Pioneer

R11 Series Drive
Command Reference Manual

Version 1.00

May 9, 2006

PIONEER CORPORATION

1 Introduction

This document specifies a command set for the PIONEER R11 series drive.

The drive fundamentally complies to SFFC INF-8090i standard.

The drive complies to Information Technology Multimedia Commands-5 (MMC-5) Draft Revision 1b prior to SFFC INF-8090i standard, when a +R/+RW or a +R DL disc is inserted in the drive.

In some cases, the drive executes unique operation which is not described in the standards.

This document describes details of such unique operation for each command or disc.

For More Information about SFFC INF-8090i, refer FTP site at:

> ftp://ftp.avc-pioneer.com/Mtfuji_6/Spec/

For More Information about Information Technology Multimedia Commands-5 (MMC-5) Draft Revision 1b, refer a site at:

> http://www.t10.org/drafts.htm

1.1 List of changes

1.1.1 List of changes (Version 0.90 to 1.00)

Page	Clause	Description
		Only version is changed from 0.90 to 1.00.

2 Interface

The drive supports ATA/ATAPI interface.

2.1 ATA/ATAPI version

The drive complies with the ATA/ATAPI-5 Specification and supports following transfer mode.

PIO Mode 4

Multi Word DMA Mode 2

Ultra DMA Mode 4 (Ultra DMA/66)

2.2 Drive Information

The data returned by INQUIRY command covers the following information.

Vendor name: ."PIONEER"

Product collation data: "DVD-RW   DVR-111 "

3 R11 Series DRIVE Descriptions

3.1 Compatible Media

The R11 series drive unit (hereinafter referred to as "drive") supports reading of CD-ROM/-R/-RW Disc, DVD-ROM/-R/-RW/-R DL /RAM Disc and +R/+RW/+R DL Disc and writing of CD-R/-RW Disc, DVD-R/-RW/-R DL/RAM Disc and +R/+RW/+R DL Disc.

3.1.1   DVD-ROM Disc

A DVD-ROM disc is specified by "DVD Specifications for Read-Only Disc".

The drive can read the Single Layer disc and the Dual Layer (Parallel track path and Opposite track path) disc.

3.1.2   DVD-R Disc

A DVD-R disc is specified by "DVD Specifications for Recordable Disc for General".

The drive can read and record to the DVD-R Disc for the capacity of 4.7GBytes.

The drive supports two write types of Disc-at-once recording and Incremental recording. For more information of write types, refer SFFC INF-8090i document.

3.1.3 DVD-R DL Disc

A DVD-R disc is specified by "DVD Specifications for Recordable Disc for Dual Layer".

The drive can read and record to the DVD-R DL Disc for the capacity of 8.54GBytes.

The drive supports 3 recording modes that are Disc-at-Once recording, Incremental recording, and Layer Jump recording, refer SFFC INF-8090i document.

3.1.4 DVD-RW Disc

A DVD-RW disc is specified by "DVD Specifications for Re-recordable Disc".

The drive can read and record to the DVD-RW Disc for the capacity of 4.7GBytes.

The drive supports three write types of Disc-at-once recording, Incremental recording and Restricted Overwrite recording. For more information of write types, refer SFFC INF-8090i document.

3.1.5 DVD-RAM Disc

A DVD-RAM disc is specified by "DVD Specifications for Rewritable Disc".

The drive can read and record to the DVD-RAM Disc for the capacity of 4.7GBytes.

3.1.6 +R Disc

A +R disc is specified by "DVD+R 4.7 Gbytes Basic Format Specifications version 1.0 or 1.1".

3.1.7 +R DL Disc

A +R DL disc is specified by "DVD+R 8.5 Gbytes Basic Format Specifications version 1.0".

3.1.8 +RW Disc

A +RW disc is specified by "DVD+RW 4.7 Gbytes Basic Format Specifications version 1.1".

3.1.9 CD-ROM Disc

Compact Disc-Read Only Memory (CD-ROM) is a standardized medium for recording digitized audio and digital data.

3.1.10 CD-R Disc

Compact Disc-Recordable (CD-R) is a standardized medium defined by the "Orange Book Part 2". The CD-R system gives the opportunity to write once and read many times CD information.

3.1.11 CD-RW Disc

Compact Disc-Rewritable (CD-RW) is a standardized medium defined by the "Orange Book Part 3." The CD-RW system gives the opportunity to write, erase, overwrite and read CD information.

3.2 Power Condition

The drive is provided with 4 power conditions including active, idle, standby and sleep.

The power consumption in the active and idle conditions is identical while that in the standby and sleep conditions is also identical. The disc keeps rotating in the active and idle conditions while it is stopped in the standby and sleep conditions.

3.3 Authentication

The copy-protection system for DVD-ROM disc is CSS or CPPM copy protection system. The drive supports the CSS/CPPM authentication.

The copy-protection system for DVD-R/RW/RAM disc is CPRM copy protection system. The drive supports the CPRM authentication.

3.4 Defect Management

The drive supports distributed real-time defect management (DRT-DM) model in the software defect management model. The drive supports small DBI cache memory model.

4 Packet Commands

The following commands are implemented in the drive.

Table 1– Packet Commands

Command Description	Operation code	Reference		
		SFFC INF-8090i	MMC-5	This document
BLANK Command	A1h	16.1	6.2	4.1
CLOSE TRACK/RZONE/SESSION/BORDER Command	5Bh	16.2	6.3	4.2
FORMAT UNIT Command	04h	16.3	6.5	4.3
GET CONFIGURATION Command	46h	16.4	6.6	4.4
GET EVENT/STATUS NOTIFICATION Command	4Ah	16.5	6.7	4.5
GET PERFORMANCE Command	ACh	16.6	6.8	4.6
INQUIRY Command	12h	16.7	6.9	4.7
LOG SELECT Command	4Ch			4.8
LOG SENSE Command	4Dh			4.9
MECHANISM STATUS Command	BDh	16.9	6.11	4.10
MODE SELECT (10) Command	55h	16.10	6.12	4.11
MODE SENSE (10) Command	5Ah	16.11	6.13	4.12
PAUSE/RESUME Command	4Bh	16.12	6.14	
PLAY AUDIO (10) Command	45h	16.13	6.15	
PLAY AUDIO (12) Command	A5h		6.16	
PLAY AUDIO MSF Command	47h	16.14	6.17	
PLAY CD Command	BCh			4.13
PREVENT / ALLOW MEDIUM REMOVAL Command	1Eh	16.15	6.18	
Read (10) Command	28h	16.16	6.19	4.14
Read (12) Command	A8h	16.17	6.20	4.14
READ BUFFER Command	3Ch	16.18	6.21	4.15
READ BUFFER CAPACITY Command	5Ch	16.19	6.22	4.16
READ CAPACITY Command	25h	16.20	6.23	4.17
READ CD Command	BEh	16.21	6.24	
READ CD MSF Command	B9h	16.22	6.25	
READ DISC INFORMATION Command	51h	16.23	6.26	4.18
READ DISC STRUCTURE Command	ADh	16.24	6.27	4.19
READ FORMAT CAPACITIES Command	23h	16.25	6.28	
READ HEADER Command	44h			4.20
READ SUBCHANNEL Command	42h	16.26	6.29	
READ TOC/PMA/ATIP Command	43h	16.27	6.30	4.21
READ TRACK/RZONE INFORMATION Command	52h	16.28	6.31	4.22
REPAIR RZONE Command	58h	16.29	6.32	
REPORT KEY Command	A4h	16.30	6.33	
REQUEST SENSE Command	03h	16.31	6.34	4.23
RESERVE TRACK/RZONE Command	53h	16.32	6.35	4.24
REZERO UNIT Command	01h			
SCAN Command	BAh	16.33	6.36	
SEEK (10) Command	2Bh	16.34	6.37	
SEND CUE SHEET Command	5Dh	16.35	6.38	
SEND DIAGNOSTIC Command	1Dh			4.25
SEND DISC STRUCTURE Command	BFh	16.36	6.39	4.26
SEND KEY Command	A3h	16.38	6.40	
SEND OPC INFORMATION Command	54h	16.39	6.41	
SETCD SPEED Command	BBh	16.40	6.42	4.27
SET READ AHEAD Command	A7h	16.41	6.43	
SET STREAMING Command	B6h	16.42	6.44	4.28
START/STOP UNIT Command	1Bh	16.43	6.45	
STOP PLAY/SCAN Command	4Eh	16.44	6.46	
SYNCHRONIZE CACHE Command	35h	16.45	6.47	
TEST UNIT READY Command	00h	16.46	6.48	4.29

Command Description	Operation code	Reference		
		SFFC INF-8090i	MMC-5	This document
VERIFY Command	2Fh	16.47	6.49	4.30
WRITE (10) Command	2Ah	16.48	6.50	4.31
WRITE (12) Command	AAh	16.49	6.51	4.31
WRITE AND VERIFY Command	2Eh	16.50	6.52	
WRITE BUFFER Command	3Bh	16.51	6.53	4.32

4.1 BLANK Command

This command is valid for CD-RW and DVD-RW media.

The Immed bit is supported.

The READ DISC INFORMATION Command, the READ TRACK/RZONE INFORMATION Command and the TEST UNIT READY Command is used to detect completion of the blank operation. While blank operation is performed by the BLANK Command that the Immed bit is set to one, the drive terminates these commands with the Check Condition status, LOGICAL UNIT NOT READY, OPERATION IN PROGRESS (2/04/07).

The drive supports following Blanking Type for CD-RW and DVD-RW media.

Table 2 - Blank Type

Code	Name	CD-RW media	DVD-RW media
000b	Blank the disc	yes	yes
001b	Minimally blank the disc	yes	yes
010b	Blank a Track	no	-
011b	Unreserve a Track/RZone	no	no
100b	Blank a Track/RZone Tail	yes	no
101b	Unclose the last Session/Border	no	no
110b	Erase Session/Border	no	no

4.2 CLOSE TRACK/RZONE/SESSION/BORDER Command

This command is valid for CD-R/-RW media, Formatted CD-RW media, DVD-R/-RW/-R DL media, Formatted DVD-RW media and +R/+RW/+R DL media.

The Immed bit is supported.

The READ DISC INFORMATION Command or READ TRACK/RZONE INFORMATION Command is used to detect completion of the close operation. While close operation is performed by the CLOSE TRACK/RZONE/SESSION BORDER Command that the Immed bit is set to one, the drive terminates these commands with the Check Condition status, LOGICAL UNIT NOT READY, OPERATION IN PROGRESS (2/04/07).

Note: The TEST UNIT READY Command can not use to identify the completion of close operation because the this command returns Good status while close operation is performed.

The Session/Border bit and the Track/RZone bit specified in SFFC INF-8090i are extended to the Close Function field specified in MMC-5 as follows.

