PHILIPS CDD2600

SCSI COMMAND SET

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SMALL COMPUTER SYSTEMS INTERFACE - 2 (SCSI-2).

This document defines mechanical, electrical, and functional specifications for attaching the CDD 2600 to computers equipped with Small Computer System Interface - 2 (SCSI-2) host adapter boards. Philips reserves the right to add status codes and/ or change the meaning of reserved bits. Please use appropriate methods (i.e., bit masks) to assure compatibility with future software releases.

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1 GENERAL INFORMATION.

1.1 REFERENCES.

X3T9.2/86-109 rev 10h: American National Standard for information systems - Small Computer System Interface - 2 (SCSI-2)

1.2 HISTORY.

All changes versus the previous version are indicated using the 'redline' method: a vertical dash on the left of the line indicates a change.

Revision	Date	Changes.
1.00	22 April 1996	First release.

2 MESSAGES.

Following single byte messages are proposed

Code	Description	Direction	
00h	command complete	in	
02h	save data pointer	in	
04h	disconnect	in	
05h	initiator detected error		out
06h	abort		out
07h	message reject	in	out
08h	no operation		out
09h	message parity error		out
0Ch	bus device reset		out
80h+	identify	in	out

Key:
In = Target to initiator
Out = Initiator to target

COMMAND COMPLETE 00H.

This message is sent from a target to an initiator to indicate that the execution of a command (or series of linked commands) has terminated and that valid status has been sent to the initiator. After successfully sending this message, the target shall go to the BUS FREE phase by releasing BSY. The target shall consider the message transmission to be successful when it detects the negation of ACK for the COMMAND COMPLETE message with the ATN signal false.

NOTE: the command may have been executed successfully or unsuccessfully as indicated in the status.

SAVE DATA POINTER 02H.

This message is sent from the CDD 2600 device to direct the initiator to copy the current data pointer to the saved data pointer for the current I/O process.

DISCONNECT 04H.

This message is sent from the CDD 2600 device to inform the initiator that the present connection is going to be broken (the writer plans to disconnect by releasing the BSY signal), but a later reconnect will be required in order to complete the current I/O process. After successfully sending this message, the target will go in the BUS FREE phase.

INITIATOR DETECTED ERROR 05h.

This message is sent from an initiator to inform a target that an error has occurred that does not preclude the target from retrying the operation. The CDD 2600 will treat this message the same as the ABORT message.

ABORT 06H.

This message is sent from the host to the CDD 2600 to clear the present operation. If a logical unit has been identified, all pending data for the issuing initiator from the effected logical unit shall be cleared, and the target will send directly a CHECK CONDITION STATUS and message COMPLETED and goes to the BUS FREE phase.

       Aborting during writing.

Upon detection by the CDD 2600 of the ABORT message, the current data collected in the buffer will be written to disc, at which time writing ceases. In case of writing in a reserved track, or in case the tracklength written was (still) lower then 4 seconds, the drive keeps writing with zero data till the end of the reserved track or the 4 seconds limit is reached.
The abort message will only abort the data transfers to buffer and not the writing action itself.
The abort message will not be accepted during a PMA update, laser power calibration or fixation.
In these situations a reject message will be returned to the host.

MESSAGE REJECT 07H.

This message is sent from either the initiator or target to indicate that the last message it received was inappropriate, has not been implemented or not valid in the current operation of the CDD 2600 . In order to indicate its intentions of sending this message, the initiator shall assert the ATN signal prior to its release of ACK for the REQ/ACK handshake of the message that is to be rejected. If the target receives this message under any other circumstance, it shall reject this message.

When a target sends this message, it shall change to MESSAGE IN phase and send this message prior to requesting additional message bytes from the initiator. This provides an interlock so that the initiator can determine which message is rejected.

NO OPERATION 08H.

This message is sent from an initiator in response to a target's request for a message when the initiator does not currently have any other valid message to send.

MESSAGE PARITY ERROR 09H.

This message is sent from an initiator to a target to indicate that it received a message byte with a parity error. The sending of this message coincident with the message byte in error provides an interlock so that the target can determine which message byte was in error. If this message is received at any other time, all current operators will cease and the target will go to

the BUS FREE phase.

BUS DEVICE RESET 0CH.

This message is sent from a initiator to direct a target to clear all current commands on that SCSI device. The message forces the SCSI device to an initial state with no operations pending for any initiator. Upon recognizing this message, the target shall go to the BUS FREE phase.
BUS DEVICE RESET will:
- clear the selftest error.
- clear sense data.
- allow medium removal.
- set unit attention.
- disable the limited command set.
- release all SCSI device reservations.

IDENTIFY 80h or C0h.

These messages are sent by either the initiator or the target to establish the physical path connection between an initiator and target for a particular logical unit. Logical units different from 0 are not supported.

The identify messages with code C0h indicates a disconnect privilege. In the CDD 2600 disconnection is supported.

OVERLAPPED COMMAND HANDLING

According to the SCSI specification, an Incorrect Initiator connection (the situation where a host is sending a new command to a target, while the target has not yet completed the previous command sent by the same host), should be reacted on by ABORTING the current command, resulting in a Check Condition with sense key ABORTED COMMAND / OVERLAPPED COMMANDS ATTEMPTED.
In case of a Write Once medium this is of course a much too drastic measure: by aborting a write or fixation command the disc may be ruined! And, in a multi-tasking environment, it is very well possible that another application wants to check the status of the drive. Because we are talking about the same host and the same target the current command would be immediately aborted! Obviously, it is much better to return BUSY status to the initiator, just as in the situation where another host wants to access the drive. And in case the host decides that an ABORT was necessary, it can always assert attention and send an ABORT message or give a bus reset

3 LOGICAL ADDRESSING.

3.1 CD-ROM LOGICAL ADDRESSING.

According to the yellow book, pre-gaps and post-gaps are located between different kind of tracks on the medium. These pre and post-gaps do not contain user data. It is recommended not to address to these gaps with a read data commands, because the drive may generate an error message, depending on the command and the address in the gap.

The logical address range for a CD-Rom disc is contiguous starting from first addressable block till the last addressable block. Numbering is contiguous all over the disc (= all tracks) including gaps (pre/post), leadin/leadout areas (hybrid disc's) and audio tracks.
If a logical address point within an audio track for data access then an error will be reported.
Logical address zero starts physical at 00:02:00 MSF (Minutes, Seconds, Frames).

Exceptions.

> Discontinuity in the addressing of logical sectors will appear if written incrementally with fixed packets.

4 COMMAND SET.

The following SCSI commands are implemented:

Group 0 commands:

Opcode[a]	Command
00	Test Unit Ready
01	Rezero Unit
03	Request Sense
08	Read
0A	Write
0B	Seek
12	Inquiry
15	Mode Select
16	Reserve
17	Release
18	Copy
1A	Mode Sense
1B	Start / Stop Unit
1C	Receive Diagnostic Results.
1D	Send Diagnostics
1E	Prevent/Allow medium removal

a. Opcode in Hexadecimal format

Group 1 & 2 - ten bytes commands:

Opcode[a]	Command
25	Read Capacity
28	Read
2A	Write
2B	Seek
2F	Verify
35	Flush Cache
3B	Write Buffer
3C	Read Buffer
42	Read Sub Channel
43	Read Toc
45	Play Audio
47	Play Audio MSF
48	Play Audio Track Index
4B	Pause Resume
51	Read Disc Information
55	Mode Select
5A	Mode Sense

a. Opcode in Hexadecimal format

Group 6-7 : Vendor Unique commands:

Opcode[a]	Command
D2	Read OPC
D3	Write OPC
E2	First Writable address
E3	Format track
E4	Reserve track
E5	Read Track Info
E6	Write Track

Opcode[a]	Command
E7	Medium Load/Unload
E8	Finish track
E9	Fixation (write Leadin and Leadout)
EA	Update PMA
EB	Send Absorption Control Errors
EC	Recover
ED	Write session
EE	Read session info
F1	Send Service
F2	Request Service Data

a. Opcode in Hexadecimal format

Because certain bits are the same in all commands, these are not explained after every command. Bits specific to a certain command will be explained at the command.
The bits common to most commands are:

VND UN = VENDOR UNIQUE = 00
FLG = FLAG = 00
LNK = LINK = 00
RES = RESERVED = 00

4.1 TEST UNIT READY.

	7	6	5	4	3	2	1	0
0	TEST UNIT READY (00)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	VND UN		RESERVED				FLG	LNK

The TEST UNIT READY command provides a means to determine if the CDD 2600 is ready.
Ready means disc is mounted, and ready for operation.

Good status is returned in the Status Phase if the drive is ready.
If the drive is not ready, then CHECK CONDITION status is returned and
a sense code is set according the following table:

case	sense code at next request
drive not ready and tray in	(NOT READY, MEDIUM NOT PRESENT)
drive not ready and tray out	(NOT READY, TRAY OUT)
selftest detected a hardware error	(UNIT ATTENTION, POWER ON or SELFTEST FAILURE)

4.2 REZERO UNIT.

	7	6	5	4	3	2	1	0
0	REZERO UNIT (01h)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	VND UN		RESERVED				FLG	LNK

The REZERO UNIT command requests that the target set the logical unit to a specific state.

If a disc is mounted, REZERO UNIT performs the same functions as the START command. If no disc is mounted, a check condition is given. The sense codes are set to (NOT READY, TRAY OUT).

In addition, if RESET, POWER UP or a SEND DIAGNOSTICS command resulted in a SELFTEST failure, the error will be cleared by this command.

4.3 REQUEST SENSE.

	7	6	5	4	3	2	1	0
0	REQUEST SENSE (03h)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	ALLOCATION LENGTH							
5	VND UN		RESERVED				FLG	LNK

The REQUEST SENSE command causes the controller to transfer sense data to the host regarding completion conditions of the host's previous command or deferred errors. Sense data is stored on completion of each command and preserved until receipt of the next command from the host. The sense data is cleared after completion of a REQUEST SENSE command.

The allocation length specifies the number of bytes allocated by the host for the sense data. If zero no sense data will be transferred.
The CD-R drive will terminate the data in phase when allocation length bytes have been sent, or when all available sense data been sent.

CHECK CONDITION status will be issued for the REQUEST SENSE command only if a non-zero reserved bit is received in the Command Descriptor Block.

If a UNIT ATTENTION condition has occurred since the last SCSI command (and therefore has not been reported yet), it will not be cleared by the REQUEST SENSE command, and will be reported when the next SCSI command is issued (except for the INQUIRY, SEND DIAGNOSTICS and REQUEST SENSE commands).

SENSE DATA FORMAT

	7	6	5	4	3	2	1	0
0	VALID	ERROR CLASS = 7			ERROR CODE = 0 or 1			
1	SEGMENT NUMBER							
2	FM=0	EOM=0	ILI	RESRV	SENSE KEY			
3	INFORMATION BYTE (MSB)							
4	INFORMATION BYTE							
5	INFORMATION BYTE							
6	INFORMATION BYTE (LSB)							
7	ADDITIONAL SENSE LENGTH = 0AH							
8	RESERVED							
9	RESERVED							
A	RESERVED							
B	RESERVED							
C	ADDITIONAL SENSE CODE (ASC)							
D	RESERVED							
E	FRU FAILED							
F	SKSV	C/D	RESERVED		BPV	BIT POINTER		
10	FIELD POINTER (MSB)							
11	FIELD POINTER (LSB)							

BYTE: EXTENDED SENSE PARAMETERS:

00   This byte contains the error class, error code and the valid flag. The error class and
           error code fields are reserved for backward compatibility with some CD-ROM
           drives and CD-WO devices which use what is now called non-extended sense.
           Is extended sense used then error class is always 7 and error code can be 0 or 1 (0
           represents current sense code and 1 deferred sense code). The valid bit is set to
           indicate that the information bytes contain valid block address.

01   The segment number is set to zero.

02   File Mark (FM) is reserved for use by sequential access devices. This field is
           always zero.
           End Of Medium (EOM) is reserved for use by sequential access and printer
           devices. This field is always 0.

           Incorrect Length Indicator (ILI) is set when the block size requested by MODE
           SELECT command does not match the block size of the data on the medium.

SENSE KEY provides a means of determining the general category of error. Sense Keys supported are:

SENSE KEY DESCRIPTIONS

CODE	NAME	DESCRIPTION
00h	NO SENSE	Indicates that there is no specific sense key information to be reported for the designated logical unit. This would be the case for a successful command.
01h	RECOVERED ERROR	Indicates that the last command completed successfully with some recovery action performed. Details may be determinable by examining the additional sense bytes and the information bytes. During read it indicates that an ECC correction or retry was done. During write it indicates that the track length is longer, because not enough block where send to the device to meet the minimum track length specification of 300 blocks
02h	NOT READY	Indicates that the logical unit addressed cannot be accessed. Operator intervention may be required to correct this condition
03h	MEDIUM ERROR	Indicates that the command terminated with a non-recovered error condition that was probably caused by a flaw in the medium or an error in the recorded data.
04h	HARDWARE ERROR	Indicates that the CDD 2600 detected a hardware failure (e.g. controller or device failure, parity error, etc.) while performing the command or during a selftest.
05h	ILLEGAL REQUEST	Indicates that there was an illegal parameter in the Command Descriptor Block or in the additional parameters supplied as data for some commands (e.g. MODE SELECT).
06h	UNIT ATTEN-TION	Indicates that either the disc or the drive operating parameters may have been changed (by a MODE SELECT command from another initiator or reset) since last command issued by this initiator.
08h	BLANK CHECK	Indicates that the drive encountered blank medium or format-defined end of data indication while reading or the drive encountered a non-blank medium while writing.

SENSE KEY DESCRIPTIONS

CODE	NAME	DESCRIPTION
09h	VENDOR SPE-CIFIC	For reporting Vendor Specific conditions.
0Bh	ABORTED COM-MAND	Indicates that the CDD 2600 aborted the command. The host may be able to recover by trying the command again.
0Dh	VOLUME OVERFLOW	Indicates that the CDD 2600 has reached the end-of volume during writing or reading.
0Eh	MISCOMPARE	Indicates that the CDD 2600 detected a mismatch of settings, used to read source data on the medium.

03H--06H Information bytes. If the valid bit is set then the information bytes contain valid information.

07H   Additional sense length. This byte contains the number of sense bytes which follow byte 7 of the extended sense data. For CDD 2600 this byte is set to 0AH.

0CH   Additional Sense Code. This byte provides a more precise indication of the error then the sense key.

The following ADDITIONAL SENSE CODES are defined:

Request Sense Code and Sense Key.

Sense Code	Sense Code Description	Sense Key	Sense Key Description
04H	DRIVE NOT READY. Indicates that the drive is temporarily not able to perform the desired operation.	02	NOT READY.
08H	COMMUNICATION FAILURE. Indicates that a communication error between the SCSI controller and the servo prevented the command from being performed.	04	HARDWARE ERROR.
09H	TRACK FOLLOWING ERROR. Indicates that focusing or radial tracking did not succeed.	04	HARDWARE ERROR.

Request Sense Code and Sense Key.

Sense Code	Sense Code Description	Sense Key	Sense Key Description
11H	UNRECOVERED READ ERROR. Indicates that the previous READ command failed, probably due to a flaw in the disc.	03	MEDIUM ERROR.
15H	POSITIONING ERROR. Indicates that a seek to a requested location on disc failed.	04	HARDWARE ERROR.
17H	RECOVERED READ DATA WITH RETRIES. Indicates that the previous READ command required data recovery which was accomplished by additional READ operations.	01	RECOVERED ERROR
18H	RECOVERED READ WITH ECC CORRECTION. Indicates that the previous READ command required data recovery, which was accomplished using ECC correction.	01	RECOVERED ERROR
1AH	PARAMETER LIST LENGTH ERROR.	05	ILLEGAL REQUEST.
20H	INVALID COMMAND. The previous SCSI command is not supported by the device.	05	ILLEGAL REQUEST.
21H	INVALID BLOCK ADDRESS. Indicates that one or more of the block addresses requested by the last READ, WRITE, SEEK or VERIFY command extends beyond the end of disc.	05	ILLEGAL REQUEST.
24H	ILLEGAL FIELD IN COMMAND DESCRIPTOR. 1. Indicates that one or more of the reserved bits in the Command Descriptor was set, or that an option was selected that is not supported by the CDD 2600. The Field Pointer and possibly the Bit Pointer will indicate which field was improperly set.	05	ILLEGAL REQUEST.
	2. Indicates that during audio playback the information type (audio to data) has changed, or that starting address for playback is not within an audio track.	08	BLANK CHECK

Request Sense Code and Sense Key.

Sense Code	Sense Code Description	Sense Key	Sense Key Description
25H	INVALID LUN. Indicates that the Logical Unit Field of the Command Descriptor was non-zero. The drive supports Logical Unit zero only.	05	ILLEGAL REQUEST.
26H	INVALID FIELD PARAMETER LIST. Indicates that the parameter list contained one or more reserved bits set to 1,or that an option was set not supported by the CDD 2600. The Field Pointer and possible the Bit Pointer contain additional information as to which bit(s) were improperly set.	05	ILLEGAL REQUEST.
28H	MEDIUM CHANGED. Indicates that the disc may have been changed since the last command issued by this initiator.	06	UNIT ATTENTION.
29H	POWER-ON RESET OR BUS-RESET OCCURRED. Indicates that a power-on reset or a bus-reset has occurred since the last command issued by this initiator.	06	UNIT ATTENTION.
2AH	MODE PARAMETERS CHANGED. Indicates that a mode change has been done by another initiator.	06	UNIT ATTENTION.
2CH	COMMAND SEQUENCE ERROR. Indicates that the previous command is not allowed in the sequence.	05	ILLEGAL REQUEST.
30H	CANNOT READ MEDIUM UNKNOWN FORMAT. Indicates that the drive couldn't read the information from the device or medium, necessary to execute the current command.	02	NOT READY.
31H	MEDIUM FORMAT CORRUPTED. Indicates that the drive couldn't read (write) the requested information from (to) disc due to a corrupted or unknown format.	03	MEDIUM ERROR.
34H	ABSORPTION CONTROL ERROR. Indicates that an error might have occurred in the recorded data that was written, caused by laser power clipping.	03	MEDIUM ERROR.

Request Sense Code and Sense Key.

Sense Code	Sense Code Description	Sense Key	Sense Key Description
3AH	MEDIUM NOT PRESENT. Indicates that no disc is mounted in the drive.	02	NOT READY.
3DH	INVALID BITS IN IDENTIFY MESSAGE. Indicates that the IDENTIFY MESSAGE is corrupted.	0B	ABORTED COMMAND.
40H	DIAGNOSTIC FAILURE. Indicates that a device self-test failed, either as the result of a power-on self-test sequence, or as the result of the SEND DIAGNOSTICS command with the self-test bit set.	06	UNIT ATTENTION.
42H	POWER-ON OR SELF TEST FAILURE. Indicates that a power-on self-test sequence failed.	06	UNIT ATTENTION.
44H	INTERNAL CONTROLLER ERROR. Indicates that the controller detected an error which could not be otherwise explained.	04	HARDWARE ERROR.
47H	SCSI PARITY ERROR. Indicates that the controller detected an parity error.	0B	ABORTED COMMAND.
50H	WRITE APPEND ERROR. Indicates that a append by a WRITE command during writing failed.	0B	ABORTED COMMAND.
53H	MEDIUM LOAD OR EJECT FAILED. Indicates that loading or unloading of the disc failed.	04	HARDWARE ERROR.
57H	UNABLE TO READ TOC, PMA OR SUBCODE. Indicates that the drive was unable to read the TOC, PMA or subcode of the current disc.	03	MEDIUM ERROR.
5AH	OPERATOR MEDIUM REMOVAL REQUEST. Indicates the operator requested to unload the disc.	06	UNIT ATTENTION.
63H	END OF USER AREA ENCOUNTERED ON THIS TRACK. Indicates that the requested block exceeds the current track.	05	ILLEGAL REQUEST.

Request Sense Code and Sense Key.

Sense Code	Sense Code Description	Sense Key	Sense Key Description
64H	ILLEGAL MODE FOR THIS TRACK. Indicates that the data on the track is not according the mode which is requested by the command. (e.g. block size < 2332 bytes for mode-2 tracks or READ DATA from audio track.)	05	ILLEGAL REQUEST.
65H	VERIFY FAILED. Reaction on the VERIFY command when the verification was not successful.	09	Vendor Specific.
81H	ILLEGAL TRACK. Indicates that the track being accessed does not exist.	05	ILLEGAL REQUEST.
82H	COMMAND NOW NOT VALID. indicates that the command valid for the current host.	05	ILLEGAL REQUEST.
83H	MEDIUM REMOVAL IS PREVENTED. Indicates that medium removal is prevented.	05	ILLEGAL REQUEST.
84H	TRAY OUT. Indicates that the drive's tray is out.	02	NOT READY.
85H	TRACK AT ONCE NOT IN PMA.	03	MEDIUM ERROR.
A0H	STOPPED ON NON-DATA BLOCK. During read data transfer is stopped because a non-data block was attempted to read.	05	ILLEGAL REQUEST.
A1H	INVALID START-ADDRESS.	05	ILLEGAL REQUEST.
A2H	ATTEMPT TO CROSS TRACK-BOUNDARY. The transfer length by a write-track-command does not match the free space length in the track.	05	ILLEGAL REQUEST.
A3H	ILLEGAL MEDIUM. For executing current command a WO (Write Once) disc is needed.	05	ILLEGAL REQUEST.
A4H	DISC WRITE-PROTECTED. Current disc is write protected.	05	ILLEGAL REQUEST.

Request Sense Code and Sense Key.

Sense Code	Sense Code Description	Sense Key	Sense Key Description
A5H	APPLICATION CODE CONFLICT. The Disc Application Code does not match with the Host Application Code.	05	ILLEGAL REQUEST.
A6H	ILLEGAL BLOCK-SIZE FOR COMMAND. Selected block-size is not allowed for this command.	05	ILLEGAL REQUEST.
A7H	BLOCK-SIZE CONFLICT. Selected block-size caused a mode conflict.	0E	MISCOMPARE.
A8H	ILLEGAL TRANSFER LENGTH. Indicates that the transfer length in the command descriptor block would overflow the write buffer.	05	ILLEGAL REQUEST.
A9H	REQUEST FOR FIXATION FAILED. Because of existing of blank area on disc (=reserved tracks).	05	ILLEGAL REQUEST.
AAH	END OF MEDIUM_REACHED. Indicates that during writing the end of medium is detected or the amount of track reached the limit of 99 or the OPC area is full or PMA is full.	0D	VOLUME OVER-FLOW.
ABH	ILLEGAL TRACK NUMBER. Indicates a invalid Track number in command descriptor block.	05	ILLEGAL REQUEST.
ACH	DATA TRACK LENGTH ERROR. Indicates that the track length is longer, because not enough block where send to the device to meet the minimum track length specification of 300 blocks.	01	RECOVERED ERROR.
ADH	BUFFER UNDER RUN. Indicates that the write action stopped because the cache buffer emptied.	0B	ABORTED COM-MAND.
AEH	ILLEGAL TRACK MODE. Indicates that the selected Track Mode is not valid.	05	ILLEGAL REQUEST.
AFH	OPTIMUM POWER CALIBRATION (OPC) ERROR. Indicates that power calibration failed.This could indicate: Wrong WO medium installed, laser failure or drive failure.	03	MEDIUM ERROR.

Request Sense Code and Sense Key.

Sense Code	Sense Code Description	Sense Key	Sense Key Description
B0H	CALIBRATION AREA ALMOST FULL. Indicates that a few Optimum Power Calibration areas are left. Its recommended to fixate after the tracks are written.	0B	ABORTED COMMAND.
B1H	CURRENT PROGRAM AREA EMPTY. Indicates that the command couldn't be executed due to a empty program area.	05	ILLEGAL REQUEST.
B2H	NO EFM AT SEARCH ADDRESS. Indicates that during reading or play-back request no EFM was present.(EFM is the CD signal needed for reading)	08	BLANK CHECK.
B3H	LINK AREA ENCOUNTERED. Indicates that during reading the link area is encountered.	05	ILLEGAL REQUEST.
B4H	CALIBRATION AREA FULL. Indicates that the Calibration area is full. This means that no further write can be performed on this disc.	0D	VOLUME OVERFLOW.
B5H	DUMMY BLOCKS ADDED. Indicates that during writing dummy blocks are added to meet the disc specification. Dummy blocks will be added if to few (host) blocks are received for that track.	05	ILLEGAL REQUEST.
B6H	BLOCK SIZE FORMAT CONFLICT. Indicates that during writing a block (with sub-header) was received and a conflict was detected between the form bit (in subheader) and the block size.	05	ILLEGAL REQUEST.
B7H	CURRENT COMMAND ABORTED. Indicates that the current command is aborted due to the ABORT message received during the message out phase (ATN active).	0B	ABORTED COMMAND.
B8H	PROGRAM AREA NOT EMPTY. Indicates that the current program area contains tracks.	05	ILLEGAL REQUEST

Request Sense Code and Sense Key.

