwritten by the following command, before the message is provided.
If a function command is send to the module the previous function command is overwritten. For the impact of function commands on messages, see §10.2.1, Cancellation of messages.

Some function commands are using a sub-identifier. This is done to specify the detailed behavior, of this function group (for example play).

Table 9-8: Overview on function commands

Req ID	function command	CD	USB	SD	iPod	opcode [hex]	sub-id [hex]	parameter	see §	return message
CIS /FC 001	Insert	x	x	x	x	12	none	1) device-id	9.6.1	Module state
CIS /FC 002	Eject	x	x	x	x	11	none	1) device-id	9.6.2	Module state
CIS /FC 003	Emergency eject *ATTENTION*: The CD might spring out	x	x	x	x	22	none	1) device-id	9.6.3	Module state
CIS /FC 011	Mount	x	x	x	x	20	none	1) device-id	9.6.4	Module state
CIS /FC 021	Play @ current position (resume play)	x	x	x	x	13	00	1) device-id	9.6.5	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information
CIS /FC 022	Play @ track/file + offset within track/file (MM:S:F)	x	x	x	-	13	10	1) device-id 2) directory # 3) song # 4) offset MM:S:F	9.6.6	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information

Req ID	function command	CD	USB	SD	iPod	opcode [hex]	sub-id [hex]	parameter	see §	return message
CIS /FC 023	Play @ NAVPTR + offset within track/file (MM:S:F)	x	x	x	x	13	20	1) offset MM:S:F	9.6.7	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information
CIS /FC 024	Play @ play-list + offset (song number) + offset within track/file (MM:S:F)	x	x	x	-	13	30	1) device-id 2) play-list # 3) offset song # 4) offset MM:S:F	9.6.8	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information
CIS /FC 025	Play @ path	x	x	x	x	13	40	1) path	9.6.9	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information
CIS /FC 027	Play @ M:S:F	x	-	-	-	13	F0	1) device-id 2) M:S:F	9.6.10	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information
CIS /FC 031	Pause @ current position	x	x	x	x	1C	00	1) device-id	9.6.11	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information

Req ID	function command	CD	USB	SD	iPod	opcode [hex]	sub-id [hex]	parameter	see §	return message
CIS /FC 032	Pause @ track/file + offset within track/file (MM:S:F)	x	x	x	-	1C	10	1) device-id 2) directory # 3) song # 4) offset_end MM:S:F	9.6.12	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information
CIS /FC 033	Pause @ NAVPTR + offset within track/file (MM:S:F)	x	x	x	-	1C	20	1) offset_end MM:S:F	9.6.13	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information
CIS /FC 034	Pause @ play-list + offset (song number) + offset within track/file (MM:S:F)	x	x	x	-	1C	30	1) device-id 2) play-list # 3) offset song # 4) offset_end MM:S:F	9.6.14	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information
CIS /FC 041	Stop @ current position	x	x	x	x	1E	00	1) device-id	9.6.15	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information
CIS /FC 051	Search forward/backward	x	x	x	x	1A	none	1) jump-time 2) play-time	9.6.16	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information

Req ID	function command	CD	USB	SD	iPod	opcode [hex]	sub-id [hex]	parameter	see §	return message
CIS /FC 061	Next/Previous	x	x	x	x	17	none	1) np-mode 2) np-distance	9.6.17	Module state File/Track-name information Directory-name information Performer information Song-title information Linear song-# File extension Album-title information

If a jump is requested that end up in an unrecorded area (e.g. by a Play / Pause @ M:S:F or an offset that exceeds the recorded area) a corresponding player_event is reported.

9.6.1 Insert

Purpose: Execute a transition to the insert position.
If a function command, load, mount or play-back, is received when a CD is in eject position, the CD is inserted.
ReqID: CIS/FC102

- **Insertion of CD media, precondition any position, except Insert or a CD at No Media**

Precondition: A CD is in any position except insert or No Media.
Action: The CD moves in insert direction until the stop position is detected.
In case of unexpected behavior an error is reported.

- **Insertion of CD media, precondition No CD media or inserted position**

Precondition: No media or inserted position detected by loader.
Action: The mechanism reports the loader_event illegal_command.
The player_state is not impacted, if the media is inserted already (if during play-back an insert command is send, play-back is not interrupted).

- **Insertion of other devices than CD**

Precondition: Power on, reset released, mechanism ready for communication.
Action: The current module state related to this device is reported.

9.6.2 Eject

Purpose: Cancel the current mode and execute a transition to the eject position.
General: By the execution of this command, information of media content and the last play-position is not cleared. The NAVPTR position is not modified.

- **Eject media, precondition any state, except Eject or No Media state**

Precondition: The CD mechanism is in any state, except Eject or No Media state.
Action: The mechanism moves the CD media to the eject position.
After successful execution of the command the disc can be removed now from the slot.
In case of unexpected behavior an error is reported.

- **Eject media, precondition Eject position**

Precondition: A CD is in eject position.
Action: The CD moves slightly in insert direction and then ejected again to eject position.

- **Eject media, precondition No Media**

Precondition: No CD position.
Action: The CD mechanism initializes the loader and reports the loader_state.

- **Eject @ other devices than CD**

Precondition: Power on, reset released, mechanism ready for communication.
Action: Same behaviour as Stop command, except if no media is inserted.

9.6.3 Emergency Eject

Purpose: Cancel the current mode and execute a transition to eject.
To be used in service case only

- **Emergency eject of CD media, precondition any state, except Eject or No CD state**

Precondition: The CD mechanism is in any state, except Eject or No CD state.
Action: The CD mechanism runs the loading-motor in eject direction for 3 seconds, without control of the position during this time. When this time window is expired a standard eject process, as described by §9.6.2, Eject, is executed. Due to this fact, there is a possibility that the media leave the mechanism. In case of an unexpected behavior an error is reported.

- **Emergency eject of CD media, precondition CD at Eject position**

Precondition: A CD is in eject position.
Action: The CD mechanism runs the loading-motor in eject direction for 3 seconds, without control of the position during this time. Due to this fact, there is a possibility that the media leave the mechanism.

- **Emergency eject of CD media, precondition No Media**

Precondition: Module state No CD.
Action: The CD mechanism runs the loading-motor in eject direction for 3 seconds, without control of the position during this time. Final message No CD is reported.

- **Emergency eject @ other devices than CD**

Precondition: Power on, reset released, mechanism ready for communication.
Action: The current module state related to the defined device is reported.