Table 3 - Close Function field definition

Close Function	Media	Description
000b	CD-R/RW	Not valid
	Formatted CD-RW	Not valid
	DVD-R/-RW DVD-R DL	Not valid
	Formatted DVD-RW	Not valid
	+RW	If a background format is in progress and de-icing is not completed, the format de-icing operation will be stopped at some +RW ECC block boundary. No further writing will occur. If there is no background format in progress, then no operation shall occur and this will not be considered an error.
	+R, +R DL	Not valid
001b	CD-R/RW	The drive closes the track associated with the track number in the CDB. If the track is an invisible track, no close operation is to be done. If the track is an incomplete track, the drive will write the PMA for the track. If the incomplete track has the length of less than 4 seconds, it will pad with all zero main data to the minimum length of 4 seconds prior to write the PMA. No other padding shall be done. If the track is a partially recorded or empty reserved track, the drive will pad until the end of the track. In the case of an empty track, the drive will write the track according to the Write Parameters Page. If the Write Parameters Page is inconsistent with the PMA, CHECK CONDITION status will be returned and SK/ASC/ASCQ will be set to ILLEGAL REQUEST/ILLEGAL MODE FOR THIS TRACK. For a partially recorded reserved track, the drive will continue writing in the same mode as the data already recorded.
	Formatted CD-RW	Not valid
	DVD-R/-RW DVD-R DL	If this is a Partially Recorded Reserved RZone or the Empty Reserved RZone, the drive will pad the RZone with 00h bytes. If the RZone status is Invisible, no close operation is to be done. In the case of an Incomplete RZone, no padding is to be done and cached RMD will be written into the RMA.
	Formatted DVD-RW	Not valid
	+RW	Not valid

Close Function	Media	Description
	+R, +R DL	The drive closes the Fragment associated with the track number in the CDB. If the Fragment being closed is reserved and blank or partially written, the drive will pad the Fragment to its defined length. User data areas in all pad sectors will be zero filled. If the Fragment being closed is an incomplete Fragment and the incomplete Fragment is not blank, then a new DCB will be appended into the Session Identification Zone defining the existence of the Fragment. If the Fragment being closed is an incomplete Fragment and the incomplete Fragment is blank, then the command will be terminated with GOOD status and sense data will be set to NO SENSE/NO ADDITIONAL INFORMATION.
010b	CD-R/RW	The drive closes the last session. If not all tracks in the last Session are closed, the drive terminates the command with CHECK CONDITION status and sets SK/ASC/ASCQ values to ILLEGAL REQUEST/SESSION FIXATION ERROR – INCOMPLETE TRACK IN SESSION. Behavior of the closing operation is dependent on the Multi-Session field in the Write Parameters Page (05h). If the last session is empty, the command will be terminated with GOOD status.
	Formatted CD-RW	Not valid
	DVD-R/-RW DVD-R DL	The drive closes the last border. If all RZones in the last Border are not complete, the drive generates CHECK CONDITION Status, 5/72/03 SESSION FIXATION ERROR - INCOMPLETE TRACK IN SESSION. If one or more empty or partially recorded reserved RZones exist in the incomplete Border, the drive generates CHECK CONDITION Status, 5/72/04 EMPTY OR PARTIALLY WRITTEN RESERVED TRACK. Behavior of the closing operation is dependent on the Multisession/Border field in the Write Parameters Mode Page (05h). Closing an empty Border does not produce an error and a write to the media will not occur.
	Formatted DVD-RW	When the last bordered area is in the intermediate state, Lead-in and/or Border-out are recorded to make the bordered area complete state. (If the bordered area is to be closed that is the first one, Lead-in and Border-out will be recorded. If the bordered area is to be closed that is second or later one, only the Border-out will be recorded.)
	+RW	If a background format is in progress, the format operation will be stopped and the disc will be structured for removal according to the *DVD+RW 4.7 Gbytes Basic Format Specifications* for the specific purpose of providing DVD-RO compatibility. To be concrete, a [partial] lead-in will be written, a [temporary] lead-out will be appended and all unrecorded gaps between lead-in and lead-out will be format written. The radius difference between the start of the temporary lead-out and the end of the temporary lead-out will approximate 1 mm. The data zone will be expanded to ensure that the total recorded area reaches at least a radius of 35 mm.
	+R	The drive closes the last session. If not all Fragments in the last Session are closed, the Drive will terminate this command with CHECK CONDITION Status and sense data shall be set to ILLEGAL REQUEST/SESSION FIXATION ERROR/ INCOMPLETE TRACK IN SESSION. If upon completion of the closure, less than 65 ECC blocks would remain, the drive will finalize the disc. If the session being closed is session number 154, when the close session is requested, the drive will finalize the disc.

Close Function	Media	Description
	+R DL	The drive closes the last session. If the session being closed straddles the layer jump position, the drive also records the Middle Zones. In this case, if the L0 Middle Zone ends prior to the 30 mm radius, the Middle Zones are extended to the 30 mm location. If the session being closed is the first session, the drive also records a Nominal Partial Lead-out Zone. If not all Fragments in the last Session are closed, the Drive will terminate this command with CHECK CONDITION Status and sense data shall be set to ILLEGAL REQUEST/SESSION FIXATION ERROR/ INCOMPLETE TRACK IN SESSION. If the LBA of the last ECC block of the session closure is greater than or equal to the LBA of the last ECC block on L0 of +R DL media, then both middle zones will be recorded. If upon completion of the closure, less than 65 ECC blocks would remain, the drive will finalize the disc. If the session being closed is session number 127, when the close session is requested, the drive will finalize the disc. If L0 Data Zone Capacity has been changed from default value and the session being closed is session number 126, when the close session is requested, the drive will finalize the disc.
011b	CD-R/RW	Not valid
	Formatted CD-RW	Not valid
	DVD-R/-RW DVD-R DL	Not valid
	Formatted DVD-RW	If the last session is complete state and Lead-out is not written, Lead-out shall be appended after the last Border-out. If the last session is intermediate state, Border-out and Lead-out is recorded.
	+RW	If a background format is in progress, the format operation will be stopped and the disc will be structured for removal according to the *DVD+RW 4.7 Gbytes Basic Format Specifications* for the specific purpose of providing DVD-RO compatibility. To be concrete, a [partial] lead-in will be written, a [temporary] lead-out will be appended and all unrecorded gaps between lead-in and lead-out will be format written. The radius difference between the start of the temporary lead-out and the end of the temporary lead-out will approximate 1 mm.
	+R, +R DL	Not valid
100b	CD-R/RW	Not valid
	Formatted CD-RW	Not valid
	DVD-R/-RW DVD-R DL	Not valid
	Formatted DVD-RW	Not valid
	+RW	Not valid
	+R	Not valid

Close Function	Media	Description
	+R DL	The drive closes the last session. If the session being closed straddles the layer jump position, the drive also records the Middle Zones. In this case, if the L0 Middle Zone ends prior to the 30 mm radius, the Middle Zones are extended to the 30 mm location. If the session being closed is the first session, and the L0 middle zone start address is at least at the 30 mm radius, the drive also records a Extended Partial Lead-out Zone on L1. If the session being closed is the first session, and the L0 middle zone start address is less than the 30 mm radius, the disc will be finalized. In this case, the L0 middle zone start address will be moved to immediately following the last recorded data on L0 before finalizing the disc. Moreover, if the L0 middle zone ends prior to the 30mm radius, the Middle Zones are extended to the 30 mm location. If not all Fragments in the last Session are closed, the Drive will terminate this command with CHECK CONDITION Status and sense data shall be set to ILLEGAL REQUEST/SESSION FIXATION ERROR/ INCOMPLETE TRACK IN SESSION. If the LBA of the last ECC block of the session closure is greater than or equal to the LBA of the last ECC block on L0 of +R DL media, then both middle zones will be recorded. If upon completion of the closure, less than 65 ECC blocks would remain, the drive will finalize the disc. If the session being closed is session number 127, when the close session is requested, the drive will finalize the disc. If L0 Data Zone Capacity has been changed from default value and the session being closed is session number 126, when the close session is requested, the drive will finalize the disc.
101b	CD-R/RW	Not valid
	Formatted CD-RW	Not valid
	DVD-R/-RW DVD-R DL	Not valid
	Formatted DVD-RW	Not valid
	+RW	Not valid
	+R	The drive closes the last session and finalize the disc. Once this close function has been executed, no more writing to the disc is allowed. If not all Fragment in the last Session are closed, the drive will terminate this command with CHECK CONDITION Status and sense data will be set to ILLEGAL REQUEST/SESSION FIXATION ERROR/ INCOMPLETE TRACK IN SESSION. In order to assure maximum interchange compatibility with read only devices, Guard Zone 2 will be recorded to a device defined PSN that approximates a disc radius of 30 mm.
	+R DL	The drive closes the last session and finalize the disc. Once this close function has been executed, no more writing to the disc is allowed. If not all Fragment in the last Session are closed, the drive will terminate this command with CHECK CONDITION Status and sense data will be set to ILLEGAL REQUEST/SESSION FIXATION ERROR/ INCOMPLETE TRACK IN SESSION. In order to assure maximum interchange compatibility with read only devices, Middle Zones will be recorded to a disc radius of 30 mm.
110b	CD-R/RW	Not valid
	Formatted CD-RW	Not valid
	DVD-R/-RW DVD-R DL	Not valid
	Formatted DVD-RW	Not valid
	+RW	Not valid

Close Function	Media	Description
	+R	Close the last session and finalize the disc. Once this close function has been executed, no more writing to the disc is allowed. If not all Tracks in the last Session are closed, the +R Drive shall terminate this command with CHECK CONDITION Status and sense data shall be set to ILLEGAL REQUEST/SESSION FIXATION ERROR/ INCOMPLETE TRACK IN SESSION.
	+R DL	The drive closes the last session and finalize the disc. Once this close function has been executed, no more writing to the disc is allowed. If not all Fragment in the last Session are closed, the drive will terminate this command with CHECK CONDITION Status and sense data will be set to ILLEGAL REQUEST/SESSION FIXATION ERROR/ INCOMPLETE TRACK IN SESSION.
111b	CD-R/RW	Not valid
	Formatted CD-RW	Not valid
	DVD-R/-RW DVD-R DL	Not valid
	Formatted DVD-RW	Not valid
	+RW	Not valid
	+R, +R DL	Not valid

4.3 FORMAT UNIT Command

The CmpLst bit is supported only in DVD-RAM media, must be set to zero with other medias.

The Interleave Value field is not supported and must be set to zero.

The Format Code field allows the value of 001b and 111b. If Format Code field is set to 001b and a CD-RW/DVD-RW/DVD-RAM media is mounted, the drive conforms for the definition of SFFC INF-8090i. If Format Code is set to 001b and a +RW media is mounted, the drive conform for the definition of MMC-5. If Format Code is set to 111b and CD-RW media is mounted, the drive conforms for legacy specifications which is described in the definition of MMC-5.