Sense Code	Sense Code Description	Sense Key	Sense Key Description
B9H	PARAMETER LIST TOO LARGE. Indicates that the CDD 2600 is not capable to process the parameter list due to too less RAM.	05	ILLEGAL REQUEST
C0H	NO BARCODE AVAILABLE. Indicates no barcode present on disc.	05	ILLEGAL REQUEST.
C1H	BARCODE READING ERROR. Indicates that an error occurred during barcode reading.	03	MEDIUM ERROR.
D0H	RECOVERY NEEDED. Indicates that the CDD 2600 detected during power up that the device was writing during the last power down. The medium format could be corrupted. Its recommended to issue the RECOVER command.	09	Vendor Specific.
D2H	CAN'T RECOVER FROM FROM POWER FAILURE Indicates that the recovering failed.	03	MEDIUM ERROR.
D5H	CAN'T RECOVER Indicates that the recovering failed.	03	MEDIUM ERROR.
D6H	EEPROM FAILURE. Indicates that the non volatile memory failed.	04	HARDWARE ERROR.

0EH   FRU (Field Replaceable Unit) failed.
           If this field is set then a hardware error is encountered in the unit. If more than one bit is set, there may be an error in one of the units, in more than one, or in all units indicated.

           FRU code

7	6	5	4	3	2	1	0

  bit 0   Servo board
        1   Write Once Signal Processing board
        2   Data Buffer Manager board
        3   Power supply
        4-7 Reserved

0FH   BPV (bit pointer valid). This bit indicates the validity of the bit pointer field. If set

to 1, the bit pointer is valid; if set to 0, the bit pointer is not valid. If the BPV field is set to 1, this field indicates the number of the first bit in either this command or data buffer which was improperly set.

C/D (Command/Data). If this bit is set, it indicates that a field in the command descriptor buffer was improperly set. If set to 0, it indicates that a field in the parameter list was improperly set.

SKSV (Sense key Specific Valid). If this bit is set, the Sense key Specific Field (bytes 0FH--11H) contains valid information related to the error.

10H--11H Field Pointer. If the SKSV flag is set, these bytes contain the byte number of the Command Descriptor Block or Parameter List which was found to be improperly set.

Additional Sense Code

(04H) Drive Not Ready
(08H) Communication Failure
(09H) Track Following Error

(11H) Unrecovered Read Error
(15H) Positioning Error
(17H) Recovered Read Data With Retries
(18H) Recovered Read With ECC Correction
(1AH) Parameter List Length Error

(20H) Invalid command
(21H) Invalid Block Address
(24H) Illegal Field in Command List
(25H) Invalid LUN
(26H) Invalid Field Parameter List
(28H) Medium Changed
(29H) Power-on Reset or Bus Reset Occurred
(2AH) Mode Parameters Changed
(2CH) Command Sequence Error

(30H) Cannot Read Medium Unknown Format
(31H) Medium Format Corrupted
(34H) Absorption Control Error
(3AH) Medium not Present
(3DH) Invalid Bits in Identify Message

(40H) Diagnostic Failure
(42H) Power-On or Self Test Failure
(44H) Internal Controller Error
(47H) SCSI Parity Error

(50H) Write Append Error
(53H) Medium Load or Eject Failed
(57H) Unable to Read TOC, PMA or subcode
(5AH) Operator Medium Removal Request

(63H) End Of User Area encountered on this Track
(64H) Illegal Mode for this Track
(65H) Verify Failed

(81H) Illegal Track
(82H) Command Now Not Valid
(83H) Medium Removal Is Prevented
(84H) Tray out
(85H) Track at once not in PMA

(A0H) Stopped on Non-data block
(A1H) Invalid Start Address
(A2H) Attempt to cross track-boundary
(A3H) Illegal Medium
(A4H) Disc Write-protected
(A5H) Application Code Conflict
(A6H) Illegal block-size for command
(A7H) Block-size Conflict
(A8H) Illegal Transfer Length
(A9H) Request for Fixation Failed
(AAH) End Of Medium Reached
(ABH) Illegal Track Number
(ACH) Data Track Length Error
(ADH) Buffer Under Run
(AEH) Illegal Track Mode
(AFH) Optimum Power Calibration Error

(B0H) Calibration Area Almost Full
(B1H) Current Program Area Empty
(B2H) No EFM at search address
(B3H) Link Area Encountered
(B4H) Calibration Area Full
(B5H) Dummy blocks added.
(B6H) Block size format conflict.
(B7H) Current Command Aborted.
(B8H) Program area not empty
(B9H) Parameter list too large

(C0H) No Barcode Available
(C1H) Barcode Reading Error

(D0H) Recovery Needed
(D2H) Can't Recover from power failure
(D5H) Can't Recover
(D6H) Eeprom failure

4.4 READ (GROUP 0 & 1).

GROUP 0:

	7	6	5	4	3	2	1	0
0	READ0 (08)							
1	LUN=0			LOG BLOCK ADD (MSB)				
2	LOGICAL BLOCK ADDRESS							
3	LOGICAL BLOCK ADDRESS (LSB)							
4	TRANSFER LENGTH							
5	VND	MIX	RESERVED				FLG	LNK

GROUP 1:

	7	6	5	4	3	2	1	0
0	READ1 (28)							
1	LUN=0			RESERVED				
2	LOGICAL BLOCK ADDRESS (MSB)							
3	LOGICAL BLOCK ADDRESS							
4	LOGICAL BLOCK ADDRESS							
5	LOGICAL BLOCK ADDRESS (LSB)							
6	RESERVED							
7	TRANSFER LENGTH (MSB)							
8	TRANSFER LENGTH (LSB)							
9	VND	MIX	RESERVED				FLG	LNK

MIX = MIXED FORMAT

Transfer of data from target to initiator.

Parameters

LOGICAL BLOCK ADDRESS
>   The logical block address specifies the address where reading is to begin.

TRANSFER LENGTH
>   Transfer Length specifies the total number of contiguous blocks to be transferred. A value of zero indicates for group 0 command a transfer length of 256 blocks and by group 1 a transfer length of 0 blocks.
>
>   Any length is legitimate if possible within one track.

MIX
>   The mix bit being set allows the CDD 2600 to read a CD-ROM XA or a CD-I track(both

are mode 2 tracks) which are a mixture of form 1 and form 2 sectors.Depending upon the blocksize selected, different portions of a sector will be transferred to the host.

The block size must be set to 2056 or 2336 to return the user data and the subheader.The block size must be set to 2060 or 2340 to return the user data, the subheader and the header.

The block size must be set to 2352 to return red book audio samples (audio data) or raw data sectors (data sectors including syncs are passed through without descrambling by a data block decoder).

In case of audio data readback, the data during the data in phase on the SCSI bus is specified corresponding following pattern:

byte nr	description
0	Most significant byte of (first) left audio sample
1	Least significant byte of (first) left audio sample
2	Most significant byte of (first) right audio sample
3	Least significant byte of (first) right audio sample
4	Most significant byte of (second) left audio sample
etc.	

The transfer length is the sum of the form 1 and form 2 blocks.

If reading within CD-ROM XA tracks, the rules for error correction, only for form 1 sectors are the same as for mode 1 tracks.

If the block size is set to 2048 or 2056 and the track mode is 2, then an error is reported if during play back a form 2 block is encountered.

Changing the disconnect privilege during a read command will cause the drive to stop the present operation and send error data back to the host.

Valid block-sizes are:

VALID BLOCKSIZE.

Track Type	Block Size	Data Transferred	Size
Mode 1 & mix = 0			
	2048	User data	(2048)
	2052	Header	(4)
		User data	(2048)
	2336	User data	(2048)
		ECC + EDC	(288)
	2340	Header	(4)
		User data	(2048)
		ECC + EDC	(288)
	2352	Raw data sectors	(2352)
Mode 2 & mix = 0			
	2336	User data	(2336)
	2340	Header	(4)
		User data	(2336)
	2352	Raw data sectors	(2352)
Mode 2 Form 1 only & mix = 0			
	2048	User data	(2048)
	2056	Subheader	(8)
		User data (2048)	(2048)
	2060	Header	(4)
		Subheader	(8)
		User data	(2048)

VALID BLOCKSIZE.

Track Type	Block Size	Data Transferred	Size
	2336		
		Subheader	(8)
		User data	(2048)
		ECC + EDC	(280)
	2340		
		Header	(4)
		Subheader	(8)
		User data	(2048)
		ECC + EDC	(280)
	2352	Raw data sectors	(2352)
Mode 2 Form 2 only & mix=0			
	2324		
		User data	(2324)
	2328		
		User data	(2324)
		Spare/ EDC	(4)
	2332		
		Subheader	(8)
		User data	(2324)
	2336		
		Subheader	(8)
		User data	(2324)
		Spare/ EDC	(4)
	2340		
		Header	(4)
		Subheader	(8)
		User data	(2324)
		Spare/ EDC	(4)
	2352	Raw data sectors	(2352)

VALID BLOCKSIZE.

Track Type	Block Size	Data Transferred	Size
Mode 2 Form 1 or Form 2 & mix = 1			
	2056 or 2336		
Form 1 sectors		Subheader	(8)
		User data	(2048)
Form 2 sectors		Subheader	(8)
		User data	(2324)
		Spare/EDC	(4)
	2060 or 2340		
		Header	(4)
		Subheader	(8)
Form 1 sectors		User data	(2048)
		Header	(4)
		Subheader	(8)
Form 2 sectors		User data	(2324)
		Spare/EDC	(4)
Audio Sectors			
	2352	Audio Samples	

The error correction rules are as specified in the mode select command.

Table sorted by Blocksize.

.

Block Size	Track Type	Data Transferred	Size
2048			
	Mode 1	User Data	2048
	Mode 2 Form 1	User Data	2048
2052			
	Mode 1	Header	(4)
		User Data	(2048)
2056			
	Mode 2 Form 1	Subheader	(8)
		User Data	(2048)
2060			
	Mode 2 Form 1	Header	(4)
		Subheader	(8)
		User Data	(2048)
2324			
	Mode 2 Form 2	User Data	(2324)
2328			
	Mode 2 Form 2	User Data	(2324)
		Spare / EDC	(4)
2332			
	Mode 2 Form 2	Subheader	(8)
		User Data	(2324)
2336			
	Mode 1	User Data	(2048)
		ECC + EDC	(288)
	Mode 2 CD ROM	User Data	(2336)
	Mode 2 Form 1	Subheader	(8)
		User data	(2048)
		ECC + EDC	(280)
	Mode 2 Form 2	Subheader	(8)
		User data	(2324)
		Spare/EDC	(4)
2340			
	Mode 1	Header	(4)
		User data	(2048)
		ECC + EDC	(288)
	Mode 2 CD ROM	Header	(4)

		User data	(2336)
Mode 2 Form 1		Header	(4)
		Subheader	(8)
		User data	(2048)
		ECC + EDC	(280)
Mode 2 Form 2		Header	(4)
		Subheader	(8)
		User data	(2324)
		Spare/EDC	(4)
2352			
	All Data + Audio mode	Raw data sectors	(2352)

Note: Not all blocks on a disc are readable. Between 2 write actions, run-out, link and run-in blocks are inserted. There is no meaningful information in these blocks. However if a host tries to access one of these blocks, errors will be generated as listed in the table below.

Table: Errors generated when reading run-in/run-out/link blocks

Block	SK (Sense Key)	ASC (Additional Sense Code)
Link	03: Medium error	11: unrecoverable read error
Run-in block 1	03: Medium error	D5: Can't recover
Run-in block 2	0D: Volume Overflow	AA: End of medium reached
Run-in block 3	0D: Volume Overflow	AA: End of medium reached
Run-in block 4	0D: Volume Overflow	AA: End of medium reached
Run-out block 1	0D: Volume Overflow	AA: End of medium reached
Run-out block 2	0D: Volume Overflow	AA: End of medium reached

Table: Packet Layout.

Link Block	Run-in block 1	Run-in block 2	Run-in block 3	Run-in block 4	User Data Blocks	Run-out Block 1	Run-out Block 2

4.5 WRITE (GROUP 0 & 1).

GROUP 0:

	7	6	5	4	3	2	1	0
0	WRITE0 (0AH)							
1	LUN=0			LOG BLOCK ADD (MSB)				
2	LOGICAL BLOCK ADDRESS							
3	LOGICAL BLOCK ADDRESS (LSB)							
4	TRANSFER LENGTH							
5	RES	MIX	RESERVED				FLG	LNK

GROUP 1:

	7	6	5	4	3	2	1	0
0	WRITE1 (2AH)							
1	LUN=0			RESERVED				
2	LOGICAL BLOCK ADDRESS (MSB)							
3	LOGICAL BLOCK ADDRESS							
4	LOGICAL BLOCK ADDRESS							
5	LOGICAL BLOCK ADDRESS (LSB)							
6	RESERVED							
7	TRANSFER LENGTH (MSB)							
8	TRANSFER LENGTH (LSB)							
9	RES	MIX	RESERVED				FLG	LNK

MIX = MIXED FORMAT

Description.

The WRITE COMMAND transfer data that has been sent to the CDD 2600 by the initiator to the medium. The WRITE COMMAND can be used is 2 ways:

The CDD 2600 enters into a write sequence mode by having received a WRITE TRACK command. This command then may be followed by zero or more WRITE COMMANDS, followed by a FLUSH CACHE COMMAND to end the write sequence.

With MODE SELECT PAGE 21 (write track), track parameters can be setup. Issuing a WRITE command, without first giving a WRITE TRACK command, will cause the CDD 2600 to use the MODE SELECT PAGE 21 settings, and entering a writing sequence. This command may then be followed by zero or more WRITE COMMANDS, followed by a FLUSH CACHE command. In case of incremental writing it is necessary to issue a FLUSH CACHE after each packet.

Transfer of data from initiator to buffer of the CD-R drive. The write command fills only the buffer with the requested amount of data. Multiple write actions continue filling the buffer.The WO drive decides when data can be written to disc, and when this writing is started.

If the CD-R drive is writing, the write action is stopped when all data from the buffer is written to disc. After this write stop, no more write commands are accepted as the current write action has ended.

Parameters.

LOGICAL BLOCK ADDRESS.

> The LOGICAL BLOCK ADDRESS specifies the sector/block address where the data associated with this WRITE command is to be placed on the disc.The use of the LOGICAL BLOCK ADDRESS is optional but if used it must reflect a successive address from previous WRTE or WRITE TRACK commands. (If not used: fill in zeroes.)The first logical block address for writing can be requested by FIRST WRITABLE ADDRESS command.

TRANSFER LENGTH.

> The TRANSFER LENGTH specifies the number of contiguous blocks of data that are to be transferred. A value of zero indicates for a group 0 command a transfer length of 256 blocks and for a group 1 command a transfer length of 0 blocks.

MIX

> If the Mix bit is set this indicates a mixture of form 1 and form 2 blocks. This is a special case because the blocks now transferred don't have the same block size, Form 1 sectors contain 2056 bytes and Form 2 sectors contain 2332 bytes. It is allowed to mixture these blocks in a single write command. The host must include the subheader of the sector in order for the CDD 2600 to be able to detect the different types of blocks that are transferred from the host. The addressing is the same as for blocks of 2048.

> If the Mix bit is zero this indicates that only one block size is used during writing.

When the write sequence is not entered via a WRITE TRACK command, the settings of MODE PAGE 21 are taken. Validation criteria are:
If the track mode is one (this concerns the CD-Rom header mode byte) only one block size is valid namely 2048.

If the track mode is two there are now four block sizes possible namely 2048, 2056, 2324 and 2332 The block sizes 2048 and 2056 concerns both a form 1 block with difference that with 2048 the subheader will be retrieved internally and by a block size of 2056 the subheader will be retrieved externally from the host.

Valid block sizes are:

Mix	Raw	Audi	Track Mode	Block-size	Data transferred
0	0	0	1	2048	User data (2048)
0	0	0	2	2048[a] (Form 1)	User data (2048)

Mix	Raw	Audi	Track Mode	Block-size	Data transferred
0	0	0	2	2056^b (Form 1)	Subheader (8)
0	0	0	2	2324^a (Form 2)	User data (2324)
0	0	0	2	2332^b (Form 2)	Subheader (8) user
0	0	0	2	2336 -	User data (2336)
1	0	0	2	Don't care (mixture of 2056^b and 2332^b)	Subheader user data (2048 or 2324)
X	0	1	XX^c	2352	Audio samples
X	1	X^c	XX^c	2352	Raw data or audio

a. Subheader is fixed and taken internally (Mode Select page 20H)

b. Subheader taken from host.

c. Value must be set to a valid combination.

During a write sequence it's not allowed to change any parameter with the MODE SELECT command.

4.6 SEEK (GROUP 0 & 1).

GROUP 0:

	7	6	5	4	3	2	1	0
0	SEEK0 (0BH)							
1	LUN=0			LOG. BLOCK ADDR MSB				
2	BLOCK ADDRESS							
3	BLOCK ADDRESS LSB							
4	RESERVED							
5	VND UN		RESERVED				FLG	LNK

GROUP 1:

	7	6	5	4	3	2	1	0
0	SEEK1 (2BH)							
1	LUN=0			RESERVED				
2	BLOCK ADDRESS (MSB)							
3	BLOCK ADDRESS							
4	BLOCK ADDRESS							
5	BLOCK ADDRESS (LSB)							
6	RESERVED							
7	RESERVED							
8	RESERVED							
9	VND UN		RESERVED				FLG	LNK

The SEEK command requests that the CDD 2600 move the head to the specified block. No data is transferred. This command only initiates the seek operation. If a READ or another SEEK operation is issued before the seek operation is completed, the first operation is cancelled and the second operation is initiated.

The block address specifies to which the head will be moved.

The range of valid seek addresses are from zero till the highest lead-out start address -1.

Note that either READ, WRITE TRACK or VERIFY command performs an implied seek, so use of the SEEK command is not required for normal operation.

4.7 INQUIRY.

	7	6	5	4	3	2	1	0
0	INQUIRY (12H)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	ALLOCATION LENGTH							
5	FMT	RESERVED					FLG	LNK

FMT = FORMAT

The INQUIRY command requests that information regarding characteristics of the controller and its attached CD/WO drive be sent to the host. The INQUIRY command is normally used by hosts during system start-up to determine or verify the type of devices and controllers attached to the SCSI bus. Allocation length specifies the number of bytes allocated by the host to accept the inquiry data list. This is the number of bytes that will be transferred to the host (unless allocation length is greater than the amount of available inquiry data, in which case only the available data will be transferred).

GOOD status will normally been returned. If a UNIT ATTENTION condition is pending, it will remain pending after the INQUIRY command and cause a CHECK CONDITION status as a result of the next command to be issued. (except for INQUIRY,SEND DIAGNOSTIC or REQUEST SENSE).

Two formats are available for the Inquiry Data List. The default
format conforms to SCSI-2 conventions. In addition, a Vendor Unique format is available which returns more specific information about the drive itself. This format is selected by setting bit 7 of byte 5 (FMT) (labelled Format in the table above) to 1.

 The default format is as follows:

	7	6	5	4	3	2	1	0
0	PERIPHERAL DEV TYPE (05H)							
1	RMB=1	DEV TYPE QUALIFIER = 00						
2	ISO VER=0		ECMA VERSION=0		ANSI VER=02			
3	RESERVED				RESPONSE DATA FORMAT=02			
4	ADDITIONAL LENGTH = 27 (Hex)							
5	RESERVED							
6	RESERVED							

7	RESERVED
08-0F	VENDOR ID (ASCII)
10-1F	PRODUCT ID (ASCII)
20-23	SCSI FIRMWARE REVISION LEVEL (ASCII)
24-2B	SCSI FIRMWARE REVISION DATE (ASCII)

All reserved bytes/bits must be zero.

BYTE   DESCRIPTION (if bit format = 0)

00   Peripheral Device Type is set to 05h to indicate a CD-ROM Device.
01   RMB (Removable Medium Bit) is set to 1 since the disc is removable.
            Device Type Qualifier is set to 00.

02   ISO Version and ECMA Version are set to 0 for this release.
            ANSI Version is set to 2.

03   Response Data Format is set to 02 (conform SCSI-2 format)

04   Additional length is set to the number of available Inquiry Data bytes which fol-
            low byte 4. If fewer bytes are requested than are available, the Additional length
            field is not adjusted.

08-0F   Vendor ID is the name of the vendor in ASCII, left justified, padded with blanks.

10-1F   Product ID is the name of the device in ASCII, left justified, padded with blanks.
.

20-23   SCSI Firmware Revision Level is ASCII digits in the format "X.YY" where X
            denotes the major revision number and YY denotes the minor revision number.

24-2B   SCSI firmware Revision Date is the last modification date of the source code to the
            SCSI firmware. It is ASCII digits in the form "MM/DD/YY", where MM is the
            month (01-12), DD is the day (01-31) and YY is the last two digits of the year.

The alternate format of the Inquiry Data List includes the SCSI standard five byte header fol-
lowed by vendor unique information. (which is optional)
The vendor unique information consists of 12 bytes of drive characteristics, followed by an
ASCII string identifying the manufacturer, model, SCSI firmware revision number and data,
as described below.

VENDOR UNIQUE INQUIRY DATA LIST

	7	6	5	4	3	2	1	0
0	PERIPHERAL DEV TYPE (05H)							
1	RMB=1	DEV TYPE QUALIFIER = 00						
2	ISO VER=0		ECMA VERSION=0		ANSI VER=02			
3	RESERVED				RESPONSE DATA FORMAT=01			
4	ADDITIONAL LENGTH = 33 (Hex)							
5	DRIVE COMMAND PROTOCOL VERSION							
6	DRIVE TYPE (BCD)							
7	DATA TRANSFER RATE							
8	HARDWARE REVISION NUMBER							
9	SERVO MICROCODE REVISION FIELD							
0A	DRIVE SERIAL NUMBER MSB							
0B	DRIVE SERIAL NUMBER							
0C	DRIVE SERIAL NUMBER LSB							
0D	LONG TIMEOUT VALUE							
0E	SHORT TIMEOUT VALUE							
0F	MAXIMUM NUMBER OF DISCS							
10	LOCK OPTION SELECTED							
11-34	DRIVE ID (ASCII)							
35	RESERVED							CA. S. UNIT
36	CACHE SIZE (MSB)							
37	CACHE SIZE (LSB)							

BYTE   DESCRIPTION (if bit format =1)

00-02   These bytes constitute the Inquiry Data Header and are of the same format as bytes
           00-02 of the default Inquiry Data List above.

03   Response Data Format is set to 01

04   Additional length = 33.

05   Drive Command Protocol Version indicates the version of the protocol used to
           communicate between the SCSI controller and the CD ROM drive itself, internal
           to the CDD 2600.

06   Drive type is 14 (BCD)

07   Data Transfer Rate. The only code currently defined is 14 (hex), for 1.4 M bit / sec.

This code indicates the transfer rate between the SCSI controller and the CDD 2600 internal

08   Hardware Revision Number. This indicates the revision number of the CDD 2600.

09   Servo Firmware Revision Field (XY). This indicates the revision field of the CDD 2600 servo micro processor code. It is a combination of the servo revision date and the servo revision number. The complete info (servo revision date and the servo revision number) can be obtained from Mode sense page 9: Peripheral device.

0A-0C   Drive serial number. If this field is non zero then it represents the serial number of the CDD 2600 drive, expressed as a three byte binary number.

0D-0E   Timeout Values. These are characteristics of the internal CDD 2600.
            If these field contains zeroes then no timeout are defined

0F   Max. number of discs. Value is 01.

10   If byte 01: Lock option selected.
            If byte 00: Lock option not selected.
            This byte is always set to zero.

11-34   DRIVE ID. This contains an ASCII string which indicates the model, the firmware revision level, the manufacturer and the firmware release date.
            The drive ID can be:'CDD2600__;VER_1.00;PHILIPS;29-08-96;'

            Note: This information can also be obtained when the default format of the inquiry command is issued. The information (default format) is returned in the following fields: VENDOR ID, PRODUCT ID, SCSI FIRMWARE REVISION LEVEL, SCSI FIRMWARE REVISION DATE. The revision date is returned as follows : DD-MM-YY.

35   Cache size unit (CA. S. UNIT):
            The unit for the Cache size is set to 10

            00   Reserved
            01   Reserved
            10   2048 bytes
            11   Reserved

36-37   Cache size.
            The unit for the cache size can be found in byte number 35H.