9.6.4 Mount

Purpose: To (re)evaluate the medium content, according the related configuration.
Break current mode of selected device and update module memory by content of device.
General: By the execution of this command, the internal information regarding the medium content is cleared and updated. Messages regarding the media content can be requested afterwards.

It is necessary to execute the mount command completly, before requesting a play/pause at position function, to ensure that this is a valid position. If the NAVPTR is operating on the same device, the postion of the NAVPTR is undefined after execution of this command and has to be set by the application.

At these conditions the file system information is cleared and has to be mounted again

- Reset
- Power off
- Loader_state = No_media
- Switching multi-session mode and next function command on CD device
- At writing of configuration that defines the support of track/file types, the content is invalid for the modified configuration until next mount is done

- **Mount, precondition any state, except Eject or No Media state**

Precondition: The mechanism is in any state, except Eject or No Media state and configuration is done.
Action: The mechanism reads, evaluates the medium content and enter Pause mode afterwards.

- **Mount, precondition CD at Eject position or CD media between eject and stop position**

Precondition: The CD is in eject position or in between eject and stop position.
Action: The CD is inserted. The mechanism reads, evaluates the medium content –according to the configuration and enter Pause mode afterwards.

- **Mount, precondition No Media**

Precondition: Module state, No Media.
Action: The module reports the loader_event illegal_command.

9.6.5 Play @ current position

Purpose: To enter the play-back mode. If no play-back was done previously, the module starts play-back at the beginning of the selected device.

General: If play-back is already provided by another device, any play-back request is rejected as illegal_command.

- **Play @ current position, precondition any state, except CD at Eject or No Media state**

Precondition: Any module state except CD at No Media or CD at Eject, iPOD at Pause state

Action: Evaluate media content (mount), if not done yet. In this case the first track/file, according the configuration, is used as start position. After reset the behavior is the same, as unknown media content.
Start the play-back mode.

- **Play @ current position, precondition Eject position or media in between**

Precondition: A CD is in eject position or in between eject and stop position.

Action: The CD is inserted
The content of the media is evaluated, if not done yet.
Start the play-back mode.

- **Play @ current position, precondition No Media state**

Precondition: Module state No Media.

Action: The module reports the loader_event illegal_command.

9.6.6 Play @ track/file + offset

Purpose: To enter the play-back mode at position.

Precondition: Media is mounted.

General: Addressing of a linear-song# can be done by setting the directory-# to zero.
All types of track/file and other file can be addressed by this command, as reported by the file_sytem-message.
At CA
-If the offset is defined in a way that it exceeds the end of the song, play-back will start at the beginning of the next song or the end of playrange is reported.
At CD-DA and data track
-If the offset exceeds the length of the addressed track, play-back start at the calculated position within the next track(s) or the end of playrange is reported.

9.6.7 Play @ NAVPTR + offset within track/file

Purpose: To enter the play-back mode at position.
If the NAVPTR does not point to a track, song or other file, the command is rejected and the player_event illegal_command is reported.
The offset within the selected track/file is ignored on the iPod-device.

Precondition: Media is mounted.

9.6.8 Play @ play-list + offset (song number) + offset within track/file (MM:S:F)

Purpose: To enter the play-back mode at position.
Offset is defined as song# within the addressed play-list.

Precondition: Media is mounted.

General: On the iPod device play-lists are accessible as *normal directory* via navigation.

9.6.9 Play @ path

Purpose: To enter the play-back mode at path position on CD, USB and SD-card device.
For iPod use resume play to continue play-back from last position.

Precondition: Configuration array re-established, media is mounted and ML created/play-list to be evaluated -if done before.

9.6.10 Play @ M:S:F

Purpose: To enter the CD play-back mode at absolute time position.
The intention of this command is to support testing at the production line and not be mixed up with other; function commands (for example Play@ track/file + offset, Next, Previous).

Precondition: Media is mounted.

General: A plausibility check on the requested absolute M:S:F position is not done,
the application is responsible to choose values in a correct range.
The minimum time that can be addressed is 2 seconds. If a position < 2 seconds is request, this value is set to 2 seconds.

9.6.11 Pause @ current position

Purpose: To enter the pause mode. A CD continues spinning.

- **Pause @ current position, precondition any state, except CD at Eject or No Media state**

Precondition: Any module state except CD at No Media and CD at Eject.

Action: The media is mounted, if not done yet.
Enter the pause mode at first track/song after mounting, otherwise at current position.

- **Pause @ current position, precondition CD at Eject position or CD in between**

Precondition: A CD is in eject position or in between eject and stop position.

Action: The CD is inserted
The content of the media is mounted, if not done yet.
Enter the pause mode at first track/song after mounting, otherwise at current position.

- **Pause @ current position, precondition No Media state**

Precondition: Module state No Media.

Action: The module reports the loader_event illegal_command.

9.6.12 Pause @ track/file + offset

Purpose: To enter the pause mode at position.

Precondition: Media is mounted.

General: Refer §9.6.11 for behavior.

9.6.13 Pause @ NAVPTR + offset within track/file (MM:S:F)

Purpose: To enter the pause mode at position.
If the NAVPTR does not point to a track/song or other file, the command is rejected and the player_event illegal_command is reported.

Precondition: Media is mounted.

General: For principle refer §9.6.7, Play @ NAVPTR

9.6.14 Pause @ play-list + offset (song number) + offset within track/file (MM:S:F)

Purpose: To enter the pause mode at position.
Offset is defined as song# within the addressed play-list.

Precondition: Media is mounted.

General: For principle refer §9.6.8,
Play @ play-list + offset (song number) + offset within track/file (MM:S:F)

9.6.15 Stop @ current position

Purpose: Cancel the current mode and perform a transition to stop position (output is muted).
A CD stops spinning.

- **Stop @ current position, precondition any state except No CD and Eject**

Precondition: Any module state except No media and CD in Eject position.
Action: The mechanism will cancel the current mode, the CD sledge remains at the current position.

- **Stop @ current position, precondition CD is in Eject position or the CD is in between**

Precondition: The CD is in eject position or in between eject and stop position.
Action: The media is inserted.

- **Stop @ current position, precondition no media**

Precondition: No media
Action: The module reports the loader_event illegal_command.