The drive supports following Format Type for each media.

Table 4 - Format Code = 001b

Format Type	Name	Support for CD-RW media	Support for DVD-RW media	Support for DVD-RAM media	Support for +RW media
00h	Full Format	yes	yes	yes	-
01h	Spare Area Expansion	-	-	yes	-
10h	C/DVD-RW Full Format	yes	yes	-	-
11h	C/DVD-RW Grow Session/Border	no	no	-	-
12h	C/DVD-RW Add Session/Border	no	no	-	-
13h	DVD-RW Quick Grow the last Border	-	yes	-	-
14h	DVD-RW Quick Add Border	-	no	-	-
15h	DVD-RW Quick	-	yes	-	-
26h	DVD+RW Basic Format	-	-	-	yes

Table 5 - Format Code = 111b (CD-RW only)

Sess bit	Grow bit	Support for CD-RW media
0	0	Yes
0	1	No
1	0	No
1	1	No

The Format Unit parameter list shall be transferred from the Host to the drive. The data sent to the drive consists of a Format List Header, followed by one Format descriptor, so the parameter list length is always 12 bytes. When the Format Options Valid (FOV) bit in the Format List Header is set to one, the DPRY, DCRT, STPF, IP, Try-out, and VS shall be set to zero. In this case, the format operation is performed with an Immed function specified by the Immed bit. When the FOV bit is set to zero, the DPRY, DCRT, STPF, IP, Try-out, Immed, and VS shall be set to zero. In this case, the format operation is performed with the drive's internal default setting. The default setting of Immed function is one. Even if the format operation is requested with the FOV bit set to one, the drive's default setting itself will not be changed.

4.3.1 Format Code = 001b

4.3.1.1 Format Type = 00h (Full Format)

Formatting for the entire media is specified. The Number of Blocks field specifies the number of addressable blocks for the entire disc and the Type Dependent Parameter field specifies the Block Length.

If the Immed function is set to zero, the drive will return the status after the format operation has completed. If the Immed bit is set to one, the drive will return the status as soon as the command descriptor block has been validated, and the entire Format Descriptor has been transferred.

The READ DISC INFORMATION Command, the READ TRACK/RZONE INFORMATION Command and the TEST UNIT READY Command is used to detect completion of the format operation. While format operation is performed by the FORMAT UNIT Command that the Immed function is set to one, the drive terminates these commands with the Check Condition status, LOGICAL UNIT NOT READY, FORMAT IN PROGRESS (2/04/04). If the drive returns Good status for these command, format operation has completed.

In response to the REQUEST SENSE command, including after the Check Condition status described above, the drive will return a SK/ASC/ASCQ values set to NOT READY/LOGICAL UNIT NOT READY/FORMAT IN PROGRESS, with the sense key specific bytes set for progress indication. The SKSV will be set to one and the Progress Indication field will contain 16 bit unsigned value such that (Progress Indication)/65 536 X 100% approximates the percentage of completion of the operation. Once the operation is completed, the SKSV will be cleared to zero.

4.3.1.1.1 On CD-RW media

The media is formatted using Write Parameter Mode Page information. Some parameters in the Write Parameter Mode Page shall be set as follows;
Test Write = 0, Write Type = 0h, FP = 1, Track Mode = 01x1b, Data Block Type = 8h or Ah,
Session Format = 00h or 20h, Packet Size = 20h

This format operation is always available regardless of the media condition.

4.3.1.1.2 On DVD-RW media

The media is inserted in the drive, the area from the beginning of the RMA to the end of the Lead-out will be recorded. There is only one bordered area on the medium and the number of RZone is one after this operation.

The Test Write bit in the Write Parameters Mode Page shall be set to zero.

This format operation is available on any recording mode and any state of a bordered area.

4.3.1.1.3 On DVD-RAM media

The defect list handling is specified by the combination of the CmpLst bit and the DCRT bit. In the case that the CmpLst bit is set to zero and the DCRT bit is set to one, the Number of Blocks field shall be ignored and the number of addressable blocks shall be retained. In other cases, the Number of Blocks field specifies the number of addressable blocks for the whole disc and the Type Dependent Parameter field specifies the Block Length. Neither field is changeable from the values reported by READ FORMAT CAPACITIES command.

The defect list handling is decided by the following combinations.

Table 6 – DVD-RAM Defect List Handling

CmpLst	DCRT	Certification	PDL			SDL	Remarks
			P-list	G1-list	G2-list		
0	0	yes	preserved	new form Certification	disposed	disposed	slow initialization
0	1	no	preserved	preserved	old + new form SDL	disposed	change linear replacement to slipping. quickly
1	0	yes(partial)	preserved	old + new from Certification	disposed	disposed	create new defect list by disposing all except P-list and G1-list
1	1	no	preserved	preserved	disposed	disposed	Return to original slipping at the latest certification. quickly

4.3.1.2 Format Type = 01h (Spare Area Expansion)

In order to keep more space as Spare area, this formatting is used. Eventually the capacity of the formatted area is reduced. Therefore, this formatting type is just available with the case of reduction of formatted capacity. The logical unit shall ignore the defect list handling specified by the combination of the CmpLst bit and the DCRT bit. The defect list entries and the written user data within the range of the area that is specified by this command shall be preserved through the execution of this command. The Number of Blocks field specifies the number of addressable blocks for the whole disc and the Type Dependent Parameter field specifies the Block Length. Neither field is changeable from the values reported by READ FORMAT CAPACITIES command.

4.3.1.3 Format Type = 10h (C/DVD-RW Full Format)

Formatting to create a Session/Border on C/DVD-RW media is specified.

If the Immed function is set to zero, the drive will return the status after the format operation has completed. If the Immed bit is set to one, the drive will return the status as soon as the command descriptor block has been validated, and the entire Format Descriptor has been transferred.

The READ DISC INFORMATION Command, the READ TRACK/RZONE INFORMATION Command and the TEST UNIT READY Command is used to detect completion of the format operation. While format operation is performed by the FORMAT UNIT Command that the Immed function is set to one, the drive terminates these commands with the Check Condition status, LOGICAL UNIT NOT READY, FORMAT IN PROGRESS (2/04/04). If the drive returns Good status for these command, format operation has completed.

In response to the REQUEST SENSE command, including after the Check Condition status described above, the drive will return a SK/ASC/ASCQ values set to NOT READY/LOGICAL UNIT NOT READY/FORMAT IN PROGRESS, with the sense key specific bytes set for progress indication. The SKSV will be set to one and the Progress Indication field will contain 16 bit unsigned value such that (Progress Indication)/65 536 X 100% approximates the percentage of completion of the operation. Once the operation is completed, the SKSV will be cleared to zero.

4.3.1.3.1 On CD-RW media

The created Session will become the only Session on the medium. The Number of Blocks field specifies the number of addressable blocks for the new Session and the Type Dependent Parameter field specifies the Fixed Packet Size (32). The Number of Blocks field may be adjusted to a value less than or equal to the values reported by the READ FORMAT CAPACITIES Command. The drive will round the Number of Blocks up to be an integral multiple of the packet size.
Some parameters in the Write Parameter Mode Page shall be set as follows;
Test Write = 0, Data Block Type = 8h or Ah, Session Format = 00h or 20h
After the FORMAT UNIT command is received by the drive, some parameters in the Write Parameter Mode Page will be modified as follows;
Write Type = 0h, FP = 1, Track Mode = 01x1b, Packet Size = 20h

This format operation is always available regardless of the media condition.

4.3.1.3.2 On DVD-RW media

The created Border will become the only Border on the medium. The Number of Blocks field specifies the number of addressable blocks for the new Border and the Type Dependent Parameter field specifies the ECC block size (16). The Number of Blocks field may be adjusted to a value less than or equal to the values reported by the READ FORMAT CAPACITIES Command. The drive will round the Number of Blocks up to be an integral multiple of the ECC block size.

The Test Write bit in the Write Parameters Mode Page shall be set to zero.

This format operation is available on any recording mode and any state of a bordered area. The number of RZone in the created Border is one after this operation.

4.3.1.4 Format Type = 13h (DVD-RW Quick Grow the last Border)

Formatting to expand the last Border and enter the last bordered area into intermediate state of a DVD-RW medium is specified. The Number of Blocks field specifies the number of addressable blocks to be added to current Border capacity and the Type Dependent Parameter field is set to ECC block size (16). The drive will round the Number of Blocks up to be an integral multiple of the ECC block size.

This format operation is available only when the disc is in Restricted overwrite mode and the last bordered area is complete state.

The number of bordered areas and RZones does not change after this operation.

If the Immed function is set to zero, the drive will return the status after the format operation has completed. If the Immed bit is set to one, the drive will return the status as soon as the command descriptor block has been validated, and the entire Format Descriptor has been transferred.

The READ DISC INFORMATION Command, the READ TRACK/RZONE INFORMATION Command and the TEST UNIT READY Command is used to detect completion of the format operation. While format operation is performed by the FORMAT UNIT Command that the Immed function is set to one, the drive terminates these commands with the Check Condition status, LOGICAL UNIT NOT READY, FORMAT IN PROGRESS (2/04/04). If the drive returns Good status for these command, format operation has completed.

In response to the REQUEST SENSE command, including after the Check Condition status described above, the drive will return a SK/ASC/ASCQ values set to NOT READY/LOGICAL UNIT NOT READY/FORMAT IN PROGRESS, with the sense key specific bytes set for progress indication. The SKSV will be set to one and the Progress Indication field will contain 16 bit unsigned value such that (Progress Indication)/65 536 X 100% approximates the percentage of completion of the operation. Once the operation is completed, the SKSV will be cleared to zero.

4.3.1.5 Format Type = 15h (DVD-RW Quick)

Formatting to create a Intermediate state Border on DVD-RW media is specified. The created Border will become the only Border on the medium. The Number of Blocks field specifies the number of addressable blocks for the new Border and the Type Dependent Parameter field is set to ECC block size (16). The Number of Blocks field may be adjusted to a value less than or equal to the values reported by the READ FORMAT CAPACITIES Command. The drive will round the Number of Blocks up to be an integral multiple of the ECC block size.

This format operation is available on any recording mode and any state of a bordered area. If a disc is to be formatted that is in Sequential recording mode, new intermediate state bordered area is created at the beginning of the disc and the recording mode is changed to Restricted overwrite mode. The number of RZone in the created Border is one after this operation.

If the Immed function is set to zero, the drive will return the status after the format operation has completed. If the Immed bit is set to one, the drive will return the status as soon as the command descriptor block has been validated, and the entire Format Descriptor has been transferred.

The READ DISC INFORMATION Command, the READ TRACK/RZONE INFORMATION Command and the TEST UNIT READY Command is used to detect completion of the format operation. While format operation is performed by the FORMAT UNIT Command that the Immed function is set to one, the drive terminates these commands with the Check Condition status, LOGICAL UNIT NOT READY, FORMAT IN PROGRESS (2/04/04). If the drive returns Good status for these command, format operation has completed.

