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MMC-2 Packet Commands for C/DVD Devices

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9.0 Packet Commands for C/DVD Devices

9.1 Packet Command Implementation Requirements

The first byte of all Command Packets shall contain an operation code as defined in this Specification. This specification is broken down into separate sections. This section describes all commands that are generic to all C/DVD Logical Units. There are separate sections for commands specific to DVD and CD media only.

9.1.1 FLUSH CACHE Command

The FLUSH CACHE command ensures that logical blocks in the cache memory, have their most recent data value recorded on the physical medium. If a more recent data value for a logical block exists in the cache memory than on the physical medium, then the logical blocks from the cache memory shall be written to the physical medium. Logical blocks are not necessarily removed from the cache memory as a result of the cache flush operation.

Note that this command does not make use of the range allowed in the SYNCHRONIZE CACHE, SCSI version of this command. This definition replaces the definition in the SCSI Standard.

Table 27- FLUSH CACHE Command

Byte	Bit	7	6	5	4	3	2	1	0
0		Operation code (5h)							
1		LUN			Reserved			Immediate (0)	Reladr (SCSI Only)
2		Logical Block Address (0)							
3									
4									
5									
6		Reserved							
7		Block Count (0)							
8									
9		Vendor-Specific	Reserved			NACA	Flag	Link	
10		PAD							
11									

The Immediate bit shall be reserved and not used. As the only method to report errors from the flush operation when the immediate type operation is used would be to use deferred errors, this feature shall not be supported by Logical Units that comply with this specification.

The Logical Block Address and the Block Count field shall not be used and are reserved.

This command is Mandatory for a Logical Unit that is capable of writing to the medium.

Table 28 - Recommended Sense Key, ASC and ASCQ for Flush Cache Command Errors

Sense Key	ASC	ASCQ	Description of Error
02	04	00	LOGICAL UNIT NOT READY - CAUSE NOT REPORTABLE
02	04	01	LOGICAL UNIT NOT READY - IN PROGRESS OF BECOMING READY
02	04	02	LOGICAL UNIT NOT READY - INITIALIZING COMMAND REQUIRED
02	04	03	LOGICAL UNIT NOT READY - MANUAL INTERVENTION REQUIRED
02	06	00	NO REFERENCE POSITION FOUND (media may be upside down)
02	30	00	INCOMPATIBLE MEDIUM INSTALLED
02	30	01	CANNOT READ MEDIUM - UNKNOWN FORMAT
02	30	02	CANNOT READ MEDIUM - INCOMPATIBLE FORMAT
02	3A	00	MEDIUM NOT PRESENT
03	02	00	NO SEEK COMPLETE
03	14	00	RECORDED ENTITY NOT FOUND
05	00	11	PLAY OPERATION IN PROGRESS
05	20	00	INVALID COMMAND OPERATION CODE
05	21	00	LOGICAL BLOCK OUT OF RANGE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	30	04	CANNOT WRITE MEDIUM - UNKNOWN FORMAT
05	30	05	CANNOT WRITE MEDIUM - INCOMPATIBLE FORMAT
05	38	00	INVALID ADDRESS FOR WRITE
05	64	00	ILLEGAL MODE FOR THIS TRACK OR INCOMPATIBLE MEDIUM
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	DEVICE OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED
0E	EF	00	LOSS OF STREAMING

9.1.2 GET EVENT STATUS NOTIFICATION Command

The Get Event Status Notification Command requests the logical unit to report event(s) status(es) as specified in the Notification Class field and provides asynchronous notification. Two modes of operation are defined here. They are polling and asynchronous modes.

In polling mode, the host will issue Get Event Status Notification commands at periodic intervals with an IMMED (immediate) bit of 1 set. The target shall complete this command with the most recently available event status requested. The logical unit shall support polling mode.

In asynchronous mode, the host will issue a single Get Event Status command with an IMMED (immediate) bit of 0 requested. If the Logical Unit supports Asynchronous event status notification (through tagged queuing) the model outlined here shall be used. If the Logical Unit does not support Asynchronous Mode, the command shall fail as an illegal request.

When Asynchronous Event Status reporting is supported, the target shall not complete a Get Event Status command with an IMMED bit of 0, until a change in event status of the requested class occurs. The target shall complete the Get Event Status Notification Command as soon after the event occurs as possible. It will report the event as outlined below.

Note: Only one class of event per Get Event Status Notification Command shall be reported. The priority of event reporting shall be by event Class number. The lower the class number, the higher the priority.

This command shall not return a Unit Attention check condition.

Table 29 - GET EVENT STATUS NOTIFICATION Command

Byte	Bit	7	6	5	4	3	2	1	0
0	Operation code (4Ah)								
1	LUN			Reserved				Immed	
2	Reserved								
3	Reserved								
4	Notification Class Request								
5	Reserved								
6	Reserved								
7	Event List Length (MSB)								
8	Event List Length (LSB)								
9	Vendor-Specific			Reserved			NACA	Flag	Link
10	PAD								
11	PAD								

Notification Class Request field requests the logical unit to report event(s) from the event classes listed requested in this field.

Table 30 - Notification Class Request

Value	Definition
0	Reserved
1	Reserved
2	Power Management Class Events
3	Reserved
4	Media Status Class Events
5	Reserved
6	Device Busy Class
7	Reserved

Note: a bit field of all 0's indicates that the target should immediately complete this command indicating No Event, and shall list the supported event class in the Event Buffer header. This Method shall be used to determine which event classes a Logical Unit supports

If a Logical Unit does not support any of the requested event classes, the Logical Unit shall terminate the command successfully, returning only the Event Data Header, and indicating a returned Class of 0.

Host Software that manages media event status, may or may not be linked to other software that manages power states. This notification field provides a way that power and media event status notifications can be independently managed by the responsible software. If a driver manages media, power management and Busy Device events, the driver can issue this command with notification field set to 0101010b to request the logical unit to report both power and media events.

Table 31 - Notification Status List

Bit	7	6	5	4	3	2	1	0
Byte								
0 - n	Event Header							
0 - n	Event Data							

Table 32 - Event Status Header

Bit Byte	7	6	5	4	3	2	1	0
0	MSB							
1	Event Data Length							LSB
2	NEA	Reserved				Notification Class		
3	Supported Event Classes							
4-n	Class Event Data							

Data Length field specifies the amount of data that follows the Event Status Notification Header. The amount of data reported shall be the number of bytes data following the data length field.

Notification Class field specifies the class of notification by number: NEA If this bit is set, it indicates that there are no events available in the requested Notification Class(es).

Table 33 - Notification Class Field

Field	Description
000b	None of the requested event classes are supported
001b	Reserved
010b	Returns Power Management class event
011b	Reserved
100b	Returns Media Event Status
101b	Reserved
110b	Device Busy class events
111b	Reserved

Supported Event Classes field specifies the event classes that the Logical Unit supports as per the Notification Class Field of section Table 30 -, "Notification Class Request", on page 92. If a Feature is supported, the corresponding bit shall be set to one.

Table 34 - Power Management Status Class Returned Data

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved				Power Event			
1	Power Status							
2	Reserved							
3	Reserved							

Power Event field reports the current change in the power status. This field is set to a new power event if a change in power state occurs.

Upon reporting the current power status change to the host, this field is reported to 0h on the subsequent Get Event Status Notification commands until a new change in power state occurs.

If the logical unit is commanded to go the same state as the logical unit is currently in, the next Get Event Status Notification (Power Class) command shall report a Power Change Successful event.

Table 35 - Power Event Format

Code	Status	Description
0h	NoChg	No changes in power state, or in power state transition
1h	PwrChg-Succ	The logical unit successfully changed to the specified power state
2h	PwrChg-Fail	The logical unit failed to enter the last requested state, and is still operating at the power state specified in the Power Status field
3h-Fh	Reserved	

Table 36 - Power Status Format

Code	Status	Description
0h	Reserved	
1h	Active	The logical unit is in Active state
2h	Idle	The logical unit is in Idle state
3h	Standby	The logical unit is in Standby state
4h-Fh		Reserved

The Power Status field shall be set to 3h (Standby) by a hard reset, power-on reset or Device reset (issued from Sleep state).

Table 37 - Media Status Class Returned Data

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved				Media Status			
1	Power Status							
2	Start Slot							
3	End Slot							

Table 38 - Media Status Format

Code	Status	Description
0h	NoEvent	Media status is unchanged.
1h	Eject Request	The logical unit has received a request from the user (usually through a mechanical switch on the logical unit) to eject the specified slot or media.
2h	New Media	The specified slot (or the logical unit) has received new media, and is ready to access it.
3h	Media Removal	The media has been removed from the specified slot, and the target is unable to access the media without user intervention.
4h - Fh		Reserved

Start Slot field defines the first slot of a multiple slot logical unit the media status notification applies to. For logical units that do not support multiple slots, this field shall be reserved.

End Slot field defines the last slot of a multiple slot logical unit the media status notification applies to. For logical units that do not support multiple slots, this field shall be reserved.

The slot numbers shall be as defined in the GET MECHANISM STATUS Command.

Table 39 - Device Busy Status Class Returned Data

Bit Byte	7	6	5	4	3	2	1	0	
0	Reserved				Device Busy Event				
1	Device Busy Status								
2	(MSE)	Time							
3								(LSB)	

Time field is the predicted amount of time remaining for the device to become not busy, in units of 100ms.

Table 40 - Device Busy Event Format

Code	Status	Description
0h	NoEvent	No event is available.
1h	Busy Event	A time-out has occurred.
2h - Fh	Reserved	

Table 41 - Device Busy Status Format

Code	Status	Description
0h	NoEvent	Logical Unit is ready to accept any command.
1h	Power	The Logical Unit is in the process of waking up from a low power state.
2h	Immediate	The Logical Unit is in the process of completing an earlier command.
3h	Deferred	The Logical Unit is in the process of completing a deferred operation, such as write.
4h - Fh	Reserved	

This type of event is usable in two environments. The first is in a queued environment. The MESN command may be issued in a non-immediate mode prior to executing commands or in the immediate mode while commands are being executed. The second environment is where immediate commands and deferred writing are performed; this command may be issued in the immediate mode to obtain status. If a normal command is issued while the device is busy, this command cannot be issued until the normal command completes. Therefore, if queuing is not used, the MESN command should precede any command that may time out.

If an MESN command with the Device Busy class bit set is queued, the device shall complete the command after a time-out as defined in the time-out section has occurred. However, instead of generating a unit attention, the only action is to complete this command. If this event is to be used via polling in the immediate mode, the host should disable the device time-outs.

If Report Status Notification is not supported or not enabled, the Logical Unit shall return CHECK CONDITION (Sense Key 05 ILLEGAL REQUEST, Sense Code 24 INVALID FIELD IN COMMAND PACKET).

If the IMMED bit is set to one, and if there is no Event to report the command shall return good status.

If the IMMED bit is set to zero (and the Logical Unit supports tagged command queuing) and if there is NO event to report, the GET EVENT STATUS NOTIFICATION command shall be queued by the target until there is an Event to report.

If the IMMED bit is set to zero and the target DOES NOT support tagged command queuing, the target shall return CHECK CONDITION (Sense Key 05 ILLEGAL REQUEST, Sense Code 24 INVALID FIELD IN COMMAND PACKET).

Table 42 - Recommended Sense Key, ASC and ASCQ for Get Event Status Notification Command Errors

Sense Key	ASC	ASCQ	Description of Error
05	20	00	INVALID COMMAND OPERATION CODE
05	24	00	INVALID FIELD IN COMMAND PACKET
0E	4E	00	OVERLAPPED COMMANDS ATTEMPTED

9.1.3 INQUIRY Command

The INQUIRY command requests that information regarding parameters of the C/DVD Logical Unit be sent to the Host Computer. An option allows the Host Computer to request additional information about the C/DVD Logical Unit.

Table 43 - INQUIRY Command

Byte	Bit	7	6	5	4	3	2	1	0
0		Operation code (12h)							
1		LUN			Reserved			CmdDt (0)	EVPD (0)
2		Page Code or Operation Code (0)							
3		Reserved							
4		Allocation Length							
5		Vendor-Specific		Reserved			NACA	Flag	Link
6		PAD							
7									
8									
9									
10									
11									

The INQUIRY command shall return CHECK CONDITION status only when the C/DVD Logical Unit cannot return the requested INQUIRY data. The INQUIRY data should be returned even though the peripheral Logical Unit may not be ready for other commands.

If an INQUIRY command is received with a pending unit attention condition (i.e. before the C/DVD Logical Unit reports CHECK CONDITION status), the C/DVD Logical Unit shall perform the INQUIRY command and shall not clear the unit attention condition.

The Enable Vital Product Data (EVPD) bit is not used by C/DVD Logical Units and shall be reserved. As the EVPD bit shall be set to zero, the Page Code field is not used and shall be reserved.

The Command Support Data (CmdDt) is used to request the Logical Unit return the command support data specified by the operation code field. This capability is not used by C/DVD Logical Units. If this bit is set to one, the logical Unit shall return CHECK CONDITION status with the sense key set to 05h ILLEGAL REQUEST and an additional sense code of 24h INVALID FIELD IN CDB.

The INQUIRY data should be returned even though the Logical Unit is not ready for other commands. To minimize delays after a power on or hard reset, the standard INQUIRY data should be available without incurring any media access delays. If the Logical Unit does store some of the INQUIRY data on the media, it may return zeros or ASCII spaces (20h) in those fields until the data is available from the media.

9.1.3.1 Standard INQUIRY Data

The standard INQUIRY data contains 36 required bytes, followed by a variable number of vendor-specific parameters. Bytes 58 through 95, if returned, are reserved for future standardization.

Table 44 - INQUIRY Data Format

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved			Peripheral Device Type				
1	RMB	Reserved						
2	ISO Version (0)		ECMA Version (0)			ANSI Version (Not zero)		
3	ATAFIT Transport Version (3)			Response Data Format				
4	Additional Length (Number of bytes following this one)							
5	Reserved							
6	Reserved							
7	Reserved							
8	Vendor Identification							
15	Vendor Identification							
16	Product Identification							
31	Product Identification							
32	Product Revision Level							
35	Product Revision Level							
36	Vendor-specific							
55	Vendor-specific							
56	Major Version							
57	Minor Version							
58	Reserved							
95	Reserved							
Vendor Specific Parameters								
96								
n								

The device type fields identifies the Logical Unit. It is defined in "Table 45 - Peripheral Device Types" on page 98.

9.1.3.2 Using the INQUIRY Command

The INQUIRY command may be used by a Host Computer to determine the configuration of the C/DVD Logical Unit. C/DVD Logical Units respond with information that includes their type and Specification level and may include the vendor's identification, model number and other useful information.

The device type fields identifies the Logical Unit. It is defined in "Table 45 - Peripheral Device Types" on page 98.

Table 45 - Peripheral Device Types

Code	Description
00h	Direct-access Logical Unit (e.g. magnetic disk)
01h - 04h	Reserved
05h	C/DVD Logical Unit (ROM, R, E and RAM types)
06h	Reserved
07h	Optical memory Logical Unit (e.g. some optical disks)
08h - 1Eh	Reserved
1Fh	Unknown or no Logical Unit type

The Peripheral Device Type shall be set to 05h to indicate a C/DVD Logical Unit.

A Removable Medium Bit (RMB) of zero indicates that the medium is not removable. A RMB bit of one indicates that the medium is removable. C/DVD-ROM Logical Units should always report "Removable".

The usage of non-zero code values in the ISO version and ECMA version fields are defined by the International Organization for Standardization and the European Computer Manufacturers Association, respectively.

The ANSI approved version field must contain a non-zero value to comply with this version of the Specification.

The ATAPI Transport Version field must contain 03h or 04h to comply with this version of the Specification. This version field indicates the version of the ATAPI Transport that is being used. For more information on the transport, see the X3T13/1153D Standard. For a SCSI Logical Unit this field shall be reserved.

A response data format value of 01h indicates that the data shall be in the format specified in this Specification. Response data format values greater than one are reserved.

The Additional Length field shall specify the length in bytes of the parameters. If the allocation length of the Command Packet is too small to transfer all of the parameters, the additional length shall not be adjusted to reflect the truncation.

ASCII data fields shall contain only graphic codes (i.e. code values 20h through 7Eh). Left aligned fields shall place any unused bytes at the end of the field (highest offset) and the unused bytes shall be filled with space characters (20h). Right aligned fields shall place any unused bytes at the start of the field (lowest offset) and the unused bytes shall be filled with space characters (20h).

The Vendor Identification field contains 8 bytes of ASCII data identifying the vendor of the product 1 . The data shall be left aligned within this field.

The Product Identification field contains 16 bytes of ASCII data as defined by the vendor. The data shall be left aligned within this field.

The Product Revision Level field contains 4 bytes of ASCII data as defined by the vendor. The data shall be left aligned within this field.

The Major Revision field contains the major revision of this specification that this Logical Unit conforms to. To comply with this specification this field shall contain a 0.

The Minor Revision field contains the minor revision of this specification that this Logical Unit conforms to. To comply with this specification this field shall contain a 9.

Table 46 - Recommended Sense Key, ASC and ASCQ for Inquiry Command Errors

Sense Key	ASC	ASCQ	Description of Error
05	24	00	INVALID FIELD IN COMMAND PACKET

Note: It is intended that this field provide a unique vendor identification of the manufacturer of the C/DVD Logical Unit. In the absence of a formal registration procedure, X3T10 maintains a list of vendor identification codes in use. Vendors are requested to voluntarily submit their identification codes to X3T10 to prevent duplication of codes.

9.1.4 LOAD/UNLOAD C/DVD Command

The LOAD / UNLOAD command requests that the C/DVD Logical Unit changer load or unload a Disc. New Load / Unload Commands issued before the changer posts a STATE of READY, will cause the changer to abort the Load / Unload command in progress and begin processing the new Load / Unload C/DVD command.

Table 47 - Load /Unload Command

Byte	Bit	7	6	5	4	3	2	1	0
0		Operation code (Abh)							
1		LUN			Reserved				Immed
2		Reserved							
3		Reserved							
4		Reserved						LoUnlo	Stat
5		Reserved							
6		Reserved							
7		Reserved							
8		Slot							
9		Reserved							
10		Reserved							
11		Vendor-Specific			Reserved		NACA	Flag	Link

An immediate (IMMED) bit of one indicates that the target shall return status as soon as the command descriptor block has been validated. An IMMED bit of zero indicates that the status shall not be returned until the operation has been completed.