4.8 MODE SELECT 6.

	7	6	5	4	3	2	1	0
0	MODE SELECT(15H)							
1	LUN=0			PF	RESERVED			SP
2	RESERVED							
3	RESERVED							
4	PARAMETER LIST LENGTH							
5	VND UN		RESERVED				FLG	LNK

This command allows the host to select the block size.

The MODE SELECT command is used to select block sizes of 2048, 2052, 2056, 2060, 2324, 2328, 2336, 2340 and 2352 bytes for the READ, WRITE TRACK and WRITE commands.

The MODE SELECT command requires a parameter list to specify the desired operating parameters. The parameter list length field of the CDB must be set to reflect the length of the parameter list. This parameter list consists of three parts:
The required mode select header, an optional block descriptor, and max. two mode select pages. If the block descriptor is included in the parameter list, it is used to specify the block size. Mode select pages are used to set additional parameters, and provide a means for further extensions to this command which may be necessary or desirable.
If any mode select page is included in the parameter list, the PF (Page Format) bit of the CDB must be set to 1.
No mode select page should appear more than once in the parameter list.

The CDD 2600 supports page code 1 (error recovery parameters), page code02 (Disconnect-Reconnect), page code 09H(Peripheral device), page code 0EH(play), page code 20H (Sub-header), page code 21 (Write track information), page code 22 (Catalogue information), page code 23 (Speed & simulation) and page code 24 + 25(Increment index information).

The mode select header is defined as follows:

mode select header

	7	6	5	4	3	2	1	0
0	RESERVED							
1	MEDIUM TYPE							
2	RES	HOST APPLICATION CODE						
3	BLOCK DESCRIPTOR LENGTH							

For further information we refer to the mode select 10 command.

4.9 RESERVE

	7	6	5	4	3	2	1	0
0	RESERVE = 16h							
1	LUN = 0			3PT	3PT DEVICE ID			RES
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	VND UN		RESERVED				FLG	LNK

The RESERVE command is used to reserve a logical unit. It requests that the entire logical unit be reserved for the exclusive use of the initiator until the reservation is superseded by another valid RESERVE command from the initiator that made the reservation, or until released by a RELEASE command from the same initiator that made the reservation, by a BUS DEVICE RESET message from any initiator, by a hard RESET condition, or by a power on cycle.

A logical unit reservation will not be granted if the logical unit is reserved by another initiator. If the unit is reserved for another initiator, the CDD 2600 will return RESERVATION CONFLICT status.

If after honouring the reservation, any other initiator attempts to perform any command on the reserved logical unit other than an INQUIRY, REQUEST SENSE, PREVENT ALLOW MEDIUM REMOVAL (with a prevent bit of zero), or a RELEASE command the command will be rejected with RESERVATION CONFLICT status.

If the third-party (3PT) bit is zero, then a third-party reservation is not requested.
If the third-party (3PT) bit is one, then the CDD 2600 reserves the specified logical unit for the SCSI device specified in the third-party device ID field. The CDD 2600 preserves the reservation until it is superseded by another valid RESERVE command from the initiator that made the reservation, or until released by the same initiator, by a BUS DEVICE RESET message from any initiator, by a hard RESET condition. The CDD 2600 will ignore any attempt to release the reservation made by any initiator.

4.10 RELEASE.

	7	6	5	4	3	2	1	0
0	RELEASE = 17h							
1	LUN = 0			3PT	3PT DEVICE ID			RES
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	VND UN		RESERVED				FLG	LNK

The RELEASE command is used to release a previously reserved logical unit.
A reservation will only be released by the initiator that made it. It is not an error for the initiator to attempt to release a reservation that is not currently valid, or is held by another initiator. In this case, the writer returns GOOD status without altering any other reservation.

If the third-party (3PT) bit is zero, then a third-party reservation is not requested.
If the third-party (3PT) bit is one, then the CDD 2600 releases the specified logical unit, but only if the reservation was made using a third-party reservation by the initiator that is requesting the release for the same SCSI device as specified in the third-party device ID field.

4.11 COPY.

	7	6	5	4	3	2	1	0
0	COPY (18H)							
1	LUN=0			RESERVED				Pad
2	PARAMETER LIST LENGTH (MSB)							
3	PARAMETER LIST LENGTH							
4	PARAMETER LIST LENGTH (LSB)							
5	VND UN		RESERVED				FLG	LNK

The copy command provides a means to write/copy data from one logical unit (of a block device type) to the CDD 2600.

The Pad bit is used in conjunction with the Cat bit in the segment descriptor to define what action should be taken when a segment of the copy does not fit into an integer number of the destination blocks.

The parameter list length field specifies the length in bytes of the parameters that shall be sent during the DATA OUT phase of the command. A parameter list length of zero indicates that no data shall be transferred. This condition is not an error condition.

The COPY parameter list begins with a four-byte header that contains the COPY function code and priority. Following the header is one segment descriptor.

	7	6	5	4	3	2	1	0
0	COPY function code = 2					Priority = 0		
1	RESERVED							
2	RESERVED							
3	RESERVED							
4	Source Address			DC	Cat	Source LUN = 0		
5	Destination Address			RES		Destination LUN = 0		
6	RESERVED							
7	RESERVED							
8-0B	Number of Blocks							
0C-0F	Source Logical Block Address							
10-13	Destination Logical Block Address							

ALL RESERVED BYTES ARE 00
The Copy Function Code field must be '2' as the writer only supports copying from block devices (devices 0, 4, 5, 7) to block devices.

Priority handling is not supported, and therefore the Priority field must be zero.

The Source Address and Source LUN fields specify the SCSI bus ID and logical unit of the device to copy the data from for the COPY command. The Destination Address and Destination LUN fields must be the SCSI bus ID and logical unit of the writer itself. Copying from a SCSI device to a SCSI device other than the writer is not supported.

When copying data between two devices with unequal block lengths, it is possible for the last source block to not completely fill the last destination block. The Pad and the Cat bit are defined to assist in controlling the copy manager's actions in these circumstances:

Pad	Cat	COPY Manager's action
0	0	On inexact segments, the COPY manager strips pad characters from the source block.
1	0	On inexact segments, the COPY manager adds pad characters (00h) to the destination block to completely fill the block, always stopping at the end of a complete block.

A destination count (DC) bit of zero indicates that the Number of Blocks field refers to the source logical unit. A DC bit of one indicates that the Number of Blocks field refers to the destination logical unit.

The Number of Block field specifies the number of blocks to be transferred to or from (depending on the DC Bit) the block device during the segment. A value of zero means that no blocks shall be transferred.

The Source Logical Block address field specifies the starting logical block address on the source block device.

The Destination Logical Block address field specifies the starting logical address on the destination block device.

4.12 MODE SENSE.

	7	6	5	4	3	2	1	0
0	MODE SENSE (1AH)							
1	LUN = 0			RESERVED				
2	PCF		PAGE CODE					
3	RESERVED							
4	ALLOCATION LENGTH							
5	RESERVED							

The MODE SENSE command provides a means for the controller to report the current parameters. It is a complementary command to the MODE SELECT command.
This command will normally be issued to obtain default or current parameter-values.

The PCF (Page Control Field), bits 6 and 7 of byte 2, define the type of Page parameter values to be returned as follows:

Bits   Type of Page parameters

0 0   Current page parameters will be returned. If the page code is equal to 3Fh, all pages implemented in the CDD 2600 will be returned to the initiator with fields and bits set to current values. If the page code is different than 3Fh, the page defined by the page code, if supported by the CDD 2600, will be returned to the initiator with fields and bits set to current values. The current values are either as set in the last MODE SELECT command, or identified to the default values. Field and bit not supported by the CDD 2600 will be set to zero value of each page, returned by the CDD 2600 indicates which fields are supported within that particular page.

0 1   A mask will be returned, denoting those mode parameters that are changeable. In the mask, the fields of the mode parameters that are changeable shall be set to all one bits and the fields of the mode parameters that are non-changeable (i.e., defined by the target) shall be set to all zero bits. An attempt to change a non-changeable mode parameter (via MODE SELECT) results in an error condition. The initiator should issue a MODE SENSE command with the PC field set to 1h and the page code field set to 3Fh to determine which mode pages are supported, which mode parameters within the mode pages are changeable, and the supported length of each mode page prior to issuing any MODE SELECT commands.

1 0   Default parameters will be returned. If the page code is equal to 3Fh, all pages implemented by the CDD 2600 will be returned to the initiator with fields and bits set to the CDD 2600 default values. If the page code is not 3Fh, the page defined by the page code (if supported by the CDD 2600) is to be returned to the initiator with fields and bits set to the CDD 2600 value.
Fields and bits not supported by the CDD 2600 shall be set to zero. The page length

byte value of each page returned by the CDD 2600 indicates up to which fields are supported within that particular page.

1 1 Saved page parameters will be returned. If the CDD 2600 does not have parameter saving capability, this page Control Field setting will have the same result as for default page parameters above.

The following page codes are supported

00h This (unspecified) page is not supported for the CDD 2600: however, this value may be supplied in the Page Code field to request that no pages will be returned, only the Mode Sense Header and Block Descriptor.

01h Error recovery parameters.

02h Disconnect Reconnect Page.

09h Peripheral device page.

0Eh Play page.

20h Subheader parameters

21h Write Track information.

22h Catalogue parameters.

23h Speed & Simulation parameters.

24h Preset index increment parameters.

25h Preset index increment parameters.

3Fh Return all pages to the initiator. See PCF bit configuration. This Page Code is valid for MODE SENSE commands only.

Note: Mode Sense header and Block Descriptor are also returned if the page code is 01, 02, 09, 0E, 20, 21, 22, 23, 24, 25 or 3F.

The Allocation length specifies the number of bytes allocated by the host that will be transferred to the initiator, unless the Allocation Length is greater than the amount of available Mode Sense Data, in which case only the available data will be transferred.

The Mode Sense Data List consists of a Header, a single Block Descriptor, and one or more page(s). The format of the Block Descriptor and Pages are identical to that for the MODE SELECT command. The format of the mode sense header appears below.

Mode Sense Data List Header

	7	6	5	4	3	2	1	0
0	SENSE DATA LENGTH							
1	MEDIUM TYPE							
2	RES	HOST APPLICATION CODE						
3	BLOCK DESCRIPTOR LENGTH = 08h							

Byte

00   Sense data length is set to the length in bytes of the following data that is available to be transferred, not including byte 00. This value varies according to which pages (if any) are being requested. The sense data length is independent of the allocation length of the mode sense command.

01   Medium type, indicates the kind of CD medium is mounted.
Medium type values of 00h means that no medium type is available.

Explanation of the medium type bits.

Bit 7
0   All other bits must also be zero and means no medium type info present.
1   Indicates vendor unique definition of the other bits, see below.

Bit 6
0   Not write protected
1   Write protected

Bit 5
0   disc size is 80 mm
1   disc size is 120 mm

Bit 4
0   No hybrid disc
1   Hybrid disc

Bit 3
0   no WO disc area present on disc
1   WO disc area present on disc

Bit 2
0   no audio tracks present on disc
1   one or more audio tracks present on disc

Bit 1 Bit 0
00   no data tracks present on disc
01   CD-ROM tracks or CD-ROM XA tracks with first track in mode 1
10   CD-ROM XA tracks with first track in mode 2
11   CD-I disc

Note: The values for bits 1 & 0 are read at startup. The information is stored in the first lead-in of the disc. The values do not change in case of a cdr disc while the disc is in!

02   Host application code reflects the actual host application code setting.

03   Block descriptor length is set to the length in bytes of the block descriptor section.
For the CDD 2600 exact one block descriptor is used.
The block descriptor is 8 bytes long, so the contents of this field is 08.

4.13 START / STOP UNIT.

	7	6	5	4	3	2	1	0
0	START / STOP UNIT = 1Bh							
1	LUN = 0			RESERVED				IMM
2	RESERVED							
3	RESERVED							
4	RESERVED						LOEJ	STR
5	VND UN		RESERVED				FLG	LNK

IMM = IMMEDIATE

The START/STOP UNIT command requests that the CD-R drive either start or stop the spindle motor. If the start bit (STR) is one, drive will be spun up. If the start bit is set zero, the drive will be spun down.

If the IMMEDIATE (IMM) bit is set, SCSI status is returned as soon as the start or stop operation is initiated. If the host sends now directly a new command to the drive, while the drive has not completed the start or stop command, status BUSY will be returned to the host.

If the IMMEDIATE(IMM) bit is zero, SCSI status will be returned following completion of the operation.

When the CD-R drive has spun up, it will go in pause.

A LOAD/EJECT (LOEJ) bit of zero requests that no action shall be taken regarding loading or ejecting the medium. A LOEJ bit of one requests that the medium shall be unloaded if the start bit is zero. A LOEJ bit of one requests that the medium is to be loaded if the start bit is one.

4.14 RECEIVE DIAGNOSTIC RESULTS.

	7	6	5	4	3	2	1	0
0	RECEIVE DIAGNOSTIC RESULTS(1CH)							
1	LUN = 0			RESERVED				
2	RESERVED							
3	ALLOCATION LENGTH (MSB)							
4	ALLOCATION LENGTH (MSB)							
5	VND UN		RESERVED				FLG	LNK

Description

Requests results of self test, after the completion of the SEND DIAGNOSTIC command. Each diagnostic page contains a function or operation that the CDD 2600 shall perform. The following table shows the diagnostic page codes defined for this device:

Diagnostic Page Codes

Page Code	Description
00h	Supported Diagnostics Pages
01h - 7Fh	Reserved (for all device type pages)
80h	Selftest 1: internal processor RAM
81h	Selftest 2: external processor SRAM
82h	Selftest 3: EPROM
83h	Selftest 4: DSP interface
84h	Selftest 5: DRAM
85h	Selftest 6: AMD SCSI
86h	Selftest 7: CDB2
87h	Selftest 8: DATA path
88h	Selftest 9: CDB2 ECC (Error Cor. Code) RAM
80h - FFh	Vendor specific pages

Receive Diagnostic Page format, 80h - 88h

	7	6	5	4	3	2	1	0
0	Page Code = 80h - 88h							
1	RESERVED							
2	PAGE LENGTH (MSB)							
3	PAGE LENGTH (LSB)							
4	RESULT							

ALL RESERVED BITS MUST BE 00

Description

See table Diagnostic Page Codes on previous page, for selftest 1 -9 (corresponding to page code 80h to 88h).

Parameters

PAGE LENGTH
    set equal to 1.

RESULT
    00h: Failed
    01h: Passed
    02h: Not executed

Note: Selftest 9 can only pass successful if selftest 8 passes successful.

4.15 SEND DIAGNOSTIC.

	7	6	5	4	3	2	1	0
0	SEND DIAGNOSTIC (1DH)							
1	LUN = 0			PF	RES	SLF	RES.	
2	RESERVED							
3	PARAMETER LIST LENGTH MSB=00							
4	PARAMETER LIST LENGTH LSB=00							
5	VND UN	RESERVED					FLG	LNK

SLF = SELFTEST
PF = PAGE FORMAT

Description

The SEND DIAGNOSTIC command requests the CDD 2600to perform diagnostic tests on itself. If one or more of these tests should fail, CHECK CONDITION status is returned, sense key = UNIT ATTENTION and additional sense code = DIAGNOSTIC FAILURE.
By sending a parameter diagnostic page, tests can be selected individually, or a group of tests can be performed (see next section for diagnostic pages).

A Send Diagnostic ends with an unchanged drive status, except for a spinned up disc: it is stopped.

If a selftest failure occurs, a limited command set is allowed:
 REQUEST SENSE
 INQUIRY
 SEND/RECEIVE DIAGNOSTIC
 REZERO UNIT (to clear status)

Parameters

PF (Page Format) bit
 Can be set to one or zero to receive diagnostics results back in standard page format.

SLF (Self Test) bit
 0: Request test(s) according to diagnostic page codes (see RECEIVE DIAGNOSTICS RESULT command, in next section). Result returned in diagnostic page.
 1: Request complete selftest with only status returning result (GOOD or CHECK CONDITION). (parameter list length = 0).

PARAMETER LIST LENGTH
 Set to 0 if selftest bit = 1, otherwise set to required page length (see diagnostic pages).

Send Diagnostic Page 7Fh: All tests

	7	6	5	4	3	2	1	0
0	Page Code = 7Fh							
1	RESERVED							
2	PAGE LENGTH (MSB)							
3	PAGE LENGTH (LSB)							
4	ST8	ST7	ST6	ST5	ST4	ST3	ST2	ST1
5	RESERVED							ST9
6	ALL SELF TESTS							

VND UN = VENDOR UNIQUE = 00
ALL RESERVED BITS = 0

Description

This page indicates which tests are to be performed.

Parameters

PAGE LENGTH
  Length of page = 3h

ST 1-9(SelfTest)
  1: Perform test
  0: Skip test

ALL SELF TESTS
  00h: Use ST bits
  01h: Perform all tests (override ST bits)

NOTE: for selecting individual tests, see diagnostic pages in next section. The parameters to fill in is the requested page number, the page length and result fields be set to zero.

VISIBLE EFFECTS
- At selftest start:
  The writing led (orange) and error/disc in led (green and red) will respectively light up
  for about 200 msec. this will be repeated 3 times.

- At start of each individual test:
  The two leds (writing and error/disc in) will go on and then the test starts.

- During the test:
  The two leds remain on.

- At the end of an individual test: if the test was unsuccessful,
  the error/disc in led will go on for 0.5 sec in red. If the test was successful,
  the error/disc in led will go on in green for 0.5 sec

- At the end of the selftest:
  During 2.5 seconds, the writing led (orange) and the error/disc in led (green) will flash if the whole test was OK. In case of an error, the error/disc in led will flash (orange) for 2.5 seconds.

4.16 PREVENT / ALLOW MEDIUM REMOVAL.

	7	6	5	4	3	2	1	0
0	PREVENT/ALLOW MED. REMOVAL(1EH)							
1	LUN = 0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							PRV
5	VND UN		RESERVED				FLG	LNK

PRV = PREVENT

This command is provided to allow a host to prevent the medium being removed.

If power is off, it is impossible to load or unload the drive.
If power is applied, it is always possible to load the drive with a disc (if the drive is not already loaded).

If the PRV Prevent bit is set to one, it is impossible to unload the drive, by command or pressing open or eject button.

If the PRV bit is set to zero, medium removal is allowed.

Default, medium removal is allowed.

4.17 READ CD-ROM CAPACITY.

	7	6	5	4	3	2	1	0
0	READ CD-ROM CAPACITY (25h)							
1	LUN=0			RESERVED				
2	LOGICAL BLOCK ADDRESS (MSB)							
3	LOGICAL BLOCK ADDRESS							
4	LOGICAL BLOCK ADDRESS							
5	LOGICAL BLOCK ADDRESS (LSB)							
6	RESERVED							
7	RESERVED							
8	RESERVED							PMI
9	VND UN		RESERVED				FLG	LNK

The READ CD-ROM CAPACITY command provides a means for the initiator to request information regarding the capacity of the logical unit.

The information returned in the READ CD-ROM CAPACITY data is the logical block address and block length (in bytes) of the last valid logical block of the logical unit for seek operations. This logical block is greater than or equal to the last readable, playable or writable block. The value returned is not more than 75 blocks greater than the last readable, playable or writable block.

If a partial medium indicator (PMI) bit of zero is specified, the logical block address of the command descriptor block must be zero. If the PMI bit is one, the logical block address of the command descriptor block is don't care.

Response Data that shall be transferred during the DATA IN PHASE from target to initiator.

	7	6	5	4	3	2	1	0
0	LOGICAL BLOCK ADDRESS (MSB)							
1	LOGICAL BLOCK ADDRESS							
2	LOGICAL BLOCK ADDRESS							
3	LOGICAL BLOCK ADDRESS (LSB)							
4	BLOCK LENGTH (MSB)							
5	BLOCK LENGTH							
6	BLOCK LENGTH							
7	BLOCK LENGTH (LSB)							

BYTE DESCRIPTION

0-3   logical block address of the last valid logical block of the logical unit for seek opera-

tions. If write once area is present on the current disc, this is the block address where the highest possible lead-out in this write once area shall start. If no write once area is present, the block address returned is the effective address of the start of the outermost lead-out.

4-7   block length (in bytes hex) of the last valid logical block of the logical unit for seek operations. Depending of the mode of the last block, the block length returned shall be

:

Type of last block	block length
write once area present	800h
audio	800h
data	800h

4.18 VERIFY.

	7	6	5	4	3	2	1	0
0	VERIFY (2FH)							
1	LUN=0			RESV.		BVY	RESV.	
2	BLOCK ADDRESS (MSB)							
3	BLOCK ADDRESS							
4	BLOCK ADDRESS							
5	BLOCK ADDRESS (LSB)							
6	RESERVED							
7	VERIFICATION LENGTH (MSB)							
8	VERIFICATION LENGTH (LSB)							
9	VND UN		RESERVED				FLG	LNK

The VERIFY command requests that the CDD 2600 verifies the data on the medium.

A blank verify (BVY) bit of one causes a verification that the blocks are blank.

A blank verify (BVY) bit of zero causes the verification to be simply a medium verification (CRC, ECC, EDC). It is the same as the group 1 READ command, except that no data is transferred to host.

The verification length specifies the number of contiguous block of "valid" data or blanks that shall be verified. A verification length of zero indicates that no blocks shall be verified. this condition shall not be considered as an error. Any other value indicates the number of blocks that shall be verified.

4.19 FLUSH CACHE.

	7	6	5	4	3	2	1	0
0	FLUSH CACHE (35H)							
1	LUN=0			RESERVED				
2	LOGICAL BLOCK ADDRESS (MSB)							
3	LOGICAL BLOCK ADDRESS							
4	LOGICAL BLOCK ADDRESS							
5	LOGICAL BLOCK ADDRESS (LSB)							
6	RESERVED							
7	NUMBER OF BLOCKS (MSB)							
8	NUMBER OF BLOCKS (LSB)							
9	VND UN		RESERVED				FLG	LNK

Description.

The FLUSH CACHE command terminates a write sequence and further stipulates that all remaining data in the buffer be written to the media.

Parameters.

LOGICAL BLOCK ADDRESS
    The logical block address field must be zero.

NUMBER OF BLOCKS
    The number of blocks field must be zero.

If the cache was empty by issuing this command no data will be written to the physical medium.

After attempting to write all of the logical blocks, if any non recovered errors have occurred that have not been previously reported, a check condition will be set and all the non recovered errors will be reported by sending the REQUEST SENSE command.

After the acceptation of the GOOD STATUS all the data is written successfully to the medium.

The flush cache command is allowed only when the limited command set is available.

4.20 WRITE BUFFER.

	7	6	5	4	3	2	1	0
0	WRITE BUFFER(3BH)							
1	LUN		RESERVED		MODE			
2	BUFFER ID							
3	BUFFER OFFSET (MSB)							
4	BUFFER OFFSET (...)							
5	BUFFER OFFSET (LSB)							
6	PARAMETER LIST LENGTH (MSB)							
7	PARAMETER LIST LENGTH (...)							
8	PARAMETER LIST LENGTH (LSB)							
9	VND UN	RESERVED					FLG	LNK

Description.

The WRITE BUFFER command is used to transfer data from initiator to target DRAM buffer. In addition, this command can be used to download microcode and save. This is optional and depends of the hardware.

Parameters.
MODE

> Vendor specific: 001b. In this mode data can be transferred to the DRAM buffer of the target.
> Download microcode and save: 101b. The use of this mode is very restricted. Proper functionality requires specific hardware. The vendor specific data must be written to the buffer. If the host is not capable to transfer the total data in one pass, it first transfers part of the data using the vendor specific mode and for the last transfer, the host uses the download microcode and save mode.
> The download microcode and save will result in a complete reset of the target. No disc information is remembered. It is recommended to have the PMA being updated in advance in order to prevent loss of information.
> Power failure during the save microcode can result in malfunction afterwards.

BUFFER ID

> The buffer ID must be zero.

BUFFER OFFSET

The buffer offset indicates the offset in bytes. Only even offsets are allowed. This offset must be incremented with the amount of data sent in a previous write buffer in order to have the data consecutive in the DRAM buffer. E.g. required for a download microcode and save if the host can not handle this in one pass.

PARAMETER LIST LENGTH.

The parameter list length indicates the amount of data which should be requested from the host.The parameter list length is expressed in bytes. Only an even amount of bytes is allowed. A parameter list length of zero indicates that no data shall be requested from the host.

4.21 READ BUFFER.

	7	6	5	4	3	2	1	0
0	READ BUFFER(3CH)							
1	LUN			RESERVED		MODE		
2	BUFFER ID							
3	BUFFER OFFSET (MSB)							
4	BUFFER OFFSET (...)							
5	BUFFER OFFSET (LSB)							
6	ALLOCATION LENGTH (MSB)							
7	ALLOCATION LENGTH (...)							
8	ALLOCATION LENGTH (LSB)							
9	VND UN		RESERVED				FLG	LNK

VND UN = VENDOR UNIQUE = 00
FLG = FLAG = 00
LNK = LINK = 00
ALL RESERVED BYTES MUST BE 00

Description.