In response to the REQUEST SENSE command, including after the Check Condition status described above, the drive will return a SK/ASC/ASCQ values set to NOT READY/LOGICAL UNIT NOT READY/FORMAT IN PROGRESS, with the sense key specific bytes set for progress indication. The SKSV will be set to one and the Progress Indication field will contain 16 bit unsigned value such that (Progress Indication)/65 536 X 100% approximates the percentage of completion of the operation. Once the operation is completed, the SKSV will be cleared to zero.

4.3.1.6 Format Type = 26h (+RW Basic Format)

The Number of Blocks field shall be set to either the value returned by the READ FORMAT CAPACITIES command or 0xFFFFFFFF. In this drive, any other value will be accepted, but it is no effect on the format operation.

The Type Dependent Parameter has the meaning of "New format" when it has the value 000000h.

The Type Dependent Parameter has the meaning of "Restart format" when it has the value 000001h.

If the field contains any other value, the drive will terminate the command with CHECK CONDITION status and set SK/ASC/ASCQ values to ILLEGAL REQUEST/INVALID FIELD IN PARAMETER BLOCK.

If the Immed function is set to zero, then once the foreground format process has completed, the command will be terminated with GOOD status. If the Immed function is set to one, the drive will return the status as soon as the command descriptor block has been validated, and the entire Format Descriptor has been transferred.

While foreground format process is performed by the FORMAT UNIT Command that the Immed function is set to one, the drive terminates the READ DISC INFORMATION Command, the READ TRACK/RZONE INFORMATION Command and the TEST UNIT READY Command with the Check Condition status, LOGICAL UNIT NOT READY, FORMAT IN PROGRESS (2/04/04). When the background format process is started, these commands will be terminated with GOOD status.

As for the REQUEST SENSE command, while the foreground format process is performed, the drive will return a SK/ASC/ASCQ values set to NOT READY/LOGICAL UNIT NOT READY/FORMAT IN PROGRESS (2/04/04), without the sense key specific bytes set for progress indication. While the background format process is performed, the drive will return a SK/ASC/ASCQ values set to NO SENSE/FORMAT IN PROGRESS (0/04/04), with the sense key specific bytes set for progress indication.

 The SKSV will be set to one and the Progress Indication field will contain 16 bit unsigned value such that (Progress Indication)/65 536 X 100% approximates the percentage of completion of the background format process. Once the background format process is completed, the SKSV will be cleared to zero.

4.3.2 Format Code = 111b

This Format Code has a legacy definition for CD-RW. It is described in Annex E of the MMC-5.

The SESS and Grow bits are ignored by the drive.

The drive performs as same as the operation which the Format Code is set to 001b and the Format type is set to 00h.

4.4 GET CONFIGURATION Command

4.4.1 Feature List and Profile List

The drive supports following Feature.

Table 7 – Feature List

Feature Number	Feature Name
0000h	Profile List
0001h	Core
0002h	Morphing
0003h	Removable Medium
0004h	Write Protect
0010h	Random Readable
001Dh	Multi Read
001Eh	CD Read
001Fh	DVD Read
0020h	Random Writable
0021h	Incremental Streaming Writable
0023h	Formattable
0024h	Hardware Defect Management
0026h	Restricted Overwrite
0029h	DRT-DM
002Ah	DVD+RW
002Bh	DVD+R
002Ch	DVD-RW Restricted Overwrite
002Dh	CD-Track at Once
002Eh	CD Mastering
002Fh	DVD-R/-RW Write
0033h	Layer Jump Recording
0037h	CD-RW Media Write Support
003Bh	DVD+R Double Layer
0100h	Power Management
0101h	S.M.A.R.T.
0103h	CD Audio analog play
0104h	Microcode Upgrade
0105h	Time-out
0106h	DVD-CSS
0107h	Real-Time Streaming
0108h	Logical Unit serial number
010Ah	Disc Control Block
010Bh	DVD CPRM

If the Layer Jump Recording has not been supported, the Layer Jump Recording feature (0033h) is not supported.

If the DVD-RAM Recording has not been supported, the Hardware Defect Management feature (0024h) and the S.M.A.R.T. feature (0101h) is not supported.

The DVD+RW feature, the DVD+R feature, the CD-RW Media Write Support feature, and the DVD+R Double Layer feature are defined in MMC-5. All other features are defined in SFFC INF-8090i.

The drive supports following Profile.

Table 8 – Profile List

Profile Number	Profile Name
0002h	Removable disk
0008h	CD-ROM
0009h	CD-R

000Ah	CD-RW
0010h	DVD-ROM
0011h	DVD-R Sequential Recording
0012h	DVD-RAM
0013h	DVD-RW Restricted Overwrite
0014h	DVD-RW Sequential Recording
0015h	DVD-R Dual Layer Sequential Recording
0016h	DVD-R Dual Layer Jump Recording
001Ah	DVD+RW
001Bh	DVD+R
002Bh	DVD+R Double Layer

If the DVD-RAM Recording has not been supported, the Removable disk profile (0002h) and the DVD-RAM profile (0012h) is not supported.

The DVD+RW profile, the DVD+R profile, and the DVD+R Double Layer profile are defined in MMC-5. All other profiles are defined in SFFC INF-8090i.

4.4.2 Media states

The Morphing is occurred when the media or media state is changed. The drive has Media states that is described in following Media states.

Table 9 – Media states

State No	Media	State	Descriptions
1	No Media	Not Ready	
2	CD-ROM	Complete	
3-1	CD-R	Empty	Empty Disc
3-2		No Complete Session	No Session closed Disc (Track at Once or Packet writing disc)
3-3		Existing Complete Session	Session closed Disc (Session at Once writing or Session closed disc : Appendable)
3-4		Complete	Not appendable Disc (Disc at Once writing or Finalized disc)
4-1	CD-RW	Empty	Empty or Blanked Disc
4-2		No Complete Session	No Session closed Disc (Track at Once or Packet writing disc)
4-3		Existing Complete Session	Session closed Disc
4-4		Complete	Not appendable Disc (Disc at Once writing or Finalized disc)
4-5		Full Formatted	Full formatted Disc
5	DVD-ROM	Complete	
6-1	DVD-R	Empty	Empty Disc
6-2		No Complete Border	No Border closed Disc
6-3		Existing Complete Border	Border closed Disc (Appendable)
6-4		Complete	Not appendable Disc
7-1	DVD-RW	Empty	Empty or Blanked Disc
7-2		No Complete Border	No Border closed Disc
7-3		Existing Complete Border	Border closed Disc
7-4		Full Formatted	Full formatted Disc
7-5		Quick Formatted	1st Border is Quick formatted
8-1	+R	Empty	Empty Disc
8-2		No Complete Session	No Session closed Disc
8-3		Existing Complete Session	One or more Session closed Disc (Appendable)
8-4		Complete	Not appendable Disc
9-1	+RW	Empty	Empty Disc
9-2		Full Formatted	Full formatted Disc
9-3		Partially Formatted	Partially Formatted Disc
10-1	+R DL	Empty	Empty Disc
10-2		No Complete Session	No Session closed Disc
10-3		Existing Complete Session	One or more Session closed Disc (Appendable)
10-4		Complete	Not appendable Disc
11-1	DVD-R DL	Empty	Empty Disc
11-2		No Complete Border (Format 1)	No Border closed Disc
11-3		Complete (Format 1)	Not appendable Disc
11-4		No Complete Border (Format 4)	No Border closed Disc
11-5		Existing Complete Border (Format 4)	Border closed Disc (Appendable)
11-6		Complete (Format 4)	Not appendable Disc
12-1	DVD-RAM	Normal	Ready to record and read disc

12-2		Format in progress	Format is necessary to record and read disc
12-3		Defect list is damaged	It is possible to read , Format is necessary to record disc
12-4		Should be in cartridge	It is possible only to read

4.4.3 Current Profile of the Feature Header and Current bit of the Profile List

The Current Profile of the Feature Header and the Current bit of the Profile List is set as following. The Current Profile and Current bit of Profile List is morphed by media state.

4.4.3.1 Current Profile and Current bit for No Media and CD Media

The following table indicates the Current Profile of the Feature Header and the Current bit of the Profile List that no media or CD media is mounted.

Table 10 – Current Profile and Current bit for No Media and CD Media

State No	Current Profile	Removable (0002)	CD-ROM (0008)	CD-R (0009)	CD-RW (000A)	DVD-ROM (0010)	DVD-R S.R. (0011)	DVD-RAM (0012)	DVD-RW R.O. (0013)	DVD-RW S.R. (0014)	DVD-R DL S.R.	DVD-R DL J.R. (0016)	DVD+RW (001A)	DVD+R (001B)	DVD+R DL (002B)	descriptions
1	0000h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	No Profile whose current bit is set to one exists.
2	0008h	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Only CD-ROM Profile is current to indicate the disc is read only.
3-1	0009h	0	0	1	0	0	0	0	0	0	0	0	0	0	0	Only CD-R Profile is current to indicate the disc is writable as a CD-R.
3-2	0009h	0	0	1	0	0	0	0	0	0	0	0	0	0	0	Only CD-R Profile is current to indicate the disc is writable as a CD-R.
3-3	0009h	0	1	1	0	0	0	0	0	0	0	0	0	0	0	CD-ROM Profile is current to indicate the disc can be mounted as a CD-ROM. CD-R Profile is current to indicate the disc is writable as a CD-R.
3-4	0008h	0	1	0	0	0	0	0	0	0	0	0	0	0	0	Only CD-ROM Profile is current to indicate the disc is read only.
4-1	000Ah	0	0	1	1	0	0	0	0	0	0	0	0	0	0	Both CD-R Profile and CD-RW Profile are current to indicate the disc is writable as a CD-R or a CD-RW.
4-2	000Ah	0	0	1	1	0	0	0	0	0	0	0	0	0	0	Both CD-R Profile and CD-RW Profile are current to indicate the disc is writable as a CD-R or a CD-RW.
4-3	000Ah	0	1	1	1	0	0	0	0	0	0	0	0	0	0	CD-ROM Profile is current to indicate the disc can be mounted as a CD-ROM. Both CD-R Profile and CD-RW Profile are current to indicate the disc is writable as a CD-R or a CD-RW.
4-4	000Ah	0	1	0	1	0	0	0	0	0	0	0	0	0	0	CD-ROM Profile is current to indicate the disc can be mounted as a CD-ROM. CD-RW Profile is current to indicate the disc can be erased or reformatted.
4-5	000Ah	0	1	0	1	0	0	0	0	0	0	0	0	0	0	CD-ROM Profile is current to indicate the disc can be mounted as a CD-ROM. CD-RW Profile is current to indicate the disc can be overwritten, erased or reformatted.