A Start bit of one requests the Logical Unit be made ready for use. A Start bit of zero requests that the Logical Unit be stopped (media cannot be accessed by the Host Computer).

Table 48 - Load/Unload or Optional Selection Operations

LoUnlo	Start	Operation to be Performed
0	0	Abort any Prior Changer Command (Stop)
0	1	Reserved
1	0	Unload Media. The Slot Parameter is ignored for this operation.
1	1	Either Move the Disc in the selected Slot to the play position or select the Slot specified for use with future Media Access Commands

The Slot field indicates the Slot to be loaded. Changers compatible with the Bootable CD specification should always initialize (Load) Slot 0 on Power On or Hard Reset.

Any attempt to Load or Unload a Disc when the Logical Unit does not support that capability shall result in an error condition being reported to the Host (Sense key 05 ILLEGAL REQUEST, Sense Code 24 INVALID FIELD IN COMMAND PACKET.)

Loading when the slot does not contain a Disc will be rejected with a Sense Key 02 (NOT READY) and Sense Code 3A (MEDIUM NOT PRESENT). When this error is returned there are two possible actions by the C/DVD Changer Logical Unit. If the Logical Unit reports Software Slot Selection (SSS) = 1, then the slot specified shall be selected for use. If the Logical Unit reports SSS = 0 then the previously used slot shall continue to be selected for use.

If the Logical Unit is capable of caching data then a delayed load of a disc into the playing position can be supported.

If delayed loading of a disc into the playing position is supported, the Logical Unit shall have previously cached the Lead-in data from that disc. If the medium is DVD then the caching of the Lead-in information shall be performed. If the medium is CD then the caching of the TOC shall be performed. If the Logical Unit has not read the Lead-in for a disc that is being loaded into the playing position, then delayed loading shall not be performed and the disc shall be loaded into the playing position immediately. If the loading of the Disc into the playing position is delayed, then the Logical Unit shall report that the Disc is ready, even though the Disc is not spinning and installed in the playing position. In all cases the behavior seen by the host (other than a longer subsequent media access latency) shall not be different between delayed and immediate loading of a disc.

A UNIT ATTENTION Condition shall not be generated when discs are loaded or unloaded from the playing position.

Unloading when the Play Position does not contain a Disc will be rejected with a Sense Key 05 (ILLEGAL REQUEST) and Sense Code 24 (INVALID FIELD IN COMMAND) for the Slot Byte.

Table 49 - recommended Sense Key, ASC and ASCQ for Load /Unload C/DVD

Sense Key	ASC	ASCQ	Description of Error
02	04	04	IN PROCESS OF BECOMING READY - WRITING
04	53	00	MEDIA LOAD OR EJECT FAILED
04	3E	16	MECHANICAL POSITIONING OR CHANGER ERROR
05	20	00	INVALID COMMAND OPERATION CODE
05	24	00	INVALID FIELD IN COMMAND PACKET
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION

9.1.5 MECHANISM STATUS Command

The MECHANISM STATUS command requests that the C/DVD Logical Unit respond with the current status of the C/DVD Logical Unit, including any Changer Mechanism that adheres to this specification. This command is intended to provide information to the Host about the current operational state of the Logical Unit. The C/DVD Logical Units take operational direction from both the Host and the user (Person). Movement of media in/out of the Logical Unit as well as external conditions beyond the control of the host. This command has been provided to allow the Host to know what as transpired at the user level.

Table 50 - MECHANISM STATUS Command

Byte	Bit	7	6	5	4	3	2	1	0
0	Operation code (BDh)								
1	LUN				Reserved				
2	Reserved								
3	Reserved								
4	Reserved								
5	Reserved								
6	Reserved								
7	Reserved								
8	MSE		Allocation Length						LSB
9									
10	Reserved								
11	Vendor-Specific			Reserved			NACA	Flag	Link

The Allocation Length field specifies the maximum length in bytes of the Returned Data that shall be transferred from the C/DVD Logical Unit to the Host Computer. A parameter list length of zero indicates that no data shall be transferred. This condition shall not be considered as an error.

The Mechanism Status List contains a header, followed by zero or more fixed length Slot Tables. If the Logical Unit does not support the changer commands, then the number of slot tables returned to the host shall be zero. The number of slot tables returned shall be same as reported in the Number of Slots Available (Byte 5 of the Mechanism Status Header) field.

Table 51 - Mechanism Status Parameter List

Bit Byte	7	6	5	4	3	2	1	0
0 - 7	Mechanism Status Header							
8 - n	Slot Table(s)							

Each Slot Table contains the a slot number and status information.

Table 52 - Mechanism Status Header

Bit Byte	7	6	5	4	3	2	1	0							
0	Fault	Changer State		Current Slot											
1	C/DVD Mechanism State			DoorOpen	Reserved										
2	MSE														
3									Current LBA						LSB
4															
5									Reserved			Number of Slots Available			
6	MSE		Length of Slot Table(s)					LSB							
7															
8 - n	Slot Tables (0-n)														

Bit 0-4 Current Slot This field indicates the current Changer Slot selected. Changers compatible with a Bootable CD specification/standard, should always initialize (Load) Slot 0 on Power On or Hard Reset. This value shall only be changed when a Load Command is processed. Operations initiated by a user shall not cause this value to change. If the Logical Unit is not a changer, then this field is reserved.

Bit 5-6 Changer State This field indicates the current state of the changer. If the Logical Unit is not a changer, then this field is reserved.

0h = Ready 1h = Load in Progress 2h = Unload in Progress 3h = Initializing

Bit 7 Fault This bit indicates that the changer failed to complete the operation reported in the Changer State field. If the Logical Unit is not a changer, then this bit is reserved.

Bit 4 DoorOpen This bit indicates that the Door(s) or Tray(s) is open or the cartridge is not present.

Bit 7-5 C/DVD Mechanism State This field encodes the current operation of C/DVD Mechanism. If the Logical Unit is not a changer, then this field is reserved.

0h - Idle

1h - Active with Audio Port in use (i.e. Playing, Paused)

2h - Scan in progress

3h - Active with Host, Composite or Other Ports in use (i.e. READ, PLAY CD, SCAN during a PLAY CD).

Note: that SCSI does not make use of this value.

4-6h - Reserved

7h - No State Information Available

The Current LBA value returns the location that was last used while reading or playing. Once a Read or Play operation has been completed the value of this field may be undefined. While a Read or Play is in progress this field will contain the LBA of the current block being processed.

The Number of Slots Available field shall return the number of logical Slots that the Logical Unit supports and shall be limited to 32.

The Length of Slot Tables field specifies the length in bytes of the all the slot information that follows (e.g. for a 2 slot Logical Unit this value would be 8).

Table 53 - Slot Table Response format

Bit Byte	7	6	5	4	3	2	1	0
0	Disc Present (Optional)	Reserved						Change (Mandatory)
1	Reserved							
2	Reserved							
3	Reserved							

Bit 0 - Change; Change indicates that the Disc in that slot has been changed since the last time the Disc was loaded.

Bit 7 - Disc Present This bit reports the presence of a Disc in a Slot, or if the Disc for a given Slot is in the Playing Position. A value of 1 indicates the Disc is present, and 0 indicates that it is not.

SDP=0 Changer Logical Units may not support the capability of reporting the presence of a Disc in each of the slots after reset or a cartridge change. In this case the Logical Unit must report this in the capabilities mode page (See "9.1.8.7 C/DVD Capabilities and Mechanical Status Page" on page 126 "Supports Disc Present Reporting bit (SDP)"). In this case the Logical Unit shall report that ALL Discs are present, until the Logical Unit can determine that there is no Disc present (i.e. when a Load Command is processed for an empty slot).

SDP=1 If the Changer Logical Unit does support the reporting of the Disc Present then this bit shall be valid for all slots. It is not acceptable for the Logical Unit to actually load and unload each slot to compute this information.

Table 54 - Recommended Sense Key, ASC and ASCQ for Mechanism Status

Sense Key	ASC	ASCQ	Description of Error
04	53	00	MEDIA LOAD OR EJECT FAILED
04	3B	16	MECHANICAL POSITIONING OR CHANGER ERROR
05	20	00	INVALID COMMAND OPERATION CODE
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	DEVICE OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

9.1.6 MODE SELECT Command

The MODE SELECT command provides a means for the Host Computer to specify medium, or logical unit parameters to the C/DVD Logical Unit. Host Computers shall issue MODE SENSE prior to each MODE SELECT to determine supported pages, page lengths, and other parameters.

Table 55 - Mode Select Command

Byte	Bit	7	6	5	4	3	2	1	0
0		Operation code (55h)							
1		LUN			PF (1)	Reserved			SP
2		Reserved							
3		Reserved							
4		Reserved							
5		Reserved							
6		Reserved							
7		Parameter List Length (MSB)							
8		Parameter List Length (LSB)							
9		Vendor-Specific		Reserved			NACA	Flag	Link
10		PAD							
11		PAD							

A Save Pages (SP) bit of zero indicates the C/DVD Logical Unit shall perform the specified MODE SELECT operation, and shall not save any pages. An SP bit of one indicates that the C/DVD Logical Unit shall perform the specified MODE SELECT operation, and shall save to a nonvolatile vendor-specific location all the savable pages. If a C/DVD Logical Unit supports saved pages, it shall save only one copy of the page. The SP bit is optional, even when mode pages are supported by the C/DVD Logical Unit. Pages that are saved are identified by the parameter savable bit that is returned in the page header by the MODE SENSE command. If the PS bit is set in the MODE SENSE data then the page shall be savable by issuing a MODE SELECT command with the SP bit set. If the C/DVD Logical Unit does not implement saved pages and the SP bit is set to one, the command shall be terminated with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN COMMAND PACKET.

The Parameter List Length field specifies the length in bytes of the mode parameter list that shall be transferred from the Host Computer to the C/DVD Logical Unit after the Command Packet is transferred. A parameter list length of zero indicates that no data shall be transferred. This condition shall not be considered as an error.

The C/DVD Logical Unit shall terminate the command with CHECK CONDITION status if the parameter list length results in the truncation of any mode parameter header, or mode page. The sense key shall be set to ILLEGAL REQUEST, and the additional sense code shall be set to PARAMETER LIST LENGTH ERROR.

The mode parameter list for the MODE SELECT and MODE SENSE commands is defined in "9.1.8 Mode Select/Sense Parameters" on page 112.

The C/DVD Logical Unit shall terminate the MODE SELECT command with CHECK CONDITION status, set the sense key to ILLEGAL REQUEST, set the additional sense code to INVALID FIELD IN PARAMETER LIST, and shall not change any mode parameters for the following conditions:

1. If the Host Computer sets any field (except for reserved fields) that is reported as not changeable by the C/DVD Logical Unit to a value other than its current value.
2. If the Host Computer sets any unreserved field in the mode parameter header to an unsupported value.
3. If an Host Computer sends a mode page with a page length not equal to the page length returned by the MODE SENSE command for that page.
4. If the Host Computer sends an unsupported value for a mode parameter and rounding is not implemented for that mode parameter.

If the Host Computer sends a value for a mode parameter that is outside the range supported by the C/DVD Logical Unit and rounding is implemented for that mode parameter, the C/DVD Logical Unit may either:

1. round the parameter to an acceptable value and terminate the command;
2. terminate the command with CHECK CONDITION status, the sense key set to ILLEGAL REQUEST, and set the additional sense code to INVALID FIELD IN PARAMETER LIST.

An C/DVD Logical Unit may alter any mode parameter in any mode page (even those reported as non-changeable) as a result of changes to other mode parameters 1.

The C/DVD Logical Unit validates the non-changeable mode parameters against the current values that existed for those mode parameters prior to the MODE SELECT command.

Mode pages are maintained per Logical Unit. The pages are thus used for multiple media insertions/removals. In the case of a Changer Mechanism all the media in the changer make use of the same mode pages. Changing of media shall not cause a Unit Attention for Mode Parameters Have Changed.

Table 56- Recommended Sense Key, ASC and ASCQ for Mode Select Command Errors

Sense Key	ASC	ASCQ	Description of Error
01	5D	FF	FAILURE PREDICTION THRESHOLD EXCEEDED - FALSE
05	20	00	INVALID COMMAND OPERATION CODE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	26	00	INVALID FIELD IN PARAMETER LIST
05	00	11	PLAY OPERATION IN PROCESS
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	DEVICE OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

Note: If the current values calculated by the C/DVD Logical Unit affect the Host Computer's operation, the Host Computer shall issue a MODE SENSE command after each MODE SELECT command.

9.1.7 MODE SENSE Command

The MODE SENSE command provides a means for an C/DVD Logical Unit to report parameters to the Host Computer. It is a complementary command to the MODE SELECT command.

Table 57 - Mode Sense command

Byte	Bit	7	6	5	4	3	2	1	0
0		Operation code (5Ah)							
1		LUN			Reserved	DED (1)	Reserved		
2		PC		Page Code					
3		Reserved							
4		Reserved							
5		Reserved							
6		Reserved							
7		Allocation Length (MSB)							
8		Allocation Length (LSB)							
9		Vendor-Specific			Reserved		NACA	Flag	Link
10		PAD							
11		PAD							

The Disable Block Descriptor (DBD) specifies that the Block Descriptor shall not be returned when set to one. This bit shall always be set to one for an ATAPI Logical Unit. For a SCSI Logical Unit this bit may be set to zero only in a legacy environment.

The Page Control (PC) field defines the type of mode parameter values to be returned in the mode pages. See sections "9.1.7.1 Current Values" - "9.1.7.4 Saved Values" below.

Table 58 - Page Control Field

Code	Type of Parameter	Section
00h	Current values	9.1.7.1 on page 110
01h	Changeable values	9.1.7.2 on page 110
10h	Default values	9.1.7.3 on page 110
11h	Saved values	9.1.7.4 on page 110

NOTE: The Page Control field only affects the mode parameters within the mode pages; however, the PSbit, Page Code and Page Length fields shall return current values since they have no meaning when used with other types. The mode parameter headers shall return current values. (see also "9.1.8 Mode Select/Sense Parameters" on page 113)

The Page Code specifies which mode page(s) to return. See "Table 61 - Mode Page Codes for C/DVD" on page 112 for a description of the Mode pages.

A Host Computer may request any one or all of the supported mode pages from an C/DVD Logical Unit. If a Host Computer issues a MODE SENSE command with a page code value not implemented by the C/DVD Logical Unit, the C/DVD Logical Unit shall return CHECK CONDITION status and shall set the sense key to ILLEGAL REQUEST and the additional sense code to INVALID FIELD IN COMMAND PACKET.

1. Mode pages shall be returned in ascending page code order except for mode page,

A Page Code of 3Fh indicates that all mode pages implemented by the C/DVD Logical Unit shall be returned to the Host Computer. If the mode parameter list exceeds 65534 bytes for ATAPI or 65536 for SCSI in a MODE SENSE command, the C/DVD Logical Unit shall return CHECK CONDITION status and the sense key shall be set to ILLEGAL REQUEST and the additional sense code set to INVALID FIELD IN COMMAND PACKET.

Mode page 00h, if implemented, shall be returned after all other mode pages.

9.1.7.1 Current Values

A PC field value of 0h requests that the C/DVD Logical Unit return the current values of the mode parameters. The current values returned are:

1. the current values of the mode parameters established by last successful MODE SELECT command.

2. the saved values of the mode parameters if a MODE SELECT command has not successfully completed since the last power-on, hard RESET condition.
3. the default values of the mode parameters, if saved values, are not available or not supported.

9.1.7.2 Changeable Values

A PC field value of 1h requests that the C/DVD Logical Unit return a mask 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 C/DVD Logical Unit) 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 Host Computer shall 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.

9.1.7.3 Default Values

A PC field value of 2h requests that the C/DVD Logical Unit return the default values of the mode parameters. Parameters not supported by the C/DVD Logical Unit shall be set to zero. Default values are accessible even if the Logical Unit is not ready.

9.1.7.4 Saved Values

A PC field value of 3h requests that the C/DVD Logical Unit return the saved values of the mode parameters. Implementation of saved page parameters is optional. Mode parameters not supported by the C/DVD Logical Unit shall be set to zero. If saved values are not implemented, the command shall be terminated with CHECK CONDITION status, the sense key set to ILLEGAL REQUEST and the additional sense code set to SAVING PARAMETERS NOT SUPPORTED.

The method of saving parameters is vendor-specific. The parameters are preserved in such a manner that they are retained when the C/DVD Logical Unit is powered down. All savable pages can be considered saved when a MODE SELECT command issued with the SP bit set to one has returned a "good" status.

Note: As C/DVD Logical Units do not have writable media and the media is removable, most will not support Saved Values. It is recommended that the Host software not make use of saved pages.

9.1.7.5 Initial Responses

After a power up condition or hard reset condition or for ATAPI the DEVICE RESET, the C/DVD Logical Unit shall respond in the following manner:

1. If default values are requested, report the default values.
2. If saved values are requested, report valid restored mode parameters, or restore the mode parameters and report them. If the saved values of the mode parameters are not able to be accessed from the non-volatile, vendor-specific location, terminate the command with CHECK CONDITION status and set the sense key set to NOT READY. If saved parameters are not implemented, respond as defined in "9.1.7.4 Saved Values" on page 110.

If current values are requested and the current values of the mode parameters have not been sent by the Host Computer (via a MODE SELECT command), the C/DVD Logical Unit may return either the default or saved values as defined above. If current values have been sent, the current values shall be reported.

Table 59 - Recommended Sense Key, ASC and ASCQ for Mode Sense Command Errors

Sense Key	ASC	ASCQ	Description of Error
01	5D	FF	FAILURE PREDICTION THRESHOLD EXCEEDED - FALSE
05	1A	00	PARAMETER LIST LENGTH ERROR
05	20	00	INVALID COMMAND OPERATION CODE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	39	00	SAVING PARAMETERS NOT SUPPORTED
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	DEVICE OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

9.1.8 Mode Select/Sense Parameters

This section describes the pages used with MODE SELECT and MODE SENSE commands.

The Mode Parameter List contains a header, followed by zero or more variable length pages.

Table 60 - Mode Parameter List

Bit Byte	7	6	5	4	3	2	1	0
0 - n	Mode Parameter Header							
0 - n	Page(s)							

Each mode page contains a page code, a page length, and a set of mode parameters.