9.6.16 Search forward/backward

Purpose: To enter the search mode, starting from current position, executing a sequence of jump and play-back periods. Search is designed for data_output_speed 1*CLV, at other settings the message illegal_command is provided.
On the iPod device, search is done by using the parameters defined by the device; search is applied on the current song only. The behaviour at the end of the current song depends on the device and the play-position.

Precondition: Media is mounted, play- or pause-mode of device.

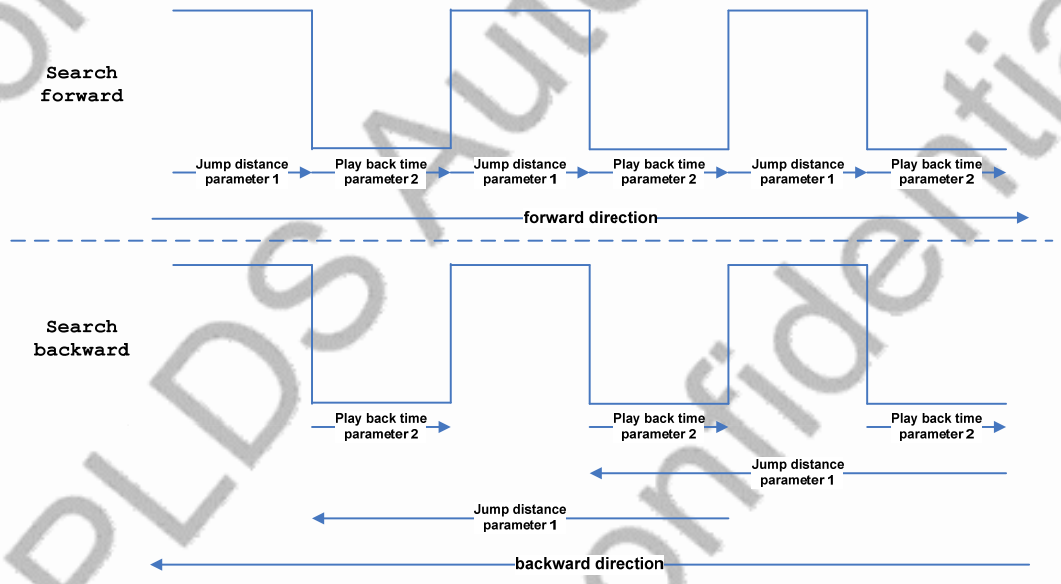
General: For principle refer §9.6.6, Play @ track/file + offset

- **Jump-time parameter**

Purpose: Define the jump distance between play-back periods, in a resolution of frames * 8 steps. The range of this parameter is 8…255 (08..FF hex) frames * 8. By this a range of 853…27200ms is defined.
At search backward, this parameter has to exceed the value of paramter 2 (ms based) to ensure a propper function.

- **Play-time parameter**

Purpose: Define the play-back time, between jump periods, in a resolution of frames * 2 steps. The range of this parameter is 8…127 (08..7F hex) frames * 2.
By this a range of 213…3387ms is defined.
The most significant bit defines the search direction, if zero search forward, else search backward.
The CAV3 suppresses a time information message with increasing time information during search backward if the play time is below 1 second (<0x26).



9.6.17 Next/Previous

Purpose: To enter the play-back mode on next or previous track/file, directory or play-list, according the configuration.

If immedeatly after mount, this function command is received, play-back starts at the first/last track/file according to the play-range configuration.

Precondition: Media is mounted.

9.7 Device navigation commands

The purpose of the NAVPTR is to navigate through the evaluated file-system.
This pointer contains the information regarding the current WD (Working Directory) and/or the SI (Selected Item). Information related to the current NAVPTR position can be request by the application.
The WD and SI positions are undefined after reset and mount and have to be initialized by one of these commands

- Set NAVPTR to ROOT
- Set NAVPTR to absolute position
- Set NAVPTR to current play-position

Table 9-9: Device navigation commands

Req ID	navigation command	CD	USB	SD	iPod	opcode [hex]	sub-id [hex]	parameter	remark	affect pos	return message
CIS /DN 001	Set NAVPTR to absolute position For examples refer [2].	x	x	x	-	50	none	1) device-id 2) directory-# 3) song-#		WD+ SI	Directory-name information File/Track-name information Linear song-# or Directory-name information
CIS /DN 002	Set NAVPTR to current play-position	x	x	x	-	51	none	none	Copy current play position to navigation pointer. If command is requested during a transition the result is undefined.	WD+ SI	Directory-name information File/Track-name information Linear song-#
CIS /DN 003	Set NAVPTR to ROOT For an example refer [2]	x	x	x	x	52	none	1) device-id		WD+ SI	Directory-name information
CIS /DN 004	Set NAVPTR to first directory [1)] For examples refer [2].	x	x	x	x	53	none	none		SI	Directory-name information
CIS /DN 012	Set NAVPTR to directory [1)]	x	x	x	x	6C	none	1) relative-directory #		SI	Directory-name information
CIS /DN 005	Set NAVPTR to next directory [1)] For examples refer [2].	x	x	x	x	54	none	none		SI	Directory-name information

Req ID	navigation command	CD	USB	SD	iPod	opcode [hex]	sub-id [hex]	parameter	remark	affect pos	return message
CIS /DN 006	Set NAVPTR to previous directory [1)]	x	x	x	x	55	none	none		SI	Directory-name information
CIS /DN 007	Set NAVPTR to last directory [1)]	x	x	x	x	56	none	none		SI	Directory-name information
CIS /DN 008	Set NAVPTR to first file [2)] For examples refer [2].	x	x	x	x	57	none	none		SI	Directory-name information File/Track-name information Linear song-#
CIS /DN 013	Set NAVPTR to file [2)]	x	x	x	x	6D	none	1) song#		SI	Directory-name information File/Track-name information Linear song-#
CIS /DN 009	Set NAVPTR to next file [2)] For examples refer [2].	x	x	x	x	58	none	none		SI	Directory-name information File/Track-name information Linear song-#
CIS /DN 010	Set NAVPTR to previous file [2)]	x	x	x	x	59	none	none		SI	Directory-name information File/Track-name information Linear song-#
CIS /DN 011	Set NAVPTR to last file [2)]	x	x	x	x	5A	none	none		SI	Directory-name information File/Track-name information Linear song-#
CIS /DN 021	Set NAVPTR to child directory For examples refer [2].	x	x	x	x	5F	none	1) relative-directory #		WD	Directory-name information
CIS /DN 022	Set NAVPTR to parent directory For example refer [2].	x	x	x	x	60	none	none		WD	Directory-name information
CIS /DN 031	Set NAVPTR to first play-list For example refer [2].	x	x	x	x	63	none	none		WD+ SI	Directory-name information
CIS /DN 032	Set NAVPTR to next play-list For example refer [2].	x	x	x	x	64	none	none		WD+ SI	Directory-name information
CIS /DN 033	Set NAVPTR to previous play-list	x	x	x	x	65	none	none		WD+ SI	Directory-name information
CIS /DN 034	Set NAVPTR to last play-list	x	x	x	x	66	none	none		WD+ SI	Directory-name information
CIS /DN 035	Set NAVPTR to play-list For example refer [2].	x	x	x	x	6F	none	1) relative-directory #		WD	Directory-name information