4.4.3.2 Current Profile and Current bit for DVD Media

The following table indicates the Current Profile of the Feature Header and the Current bit of the Profile List that DVD media is mounted

Table 11 – Current Profile and Current bit for DVD Media

State No	Current Profile	Current bit of the Profile														descriptions
		Removable (0002)	CD-ROM (0008)	CD-R (0009)	CD-RW (000A)	DVD-ROM (0010)	DVD-R S.R. (0011)	DVD-RAM (0012)	DVD-RW R.O. (0013)	DVD-RW S.R. (0014)	DVD-R DL S.R.	DVD-R DL J.R.	DVD+RW (001A)	DVD+R (001B)	DVD+R DL (002B)	
5	0010h	0	0	0	0	1	0	0	0	0	0	0	0	0	0	DVD-ROM Profile is current to indicate the read only.
6-1	0011h *a	0	0	0	0	0	1	0	0	0	0	0	0	0	0	DVD-R Sequential Recording Profile is current to indicate the sequential writable.
6-2	0011h *b	0	0	0	0	0	1	0	0	0	0	0	0	0	0	DVD-R Sequential Recording Profile is current to indicate the sequential writable.
6-3	0011h *b	0	0	0	0	1	1	0	0	0	0	0	0	0	0	DVD-ROM Profile is current to indicate the disc can be mounted as a DVD-ROM. DVD-R Sequential Recording Profile is current to indicate the disc is sequential writable.
6-4	0010h	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Only DVD-ROM Profile is current to indicate the disc is read only.
7-1	0014h	0	0	0	0	0	1	0	1	1	0	0	0	0	0	DVD-R/-RW Sequential Recording Profile is current to indicate the disc is sequential writable.
7-2	0014h	0	0	0	0	0	1	0	1	1	0	0	0	0	0	DVD-RW Restricted Overwrite Profile is current to indicate the disc is formattable.
7-3	0014h	0	0	0	0	1	1	0	1	1	0	0	0	0	0	DVD-ROM Profile is current to indicate the disc can be mounted as a DVD-ROM. DVD-R/RW Sequential Recording Profile is current to indicate the disc is sequential writable. DVD-RW Restricted Overwrite Profile is current to indicate the disc is formattable..
7-4	0013h	0	0	0	0	1	0	0	1	1	0	0	0	0	0	DVD-ROM Profile is current to indicate the disc can be mounted as a DVD-ROM. DVD-RW Sequential Recording Profile is current to indicate the disc is erasable. DVD-RW Restricted Overwrite Profile is current to indicate the disc is overwritable.
7-5	0013h	0	0	0	0	0	0	0	1	1	0	0	0	0	0	DVD-RW Sequential Recording Profile is current to indicate the disc is erasable. DVD-RW Restricted Overwrite Profile is current to indicate the disc is overwritable.

11-1	0015h	0	0	0	0	0	0	0	0	0	1	1	0	0	0	DVD-R DL Sequential Recording Profile is current to indicate the disc is sequential writable. DVD-R DL Jump Recording Profile is current to indicate the disc is jump recording writable.
11-2	0015h	0	0	0	0	0	0	0	0	0	1	0	0	0	0	DVD-R DL Sequential Recording Profile is current to indicate the disc is sequential writable.
11-3	0015h	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
11-4	0016h	0	0	0	0	0	0	0	0	0	0	1	0	0	0	DVD-R DL Jump Recording Profile is current to indicate the disc is jump recording writable.
11-5	0016h	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
11-6	0016h	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
12-1	0012h	1	0	0	0	0	0	1	0	0	0	0	0	0	0	Removable disc Profile is current to indicate the disc is Writable disk capable with removable media.
12-2	0012h	1	0	0	0	0	0	1	0	0	0	0	0	0	0	
12-3	0012h	1	0	0	0	0	0	1	0	0	0	0	0	0	0	
12-4	0012h	1	0	0	0	0	0	1	0	0	0	0	0	0	0	DVD-RAM Profile is indicate the disc is Random writable.

*a : If the LPP information of the disc does not applicable for the drive to execute write operations, the disc is regarded as incompatible media and the Current Profile is set to 0000h.

*b : If the LPP information of the disc does not applicable for the drive to execute write operations, the Current Profile is set to 0010h.

4.4.3.3 Current Profile and Current bit for +R/+RW/+R DL Media

The following table indicates the Current Profile of the Feature Header and the Current bit of the Profile List that +R/+RW/+R DL media is mounted.

Table 12 – Current Profile and Current bit for +R/+RW/+R DL Media

State No	Current Profile	Current bit of the Profile														descriptions
		Removable (0002)	CD-ROM (0008)	CD-R (0009)	CD-RW (000A)	DVD-ROM (0010)	DVD-R S.R. (0011)	DVD-RAM (0012)	DVD-RW R.O. (0013)	DVD-RW S.R. (0014)	DVD-R DL S.R. (0015)	DVD-R DL J.R. (0016)	DVD+RW (001A)	DVD+R (001B)	DVD+R DL (002B)	
8-1	001Bh	0	0	0	0	0	0	0	0	0	0	0	0	1	0	Only DVD+R Profile is current.
8-2		0	0	0	0	0	0	0	0	0	0	0	0	1	0	
8-3		0	0	0	0	0	0	0	0	0	0	0	0	1	0	
8-4		0	0	0	0	0	0	0	0	0	0	0	0	1	0	
9-1	001Ah	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Only DVD+RW Profile is current.
9-2		0	0	0	0	0	0	0	0	0	0	0	1	0	0	
9-3		0	0	0	0	0	0	0	0	0	0	0	1	0	0	
10-1	002Bh	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Only DVD+R Double Layer Profile is current.
10-2		0	0	0	0	0	0	0	0	0	0	0	0	0	1	
10-3		0	0	0	0	0	0	0	0	0	0	0	0	0	1	
10-4		0	0	0	0	0	0	0	0	0	0	0	0	0	1	

4.4.4 Current bit of the Feature List

4.4.4.1 Current bit of the Feature List for CD Media

The Current bit of the Feature List for CD media is set as following list. The State No. is described in the Table 9 – Media states.

Table 13 – Feature List for CD Media

State No. Feature Name	1	2	3-1	3-2	3-3	3-4	4-1	4-2	4-3	4-4	4-5	
0000h: Profile List	1	1	1	1	1	1	1	1	1	1	1	
0001h: Core	1	1	1	1	1	1	1	1	1	1	1	
0002h: Morphing	1	1	1	1	1	1	1	1	1	1	1	
0003h: Removable Medium	1	1	1	1	1	1	1	1	1	1	1	
0004h: Write Protect	0	0	0	0	0	0	0	0	0	0	0	
0010h: Random Readable	0	1	0	1	1	1	0	1	1	1	1	*a
001Dh: Multi Read	1	1	1	1	1	1	1	1	1	1	1	
001Eh: CD Read	0	1	0	0	1	1	0	0	1	1	1	*a
001Fh: DVD Read	0	0	0	0	0	0	0	0	0	0	0	
0020h: Random Writable	0	0	0	0	0	0	0	0	0	0	0	
0021h: Incremental Streaming Writable	0	0	1	1	1	0	1	1	1	0	0	*b
0023h: Formattable	0	0	0	0	0	0	1	1	1	1	1	
0024h: Hardware Defect Management	0	0	0	0	0	0	0	0	0	0	0	
0026h: Restricted Overwrite	0	0	0	0	0	0	1	*c	*c	*c	1	*b
0029h: Software Defect Management	0	0	0	0	0	0	0	0	0	0	1	
002Ah: DVD+RW	0	0	0	0	0	0	0	0	0	0	0	
002Bh: DVD+R	0	0	0	0	0	0	0	0	0	0	0	
002Ch: Rigid Restricted Overwrite	0	0	0	0	0	0	0	0	0	0	0	
002Dh: CD-Track at Once	0	0	1	1	1	0	1	1	1	0	0	*b
002Eh: CD Mastering	0	0	1	0	0	0	1	0	0	0	0	*b
002Fh: DVD-R/-RW Write	0	0	0	0	0	0	0	0	0	0	0	
0033h: Layer Jump Recording	0	0	0	0	0	0	0	0	0	0	0	
0037h: CD-RW Media Write Support	0	0	0	0	0	0	1	1	1	1	1	
003B: DVD+R Double Layer	0	0	0	0	0	0	0	0	0	0	0	
0100h: Power Management	1	1	1	1	1	1	1	1	1	1	1	
0101h: S.M.A.R.T.	0	0	0	0	0	0	0	0	0	0	0	
0103h: CD Audio analog play	0	*d	0	*d	*d	*d	0	*d	*d	*d	0	
0104h: Microcode Upgrade	1	0	0	0	0	0	0	0	0	0	0	
0105h: Time-out	1	1	1	1	1	1	1	1	1	1	1	
0106h: DVD-CSS	0	0	0	0	0	0	0	0	0	0	0	
0107h: Real-Time Streaming	0	1	1	1	1	1	1	1	1	1	1	
0108h: Logical Unit serial number	1	1	1	1	1	1	1	1	1	1	1	
010Ah: Disc Control Block	0	0	0	0	0	0	0	0	0	0	0	
010Bh: DVD CPRM	0	0	0	0	0	0	0	0	0	0	0	

*a: In write operation, if Read command or Play Audio command returns the Check Condition, the current bit is set to zero.

*b: In write operation, it keeps previous setting.

*c: This Feature indicates that Fixed Packet Writing is allowed. If only one Track is existing and the track is invisible or Fixed Packet writing, the current bit is set to one.

*d: If Audio Track is existing, the current bit is set to one.

4.4.4.2 Current bit of the Feature List for DVD Media

The Current bit of the Feature List for DVD media is set as following list. The State No. is described in the Table 9 – Media states.

Table 14 – Feature List for DVD-ROM/-R/-RW/RAM Media

Feature Name \ State No.	1	5	6-1	6-2	6-3	6-4	7-1	7-2	7-3	7-4	7-5	11-1	11-2	11-3	11-4	11-5	11-6	12-1	12-2	12-3	12-4	
0000h: Profile List	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
0001h: Core	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
0002h: Morphing	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
0003h: Removable Medium	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
0004h: Write Protect	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	1	1	1	0	
0010h: Random Readable	0	1	0	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	1	1	1	*a
001Dh: Multi Read	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
001Eh: CD Read	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
001Fh: DVD Read	0	1	0	1	1	1	0	0	1	1	1	0	1	1	1	1	1	0	1	1	1	*a
0020h: Random Writable	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0021h: Incremental Streaming Writable	0	0	1	1	1	0	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	*b
0023h: Formattable	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	1	1	1	0	
0024h: Hardware Defect Management	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0026h: Restricted Overwrite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0029h: Software Defect Management	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	
002Ah: DVD+RW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
002Bh: DVD+R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
002Ch: Rigid Restricted Overwrite	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	
002Dh: CD-Track at Once	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
002Eh: CD Mastering	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
002Fh: DVD-R/-RW Write	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
0033h: Layer Jump Recording	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	
0037h: CD-RW Media Write Support	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
003Bh: DVD+R Double Layer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0100h: Power Management	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	
0101h: S.M.A.R.T.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
0103h: CD Audio analog play	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0104h: Microcode Upgrade	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0105h: Time-out	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	
0106h: DVD-CSS	0	*c	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0107h: Real-Time Streaming	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	
0108h: Logical Unit serial number	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	
010Ah: Disc Control Block	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
010Bh: DVD CPRM	0	0	*d	*d	*d	*d	*d	*d	*d	*d	*d	*d	*d	*d	*d	*d	*d	*d	*d	*d	*d	

*a: In write operation, if Read command returns the Check Condition, the current bit is set to zero.