Table 61 - Mode Page Codes for C/DVD

Page code	Description	Section	Type
00h	Vendor-specific (does not require page format)		
01h	C/DVD Read/Write error recovery page	27.8.1 on page 114	Mandatory
02h - 07h	Reserved		
08h - 0Dh	Reserved		
0Eh	CD audio control page	27.8.2 on page 120	Audio Feature set
0Fh - 17h	Reserved		
18h	Feature Set Support & Version page	27.8.4 on page 122	Mandatory
19h	Reserved		
1Ah	Power Condition Page	27.8.2 on page 119	Mandatory
1Bh	Reserved		
1Ch	Fault / Failure Reporting Page	27.8.5 on page 123	SMART Feature set
1Dh	C/DVD Inactivity page	27.8.6 on page 125	Mandatory
1Eh - 1Fh	Reserved		
2Ah	C/DVD Capabilities & Mechanical Status Page	27.8.7 on page 126	Mandatory
20h-29h, 2Eh-3Eh	Vendor-specific (page format required)		
3Fh	Return all pages (valid only for the MODE SENSE command)		

Table 62 - Mode Page Format

Bit Byte	7	6	5	4	3	2	1	0
0	PS/ Reserved	Reserved	Page Code					
1	Page Length (n-1)							
2	Mode Parameters							
n								

When using the MODE SENSE command, a Parameters Savable (PS) bit of one indicates that the mode page can be saved by the C/DVD Logical Unit in a non-volatile, vendor-specific location. A PS bit of zero indicates that the supported parameters cannot be saved. When using the MODE SELECT command, the PS bit is reserved.

The Page Code field identifies the format and parameters defined for that mode page.

When using the MODE SENSE command, if Page Code 00h (vendor-specific page) is implemented, the C/DVD Logical Unit shall return that page last in response to a request to return all pages (page code 3Fh). When using the MODE SELECT command, this page shall be sent last.

The Page Length field specifies the length in bytes of the mode parameters that follow. If the Host Computer does not set this value to the value that is returned for the page by the MODE SENSE command, the C/DVD Logical Unit shall terminate the command with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST with the additional sense code set to INVALID FIELD IN PARAMETER LIST. The C/DVD Logical Unit is permitted to implement a mode page that is less than the full page length defined in this Specification, provided no field is truncated and the Page Length field correctly specifies the actual length implemented.

The mode parameters for each page are defined here. Mode parameters not implemented by the C/DVD Logical Unit shall be set to zero.

Table 63 - Mode Parameter Header

Bit Byte	7	6	5	4	3	2	1	0
0	Mode Data Length							
1								LSB
2	Reserved Obsolete (Medium Type Code)							
3	Reserved							
4	Reserved							
5	Reserved							
6	Block Descriptor Length 0 (8 for legacy SCSI logical units)							
7								

When using the MODE SENSE command, the mode data length field specifies the length in bytes of the following data that is available to be transferred. The mode data length is the total byte count of all data following the mode data length field. When using the MODE SELECT command, this field is reserved.

The block descriptor associated with the Mode Select and Mode Sense commands is used for legacy system support for SCSI systems. If supported, block sizes (see “Block Descriptor Block Sizes for Read” on page 114.) shall include 2048 and may include 512, 2056, 2324, 2332, 2336, 2340, 2352, 2368, and 2448 bytes. The Table of Block Sizes for Read shows the implementation of the various block sizes. These definitions apply for reading with the Read commands. Other block sizes are allowed and the contents of those blocks is not specified by this specification.

In a SCSI Logical Unit, if the block descriptor is not supported and the DBD bit in the Mode Sense command Packet is set to zero, the device shall respond with CHECK CONDITION status, ILLEGAL FIELD IN COMMAND PACKET.

Table 64 - Block Descriptor Block Sizes for Read

Size	Readable block types
512	Mode 1 or Mode 2 Form 1 sectors divided into four blocks each.
2048	Mode 1, Mode 2 Form 1, or DVD
2056	Mode 2 Form 1 with subheader. Equivalent to Read CD, Flag = 50h.
2324	Mode 2 Form 2 with no subheader. Note: There is no mapping to Read CD, as the 4 spare bytes are not returned.
2332	Mode 2, form 1 or 2 data. The drive shall operate as specified for 2048 byte blocks except: Both forms send 2332 byte blocks. Form 1 blocks return the third layer ECC with the user data. Note: There is no mapping to Read CD, as the 4 spare bytes are not returned.
2336	Mode 2 data. The drive shall operate as specified for 2048 byte blocks lengths. This mode will include all data, including Yellow Book Mode 2 sectors and Form 1 and Form 2. Equivalent to Read CD, Flag = 58h.
2340	All bytes except the synchronization field. Equivalent to Read CD, Flag = 78h.
2352	Audio or raw blocks. The drive shall operate as specified for 2048 byte blocks. Reads of data mode sectors shall return descrambled data. Equivalent to Read CD, Flag = F8h.
2448 or 2368	Audio or raw blocks with raw sub-channel. The drive shall not perform the data descrambling operation. Equivalent to Read CD, Flag = F8, Sub-channel data selection = 010b (2448) or Sub-channel data selection = 001b (2368).

9.1.8.1 Read/Write Error Recovery Parameters Page

The Read/Write Error Recovery Parameters Page specifies the error recovery parameters the C/DVD Logical Unit shall use during any command that performs a data read operation from the media (e.g. READ, READ TOC/PMA/ATIP, etc.).

Table 65 - Read/Write Error Recovery Parameters Page Format

Bit Byte	7	6	5	4	3	2	1	0	
0	PS (Optional) Default 0	Reserved	Page Code (01h)						
1	Page Length (0Ah)								
2	Error Recovery Parameter, Default 0								
	AWRE	ARRE	TB	RC	Reserved	PER	DTE	DCR	
3	Read Retry Count								
4	Reserved (Correction Span in SCSI SEC)								
5	Reserved (Head Offset count in SCSI SEC)								
6	Reserved (Data Strobe Offset Count in SCSI SEC)								
7	Reserved								
8	Write Retry Count								
9	Reserved								
10	(MSB)	Recovery Time Limit (0)							
11								(LSB)	

The Parameters Savable (PS) bit is only used with the MODE SENSE command. This bit is reserved with the MODE SELECT command. A PS bit of one indicates that the C/DVD Logical Unit is capable of saving the page in a non-volatile vendor-specific location. The PS bit is optional.

NOTE The implementation of error recovery procedures for C/DVD Logical Units is markedly different from those used for magnetic medium disk drives. At least one level of error correction is required to transfer the data stream. Therefore, the performance of the Logical Unit may differ substantially from what would be expected by sending the same error recovery parameters to a magnetic medium Logical Unit.

An automatic write reallocation enabled (AWRE) bit of one indicates that the Logical Unit shall enable automatic reallocation to be performed during write operations. An AWRE bit of zero indicates that the Logical Unit shall not perform automatic reallocation of defective data blocks during write operations.

An automatic read reallocation enabled (ARRE) bit of one indicates that the Logical Unit shall enable automatic reallocation of defective data blocks during read operation. An ARRE bit of zero indicates that the Logical Unit shall not perform automatic reallocation of defective data blocks during read operation. When ARRE is enabled other error recovery modes shall not be used. The Disable Correction and Read Continuous shall not be enabled while ARRE is enabled.

A Transfer Block (TB) bit of one indicates that a data block that is not recovered within the recovery limits specified, shall be transferred to the Host Computer before CHECK CONDITION status is returned. A TB bit of zero indicates that such a data block shall not be transferred to the Host Computer. The TB bit does not affect the action taken for recovered data.

A Read Continuous (RC) bit of one indicates that the Logical Unit shall transfer the entire requested length of data without adding delays to perform error recovery procedures. This implies that the Logical Unit may send data that is erroneous or fabricated in order to maintain a continuous flow of data. A RC bit of zero indicates that error recovery operations that cause delays are acceptable during the data transfer.

A Post Error (PER) bit of one indicates that the Logical Unit shall report recovered errors. A PER bit of zero indicates that the Logical Unit shall not report recovered errors. Error recovery procedures shall be performed within the limits established by the error recovery parameters. This capability is very different for DVD media. To be able to recover the data from DVD media, error correction must be used. Thus it is not reasonable to report when ECC is used to recover the data. This bit for DVD media shall only be used to report when auto reallocation of a logical block has been performed. For CD media this capability is used to report when the Layered Error correction has been used to recover the data. Again as the CIRC is mandatory for recovery of data it shall not cause recovered errors to be reported.

A Disable Transfer on Error (DTE) bit of one indicates that the Logical Unit shall terminate the data transfer to the Host upon detection of a recovered error. A DTE bit of zero indicates that the Logical Unit shall not terminate the data transfer upon detection of a recovered error.

A Disable Correction (DCR) bit of one indicates that error correction codes shall not be used for data error recovery. A DCR bit of zero allows the use of error correction codes for data error recovery.

The interpretation of the bits 5-0 in the Error Recovery Parameter byte for C/DVD Logical Units is given in "Table 66 - C/ DVD Error Recovery Descriptions (CD Media)" on page 116. If the error recovery parameter is set to any other value, the command shall be terminated with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code set to INVALID FIELD IN PARAMETER LIST.

Table 66- C/DVD Error Recovery Descriptions (CD Media)

Code	Error Recovery Description
00h	The maximum error recovery procedures available are used. If an error occurs which is uncorrectable with the error correction codes (ECC) on the media, data transfer is terminated with CHECK CONDITION status. The block with the error is not transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the unrecovered error was detected. Recovered errors are not reported.
01h	Only retries of the read operation and CIRC are used (layered error correction is not used). Only CIRC unrecovered data errors are reported. If a CIRC unrecovered data error occurs, data transfer is terminated with CHECK CONDITION status. The block with the error is not transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the unrecovered error was detected. Recovered errors are not reported.
04h	The maximum error recovery procedures available are used. Recovered data errors are reported. If a recovered data error occurs, data transfer is not terminated. However, when the data transfer has completed CHECK CONDITION status is reported. The sense key is set to RECOVERED ERROR. The information bytes give the address of the last block where a recovered data error was detected. If a data error occurs that is uncorrectable with the ECC information available on the media, data transfer is terminated and CHECK CONDITION status is reported. The block with the error is not transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the uncorrectable error was detected.
05h	Only retries of the read operation and CIRC are used (layered error correction is not used). Recovered data errors are reported. If a recovered data error occurs, data transfer is not terminated. However, when the data transfer has completed CHECK CONDITION status is reported. The sense key is set to RECOVERED ERROR. The information bytes give the address of the last block where a CIRC recovered data error was detected. If an unrecovered data error occurs, data transfer is terminated and CHECK CONDITION status is reported. The block with the error is not transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the unrecovered error was detected.
06h	The maximum error recovery procedures are used. Recovered data errors are reported. If a recovered data error occurs data transfer is terminated and CHECK CONDITION status is reported. The block with the recovered error is not transferred. The sense key is set to RECOVERED ERROR. The information bytes give the address of the block where the recovered data error was detected. If a data error occurs that is uncorrectable with the ECC information on the medium, data transfer is terminated with CHECK CONDITION status. The block with the error is not transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the uncorrectable error was detected.
07h	Only retries of the read operation are used (layered error correction is not used) and CIRC recovered data errors are reported. If a CIRC recovered data error occurs, data transfer is terminated with CHECK CONDITION status. The block with the recovered error is not transferred. The sense key is set to RECOVERED ERROR. The information bytes give the address of the block where the recovered data error was detected. If a CIRC unrecovered data error occurs, data transfer is terminated with CHECK CONDITION status. The block with the error is not transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the unrecovered error was detected.
10h	If data transfer can be maintained, the maximum error recovery procedures available are used. (RC = 1.) If an error occurs which is uncorrectable with the error correction codes (ECC) on the media, or is uncorrectable in time to maintain data transfer, the data transfer is not terminated. However, when the data transfer has completed, CHECK CONDITION status is reported. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the first unrecovered error was detected. Recovered errors are not reported.
14h	If data transfer can be maintained, the maximum error recovery procedures available are used. (RC = 1.) Recovered data errors are reported. If a recovered data error occurs, data transfer is not terminated. However, when the data transfer has completed, CHECK CONDITION status is reported. The sense key is set to RECOVERED ERROR. The information bytes give the address of the block where a recovered data error was detected. If an data error occurs that is uncorrectable with the ECC information available on the media, or is uncorrectable in time to maintain data transfer, the data transfer is not terminated. However, when the data transfer has completed CHECK CONDITION, status is reported. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the first uncorrectable error was detected. Reporting unrecovered errors takes precedence over reporting recovered errors.
20h	The maximum error recovery procedures available are used. If an error occurs which is uncorrectable with the error correction codes (ECC) on the media, data transfer is terminated with CHECK CONDITION status. The block with the error is transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the unrecovered error was detected. Recovered errors are not reported.

Table 66 - C/DVD Error Recovery Descriptions (CD Media)

Code	Error Recovery Description
21h	Only retries of the read operation and CIRC are used (layered error correction is not used). Only CIRC unrecovered data errors are reported. If a CIRC unrecovered data error occurs data transfer is terminated with CHECK CONDITION status. The block with the error is transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the unrecovered error was detected. Recovered errors are not reported.
24h	The maximum error recovery procedures available are used. Recovered data errors are reported. If a recovered data error occurs data transfer is not terminated. However, when the data transfer has completed, CHECK CONDITION status is reported. The sense key is set to RECOVERED ERROR. The information bytes give the address of the last block where a recovered data error was detected. If a data error occurs that is uncorrectable with the ECC information available on the media data transfer is terminated and CHECK CONDITION status is reported. The block with the error is transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the uncorrectable error was detected.
25h	Only retries of the read operation and CIRC are used (layered error correction is not used). Recovered data errors are reported. If a recovered data error occurs, data transfer is not terminated. However, when the data transfer has completed, CHECK CONDITION status is reported. The sense key is set to RECOVERED ERROR. The information bytes give the address of the last block where a CIRC recovered data error was detected. If an unrecovered data error occurs, data transfer is terminated and CHECK CONDITION status is reported. The block with the error is transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the unrecovered error was detected.
26h	The maximum error recovery procedures are used. Recovered data errors are reported. If a recovered data error occurs, data transfer is terminated and CHECK CONDITION status is reported. The block with the recovered error is transferred. The sense key is set to RECOVERED ERROR. The information bytes give the address of the block where the recovered data error was detected. If a data error occurs that is uncorrectable with the ECC information on the media, data transfer is terminated with CHECK CONDITION status. The block with the error is transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the uncorrectable error was detected.
27h	Only retries of the read operation are used (layered error correction is not used). CIRC recovered data errors are reported. If a CIRC recovered data error occurs, data transfer is terminated with CHECK CONDITION status. The block with the recovered error is transferred. The sense key is set to RECOVERED ERROR. The information bytes give the address of the block where the recovered data error was detected. If a CIRC unrecovered data error occurs, data transfer is terminated with CHECK CONDITION status. The block with the error is transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the unrecovered error was detected.

Table 67 - C/DVD Error Recovery Descriptions (DVD-ROM media)

Code	Error Recovery Description
00h	The maximum error recovery procedures available are used. If an error occurs which is uncorrectable with the error correction codes (ECC) on the media, data transfer is terminated with CHECK CONDITION status. The block with the error is not transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the unrecovered error was detected. Recovered errors are not reported.
04h	The maximum error recovery procedures available are used. Recovered data errors are reported. If a recovered data error occurs, data transfer is not terminated. However, when the data transfer has completed CHECK CONDITION status is reported. The sense key is set to RECOVERED ERROR. The information bytes give the address of the last block where a recovered data error was detected. If a data error occurs that is uncorrectable with the ECC information available on the media, data transfer is terminated and CHECK CONDITION status is reported. The block with the error is not transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the uncorrectable error was detected. The only possible recovered errors are when a block is automatically reassigned using ARRE.

Table 67 - C/DVD Error Recovery Descriptions (DVD-ROM media)

Code	Error Recovery Description
10h	If data transfer can be maintained, the maximum error recovery procedures available are used. (EC = 1.) If an error occurs which is uncorrectable with the error correction codes (ECC) on the media, or is uncorrectable in time to maintain data transfer, the data transfer is not terminated. However, when the data transfer has completed, CHECK CONDITION status is reported. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the first unrecovered error was detected. Recovered errors are not reported.
20h	The maximum error recovery procedures available are used. If an error occurs which is uncorrectable with the error correction codes (ECC) on the media, data transfer is terminated with CHECK CONDITION status. The block with the error is transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the unrecovered error was detected. Recovered errors are not reported.
24h	The maximum error recovery procedures available are used. Recovered data errors are reported. If a recovered data error occurs data transfer is not terminated. However, when the data transfer has completed, CHECK CONDITION status is reported. The sense key is set to RECOVERED ERROR. The information bytes give the address of the last block where a recovered data error was detected. If a data error occurs that is uncorrectable with the ECC information available on the media data transfer is terminated and CHECK CONDITION status is reported. The block with the error is transferred. The sense key is set to MEDIUM ERROR. The information bytes give the address of the block where the uncorrectable error was detected. The only possible recovered errors are when a block is automatically reassigned using ARRE.

The Read Retry Count field specifies the number of times that the controller shall attempt its read recovery algorithm.

The Write Retry Count field specifies the number of times that the controller shall attempt its write recovery algorithm. This may not have any affect if the Logical Unit does not support read after write operations.

A CIRC Recovered Data Error is defined as a block for which the CIRC based error correction algorithm was unsuccessful for a read attempt, but on a subsequent read operation no error was reported. The number of subsequent read operations is limited to the read retry count. Layered error correction was not used.

A CIRC Unrecovered Data Error is defined as a block for which the CIRC based error correction algorithm was unsuccessful on all read attempts up to the read retry count. Layered error correction was not used.

An L-EC Recovered Data Error is defined as a block for which the CIRC based error correction algorithm was unsuccessful, but the layered error correction was able to correct the block within the read retry count.

An L-EC Uncorrectable Data Error is defined as a block which could not be corrected by layered error correction within the read retry count.

9.1.8.2 Power Condition Page

The power condition page provides the application client the means to control the length of time a logical unit will delay before changing its power requirements. There are notification events to the host that a logical unit has entered into one of the power conditions.

Table 68 - Power Condition Mode Page Format

Bit Byte	7	6	5	4	3	2	1	0
0	PS (Optional)	Reserved	Page Code (1Ah)					
1	Page Length (0Ah)							
2								
3	Reserved					Idle	Standby	
4	MSE Idle Timer							
5								
6								
7								
8	MSE Standby Timer							
9								
10								
11								

On the receipt of a command the Logical Unit shall adjust itself to the power condition which allows the command to execute. The timer which maps to this power condition and any lower power condition timers shall be reset on receipt of the command. On completion of the command the timer associated with this power condition shall be restarted.