The READ BUFFER command is used to transfer data from the target DRAM buffer to the initiator.

Parameters

MODE

The mode must be set to vendor specific (001b). In this mode data can be transferred from the target DRAM buffer.

BUFFER ID

The buffer ID must be zero.

BUFFER OFFSET

The buffer offset indicates the offset in bytes and must be even.

ALLOCATION LENGTH

The allocation length indicates the amount of data which should be transferred to the host .
The allocation length is expressed in bytes and must be even.

4.22 READ SUB CHANNEL.

	7	6	5	4	3	2	1	0
0	READ SUB CHANNEL (42h)							
1	LUN=0			RESERVED			MSF	RES
2	RES	SUB	RESERVED					
3	SUB-CHANNEL DATA FORMAT							
4	RESERVED							
5	RESERVED							
6	TRACK NUMBER (HEX)							
7	ALLOCATION LENGTH (MSB)							
8	ALLOCATION LENGTH (LSB)							
9	VND UN		RESERVED				FLG	LNK

Description.

The READ SUB-CHANNEL command request that the CDD 2600 returns the requested sub-channel data (SUB = 1) or no sub-channel data (SUB = 0) like Bar-Code data.

Parameters.

An MSF bit of zero requests that the logical block address format be used for the CD-ROM absolute address field or for the offset from the beginning of the current track expressed as a number of logical blocks in a CD-ROM track relative address field. This track relative logical block address (TRLBA) value is reported as a negative value in twos-complement notation for transition areas that have decreasing MSF encoded relative addresses.

An MSF bit of one requests that the MSF format be used for these fields. In certain transition areas the relative MSF addresses are decreasing positive values. The absolute MSF addresses are always increasing positive values.

SUB CHANNEL DATA FORMAT.

The Sub-channel Data Format field specifies the Sub Channel data. The following data format is defined in the CDD 2600 :

- Sub-Q channel data (Sub-channel Data Format = 00H, 01H, 02H, 03H)
- Disc Application Code (Sub-channel Data Format = F0H)

For CDD 2600 s equipped with a barcode reader:

- Bar Code Data (Sub-channel Data Format = F1H)

SUB

To request the Sub-Q channel data the SUB bit must be set to one The SUB bit set to zero requests that no sub-channel data be returned. This shall not be considered an error. The SUB-CHANNEL DATA FORMAT field specifies the returned sub channel data. If

this field is 00h, sub-Q channel data is returned. If this field is 01h, 02h or 03h, the requested Sub data item is returned. TRACK NUMBER must be set to the track of which the ISRC code is requested.

SUB-CHANNEL DATA FORMAT CODES

Format Code	Returned data
00h	Sub - Q channel data
01h	CD - ROM current position
02h	Media Catalog Number (UPC/Bar Code)
03h	Track International - Standard - Recording - Code (ISRC)
04h - EFh	Reserved
F0h - FFh	Vendor specific

To request the Disc Application Code the SUB bit must be set to one and the SUB-CHANNEL DATA FORMAT byte to F0H.

To request the Bar code located on the most inner circle of the disc the SUB bit must be set to zero and the SUB-CHANNEL DATA FORMAT byte to F1H.

TRACK NUMBER
The Track Number field specifies the track from which the Q-Channel data needs to be returned. Only the ISRC data is related to the track number. This info may imply that a seek action will be performed. If the track number is set to zero, no seek is performed and no ISCR code will be validated, but the actual Q-channel data will only be returned.

ALLOCATION LENGTH
Allocation length specifies the number of bytes that will be returned to the initiator during the data-in phase, unless the allocation length is greater than the amount of available Sub Channel Data, in which case only the available data will be transferred.

The READ SUB-CHANNEL command data formats consist of a four-byte header followed by a sub-channel data block.
The header contains the audio status byte and the sub-channel data block.
The audio status byte indicates the status of audio play operations..

AUDIO STATUS CODES :

Status	Description
00h	Audio status byte not supported or not valid
11h	Audio play operation in progress
12h	Audio play operation paused
13h	Audio play operation succesfully completed
14h	Audio play operation stopped due to error
15h	No current audio status to return

READ SUB-CHANNEL command data formats:

SUB-Q CHANNEL DATA FORMAT:

Header

	7	6	5	4	3	2	1	0
0	RESERVED							
1	AUDIO STATUS							
2	SUB-CHANNEL DATA LENGTH (MSB)							
3	SUB-CHANNEL DATA LENGTH (LSB)							

Sub-Q Channel Data Block

	7	6	5	4	3	2	1	0
4	SUB-Q CHANNEL DATA FORMAT CODE = 00H							
5	ADR				CONTROL			
6	TRACK NUMBER							
7	INDEX NUMBER							
08-0B	ABSOLUTE LOGICAL BLOCK ADDRESS							
0C-0F	TRACK RELATIVE LOGICAL BLOCK ADDRESS							
10	MCVal	RESERVED						
11-1F	MEDIA CATALOG NUMBER							
20	TCVal	RESERVED						
21-2F	ISRC CODE							

ALL RESERVED BITS MUST BE ZERO

ADR:
  If ADR is zero, no sub-channel Q-mode information is supplied.
  If ADR is one, the sub-channel Q encodes the last read position data (CONTROL, TRACK, INDEX, ABSOLUTE & RELATIVE CD-ROM ADDRESS).

CONTROL:
  this information is valid if the ADR field reads one. The control bits contain the four bits of the control nibble of the subcode frame (see red book of CDDA).

TRACK NUMBER:
  this field contains the last read track number and is only valid if the ADR field reads one.

INDEX NUMBER:
  this field contains the last read index number and is only valid if the ADR field reads

one.

ABSOLUTE LOGICAL BLOCK ADDRESS:
> this field gives the current location relative to the logical beginning of the media. It is expressed as a logical block address and is only valid if the ADR field reads one.

TRACK RELATIVE LOGICAL BLOCK ADDRESS
> this field gives the current location relative to the logical beginning of the current track. It is expressed as a logical block address and is only valid if the ADR field reads one (if the current block is in the pre-gap of a track, this will be a negative value, expressed as a twos complement number).

MCVal:
> A media catalog valid bit of one indicates that the media catalog number field is valid. A media catalog valid bit of zero indicates that the media catalog number field is not valid.

MEDIA CATALOG NUMBER:
> contains the identifying number of this media according to the uniform product code values expressed in ASCII. Non-zero values in this field are controlled by the Uniform Product Code Council and the European Article Number Council. A value in this field of all ASCII zeros indicates that the media catalog number is not supplied.

TCVal:
> A track code valid bit of one indicates that the track ISRC field is valid. A track code valid bit of zero indicates that the International-Standard-Recording-Code field is not valid.

ISRC CODE:
> this field contains the identifying number of this media according to the ISRC standards expressed in ASCII.

DISC APPLICATION CODE FORMAT

Header

	7	6	5	4	3	2	1	0
0	RESERVED							
1	AUDIO STATUS							
2	SUB-CHANNEL DATA LENGTH = 00 (MSB)							
3	SUB-CHANNEL DATA LENGTH = 08 (LSB)							

Sub-Channel Data Block

	7	6	5	4	3	2	1	0

Sub-Channel Data Block

4	SUB-Q CHANNEL DATA FORMAT CODE = F0H
5	RESERVED
6	RESERVED
7	RES / DISC APPLICATION CODE
8	RESERVED
9	RESERVED
A	RESERVED
B	RESERVED

DISC APPLICATION CODE:

Discs for restricted use:
general purpose discs:0000000 (no mask)
special purpose discs:0111111 (special disc code masked)

Discs for unrestricted use: 1XXXXXX (no mask, X is read from disc)

BAR CODE DATA FORMAT:

Header

	7	6	5	4	3	2	1	0
0	RESERVED							
1	AUDIO STATUS							
2	SUB-CHANNEL DATA LENGTH = 00 (MSB)							
3	SUB-CHANNEL DATA LENGTH (LSB)							

Sub-Channel Data Block

	7	6	5	4	3	2	1	0
4	SUB-Q CHANNEL DATA FORMAT CODE = F1H							
5	RESERVED							
6	BAR CODE BYTE 7							
7	BAR CODE BYTE 6							
8	BAR CODE BYTE 5							
9	BAR CODE BYTE 4							
A	BAR CODE BYTE 3							
B	BAR CODE BYTE 2							
C	BAR CODE BYTE 1							
D	BAR CODE BYTE 0							

ALL RESERVED BITS MUST BE ZERO

In case of bar code data, the SUB-CHANNEL DATA LENGTH is an indication for the bar code data length.
In case of a 12-digit bar code, the SUB-CHANNEL DATA LENGTH will be set to 8, and the barcode data will be put in the data block bytes 6 to 0Bh.
In case of a 16-digit bar code, the SUB-CHANNEL DATA LENGTH will be set to 0Ah, and the barcode data will be put in the data block bytes 6 to 0Dh.

The Barcode read is ONLY done at startup time. Reissuing Read Subchannel will not reread the barcode info from the disc, but will only return the data read at startup time.

4.23 READ TOC.

	7	6	5	4	3	2	1	0
0	READ TOC (43H)							
1	LUN=0			RESERVED			MSF	RES
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	TRACK/SESSION NUMBER (HEX)							
7	ALLOCATION LENGTH (MSB)							
8	ALLOCATION LENGTH (LSB)							
9	FORMAT		RESERVED				FLG	LNK

An MSF bit of zero requests that the logical block address format be used for the CD-ROM absolute address field or for the offset from the beginning of the current track expressed as a number of logical blocks in a CD-ROM track relative address field. This track relative logical block address (TRLBA) value is reported as a negative value in twos-complement notation for transition areas that have decreasing MSF encoded relative addresses.
An MSF bit of one requests that the MSF format be used for these fields. In certain transition areas the relative MSF addresses are decreasing positive values. The absolute MSF addresses are always increasing positive values.

The READ TOC command transfers data from one of the tables of contents (TOC or PMA) on the CD medium. The data is returned in a format as specified in the tables TOC DATA FORMAT or SESSIONS DATA FORMAT.

The INFO data returned is a four byte header followed by one or more track descriptors.

If FORMAT = 00 then the track number field specifies the starting track number for which the data will be returned. If this value is zero, the TOC INFO data will begin with the first track. The data is returned in contiguous ascending order. For track range see next page.
Note : CD-I disc format does not have a track descriptor for CD-I tracks. It has a track descriptor for each CD-DA track.

FORMAT = 01 . This format returns the first session number, last session number and the last session starting address. In this format the field Track/Session number is reserved and should be set to 00h. (This format provides the host to access the last session starting address quickly)

FORMAT = 10. This format returns all Q subcodes data in the leadin (TOC) area starting from a specified session number as specified in the Session Number field. In this mode, the drive will support Q subcode Point field value of A0h, A1h, A2h, Tracknumbers, B0h, B1h, B2h, B3h, B4h and C0.

FORMAT = 11 : Reserved

Maximum Track number range (FORMAT=00):

CD disc mounted:

00   All TOC information (of all sessions) will be returned starting from first
          track.

Lowest - HighestTOC information returned starting from requested track.

AAh   Start time lead-out of last session is returned.

CD-WO disc mounted:

00   All TOC information (of all sessions) will be returned starting from first
          track.

Lowest - HighestTOC information returned starting from requested track.

If there exists an incomplete track on the disc, then this incomplete track number is returned in
the Highest Toc information, although incomplete tracks are not included into PMA or TOC.
By doing it this way, the host is informed of the presence of this track. Detailed information of
this track can be obtained by performing a READ TRACK INFO command.

AAh   Highest possible lead-out start time is returned.

If the track number field is not valid for the selected area, the command shall be terminated
with a CHECK CONDITION status.
The sense key shall be set to ILLEGAL REQUEST status and the additional sense code set to
invalid track number.

The allocation length specifies the number of bytes that the host has allocated for data. An
allocation length of zero indicates that no data will be transferred. Any other value indicates
the maximum number of bytes that will be transferred. The controller terminates the DATA IN
phase when allocation length bytes have been transferred or when all available data have been
transferred to the initiator, whichever is less.

TOC DATA FORMAT (FORMAT=00)

DISC INFO HEADER

	7	6	5	4	3	2	1	0
0	TOC/PMA DATA LENGTH (MSB)							
1	TOC/PMA DATA LENGTH (LSB)							
2	FIRST TRACK NUMBER							
3	LAST TRACK NUMBER							

DISC TOC TRACK DESCRIPTOR

	7	6	5	4	3	2	1	0
0	RESERVED = 00							
1	ADR				CONTROL			
2	TRACK NUMBER (HEX)							
3	RESERVED							
4	LOGICAL BLOCK ADDRESS (MSB)							
5	LOGICAL BLOCK ADDRESS							
6	LOGICAL BLOCK ADDRESS							
7	LOGICAL BLOCK ADDRESS (LSB)							

The TOC data returned is a four byte header followed by one or more (up to 100) track descriptors.

The TOC data length specifies the length in bytes of the available table of contents data. The value of TOC data length does not include itself. The maximum value is 802 (322H). This value is not modified when the allocation length is insufficient to return all the TOC data available.

The first track number field indicates the first track number on disc. The last track number field indicates the last track number on disc.

The track number value field indicates the track number for which the data in the disc info track descriptor is valid.
A track number value of 0AAH will be supplied for the lead-out value.

The ADR field gives the type of info encoded in Q sub-channel of the block where this TOC entry was found.

The control field indicates the attributes of the track. These are defined in the yellow and orange book.
If the control field contain F (hex) then this field contains no valid data.

SESSIONS DATA FORMAT (FORMAT = 01)

DISC TOC SESSION HEADER

	7	6	5	4	3	2	1	0
0	SESSIONS DATA LENGTH (MSB) = 00h							
1	SESSIONS DATA LENGTH (LSB) = 0Ah							
2	FIRST SESSION NUMBER							
3	LAST SESSION NUMBER							

DISC TOC SESSION DESCRIPTOR

	7	6	5	4	3	2	1	0
0	RESERVED							
1	ADR				CONTROL			
2	FIRST TRK NR IN LAST SESS. (HEX)							
3	RESERVED							
4	START ADDRESS							
5	OF FIRST							
6	TRACK							
7	IN LAST SESSION							

The sessions data returned is a four byte header followed by one or more session descriptors. The sessions data length specifies the length in bytes of the available sessions data. The value of sessions data length does not include itself. This value is not modified when the allocation length is insufficient to return all the sessions data available.

If the first track in a session exists THE FIRST TRACK NUMBER IN LAST SESSION field returns that track number. If this field is zero and the unfinished session number is non zero then it indicates that there is an empty program area.

TOC DATA FORMAT (FORMAT = 10)

DISC TOC HEADER

	7	6	5	4	3	2	1	0
0	TOC DATA LENGTH (MSB)							
1	TOC DATA LENGTH (LSB)							
2	FIRST SESSION NUMBER							
3	LAST SESSION NUMBER							

DISC TOC SESSION DESCRIPTOR

	7	6	5	4	3	2	1	0
0	SESSION NUMBER							
1	ADR				CONTROL			
2	BYTE 1 (TNO)							
3	BYTE 2 (POINT)							
4	BYTE 3 (MIN)							
5	BYTE 4 (SEC)							
6	BYTE 5 (FRAME)							
7	BYTE 6 (ZERO)							
8	BYTE 7 (PMIN)							
9	BYTE 8 (PSEC)							
A	BYTE 9 (PFRAME)							

For this format (10), the drive should return TOC data for Q subcode modes (ADR field) 1 and 5 (except mode 5 point 1 through 40) in the lead in Area.

For single session discs, the first session number is equal to the last session number. The returned TOC data for a multisession disc is arranged in ascending order of the session number. The toc data within a session is arranged in the order ofQ subcode point field value of A0h, A1h, A2h, Track numbers, B0h, B1h, B2h, B3h, B4h and C0h.

4.24 PLAY AUDIO

	7	6	5	4	3	2	1	0
0	PLAY AUDIO (45h)							
1	LUN=0			RESERVED				RA
2	STARTING LOGICAL BLOCK ADDRESS (MSB)							
3	STARTING LOGICAL BLOCK ADDRESS							
4	STARTING LOGICAL BLOCK ADDRESS							
5	STARTING LOGICAL BLOCK ADDRESS (LSB)							
6	RESERVED							
7	TRANSFER LENGTH (MSB)							
8	TRANSFER LENGTH (LSB)							
9	VND UN		RESERVED				FLG	LNK

VND UN= VENDOR UNIQUE= 0
FLG　　　= FLAG　　= 0
LNK　　　= LINK　　= 0
RA　　　　=RELATIVE ADDRESS = 0

ALL RESERVED BYTES MUST BE 00

Description

Request CDD 2600 to begin an audio play operation, starting at a logical block address, for the number of blocks specified in the transfer length.

The command function (Immed and SOTC bits) and the output of the audio signals shall be specified by the settings of the mode parameters.

Parameters

STARTING LOGICAL BLOCK ADDRESS:
　　　The logical block at which the audio playback operation begins.

TRANSFER LENGTH:
　　　Number of contiguous logical blocks that shall be played. Length = 0 means no audio operation shall occur. This condition is not an error.

Exceptions

Starting address is not found,
　　　Terminate command with CHECK CONDITION status.
　　　SENSE KEY =　ILLEGAL REQUEST.
　　　ADDITIONAL SK =　INVALID BLOCK ADDRESS.

Starting address is not within an audio track,
    Command shall be terminated with CHECK CONDITION status.
    SENSE KEY = BLANK CHECK.
    ADDITIONAL SK = ILLEGAL MODE FOR THIS TRACK.

CD-ROM information type changes from audio (to data),
    Command shall be terminated with CHECK CONDITION status.
    SENSE KEY = BLANK CHECK.
    ADDITIONAL SK = ILLEGAL MODE FOR THIS TRACK.

ALLOWED COMMANDS DURING AUDIO.

Commands That Will Stop a Play or Scan Operation.

Opcode	Command Description
4Bh	PAUSE / RESUME
45h	PLAY AUDIO (10)
47h	PLAY AUDIO MSF
48h	PLAY AUDIO TRACK INDEX
28h	READ (10)
2Bh	SEEK
1Bh	START / STOP UNIT

Commands That Will Not Stop a Play or Scan Operation.

Opcode	Command Description	Action Taken
ANY	When it generates an Illegal Field in Command Packet CHECK CONDITION.	Will terminate normally
12h	INQUIRY	The Inquiry data will be returned

Opcode	Command Description	Action Taken
55h	MODE SELECT	The Mode Select will be accepted and executed as long as no Media or Mode information is changed. If parameters that affect the play are changed, the Mode Select will terminate a CHECK CONDITION without being executed
5Ah	MODE SENSE	Will execute normally
1Eh	PREVENT/ALLOW MEDIA REMOVAL	Will execute normally
25h	READ CD-ROM CAPACITY	Will execute normally
42h	READ SUB-CHANNEL	Only the current position information (Format Code 01h) will be supported while the play is in progress. If any other type of information is requested the READ SUB-CHANNEL will not be executed and a CHECK CONDITION will be generated.
43h	READ TOC	Only drives that cache the TOC will be able to respond to this command while the play is in progress. If the drives does not support caching the TOC, the command will not be executed and a CHECK CONDITION will be generated.
03h	REQUEST SENSE	Will execute normally
00h	TEST UNIT READY	Will execute normally

4.25 PLAY AUDIO MSF

	7	6	5	4	3	2	1	0
0	PLAY AUDIO MFS (47h)							
1	LUN=0			RESERVED				
2	RESERVED							
3	STARTING M FIELD							
4	STARTING S FIELD							
5	STARTING F FIELD							
6	ENDING M FIELD							
7	ENDING S FIELD							
8	ENDING F FIELD							
9	VND UN		RESERVED				FLG	LNK

VND UN= VENDOR UNIQUE= 0
FLG   = FLAG   = 0
LNK   = LINK   = 0

ALL RESERVED BYTES MUST BE 00

Description

Request CDD 2600 to begin an audio play operation. Play all contiguous audio sectors between the absolute start MSF (Minutes, Seconds, Frames) address, till the end MSF address.

The command function (Immed and SOTC bits) and the output of the audio signals shall be specified by the settings of the mode parameters.

Parameters

STARTING M FIELD, STARTING S FIELD, STARTING F FIELD
Starting MSF address.

ENDING M FIELD, ENDING S FIELD, ENDING F FIELD
ending MSF address.

Exceptions

Starting address is not found,
    Terminate command with CHECK CONDITION,
    SENSE KEY = ILLEGAL REQUEST,
    ADDITIONAL SK =   INVALID BLOCK ADDRESS.

Starting address is not within an audio track,
    Command shall be terminated with CHECK CONDITION status,
    SENSE KEY = BLANK CHECK,
    ADDITONAL SK = ILLEGAL MODE FOR THIS TRACK.

Start address is higher than the end address.
    Terminate command with CHECK CONDITION status.
    SENSE KEY = ILLEGAL REQUEST.

Start address equal to end address.
    No audio play operation started (not error).

4.26 PLAY AUDIO TRACK INDEX

	7	6	5	4	3	2	1	0
0	PLAY AUDIO TRACK INDEX (48h)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	STARTING TRACK							
5	STARTING INDEX							
6	RESERVED							
7	ENDING TRACK							
8	ENDING INDEX							
9	VND UN		RESERVED				FLG	LNK

VND UN= VENDOR UNIQUE= 0
FLG   = FLAG   = 0
LNK   = LINK   = 0

ALL RESERVED BYTES MUST BE 00

Description

Request CDD 2600 to begin an audio play operation. Play all contiguous audio sectors from the starting index in the starting track, to and including the ending index in the ending track (play operation terminates at the last block with an index equal to the ending index).

The command function (Immed and SOTC bits) and the output of the audio signals shall be specified by the settings of the mode parameters.

Parameters

STARTING TRACK, STARTING INDEX
starting audio track and the starting index within this track. A start index = 1 means start with first audio sector of the track.

ENDING TRACK, ENDING INDEX
ending audio track and the ending index within this track. A end index =99 means continue playback through last sector of the track.

Exceptions

Starting address is not found.
        Terminate command with CHECK CONDITION status.
        SENSE KEY = ILLEGAL REQUEST.
        ADDITIONAL SK = INVALID BLOCK ADDRESS.

Starting address is not within an audio track.
        Command shall be terminated with CHECK CONDITION status.
        SENSE KEY = BLANK CHECK.
        ADDITONAL SK = ILLEGAL MODE FOR THIS TRACK.

Ending track > actual last track on a disc.
        Continue until last track completed (not error)

Ending index > actual last index in a track.
        Continue until track is completed (not error)

Starting index > largest index on the starting track and SOTC bit = 0.
        Playback operation will start at the beginning of the next track (not error).

Starting index > largest index on the starting track and SOTC bit = 1.
        Playback shall not begin, and return CHECK CONDITION status.
        SENSE KEY = ILLEGAL REQUEST.

4.27 PAUSE RESUME

	7	6	5	4	3	2	1	0
0	PAUSE RESUME (4Bh)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	RESERVED							
8	RESERVED							RES
9	VND UN		RESERVED				FLG	LNK

VND UN= VENDOR UNIQUE= 0
FLG   = FLAG   = 0
LNK   = LINK   = 0

ALL RESERVED BYTES MUST BE 00

Description

Request CDD 2600 to stop or start an audio play operation.
This command is used with PLAY AUDIO commands while the immediate bit is set to one.

Parameters

RES (Resume) bit set to:
       0: Enter pause with audio muted after current block is played.
       1: Resume play (release pause) at the block following the last played block.

Exceptions

RES = 0 and no pause possible (no play operation requested or requested play finished).
       Terminate command with CHECK CONDITION status.

RES = 1 and audio play cannot be resumed,
       Terminate command with CHECK CONDITION status.

Pause requested when a pause is already in effect.
       Continue pause (not error).

Resume requested and a play operation is in progress.
       Continue playback (not error).

4.28 READ DISC INFORMATION.

	7	6	5	4	3	2	1	0
0	READ DISC INFORMATION (51H)							
1	RESERVED							
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED)							
7	ALLOCATION LENGTH (MSB)							
8	ALLOCATION LENGTH (LSB)							
9	VND UN	RESERVED					FLG	LNK

The number of Disc Information Block bytes returned is limited by the Allocation Length parameter of the CDB. An Allocation Length of zero is not to be considered an error. The Information Block has two parts; a static disc information area, as shown in table Disc Information Block and an OPC table, shown in table OPC Table Entry. The Disc Information content is defined as follows :

Disc Information Block.