Req ID	navigation command	CD	USB	SD	iPod	opcode [hex]	sub-id [hex]	parameter	remark	affect pos	return message
CIS /DN 041	Set NAVPTR to first file of play-list	x	x	x	x	67	none	none		SI	Directory-name information File/Track-name information Linear song-#
CIS /DN 045	Set NAVPTR to file within play-list	x	x	x	x	5B	none	1) song-#		SI	Directory-name information File/Track-name information Linear song-#
CIS /DN 042	Set NAVPTR to next file within play-list	x	x	x	x	68	none	none		SI	Directory-name information File/Track-name information Linear song-#
CIS /DN 043	Set NAVPTR to previous file within play-list	x	x	x	x	69	none	none		SI	Directory-name information File/Track-name information Linear song-#
CIS /DN 044	Set NAVPTR to last file of play-list	x	x	x	x	6A	none	none		SI	Directory-name information File/Track-name information Linear song-#
CIS /DN 051	Set NAVPTR to path	x	x	x	x	6B	none	1) path		WD+ SI	Directory-name information File/Track-name information Linear song-# or Directory-name information

1) : of current path
2) : of the WD

Before any movement of the NAVPTR, all messages related to the previous NAVPTR-command have to be read by the application.
If the NAVPTR is used to switch between directory/file and play-list navigation the behavior is undefined.
The content of a play-list is not evaluated by the usage of Set NAVPTR commands.

.8 Request commands

All request commands are responded by a message.
A request command does not force a transition of the module_state.
A request command can't be overwritten.

The evaluated information related to the last play-back position is not available at the module state No media.
If the requested information is not available, an empty string is reported.

Table 9-10: Request commands

Req ID	request command	CD	USB	SD	iPod	opcode [hex]	sub-id [hex]	parameter	remark	return message
CIS /RC 001	Get position information	x	x	x	x	80	0x00 at play position 0x20 at NAVPTR position	none		Directory-name information File/Track-name information Linear song-# or Directory-name information
CIS /RC 011	Get module state	x	x	x	x	81	none	1) device-id		Module state
CIS /RC 012	Get module ID	x	x	x	x	82	none	none		Module ID
CIS /RC 021	Get device Information	x	x	x	x	83	none	1) device-id		Device information
CIS /RC 022	Get medium Information	x	x	x	x	84	none	1) device-id		Medium ID identification
CIS /RC 031	Get directory content	x	x	x	x	85	0x00 at play position 0x20 at NAVPTR position	none		Directory content information
CIS /RC 041	Get play-list content	x	x	x	x	86	0x00 at play position 0x20 at NAVPTR position	none	Forces the evaluation of play-list content	Play-list content information
CIS /RC 042	Get performer metadata	x	x	x	x	87	0x00 at play position 0x20 at NAVPTR position	none		Performer information
CIS /RC 043	Get song-title metadata	x	x	x	x	88	0x00 at play position 0x20 at NAVPTR position	none		Song-title information

Req ID	request command	CD	USB	SD	iPod	opcode [hex]	sub-id [hex]	parameter	remark	return message
CIS /RC 044	Get album-title metadata	x	x	x	x	89	0x00 at play position 0x20 at NAVPTR position	none		Album-title information
CIS /RC 045	Get genre metadata	x	x	x	x	8A	0x00 at play position 0x20 at NAVPTR position	none		Genre information
CIS /RC 046	Get year metadata	x	x	x	x	8B	0x00 at play position 0x20 at NAVPTR position	none		Year information
CIS /RC 047	Get comment metadata	x	x	x	x	8C	0x00 at play position 0x20 at NAVPTR position	none		Comment information
CIS /RC 048	Get detailed info about song	x	x	x	x	8D	0x00 at play position 0x20 at NAVPTR position	none		Detailed information about current song
CIS /RC 051	Get filesystem information	x	x	x	x	8E	none	1) device-id	Feedback on iPod is limited to media descriptor	Filesystem information
CIS /RC 061	Get file extension information	x	x	x	x	90	0x00 at play position 0x20 at NAVPTR position	none	If the request position points to a file specified as CD-DA or data track/file, an empty string is reported as response on the request.	File extension
CIS /RC 071	Get path information	x	x	x	x	91	0x00 at play position	none		Path information message

10 Messages from the mechanism

Messages are send to the application whenever a corresponding command is received by the mechanism or when an event occurs.

The distinction between messages is made by a unique identification byte (ID-Byte).
A fixed order of messages cannot be guaranteed.
A message that a transition has been started is reported if the execution of this command/event cannot be done immediately.

10.1 Format of messages

Table 10-1: Format of messages

bytes to add for the check sum	subject	value [hex]	generated by/data line belongs to ...
-	start condition	-	master
-	slave address with read bit set (SLA+R)	31	master
-	number of following bytes including check sum byte	N	slave (module)
First byte	Identification byte (ID-byte)	xx	slave (module)
Next byte	1. data byte	see message description of ID byte	slave (module)
...	...	- " -	slave (module)
Last byte to add	last data byte	- " -	slave (module)
-	check sum	ID byte + 1. data byte+... + n. data byte = xx	slave (module)
-	stop condition	-	master

The check sum byte is a one byte sum of all bytes transmitted from ID byte to last data byte. The check sum itself is not included in this sum. The data format of the check sum byte is uint8 (carry is ignored).