An Idle bit of one indicates a logical unit shall use the Idle Timer to determine the length of inactivity time to wait before entering the Idle condition.

If the Idle bit is zero, or a value of zero in the Idle Timer indicates the logical unit shall disable the Idle Timer.

The Idle Timer field indicates the inactivity time in 100 millisecond increments that the logical unit shall wait before entering the Idle condition.

A Standby bit of one indicates a logical unit shall use the Standby Timer to determine the length of inactivity time to wait before entering the Standby condition.

The Standby Timer field indicates the inactivity time in 100 millisecond increments that the logical unit shall wait before entering the Standby condition.

If the Standby bit is zero or a value of zero in the Standby Timer indicates the logical unit shall disable the Standby Timer.

For more information on these timers see section 7.1.2, "Timers", on page 77.

9.1.8.3 CD Audio Control Parameters Page

The CD Audio Control Parameters Page sets the playback modes and output controls for subsequent PLAY AUDIO commands and any current audio playback operation.

Table 69 - CD Audio Control Mode Page Format

Bit Byte	7	6	5	4	3	2	1	0
0	PS (Optional)	Reserved	Page Code (0Eh)					
1	PageLength (0Eh)							
2	Reserved					Immed (Mandato- ry) Always 1	SOTC (Mandato- ry) Default 0	Reserved
3	Reserved							
4	Reserved							
5	Reserved							
6	Obsolete (75)							
7								
8	Reserved				CDDA Output Port 0 Channel Selection			
9	Output Port 0 Volume (Mandatory) Default FFh							
10	Reserved				CDDA Output Port 1 Channel Selection			
11	Output Port 1 Volume (Mandatory) Default FFh							
12	Reserved				CDDA Output Port 2 Channel Selection			
13	Output Port 2 Volume (Optional) Default 00h							
14	Reserved				CDDA Output Port 3 Channel Selection			
15	Output Port 3 Volume (Optional) Default 00h							

The Parameters Savable (PS) bit is only used with the MODE SENSE command. The PS bit is optional. This bit is reserved with the MODE SELECT command. A PS bit of one indicates that the C/DVD Logical Unit is capable of saving the page in a non-volatile vendor-specific location.

The Immediate Bit (IMMED) is used for information purposes only; the audio commands will always send completion status as soon as the playback operation has been started. This bit shall always be set to 1.

A Stop On Track Crossing (SOTC) bit of zero indicates the C/DVD Logical Unit shall terminate the audio playback operation when the transfer length is satisfied. Multiple tracks shall be played as necessary. Periods of time encoded as audio pause/silence at the beginning of tracks, (index 0) shall also be played. A SOTC bit of one indicates the C/DVD Logical Unit shall terminate the audio playback operation when the beginning of a following track is encountered. The SOTC bit is mandatory.

The CDDA Output Port Channel Selection field specifies the Red Book audio channels from the disc to which a specific output port shall be connected. More than one output port may be connected to an audio channel. More than one audio channel may be connected to an output port.

Table 70 - CDDA Output Port Channel Selection Codes

Code	Description
0000b	Output port muted
0001b	Connect audio channel 0 to this output port
0010b	Connect audio channel 1 to this output port
0011b	Connect audio channel 0 and audio channel 1 to this output port
0100b	Connect audio channel 2 to this output port
1000b	Connect audio channel 3 to this output port

The Output Port Volume Control indicates the relative volume level for this audio output port. The value used is specified as an attenuation of the normal volume level. A value of zero indicates the minimum volume level (Mute), and a value of FFh indicates maximum volume (No attenuation) level. It is recommended that the MUTE and volume functions should be supported on a per channel basis. The attenuation used shall be as specified in "Table 71 - Attenuation Levels for Audio". All values not shown in the table shall be valid, with the attenuation selected by interpolating using the known table values.

It is recommended that the Logical Unit support at least 16 volume levels. The actual attenuation levels for any given Binary attenuation value shall be given by the following equation: $20 \text{ Log (Binary Level / 256)}$

Note: Audio channel volume control regarding channel selection of MUTE vs. Volume Level setting of 0. It is recommend that Logical Units allow the setting of the Channel Selection fields to MUTE and also allow the setting of the Volume Level field to 0. It is up to the Logical Unit to determine how to shut off the volume, either via muting circuitry or via the volume control.

Table 71 - Attenuation Levels for Audio

Binary Level	Attenuation
FFh	0dB (0h)
F0h	-0.56
E0h	-1.16
C0h	-2.50
80h	-6.00
40h	-12.0
20h	-18.0
10h	-24.0
0Fh	-24.6
0Eh	-25.2
0Ch	-26.6
08h	-30.0
04h	-36.0
02h	-42.1
01h	-48.0
00h	Mute (0h)

9.1.8.4 Feature Set Support & Version Page

The Feature Set Support & Version page specifies which sets and their versions that are supported. Each entry in the page contains 16 bits. Each bit in the entry correspond to one version. The least significant bit the first version supported. All logical units that support a feature as specified in this specification shall set bit 0 to one. All other bits are reserved.

This page is read only and shall not be changeable by the host.

Table 72 - Feature Set Support & Version Page Format

Bit Byte	7	6	5	4	3	2	1	0
0	PS (Optional) Default 0	Reserved	Page Code (18h)					
1	Page Length (16h)							
2	(MSB)	CD Audio						(LSB)
3								
4	(MSB)	Embedded Changer						(LSB)
5								
6	(MSB)	Packet SMART						(LSB)
7								
8	(MSB)	Persistent Prevent (MESN)						(LSB)
9								
10	(MSB)	Event Status Notification						(LSB)
11								
12	(MSB)	Digital Output						(LSB)
13								
14	(MSB)	CD Sequential Recordable						(LSB)
15								
16	(MSB)	DVD Sequential Recordable						(LSB)
17								
18	(MSB)	Random Recordable						(LSB)
19								
20	(MSB)	Key Exchange						(LSB)
21								
22	Reserved							
23	Reserved							

The Parameters Savable (PS) bit is only used with the MODE SENSE command. This bit is reserved with the MODE SELECT command. A PS bit of one indicates that the C/DVD Logical Unit is capable of saving the page in a non-volatile vendor-specific location. The PS bit is optional.

9.1.8.5 Fault / Failure Reporting Control Page

The Fault / Failure Reporting control page defines the methods used by the target to control the reporting and the operations of specific informational exception conditions. This page shall only apply to informational exception that report an additional sense code of FAILURE PREDICTION THRESHOLD EXCEEDED to the application client.

Informational exception conditions occur as result of vendor specific events within a target. An informational exception condition may occur asynchronous to any commands issued by an application client.

Table 73 - Fault / Failure Reporting Page Format

Bit Byte	7	6	5	4	3	2	1	0																
0	PS (Optional) Default 0	Reserved	Page Code (1Ch)																					
1	Page Length (0Ah)																							
2	Perf	Reserved			DExcept	Test	Reserve	LogErr (0)																
3	Reserved				MRIE																			
4	MSE																							
5									Interval Timer															
6																	Report Count							
7																								
8	MSE																							
9									Report Count															
10																	LSB							
11																								

The log errors bit (LogErr) of zero indicates that the logging of informational exception conditions within a Logical Unit is vendor specific.

A disable exception control (DExcpt) bit of zero indicates information exception operations shall be enabled. The reporting of informational exception conditions when the DExcpt bit is set to zero is determined from the method of reporting informational exception field. A DExcpt bit of one indicates the Logical Unit shall disable all information exception operations. The method of reporting Fault / Failure Reporting field is ignored when DExcpt is set to one.

A Test bit of one shall create a false Logical Unit failure at the next interval time (as specified by the Interval timer field), if the DExcpt bit is not set. When the Test bit is one, the MRIE and Report count fields shall apply as if the Test bit were zero. The false Logical Unit failure shall be reported with an additional sense code of FAILURE PREDICTION THRESHOLD EXCEEDED (FALSE). If both the Test and the DExcpt bits are one, the Logical Unit shall terminate the MODE SELECT command with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST with the additional sense code set to INVALID FIELD IN PARAMETER LIST. A Test bit of zero shall instruct the Logical Unit not to generate any false Logical Unit failure notifications.

A Performance bit (Perf) of zero indicates that informational exception operations that are the cause of delays are acceptable. A Perf bit of one indicates the Logical Unit shall not cause delays while doing informational exception operations. A Perf bit set to one may cause the Logical Unit to disable some or all of the informational exception operations, thereby limiting the reporting of informational exception conditions.

The Method of Reporting Fault / Failure Reporting field (MRIE) indicates the methods that shall be used by the Logical Unit to report informational exception conditions (see Table 74 - on page 124). The priority of reporting multiple information exceptions is vendor specific.

Table 74- Method of Reporting Fault / Failure Reporting field

MRIE	Description
0h	No reporting of informational exception condition: This method instructs the target to not report information exception conditions.
1h - 3h	Reserved
4h	Unconditionally generate recovered error: This method instructs the target to report informational exception conditions, regardless of the value of the per bit of the error recovery parameters mode page, by returning a CHECK CONDITION status on any command. The sense key shall be set to RECOVERD ERROR and the additional sense code shall be set to 5D/00 FAILURE PREDICTION THRESHOLD EXCEEDED - Predicted Logical Unit Failure or 5D/01 FAILURE PREDICTION THRESHOLD EXCEEDED - Predicted Media Failure. The command that has the CHECK CONDITION shall complete without error before any informational exception condition may be reported.
5h - 8h	Reserved
Ch - Fh	Vendor specific

The Interval Timer field indicates the period in 100 millisecond increments that a informational exception condition has occurred. The Logical Unit shall not report informational exception conditions more frequently than the time specified by the Interval Timer field and as soon as possible after the timer interval has elapsed. After the informational exception condition has been reported the interval timer shall be restarted. A value of zero in the Interval Timer field indicates that the Logical Unit shall only report the informational exception condition one time.

The Report Count field indicates the number of times to report an informational exception condition to the application client. A value of zero in the Report Count field indicates there is no limit on the number of times the Logical Unit shall report an informational exception condition.

The maintaining of the Interval Timer and the Report Count field across power cycles and/or resets by the Logical Unit shall be vendor specific.

9.1.8.6 C/DVD Time-out & Protect Page

The C/DVD Time-out & Protect parameters page specifies parameters that affect C/DVD operation.

Table 75 - C/DVD Time-out & Protect Page Format

Bit Byte	7	6	5	4	3	2	1	0
0	PS (Optional) Default 0	Reserved	Page Code (1Dh)					
1	Page Length (08h)							
2	Reserved							
3	Reserved							
4	Reserved						DISP (Optional) Default 0	SWPP (Optional) Default 0
5	Reserved							
6	Group 1 Minimum Time-out (Seconds)							
7								
8	Group 2 Minimum Time-out (Seconds)							
9								

The Parameters Savable (PS) bit is only used with the MODE SENSE command. This bit is reserved with the MODE SELECT command. A PS bit of one indicates that the C/DVD Logical Unit is capable of saving the page in a non-volatile vendor-specific location. The PS bit is optional.

The DISP bit when set to 1 shall make the Logical Unit unavailable until power has been removed and then reapplied. The Logical Unit shall report not ready for all media access after this bit has been set to 1.

The SWPP bit provides a Software Write Protect until Power down. When this bit is set to 1 the Logical Unit shall prevent writes to the media. When the bit is set to 1, the Logical Unit shall flush any data in the Cache to the media before preventing any further writes.

See the Time-out model for more information on the Group 1 & 2 Minimum Time-out fields.

9.1.8.7 C/DVD Capabilities and Mechanical Status Page

The Capabilities Page is read only and may not be set with Mode Select.

Table 76- C/DVD Capabilities and Mechanical Status Page Format

Bit Byte	7	6	5	4	3	2	1	0
0	PS	Reserved	Page Code (2Ah)					
1	Page Length (18h)							
2	Reserved		DVD-RAM Read	DVD-R Read	DVD-ROM Read	Method 2	CD-E Rd	CD-R Rd
3	Reserved		DVD-RAM Wr	DVD-R Write	Reserved	Test Write	CD-E Wr	CD-R Wr
4	Reserved	Multi Session	Mode 2 Form 2	Mode 2 Form 1	Digital Port(2)	Digital Port(1)	Composite	AudioPlay
5	Read Bar Code Capable	UPC	ISRC	C2 Pointers	R-W De-interleaved & corrected	R-W Supported	DAAccu	CD DA
6	Loading Mechanism Type			Reserved	Eject	Prevent Jumper	Lock State	Lock
7	Reserved			Side Change Capable	S/W Slot Selection (SSS)	Supports Disc Present (SDP)	Separate Channel Mute	Separate volume
8	(MSB) Obsolete Reserved							
9	(LSB)							
10	(MSB) Number of Volume Levels Supported							
11	(LSB)							
12	(MSB) Buffer Size supported by Logical Unit (in KBytes)							
13	(LSB)							
14	(MSB) Obsolete Reserved							
15	(LSB)							
16	Obsolete Reserved							
17	Reserved	Length		LSEF	RCK	BCK	Reserved	
18	(MSB) Obsolete Reserved							
19	(LSB)							
18	(MSB) Obsolete Reserved							
19	(LSB)							
20	Copy Management Revision Supported							
21								
22	Reserved							
23	Reserved							

Media Function Capabilities:

If CD-R Read Field is set to one, the Logical Unit shall support the read function of CD-R disc (Orange Book Part II).

If CD-E Read Field is set to one, the Logical Unit shall support the read function of CD-E disc (Orange Book Part III).

If Method 2 is set to one, the Logical Unit shall support the read function of CD-R media written using fixed packet tracks using Addressing Method 2.

If DVD-ROM Read bit (read only field) is set to one, the Logical Unit shall support the read function of DVD-ROM disc.

If DVD-RAM Read bit (read only field) is set to one, the Logical Unit shall support the read function of DVD-RAM disc.

If DVD-R Read bit (read only field) is set to one, the Logical Unit shall support the read function of DVD-R disc.

If CD-R Write Field is set to one, the Logical Unit shall support the write function of CD-R disc (Orange Book Part II).

If CD-E Write Field is set to one, the Logical Unit shall support the write function of CD-E disc (Orange Book Part III).

If DVD-RAM Write bit (read only field) is set to one, the Logical Unit shall support the write function of DVD-RAM disc.

If DVD-R Write bit (read only field) is set to one, the Logical Unit shall support the write function of DVD-R disc.

If the Test Write bit is set to one, the Logical Unit shall only accept data from the host and not write to the media.

The individual capabilities of the Logical Unit are specified by bytes 4 through 7. Each of the bits indicate if that specific capability is supported. A value of zero indicates that the capability is NOT supported; a value of one indicates the capability IS supported.

Bit 0 - Audio Play The Logical Unit is capable of Audio Play operation. This also indicates that the Logical Unit is capable of overlapping Play and other commands such as reading of the Sub-channel information.

Bit 1 - Composite The Logical Unit is capable of delivering a composite Audio and Video data stream.

Bit 2 - Digital Port(1) The Logical Unit supports digital output (IEC958) on port 1

Bit 3 - Digital Port(2) The Logical Unit supports digital output(IEC958) on port 2

Bit 4 - Mode 2 Form 1 The Logical Unit is capable of reading sectors in Mode 2 Form 1 (XA) format.

Bit 5 - Mode 2 Form 2 The Logical Unit is capable of reading sectors in Mode 2 Form 2 format. Bit 6 Multi Session The Logical Unit is capable of reading multiple session or Photo CD discs.

Bit 8 - CD-DA Commands Supported Red Book audio can be read using the READ-CD command.

Bit 9 - CD-DA Stream is Accurate This bit indicates that the Logical Unit supports an advanced feature that allows it to return to an audio location without losing place to continue the READ CD-DA command. 0 The Logical Unit is incapable of accurately restarting the CD-DA read operation, and a BUFFER OVERFLOW error shall be reported whenever a loss of streaming occurs. This error will be fatal and the command will have to be repeated from the beginning. 1 The Logical Unit can continue from a loss of streaming condition and no error will be generated.

Bit 10 - R-W Supported The commands that return Sub-channel data can return the combined R-W information.

Bit 11 - R-W De-interleaved & Corrected This indicates that the R-W sub-channel data will be returned de-interleaved and error corrected.

Bit 12 - C2 Pointers are Supported This indicates that the Logical Unit supports the C2 Error Pointers. This also indicates that the Logical Unit is capable of returning the C2 Error Pointers and C2 Block Error flags in the READ CD command. Bit 13 ISRC The Logical Unit can return the International Standard Recording Code Information.

Bit 14 - UPC The Logical Unit can return the Media Catalog Number (UPC)

Bit 15 - Read Bar Code The Logical Unit is capable of reading the disc bar code.

Bit 16 - Lock The PREVENT/ALLOW command is capable of actually locking the media into the Logical Unit.

Bit 17 - Lock State This indicates the current state of the Logical Unit. 0 The Logical Unit is currently in the allow (Unlocked) state. Media may be inserted or ejected. 1 The Logical Unit is currently in the prevent (Locked) state. Media loaded in the Logical Unit may not be removed via a soft or hard eject. If the Logical Unit is empty, media may not be inserted if the Prevent Jumper is not present. If the jumper is present, then media may be inserted.

Bit 18 - Prevent Jumper This indicates the state of the (Optional) Prevent/Allow Jumper. 0 Jumper is present. Logical Unit will power up to the allow state. Locking the Logical Unit with the Prevent/Allow Command shall NOT prevent the insertion of media. 1 Jumper is not present. Logical Unit will power up to the Prevent State (Locked). The Logical Unit will not accept new media or allow the ejection of media already loaded until an allow command is issued.

Bit 19 - Eject Command The Logical Unit can eject the disc via the normal START/STOP command with the LoEj bit set. If the mechanism is a Changer that uses a Cartridge, then this bit indicates that the Cartridge can be ejected.

Bit 20 - Reserved

Bit 23-21 - Loading Mechanism Type This field specifies the type of disc loading the Logical Unit supports.

23 22 21

0 0 0 Caddy type loading mechanism

0 0 1 Tray type loading mechanism

0 1 0 Popup type loading mechanism

0 1 1 Reserved

1 0 0 Changer with individually changeable discs

1 0 1 Changer using a Cartridge Mechanism

1 1 0 Reserved

1 1 1 Reserved

Bit 24 - Separate Volume Levels The audio level for each channel can be controlled independently.

Bit 25 - Separate Channel Mute The mute capability for each channel can be controlled independently.