	7	6	5	4	3	2	1	0
0	DATA LENGTH (MSB)							
1	DATA LENGTH (LSB)							
2	RESERVED			Erasable	State of last Session		Disc Status	
3	NUMBER OF FIRST TRACK ON DISC							
4	NUMBER OF SESSIONS							
5	FIRST TRACK NUMBER IN LAST SESSION							
6	LAST TRACK NUMBER IN LAST SESSION							
7	Disc ID Valid	Disc Bar Code Valid	restricted Use Disc	RESERVED				
8	DISC TYPE							
9	RESERVED							
10	RESERVED							

11	RESERVED
12	DISC IDENTIFICATION (MSB)
13	DISC IDENTIFICATION
14	DISC IDENTIFICATION
15	DISC IDENTIFICATION(LSB)
16	LAST SESSION LEAD-IN START TIME(MSB)
17	LAST SESSION LEAD-IN START TIME)
18	LAST SESSION LEAD-IN START TIME)
19	LAST SESSION LEAD-IN START TIME(LSB)
20	Last Possible Start Time for Start of Lead-out(MSB)
21	Last Possible Start Time for Start of Lead-out
22	Last Possible Start Time for Start of Lead-out
23	Last Possible Start Time for Start of Lead-out(LSB)
24	Disc Bar Code (MSB)
25	Disc Bar Code
26	Disc Bar Code
27	Disc Bar Code
28	Disc Bar Code
29	Disc Bar Code
30	Disc Bar Code
31	Disc Bar Code (LSB)
32	Reserved
33	Number of OPC Table Entries
34	OPC Table Entries

Data Length is the number of bytes available in both the recording information area and the appended OPC table. Data Length excludes itself.

Disc Status is given by:
  00 - Empty
  01 - Incomplete disc (Appendable)
  10 - Complete (CD-ROM or last session is closed and has no next session pointer)
  11 - Reserved

State of Last Session is valid only for discs with either empty or incomplete status and is given by:
  00 - Empty Session
  01 - Incomplete Session
  10 - Reserved
  11 - Complete Session (only possible when Disc Status is Complete)

The Erasable flag, when set to one indicates that CD-E medium is present. Otherwise, CD-E medium is not present.

The Number of First Track on the disc is:
1) The track number of the invisible/incomplete track when the disc is incomplete.
2) The track number for the first TOC entry for track.

The Number of Sessions on the disc refers to all complete sessions plus any incomplete or empty sessions. A Blank Disc will always have a session count equal to one.
First Track Number in Last Session is the track number of the first track in the last session.
Last Track Number in Last Session is the track number of the last track in the last session. This is inclusive of the invisible track.
The Disc Type valid flag, when set to one, indicates that the Disc Type field is valid. Otherwise, the Disc Type field is not valid.
The Disc Identifiaction valid flag, when set to one, indicates that the Disc Identification field is valid.
The Disc Bar Code valid flag, when set to one, indicates that the Disc Bar Code field is valid.
The Restricted Use Disc flag, when set to one, indicates that the CD-R/E disc is not defined for general purpose use. In order to record data on the disc, the Host Application code in the Write Parameters Mode Page must be set to the appropriate value. When the Restricted Use Disc flag is set to zero, the CD-R/E disc is defined for general purpose use. In order to record data on the disc, the Host Application code in the Write Parameters Mode Page must be set to 00h.
The Disc Type field specifies the type of data on the whole disc. A disc has only one disc type. The disc type is recorded in the A0/Psec field in the TOC of the session in which there is at least one data track, or is recorded together with ID in the PMA.
In the case of a session that contains no data track (only audio), A0/Psec field in the TOC of the session is always 00h regardless of actual disc type.
For all disc, the disc type shall be determined from the following sequences;
     1) - Disc ID (Disc Type) is written in PMA.
     2) - From the first Complete Session that includes at least one data
        track.
     3) - From the first session of a Complete Disc.
     4) - The Disc type is NOT decided, the Disc Type field of Disc Information shall
        contain FF (undefined)

Disc Type Field PMA

Disc Type Code	Disc Type
00	CD-DA or CD-ROM Disc
10	CD-I Disc
20	CD-ROM XA Disc
FF	Undefined

Disc Type Code	Disc Type
All Other Values	Reserved

The Disc Identification number recorded in the PMA is returned. If there is no Disc Identification number recorded, then the field shall be zero filled. The Disc Identification Number is recorded in the PMA as a six-digit BCD number. It is returned in the Disc Information Block as a 32 bit binary integer.If the device has the ability to read Disc Bar Code and a bar code is present, then the Disc Bar Code field contains the 12 BCD digits of the bar code.
The Last Session Lead-in Start Time field is an address given in MSF format.
Note : For stamped CD's FFFFFF is filled in.
The Last Possible Start Time of Lead-out field is an address given in MSF format .
An OPC (Optimum Power Control) Table is attached only if the values are known for the disc. Since OPC values are likely to be different for different recording speeds, each table entry is associated with a recording speed. The Number of OPC Table Entries indicates that (Number of OPC Table Entries) bytes follow the first part of the Disc Information. This number shall be the same for all values of Allocation Length. The Number of OPC Table Entries willalways be zero for CD-ROM discs and for CD-R/E discs for which OPC have not yet been determined.

OPC Table Entry.

0	Speed
1	Speed
2	OPC Values
3	OPC Values
4	OPC Values
5	OPC Values
6	OPC Values
7	OPC Values

The OPC Value field is associated with the given speed and its content is vendor specific.

4.29 MODE SELECT 10.

	7	6	5	4	3	2	1	0
0	MODE SELECT(55H)							
1	LUN=0			PF	RESERVED			SP
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	msb PARAMETER LIST LENGTH							
8	PARAMETER LIST LENGTH lsb							
9	VND UN		RESERVED				FLG	LNK

VND UN = VENDOR UNIQUE = 00
FLG = FLAG = 00
LNK = LINK = 00
SP = 00 ALL RESERVED BYTES MUST BE 00

This command allows the host to select the block size.

The MODE SELECT command is used to select block sizes of 2048, 2052, 2056, 2060, 2324, 2328, 2336, 2340 and 2352 bytes for the READ, WRITE TRACK and WRITE commands.

The MODE SELECT command requires a parameter list to specify the desired operating parameters. The parameter list length field of the CDB must be set to reflect the length of the parameter list. This parameter list consists of three parts:
The required mode select header, an optional block descriptor, and maximum two (optional) mode select pages. If the block descriptor is included in the parameter list, it is used to specify the block size. Mode select pages are used to set additional parameters, and provide a means for further extensions to this command which may be necessary or desirable.
If any mode select page is included in the parameter list, the PF (Page Format) bit of the CDB must be set to 1.
No mode select page should appear more than once in the parameter list.

The CDD 2600 supports page code 1 (error recovery parameters), page code02 (Disconnect-Reconnect), page code 09H(Peripheral device), page code 0EH(play), page code 20H (Sub-header), page code 21 (Write track information), page code 22 (Catalogue information), page code 23 (Speed & simulation) and page code 24 + 25(Increment index information).

Mode Select Header

	7	6	5	4	3	2	1	0
0	RESERVED							
1	RESERVED							
2	MEDIUM TYPE							
3	RES	HOST APPLICATION CODE						
4	RESERVED							
5	RESERVED							
6	MSB BLOCK DESCRIPTOR LENGTH							
7	BLOCK DESCRIPTOR LENGTH LSB							

Byte header parameters

02   Medium type can be 00h or must be according the medium that is mounted.
     The medium type can be read by the MODE SENSE command.
     Medium type values 00h means that all CD media are allowed. 00h should be used when
     no disc is mounted.

     Explanation of the medium type bits.

     Bit 7
     0   All other bits must also be zero and means no medium type info present.
     1   Indicates vendor unique definition of the other bits, see below.

     Bit 6
     0   Not write protected
     1   Write protected

     Bit 5
     0   disc size is 80 mm
     1   disc size is 120 mm

     Bit 4
     0   No multivolume disc
     1   Multivolume disc

     Bit 3
     0   no WO disc area present on disc
     1   WO disc area present on disc

     Bit 2
     0   no audio tracks present on disc
     1   one or more audio tracks present on disc

     Bit 1 Bit 0

<div style="padding-left: 2em;">

00   no data tracks present on disc
01   CD-ROM tracks or CD-ROM XA tracks with first track in mode 1
10   CD-ROM XA tracks with first track in mode 2
11   CD-I disc

</div>

03   Host application code: used to compare with the Disc application code before a write action takes place.

Note: after power-up, the Host Application Code is 0.

6.7   Block descriptor length is set to the length in bytes of the block descriptor section. For the CDD 2600 either zero or one block descriptor must be used. Each block descriptor is eight bytes long, therefore this field must be either 00 or 08.

Block Descriptor

	7	6	5	4	3	2	1	0
0	DENSITY CODE = 00							
1	NUMBER OF BLOCKS MSB = 00							
2	NUMBER OF BLOCKS = 00							
3	NUMBER OF BLOCKS LSB = 00							
4	RESERVED							
5	BLOCK SIZE MSB							
6	BLOCK SIZE							
7	BLOCK SIZE LSB							

Byte Block descriptor parameters

00   Density code must be set to the SCSI default value 00.

1-3   Number of blocks must be set to zero to indicate all blocks on the disc.

5-7   Block size may be set to (800H) 2048 , (804h) 2052, (808h) 2056 bytes, (80CH) 2060, (914H) 2324, (918H) 2328, (91CH) 2332, (920H) 2336, (924H) 2340 or (930H) 2352 bytes.

The block size determines the number of bytes in a block. Block zero is physical located at 00:02:00 MSF.

Mode Select Pages

Page 1   Error Recovery

	7	6	5	4	3	2	1	0
0	RESERVED		PAGE CODE = 01h					
1	PARAMETER LENGTH = 06h							
2	RESERVED		TB	RC	EEC	PER	DTE	DCR
3	READ RETRY COUNT							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	RESERVED							

RC and EEC are ignored.
ALL RESERVED BITS MUST BE ZERO

Description

Specifies the error recovery parameters the CDD 2600 shall use during any command that performs a read or write operation to the medium (e.g. READ,WRITE, COPY, VERIFY, etc.). Note that the ECC correction while reading will only be applied if the block size is 2048.

Parameters

02   A DCR (Disable Correction) bit 0 set to one indicates that error correction shall not be applied in the course of error recovery. Other normal error recovery operations are not affected by this bit. A DCR bit set to zero enables error correction.

A DTE (Disable Transfer on Error) bit 1 set to one and if the PER bit is set to one, indicates that the CDD 2600 shall create the CHECK CONDITION status and terminate the data transfer to the initiator immediately upon detection of an error. The Transfer Length is then not exhausted. The data of the block in error, which is the first erring block encountered, may or may not be transferred to the initiator depending upon the setting of the TB bit. The DTE bit can only be set to one by the initiator if the PER bit is set to one. The CDD 2600 shall create the CHECK CONDITION status with Illegal Request Sense Key, if it receives PER bit of zero and DTE bit set to one.

A DTE bit set to zero enables data transfer for any data which can be recovered within the limits of the Error Recovery Flags. Any erring block that would be posted, which is the last recovered block encountered, is not posted until the Transfer Length is exhausted.

A PER (Post Error) bit 2 set to one indicates that the CDD 2600 shall enable the reporting of the CHECK CONDITION status for recovered errors. With the appropriate Sense Key. The CHECK CONDITION status shall happen during the data transfer depending either on the DTE bit value or if an unrecoverable error occurred. If multiple errors occur, the REQUEST SENSE data shall report the block address of either the last block on which the recovered error occurred or of the first unrecoverable error.

A PER bit set to zero indicates that the CDD 2600 shall not create the CHECK CONDI-

TION status for errors recovered within the limits established by the other Error Recovery by the other Error Recovery Flags shall be posted accordingly by the CDD 2600 . The transfer of data may terminate prior to exhausting the Transfer Length depending on the error and the state of the other Error Recovery Flags.

An EEC (Enable Early Correction) bit 3 set to one indicates that the CDD 2600 shall enable the use of the most expedient form of error recovery, such as error correction, before applying retries. Seek or positioning retries and the recovery procedure retries of the message system are not affected by the value of this bit. The CDD 2600 implemented error correction schemes which do not provide the most expedient form of error recovery should default to zero and report the EEC bit as not changeable in the MODE SENSE page code 3. EEC and DCR both of one is an invalid request, for which the CDD 2600 shall created the CHECK CONDITION status with Illegal Request Sense Key.

An EEC bit set to zero indicates that the CDD 2600 shall exhaust the defined retry limit prior to enabling error correction.
EEC is not implemented.

A RC (Read Continuous) bit 4 set to one requests the CDD 2600 to transfer the entire requested length of data without adding delays which would increase or ensure data integrity (i.e delays caused by the CDD 2600 error recovery schemes).
This applies that the CDD 2600 may send data which may be flow of data and avoid delays. The CDD 2600 shall assign priority to this bit over conflicting error control bits (EEC, DCR, DTE, PER) within this byte.

A RC bit set to zero indicates that error recovery operations which cause reasonable delays are acceptable during the data transfer. Data shall not be fabricated.
RC is not implemented. Same function can be achieved with DCR bit.

A TB (TRANSFER BLOCK) bit 5 set to one indicates that the failing data block (recovered or unrecoverable) data shall be transferred to the initiator.

A TB bit set to zero indicates that the failing data block (recovered or unrecoverable) data shall not be transferred to the initiator.

The following table summarizes all valid modes of operation.

	Status	PER	DTE	TB	DCR	Error Corr.	Soft Error		Hard Error	
							TRAN Sblk	Report Soft Error	Transf	Report
1	implemented	0	0	0	0	Yes	Yes	No	No	Yes
	not implemen.	0	0	0	1					
	not implemen.	0	0	1	0					
2	implemented	0	0	1	1	No	n.a.	n.a.	Yes	Yes
	illegal	0	1	0	0					
	illegal	0	1	0	1					
	illegal	0	1	1	0					
	illegal	0	1	1	1					
3	default	1	0	0	0	Yes	Yes	at end of tran. length	No	Yes
	illegal	1	0	0	1					
4	implemented	1	0	1	0	Yes	Yes	at end of tran. length	Yes	Yes
	illegal	1	0	1	1					
5	implemented	1	1	0	0	Yes	No	where ECC occurs	No	Yes
	illegal	1	1	0	1					
6	implemented	1	1	1	0	Yes	Yes	when ECC occurs	Yes	Yes
	illegal	1	1	1	1					

n.a. = not applicable
soft error = correctable error. (mode 1 & mode 2 form 1)
hard error = uncorrectable error. (mode 1 & mode 2 form 1)

Explanation.

1.   ECC will be invoked; the transfer of data will stop if a hard error is encountered; soft errors will not be reported; the block with the hard error will not be transferred.

2.   Streaming. ECC will not be invoked, has the same effect as setting RC bit; errors will be reported at the end of the transfer length.

3.   Default mode; ECC will be invoked; soft error block will be transferred and the DMA will continue to the end of the transfer length; The transfer stops if a hard error is encountered; the hard error block is not transferred; soft errors are reported at the end of transfer length.

4.   Same as 3 except the block where a hard error occurred will be transferred.

5.   ECC will be invoked; transfer will stop if a hard or soft error is encountered; the block with a hard or soft error will not be transferred.

6.   Same as 5, except the block where a hard or soft error occurred will be transferred.

Note: If both soft and hard errors occur, only the hard error will be reported.

03   This byte sets the read retry counter. Values valid are 00-07, default value is 03. The Read Retry counter will only be taken into account if the ECC error correction is enabled. (DCR = 0).
Retries will be attempted after ECC correction.

Page 02h   *Disconnect-Reconnect*

	7	6	5	4	3	2	1	0
0	RESERVED		PAGE CODE = 02h					
1	PARAMETER LENGTH (0Eh) (14)							
2	BUFFER FULL RATIO							
3	BUFFER EMPTY RATIO							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	RESERVED							
8	RESERVED							
9	RESERVED							
10	RESERVED							
11	RESERVED							
12	RESERVED							
13	RESERVED							
14	RESERVED							
15	RESERVED							

ALL RESERVED BITS MUST BE ZERO

Description
Provides the initiator the means to tune the performance of the SCSI bus.

Parameters
00   Pages code is set to 02h for this page.
01   Parameter Length is set to 14.

02   Buffer Full Ratio.
     The buffer full ratio field indicates to the target, on READ operations, how full the buffer
should be prior to attempting a reselection.

03   Buffer Empty Ratio.
     The buffer empty ratio field indicates to the target, on WRITE operations, how empty
     the buffer should be prior to attempting a reselection.

4..15 Reserved

Note : The buffer empty ratio is not related with the treshold value when data will be written to
disc.
That treshold value is determined internally: it is 90% of the amount of blocks that the DRAM
can contain., e.g. (DRAMSIZE/BLOCKSIZE) * 90%.

When the blocksize is 800h, the treshold will be: 457 blocks.

The Buffer Full and Buffer Empty ratios are the numerators of a fractional multiplier that has 256 (100h) as its denominator. This ratio is based on 1 MB of buffer space (practically FE000h, since 2000h is used internally.

These ratios have a lower limit of 0Ah and an upper limit of F6h. These limits work out to be 4% and 96% of the buffer. If a value below 0Ah is entered, the drive will default to 0Ah. If a value greater than F6h is entered, the drive will default to F6h.

Page 09h   *Peripheral device*
:

	7	6	5	4	3	2	1	0
0	RESERVED		PAGE CODE = 09h					
1	PARAMETER LENGTH = 0Ch (12)							
2	SERIAL NR. DIGIT 1				SERIAL NR. DIGIT 2			
3	SERIAL NR. DIGIT 3				SERIAL NR. DIGIT 4			
4	SERIAL NR. DIGIT 5				SERIAL NR. DIGIT 6			
5	SERIAL NR. DIGIT 7				SERIAL NR. DIGIT 8			
6	SERIAL NR. DIGIT 9				SERIAL NR. DIGIT 10			
7	SERIAL NR. DIGIT 11				SERIAL NR. DIGIT 12			
8	SERVO REVISION NR. MSB							
9	SERVO REVISION NR. LSB							
10	SERVO REVISION DAY OF MONTH							
11	SERVO REVISION MONTH OF YEAR							
12	SERVO REVISION YEAR							
13	CDM SETTINGS REVISION NR.							

ALL RESERVED BITS MUST BE ZERO

Description

This contains vendor specific information. For now only the CDD 2600 serial number is proposed.

Parameters

SERIAL NUMBER
>A unique 12 digit serial number for a CDD 2600 .
>An inquiry command only selects the six first digits

Page 0Eh   Play
:

	7	6	5	4	3	2	1	0
0	RESERVED		PAGE CODE = 0Eh					
1	PARAMETER LENGTH = 0Eh (14)							
2	RESERVED					IMM	SOTC	RES
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	RESERVED							
8	RESERVED				OUTPUT CHANNEL 0			
9	OUTPUT PORT 0 VOLUME							
10	RESERVED				OUTPUT CHANNEL 1			
11	OUTPUT PORT 1 VOLUME							
12	RESERVED				OUTPUT CHANNEL 2			
13	OUTPUT PORT 2 VOLUME							
14	RESERVED				OUTPUT CHANNEL 3			
15	OUTPUT PORT 3 VOLUME							

ALL RESERVED BITS MUST BE ZERO

Description

Parameters used for the playback commands (PLAY AUDIO, PLAY AUDIO MFS, PLAY AUDIO TRACK INDEX).

Parameters

IMM (Immediate) bit:
>   0: CDD 2600 sends completion status when audio playback operation is finished.
>   1: CDD 2600 sends completion status as soon as the playback operation has started.
>   Default = 1.

SOTC (Stop On Track Crossing) bit:
>   0: means play is terminated when transfer length is satisfied, multiple tracks shall be played as necessary, and audio pause/silence at the beginning of tracks will be played.
>   1: means terminate playback operation when the beginning of a following track is encountered.
>   Default = 1

OUTPUT CHANNEL
>   Of the four possible audio channels only two are used: OUTPUT CHANNEL 0 and OUTPUT CHANNEL 1. The two remaining audio channels (OUTPUT CHANNEL 2 and OUTPUT CHANNEL 3) are ignored.

OUTPUT	CHANNEL0	CHANNEL 1
MUTE	0	0
STEREO	1	2
SWAPPED	2	1
LEFT	1	1
RIGHT	2	2

0: means no signal is applied.
1: means that the LEFT signal is applied.
2: means that the RIGHT signal is applied.

The default value is STEREO, all other combinations are invalid!

OUTPUT VOLUME
Relative volume level of output channel, where 0 indicates the output is muted, and a value of FFh indicates maximum volume level.
Default = FFh   (max. volume)

Page 20h   Subheader

Used to set the Subheader information, which can be selected as input for each data blocks subheader during writing and is defined as follows:

	7	6	5	4	3	2	1	0
0	RESERVED		PAGE CODE = 20h					
1	PARAMETER LENGTH = 06h							
2	RESERVED							
3	FILE NUMBER							
4	CHANNEL NUMBER							
5	SUBMODE							
6	CODING INFORMATION							
7	RESERVED							

ALL RESERVED BITS MUST BE ZERO

Parameters

03   File number.
      The file number to identify all sectors that belong to one and the same file. This is set to zero.
      For detailed information see 'Green book' III.4.4. and Appendix II.1.

04   Channel number.
      Facilitates realtime channel selection.
      For detailed information see 'Green book' VII.2.2.3.2(SS_play) and Appendix II.1.3.

05   Submode.
      The submode byte defines global attributes of a sector as required for the initial selection and allocation of a sector the system.
      For detailed information see 'Green book' II.4.5.3 and Appendix II.1.3.

06   Coding information.
      This byte defines the details of the byte of the type data located in the user area of the sector.
      For detailed information see 'Green book' IV.3.2.4, V.6.3.1 and VI.4.2 and Appendix II.1.4.

07   Reserved.

Page 21h   *Write Track*

Used to set the Write Track information, which can be selected as input for each track during writing and is defined as follows:

	7	6	5	4	3	2	1	0
0	RESERVED		PAGE CODE = 21h					
1	PARAMETER LENGTH = 0Eh (14)							
2	RESERVED							
3	RES	COPY		Raw	Mix	Audio	MODE	
4	TRACK NUMBER							
5	RESERVED		ISRC I1					
6	RESERVED		ISRC I2					
7	RESERVED		ISRC I3					
8	RESERVED		ISRC I4					
9	RESERVED		ISRC I5					
10	ISRC I6				ISRC I7			
11	ISRC I8				ISRC I9			
12	ISRC I10				ISRC I11			
13	ISRC I12				RESERVED			
14	RESERVED							
15	RESERVED							

ALL RESERVED BITS MUST BE ZERO

This page is optional if a write is issued with a write track. This page is mandatory if a write is issued without a write track.

Parameters

03   Track Mode, Audio, Mix, Raw,Copy
     These parameters define the mode a track at once is written. It is mandatory to set the mode field correct in order to start writing without a WRITE TRACK command. (needed to generate the pregap.)

COPY
     The copy bits will define the possibilities for copying :

     00   copy inhibited   (default)
     01   copy permitted
     10   SCMS copy (alternate)
     11   RESERVED

     When the Audio field is set, the delivered data will be regarded as audio. The block size is always 2352 bytes. The sequence of the bytes delivered should be conform with the

following:

byte nr	description
0	Most significant byte of (first) left audio sample
1	Least significant byte of (first) left audio sample
2	Most significant byte of (first) right audio sample
3	Least significant byte of (first) right audio sample
4	Most significant byte of (second) left audio sample
	etc.

The Mix field set to 1 indicates a mixture of form 1 and form 2 blocks. Form 1 sectors contains 2056 bytes and form 2 contains 2332 bytes. It is allowed to mixture these blocks. If the Mix field is 0, only one blocksize is used during write / read. Valid blocksizes in combination with the Mix, Raw, Audio and Track mode are:

Mix	Raw	Audi	Track Mode	Block-size	Data transferred
0	0	0	1	2048	User data (2048)
0	0	0	2	2048^a (Form 1)	User data (2048)
0	0	0	2	2056^b (Form 1)	Subheader (8)
0	0	0	2	2324^a (Form 2)	User data (2324)
0	0	0	2	2332^b (Form 2)	Subheader (8) user
0	0	0	2	2336 -	User data (2336)
1	0	0	2	Don't care (mixture of 2056^b and 2332^b)	Subheader user data (2048 or 2324)
X	0	1	XX^c	2352	Audio samples
X	1	X^c	XX^c	2352	Raw data or audio

a. Subheader is fixed and taken internally (Mode Select page 20H)
b. Subheader taken from host.
c. Value must be set to a valid combination.