10.2 Messages

Table 10-2: Messages

ReqID	Message name	Data content [1)]	Messages provided				Remark
			Player based		Navigation based		
			automatically	on request	automatically	on request	
			ID [hex]	ID [hex]	ID [hex]	ID [hex]	
CIS/ MS001	Module state	device-ID, player-state, player-event, loader-state, loader-event check sum	40	41	--	--	
CIS/ MS002	Module ID	module ID, major and minor software # check sum	42	43	--	--	
CIS/ MS003	Module configuration	Start address within configuration array, # byte reported from configuration array configuration area settings of module check sum	--	45	--	--	
CIS/ M004	Temperature information	temperature value check sum	46	--	--	--	only in conjunction with CD-device

ReqID	Message name	Data content [1)]	Messages provided				Remark
			Player based		Navigation based		
			automatically	on request	automatically	on request	
			ID [hex]	ID [hex]	ID [hex]	ID [hex]	
CIS/ MS005	Time information	device-id, directory-# or play-list-#, song #, ctrl+addr, type information, rel. time, abs. time check sum	48	--	--	--	
CIS/ MS006	Device information	device-id, first byte of medium information, second byte of medium information, #-CD-DA tracks, # directories, # CA songs, # play-lists, # data track, # other files check sum	--	4B	--	--	
CIS/ MS007	Medium ID identification	device-id, unique identifier of medium check sum	--	4D			
CIS/ MS008	File/Track-name information	device-id, directory-#, song-#, origin byte, string and termination check sum	4E	4F	68	69	
CIS/ MS009	Directory-name information	device-id, parent-directory #, directory-#, origin-byte, string and termination check sum	50	51	6C	6D	Message contains the play-list name information and the play-list # instead the directory-#, if forced by addressed play-list. On iPod device the name of the parent directory is provided, if the message is forced by NAVPTR command, otherwise an empty string.
CIS/ MS011	Directory content information	device-id, parent-directory #, directory-#, linear song-# of first song, # of songs, # of subdirectories (1 level), # of play-lists, # of other files check sum	--	55	--	53	
CIS/ MS012	Play-list content information	device-id, type information, directory-#, play-list #, # of songs in play-list check sum	--	57	--	6B	

ReqID	Message name	Data content [1)]	Messages provided				Remark
			Player based		Navigation based		
			automatically	on request	automatically	on request	
			ID [hex]	ID [hex]	ID [hex]	ID [hex]	
CIS/ MS013	Performer information	device-id, directory-#, song-#, origin-byte, cd-text language, string and terminator check sum	58	59	--	77	If the performer information of a CD-DA track or CD-data track is requested and the related CD-text information is available related to this track, the CD-text info track-performer is reported. If the CD-text information track_performer is not available, it is replaced by the CD-text information Album_performer, if existing.
CIS/ MS014	Song-title information	device-id, directory-#, song-#, origin-byte, cd-text language, string and terminator check sum	5A	5B	--	79	
CIS/ MS015	Album-title information	device-id, directory-#, song-#, origin-byte, cd-text language, string and terminator check sum	52	5D	--	47	
CIS/ MS016	Genre information	device-id, directory-#, song-#, origin-byte, cd-text language, string and terminator check sum	--	5F	--	49	
CIS/ MS017	Year information	device-id, directory-#, song-#, origin-byte, cd-text language, string and terminator check sum	--	61	--	7B	
CIS/ MS018	Comment information	device-id, directory-#, song-#, origin-byte, cd-text language, string and terminator check sum	--	63	--	7D	The iPod CIS does not support the Comment. Thus an emty string is provided for this device.
CIS/ MS019	Detailed information about current song	device-id, directory-#, song-#, compression type, bit-rate, sample-rate, track/song-length check sum	--	65	--	7F	

ReqID	Message name	Data content [1)]	Messages provided				Remark
			Player based		Navigation based		
			automatically	on request	automatically	on request	
			ID [hex]	ID [hex]	ID [hex]	ID [hex]	
CIS/ MS020	Filesystem information	device-id, type information, directory-# or song-# or play-list # or other file #, parent (reference)- directory #, linear song-# check sum	--	67	--	--	This message is split up into the following parts -messages that contains file system related information -the final message, that terminates the transition (type-information to linear song-# set to zero)
CIS/ MS022	Linear song-#	device-id, directory-#, song-#, linear song-# check sum	6A	87	84	85	
CIS/ MS023	File extension	device-id, directory-#, song-#, origin-byte, string and terminator check sum	6E	6F	--	75	
CIS/ MS024	Path information message	path check sum	--	71	--	73	

10.2.1 Cancellation of messages

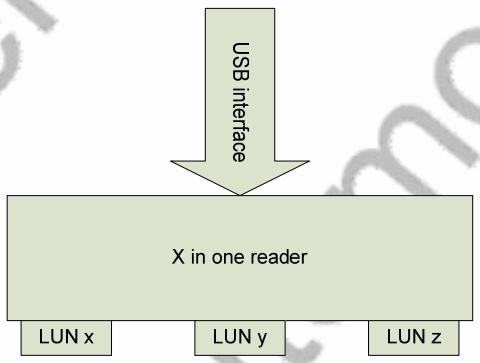
Whenever a new function command related to device_x is received the automatic messages related to device_x from previous function are cancelled. Additionally messages from device_x are cancelled that are provided in a queue/sequence.
Whenever a new navigation command is received the automatic messages from previous navigation command are cancelled. Additionally messages are cancelled that are provided in a queue/sequence.
ReqID: CIS/MS101

11 Explanations of CAv3 behavior

11.1 LUNs

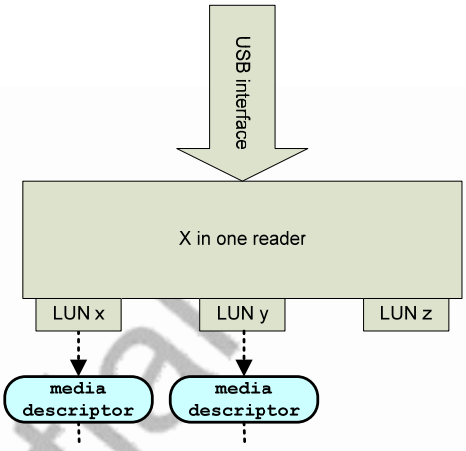
The CAv3 module is designed to support one device on the USB interface (no HUB support).
If a device is connected via USB, which supports multiple LUNs and all of available connections are empty, no event related to the USB device will be reported to the application.
It is not possible to have several LUNs activated or mounted in parallel.
If at least 1 or more LUNs are available, the first identified LUN is reported as USB device and is able to be mounted.
Plug-in of other memory-card into a multi–slot–card–reader will not be reported to the host.
If the active LUN is reported as unavailable (e. g. removed from the slot) and another LUN (e. g. another card) is available, the other LUN will be reported as available.
ReqID: CIS/FC103