Bit 26 - Supports Disc Present (SDP) This bit indicates that the Logical Unit contains an embedded changer, and that after a reset condition or if a cartridge is changed, it can report the exact contents of the slots. The response to the MECHANISM STATUS command will contain valid Disc is Present status information for all slots.

Bit 27 - Software Slot Selection (SSS) This bit controls the behavior of the LOAD/UNLOAD command when trying to load a Slot with no Disc present (see "Table 48 - Load/Unload or Optional Selection Operations" on page 101).

Bit 28 - Side Change Capable This bit indicates that the Logical Unit is capable of selecting both sides of the Discs. This capability can be reported for Logical Units that have changer functions.

The Number of Volume Levels Supported field returns the number of discrete levels. If the Logical Unit only supports turning audio on and off, the Number of Volume Levels field shall be set to 2.

The Buffer Size Supported field returns the number of bytes of buffer dedicated to the data stream returned to the Host Computer. This value is returned in Kbytes (Size/1024). If the Logical Unit does not have a buffer cache, the value returned shall be zero.

Byte 17 - is used to describe the format of the Logical Units digital output.

Bit 1 - BCKF Set if data valid on the falling edge of the BCK signal. Clear if data valid on the rising edge of the BCK signal

Bit 2 - RCK Set if HIGH on LRCK indicates left channel. Clear if HIGH on LRCK indicates right channel.

Bit 3 - LSBF Set if LSB first. Clear if MSB first.

Bit 4-5 - Length 00 32 BCKs 01 16 BCKs 10 24 BCKs 11 24 BCKs (I 2 S)

The Copy Management Revision Supported Field indicates the version of the DVD Copy Protection scheme that is supported by the Logical Unit. This shall be 0001h to comply with this specification.

9.1.9 PREVENT/ALLOW MEDIUM REMOVAL Command

The PREVENT/ALLOW MEDIUM REMOVAL command requests that the C/DVD Logical Unit enable or disable the removal of the medium. The prevention of media removal (when implemented) shall be accomplished through the use of a Locking Mechanism. The use of a physical locking mechanism is optional. If a non persistent prevent is issued and the Logical Unit does not support a physical locking mechanism an error shall be returned (Sense key 05 ILLEGAL REQUEST, Sense Code 24 INVALID FIELD IN COMMAND PACKET). If the operation is persistent then the prevent will not be reset when media is removed or inserted. This will allow new media to become captive without host interaction. The Persistent Prevent is to be used in conjunction with the Get Event Status Notification command, to prevent media from being ejected with dirty file system buffers.

Table 77 - PREVENT ALLOW MEDIUM REMOVAL Command

Byte	Bit	7	6	5	4	3	2	1	0	
0		Operation Code (LEH)								
1		LUN				Reserved				
2		Reserved								
3		Reserved								
4		Reserved						Persistent	Prevent	
5		Vendor-Specific	Reserved			NACA	Flag	Link		
6		PAD								
7										
8										
9										
10										
11										

The persistent bit indicates that this will be a persistent prevent / allow command. If the prevent bit is a 1, upon receiving this command, the target shall disable any hardware eject mechanisms, and all media after initial drive spin up, shall remain locked in the drive until the host issues an eject request, or persistent prevent status is reset and the hardware eject mechanism again becomes available.

The persistent prevent status shall be reset upon receipt of a persistent allow command, a bus reset, or a power reset condition.

Upon insertion of new media, under persistent prevent conditions, the target eject controls shall remain functional up until the drive generates a New Media event as defined in the Media Status Events section. After this event has been generated, the media shall remain locked as defined above.

Note: the prevent command with a persistent bit of 1, shall not prevent an eject request from the host from succeeding.

The behavior of the prevent / allow command with a persistent bit of 0 is not effected by the persistent prevent state. The prevention of medium removal shall begin when the Host Computer issues a PREVENT/ALLOW MEDIUM REMOVAL command with a prevent bit of one and a Persistent bit of zero (medium removal prevented). The prevention of medium removal shall terminate:

1. after the Host Computer has issued a PREVENT ALLOW MEDIUM REMOVAL command with a prevent bit of zero (Unlock), and the C/DVD Logical Unit has successfully performed a Flush cache operation; or
2. upon a hard RESET condition; or
3. upon a DEVICE RESET in an ATAPI environment; or
4. if the drive does not support a locking mechanism.

While a prevention of medium removal condition is in effect (Locked) the C/DVD Logical Unit shall inhibit mechanisms that normally allow removal of the medium by an operator. This is also the case for Changers.

The default state of the drive at power on is unlocked, unless the drive supports a prevent/allow jumper and the jumper is in the prevent state (See "9.1.8.7 C/DVD Capabilities and Mechanical Status Page" on page 126.)

This command will affect the actions of the START/STOP UNIT command (See "9.1.14 START/STOP UNIT Command" on page 147) and other mechanisms external to this specification (manual ejection / media removal systems.)

Table 78 - Actions for Lock/Unlock/Eject

Operation	Locked / Unlocked	If Drive Not Ready (No Media)	If Drive Ready (Media Present)
Unlock (Prevent = 0)	Unlocked	No Error	No Error
	Locked	No Error, Now media may be inserted	No Error, Now media may be removed
Lock (Prevent = 1)	Unlocked	No Error, Drive door locked and will not allow media to be inserted	No Error, Drive door locked and will not allow media to be removed
	Locked	No Error	No Error
Lock when the drive does not support a Locking Mechanism	Would always be Unlocked	Error: 05 ILL EGAL REQ UEST, 24 I NVAL I D F IEL D I N C OMM A N D P A C K E T	Error: 05 ILL EGAL REQ UEST, 24 I NVAL I D F IEL D I N C OMM A N D P A C K E T
Eject (START/STOP UNIT command with LoEj set)	Unlocked	No Error and Tray is opened	No Error: Media Ejects
	Locked	Error: 02 Not ready, 53 Media Removal Prevented	Error: 05 Illegal Request, 53 Media Removal Prevented
Manual Eject	Unlocked	Tray opens (If tray exists)	Media is Ejected
	Locked	No operation occurs	No operation, Media stays locked in drive

Table 79 - Recommended Sense Key, ASC and ASCQ for Prevent/Allow Command Errors

Sense Key	ASC	ASCQ	Description of Error
02	04	00	LOGICAL UNIT NOT READY - CAUSE NOT REPORTABLE
02	04	01	LOGICAL UNIT NOT READY - IN PROGRESS OF BECOMING READY
02	04	02	LOGICAL UNIT NOT READY - INITIALIZING COMMAND REQUIRED
02	04	03	LOGICAL UNIT NOT READY - MANUAL INTERVENTION REQUIRED
02	3A	00	MEDIUM NOT PRESENT
05	20	00	INVALID COMMAND OPERATION CODE
05	24	00	INVALID FIELD IN COMMAND PACKET
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	DEVICE OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

9.1.10 READ (12) Command

The READ (12) command requests that the C/DVD Logical Unit transfer data to the Host Computer. The most recent data value written in the addressed logical block shall be returned.

Table 80 - READ (12) Command

Byte	Bit	7	6	5	4	3	2	1	0																								
0		Operation Code (A8h)																															
1		LUN			DPO (0)	FUA	Reserved		RelAdr																								
2		Logical Block Address																															
3										Logical Block Address																							
4																		Logical Block Address															
5																										Logical Block Address							
6																																	
7		Logical Block Address																															
8										Logical Block Address																							
9																		Logical Block Address															
10																										Logical Block Address							
11																																	

The RelAdr bit is only used for SCSI Logical Units. For information on this bit See “Use of the RelAdr bit” on page 257.

The Disable Page Out (DPO) bit is not used by C/DVD Logical Units and shall be set to zero. A DPO bit of zero indicates the priority shall be determined by the retention priority fields in the cache page if supported. All other aspects of the algorithm implementing the cache memory replacement strategy are vendor specific.

A Force Unit Access (FUA) bit of one indicates that the C/DVD Logical Unit shall access the media in performing the command. Read commands shall access the specified logical blocks from the media (i.e. the data is not directly retrieved from the cache). In the case where the cache contains a more recent version of a logical block than the media, the logical block shall first be written to the media.

An FUA bit of zero indicates that the C/DVD Logical Unit may satisfy the command by accessing the cache memory. For read operations, any logical blocks that are contained in the cache memory may be transferred to the Host directly from the cache memory.

The Transfer Length field specifies the number of contiguous logical blocks of data that shall be transferred. A transfer length of zero indicates that no logical blocks shall be transferred. This condition shall not be considered an error. Any other value indicates the number of logical blocks that shall be transferred.

Although the C/DVD Logical Unit is capable of returning a variety of data, this command shall only return the “User Data” portion of the sector. This length is always 2048 bytes.

For CD Media Mode 1 and Mode 2 Form 1 sectors are the only sector types allowed. For all other sector types, the Logical Unit shall set the ILI bit in the Request Sense Standard Data and return a “ILLEGAL MODE FOR THIS TRACK” error if any read to them using this command is attempted.

For DVD media, all the sectors are of the same type, thus the user data portion of any sector in the user area of the media can be read with this command.

Table 81 - Recommended Sense Key, ASC and ASCQ for READ Command Errors

Sense Key	ASC	ASCQ	Description of Error
01	17	01	RECOVERED DATA WITH RETRIES
01	18	01	RECOVERED DATA WITH ERROR CORRECTION & RETRIES APPLIED
01	18	04	RECOVERED DATA WITH ECC
01	5D	01	FAILURE PREDICTION THRESHOLD EXCEEDED - Predicted Media Failure
02	04	00	LOGICAL UNIT NOT READY - CAUSE NOT REPORTABLE
02	04	01	LOGICAL UNIT NOT READY - IN PROGRESS OF BECOMING READY
02	04	02	LOGICAL UNIT NOT READY - INITIALIZING COMMAND REQUIRED
02	04	03	LOGICAL UNIT NOT READY - MANUAL INTERVENTION REQUIRED
02	06	00	NO REFERENCE POSITION FOUND (media may be upside down)
02	3A	00	MEDIUM NOT PRESENT
03	02	00	NO SEEK COMPLETE
03	11	05	ECC UNCORRECTABLE ERROR
03	11	06	CIRC UNRECOVERED ERROR (CD Media only)
04	15	00	RANDOM POSITIONING ERROR
04	15	01	MECHANICAL POSITIONING ERROR
05	20	00	INVALID COMMAND OPERATION CODE
05	21	00	LOGICAL BLOCK ADDRESS OUT OF RANGE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	30	01	CANNOT READ MEDIUM - UNKNOWN FORMAT
05	30	02	CANNOT READ MEDIUM - INCOMPATIBLE FORMAT
05	6F	03	READ OF SCRAMBLED SECTOR WITHOUT AUTHENTICATION
06	28	00	NOT READY TO READY TRANSITION
05	64	00	ILLEGAL MODE FOR THIS TRACK OR INCOMPATIBLE MEDIUM
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	DEVICE OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

9.1.11 READ DVD STRUCTURE Command

The READ DVD STRUCTURE command requests that the DVD Logical Unit transfer data from areas on the DVD Media to the Host Computer. There are several control structures on the DVD media, including the Lead-in and Burst Cutting Area (BCA). The Lead-in area for DVD media contain information about the media as well as information used by the Logical Unit to allow it to recover information from the media. The BCA for DVD media is optional which contents is specified by media manufacture.

Table 82 - READ DVD STRUCTURE Command

Byte	Bit	7	6	5	4	3	2	1	0	
0		Operation code (ADh)								
1		LUN				Reserved				
2		Reserved for RMD Block Number								
3										
4										
5										
6										
7		Layer Number								
8		Format								
9		Allocation Length								
10		AGID				Reserved				
11		Vendor-Specific				Reserved		NACA	Flag	Link

The Format field indicates the type of information that is requested be sent to the host.

The Layer Number field specifies the starting layer number for which the DVD STRUCTURE data will be returned.

The AGID field is described in the REPORT KEY command. This field is used only when the Format field contains 2h, for all other values it is reserved.

When a READ DVD STRUCTURE Command is presented for a CD media, this command shall be terminated with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code set to INVALID COMMAND OPERATION CODE.

Table 83 - Format Code definitions for READ DVD STRUCTURE command

Format Code	Returned Data	Type or Feature	Layer/Byte Usage	Description
00h	Physical	Mandatory	Layer Number	Returns information in the DVD Lead-in area
01h	Copyright	Mandatory	Layer Number	Returns the Copyright information from DVD Lead-in
02h	Disc Key	Key Exchange Feature	Reserved	Returns the Disc Key obfuscated by using a Bus Key
03h	BCA	Optional	Reserved	Returns the BCA information on DVD media
04h	Manufacturer's	Mandatory	Layer Number	Returns the Disc Manufacturing information from DVD Lead-in
05h - FFh				Reserved

Table 84- READ DVD STRUCTURE Data Format (With Format Field = 00h)

Bit Byte	7	6	5	4	3	2	1	0
0	MSB DVD STRUCTURE Data Length							
1	LSB							
2	Reserved							
3	Reserved							
DVD Lead-in Structures								
1 or more Layer Descriptors								

Table 85- Layer Descriptor(s)

Bit Byte	7	6	5	4	3	2	1	0
0	MSB Length of Layer Information							
1	LSB							
2	Book Type				Book Version			
3	Disc Size				Minimum Rate			
4	Reserved	Number of Layers		Track Path	Layer Type			
5	Linear Density				Track Density			
6	00h							
7	MSB Starting Sector Number of Main Data (030000h)							
8								
9	LSB							
10	00h							
11	MSB End Sector of Main Data							
12								
13	LSB							
14	00h							
15	MSB End Sector Number in Layer 0							
16								
17	LSB							
18	ECA Flag	Reserved						
19	Reserved							

The DVD STRUCTURE Data Length specifies the length in bytes of the following DVD STRUCTURE data that is available to be transferred to the Host. The DVD STRUCTURE Data Length value does not include the DVD STRUCTURE Data Length field itself.

The Length of Layer Information specifies the length in bytes of a Layer Information that follow.

This information is returned for DVD media Only. The information for the starting layer specified by the Layer Number field in the Command Packet and information for all higher layer numbers is returned. If there is only one layer then the only valid layer is layer 0. If a nonexistent layer is requested then the command shall be aborted with an INVALID FIELD IN THE COMMAND PACKET error. If the media has more than one layer, but is recorded using the Opposite Track Path method, then the same information shall be returned for all layers.

The Book Type field specifies which DVD Book this media complies with. Currently the only valid value is 0h for DVD-ROM.

The Book Version specifies the version of the specified book that this media complies with.

The Disc Size specifies the physical size of the Media. A value of 0000b specifies 120mm, a value of 0001b specifies a size of 80mm.

The Minimum Rate is used to specify to the Logical Unit the read rate to use for this media.

0000b 2.52 Mbps 0001b 5.04 Mbps 0010b 10.08 Mbps

The Number of Layers field specifies the number of layers for this side of the media. A value of 00b indicates that the media has only one layer. A value of 01b specifies that this side of the media has two layers. Currently only one and two layer discs are specified.

The Track Path bit specifies the direction of the layers when more than one layer is used. If the bit is cleared to 0 then this media uses Parallel Track Path (PTP). When PTP is used each layer is independent and has its own Lead-in and Leadoff areas on the media. If the bit is set to 1 then the media uses Opposite Track Path (OTP). With opposite track path both layers are tied together. There is only one Lead-in and Leadoff. In the middle of the media there is an area called the middle area. The addresses of blocks in one layer are mirrored in the other layer.

The Layer Type field read/writability of the layer. Only a value of 0 indicating that the media is read only is specified today.

The Linear Density field indicates the minimum/maximum pit length used for this layer.

0000b 0.267 $\mu\text{m/bit}$ 0001b 0.293 $\mu\text{m/bit}$

The Track Density field indicates the track width used for this media.

0000b 0.74 $\mu\text{m/track}$

The Starting Sector Number of Main Data field specifies the first block that contains user data. Currently the only valid value is 030000h.

The End Sector of Main Data field specifies the last sector of the user data in the last layer of the media.

The End Sector Number in Layer 0 field specifies the last sector of the user data in layer 0. If this media does not use Opposite Track Path and contain Multiple Layers, this value is set to 000000h.

The BCA flag indicates the presence of data in the Burst Cutting Area. A bit of zero indicates BCA data does not exist. a bit of one indicates BCA data does exist.

Table 86 - READ DVD STRUCTURE Data Format (With Format Field = 01h)

Bit Byte	7	6	5	4	3	2	1	0
0	DVD STRUCTURE DataLength							
1								LSB
2	Reserved							
3	Reserved							
DVD Copyright Information								
4	Copyright Protection SystemType							
5	Region Management Information							
6	Reserved							
7	Reserved							

The DVD STRUCTURE Data Length specifies the length in bytes of the following DVD STRUCTURE data that is available to be transferred to the Host. The DVD STRUCTURE Data Length value does not include the DVD STRUCTURE Data Length field itself.

The Copyright Protection System Type field indicates the presence of data structures specific to a copyright protection system. Only two values are defined, 00h indicates there is no such data and 01h indicates a specific data structure exists. All other values are reserved.

The Region Management Information field describes the regions in which the disc can be played. Each bit represents one of eight regions. If a bit is set in this field, the disc can be played in the corresponding region. If a bit is cleared in this field the disc can not be played in the corresponding region.

Table 87 - READ DVD STRUCTURE Data Format (With Format Field = 02h)

Bit Byte	7	6	5	4	3	2	1	0
0	MSB DVD STRUCTURE DataLength							
1								LSB
2	Reserved							
3	Reserved							
Disc Key Structures								
0	MSB							
.								
2047	DISC KEY Data							LSB

The DVD STRUCTURE Data Length specifies the length in bytes of the following DVD STRUCTURE data that is available to be transferred to the Host. The DVD STRUCTURE Data Length value does not include the DVD STRUCTURE Data Length field itself.

DISC KEY Value field returns the DISC KEY which is obfuscated by a Bus Key. The length of DISC KEY value is currently 2048 bytes only.

When the DISC KEY does not exist on DVD media, this command with Format = 02h shall be terminated with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code set to COPY PROTECTION KEY EXCHANGE FAILURE - KEY NOT PRESENT.

When the DVD Logical Unit is not in the Bus Key state, this command with Format = 02h shall be terminated with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code set to COPY PROTECTION KEY EXCHANGE FAILURE - KEY NOT ESTABLISHED.

Table 88 - READ DVD STRUCTURE Data Format (With Format Field = 03h)

Bit Byte	7	6	5	4	3	2	1	0
0	MSB DVD STRUCTURE DataLength							
1								LSB
2	Reserved							
3	Reserved							
DVD BCA Structures								
0	MSB							
.								
.	BCA Information							
N								LSB

This Information is returned from BCA recorded DVD media only. The Length of BCA Information is in the range of 12 to 188 bytes.