In case of incremental writing only a limited number of blocksizes are: valid:

Mix	Raw	Audi	Track Mode	Block-size	Data transferred
0	0	0	1	2048	User data (2048)
0	0	0	2	2048^a (Form 1)	User data (2048)
0	0	0	2	2056^b (Form 1)	Subheader (8)
0	0	0	2	2324^a (Form 2)	User data (2324)
0	0	0	2	2332^b (Form 2)	Subheader (8) user

a. Subheader is fixed and taken internally (Mode Select page 20H)
b. Subheader taken from host.

Mode select page 20 (Subheader) must be used to select the desired Form.

04   Track Number.
       If the track number is zero, a new track will be created with a track number one higher
       then the previous track. If the track number is not zero, then this track number must
       point to a reserved track, unless it is an empty disc which will start with the given track
       number.

05..13 ISRC Number.
       ISRC (International Standard Recording Code) is a unique code that can be given to an
       individual track.
       I1..I2   : country code 6 bit ASCII
       I3..I5   : owner code 6 bit ASCII
       I6..I7   : year of recording BCD
       I8..I12   : serial number BCD

       Once the Mode Select page 21 has been issued to give in any parameter, the ISRC shall
       be written to disc (when writng an audio track). The ISRC value written can be the
       default : all zeroes or can be specified by the host. The read back of the ISRC code can
       be found in READ SUBCHANNEL.

14..15Reserved.

Using this page, offers an alternative way for writing or copying a track. When this page is set
correctly, on can give the write command without the need of first giving a write track com-
mand.

Page 22h   Catalogue number

Used to set the Catalogue Number information, which can be selected as input for writing and is defined as follows:

	7	6	5	4	3	2	1	0
0	RESERVED		PAGE CODE = 22h					
1	PARAMETER LENGTH = 08h							
2	CATALOG VALID							
3	N1, N2							
4	N3, N4							
5	N5, N6							
6	N7, N8							
7	N9, N10							
8	N11, N12							
9	N13, 0							

ALL RESERVED BITS MUST BE ZERO

Parameters

02   Catalogue Valid.
       If this field is set to 1, the catalogue number as described in N1..N13 will be used. If this
       field is set to zero, no catalogue number will be written.

02..08 Catalogue Number.
       The Catalogue Number defines a catalogue number of a disc. The catalogue number of a
       disc is expressed is 13 digits BCD according the UPC/EAN code. If no catalogue
       number is used, clear the catalogue valid field.
       The catalogue number may not change on a disc.

Page 23h   Speed selection

Used to set a speed selection used during recording and playing, and for write simulations. This page is defined as follows:

	7	6	5	4	3	2	1	0
0	RESERVED		PAGE CODE = 23h					
1	PARAMETER LENGTH = 06h							
2	WRITE SPEED SELECT							
3	EMULATION WRITE							
4	READ SPEED SELECT							
5	RESERVED							
6	RESERVED							
7	SCR	RESERVED						

ALL RESERVED BITS MUST BE ZERO

Parameters

READ/WRITE SPEED SELECT.
> The Speed Select defines the speed of the disc referenced to normal audio CD speed.
> Implemented values are
> 0 = Automatic internal speed selection to maximum speed being
>> 1 for audio play
>> 2 for recording
>> 2 for reading not finalized parts of a disc, or Audio CD
>> 6 for reading finalized sessions (data only, not Audio CD).
> 1 = Audio CD speed,
> 2 = double speed of Audio CD,
> 6 = sextuble speed of Audio CD.
> Default =0 automatic internal setting.

SCR = SCRAMBLED.
The scrambled bit set allows the CDD 2600 to read scrambled. If the scrambled bit is not set, the CDD 2600 will read descrambled. By default is the SCR bit zero (descrambled).
Notice that in order to ensure a correct fuctioning of the SCR bit, two conditions have to be forfilled : - read in raw mode (blocksize is 930h)
          - read data
The scrambled bit is ignored if the blocksize is not 930h.

EMULATION WRITE.
> The Emulation Write defines if the recorder really records or just act as if it is recording.
> This field set to 1 means: write actions are simulated. This field set to 0 is the normal
> operation mode. Default = 0.

> During the write emulation mode, the writing led is blinking in stead of continuously on.
> Switching from emulation to real mode (or vice versa) is not allowed if the PMA needs

to be updated. After an (emulated) PMA update(open/start) one is allowed to switch the write modes.

In emulated mode, no absorption control errors are generated.

RESERVED.
These bytes are reserved for future use and must be set to 0

Page 24h   Subcode Increment index

Used to set the Increment Index information, which can be selected as input for each track during writing and is defined as follows:

	7	6	5	4	3	2	1	0
0	RESERVED		PAGE CODE = 24h					
1	PARAMETER LENGTH (IN BYTES)							
2	NUMBER OF INCREMENTS							
3	LOGICAL BLOCK ADDRESS (MSB)							
4	LOGICAL BLOCK ADDRESS							
5	LOGICAL BLOCK ADDRESS							
6	LOGICAL BLOCK ADDRESS (LSB)							
7	etc...							
8								
9								
10								
11	etc....							

ALL RESERVED BITS MUST BE ZERO

Parameters

01   Parameter Length. is set to4 * 98.
      As the theoretical parameter length(1 + 4 * 98) exceeds the size of 1 byte, the information of this page is divided over 2 pages (page 24 + 25). The parameter Length of page 24 will then be 197, allowing 49 index transitions. If one wants more transitions, page code 25 can be filled in.

02   Number of increments.
      The number of increments defines how many times the index in the subcode will be incremented during the write of that track. The theoretical maximum number is 98.

3..6 LBA 1.
      This is the location expressed in blocks, relative to the beginning of a track, where an increment of index in the Q-subcode must take place. The LBA fields must be given in growing order.
      LBA1 defines the location where the Q-subcode index changes from 1 to 2.

      When writing raw, LBA1 defines the location where the Q-subcode index changes from 0 to 1.

Page 25h   *Extension of page 24, Subcode Increment Index*

Used as an extension of page 24 and is used to set the Increment Index information, which can be selected as input for each track during writing. Page 25 is defined as follows:

	7	6	5	4	3	2	1	0
0	RESERVED		PAGE CODE = 25h					
1	PARAMETER LENGTH (IN BYTES)							
2	LOGICAL BLOCK ADDRESS (MSB)							
3	LOGICAL BLOCK ADDRESS							
4	LOGICAL BLOCK ADDRESS							
5	LOGICAL BLOCK ADDRESS (LSB)							
6	etc...							
7								
8								
9								
10	etc....							

ALL RESERVED BITS MUST BE ZERO

Parameters

01   Parameter Length. is set to196.

3..6 LBA 1.
      This is the location expressed in blocks, relative to the beginning of a track, where an increment of index in the Q-subcode must take place. The LBA fields must be given in growing order.

If one uses page 25, it must always be used together with page 24.

4.30 MODE SENSE 10.

	7	6	5	4	3	2	1	0
0	MODE SENSE (5AH)							
1	LUN = 0			RESERVED				
2	PCF		PAGE CODE					
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	msb ALLOCATION LENGTH							
8	ALLOCATION LENGTH lsb							
9	RESERVED							

The MODE SENSE command provides a means for the controller to report the current parameters. It is a complementary command to the MODE SELECT command.
This command will normally be issued to obtain default or current parameter-values.

The PCF (Page Control Field), bits 6 and 7 of byte 2, define the type of Page parameter values to be returned as follows:

Bits   Type of Page parameters

0 0   Current page parameters will be returned. If the page code is equal to 3Fh, all pages implemented in the CDD 2600 will be returned to the initiator with fields and bits set to current values. If the page code is different than 3Fh, the page defined by the page code, if supported by the CDD 2600, will be returned to the initiator with fields and bits set to current values. The current values are either as set in the last MODE SELECT command, or identified to the default values. Field and bit not supported by the CDD 2600 will be set to zero value of each page, returned by the CDD 2600 indicates which fields are supported within that particular page.

0 1   A mask will be returned, denoting those mode parameters that are changeable. In the mask, the fields of the mode parameters that are changeable shall be set to all one bits and the fields of the mode parameters that are non-changeable (i.e., defined by the target) shall be set to all zero bits. An attempt to change a non-changeable mode parameter (via MODE SELECT) results in an error condition. The initiator should issue a MODE SENSE command with the PC field set to 1h and the page code field set to 3Fh to determine which mode pages are supported, which mode parameters within the mode pages are changeable, and the supported length of each mode page prior to issuing any MODE SELECT commands.

1 0   Default parameters will be returned. If the page code is equal to 3Fh, all pages implemented by the CDD 2600 will be returned to the initiator with fields and bits set to the

CDD 2600 default values. If the page code is not 3Fh, the page defined by the page code (if supported by the CDD 2600) is to be returned to the initiator with fields and bits set to the CDD 2600 value.

Fields and bits not supported by the CDD 2600 shall be set to zero. The page length byte value of each page returned by the CDD 2600 indicates up to which fields are supported within that particular page.

1 1   Saved page parameters will be returned. Since the CDD 2600 does not have parameter saving capability, this page Control Field setting will have the same result as for default page parameters above.

The following page codes are supported

00h   This (unspecified) page is not supported for the CDD 2600: however, this value may be supplied in the Page Code field to request that no pages be returned, only the Mode Sense Header and Block Descriptor.

01h   Error recovery parameters.

02h   Disconnect Reconnect Page.

09h   Peripheral device page.

0Eh   Play page.

20h   Subheader parameters

21h   Write Track information.

22h   Catalogue parameters.

23h   Speed & Simulation parameters.

24h   Preset index increment parameters.

25h   Preset index increment parameters.

3Fh   Return all pages to the initiator. See PCF bit configuration. This Page Code is valid for MODE SENSE commands only.

Note: Mode Sense header and Block Descriptor are also returned if the page code is 01, 02, 09, 0E, 20, 21, 22, 23, 24, 25 or 3F.

The Allocation length specifies the number of bytes allocated by the host that will be transferred to the initiator, unless the Allocation Length is greater than the amount of available Mode Sense Data, in which case only the available data will be transferred.

Mode sense data list

The Mode Sense Data List consists of a Header, a single Block Descriptor, and one or more page(s). The format of the Block Descriptor and Pages are identical to that for the MODE SELECT command. The format of the mode sense header appears below.

Mode Sense Data List Header

	7	6	5	4	3	2	1	0
0	msb SENSE DATA LENGTH							
1	SENSE DATA LENGTH lsb							
2	MEDIUM TYPE							
3	RES	HOST APPLICATION CODE						
4	RESERVED							
5	RESERVED							
6	msb BLOCK DESCRIPTOR LENGTH							
7	BLOCK DESCRIPTOR LENGT lsb							

Parameters

00   Sense data length is set to the length in bytes of the following data that is available to be transferred, not including byte 00. This value varies according to which pages (if any) are being requested. The sense data length is independent of the allocation length of the mode sense command.

01   Medium type, indicates what kind of CD medium is mounted (00h = no type available). Explanation of the medium bits:

Bit 7
0   All other bits must also be zero and means no medium type info present.
1   Indicates vendor unique definition of the other bits, see below.

Bit 6
0   Not write protected
1   Write protected

Bit 5
0   disc size is 80 mm
1   disc size is 120 mm

Bit 4
0   No hybrid disc
1   Hybrid disc

Bit 3
0   no WO disc area present on disc
1   WO disc area present on disc

Bit 2
0   no audio tracks present on disc
1   one or more audio tracks present on disc

Bit 1 0	
00	no data tracks present on disc
01	CD-ROM tracks or CD-ROM XA tracks with first track in mode 1
10	CD-ROM XA tracks with first track in mode 2
11	CD-I disc

Note: The values for bits 1 & 0 are read at startup. The information is stored in the first lead-in of the disc. The values do not change in case of a cdr disc while the disc is in!

02   Host application code reflects the actual host application code setting.

03   Block descriptor length is set to the length in bytes of the block descriptor section.
For the CDD 2600 exact one block descriptor is used.
The block descriptor is 8 bytes long, so the contents of this field is 08.

4.31 READ OPC INFO.

	7	6	5	4	3	2	1	0
0	READ OPC INFO (D2)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	SPEED							
6	RESERVED							
7	RESERVED							
8	ALLOCATION LENGTH							
9	VND UN		RESERVED				FLG	LNK

Description

Read the OPC (Optimum Power Calibration) value(s) and the DISC ID for currently loaded disc. Note that OPC values depend on the disc speed (n=1, n=2), and can be restored with WRITE OPC for the right speed.

Parameters.

SPEED

The Optimum Power Calibration values are speed dependent.By this parameter the host defines which speed values it wants.
SPEED = 0   target shall return the available values.
SPEED = 1   target shall return the available values. If the values for n=1 are not available, the drive will perform a calibration. If required, a DISC ID will be generated.
SPEED = 2   target shall return the available values. If the values for n=2 are not available, the drive will perform a calibration. If required, a DISC ID will be generated.

ALLOCATION LENGTH

As the drive will always returns the available settings, the allocation length is 10.

Response Data

	7	6	5	4	3	2	1	0
0	BUFFER LENGTH							

1	RESERVED	O2V	O1V	DIV
2	DISC ID (MSB)			
3	DISC ID			
4	DISC ID (LSB)			
5	OPC SPEED 1 (MSB)			
6	OPC SPEED 1			
7	OPC SPEED 1 (LSB)			
8	OPC SPEED 2(MSB)			
9	OPC SPEED 2			
A	OPC SPEED 2(LSB)			

Parameters

BUFFER LENGTH

> The length in bytes of the result buffer.
> If the allocation length requested is not big enough to contain the buffer, only the number of bytes requested is returned. In this case, the buffer length reflects the number of bytes (minus 1) which would have been returned if the allocation length had been big enough.

O2V
> The values returned in OPC SPEED 2 contain valid information only if this bit is set to 1. If this field is set to 0, no relevant information is contained in OPC SPEED 2.

O1V
> The values returned in OPC SPEED 1 contain valid information only if this bit is set to 1. If this field is set to 0, no relevant information is contained in OPC SPEED 1.

DIV
> The values returned in DISC ID contain valid information only if this bit is set to 1. If this field is set to 0, no relevant information is contained in DISC ID.

DISC ID
> If DIV is set to 1, this field contains a valid disc identification. The use of this field is to be able to link the OPC settings to a disc.

OPC SPEED 1
> If O1V is set to 1, this field contains a valid calibration values for speed n=1.

OPC SPEED 2
    If O2V is set to 1, this field contains a valid calibration values for speed n=2.

Exceptions

If not a WO (Write Once) disc.
ILLEGAL REQUEST,   COMMAND NOW NOT VALID.

4.32 WRITE OPC INFO.

.

	7	6	5	4	3	2	1	0
0	WRITE OPC (D3)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	PARAMETER LIST LENGTH (MSB)							
8	PARAMETER LIST LENGTH (LSB)							
9	VND UN		RESERVED				FLG	LNK

VND UN = VENDOR UNIQUE = 00
FLG = FLAG = 00
LNK = LINK = 00
ALL RESERVED BYTES MUST BE 00

Description

Restore the OPC (Optimum Power Calibration) value in the CDD 2600 for a particular disc. This is to save writing to the power calibration area on the disc an not exceed the limit of 99 writes. Is to be used in combination with READ OPC INFO, for many incremental writes to a disc.

Parameters

PARAMETER LIST LENGTH
> The Parameter List Length must be set to reflect the length of the parameter list. A minimum parameter length is 7 (3 bytes DISC ID, 1 byte OPC SPEED, 3 bytes OPC value for the given speed. This can be extended with a second OPC SPEED and OPC VALUE. In this case the Parameter List Length is 11.

Parameter block.

	7	6	5	4	3	2	1	0
0	DISC ID (msb)							
1	DISC ID							
2	DISC ID (lsb)							
3	OPC SPEED							
4	OPC VALUE (msb)							
5	OPC VALUE							
6	OPC VALUE (lsb)							

DISC ID

This field contains an identification of the disc (which can be obtained by READ OPC INFO). As OPC values are specific disc dependant, the drive will verify that the given DISC ID matches the currently loaded disc.

OPC SPEED

This field defines the speed for which the OPC VALUES are supposed to be used.

OPC VALUE

The given set of OPC VALUES will be used for power settings during write sessions when the given speed is selected. If the host provides selfgenerated values, the drive will accept them but a good writing performance is not guaranteed. Proper values can be obtained with the READ OPC INFO command.

When the host wants to specify OPC VALUES for 2 different speeds, it just can adapt the parameter list length and append a second OPC SPEED and corresponding OPC VALUE.

Exceptions

If not a WO (Write Once) disc.
ILLEGAL REQUEST,   ILLEGAL MEDIUM.

4.33 FIRST WRITABLE ADDRESS.

	7	6	5	4	3	2	1	0
0	FIRST WRITABLE ADDRESS (E2H)							
1	LUN=0			RESERVED				
2	RES		TRACK NUMBER (HEX)					
3	RESERVED				RAW	AUD	MODE	
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	RESERVED							NPA
8	ALLOCATION LENGTH							
9	VND UN		RESERVED				FLG	LNK

Description.

The FIRST WRITABLE ADDRESS command will return next logical writable address for a next write command. The next logical writable address is counted according to the current setting of the block size.

Note: If data is queued in the cache for the requested track then FIRST WRITABLE ADDRESS command returns the address which should be used by the next write command.

Parameters.

TRACK NUMBER

> The Track number is expressed in binary.

> Track number NON ZERO

>> The first logical write address in that track will be returned. This implies that the track is not complete, some free space must be left.(i.e. a reserved track or a partial incrementally written track)

> Track number ZERO

>> If the Track number is zero and the NPA (Next Program Area) bit is zero then the next write address will be returned from the new track which follows directly the last Track.

NPA

> If the Track number is zero and the NPA bit is set to one then the next write address will be returned from the next program area. The next write address points then to the begin address of the first track.

> Setting the NPA bit is only valid if the device is not in the write state.

RAW, AUD, MODE

> The RAW together with the AUD (Audio) and mode indicator indicate which Pre-Gap

length should be used for the calculation of the first writable address.

Note : The pregap contains the link and runin blocks. See also Read Track command.

If RAW is zero then:

> if the mode (1,2 or audio) changes then a Pre-Gap length of 225 blocks will be used for the calculation of first writable address,
> else a Pre-Gap length of 150 will be used.

If RAW is 1, then the command returns an address where the next data block will be written without taking a Pre-Gap in account (because the Pre-Gap in this mode is defined by the user with a Mode Select page 24h).

ALLOCATION LENGTH.
> Allocation length specifies the number of bytes that will be returned to the initiator during the data-in phase.

Note about setting the NPA bit:

If the first write address that is returned with NPA set, is used (stored somewhere in the current program area) then no new tracks should be added to the current program area.
This means that the track in which such a pointer (to a next program area) will be stored, first has to be reserved and thereafter be written. To ensure the validity after these pointers are written the current program should be fixated before allowing the disc to be ejected.

If an error occurs during the execution of this command, then CHECK CONDITION status will be returned in the status phase and no data will be transferred.

Response Data that shall be transferred during the DATA IN PHASE from target to initiator.

	7	6	5	4	3	2	1	0
0	DATA BLOCK LENGTH							
1	LOGICAL ADDRESS MSB							
2	LOGICAL ADDRESS							
3	LOGICAL ADDRESS							
4	LOGICAL ADDRESS LSB							
5	RESERVED							

BYTE DESCRIPTION

0   Data block length specifies the amount of bytes available for the initiator (is always 5).

1-4   Logical start address for single or multiple successive data transfers.

Exceptions.
Track number is non zero and no free space left in track:
     illegal request, invalid track.

4.34 FORMAT TRACK

	7	6	5	4	3	2	1	0
0	FORMAT TRACK (E3)							
1	LUN=0			RESERVED				
2	RT	TAO	FP	RESERVED			MODE	
3	PACKET SIZE (MSB)							
4	PACKET SIZE (LSB)							
5	RESERVE LENGTH (MSB)							
6	RESERVE LENGTH							
7	RESERVE LENGTH							
8	RESERVE LENGTH (LSB)							
9	VND UN		RESERVED				FLG	LNK

VND UN = VENDOR UNIQUE = 00
FLG = FLAG = 00
LNK = LINK = 00
ALL RESERVED BYTES MUST BE 00

Description

The Format Track command allows the host to select the reserved / incomplete track, and to determine the way such a track will be written: at once, incrementally fixed (number of user data blocks are constant) or incrementally variable (number of user data blocks can vary).

Parameters

RT: Reserved Track bit
    0: track will be incomplete (only one incomplete track per disc: the last track).
    1: track will be reserved.

TAO: Track At Once bit.
    0: track will be incrementally written (for fixed or variable, see FP).
    1: track is recorded at once (note: RT must be set to 1 (reserved), and FP and MODE are ignored).

FP: Fixed Packet bit.
    0: track recording will be incremental with variable packet size.
    1: track recording will be incremental with fixed packet size.

MODE
    This field defines the mode in which a track will be written. Allowed values are
    1 = mode 1 track
    2 = mode 2 track

Note: The desired block size is filled in with Mode Select.

PACKET SIZE

The number of User Data Blocks in a Fixed Packet.
This field is only used if FP (fixed packed) = 1 and TOA (track at once) = 0,otherwise
this field is set to zero.

Note: the smallest recording information is 1 packet, consisting of a link block, 4 run-in
blocks, the user data blocks, and then 2 run-out blocks. One must take into account the
packet overhead of 7 blocks when using small fixed packet sizes (e.g. size = 16 results in
70% user data).

RESERVE LENGTH

This field defines the amount of data blocks that should be reserved.
If TAO = 1, (track at once) then the reserved length concerns only the user data blocks,
no run-in, pregap and run-out blocks are included.
If TAO = 0 (incrementally recording) the reserved length excludes the pregap, the link
block and the run-in blocks of the first packet and the run-out blocks of the last packet.
All other blocks are included in the reserve length.
In both cases, note that the actual track length written on the disc will include the 2 run-
out blocks.

Exceptions

Disc application code does not match with the host application code, (and it is not a 'disc for
unrestricted use', nor a 'disc for restricted use - general purpose disc').

Command shall be terminated with CHECK CONDITION status.
SENSE KEY = ILLEGAL REQUEST
ADDITIONAL SK = APPLICATION CODE CONFLICT

MODE field out of range (must be 1 or 2)
ILLEGAL REQUEST, ILLEGAL FIELD IN COMMAND DESCRIPTOR

TAO = 1 but RI = 0, track at once requested but reserved bit off.
ILLEGAL REQUEST, ILLEGAL FIELD IN COMMAND DESCRIPTOR

4.35 RESERVE TRACK.

	7	6	5	4	3	2	1	0
0	RESERVE TRACK (E4H)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVE LENGTH (MSB)							
6	RESERVE LENGTH							
7	RESERVE LENGTH							
8	RESERVE LENGTH (LSB)							
9	VND UN		RESERVED				FLG	LNK

VND UN = VENDOR UNIQUE = 00
FLG = FLAG = 00
LNK = LINK = 00
ALL RESERVED BYTES MUST BE 00

This command reserves one track on the disc. Tracks can only be reserved in successive order.
No Pre-Gap or user data will be written into the track.
The start and stop times (calculated by drive) will be updated in the PMA. A pregap of 150 blocks will be taken into account (see WRITE TRACK command).

The reserve length defines the amount of data blocks that should be reserved.
The reserve length concerns only the data blocks writable by the host and is excluding pre-gap and runout blocks.
With the Write track command data can be written into the track.

A RESERVE TRACK command compares the Disc application code with the Host application code. When the compare does not match, and it is not a 'disc for unrestricted use', nor a 'disc for restricted use - general purpose disc', a check condition state is returned. The sense key is ILLEGAL REQUEST, and the additional sense code is APPLICATION CODE CONFLICT.

The track info command returns all available information about this track.
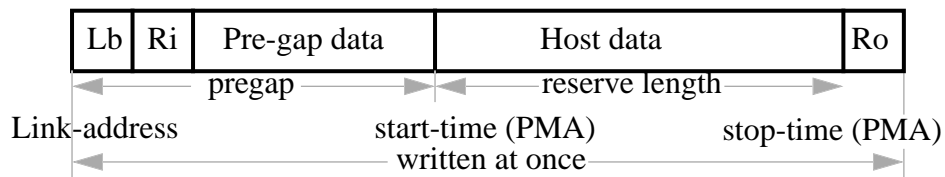
Lb	Ri	Pre-gap data	Host data	Ro

pregap ← → reserve length ← →

Link-address   start-time (PMA)   stop-time (PMA)

← written at once →

Lb = 1 Link block
Ri = 4 Runin blocks
Ro = 2 Run-out blocks

start-time = first host data block address
stop-time = start-time + host data size + 2
           = first link-address after track

(PMA) means written in the PMA

As the current command set supports incremental write, a new command FORMAT TRACK is created. The FORMAT TRACK command has also the possibilities of RESERVE TRACK. So RESERVE TRACK is only in the command set for compatibility reasons. We advise to use in future developments the FORMAT TRACK in stead of the RESERVE TRACK.