Examples for LUN connectivity on x in one-reader:
First example



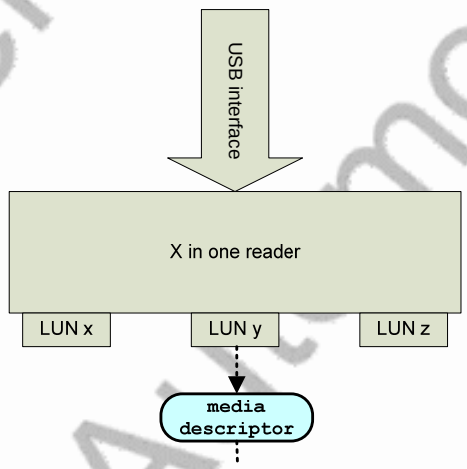
Empty card reader connected, no loader_event reported that connection is done

Second example



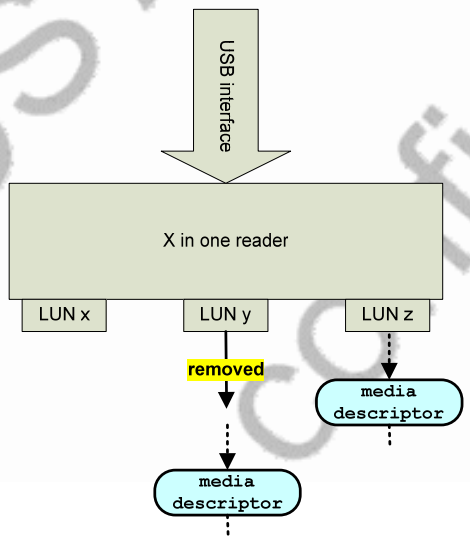
Card reader containing two devices is connected, loader_event reported that LUN x is inserted. Insertion of LUN z or removing LUN y will not be reported.

Third example



Card reader containing one device is connected; loader_event reported that LUN y is inserted

Fourth example



LUN y is removed; loader_event LUN y no media and loader_event LUN z media inserted are reported.
If play-back was done from LUN y, play-back is stopped and it is up to the application to decide how to continue.

11.1.1 End of medium behavior

Precondition: Pause after play-back of last track/file of media.
Action: Function command Play or Search_forward without position parameter will force the reporting of the same module state message again.

ReqID: CIS/Me001

11.1.2 Begin of medium behavior

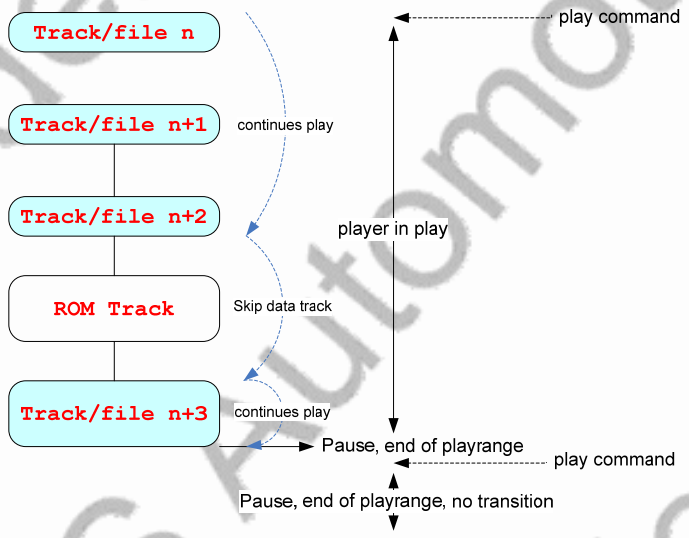
Precondition: Pause after detecting begin of media.
Action: The function command Search_backward without position parameter will force the same message again.

ReqID: CIS/Me002

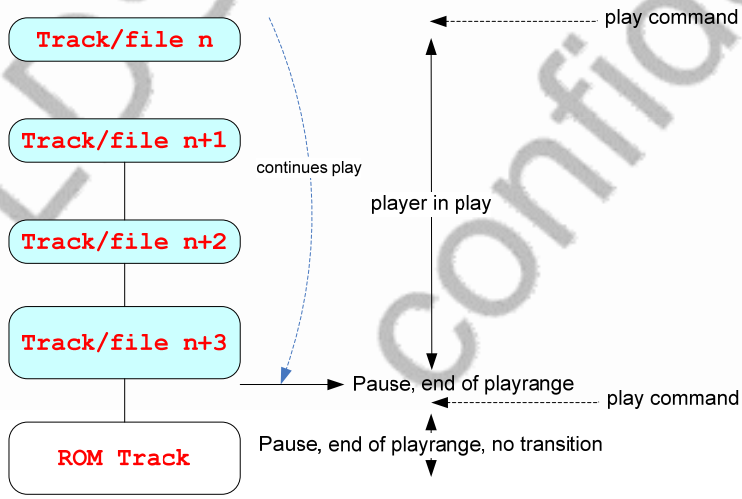
11.1.3 End of play-range behavior

If metadata is requested at the end of the play-range, data is reported from the last played track/file.
These pictures describes the behavior of the module at end of the play-range -end_of_media-, especially when a data-track is included.
The play position is reset to the beginning of the play-range, if the media is removed from the mechanism.

- data track is not last track



- data track is last track



ReqID: CIS/Me003

11.1.4 Begin of track/file behavior

The behavior at begin of track is similar (mirrored) the end_of_play-range_behaviour. Begin of track/file, can be achieved by using the search_backward functionality.

ReqID: CIS/Me004

11.1.5 Behavior at CA decoding error

Precondition: if the player_event CA_decoding_error is reported, the application has to steer the module to continue play-back.

Action: a play command (resume play or addressing the same song again or play @NAVPTR that is pointing to the defect song) is send by the application

Reaction: the module tries to start play-back of same file, where error was reported again.

Action: a next or a previous command is send by the application

Reaction: module start play-back of next file or previous file, according configuration

To avoid infinite recoveries by the application, the application has to identify if the song is the same, if a next or previous command is applied (for example by the linear song#). If the song# is the same, this song is the one and only on the media / play-range.