When a READ DVD STRUCTURE Command with a format field value of 03h is presented for a DVD media without BCA, the command shall be terminated with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code set to INVALID FIELD IN COMMAND PACKET.

Table 89 - READ DVD STRUCTURE Data Format (With Format Field = 04h)

Bit Byte	7	6	5	4	3	2	1	0	
0	DVD STRUCTURE DataLength							MSB	
1								LSB	
2	Reserved								
3	Reserved								
DVD Manufacturer's Structures									
Disc Manufacturing Information									
2047									

The DVD STRUCTURE Data Length specifies the length in bytes of the following DVD STRUCTURE data that is available to be transferred to the Host. The DVD STRUCTURE Data Length value does not include the DVD STRUCTURE Data Length field itself.

The Disc Manufacturing Information is taken from the DVD media lead-in.

Table 90 - Recommended Sense Key, ASC and ASCQ for READ DVD STRUCTURE Command Errors

Sense Key	ASC	ASCQ	Description of Error
02	04	00	LOGICAL UNIT NOT READY - CAUSE NOT REPORTABLE
02	04	01	LOGICAL UNIT NOT READY - IN PROGRESS OF BECOMING READY
02	04	02	LOGICAL UNIT NOT READY - INITIALIZING COMMAND REQUIRED
02	04	03	LOGICAL UNIT NOT READY - MANUAL INTERVENTION REQUIRED
02	04	04	IN PROCESS OF BECOMING READY - WRITING
02	06	00	NO REFERENCE POSITION FOUND (media may be upside down)
02	3A	00	MEDIUM NOT PRESENT
04	15	00	RANDOM POSITIONING ERROR
04	15	01	MECHANICAL POSITIONING ERROR
05	20	00	INVALID COMMAND OPERATION CODE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	30	01	CANNOT READ MEDIUM - UNKNOWN FORMAT
05	30	02	CANNOT READ MEDIUM - INCOMPATIBLE FORMAT
05	6F	01	COPY PROTECTION KEY EXCHANGE FAILURE - KEY NOT PRESENT
05	6F	02	COPY PROTECTION KEY EXCHANGE FAILURE - KEY NOT ESTABLISHED
05	6F	03	READ OF SCRAMBLED SECTOR WITHOUT AUTHENTICATION
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON, RESET OR BUS DEVICE RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	DEVICE OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

9.1.12 READ C/DVD CAPACITY Command

The READ C/DVD CAPACITY command provides a means for the Host Computer to request information regarding the capacity of the Logical Unit. This function will be replaced by the Read Formatted Capacities command in the future. It is recommended that this command not be used.

Table 91 - READ C/DVD CAPACITY Command

Byte	Bit	7	6	5	4	3	2	1	0
0	Operation code (25h)								
1	LON			Reserved				RelAdr (0)	
2	Reserved								
3									
4									
5									
6									
7	Reserved								
8	Reserved							PMI (0)	
9	Vendor-Specific			Reserved			NACA	Flag	Link
10	PAD								
11									

The RelAdr and the PMI bits shall be reserved for C/DVD Logical Units.

Eight bytes of READ C/DVD CAPACITY data shall be returned to the Host Computer. The returned logical block address and the block length in bytes are those of the last logical block on the logical unit.

Table 92 - READ CAPACITY DATA

Bit Byte	7	6	5	4	3	2	1	0
0	MSE Logical Block Address							
1								
2								
3								
4	MSE Block Length in Bytes (Length reported shall be 2048d)							
5								
6								
7								

Table 93 - Recommended Sense Key, ASC and ASCQ for Read Capacity Command Errors

Sense Key	ASC	ASCQ	Description of Error
02	04	00	LOGICAL UNIT NOT READY - CAUSE NOT REPORTABLE
02	04	01	LOGICAL UNIT NOT READY - IN PROGRESS OF BECOMING READY
02	04	02	LOGICAL UNIT NOT READY - INITIALIZING COMMAND REQUIRED
02	04	03	LOGICAL UNIT NOT READY - MANUAL INTERVENTION REQUIRED
02	04	08	IN PROCESS OF BECOMING READY - WRITING
02	06	00	NO REFERENCE POSITION FOUND (media may be upside down)
02	3A	00	MEDIUM NOT PRESENT
05	20	00	INVALID COMMAND OPERATION CODE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	30	01	CANNOT READ MEDIUM - UNKNOWN FORMAT
05	30	02	CANNOT READ MEDIUM - INCOMPATIBLE FORMAT
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	DEVICE OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

9.1.13 SEND KEY Command

The SEND KEY command provides data necessary for authentication and for generating a Bus Key for the DVD Logical Unit.

This command, in conjunction with REPORT KEY command, is intended to perform authentication for Logical Units which conform to DVD Copy Protection scheme and to generate a Bus Key as the result of authentication.

Table 94 - SEND KEY Command

Byte	Bit	7	6	5	4	3	2	1	0	
0		Operation code (A3h)								
1		LUN			Reserved					
2		Reserved								
3		Reserved								
4		Reserved								
5		Reserved								
6		Reserved								
7		Reserved								
8		MSB		Parameter List Length						LSB
9										
10		AGID			KEY Format					
11		Vendor-Specific			Reserved			NACA	Flag	Link

The KEY Format field indicates the type of information that is requested to be sent to the host.

The AGID field is described in the REPORT KEY command.

Table 95 - Key Format Code definitions for SEND KEY Command

Key Format	Sent Data	Description
000001b	Challenge KEY	Send a Challenge KEY
000011b	KEY2	Send a KEY2
111111b		Invalidate Specified AGID
All other value		Reserved

Table 96- SEND KEY Parameter List (With KEY Format = 000001b)

Bit Byte	7	6	5	4	3	2	1	0
0	SEND KEY Parameter List Length (0Bh)							LSB
1								
2	Reserved							
3	Reserved							
Challenge Key								
0	Challenge Key Value							LSB
.								
9								
10	Reserved							
11	Reserved							

Challenge Key is sent to the DVD Logical Unit to get corresponding KEY1 from the DVD Logical Unit to interrogate conformity with DVD Copy Protection scheme.

Table 97- SEND KEY Parameter List (With KEY Format = 000011b)

Bit Byte	7	6	5	4	3	2	1	0
0	SEND KEY Parameter List Length (0Ah)							LSB
1								
2	Reserved							
3	Reserved							
KEY2								
0	KEY2 Value							LSB
.								
4								
5	Reserved							
6	Reserved							
7	Reserved							

The KEY2, generated external to the DVD Logical Unit, is sent to the DVD Logical Unit to determine its conformity with DVD Copy Protection scheme. The KEY 2 value will be used for the second input to generate a Bus Key in the DVD Logical Unit.

When the KEY2 value sent does not conform with the DVD Copy Protection scheme, this command shall be terminated with an CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code & qualifier set to COPY PROTECTION KEY EXCHANGE FAILURE - AUTHENTICATION FAILURE.

Implementor's Note: When the SEND KEY command with KEY Format = 000011b terminates with CHECK CONDITION status, the retry of authentication shall be performed from the beginning.

Table 98 - Recommended Sense Key, ASC and ASCQ for SEND KEY Command Errors

Sense Key	ASC	ASCQ	Description of Error
02	04	00	LOGICAL UNIT NOT READY - CAUSE NOT REPORTABLE
02	04	01	LOGICAL UNIT NOT READY - IN PROGRESS OF BECOMING READY
02	04	02	LOGICAL UNIT NOT READY - INITIALIZING COMMAND REQUIRED
02	04	03	LOGICAL UNIT NOT READY - MANUAL INTERVENTION REQUIRED
02	06	00	NO REFERENCE POSITION FOUND (media may be upside down)
02	3A	00	MEDIUM NOT PRESENT
05	30	01	CANNOT READ MEDIUM - UNKNOWN FORMAT
05	30	02	CANNOT READ MEDIUM - INCOMPATIBLE FORMAT
05	20	00	INVALID COMMAND OPERATION CODE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	2C	00	COMMAND SEQUENCE ERROR
05	6F	00	COPY PROTECTION KEY EXCHANGE FAILURE - AUTHENTICATION FAILURE
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	DEVICE OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

9.1.14 START/STOP UNIT Command

The START/STOP UNIT command requests that the C/DVD Logical Unit enable or disable media access operations.

Table 99 - START/STOP UNIT Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation code (1Eh)							
1	LUN			Reserved			Immed	
2	Reserved							
3	Reserved							
4	Power Condition				Reserved		LoEj	Start
5	Vendor-Specific		Reserved		NACA		Flag	Link
6	PAD							
7								
8								
9								
10								
11								

An immediate (IMMED) bit of one indicates that status shall be returned as soon as the Command Packet has been validated. An IMMED bit of zero indicates that status shall be returned after the operation is completed.

A start bit of one requests the Logical Unit be made ready for use, the Idle and Standby timers are reloaded. A start bit of zero requests that the Logical Unit be stopped (media cannot be accessed by the Host Computer).

Table 100 - Start/Stop and Eject Operations

LoEj	Start	Power Condition	Operation to be Performed
0	0	0	Stop the Disc
0	1	0	Start the Disc and read the TOC
1	0	0	Eject the Disc if possible (See "Table 98 - Actions for Lock / Unlock / Eject" on page 132)
1	1	0	Load the Disc (Close Tray)
x	x	1h - Fh	Power Condition Change (See "Power Conditions" on page 149.)

Any attempt to Eject or Load a Disc when the Logical Unit does not support that capability shall result in an error condition being reported to the Host (Sense key 05 ILLEGAL REQUEST, Sense Code 24 INVALID FIELD IN COMMAND PACKET.)

A load eject (LoEj) bit of zero requests that no action be taken regarding loading or ejecting the medium. A LoEj bit of one requests that the medium be unloaded if the start bit is zero. A LoEj bit of one requests that the medium be loaded if the start bit is one.

When the Loading Mechanism Type is a Changer utilizing individual disc change capability (4h), the Eject operation shall only eject the disc that is currently in the Play Position. If the Loading Mechanism is a changer utilizing a Cartridge (5h), then the Cartridge shall only be ejected when no media is in the play position.

Table 101 - Actions for Eject/Load Disc

Operation	Locked / Unlocked	If Logical Unit Not Ready (No Media)	If Logical Unit Ready (Media Present)
Eject	Unlocked	No Error and Tray is opened	No Error: Media Ejects
	Locked	Error: 02 Not ready, 53 Media Removal Prevented	Error: 02 Not ready, 53 Media Removal Prevented
	Changer using Cartridge with Disc in Play Position	Error: 02 Not ready, 53 Media Removal Prevented	Error: 02 Not ready, 53 Media Removal Prevented
	Changer using Individual disc changability with no Disc in the Play Position	Error: 02 Not ready, 53 Media Removal Prevented	Error: 05 Not ready, 53 Media Removal Prevented
Manual Eject	Unlocked	Tray opens (If tray exists)	Media is Ejected
	Locked	No operation occurs	No operation, Media stays locked in Logical Unit

The Power Condition field requests the Logical Unit be placed into the power state defined in Table 102 - on page 149. If any bit is set in this field then the Start and the LoEj bits shall be ignored.

When the logical unit enters the sleep state, any queued GET EVENT STATUS NOTIFICATION commands shall be removed from the command queue without command completion.

If any commands other than event status are in the queue upon receipt of the sleep command then the sleep command shall terminate with a CHECK CONDITION and set the sense key to 05 INVALID REQUEST and the additional sense code to 2C/00 COMMAND SEQUENCE ERROR.

An immediate (IMMED) bit of one indicates that status shall be returned as soon as the command packet has been validated. An IMMED bit of zero indicates that status shall be returned after the operation is completed.

The IMMED bit shall be ignored if the SetPwrStat field contains sleep.

Requests to enter the current power state shall complete without error.

If a request to go to a power state fails, the logical unit shall remain in the current power state and shall generate power management class event with the Power Event Field set to PwrChgFail.

All power state change requests, except sleep, that complete successfully shall generate power management class event with the Power Event Field set to PwrChgSucc.

Notification of power states shall occur upon entering a new power state.

Table 102 - Power Conditions

Code	Description
0h	No change in power conditions or in which Logical Unit is controlling power conditions
1h	Reserved
2h	Place Logical Unit into the Idle State, Standby Timer is reloaded
3h	Place Logical Unit into the Standby State
4h	Reserved
5h	Place Logical Unit into Sleep State. Before entering the sleep state, all buffers must be successfully flushed by the logical unit. If the sleep command is successful, the host shall not issue new commands after receiving the successful completion status. The Device shall de-power and disable the interface only after all logical units have successfully complete sleep commands.
6h - Fh	Reserved

In the Sleep condition the device shall only respond to a reset condition. When a device has multiple logical units attached it shall enter the Sleep condition only after all the logical units have been placed into a Sleep condition.

Table 103 - Recommended Sense Key, ASC and ASCQ for START/STOP Command Errors

Sense Key	ASC	ASCQ	Description of Error
02	04	00	LOGICAL UNIT NOT READY - CAUSE NOT REPORTABLE
02	04	01	LOGICAL UNIT NOT READY - IN PROGRESS OF BECOMING READY
02	04	02	LOGICAL UNIT NOT READY - INITIALIZING COMMAND REQUIRED
02	04	03	LOGICAL UNIT NOT READY - MANUAL INTERVENTION REQUIRED
02	06	00	NO REFERENCE POSITION FOUND (media may be upside down)
02	3A	00	MEDIUM NOT PRESENT
02	53	02	MEDIA REMOVAL PREVENTED
03	02	00	NO SEEK COMPLETE
04	E6	00	MEDIA LOAD MECHANISM FAILED
05	20	00	INVALID COMMAND OPERATION CODE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	2C	00	COMMAND SEQUENCE ERROR
05	30	01	CANNOT READ MEDIUM - UNKNOWN FORMAT
05	30	02	CANNOT READ MEDIUM - INCOMPATIBLE FORMAT
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON, RESET OR EOS DEVICE RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	DEVICE OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

9.1.15 REPORT KEY Command

The REPORT KEY command requests the start of the authentication process and provides data necessary for authentication and for generating a Bus Key for the DVD Logical Unit. This command, in conjunction with SEND KEY command, is intended to perform authentication for Logical Units which conform to DVD Copy Protection scheme and to generate a Bus Key as the result of authentication.

The REPORT KEY command also requests the DVD Logical Unit to transfer TITLE KEY data, obfuscated by a Bus Key, to the Host Computer.

Table 104 - REPORT KEY Command

Byte	Bit	7	6	5	4	3	2	1	0											
0	Operation code (Aah)																			
1	LUN					Reserved														
2	Reserved or Logical Block Address																			
3																				
4																				
5											LSB									
6											Reserved									
7	Reserved																			
8	Allocation Length																			
9																				
10											AGID					KEY Format				
11	Vendor-Specific					Reserved			NALM	Flag	Link									

The KEY Format field indicates the type of information that is requested to be sent to the host.

The REPORT KEY command with KEY Format field of 000000b begins the authentication process. The Logical Unit, when ready to begin the authentication process, shall grant the request by returning an Authentication Grant ID (AGID). If there is no available Authentication Grant ID, the command shall be terminated with CHECK CONDITION

status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code set to SYSTEM RESOURCE FAILURE.

The AGID field is used to control simultaneous key exchange sequences. The AGID specified in subsequent Key Exchange commands shall match a currently active AGID. The AGID field shall be reserved with the KEY Format Field is 0h.

In case of KEY Format = 000100b, the Reserved / Logical Block Address field specifies the logical block address which contains the TITLE KEY to be sent to the Host obfuscated by a Bus Key. In all other cases, this field shall be reserved.

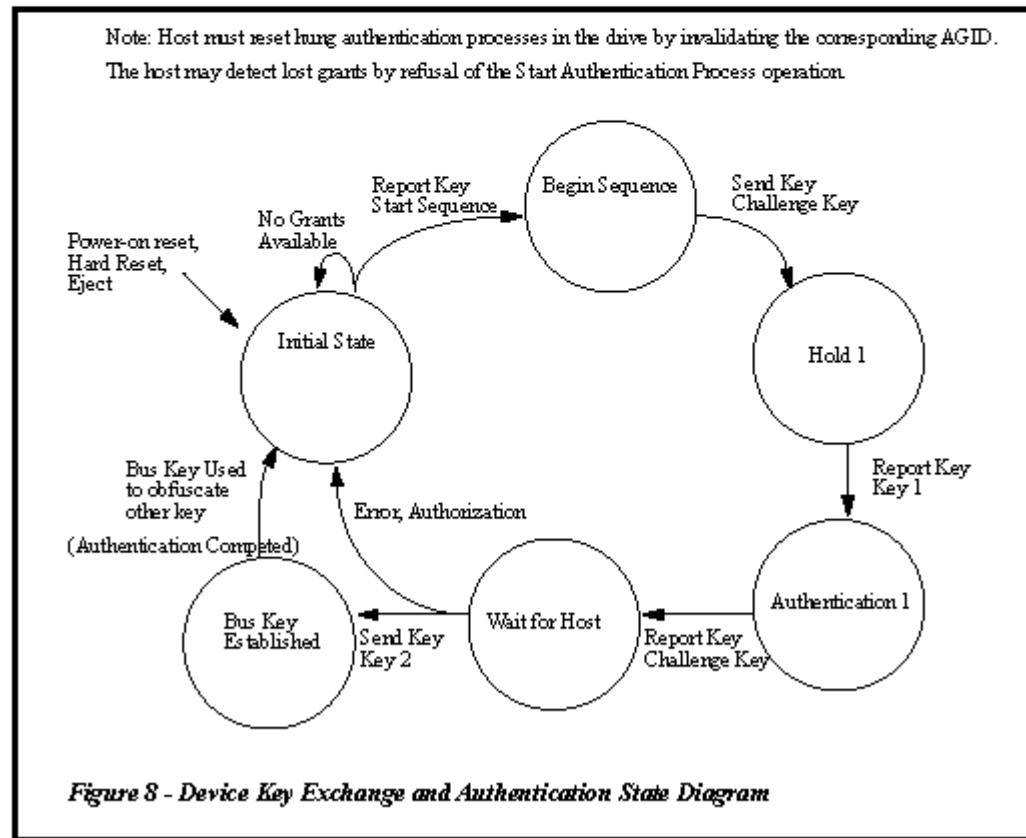
Table 165 - Key Format Code definitions for REPORT KEY Command

Key Format	Returned Data	Description
00000b	AGID	Returns an AUTHENTICATION GRANT ID
000001b	Challenge KEY	Returns a Challenge KEY
000010b	KEY1	Returns a KEY1
000100b	TITLE KEY	Returns a TITLE KEY obfuscated by a Bus Key
000101b	ASF	Returns the current state of the Authentication Success Flag
111111b		Invalidate Specified AGID
All other values		Reserved

The Following show the data returned to the host for this command.