*b: In write operation, it keeps previous setting.

*c: If CSS encrypted disc is existing, the current bit is set to one.

*d: If the CPRM exists on the disc the current bit is set to one, if the CPRM does not exist on the disc the current bit is set to zero.

4.4.4.3 Current bit of the Feature List for +R/+RW/+R DL Media

The Current bit of the Feature List for +R/+RW/+R DL media is set as following list. The State No. is described in the Table 9 – Media states.

Table 15 – Feature List for +R/+RW/+R DL Media

Feature Name \ State No.	1	8-1	8-2	8-3	8-4	9-1	9-2	9-3	10-1	10-2	10-3	10-4	
0000h: Profile List	1	1	1	1	1	1	1	1	1	1	1	1	
0001h: Core	1	1	1	1	1	1	1	1	1	1	1	1	
0002h: Morphing	1	1	1	1	1	1	1	1	1	1	1	1	
0003h: Removable Medium	1	1	1	1	1	1	1	1	1	1	1	1	
0004h: Write Protect	0	0	0	0	0	0	0	0	0	0	0	0	
0010h: Random Readable	0	0	1	1	1	0	1	1	0	1	1	1	*a
001Dh: Multi Read	0	0	0	0	0	0	0	0	0	0	0	0	
001Eh: CD Read	0	0	0	0	0	0	0	0	0	0	0	0	
001Fh: DVD Read	0	0	1	1	1	0	1	1	0	1	1	1	*a
0020h: Random Writable	0	0	0	0	0	0	1	1	0	0	0	0	
0021h: Incremental Streaming Writable	0	0	0	0	0	0	0	0	0	0	0	0	
0023h: Formattable	0	0	0	0	0	1	1	1	0	0	0	0	
0024h: Hardware Defect Management	0	0	0	0	0	0	0	0	0	0	0	0	
0026h: Restricted Overwrite	0	0	0	0	0	0	0	0	0	0	0	0	
0029h: Software Defect Management	0	0	0	0	0	0	0	0	0	0	0	0	
002Ah: DVD+RW	0	0	0	0	0	1	1	1	0	0	0	0	
002Bh: DVD+R	0	1	1	1	1	0	0	0	0	0	0	0	
002Ch: Rigid Restricted Overwrite	0	0	0	0	0	0	0	0	0	0	0	0	
002Dh: CD-Track at Once	0	0	0	0	0	0	0	0	0	0	0	0	
002Eh: CD Mastering	0	0	0	0	0	0	0	0	0	0	0	0	
002Fh: DVD-R/-RW Write	0	0	0	0	0	0	0	0	0	0	0	0	
0033h: Layer Jump Recording	0	0	0	0	0	0	0	0	0	0	0	0	
0037h: CD-RW Media Write Support	0	0	0	0	0	0	0	0	0	0	0	0	
003Bh: DVD+R Double Layer	0	0	0	0	0	0	0	0	1	1	1	1	
0100h: Power Management	1	1	1	1	1	1	1	1	1	1	1	1	
0101h: S.M.A.R.T.	0	0	0	0	0	0	0	0	0	0	0	0	
0103h: CD Audio analog play	0	0	0	0	0	0	0	0	0	0	0	0	
0104h: Microcode Upgrade	1	0	0	0	0	0	0	0	0	0	0	0	
0105h: Time-out	1	1	1	1	1	1	1	1	1	1	1	1	
0106h: DVD-CSS	0	0	0	0	0	0	0	0	0	0	0	0	
0107h: Real-Time Streaming	0	0	1	1	1	0	1	1	0	1	1	1	
0108h: Logical Unit serial number	1	1	1	1	1	1	1	1	1	1	1	1	
010Ah: Disc Control Block	0	1	1	1	1	1	1	1	1	1	1	1	
010Bh: DVD CPRM	0	0	0	0	0	0	0	0	0	0	0	0	

*a: In write operation, if Read command returns the Check Condition, the current bit is set to zero.

4.5 GET EVENT/STATUS NOTIFICATION Command

The drive supports polling mode only. The Immed bit must be set to one.

Following Notification Classes are supported.

Table 16 - Notification Class Request

Bit	Definition	Support
0	Reserved	-
1	Operational Change Request/Notification	yes
2	Power Management	yes
3	External Request	no
4	Media	yes
5	Multi Host	no
6	Device Busy	no
7	Reserved	-

4.5.1 Media Events

Following Media Events are supported.

Table 17 – Media Event Format

Code	Event	Description
0	NoChg	Media status is unchanged.
1	Eject Request	The drive has received a request from the user to eject the media.
2	NewMedia	The drive has received new media, and is ready to access it.
3 - 4	Reserved	
5	BGformatCompleted	A +RW background format has completed.
6	BGformatRestarted	A +RW background format has been automatically restarted by the drive.
7 - F	Reserved	

4.6 GET PERFORMANCE Command

Following Types are supported.

Table 18 – Type field values description

Type field value	Definition	Support
00h	Performance	yes
01h	Unusable Area	yes
02h	Defect Status	no
03h	Write Speed	yes
04h	DBI	yes
05h	DBI Cache Zone	yes

The Unusable Area is supported only in DVD-RAM media.

4.6.1 Performance (Type field = 00h)

The drive has nominal only performance parameter. If Except field dose not set to 00b, the drive returns the Performance Header only.

Table 19 – Performance Data

Write bit	Disc	Start LBA	Start Performance	End LBA	End Performance
0	No Media	0	DVD 12x CAV 12*1385*(240/585) = 6818 (1AA2h)	0	DVD 12x CAV 12*1385 = 16620 (40ECh)
	CD-ROM	0	CD 40x CAV 40*2352*75/1000*(240/585) = 2894 (B4Eh)	Lead-out Start LBA of Last Session -1	CD 40x CAV 40*2352*75/1000 = 7056 (1B90h)
	CD-R	0	CD 40x CAV 40*2352*75/1000*(240/585) = 2894 (B4Eh)	Outermost Lead-out Start LBA from ATIP -1	CD 40x CAV 40*2352*75/1000 = 7056 (1B90h)
	CD-RW	0	CD 32x CAV 32*2352*75/1000*(240/585) = 2315 (90Bh)	Outermost Lead-out Start LBA from ATIP -1	CD 32x CAV 32*2352*75/1000 = 5644 (160Ch)
	DVD-ROM	0	DVD 12x CAV 12*1385*(240/585) = 6818 (1AA2h)	Last LBA	DVD 12x CAV 12*1385 = 16620 (40ECh)
	DVD-R	0	DVD 8x CAV 8*1385*(240/585) = 4545 (11C1h)	Outermost Lead-out Start LBA in LPP -1	DVD 8x CAV 8*1385 = 11080 (2B48h)
	DVD-RW	0	DVD 8x CAV 8*1385*(240/585) = 4545 (11C1h)	Outermost Lead-out Start LBA in LPP -1	DVD 8x CAV 8*1385 = 11080 (2B48h)
	DVD-R DL	0	DVD 8x CAV 8*1385*(240/585) = 4545 (11C1h)	Last Possible Lead-out Start LBA - 1	DVD 8x CAV 8*1385 = 11080 (2B48h)
	DVD-RAM	0	Established Read Speed, the same as Write Speed	Last LBA, decided with FormatUnitCommand	Established Read Speed, the same as Write Speed
	+R	0	DVD 8x CAV 8*1385*(240/585) = 4545 (11C1h)	Outermost Lead-out Start LBA in ADIP -1	DVD 8x CAV 8*1385 = 11080 (2B48h)

	+RW	0	DVD 8x CAV 8*1385*(240/585) = 4545 (11C1h)	Outermost Lead-out Start LBA in ADIP -1	DVD 8x CAV 8*1385 = 11080 (2B48h)
	+R DL	0	DVD 8x CAV 8*1385*(240/585) = 4545 (11C1h)	Last Possible Lead-out Start LBA - 1	DVD 8xCAV 8*1385 = 11080 (2B48h)
1	No Media	0	DVD 4x CLV 4*1385 = 5540 (15A4h)	0	DVD 4x CLV 4*1385 = 5540 (15A4h)
	CD-ROM	Only the Performance Header is returned.			
	CD-R CD-RW	0	Established Write Speed	Outermost Lead-out Start LBA in ATIP -1	Established Write Speed
	DVD-ROM	Only the Performance Header is returned.			
	DVD-R DVD-RW	0	Established Write Speed	Outermost Lead-out Start LBA in LPP -1	Established Write Speed
	DVD- R DL	0	Established Write Speed	Last Possible Lead-out Start LBA – 1	Established Write Speed
	DVD-RAM	0	Established Write Speed	Last LBA, decided with FormatUnitCo mand	Established Write Speed
	+R +RW	0	Established Write Speed	Outermost Lead-out Start LBA in ADIP -1	Established Write Speed
	+R DL	0	Established Write Speed	Last Possible Lead-out Start LBA – 1	Established Write Speed

Notes: About the Last Possible Lead-out Start LBA of +R DL media, refer the Notes of 4.6.2.2 .