ReqID: CIS/Me012

11.1.6 Behavior of current play position

The current play position is updated to a new position

- if a time information message is provide that points to a different track/file, as a result of a requested or automatic track/file change
- if a player event CA decoding error is reported as a result of a requested or automatic track/file change

ReqID: CIS/Me014

12 Overview about CD device related features

12.1 CD loader features

12.1.1 Insertion by user

Precondition: Power on, reset released, mechanism ready for communication, a CD is manually inserted into the module.
Action: at insert switch activation, the media is inserted and the transition to the stop position is started.
Message: player_state = Stop, player_event=No status,
loader_state=Inserted, loader_event=Insert by user
or
player_state = Stop, player_event=No status,
loader_state=Error, loader_event=Insert by user

ReqID: CIS/Lo001

12.1.2 Power on, external reset, voltage drop reset

If the application applies a reset to the module, the application has to choose a different audio source or to mute. It is recommended to apply a reset cycle for the USB voltage supply in the same way.

•Power on, external reset, voltage drop reset, media in unknown position

Precondition: Power on, reset released, mechanism ready for communication, a CD is in unknown position
Action: automatically insertion of media starts
Message: first message is according Module ID and followed by
player_state = Stop, player_event=No status,
loader_state=Inserted, loader_event=Automatic insertion
or
player_state = Stop, player_event=No status,
loader_state=Error, loader_event= Automatic insertion

ReqID: CIS/Lo002

•Power on, external reset, voltage drop reset, No CD

Precondition: Power on, reset released, mechanism ready for communication, no CD in mechanism
Action: on power on/release reset no media is detected
Message: first message is according Module ID and followed by
player_state = Stop, player_event=No status,
loader_state=No CD, loader_event=No event

ReqID: CIS/Lo003

12.1.3 Push back

Precondition: Power on, reset released, mechanism ready for communication, the CD media is in eject position and the autoload time window is not expired.

Action: The user manually pushes the media back into the slot; the CD module immediately loads the media to stop position.

Message: player_state = Stop, player_event=No status,
loader_state=Inserted, loader_event=Pushback by user
or
player_state = Stop, player_event=No status,
loader_state=Error, loader_event=Pushback by user

ReqID: CIS/Lo004

12.1.4 Fast push back/blocking transition of media

Precondition: Power on, reset released, mechanism ready for communication, a CD is in transition (ejecting) between stop and eject position.

Action: The media is manually pushed back into the mechanism or blocked; the reaction of the mechanism is according the configuration of loader recoveries, if a time out for the transition is detected due to user invention.

Message: see state transition Module state

ReqID: CIS/Lo005

12.1.5 Power off loading feature

Precondition: No media, mechanism is not powered.

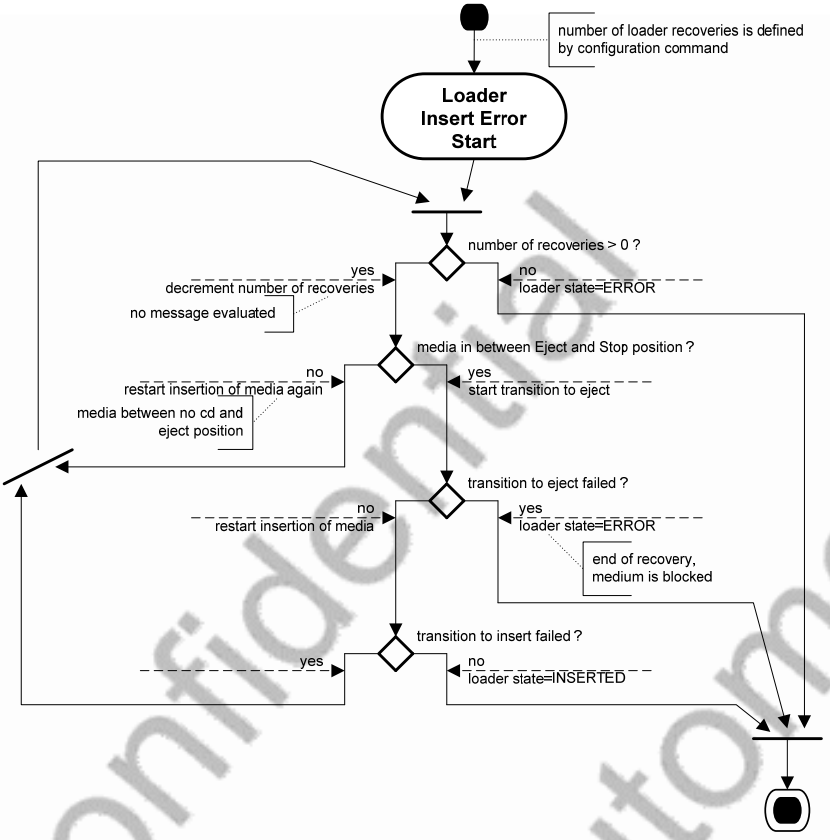
Action: The user inserts a media into the mechanism.

Message: A high (no CD) to low transition takes place at the SENS_I (Insert sensor) line

ReqID: CIS/Lo006

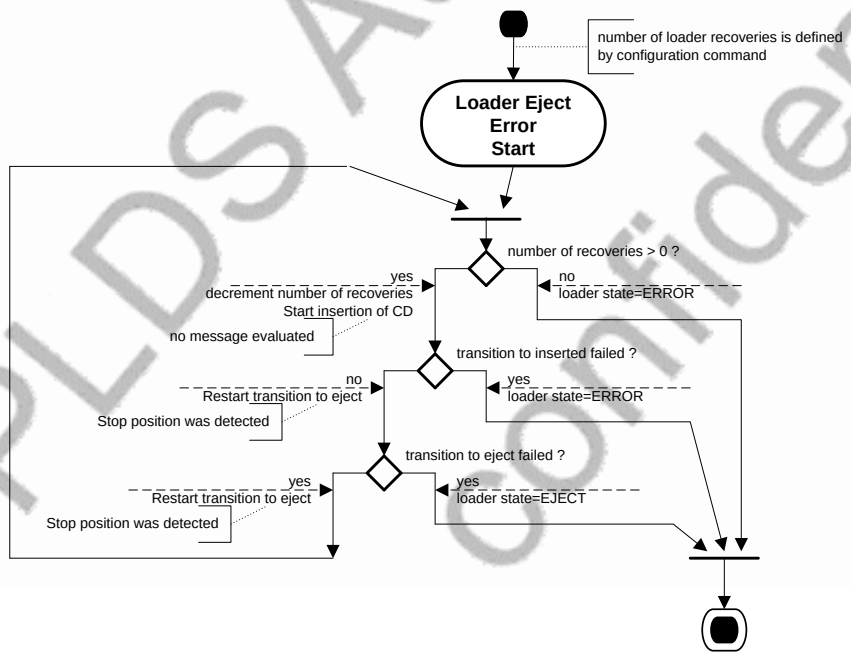
Remark: It is up to the application to perform the de-bouncing of the insert-switch and to power up the mechanism in order to force the insertion.