Table 106 - REPORT KEY Data Format (With KEY Format = 000000h)

Bit Byte	7	6	5	4	3	2	1	0	
0	REPORT KEY DataLength							MSB	
1								LSB	
2	Reserved								
3	Reserved								
AUTHENTICATION GRANT ID									
0	Reserved								
1	Reserved								
2	Reserved								
3	AGID			Reserved					



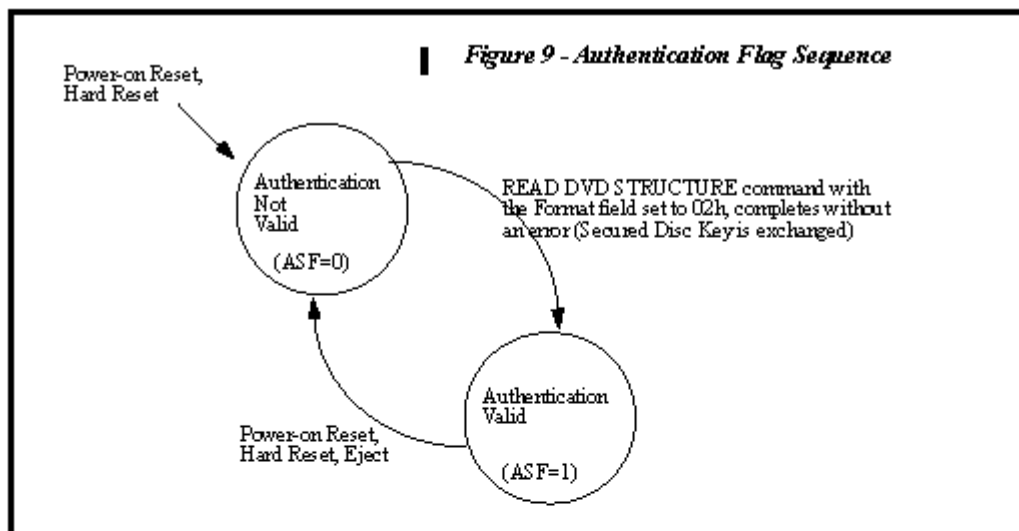


Table 107 - REPORT KEY Data Format (With KEY Format = 000001b)

Bit Byte	7	6	5	4	3	2	1	0
0	MSB REPORT KEY Data Length (0Eh)							
1								LSB
2	Reserved							
3	Reserved							
Challenge Key								
0	MSB							
.								LSB
9	Challenge Key Value							
10	Reserved							
11	Reserved							

Challenge Key Value field returns a value to be used to interrogate an external device to determine conformance with the DVD Copy Protection scheme. The external device then generates the corresponding KEY2.

Table 108 - REPORT KEY Data Format (With KEY Format = 000010b)

Bit Byte	7	6	5	4	3	2	1	0
0	MSB REPORT KEY Data Length (0Ah)							
1								LSB
2	Reserved							
3	Reserved							
KEY1								
0	MSB							
.								LSB
4	KEY1 Value							
5	Reserved							
6	Reserved							
7	Reserved							

KEY1 Value field returns a value used to determine the Logical Unit's conformity with DVD Copy Protection scheme by an external device. The KEY1 value will also be used as a parameter to generate a Bus Key in the Logical Unit.

When the Logical Unit is unable to produce a KEY1 value, this command with KEY Format = 000010b shall be terminated with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code & qualifier set to COPY PROTECTION KEY EXCHANGE FAILURE - KEY NOT PRESENT.

Table 109 - REPORT KEY Data Format (With KEY Format = 000100b)

Bit Byte	7	6	5	4	3	2	1	0
0	REPORT KEY Data Length (0Ah)							
1								LSB
2	Reserved							
Copyright Management Information								
3	0	CPM	CP_SEC	CGMS		Reserved		
TITLE KEY								
0	TITLE KEY Value							
1								LSB
4	Reserved							
5	Reserved							
6	Reserved							
7	Reserved							

The CPM field identifies the presence of copyrighted material in this sector:

0b - Material not copyrighted

1b - Copyrighted material The CP_SEC field indicates that the specified sector has a specific data structure for copyright protection system:

0b - No Such data structure exists in this sector

1b - A specific data structure exists in this sector

The CGMS field indicates the restrictions on copying:

00b Copying is permitted without restriction

01b Reserved

10b One generation of copies may be made

11b No copying is allowed

TITLE KEY Value field returns the TITLE KEY which is obfuscated by a Bus Key. The length of TITLE KEY value is currently 5 bytes only.

When the TITLE KEY does not exist on DVD media, this command with KEY Format = 000100b shall be terminated with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code set to COPY PROTECTION KEY EXCHANGE FAILURE and the additional sense code qualifier shall be set to KEY NOT PRESENT.

When the Logical Unit is not in the Bus Key Established state, this command with KEY Format = 000100b shall be terminated with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code & qualifier set to COPY PROTECTION KEY EXCHANGE FAILURE - KEY NOT ESTABLISHED.

Table 110 - REPORT KEY Data Format (With KEY Format = 000101b)

Bit Byte	7	6	5	4	3	2	1	0
0	REPORT KEY Data Length							
1								LSB
2	Reserved							
3	Reserved							
AUTHENTICATION SUCCESS FLAG								
0	Reserved							
1	Reserved							
2	Reserved							
3	Reserved							Success Flag

For more information on the contents of the Success Flag See “Authentication Flag Sequence” on page 153.

Table 111 - Recommended Sense Key, ASC and ASCQ for REPORT KEY Command Errors

Sense Key	ASC	ASC Q	Description of Error
02	04	00	LOGICAL UNIT NOT READY - CAUSE NOT REPORTABLE
02	04	01	LOGICAL UNIT NOT READY - IN PROGRESS OF BECOMING READY
02	04	02	LOGICAL UNIT NOT READY - INITIALIZING COMMAND REQUIRED
02	04	03	LOGICAL UNIT NOT READY - MANUAL INTERVENTION REQUIRED
02	06	00	NO REFERENCE POSITION FOUND (media may be upside down)
02	3A	00	MEDIUM NOT PRESENT
05	20	00	INVALID COMMAND OPERATION CODE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	30	01	CANNOT READ MEDIUM - UNKNOWN FORMAT
05	30	02	CANNOT READ MEDIUM - INCOMPATIBLE FORMAT
05	55	00	SYSTEM RESOURCE FAILURE
05	6F	01	COPY PROTECTION KEY EXCHANGE FAILURE - KEY NOT PRESENT
05	6F	02	COPY PROTECTION KEY EXCHANGE FAILURE - KEY NOT ESTABLISHED
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	DEVICE OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

9.1.16 SET READ AHEAD Command

The SET READ AHEAD command requests that the C/DVD Logical Unit perform Read Ahead Caching operations from the Read-Ahead Logical Block Address when the drive encounters the Trigger Logical Block Address during its internal Read Ahead Caching operation.

If this command is received by the DVD Logical Unit when data after the Trigger Logical Block Address and before the Read Ahead Logical Block Address is contained in its cache, that data should be discarded and Read Ahead Caching restarted from the specified Read Ahead Logical Block Address.

Sectors after the Trigger LBA (Not including the Trigger LBA) should be skipped. The data for both the Trigger and Read Ahead LBAs will normally be read by the host. The sectors between these addresses (exclusive) are normally not read by the host.

The Read-Ahead operation shall be performed in background, i.e. the C/DVD Logical Unit shall accept a command during the Read-Ahead operation.

Table 112 - SET READAHEAD Command

Byte	Bit	7	6	5	4	3	2	1	0	
0		Operation code (A/h)								
1		LUN				Reserved				
2		Trigger Logical Block Address								
3										
4										
5										LSB
6										
6		Read Ahead Logical Block Address								
7										
8										
9										LSB
10										
10		Reserved								
11		Vendor-Specific		Reserved			NACA	Flag	Link	

Table 113 - Recommended Sense Key, ASC and ASCQ for SET READAHEAD Command Errors

Sense Key	ASC	ASCQ	Description of Error
02	04	00	LOGICAL UNIT NOT READY - CAUSE NOT REPORTABLE
02	04	01	LOGICAL UNIT NOT READY - IN PROGRESS OF BECOMING READY
02	04	02	LOGICAL UNIT NOT READY - INITIALIZING COMMAND REQUIRED
02	04	03	LOGICAL UNIT NOT READY - MANUAL INTERVENTION REQUIRED
02	06	00	NO REFERENCE POSITION FOUND (media may be upside down)
02	3A	00	MEDIUM NOT PRESENT
05	20	00	INVALID COMMAND OPERATION CODE
05	21	00	LOGICAL BLOCK ADDRESS OUT OF RANGE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	30	01	CANNOT READ MEDIUM - UNKNOWN FORMAT
05	30	02	CANNOT READ MEDIUM - INCOMPATIBLE FORMAT
05	6F	03	READ OF SCRAMBLED SECTOR WITHOUT AUTHENTICATION
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	LOGICAL UNIT OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

9.1.17 READ FORMATTED CAPACITIES Command

The READ FORMATTED CAPACITIES command allows the host to request a list of the possible media capacities for an installed media. This command also has the capability to report possible capacities for a media when it is reformatted.

Table 114 - READ FORMATTED CAPACITIES Command

Byte	Bit	7	6	5	4	3	2	1	0	
0		Operation Code (23h)								
1		LUN			Reserved					
2		Reserved								
3		Reserved								
4		Reserved								
5		Reserved								
6		Reserved								
7		MSB			Allocation Length				LSB	
8										
9		Vendor-Specific		Reserved			NACA	Flag	Lmk	
10										
11		PAD								

The allocation length field specifies the maximum number of bytes that a host has allocated for returned data. An allocation length of zero indicates that no data shall be transferred. This condition shall not be considered as an error. The drive shall terminate the data transfer when allocation length bytes have been transferred or when all available data have been transferred to the host, whichever is less.

Table 115 - Read Formatted Capacities Data Format

Bit Byte	7	6	5	4	3	2	1	0
	Capacity List Header							
	Current/Maximum Capacity Descriptor							
	Formatted Capacity Descriptor(s)							
0	Formatted Capacity Descriptor 0							
7								
	.							
	.							
0	Formatted Capacity Descriptor n							
7								

Table 116 - Capacity List Header

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved							
1								
2								
3	Capacity List Length							

The Capacity List Length specifies the length in bytes of the Capacity Descriptors that follow. Each Capacity Descriptor is eight bytes in length, making the Capacity List Length equal to eight times the number of descriptors. A value of zero is valid

Table 117 - Formatted Capacity Descriptor

Bit Byte	7	6	5	4	3	2	1	0
0	MSB Number of Blocks LSB							
1								
2								
3								
4	Reserved					Valid	Maximum	
5	MSB Block Length LSB							
6								
7								
7								

The Number of Blocks indicates the number of addressable blocks for the descriptor's media type.

A Valid bit of one indicates that the descriptor contains meaningful data. A Valid bit of zero indicates that an unformatted media is currently installed in the drive, and the Number of Blocks, Block Length, and Maximum fields shall be set to zero.

For a Maximum bit of one, the descriptor indicates that no media is currently installed in the drive. The descriptor fields specify the maximum capacity supported by the drive. For a MAX bit of zero, the descriptor indicates that a formatted media is in the drive. The descriptor fields specify the current media type.

The Block Length specifies the length in bytes of each logical block for the descriptor's media type.

The Number of Blocks indicates the maximum (or fixed) number of addressable blocks for the descriptor's media type.

The Block Length specifies the length in bytes of each logical block for the descriptor's media type.

Table 118 - Recommended Sense Key, ASC and ASCQ for READ FORMATTED CAPACITY Command Errors

Sense Key	ASC	ASCQ	Description of Error
05	20	00	INVALID COMMAND OPERATION CODE
05	24	00	INVALID FIELD IN COMMAND PACKET
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	LOGICAL UNIT OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

9.1.18 REQUEST SENSE Command

The REQUEST SENSE command requests that the C/DVD Logical Unit transfer sense data to the Host Computer.

Table 119 - Request Sense Command

Byte	Bit	7	6	5	4	3	2	1	0
0	Operation code (03h)								
1	LUN			Reserved					
2	Reserved								
3	Reserved								
4	Allocation Length								
5	Vendor-Specific			Reserved			Flag		Link
6	PAD								
7									
8									
9									
10									
11									

The sense data:

1. shall be available if an error condition (CHECK CONDITION) had previously been reported to the Host Computer;
2. shall be available if other information (e.g. medium position) is available in any field.

If the C/DVD Logical Unit has no other sense data available to return, it shall return a sense key of NO SENSE and an additional sense code of NO ADDITIONAL SENSE INFORMATION.

The sense data shall be preserved by the C/DVD Logical Unit until retrieved by a REQUEST SENSE command or until the receipt of any other I/O Command.

The C/DVD Logical Unit shall return CHECK CONDITION status for a REQUEST SENSE command only to report exception conditions specific to the command itself. For example:

1. An C/DVD Logical Unit malfunction prevents return of the sense data.

If a recovered error occurs during the execution of the REQUEST SENSE command, the C/DVD Logical Unit shall return the sense data with GOOD status. If an C/DVD Logical Unit returns CHECK CONDITION status for a REQUEST SENSE command, the sense data may be invalid.

C/DVD Logical Units shall be capable of returning at least 18 bytes of data in response to a REQUEST SENSE command. If the allocation length is 18 or greater, and an C/DVD Logical Unit returns less than 18 bytes of data, the Host Computer should assume that the bytes not transferred would have been zeros had the C/DVD Logical Unit returned those bytes. Host Computers can determine how much sense data has been returned by examining the allocation length parameter in the Command Packet and the additional sense length in the sense data. C/DVD Logical Units shall not adjust the additional sense length to reflect truncation if the allocation length is less than the sense data available.

The sense data format for error codes 70h (current errors) and 71h (deferred errors) are defined in "Table 120 - Request Sense Standard Data" on page 164. Error code values of 72h to 7Eh are reserved. Error code 7Fh is for a vendor-specific sense data format. C/DVD Logical Units shall implement error code 70h; implementation of error code 71h is optional. Error code values of 00h to 6Fh are not defined by this Specification and their use is not recommended.

Table 120 - Request Sense Standard Data

Bit Byte	7	6	5	4	3	2	1	0								
0	Valid	Error Code (70h or 71h)														
1	Segment Number (Reserved)															
2	Reserved		ILI	Reserved		Sense Key										
3	Information															
6																
7									Additional Sense Length (n - 7)							
8									Command Specific Information							
9																
10																
11																
12	Additional Sense Code															
13	Additional Sense Code Qualifier (Optional)															
14	Field Replaceable Unit Code (Optional)															
15	SKSV (Optional)	Sense Key Specific (Optional)														
16																
17	Additional Sense Bytes															
18																
n																

A Valid bit of zero indicates that the information field is not as defined in this Specification. A Valid bit of one indicates the information field contains valid information as defined in this Specification. C/DVD Logical Units shall implement the Valid bit.

The Segment Number field is Reserved.

An Incorrect Length Indicator (ILI) bit of one indicates that the requested allocation length did not match the logical block length of the data on the medium.

The Sense Key, Additional Sense Code and Additional Sense Code Qualifier provide a hierarchy of information. The intention of the hierarchy is to provide a top-down approach for a Host Computer to determine information relating to the error and exception conditions. The Sense Key provides generic categories in which error and exception conditions can be reported. Host Computers would typically use sense keys for high level error recovery procedures. Additional Sense Codes provide further detail describing the sense key. Additional Sense Code Qualifiers add further detail to the additional sense code. The Additional Sense Code and Additional Sense Code Qualifier can be used by Host Computers where sophisticated error recovery procedures require detailed information describing the error and exception conditions.

The Sense Key field is mandatory and indicates generic information describing an error or exception condition. The sense keys are defined in section Table 123 -, "Sense Key Descriptions", on page 167.

The contents of the Information field is command specific and is defined within the appropriate section for the command of interest. C/DVD Logical Units shall implement the Information field. Unless specified otherwise, this field contains the unsigned logical block address associated with the sense key.

The Additional Sense Length field indicates the number of additional sense bytes to follow. If the allocation length of the Command Packet is too small to transfer all of the additional sense bytes, the Additional Sense Length is not adjusted to reflect the truncation.

The Command specific Information field contains information that depends on the command that was executed. Further meaning for this field is defined within the command description. When this field is used to report a logical block address the data contained in this field shall always be a logical address. Commands that make use of MSF addressing shall report the error location in LBA format.

The Additional Sense Code (ASC) field indicates further information related to the error or exception condition reported in the Sense Key field. C/DVD Logical Units shall support the Additional Sense Code field. Support of the additional sense codes not explicitly required by this Specification is optional. A list of additional sense codes is in "Table 124 -

ASC and ASCQ Assignments" on page 168. If the C/DVD Logical Unit does not have further information related to the error or exception condition, the Additional Sense Code is set to NO ADDITIONAL SENSE INFORMATION.

The Additional Sense Code Qualifier (ASCQ) indicates detailed information related to the Additional Sense Code. The ASCQ is optional. If the error or exception condition is reportable by the Logical Unit, the value returned shall be as specified in "Table 124 - ASC and ASCQ Assignments" on page 168. If the C/DVD Logical Unit does not have detailed information related to the error or exception condition, the ASCQ is set to zero.

Non-zero values in the Field Replaceable Unit Code field are used to define a Logical Unit specific mechanism or unit that has failed. A value of zero in this field shall indicate that no specific mechanism or unit has been identified to have failed or that the data is not available. The Field Replaceable Unit Code field is optional. The format of this information is not specified by this Specification. Additional information about the field replaceable unit may be available in the ASCII information page, if supported by the C/DVD Logical Unit.

The Additional Sense Bytes field may contain command specific data, peripheral device specific data, or vendor-specific data that further defines the nature of the CHECK CONDITION status.

9.1.18.1 Sense key Specific

The Sense key Specific field is defined by this Specification when the value of the Sense key Specific Valid (SKSV) bit is one. The Sense key Specific Valid bit and Sense key Specific field are optional. The definition of this field is determined by the value of the sense key field. This field is reserved for sense keys not described below. An SKSV value of zero indicates that this field is not as defined by this Specification.