4.36 READ TRACK INFO.

	7	6	5	4	3	2	1	0
0	READ TRACK INFO (E5h)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	TRACK NUMBER (HEX)							
6	RESERVED							
7	RESERVED							
8	ALLOCATION LENGTH							
9	VND UN		RESERVED				FLG	LNK

Description.

The READ TRACK INFO command requests that the CDD 2600 returns the total number of tracks on disc and the information of the specified track, being the starting address, the length of the given track on the disc, the amount of free blocks in the requested track, track status and mode and in case of fixed packet incremental write the packet size.

TRACK NUMBER.
The requested track number is expressed in HEX format.

CD-ROM disc mounted:
Lowest - highest   Track information returned from requested track.

CD-WO disc mounted:
Lowest - highest   Track information returned from requested track.
Highest + 1   The unformatted (=unwritten) area behind the last track is associated with a track number. This track number is the highest track number plus one. The free blocks field reflexes the amount of free block in the unwritten area. Start address and track length are set to zero.
Incomplete track   If the disc contains an incomplete track, this track is the highest track on disc. The track contains a pregap, some (0 or more) fixed or variable packets and an yet unwritten area limited to the start of the leadout. In the information returned for this track, the track length reflects the length written until now, and the free blocks will reflect the maximum remaining space on the disc. The same information will be returned for the highest +1 tracknumber if an incomplete track exists.

The allocation length defines the number of bytes to be returned to the initiator, unless the allocation length is greater than the amount of available Track Info Data, in which case only the available data will be transferred.

If the drive is logged on to a CD disc the recommended allocation length is 12 bytes. In the case of a CD-WO disc the maximum allocation length is 20 bytes.

Response data.

Response Data that shall be transferred during the DATA IN PHASE from CDD 2600 to the host.

	7	6	5	4	3	2	1	0
0	BUFFER LENGTH							
1	NUMBER OF TRACKS ON DISC (HEX)							
2	START ADDRESS (MSB)							
3	START ADDRESS							
4	START ADDRESS							
5	START ADDRESS (LSB)							
6	TRACK LENGTH (MSB)							
7	TRACK LENGTH							
8	TRACK LENGTH							
9	TRACK LENGTH (LSB)							
A	TRACK STATUS				TRACK MODE			
B	INCREMENTAL				DATA MODE			
C	FREE BLOCKS (MSB)							
D	FREE BLOCKS							
E	FREE BLOCKS							
F	FREE BLOCKS (LSB)							
10	FIXED PACKET SIZE (MSB)							
11	FIXED PACKET SIZE							
12	FIXED PACKET SIZE							
13	FIXED PACKET SIZE (LSB)							

BUFFER LENGTH

> The length in bytes of the result buffer.
> If the allocation length requested is not big enough to contain the buffer, only the number of bytes requested is returned. In this case, the buffer length reflects the number of bytes (minus 1) which would have been returned if the allocation length had been big enough.

NUMBER OF TRACKS ON DISC.

This byte gives the total number of tracks on the disc in hex format.If the disc contains an incomplete track, this track is included.

START ADDRESS

This is the starting address of the first user data block in that track.

TRACK LENGTH

This is the sum of the written and unwritten blocks in the track when we have a complete track. In case of an incomplete track, this returns only the number of written blocks.

The table below shows how the track-length has to be interpreted in relating with Medium-type and track number.

Medium Type	Track Range	Track Length
CD-WO	lowest till highest-1	stop address current track - start address current track
	highest complete	stop address current track - start address current track
	highest incomplete	stop address written part - start address current track
	highest + 1 (if highest =incomplete)	stop address written part - start address current track
	highest + 1 (if highest = complete)	zero
CD-ROM	each track which is not last track of session	start address next track - start address current track
	each track which is last of session	start address session's lead out - start address current track

TRACK MODE.

This is the mode of the specified track and is defined as the control field from the Q channel. See also the definitions in "Yellow/Green/ORANGE books".

3210 : bit positions in field.

00x0 : 2 audio channels without pre-emphasis

00x1 : 2 audio channels with pre-emphasis

01x0 : data track, recorded uninterrupted (not incremental)

01x1 : data track, incremental

the x defines the copy bit as taken from pma-area or toc- area.

In case of an incomplete track, these values reflect what will be written into the pma and/or toc.

TRACK STATUS

```
bit    7 6 5 4
       0 0 0 0 - track is reserved   : only for TRACK AT ONCE
       0 0 0 1 - track is formatted  : only for INCREMENTAL TRACK
       0 0 1 0 - track is written at once
       0 0 1 1 - reserved
       1 1 1 1 - Audio track
       other  - not used
```
This field remains unchanged because of compatibility. As from now on incremental write is supported, more information can be obtained. If the field "TRACK IS FORMATTED" is set, then the field "INCREMENTAL" reflects additional information.

DATA MODE.
```
       1      Mode 1 yellow book
       2      Mode 2 yellow book or Mode 2 CD-I, CD-ROM XA (form 1 & form 2)
       0,3-E  These modes are reserved
       F      No data-mode available. (e.g. audio, reserved TAO)
```

INCREMENTAL
7654 : bit positions in field.

0xxx : complete track

1xxx : incomplete track

x0xx : if track is incremental, the packet size is variable

x1xx : if track is incremental, the packet size fixed

xx11 : copy protection, in track, Track is first or higher generation copy of a copy-right protected track.

xx01 : copy protection, in track. Track is copy-right protected.

xx00 : copy protection, in track, Track is not copy-right protected.

0000 : not incomplete, not incremental, no packet size, track not copy-right protected.

This is the typical situation for the TAO (track at once).

FREE BLOCKS

This reflects the amount of free (=unwritten) blocks in the requested track.
For reserved "tracks at once", this is equal to the number of user writable blocks (pregap and runout blocks are not included.)
In case of incremental tracks, the number of user blocks depends on the number of packets which will be used to fill up the remaining space. For every packet 7 blocks overhead are used.
For the track number which is one higher than the current highest track number and there exist no incomplete track: The free blocks field reflexes the amount of free blocks in the unwritten area. (pregap & runout blocks included!)
For the track number which is one higher than the current highest track number and there exist an incomplete track: The free blocks field reflexes the amount of free blocks in the unwritten area. (Limit is the start of the outermost leadout area) (same as incremental tracks)

PACKET SIZE.
If the requested track number is an incremental track, with a fixed packet size, the packet size is returned in this field. Otherwise this field is set to 0.

4.37 WRITE TRACK.

	7	6	5	4	3	2	1	0
0	WRITE TRACK (E6H)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	TRACK NUMBER (HEX)							
6	RES		COPY		RAW	AUD	MODE	
7	TRANSFER LENGTH (MSB)							
8	TRANSFER LENGTH (LSB)							
9	RES	MIX	RESERVED				FLG	LNK

MIX = MIXED FORMAT : OPTIONAL
COPY = COPY bit in subcode control
RAW = RAW data transfer
AUD = AUDIO
MODE = TRACK MODE

Description.

The intention of the WRITE TRACK command is to set up track-at-once writing or to write a complete track-at-once. Incremental writing can not be performed with a WRITE TRACK command.

Writing of a track-at-once can be done in two ways. The first method is with one single WRITE TRACK command (max 65535 blocks). The second method is with one WRITE TRACK and multiple WRITE commands. Both methods must be terminated by a FLUSH CACHE command.

Data transferred within a WRITE TRACK command is stored into the cache buffer. This means if all the requested data is stored into the buffer, then directly GOOD STATUS is returned to the host. The WO drive starts writing when enough data has been loaded into the buffer. It's the host responsibility to maintain a data transfer rate fast enough to prevent the buffer from going prematurely empty.

Once WRITE TRACK command accepted (good Status) a limited command set is available. The limited command set will be disabled after a FLUSH CACHE command.
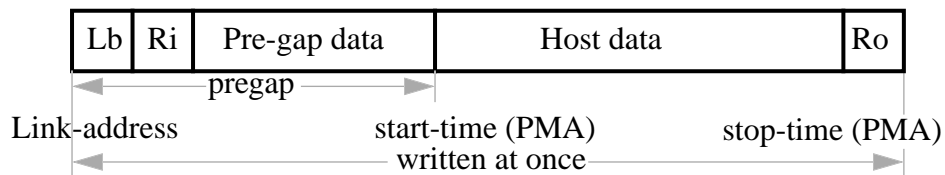Below is the list of the limited command set.

Limited command set:
>   WRITE
>   REQUEST SENSE
>   TEST UNIT READY
>   FLUSH CACHE

FIRST WRITABLE ADDRESS

Also, the eject button will be ignored in the limited command set.

| Lb | Ri | Pre-gap data | Host data | Ro |

← pregap →

Link-address   start-time (PMA)   stop-time (PMA)

← written at once →

Lb = 1 Link block
Ri = 4 Runin blocks
Ro = 2 Run-out blocks

start-time = first host data block address
stop-time = start-time + host data size + 2
          = first link-address after track

(PMA) means written in the PMA

If non-RAW-mode is selected, the Pre-Gap length is either 150 or 225 blocks long. If a new track is written (which is not reserved) and the mode (1 or 2 or audio) differs with the previous track (which is not reserved) then the Pre-Gap length will be 225, otherwise 150. The Pre-Gap contains the repeated track descriptor, excluding the Link and Runin blocks.
The pause area in a non-RAW audio track is always 225 sectors if a data track preceded the audio track; otherwise it is 150 sectors.
If a subheader is written (mode = 2) in a Pre-Gap then all the subheader bytes are set to zero.

If RAW-mode writing is selected, the Pre-Gap length (and the pause area in an audio track) is specified by the user with a Mode Select command (mode page 24h). In this case the Pre-Gap data (or audio pause) is supplied by the user.

If the WRITE TRACK command is issued for the first time after a WO disc is mounted then a laser power calibration will be performed. If the Calibration area is almost full then the WRITE TRACK command will directly be terminated with a check condition, the additional sense code is to CALIBRATION AREA ALMOST FULL and the sense key to VOLUME OVERFLOW. If WRITE TRACK command is issued for the second time then the laser calibration is performed as normally. It is strongly recommended to fixate before ejecting when the calibration area is almost full.

A WRITE TRACK command compares the Disc application code with the Host application code. When the compare does not match, and it is not a 'disc for unrestricted use', nor a 'disc for restricted use - general purpose disc', a check condition state is returned. The sense key is ILLEGAL REQUEST, and the additional sense code is APPLICATION CODE CONFLICT.

Parameters.

TRACK NUMBER

    If the TRACK NUMBER is zero then a new track will be created with a TRACK NUMBER which is one higher then the previous track. If the TRACK NUMBER is not zero then this track number must point to a reserved track.

    If the track number points to a reserved track then it starts writing at the beginning and stops at the end of the track.

    A write sequence to a reserved track at once will completely fill the reserved track with zero data if there is a lack of data from the host.

TRANSFER LENGTH

    The transfer length indicates the total number of contiguous blocks which should be requested from the host. A transfer length of non-zero indicates the amount of blocks to request from the host. A TRNASFER LENGTH of zero means no data is requested from the host (i.e., no Pre-gap will be written).

    If the transfer length is greater than the length of the reserved track then check condition will be given.

COPY

    The copy bits will define the possibilities for copying :

    00   copy inhibited   (default)
    01   copy permitted
    10   SCMS copy (alternate)
    11   RESERVED

RAW

    If RAW data mode is selected (RAW = 1), then data sectors including syncs must be forwarded in the data out phase of the command.This data will be written to disc without being scrambled by a data block encoder.

    The blocksize is always 2352.

AUD

    The blocksize is always 2352.

    In case of audio writing, the data during the data out phase on the SCSI bus is specified corresponding following pattern:

byte nr	description
0	Most significant byte of (first) left audio sample
1	Least significant byte of (first) left audio sample
2	Most significant byte of (first) right audio sample
3	Least significant byte of (first) right audio sample
4	Most significant byte of (second) left audio sample
etc.	

MIX

If the Mix bit is set this indicates a mixture of form 1 and form 2 blocks. This is a special case because the blocks now transferred don't have the same block size, Form 1 sectors contain 2056 bytes and Form 2 sectors contain 2332 bytes. It is allowed to mixture these blocks in a single write command. The addressing is the same as for blocks of 2048.

If the Mix bit is zero this indicates that only one block size is used during writing.

MODE

The AUD (Audio) together with the mode indicator specify in which mode the data will be written.

AUD	MODE	
0 (DATA)	00	reserved
	01	mode 1
	10	mode 2
	11	reserved
1 (AUDIO)	00	2 channels without pre-emphasis
	01	2 channels with pre-emphasis
	10	reserved
	11	reserved

If the track mode is one (this concerns the CD-Rom header mode byte) only one block size is valid namely 2048.

If the track mode is two there are five block sizes possible namely 2048, 2056, 2324 and 2332, 2336. The block sizes 2048 and 2056 concerns both a form 1 block format with the difference that by 2048 the subheader will be retrieved internally and by a block size of 2056 the subheader will be retrieved externally from the host.

The block size 2336 indicates writing a CD-Rom track in mode 2 with 2336 bytes of user data.

The block size and the internally subheader can be set by the mode select command.

Valid block sizes are:

Mix	Raw	Audi	Track Mode	Block-size	Data transferred
0	0	0	1	2048	User data (2048)
0	0	0	2	2048[a] (Form 1)	User data (2048)
0	0	0	2	2056[b] (Form 1)	Subheader (8)
0	0	0	2	2324[a] (Form 2)	User data (2324)
0	0	0	2	2332[b] (Form 2)	Subheader (8) user

Mix	Raw	Audi	Track Mode	Block-size	Data transferred
0	0	0	2	2336 -	User data (2336)
1	0	0	2	Don't care (mixture of 2056[b] and 2332[b])	Subheader user data (2048 or 2324)
X	0	1	XX[c]	2352	Audio samples
X	1	X[c]	XX[c]	2352	Raw data or audio

a. Subheader is fixed and taken internally (Mode Select page 20H)

b. Subheader taken from host.

c. Value must be set to a valid combination.

During a write sequence it's not allowed change any parameter by the MODE SELECT command.

4.38 MEDIUM LOAD/UNLOAD.

	7	6	5	4	3	2	1	0
0	MEDIUM LOAD/UNLOAD (E7h)							
1	LUN=0			RESERVED				IMM
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	RESERVED							
8	RESERVED							MLU
9	VND UN		RESERVED				FLG	LNK

VND UN = VENDOR UNIQUE = 00
FLG = FLAG = 00
LNK = LINK = 00
IMM = IMMEDIATE
ALL RESERVED BYTES MUST BE 00

The Load/unload command requests that the CD drive opens or closes the tray.
The open request will be ignored during writing of a track, fixation, updating the PMA or during laser power calibration.

In the case tracks were written or reserved then first the PMA will be updated before ejecting the disc.

A unload (eject) will always set the unit attention condition.

If the MLU bit is set the drive will open the loading tray.
If the MLU bit is zero then the drive will close the loading tray.

If the immediate bit is set, SCSI status is returned as soon as the load or unload operation is initiated. If the host sends now directly a new command to the drive, while the drive has not completed the load or unload command, status BUSY will be returned to the host, except with the following commands:

> REQUEST SENSE
> TEST UNIT READY
> INQUIRY
> MODE SELECT
> MODE SENSE
> PREVENT/ALLOW MEDIUM REMOVAL

Note: Its also possible to open and to close the loading tray manually. Opening can be done by pressing the open button and closing by pushing to the tray. In this case Unit Attention will be set.

4.39 FINISH TRACK.

.

	7	6	5	4	3	2	1	0
0	FINISH TRACK (E8)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	RESERVED							
8	RESERVED							
9	VND UN		RESERVED				FLG	LNK

Description

This command is only applicable if we have an incomplete track. The incomplete track is examined. If the minimum track length is reached, this track is now complete. The stop time is defined. No further writing to this track is possible. Start and stop times are recorded into PMA.

Exceptions

If the minimum track length is not yet reached, we have an error situation:
ILLEGAL REQUEST, COMMAND NOW NOT VALID.

If the last track on disc is not an incomplete track, this results in a CHECK CONDITION:
ILLEGAL REQUEST, ILLEGAL TRACK.

4.40 FIXATION (WRITE LEADIN AND LEADOUT).

	7	6	5	4	3	2	1	0
0	FIXATION (E9H)							
1	LUN=0		RESERVED					IMM
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	RESERVED							
8	RESERVED			ONP		TOC TYPE		
9	VND UN		RESERVED				FLG	LNK

IMM = IMMEDIATE

Description.

This command writes a TOC (Table of Content) and LEADOUT information to the disc to complete a session.

This command will only be accepted if all reserved tracks are written completely,all incremen-tally written tracks are completely written, no incomplete tracks exists and at least one track is written. Otherwise, a check condition will be given. There is no further check on the TOC TYPE.

A FIXATION command compares the Disc application code with the Host application code. When the compare does not match, and it is not a 'disc for unrestricted use', nor a 'disc for restricted use - general purpose disc', a check condition state is returned. The sense key is ILLEGAL REQUEST, and the additional sense code is APPLICATION CODE CONFLICT.

Parameters.

IMM

> If the immediate bit is set, SCSI status is returned as soon as the fixation operation is ini-tiated. If the host sends now directly a new command to the drive, while the drive has not completed the fixation command, status BSY will be returned to the host.

ONP

> If the ONP (Open Next Program area) bit is set then the start time (pointer) for the next session will be included in the LEAD-IN of the session that is being fixated. If the ONP bit is not set, then the session being closed (fixated) becomes the last session of the disc and the disc is no longer writable.TOC.

TOC TYPE

> The two TOC TYPE bits indicates what kind of TOC (table of contents) will be written

in the leadin.

TOC TYPE

0   CD-DA

1   CD-ROM

2   CD-ROM XA with first track in mode 1.

3   CD-ROM XA with first track in mode 2.

4   CDI

5 - 7 Reserved.

Note.

CDI tracks are not indicated in the CDI TOC. This means that normally, for a CDI disc, the track information is not available. However, after fixation of a WO disc, all the track information is still in volatile memory (RAM), and available for the drive.

4.41 UPDATE PMA.

	7	6	5	4	3	2	1	0
0	UPDATE PMA (EAH)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	RESERVED							
8	RESERVED							
9	VND UN		RESERVED				FLG	LNK

Description.

The update pma command will perform an update of the Program Memory Area on the medium. Normally, this is performed automatically when the disc is unloaded. If there exist no new information, the PMA will not be update. This is not considered as an error condition.

4.42 SEND ABSORPTION CONTROL ERRORS.

	7	6	5	4	3	2	1	0
0	SEND ABSORPTION CONTROL ERRORS (EBh)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	ALLOCATION LENGTH (MSB)							
8	ALLOCATION LENGTH (LSB)							
9	VND UN		RESERVED				FLG	LNK

Description.

The SEND ABSORPTION CONTROL ERRORS command transfers data from the absorption control error table. The data is returned in a format as specified in the ABSORPTION CONTROL ERRORS FORMAT.

Parameters.

ALLOCATION LENGTH

> The allocation length specifies the number of bytes that the host has allocated for data. An allocation length of zero indicates that no data will be transferred. Any other value indicates the maximum number of bytes that will be transferred. The controller terminates the DATA IN phase when allocation length bytes have been transferred or when all available data have been transferred to the initiator, whichever is less.

ABSORPTION CONTROL ERRORS FORMAT:

ABSORPTION CONTROL ERROR HEADER

	7	6	5	4	3	2	1	0
0	ERROR DATA LENGTH (MSB)							
1	ERROR DATA LENGTH (LSB)							
2	RESERVED							
3	NUMBER OF ERRORS							

ABSORPTION CONTROL ERROR DESCRIPTOR

	7	6	5	4	3	2	1	0
0	RESERVED							

ABSORPTION CONTROL ERROR DESCRIPTOR

1	RESERVED	
2	RESERVED	ERROR NUMBER
3	RESERVED	
4	LOGICAL BLOCK ADDRESS (MSB)	
5	LOGICAL BLOCK ADDRESS	
6	LOGICAL BLOCK ADDRESS	
7	LOGICAL BLOCK ADDRESS (LSB)	

The ABSORPTION CONTROL ERROR data returned is a four byte header followed by one or more (up to 16) descriptors.

The ERROR DATA LENGTH specifies the length in bytes of the available ABSORPTION CONTROL ERROR data. The value of ERROR DATA LENGTH does not include itself. The maximum value is 130 (82H). This value is not modified when the allocation length is insufficient to return all the ABSORPTION CONTROL ERROR data available.

NUMBER OF ERRORS indicates the number of areas on disc where absorption control errors occurred. An area is defined by 1000 blocks, following the first error.

ERROR NUMBER is the area number for which the data in the ABSORPTION CONTROL ERROR DESCRIPTOR holds.

LOGICAL BLOCK ADDRESS is the logical block address the area starts with. It is the address of the first occurrence of an absorption control error.

4.43 RECOVER.

	7	6	5	4	3	2	1	0
0	RECOVER (ECh)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	RESERVED							
8	RESERVED							
9	RES	VND	RESERVED				FLG	LNK

Description

The intention of this command is to recover from an erroneous disc format corruption, caused by power down.

Whenever the CDD 2600 returns the additional sense code RECOVERY_NEEDED then this should be issued.
During power down, the drive status is saved in EEPROM. This power down status determines the recover action.The drive power down status in EEPROM will only be erased (cleared) at an eject.

 When recovery is needed, only a limited command set is allowed:
> RECOVER
> INQUIRY
> REQUEST SENSE
> EJECT
> SEND DIAGNOSTICS
> REZERO UNIT

The CDD 2600 will only return with a GOOD status when the error is recovered or no medium format error found.

If the power down happens after a write (but PMA is not updated) a recovery will be necessary. The recovery will finish successful and the disc remains writable.
If the power failure happens during a write a recovery is needed but the recovery will fail. The disc will remain readable but no longer be writable. Although the disc is still readable the host should be aware of the (possible) low usability of the recovered disc.

4.44 WRITE SESSION.

Description

The WRITE SESSION command enables the initiator to write a session without interruption. A session consists of a lead-in, a program area with at least one track, and a lead-out.

Writing a session without interruption implies that no frames within a session are needed for linking purposes. This enables initiators to produce CDs according the yellow-book, the red-book, and the green-book with the CDD 2600.

The initiator must supply raw data blocks, i.e. data blocks of 2352 bytes. Further more, the initiator must generate pregaps or pause areas between the tracks of the program area. Also, generating main channel data for the lead-in and lead-out is a responsibility of the initiator.

The WRITE SESSION command only initiates the writing of a session. The write action must be terminated by a FLUSH CACHE command. Between the WRITE SESSION and the FLUSH CACHE commands, the initiator must issue WRITE commands to supply data for the program area of the session.

Command Descriptor Block

	7	6	5	4	3	2	1	0
0	WRITE SESSION (EDH)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED		LOFP		ONP	TOC TYPE		
7	PARAMETER LIST LENGTH (MSB)							
8	PARAMETER LIST LENGTH (LSB)							
9	VND UN		RESERVED				FLG	LNK

OFP = LEAD OUT FIXATION PARAMETER
ONP = OPEN NEW PROGRAM AREA

An Open New Program Area bit set to one requests a new program area to be opened. An Open New Program Area bit set to zero requests a new program area not to be opened. Opening a new program area implies that the start time of the new program area is included in the lead-in of the current session.

TOC Type determines what kind of TOC will be recorded in the lead-in. The following values for TOC Type are valid:

    0   CD-DA

    1   CD-ROM

    2   CD-ROM XA with first track in mode 1

3   CD-ROM XA with first track in mode 2
    4   CDI

Lead Out Fixation Parameter is only valid when TOC Type is equal to CD-ROM.and specifies whether the lead out must be written in mode 1 or mode 2. The mode of the lead-out must be equal to the mode of the last track of the session.

Parameter List Length specifies the length of the parameter list which is accompanied with the WRITE SESSION command. The parameter list contains information that the CDD 2600 uses to generate subcode.

Special Conditions

WRITE SESSION commands will be terminated with a check condition status when a disc is loaded whose current program area is not empty. The sense key will be set to ILLEGAL RE-QUEST, and the additional sense code to PROGRAM AREA NOT EMPTY.

A WRITE SESSION command compares the Disc application code with the Host application code. When the application codes do not match, and it is not a 'disc for unrestricted use', nor a 'disc for restricted use - general purpose disc', a check condition status is returned. The sense key is ILLEGAL REQUEST, and the additional sense code is APPLICATION CODE CONFLICT.

Once a WRITE SESSION command has been accepted, only a limited command set is available. This command consists of the following commands:
* WRITE (GROUP 0 & 1)
* REQUEST SENSE
* TEST UNIT READY
* FLUSH CACHE
* FIRST WRITABLE ADDRESS

After issuing the FLUSH CACHE command, the full command set becomes active again.