12.1.6 Loader recovery at insert error detection



ReqID: CIS/Lo007

12.1.7 Loader recovery at eject error detection



ReqID: CIS/Lo008

12.2 General CD player features

12.2.1 Behavior at Pause, Pre gap and Post gap

Play-back can take place within these areas.
A play function command always uses the absolute time, shown in the TOC to start play-back.
A play@M:S:F function command can be targeting in one of these areas will be executed and the play-back starts from the specified position. In all these areas the relative time counts backward (Index=0).

ReqID: CIS/Me005

12.2.2 Behavior at Lead-Out and Lead-In

During play-back all these areas are skipped.

ReqID: CIS/Me006

12.2.3 Play-back of CD media with unknown TOC

Precondition: A readable CD is in Eject position or Stop position after insert CD respectively after change of multi session mode (forcing new media evaluation only at mount command)

Action: Function command Play
Message: Module state = Play_by_function_command (play-back of first track/file)
ReqID: CIS/Me007

Action: Function command Search_forward
Message: Module state = Search forward, (searching in first track/file)

ReqID: CIS/Me008

Action: Function command Search_backward
Message: Module state = Search backward (search backward in last track/file)

ReqID: CIS/Me009

12.2.4 Playing CDs without TOC

Precondition: a self recorded not finalized CD or a CD with scratched (unreadable) TOC is inserted and a play command is send
Action: module tries to read TOC, after TOC reading is not possible the module reports an player_event and the player_state STOP.
Message: player_state= Stop, player_event=TOC reading failed

ReqID: CIS/Me010

12.2.5 Playing into blank area

Precondition: activated play-mode or search mode and an area without a signal is reached
Action: mechanism stop play-back and execute the transition to stop mode
Message: player_state=Stop, player_event= HF error or similar

ReqID: CIS/Me011

12.2.6 Behavior on reading error from media

Precondition: play-back is requested or play-back is active, reading from media failed at current position

Action: mechanism is executing internal recoveries

Reaction:
- If the recovery is done successfully within the defined play-range, play-back continues. If this recovery exceeds the current track, a track change occurs and play-back continues.
- If the recovery exceeds the configured play-range, the mechanism reports End_of_playrange as event.

ReqID: CIS/Me013

12.3 CD text language code

Table 12-1: Extract of language codes of CD-TEXT (information copied from [4])

Language	code [hex]	Language	code [hex]	Language	code [hex]
Unknown/ not applicable	00				
Albanian	01	Romansh	23	Ndebele	5E
Breton	02	Serbian	24	Marathi	5F
Catalan	03	Slovak	25	Moldavian	60
Croatian	04	Slovenian	26	Malaysian	61
Welsh	05	Finnish	27	Malagasy	62
Czech	06	Swedish	28	Macedonian	63
Danish	07	Turkish	29	Laotian	64
German	08	Flemish	2A	Korean	65
English	09	Walloon	2B	Khmer	66
Spanish	0A	Zulu	45	Kazakh	67
Esperanto	0B	Vietnamese	46	Canadian	68
Estonian	0C	Uzbek	47	Japanese	69
Basque	0D	Urdu	48	Indonesian	6A
Faroese	0E	Ukrainian	49	Hindi	6B
French	0F	Thai	4A	Hebrew	6C
Frisian	10	Telugu	4B	Hausa	6D
Irish	11	Tatar	4C	Guarani	6E
Gaelic	12	Tamil	4D	Gujarati	6F
Galician	13	Tadzhik	4E	Greek	70
Icelandic	14	Swahili	4F	Georgian	71
Italian	15	Sranan Tongo	50	Fulani	72
Lappish	16	Somali	51	Dari	73
Latin	17	Sinhalese	52	Churash	74
Latvian	18	Shona	53	Chinese	75
Luxembourgian	19	Serbo-croat	54	Burmese	76
Lithuanian	1A	Ruthenian	55	Bulgarian	77
Hungarian	1B	Russian	56	Bengali	78
Maltese	1C	Quechua	57	Byelorussian	79
Dutch	1D	Pushtu	58	Bambora	7A
Norwegian	1E	Punjabi	59	Azerbaijani	7B
Occitan	1F	Persian	5A	Assamese	7C
Polish	20	Papamiento	5B	Armenian	7D
Portugese	21	Oriya	5C	Arabic	7E
Romanian	22	Nepali	5D	Amharic	7F

13 Data signal output (depending on version)

13.1 Output mute

The application has to mute the output in the following conditions
- Mechanism power on
- Mechanism power off
- When reset is active
- Until first message of mechanism is signaled (CRQ low) after release reset
- Change of data output format

In all other cases the mechanism performs a mute as configured.

13.2 Digital output output:

The digital output (S/P-DIF or I^2S/EIAJ) signal needs to be enabled by the data output mode setting (see configuration commands). The signal is valid in the play- and search mode.

13.3 Analogue audio output:

The audio output is enabled in any play-back mode, if selected. Otherwise the output is muted.

14 Customer related feature

15 Get relative directory

The purpose of this command is to provide the relative directory number.

15.1 Get relative directory # command

A Get relative directory # command is responded by a message.
A Get relative directory # command does not force a transition of the module_state.
A Get relative directory # command can't be overwritten.

Table 15-1: relative dir # parameter

#	Name	format	description
1.	rel. dir#	uint16	Relative directory number

Table 15-2: Get relative directory # command

ReqID	request command	opcode [hex]	sub-id [hex]	parameter	return message
CIS/RDC001	Get relative directory #	9B	0x00	-	Relative directory info

15.2 Get relative directory # message

Table 15-3: Get relative directory # messages

ReqID	Message name	ID [hex]	Data content
CIS/RDM001	Relative directory info	90	device-id, directory-# or play-list-#, song #, rel. dir#, check sum