If the Sense Key field is set to ILLEGAL REQUEST and the SKSV bit is set to one, the Sense key Specific field indicates which illegal parameters in the Command Packet or the data parameters are in error.

Table 121 - Field Pointer Bytes

Bit Byte	7	6	5	4	3	2	1	0
15	SKSV	C/D	Reserved	Reserved	BPV	Bit Pointer		
16	Field Pointer							
17	LSB							

A Command Data (C/D) bit of one indicates that the illegal parameter is in the Command Packet. A C/D bit of zero indicates that the illegal parameter is in the data parameters sent by the Host Computer.

A Bit Pointer Valid (BPV) bit of zero indicates that the value in the Bit Pointer field is not valid. A BPV bit of one indicates that the Bit Pointer field specifies which bit of the byte designated by the field pointer field is in error. When a multiple bit field is in error, the Bit Pointer field shall point to the most significant (left most) bit of the field.

The Field Pointer field indicates which byte of the Command Packet or of the parameter data was in error. Bytes are numbered starting from zero, as shown in the tables describing the commands and parameters. When a multiple byte field is in error, the pointer shall point to the most significant (left most) byte of the field.

If the sense key is RECOVERED ERROR, HARDWARE ERROR or MEDIUM ERROR and if the SKSV bit is one, the sense key specific field shall be as shown in "Table 122 - Field Pointer Bytes" on page 166.

Table 122 - Field Pointer Bytes

Bit Byte	7	6	5	4	3	2	1	0
15	SKSV	C/D	Reserved	Reserved	BPV	Bit Pointer		
16	Actual Retry Count							
17	LSB							

The Actual Retry Count field returns implementation specific information on the actual number of retries of the recovery algorithm used in attempting to recover an error or exception condition. This field should relate to the retry count fields within the Error Recovery Page of the MODE SELECT command.

9.1.18.2 Deferred Errors

Error code 70h indicates that the CHECK CONDITION status returned is the result of an error or exception condition on the I/O process that returned the CHECK CONDITION status. This includes errors generated during execution of the command by the actual execution process. It also includes errors not related to any command that are first observed during execution of a command. Examples of this latter type of error include disk servo mechanism, off track errors, and power-up test errors.

Error code 71h (deferred error) indicates that the CHECK CONDITION status returned is the result of an error or exception condition that occurred during execution of a previous command for which GOOD status has already been returned. Such commands are associated with use of the immediate bit, with some forms of caching, and with multiple command buffering. C/DVD Logical Units that implement these features are required to implement deferred error reporting.

The deferred error may be indicated by returning CHECK CONDITION status to the Host Computer as described below. The subsequent execution of a REQUEST SENSE command shall return the deferred error sense information.

If an I/O Command terminates with CHECK CONDITION status and the subsequent sense data returns a deferred error, that I/O command shall not have been executed. After the C/DVD Logical Unit detects a deferred error condition on a Logical Unit, it shall return a deferred error according to the rules described below:

1. If a deferred error can be recovered with no external system intervention, a deferred error indication shall not be posted unless required by the error handling parameters of the MODE SELECT command. The occurrence of the error may be logged if statistical or error logging is supported.
2. If a deferred error can be associated with a particular function or a particular subset of data, and the error is either unrecovered or required to be reported by the mode parameters, a deferred error indication shall be returned to the Host Computer.

Deferred errors may indicate that an operation was unsuccessful long after the command performing the data transfer returned GOOD status. If data that cannot be replicated or recovered from other sources is being stored using buffered write operations, synchronization commands should be performed before the critical data is destroyed in the host computer. This is necessary to be sure that recovery actions can be taken if deferred errors do occur in the storing of the data.

9.1.18.3 Sense-key and Sense Code Definitions

Table 123 - Sense Key Descriptions

Sense key	Description
0h	NO SENSE . Indicates that there is no specific sense key information to be reported. This would be the case for a successful command.
1h	RECOVERED ERROR . Indicates that the last command completed successfully with some recovery action performed by the C/DVD Logical Unit. Details may be determinable by examining the additional sense bytes and the information field. When multiple recovered errors occur during one command, the choice of which error to report (first, last, most severe, etc.) is Logical Unit specific.
2h	NOT READY . Indicates that the Logical Unit cannot be accessed. Operator intervention may be required to correct this condition.
3h	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. This sense key may also be returned if the C/DVD Logical Unit is unable to distinguish between a flaw in the medium and a specific hardware failure (sense key 4h).
4h	HARDWARE ERROR . Indicates that the C/DVD Logical Unit detected a non-recoverable hardware failure (for example, controller failure, Logical Unit failure, parity error, etc.) while performing the command or during a self test.
5h	ILLEGAL REQUEST . Indicates that there was an illegal parameter in the Command Packet or in the additional parameters supplied as data for some commands. If the C/DVD Logical Unit detects an invalid parameter in the Command Packet, then it <i>shall</i> terminate the command without altering the medium. If the C/DVD Logical Unit detects an invalid parameter in the additional parameters supplied as data, then the C/DVD Logical Unit may have already altered the medium.
6h	UNIT ATTENTION . Indicates that the removable medium may have been changed or the C/DVD Logical Unit has been reset.
7h	DATA PROTECT . Indicates that a command that reads the medium was attempted on a block that is protected from this operation. The read operation is not performed.
8h	Reserved
9h - Ah	Reserved
Bh	ABORTED COMMAND . Indicates that the Logical Unit has aborted the command. The Host may be able to recover by trying the command again. This error is reported for conditions such as an overrun etc.
0Ch - 0Dh	Reserved
Eh	MISCOMPARE . Indicates that the source data did not match the data read from the medium.
Fh	Reserved

9.1.18.4 Using the REQUEST SENSE Command

Whenever an Error is reported, the Host Computer should issue a REQUEST SENSE command to receive the sense data describing what caused the Error condition. If the Host Computer issues some other command, the sense data is lost.

Table 124 - ASC and ASCQ Assignments

Key	ASC	ASCQ	DESCRIPTION
00	00	00	NO ADDITIONAL SENSE INFORMATION
00	00	11	PLAY OPERATION IN PROGRESS
00	00	12	PLAY OPERATION PAUSED
00	00	13	PLAY OPERATION SUCCESSFULLY COMPLETED
00	00	14	PLAY OPERATION STOPPED DUE TO ERROR
00	00	15	NO CURRENT AUDIO STATUS TO RETURN
04	3C	00	MECHANICAL POSITIONING OR CHANGER ERROR
04	02	00	NO SEEK COMPLETE
04	03	00	WRITE FAULT
02	04	00	LOGICAL UNIT NOT READY - CAUSE NOT REPORTABLE
02	04	01	LOGICAL UNIT NOT READY - IN PROGRESS OF BECOMING READY
02	04	02	LOGICAL UNIT NOT READY - INITIALIZING COMMAND REQUIRED
02	04	03	LOGICAL UNIT NOT READY - MANUAL INTERVENTION REQUIRED
02	04	04	IN PROCESS OF BECOMING READY - WRITING
02	06	00	NO REFERENCE POSITION FOUND (media may be upside down)
04	09	00	TRACK FOLLOWING ERROR
04	09	01	TRACKING SERVO FAILURE
04	09	02	FOCUS SERVO FAILURE
04	09	03	SPINDLE SERVO FAILURE
03	11	00	UNRECOVERED READ ERROR
03	11	06	CIRC UNRECOVERED ERROR
04	15	00	RANDOM POSITIONING ERROR
04	15	01	MECHANICAL POSITIONING OR CHANGER ERROR
04	15	02	POSITIONING ERROR DETECTED BY READ OF MEDIUM
01	17	00	RECOVERED DATA WITH NO ERROR CORRECTION APPLIED
01	17	01	RECOVERED DATA WITH RETRIES
01	17	02	RECOVERED DATA WITH POSITIVE HEAD OFFSET
01	17	03	RECOVERED DATA WITH NEGATIVE HEAD OFFSET
01	17	04	RECOVERED DATA WITH RETRIES AND/OR CIRC APPLIED
01	17	05	RECOVERED DATA USING PREVIOUS SECTOR ID
01	18	00	RECOVERED DATA WITH ERROR CORRECTION APPLIED
01	18	01	RECOVERED DATA WITH ERROR CORRECTION & RETRIES APPLIED
01	18	02	RECOVERED DATA - THE DATA WAS AUTO-REALLOCATED
01	18	03	RECOVERED DATA WITH CIRC
01	18	04	RECOVERED DATA WITH L-BC
05	1A	00	PARAMETER LIST LENGTH ERROR
05	20	00	INVALID COMMAND OPERATION CODE
05	21	00	LOGICAL BLOCK ADDRESS OUT OF RANGE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	26	00	INVALID FIELD IN PARAMETER LIST
05	26	01	PARAMETER NOT SUPPORTED
05	26	02	PARAMETER VALUE INVALID
07	27	00	WRITE PROTECTED MEDIA
06	28	00	NOT READY TO READY TRANSITION, MEDIUM MAY HAVE CHANGED
06	29	00	POWER ON, RESET OR HARDWARE RESET OCCURRED

Table 124 - ASC and ASCQ Assignments (Continued)

Key	ASC	ASCQ	DESCRIPTION
06	2A	00	PARAMETERS CHANGED
06	2A	01	MODE PARAMETERS CHANGED
05	2C	00	COMMAND SEQUENCE ERROR
06	2E	00	INSUFFICIENT TIME FOR OPERATION
02	30	00	INCOMPATIBLE MEDIUM INSTALLED
05	30	01	CANNOT READ MEDIUM - UNKNOWN FORMAT
05	30	02	CANNOT READ MEDIUM - INCOMPATIBLE FORMAT
03	31	01	FORMAT COMMAND FAILED
05	39	00	SAVING PARAMETERS NOT SUPPORTED
02	3A	00	MEDIUM NOT PRESENT
06	3F	00	LOGICAL UNIT OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED
04	40	NN	DIAGNOSTIC FAILURE ON COMPONENT NN (80H-FFH)
04	44	00	INTERNAL C/DVD LOGICAL UNIT FAILURE
05	4E	00	OVERLAPPED COMMANDS ATTEMPTED
02	53	00	MEDIA LOAD OR EJECT FAILED
05	53	02	MEDIUM REMOVAL PREVENTED
05	55	00	SYSTEM RESOURCE FAILURE
02	57	00	UNABLE TO RECOVER TABLE OF CONTENTS
06	5A	00	OPERATOR REQUEST OR STATE CHANGE INPUT (UNSPECIFIED)
06	5A	01	OPERATOR MEDIUM REMOVAL REQUEST
01	5D	00	FAILURE PREDICTION THRESHOLD EXCEEDED - Predicted Logical Unit Failure
01	5D	01	FAILURE PREDICTION THRESHOLD EXCEEDED - Predicted Media Failure
01	5D	FF	FAILURE PREDICTION THRESHOLD EXCEEDED - FALSE
05	63	00	END OF USER AREA ENCOUNTERED ON THIS TRACK
05	64	00	ILLEGAL MODE FOR THIS TRACK OR INCOMPATIBLE MEDIUM
05	6F	00	COPY PROTECTION KEY EXCHANGE FAILURE - AUTHENTICATION FAILURE
05	6F	01	COPY PROTECTION KEY EXCHANGE FAILURE - KEY NOT PRESENT
05	6F	02	COPY PROTECTION KEY EXCHANGE FAILURE - KEY NOT ESTABLISHED
04	B6	00	MEDIA LOAD MECHANISM FAILED
0E	B9	00	PLAY OPERATION ABORTED
05	BF	00	LOSS OF STREAMING
	80h-XXh THROUGH FFh XX		Vendor-specific
	XXh-80h THROUGH XXh DDh		Vendor-specific QUALIFICATION OF STANDARD ASC.
ALL CODES NOT SHOWN ARE RESERVED.			

Table 125 - Recommended Sense Key, ASC and ASCQ for Request Sense Command Errors

Sense Key	ASC	ASCQ	Description of Error
05	20		INVALID COMMAND OPERATION CODE
05	24		INVALID FIELD IN COMMAND PACKET
06	28		NOT READY TO READY TRANSITION
06	29		POWER ON, RESET OR HARDWARE RESET OCCURRED

9.1.19 SEEK Command

The SEEK command request that the Logical Unit seek to the specified logical block address. All Logical Block Addresses are valid targets for a seek operation, including a CD-DA audio sector. The content of the Sector at the specified LBA shall not affect the seek operation nor cause an error to be generated.

The SEEK Command will always be executed as an immediate command. The command will return completion stations as soon as the seek operation has been started.

Table 126 - SEEK Command

Byte	Bit	7	6	5	4	3	2	1	0	
0		Operation code (2Bh)								
1		LON			Reserved					
2		Logical Block Address								
3										
4										
5										
5										LSB
6		Reserved								
7		Reserved								
8		Reserved								
9		Vendor-Specific			Reserved			NACA	Flag	Link
10		PAD								
11										

Table 127 - Recommended Sense Key, ASC and ASCQ for Seek Command Errors

Sense Key	ASC	ASCQ	Description of Error
01	5D	01	FAILURE PREDICTION THRESHOLD EXCEEDED - Predicted Media Failure
02	04	00	LOGICAL DRIVE NOT READY - CAUSE NOT REPORTABLE
02	04	01	LOGICAL DRIVE NOT READY - IN PROGRESS OF BECOMING READY
02	04	02	LOGICAL DRIVE NOT READY - INITIALIZING COMMAND REQUIRED
02	04	03	LOGICAL DRIVE NOT READY - MANUAL INTERVENTION REQUIRED
02	06	00	NO REFERENCE POSITION FOUND (media may be upside down)
02	3A	00	MEDIUM NOT PRESENT
03	02	00	NO SEEK COMPLETE
05	20	00	INVALID COMMAND OPERATION CODE
05	21	00	LOGICAL BLOCK ADDRESS OUT OF RANGE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	30	01	CANNOT READ MEDIUM - UNKNOWN FORMAT
05	30	02	CANNOT READ MEDIUM - INCOMPATIBLE FORMAT
06	28	00	NOT READY TO READY TRANSITION
06	29	00	POWER ON OR HARD RESET OCCURRED
06	2E	00	INSUFFICIENT TIME FOR OPERATION
06	3F	00	DEVICE OPERATING CONDITIONS HAVE CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED

9.1.20 TEST UNIT READY Command

The TEST UNIT READY command provides a means to check if the Logical Unit is ready. This is not a request for a self test. If the Logical Unit would accept an appropriate medium access command without returning CHECK CONDITION status, this command shall return a GOOD status. If the Logical Unit cannot become operational or is in a state such that an Host Computer action (e.g. START/STOP UNIT command with LoEj = 0 & Start = 1) is required to make the unit ready, the C/DVD Logical Unit shall return CHECK CONDITION status with a sense key of NOT READY.

Table 128 - Test Unit Ready Command

Byte	Bit	7	6	5	4	3	2	1	0
0		Operation code (00h)							
1		LUN			Reserved				
2		Reserved							
3		Reserved							
4		Reserved							
5		Vendor-Specific		Reserved			NACA	Flag	Link
6		PAD							
7									
8									
9									
10									
11									

9.1.20.1 Using the TEST UNIT READY Command

The TEST UNIT READY command is useful in that it allows a Host Computer to poll a Logical Unit until it is ready without the need to allocate space for returned data. It is especially useful to check cartridge status. C/DVD Logical Units are expected to respond promptly to indicate the current status of the Logical Unit.

Table 129 - Recommended Sense Key, ASC and ASCQ for TEST UNIT READY Command Errors

Sense Key	ASC	ASCQ	Description of Error
00	00	00	NO ADDITIONAL SENSE INFORMATION
02	04	00	LOGICAL DRIVE NOT READY - CAUSE NOT REPORTABLE
02	04	01	LOGICAL DRIVE NOT READY - IN PROGRESS OF BECOMING READY
02	04	02	LOGICAL DRIVE NOT READY - INITIALIZING COMMAND REQUIRED
02	04	03	LOGICAL DRIVE NOT READY - MANUAL INTERVENTION REQUIRED
02	06	00	NO REFERENCE POSITION FOUND (media may be upside down)
02	30	00	INCOMPATIBLE MEDIUM INSTALLED
02	3A	00	MEDIUM NOT PRESENT
05	20	00	INVALID COMMAND OPERATION CODE
05	24	00	INVALID FIELD IN COMMAND PACKET
05	30	01	CANNOT READ MEDIUM - UNKNOWN FORMAT
05	30	02	CANNOT READ MEDIUM - INCOMPATIBLE FORMAT

Note: Some drives return ASC/ASCQ with *ascii*, status and sense code 00 when there is no error condition.

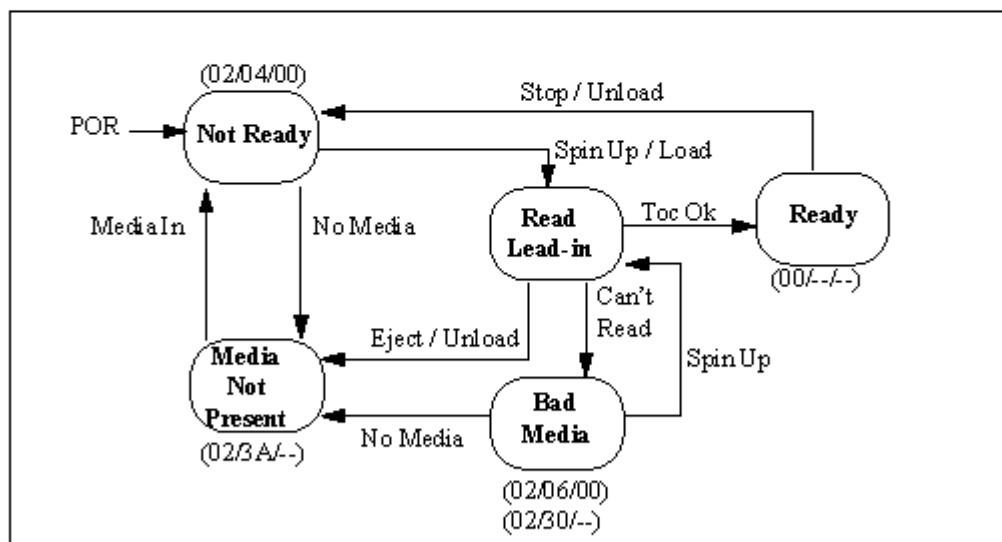


Figure 10 - Test Unit Ready State Diagram