4.6.2 Write Speed (Type field = 03h)

4.6.2.1 Write Speed Data for No Media and CD Media

Table 20 – Write Speed Data for No Media and CD Media

Disc	Write Speed Descriptor #	End LBA	Read Speed	Write Speed
No Media	#1	23127Fh	DVD 16x CLV 16*1385 = 22160 (5690h)	DVD 16x CLV 16*1385 = 22160 (5690h)
	#2		DVD 12x CLV 12*1385 = 16620 (40ECh)	DVD 12x CLV 12*1385 = 16620 (40ECh)
	#3		DVD 8x CLV 8*1385 = 11080 (2B48h)	DVD 8x CLV 8*1385 = 11080 (2B48h)
	#4		DVD 6x CLV 6*1385 = 8310 (2076h)	DVD 6x CLV 6*1385 = 8310 (2076h)
	#5		DVD 5x CLV 5*1385 = 6925 (1B0Dh)	DVD 5x CLV 5*1385 = 6925 (1B0Dh)
	#6		DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
	#7		DVD 3.3x CLV 3.3*1385 = 4570 (11DAh)	DVD 3.3x CLV 3.3*1385 = 4570 (11DAh)
	#8		DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)	DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)
	#9		DVD 2x CLV 2*1385 = 2770 (AD2h)	DVD 2x CLV 2*1385 = 2770 (AD2h)
	#10		DVD 1x CLV 1*1385 = 1385 (569h)	DVD 1x CLV 1*1385 = 1385 (569h)
CD-ROM	#1	Lead-out Start LBA of Last Session -1	CD 40x CAV 40*2352*75/1000 = 7056 (1B90h)	CD 40x CAV 40*2352*75/1000 = 7056 (1B90h)
	#2		CD 32x CLV 32*2352*75/1000 = 5644 (160Ch)	CD 32x CLV 32*2352*75/1000 = 5644 (160Ch)
	#3		CD 24x CLV 24*2352*75/1000 = 4233 (1089h)	CD 24x CLV 24*2352*75/1000 = 4233 (1089h)
	#4		CD 16x CLV 16*2352*75/1000 = 2822 (B06h)	CD 16x CLV 16*2352*75/1000 = 2822 (B06h)
	#5		CD 10x CLV 10*2352*75/1000 = 1764 (6E4h)	CD 10x CLV 10*2352*75/1000 = 1764 (6E4h)
	#6		CD 4x CLV 4*2352*75/1000 = 705 (2C1h)	CD 4x CLV 4*2352*75/1000 = 705 (2C1h)
CD-R	#1	Outermost Lead-out Start LBA from ATIP -1	CD 40x CAV 40*2352*75/1000 = 7056 (1B90h)	CD 40x CAV 40*2352*75/1000 = 7056 (1B90h)
	#2		CD 32x CLV 32*2352*75/1000 = 5644 (160Ch)	CD 32x CLV 32*2352*75/1000 = 5644 (160Ch)
	#3		CD 24x CLV 24*2352*75/1000 = 4233 (1089h)	CD 24x CLV 24*2352*75/1000 = 4233 (1089h)
	#4		CD 16x CLV 16*2352*75/1000 = 2822 (B06h)	CD 16x CLV 16*2352*75/1000 = 2822 (B06h)
	#5		CD 10x CLV 10*2352*75/1000 = 1764 (6E4h)	CD 10x CLV 10*2352*75/1000 = 1764 (6E4h)

	#6		CD 4x CLV 4*2352*75/1000 = 705 (2C1h)	CD 4x CLV 4*2352*75/1000 = 705 (2C1h)
CD-RW (Ultra Speed+)	#1		CD 32x CLV 32*2352*75/1000 = 5644 (160Ch)	CD 32x CLV 32*2352*75/1000 = 5644 (160Ch)
	#2		CD 24x CLV 24*2352*75/1000 = 4233 (1089h)	CD 24x CLV 24*2352*75/1000 = 4233 (1089h)
	#3		CD 20x CLV 20*2352*75/1000 = 3528 (DC8h)	CD 20x CLV 20*2352*75/1000 = 3528 (DC8h)
	#4		CD 16x CLV 16*2352*75/1000 = 2822 (B06h)	CD 16x CLV 16*2352*75/1000 = 2822 (B06h)
	#5		CD 10x CLV 10*2352*75/1000 = 1764 (6E4h)	CD 10x CLV 10*2352*75/1000 = 1764 (6E4h)
CD-RW (Ultra Speed)	#1		CD 24x CLV 24*2352*75/1000 = 4233 (1089h)	CD 24x CLV 24*2352*75/1000 = 4233 (1089h)
	#2		CD 20x CLV 20*2352*75/1000 = 3528 (DC8h)	CD 20x CLV 20*2352*75/1000 = 3528 (DC8h)
	#3		CD 16x CLV 16*2352*75/1000 = 2822 (B06h)	CD 16x CLV 16*2352*75/1000 = 2822 (B06h)
	#4		CD 10x CLV 10*2352*75/1000 = 1764 (6E4h)	CD 10x CLV 10*2352*75/1000 = 1764 (6E4h)
CD-RW (High Speed)	#1		CD 10x CLV 10*2352*75/1000 = 1764 (6E4h)	CD 10x CLV 10*2352*75/1000 = 1764 (6E4h)
	#2		CD 4x CLV 4*2352*75/1000 = 705 (2C1h)	CD 4x CLV 4*2352*75/1000 = 705 (2C1h)
CD-RW (1x − 4x)	#1		CD 4x CLV 4*2352*75/1000 = 705 (2C1h)	CD 4x CLV 4*2352*75/1000 = 705 (2C1h)

4.6.2.2 Write Speed Data for DVD Media

Table 21 – Write Speed Data for DVD Media

Disc	Write Speed Descriptor #	End LBA	Read Speed	Write Speed
DVD-ROM	#1	Last LBA	DVD 16x CLV 16*1385 = 22160 (5690h)	DVD 16x CLV 16*1385 = 22160 (5690h)
	#2		DVD 12x CLV 12*1385 = 16620 (40ECh)	DVD 12x CLV 12*1385 = 16620 (40ECh)
	#3		DVD 8x CLV 8*1385 = 11080 (2B48h)	DVD 8x CLV 8*1385 = 11080 (2B48h)
	#4		DVD 6x CLV 6*1385 = 8310 (2076h)	DVD 6x CLV 6*1385 = 8310 (2076h)
	#5		DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
	#6		DVD 3.3x CLV 3.3*1385 = 4570 (11DAh)	DVD 3.3x CLV 3.3*1385 = 4570 (11DAh)
	#7		DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)	DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)
	#8		DVD 2x CLV 2*1385 = 2770 (AD2h)	DVD 2x CLV 2*1385 = 2770 (AD2h)
	#9		DVD 1x CLV 1*1385 = 1385 (569h)	DVD 1x CLV 1*1385 = 1385 (569h)
DVD-R (16x) CAV Writing	#1		DVD 16x CAV 16*1385 = 22160 (5690h)	DVD 16x CAV 16*1385 = 22160 (5690h)
	#2		DVD 12x P-CAV 12*1385 = 16620 (40ECh)	DVD 12x P-CAV 12*1385 = 16620 (40ECh)
	#3		DVD 8x P-CAV 8*1385 = 11080 (2B48h)	DVD 8x P-CAV 8*1385 = 11080 (2B48h)
	#4		DVD 6x CLV 6*1385 = 8310 (2076h)	DVD 6x CLV 6*1385 = 8310 (2076h)
	#5		DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
DVD-R (16x) Z-CLV Writing DVD-R (8x)	#1	Outermost Lead-out Start LBA in LPP - 1	DVD 12x CLV 12*1385 = 16620 (40ECh)	DVD 12x CLV 12*1385 = 16620 (40ECh)
	#2		DVD 8x CLV 8*1385 = 11080 (2B48h)	DVD 8x CLV 8*1385 = 11080 (2B48h)
	#3		DVD 6x CLV 6*1385 = 8310 (2076h)	DVD 6x CLV 6*1385 = 8310 (2076h)
	#4		DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
DVD-R (4x)	#1		DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
	#2		DVD 2x CLV 2*1385 = 2770 (AD2h)	DVD 2x CLV 2*1385 = 2770 (AD2h)
	#3		DVD 1x CLV 1*1385 = 1385 (569h)	DVD 1x CLV 1*1385 = 1385 (569h)
DVD-R (1x)	#1		DVD 1x CLV 1*1385 = 1385 (569h)	DVD 1x CLV 1*1385 = 1385 (569h)
DVD-R DL(2x)	#1	Last Possible Lead-out Start LBA -1	DVD 8x CLV 8*1385 = 11080 (2B48h)	DVD 8x CLV 8*1385 = 11080 (2B48h)

	#2		DVD 6x CLV 6*1385 = 8310 (2076h)	DVD 6x CLV 6*1385 = 8310 (2076h)
	#3		DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
	#4		DVD 2x CLV 2*1385 = 2770 (AD2h)	DVD 2x CLV 2*1385 = 2770 (AD2h)
DVD-RW (6x)	#1		DVD 6x CLV 6*1385 = 8310 (2076h)	DVD 6x CLV 6*1385 = 8310 (2076h)
	#2		DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
	#3		DVD 2x CLV 2*1385 = 2770 (AD2h)	DVD 2x CLV 2*1385 = 2770 (AD2h)
DVD-RW (4x)	#1	Outermost Lead-out Start LBA in LPP - 1	DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
	#2		DVD 2x CLV 2*1385 = 2770 (AD2h)	DVD 2x CLV 2*1385 = 2770 (AD2h)
DVD-RW (2x)	#1		DVD 2x CLV 2*1385 = 2770 (AD2h)	DVD 2x CLV 2*1385 = 2770 (AD2h)
	#2		DVD 1x CLV 1*1385 = 1385 (569h)	DVD 1x CLV 1*1385 = 1385 (569h)
DVD-RW (1x)	#1		DVD 1x CLV 1*1385 = 1385 (569h)	DVD 1x CLV 1*1385 = 1385 (569h)
DVD-RAM (5x)	#1	Last LBA, decided with FormatUnitComand	DVD 5x CLV 5*1385 = 6925 (1B0Dh)	DVD 5x CLV 5*1385 = 6925 (1B0Dh)
	#2		DVD 3x CLV 3*1385 = 4155 (103Bh)	DVD 3x CLV 3*1385 = 4155 (103Bh)
	#3		DVD 2x CLV 2*1385 = 2770 (AD2h)	DVD 2x CLV 2*1385 = 2770 (AD2h)
DVD-RAM (3x)	#1		DVD 3x CLV 3*1385 = 4155 (103Bh)	DVD 3x CLV 3*1385 = 4155 (103Bh)
	#2		DVD 2x CLV 2*1385 = 2770 (AD2h)	DVD 2x CLV 2*1385 = 2770 (AD2h)
DVD-RAM (2x)	#1		DVD 2x CLV 2*1385 = 2770 (AD2h)	DVD 2x CLV 2*1385 = 2770 (AD2h)
+R (16x) CAV Writing	#1	Outermost Lead-out Start LBA in ADIP - 1	DVD 16x CAV 16*1385 = 22160 (5690h)	DVD 16x CAV 16*1385 = 22160 (5690h)
	#2		DVD 12x P-CAV 12*1385 = 16620 (40ECh)	DVD 12x P-CAV 12*1385 = 16620 (40ECh)
	#3		DVD 8x P-CAV 8*1385 = 11080 (2B48h)	DVD 8x P-CAV 8*1385 = 11080 (2B48h)
	#4		DVD 6x CLV 6*1385 = 8310 (2076h)	DVD 6x CLV 6*1385 = 8310 (2076h)
	#5		DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
+R (16x) Z-CLV Writing +R (8x)	#1		DVD 12x CLV 12*1385 = 16620 (40ECh)	DVD 12x CLV 12*1385 = 16620 (40ECh)
	#2		DVD 8x CLV 8*1385 = 11080 (2B48h)	DVD 8x CLV 8*1385 = 11080 (2B48h)
	#3		DVD 6x CLV 6*1385 = 8310 (2076h)	DVD 6x CLV 6*1385 = 8310 (2076h)
	#4		DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
+R (4x)	#1		DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
	#2		DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)	DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)