Parameter List Structure.

The parameter list contains information that the CDD 2600 uses to generate subcode. Three modes are defined for the subcode.
* Mode 1: CD position information
* Mode 2: Media Catalog Number (UPC/Bar Code)
* Mode 3: Track-International-Standard-Recording-Code (ISRC)

The parameter list contains information for the subcode generation of mode 1 and 3. Information to generate subcode of mode 2 is obtained from mode page 22 hex.

The parameter list consists of a sequence of track descriptors. The format of a track descriptor is:

	7	6	5	4	3	2	1	0
0	TRACK DESCRIPTOR LENGTH (MSB)							

1	TRACK DESCRIPTOR LENGTH (LSB)

2	IsrcV	RESERVED	CONTROL
3	RESERVED	ISRC I1	
4	RESERVED	ISRC I2	
5	RESERVED	ISRC I3	
6	RESERVED	ISRC I4	
7	RESERVED	ISRC I5	

8	ISRC I6	ISRC I7
9	ISRC I8	ISRC I9
10	ISRC I10	ISRC I11
11	ISRC I12	RESERVED

12	LOGICAL START ADDRESS (MSB)
13	LOGICAL START ADDRESS
14	LOGICAL START ADDRESS
15	LOGICAL START ADDRESS (LSB)
16	LOGICAL ADDRESSES TO INCREMENT THE INDEX
16+$n*4$	LOGICAL STOP ADDRESS (MSB)
17+$n*4$	LOGICAL STOP ADDRESS
18+$n*4$	LOGICAL STOP ADDRESS
19+$n*4$	LOGICAL STOP ADDRESS (LSB)

n specifies the number of addresses at which the index is incremented. The value of n is in range of 0 to 98.

Track Descriptor Length specifies the length of the track descriptor, expressed in number of bytes.

Control specifies the kind of information in a track:

Bit	equals zero	equals one
0	Audio without pre-emphasis	Audio with pre-emphasis
1	Digital copy protected	Digital copy permitted
2	Audio track	Data track

Bit	equals zero	equals one
3	Two channel audio	Four channel audio

The IsrcV (ISRC Valid) bit set to 1 requests to record the specified ISRC in the track's subcode. The IsrcV bit set to zero requests to record no ISRC in the track's subcode.

ISRC I0-I12 specifies the ISRC of the track, i.e. the identifying number of the track according to the ISRC standards. The format of the ISRC is:

Field	Description
I1..I2	country code, ASCII
I3..I5	owner code, ASCII
I6..I7	country code, BCD
I8..I12	serial number, BCD

Logical Start Address specifies the logical block address at which the track starts, i.e. the logical address at which the index changes from 0 to 1. Logical Addresses To Increment Index specifies the next logical block addresses at which the index increments. The maximum amount of indexes in one session is 99. Logical Stop Address Specifies the logical block address at which the track stops, i.e. the logical block address at which the track increments and the index changes to 0.

4.45 READ SESSION INFO.

	7	6	5	4	3	2	1	0
0	READ SESSION INFO (EEH)							
1	LUN=0			RESERVED				
2	RESERVED							
3	RESERVED							
4	RESERVED							
5	RESERVED							
6	RESERVED							
7	RESERVED							
8	ALLOCATION LENGTH							
9	VND UN		RESERVED				FLG	LNK

The READ SESSION INFO command returns information that is needed for the WRITE SESSION command. This information consists of the lead-in length and the lead-out length for the current session.

Allocation Length specifies the maximum number of bytes that the initiator has allocated for the response data.

Response Data Structure

	7	6	5	4	3	2	1	0
0	LEAD-IN LENGTH (MSB)							
1	LEAD-IN LENGTH (LSB)							
2	LEAD-OUT LENGTH (MSB)							
3	LEAD-OUT LENGTH (LSB)							

Lead-In Length specifies the length of the current session's lead-in. Lead-Out Length specifies the length of the current session's lead-out.

5 Error recovery table.

ADDITIONAL SENSE CODE	RECOVERY PROCEDURE
DRIVE_NOT_READY	give a START command
COMMUNICATION_FAILURE	reset device try again else replace hardware boards
TRACK_FOLLOWING_ERROR	retry command again else clean disc else retry command again with other medium else check vibrations of device else replace hardware boards or mechanism
UNRECOVERED_READ_ERROR	retry again else this block is unable to read
POSITIONING_ERROR	retry command again else clean disc else retry command again with other medium else replace hardware boards or mechanism
PARAMETER_LIST_LENGTH_ERROR	change the allocation or transfer length in command descriptor block
INVALID_COMMAND	issue another command
INVALID_BLOCK_ADDRESS	issue another address
ILLEGAL_FIELD_IN_COMMAND DESCRIPTOR	read SCSI command set manual for correct settings
INVALID_LUN	set LUN to zero
INVALID_FIELD_PARAMETER_LIST	read SCSI command set manual for correct settings
MEDIUM_CHANGED	log off from medium
POWER_ON_RESET_OR_BUS_RESET OCCURRED	initialise
COMMAND_SEQUENCE_ERROR	read SCSI command set manual for limited command set
CANNOT READ MEDIUM UNKNOWN FORMAT	fatal: could not determine block size of copy target device
MEDIUM_FORMAT_CORRUPTED	try RECOVER COMMAND the case of a WO disc else disc unusable

ADDITIONAL SENSE CODE	RECOVERY PROCEDURE
ABSORPTION CONTROL ERROR	warning: the data written on disc night contain an error
MEDIUM_NOT_PRESENT	insert a disc
INVALID_BITS_IN_IDENTIFY_MESSAGE	read SCSI command set manual for supported messages only 80h and C0h are valid for identify messages
DIAGNOSTIC_FAILURE	issue SEND DIAGNOSTIC command else reset device else replace hardware boards
POWER_ON_OR_SELFTEST_FAILURE	issue SEND DIAGNOSTIC command else reset device else replace hardware boards
INTERNAL_CONTROLLER_ERROR	no recover procedure available
PARITY_ERROR	try command again else check cable
WRITE_APPEND_ERROR	check transfer rate host must be at least 500 Kbytes/sec
MEDIUM_LOAD_OR_EJECT_FAILURE	try command again else check loading mechanism else replace loading mechanism
UNABLE_TO_READ_TABLE_OF CONTENTS	try command again else clean disc
OPERATOR_MEDIUM_REMOVAL REQUEST	log off from medium
ILLEGAL_TRACK_NUMBER	change track number
COMMAND_NOW_NOT_VALID	try again with some delay
MEDIUM_REMOVAL_IS_PREVENTED	allow medium removal (can only be done by the same which prevented) else no recoverable
STOPPED_ON_NON_DATA_BLOCK	check start address or transfer length
INVALID_START_ADDRESS	change start address
ATTEMPT_TO_CROSS_TRACK-BOUNDARY	check start address or transfer length
ILLEGAL_MEDIUM	change medium

ADDITIONAL SENSE CODE	RECOVERY PROCEDURE
DISC_WRITE_PROTECTED	check write protection reason
APPLICATION_CODE_CONFLICT	select correct application code, or change disc
ILLEGAL_BLOCKSIZE_FOR_COMMAND	change block size
BLOCKSIZE_CONFLICT	change block size
ILLEGAL_TRANSFER_LENGTH	change transfer length
REQUEST_FOR_FIXATION_FAILED	check medium else check amount track in program area (should greater than zero)
END_OF_MEDIUM_REACHED	check start address or transfer length
NONE_RESERVED_RESERVED_TRACK	check reservation of track with READ TRACK INFO command
DATA_TRACK_LENGTH_ERROR	change length
BUFFER_UNDER_RUN	check transfer rate host must be at least 500 Kbytes/sec
ILLEGAL_TRACK_MODE	change track mode
OPTIMUM_POWER_CALIBRATION ERROR	retry else check medium issue SEND DIAGNOSTIC
CALIBRATION_AREA_ALMOST_FULL	write all information to disc and fixate directly afterwards
CURRENT_PROGRAM_AREA_EMPTY	write a track or reserve a track
NO_BARCODE_AVAILABLE	use disc with barcode
BARCODE_READING_ERROR	try again else clean disc
CALIBRATION_AREA_FULL	unable to recover
RECOVERY NEEDED	issue the RECOVER command
CAN'T RECOVER FROM POWER FAILURE	unable to recover
CAN'T RECOVER	unable to recover
EEPROM FAILURE	no recover procedures available

6 Appendix: CD Write once Disc.

The intend of this appendix is to give the user first an idea of some definitions and write methods and secondly an idea of what is involved when applying the different write methods.

6.1 INTRODUCTION.

A disc written with a CD-Recorder is the result of a various number of uninterrupted recording actions. The ORANGE book prescribes the start of a write action by means of the linking rules.

Audio linking rules:
>   At least 1 interleave length of digital silence is recommended at the beginning and at the end of a sequence of EFM recording.

Data Linking:
>   A set of recorded Link-, Run-in, User Data- and Run-out blocks is called a packet. Each Recording within a Data Track must be recorded as one packet. Each Data Track must contain minimum one Packet with user Data

Table 1: Packet Layout

Link Block	Run-in block 1	Run-in block 2	Run-in block 3	Run-in block 4	User Data Blocks	Run-out Block 1	Run-out Block 2

6.2 WRITE METHODS

Writing to a CDR disc can be done by different methods.

6.2.1 Disc At Once. (DAO)
>   The objective of Disc At Once is to produce CD's according the YELLOW-book, the RED-book or the GREEN-book. As the whole session is written in one uninterrupted recording session, no link points are created.
>
>   The smallest recording information is 1 session.
>
>   The Disc At Once extension requires two SCSI commands:
>   READ NEW SESSION INFO and WRITE SESSION.
>
>   Further more, the Disc At Once extension has impact on the following commands:
>   WRITE (GROUP 0 & 1), FLUSH CACHE, FIRST WRITABLE ADDRESS, RECOVER, and REQUEST SENSE.

6.2.2 Track At Once (TAO)

The objective of Track At Once is to record 1 track uninterrupted. This is an easy way to write tracks, but one can only write 99 tracks, and each track is at least 4 seconds.

The smallest recording information is 1 track.The complete track is composed out of one (1) packet.

6.2.3 Incremental Write. (IW)

In some applications, there exists a strong wish to write many more times than 99 (=maximum number of tracks). This can be accomplished by using Incremental Write.

There exists 2 versions of Incremental Write
- fixed packet size: for every write, the number of user data blocks is constant.
- variable packet size: the number of user data blocks in a packet can vary.

The smallest recording information is 1 packet.

It is clear that packet writing creates overhead on disc. Table 3 illustrates the relation between efficiency (on disc space) and packet size (incremental fixed packet size).

Table 2: 63 min CDR

Packet size	Efficiency
2	22%
4	36%
8	53%
16	70%
32	82%
48	87%
64	90%
96	93%
128	95%
256	97%

An advantage of writing incremental with fixed packet size is that the Logical Ad-

---

dressing is linear through the track. The disadvantage is that one can waste disc space if the information is not equal to the packet size.

To write an incremental track the following steps should be followed:
Create a reserved or incomplete track with the format track command. It is possible to write fixed or variable packets. In case of fixed packets the maximum packet size that can be specified is 65535 blocks. In case of variable packets, the packet size is only limited by the free space on the disc. To execute the format track command successfully the blockdescriptor of the mode select pages should be filled in with a legal blocksize. Legal blocksizes are: 2048 (Mode1 and Mode2 Form1), 2056 (Mode2 Form1), 2324 (Mode2 Form2), 2332 (Mode2 Form2). Once a track is formatted it is possible to write in it. First make sure that the blockdescriptor, page 20 and page 21 of the mode select pages are filled in correctly. Issue a flush cache command after each packet. When the incremental writing is done with fixed packet sizes the host must give the correct amount of blocks for every packet. When too many blocks are given the drive will generate an error: Illegal request, Illegal transfer length. When too few blocks are given, the error will be: Illegal request, Dummy blocks added.
In case of an incomplete track it is possible to 'complete' the track with a finish track command. The finish track command will be successfully if the minimum track length is reached (300 blocks)

6.3 TRACKS (RESERVED / INCOMPLETE)

When using Incremental Write, we must distinguish RESERVED and INCOMPLETE tracks.

6.3.1 RESERVED TRACK:
A Reserved Track is a track in which data is not yet recorded completely. The start and stop time of the track is defined and recorded in PMA. A Reserved Track can be written at once or can be written incrementally.
There may exist several reserved tracks on a disc, but before the disc can be fixated, all reserved parts must be recorded.
A reserved track always gets a pregap of 2 seconds. Audio tracks will not be reserved.
If a reserved track is written with fixed packets, the packet size and the length of the track must meet the following rule:
Stop-time - Start-time = Number of Packets * (Packet size +7) - 5.

6.3.2 INCOMPLETE TRACK:
An Incomplete Track is a track in which series of incrementally written data packets are recorded. Start and stop time are NOT recorded.
Only one (1) incomplete track is allowed: the last track on a disc.

6.4 ADDRESSING METHOD.

The addressing method defines the relation between the logical block number (LBN) and the block address in the block header.

6.4.1 Method 1:

LBN= (((min*60)+sec)*75+frames)-150

6.4.2 Method 2:

LBN's upto and included the first user data block are calculated by method 1. All the following LBN's are calculated by counting all User Data Blocks in the track. (this means exclusion of all Run-in, Run-out and Linkblocks.)

6.4.3 BASICS:

Method 1 is used for the entire disc, except within an incrementally written track with fixed packets, method 2 is used.

ALERT: discontinuity in the addressing of logical sectors will appear if written incrementally with fixed packets.

6.5 THE "WRITE TRACK AT ONCE" PROCESS.

The intent of this chapter is to give the user an idea of what is involved in writing "TRACK-AT-ONCE". For detailed information on each command the user should refer to that particular command contained in the front of this manual.

1.   Basic Administration.

Before doing any write, we must do some basic administration. Issue a MODE SENSE command for all pages to get the current settings of the CDD 2600. Issue a MODE SELECT command to configure the CDD 2600 for the way in which you intend to use it. Supply following information with the MODE SELECT :

   1. The appropriate host application code.
   2. The block size for the mode you are going to write.
   3. The subheader page parameters.

2.   Write Sequence.

A write sequence consist out of following SCSI commands :
       WRITE TRACK
       [WRITE]

FLUSH CACHE

When the WRITE TRACK command is received and accepted, the CDD 2600 is then in the write sequence. Only a limited command set is accepted.

WRITE
FLUSH CACHE
FIRST WRITABLE ADDRESS
TEST UNIT READY
REQUEST SENSE

If any other command is received during a write sequence, a CHECK CONDITION will be issued with a sense key of ILLEGAL REQUEST and a sense code of COMMAND SEQUENCE ERROR.

An alternate way of starting a write sequence is

MODE SELECT PAGE 21 (write track page)
WRITE
[WRITE]
FLUSH CACHE
Both ways are equivalent.

3.   Starting a write sequence.

The starting address of a track will automatically be calculated by the CDD 2600, taking into account the proper pregap length for the track. If you must know the starting address of the track prior to starting the write sequence, you can obtain this information by issuing the FIRST WRITABLE ADDRESS command. You CANNOT alter this address. Following actions will occur:

1. Optimum Power Calibration if required.
2. Enter write sequence (limited command set).
3. Transfer data bytes (specified by transfer length)
4. Write data to the disc (if buffer is almost full)
5. Terminate with GOOD Status.

4.   Multiple write.

If the track is greater then the transfer length by WRITE TRACK (or by the initial write) command, then 1 or more additional WRITE commands are necessary. Parameters specified by the WRITE command are:

1. Logical Block Address
2. Transfer Length
3. Mixed bit.

The logical block address (LBA) specifies where the data associated with this command should be written on the disc. The use of the address field is optional. The recommended method to use is setting this field to zero, telling the CDD 2600 to use the next available address on the disc. If you insist on using the address field you must ensure that the address you specify is the next contiguous address on the disc. Otherwise, a CHECK CONDITION will be returned. The next address can be obtained by issuing the FIRST

WRITABLE ADDRESS command.

The transfer length defines how many blocks of data will be written with this command. Small transfer lengths adds overhead to the transfer that slows data throughput and can lead to buffer underruns.

Buffer underrun is the condition where the CDD 2600 runs out of data to write because the host cannot supply the data fast enough. At the 2x writing speed, data is being removed from the buffer at following rates:

Mode 2 Form 2 (2324 bytes) 348,600 bytes/second
Audio　　　　　(2352 bytes) 352,800 bytes/second

5. Flush CACHE.

When you have sent all the data, you can send the FLUSH CACHE command. This command tells the CDD 2600 to end the write sequence. After the command is received and the last byte has been written to the disc, the CDD 2600 will terminate the write sequence and return GOOD status.

An exception is normally a CHECK CONDITION on the FLUSH CACHE to report ABSORPTION CONTROL ERRORS. Absorption control errors (ACE) are areas in the track where the CDD 2600 had trouble writing the data but the CDD 2600 thinks the data is ok. Even though the are called errors they are, in reality, only warnings. The host would be wise to verify these areas. The location of the questionable areas can be obtained by using the SEND ABSORPTION CONTROL ERRORS command and then using the VERIFY command to test the integrity of those areas. All other CHECK CONDITIONS will be for an error related to writing the data to the disc.

6. NOTES

The minimum track length must be at least 4 seconds (= 300 blocks), exclusive the pre-gap. If the host writes a track with less than the minimum length, the CDD 2600 would append the necessary blocks informs the host by returning CHECK CONDITION with a sense code of DUMMY BLOCKS ADDED.

6.6 THE "WRITE DISC AT ONCE" PROCESS.

Writing a "Disc-At-Once" is a similar process as writing a "Track_AT_Once". The WRITE SESSION commands enters a write sequence mode after validation. The limited command set becomes active and after one or more WRITE commands a FLUSCH cache command will end the write sequence.The FLUSH CACHE command returns when all data in the cache has been written to disc.

However note following main differences.

The "Disc-At-Once" requires an empty program area.
During writing a session, the objective of the WRITE commands is to supply main channel data for the lead-in, the program area, and the lead-out.
During the writing of a session, the WRITE commands have some restrictions:

- Only block size 2352 is valid.
- The Mixed Format bit of the command descriptor block must be zero.

To obtain the first writable address of a session, Track Number of the command descriptor block must be equal to 0 and the Raw bit of the command descriptor must be equal to 1.

The disc-at-once extension requires two additional sense codes:

B8H PROGRAM AREA NOT EMPTY
    Indicates that the current program area contains tracks.
    (Sense Key: ILLEGAL REQUEST)

B9H PARAMETER LIST TOO LARGE
    Indicates that the CDD 2600 is not capable to process the parameter list due to too less RAM.
    (Sense Key: ILLEGAL REQUEST)

The Disc At Once feature (DAO) has the ability to write a complete session without generating link blocks between track limits. The user must therefore generate the necessary data sectors, correct encoded and in the correct lengths so the session can be written uninterrupted.
He should therefore generate all the necessary blocks, encoded by a data encoding algorithm, so that the sectors only will be encoded by a audio encoder (which performs CIRC and other standard audio encoding).
The user should therefore provide after a WRITE_SESSION enough datablocks in order to write:
- a leadin of the correct size (the leadin length can be inquired with the READ SESSION INFO command)
- a pregap (of a data track) or a pause area (of an audio track) which has the length of the first INCREMENT INDEX ADDRES minus LOGICAL START ADDRESS
- user data for the tracks which have the length LOGICAL STOP ADDRESS minus LOGICAL START ADDRESS (if no indexes are specified) or LOGICAL STOP ADDRESS minus the first INCREMENT INDEX ADDRESS (if an index is specified).

- a leadout of the correct size (the leadout length can be inquired with the READ SESSION INFO command)

The way in which the pregap or audio pause area, and the leadin and leadout need to be encoded can be found in the orange book specification chapters 5.5, 5.6 and 5.7.

In order to issue the WRITE SESSION command, the PARAMETER LIST LENGTH must be set to the total amount of bytes which need to be transferred after the CDB as parameters. The TRACK DESCRIPTOR LENGTH must be set to the value 0x14 + 4 * **n,** with **n** being the number of INDEX increments (a value of 0-98). Only the tracks in the program area need to be specified by the WRITE SESSION COMMAND.

The parameters in a track descriptor imply following:
- LOGICAL START ADDRESS: start address where the first user sector of the track can be found (address after pregap or audio pause of the track). Attention: logical block addressing is used, so logical block address 0 is equivalent to 00:02:00 (minutes seconds frames absolute).
- LOGICAL ADDRESSES TO INCREMENT THE INDEX: logical blockaddress where the additional track index-increment must take place. A pause index or a pregap (with index value 0 in the P-channel) is automatically detected by the writer if the STOP ADDRESS of track n differs from START ADDRESS of track n+1.
- LOGICAL STOP ADDRESS:stop address where the last sector of the track is found (attention: logical block addressing).

As a valid example, a regular sequence for writing a session would be:

issue a READ SESSION INFO:
    0xEE 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x04 0x00
            response: 0x2B 0xF2 0x1A 0x5E

issue a MODE SELECT command for setting the blocksize to 0x930
    0x15 0x10 0x00 0x00 0x0C 0x00
            0x00 0xA8 0x00 0x08   0x00 0x00 0x00 0x00 0x00 0x00 0x09 0x30

issue a WRITE SESSION COMMAND f.i. for 3 tracks
    0xED 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x40 0x00
            0x00 0x18 0x02 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00
                0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x96 0x00 0x00 0x10 0x00
            0x00 0x14 0x02 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00
                0x00 0x00 0x10 0x00 0x00 0x00 0x20 0x00
            0x00 0x14 0x02 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00
                0x00 0x00 0x20 0x96 0x00 0x00 0x30 0x00

issue a WRITE COMMAND with corresponding data:
    0x2A 0x00 0x00 0x00 0x00 0x00 0x00 0x76 0xE6 0x00

issue a FLUSH CACHE command:
    0x35 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

This sequence will result in an audio disc with no appendable session with 3 tracks:

Track 1: audio, pause area from 00:00:00 (MSF) until 00:02:00,
    user area and index 1 from 00:02:00 until 00:04:00,
    user area and index 2 from 00:04:00 until 00:56:46.
Track 2: audio, no pause area,
    user area and index 1 from 00:56:46 until 01:51:17.
Track 3: audio, pause area from 01:51:17 (MSF) until 01:53:17,
    user area and index 1 from 01:53:17 until 02:45:63.

6.7 OPC (Power Calibration)

Primary to a write action, a OPTIMUM POWER CALIBRATION must be done. This power calibration remains valid until the disc is ejected. As the maximum number of possible calibrations is limited to 100, this is sufficient for track-at-once applications. Incremental write overrules the number of writes to a disc (normally limited to 99 tracks) Writing more than 99 times can cause as many power calibrations. Precautions must be taken to prevent an overflow of the power calibration area.

THe host can use the READ OPC INFO and WRITE OPC INFO commands in order to prevent an overflow of the calibration area.

When the CDD 2600 spins up a disc, the disc is scanned for an DISC-ID. When the DISC-ID is not present, a random DISC-ID is generated. When performing write power calibrations, the calibration values can be coupled to the DISC-ID. The host is now able to retrieve and to restore the POWER values.

Warning: changing the power values is not allowed and can lead to unreadable discs.

6.8 Miscellaneous

6.8.1 Starting up CD's

Extra filters have been build in the drive to prevent the drive of working with CD's that are out of specification. A disc will not start up if it has a positive value in the timefield (Min, Sec, Frame) of the Lead-in.

6.8.2 Read/write buffer.

A write buffer will fail when it is issued for a first time after a read. This is not a major problem because in practise this command sequence will normally not be executed In case of test purposes (such as reprogramming the firmware in a flash) special care should be taken into account.

6.8.3 ATN handling

According to the SCSI specification, the host may assert Attention (ATN) during any bus-phase; the target does not have to react immediately to the ATN, it can normally finish the current bus phase, but before switching to any other bus phase, it now must first change to StatusOut phase and receive the message byte(s) from the host. Unfortunately, the CDD2600 drive does not meet this requirement completely: for example during a disconnect sequence (where first a status byte is sent to the host, followed by a DISCONNECT message and the disconnection from the bus itself) asserting Attention is ignored, the disconnection is completed normally.

Also, during Data In phase (where the drive is transferring data to the host) asserting ATN will cause an Abort of the current command: this because asserting ATN in this case disrupts the data transfer, so that it is not possible to correctly continue executing the current command. Only the ABORT and BUS DEVICE RESET messages are handled normally; sending an IDENTIFY or INITIATOR DETECTED ERROR will cause the drive to abort the current command.
Changing the disconnect privilege during a read command will cause the drive to stop the present operation and send error data back to the host.