+R (2.4x)	#1		DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)	DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)
+R DL(2.4x)	#1	Last Possible Lead-out Start LBA -1	DVD 8x CLV 8*1385 = 11080 (2B48h)	DVD 8x CLV 8*1385 = 11080 (2B48h)
	#2		DVD 6x CLV 6*1385 = 8310 (2076h)	DVD 6x CLV 6*1385 = 8310 (2076h)
	#3		DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
	#4		DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)	DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)
+RW (8x)	#1	Outermost Lead-out Start LBA in ADIP - 1	DVD 8x CLV 8*1385 = 11080 (2B48h)	DVD 8x CLV 8*1385 = 11080 (2B48h)
	#2		DVD 6x CLV 6*1385 = 8310 (2076h)	DVD 6x CLV 6*1385 = 8310 (2076h)
	#3		DVD 3.3x CLV 3.3*1385 = 4570 (11DAh)	DVD 3.3x CLV 3.3*1385 = 4570 (11DAh)
+RW (4x)	#1		DVD 4x CLV 4*1385 = 5540 (15A4h)	DVD 4x CLV 4*1385 = 5540 (15A4h)
	#2		DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)	DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)
+RW (2.4x)	#1		DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)	DVD 2.4x CLV 2.4*1385 = 3324 (CFCh)

Notes : For +R DL media, the Last Possible Lead-out Start LBA is set as follows.

1) In case of the disc which has no complete status, it is set to the following value.

The value = (L0 Data Zone Capacity + 1 – 30000h) x 2 – Extended Partial Lead-out Size

As for the L0 Data Zone Capacity,
if it has not been changed from the default value, it is set to the Last Possible Physical Sector of the Data Zone on Layer 0 in ADIP,
and if it has been changed from the default value, it is set to the Actual last PSN of Data Zone on Layer 0 in TOC.

As for the Extended Partial Lead-out Size,
if the disc has an Extended Partial Lead-out, it is 30000h,
and if the disc has no Extended Partial Lead-out, it is 0.

2) In case of the disc which has a complete status, it is set to the Actual Lead-out Start LBA.

4.7 INQUIRY Command

CmdDt bit, EVPD bit and Page Code or Operation Code field does not supported. These bit or field must be set to 0.

The drive returns following 96bytes Inquiry data.

Table 22 - INQUIRY Data Format

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved				Peripheral Device Type (05h)			
1	RMB (1)	Reserved						
2	ISO Version (0h)		ECMA Version (0h)			ANSI Version (0h)		
3	ATAPI Transport Version(3h)				Response Data Format(2h)			
4	Additional Length (35h)							
5	Reserved							
6	Reserved							
7	Reserved							
8 15	Vendor Identification = "PIONEER "							
16 31	Product Identification = "DVD-RW DVR-111 "							
32 35	Product Revision Level = "X.XX"							
36	Reserved							
37 46	Release Date = "YY/MM/DD"							
47 55	Manufacture's Information							
56 95	Reserved							

4.8 Log Select Command

This command is used for checking the drive.

The specifications of this command are vendor unique.

4.9 Log Sense Command

This command is used for checking the drive.

The specifications of this command are vendor unique.

4.10 MECHANISM STATUS Command

Mechanism Status Parameter List:

Fault bit, Change Status field, Current Slot field, C/DVD Mechanism State field, Number of Slots Available field and Length of Slot Table(s) field are set to zero.

4.11 MODE SELECT (10) Command

The Save Page function is not supported. The SP bit must be set to zero.

Refer the MODE SENSE Command for the descriptions of each page.

4.12 MODE SENSE (10) Command

4.12.1 Mode Parameter Header

The Mode Parameter Header format is defined as shown in following list.

Table 23 - Mode Parameter Header

Bit Byte	7	6	5	4	3	2	1	0
0	(MSB)							
1				Mode Data Length				(LSB)
2				Medium Type				
3								
4				Reserved				
5								
6	(MSB)							
7				Block Descriptor Length (always 0000h)				(LSB)

The Medium Type was defined in a legacy specification, and remains in this drive.

The Medium Type Codes are defined as shown in following list.

Table 24 – Medium Type Codes

Page code	Description
00h	Door closed, medium type unknown
01h	120 mm CD-ROM data only, door closed
02h	120 mm CD-ROM audio only (CD-DA), door closed
03h	120 mm CD-ROM data and audio combined, door closed
04h	120 mm multi-session CD-ROM or CD-I, door closed
05h	80 mm CD-ROM data only, door closed
06h	80 mm CD-ROM audio only (CD-DA), door closed
07h	80 mm CD-ROM data and audio combined, door closed
08h	80 mm multi-session CD-ROM or CD-I, door closed
09h – 10h	Reserved
11h	120 mm CD-R data only, door closed
12h	120 mm CD-R audio only, door closed
13h	120 mm CD-R data and audio combined, door closed
14h	120 mm multi-session CD-R, door closed
15h	80 mm CD-R data only, door closed
16h	80 mm CD-R audio only, door closed
17h	80 mm CD-R data and audio combined, door closed
18h	80 mm multi-session CD-R, door closed
19h – 20h	Reserved
21h	120 mm CD-RW data only, door closed
22h	120 mm CD-RW audio only, door closed
23h	120 mm CD-RW data and audio combined, door closed
24h	120 mm multi-session CD-RW, door closed
25h	80 mm CD-RW data only, door closed
26h	80 mm CD-RW audio only, door closed
27h	80 mm CD-RW data and audio combined, door closed
28h	80 mm multi-session CD-RW, door closed
29h – 40h	Reserved
41h	120 mm single border/session DVD-ROM/-R/-RW/RAM/+R/+RW, door closed
42h	Reserved
43h	Reserved
44h	120 mm multi border/session DVD-R/-RW/+R, door closed
45h	80 mm single border/session DVD-ROM/-R/-RW/RAM/+R/+RW, door closed
46h	Reserved
47h	Reserved
48h	80 mm multi border/session DVD-R/-RW/+R, door closed
47h	Reserved
48h	80 mm multi border/session DVD-R/-RW/+R, door closed
49h – 6Fh	Reserved
70h	Door closed, no disc present
71h	Door open
72h	Door closed, incompatible medium exists
73h – FFh	Reserved

4.12.2 Mode Pages

The drive is not supported the Parameters Savable (PS) bit and must be set to zero.

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

The drive supports following Mode pages.

Table 25 - Mode Page Codes

Page code	Description	Section
01h	Error Recovery Page	4.12.2.2 on page 42
05h	Write Parameters Page	4.12.2.5 on page 43
08h	Caching Page	4.12.2.1 on page 42
0Eh	CD Audio Control Page	
1Ah	Power Condition Page	4.12.2.3 on page 42
1Dh	Time-out & Protect Page	4.12.2.4 on page 42
2Ah	Capabilities & Mechanical Status Page	4.12.2.6 on page 44
3Fh	Return all pages (valid only for the MODE SENSE command)	

4.12.2.1 Caching Page

The Caching Page is supported for compatibility of other CD-R/RW drive. This page has no effect on write/read operation. The returned Caching parameters by the MODE SENSE (10) Command are modified to the new parameters after receiving new parameters by MODE SENSE (10) Command.

Table 26 - Caching Parameter

Bit Byte	7	6	5	4	3	2	1	0
0	PS	Reserved	Page Code = 08h					
1	Page Length = 0Ah							
2	IC	ABPF	CAP	DISC	SIZE	WCE	MF	RCD
3	Demand Read Priority				Write Retention Priority			
4	(MSB)	Disable Pre-fetch Transfer Length						
5								(LSB)
6	(MSB)	Minimum Pre-fetch						
7								(LSB)
8	(MSB)	Maximum Pre-fetch						
9								(LSB)
10	(MSB)	Maximum Pre-fetch Ceiling						
11								(LSB)

Default value of the WCE bit is one. Default value of any other bits and field is zero.

4.12.2.2 Error Recovery Parameters Page

The AWRE and ARRE bits are not supported and are ignored.

The TB, RC, DTE and DCR bits are ignored.

The Write Retry Count field is reserved.

The PER bit and EMCDR field are used to control the defect reporting.

4.12.2.3 Power Condition Page

The default value of an Idle bit is one. The default value of the Idle Timer field is 00000258h (1 minute).

The default value of the Standby bit is one. The default value of Standby Timer field is 000012C0h (8 minutes).

4.12.2.4 Time-out & Protect Page

The DISP, SWPP bits are not supported and must be set to 0.

4.12.2.5 Write Parameters Mode Page

The parameters specified in the Write Parameters Mode Page are not applicable to DVD-RAM media.

The parameters specified in the Write Parameters Mode Page are not applicable to +R/+RW media.

The parameters specified in the Write Parameters Mode Page are not applicable to formatted DVD-RW media.

The default value of the BUFE bit is 1.

If LS_V bit is set to one, the Link Size field must be set to 7h for CD-R/RW or 10h for DVD-R/-RW. If LS_V bit is set to zero, the drive assumes the Link Size of 7h for CD-R/RW or 10h for DVD-R/-RW. The default value of the LS_V bit is 1, and the default value of the Link Size field is 10h.

The drive supports following Write Type.

Table 27 - Write Type Field

Value	Definition	for CD-R/RW		for DVD-R/-RW		for DVD-R DL	
		Support	Test Write	Support	Test Write	Support	Test Write
00h	Packet/Incremental	yes	yes	yes	yes	yes	yes
01h	Track-at-once	yes	yes	-	-	-	-
02h	Session-at-once/Disc-at-once	yes	yes	yes	yes	yes	yes
03h	Raw	yes	-	-	-	-	-
04h	Layer Jump Recording	-	-	-	-	yes	yes

If the Layer Jump Recording has not been supported, Layer Jump Recording (04h) is not supported.

The default value of the Test Write bit is 0, and the default value of the Write Type field is 0h.

When FP bit is set to one for CD-R/RW media, the Packet Size field must be set to 32. Because the drive supports 64K Fixed Packet Writing only. The default value of the FP bit is 0.

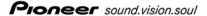The Copy bit is not supported, and setting of this bit is ignored.

The drive supports following Data Block Type for CD-R/RW media.

Table 28 – Data Block Type Field

Value	Block Size	Definition	Support for CD-R/RW
0	2352	Raw data	yes
1	2368	Raw data with P and Q sub-channel	yes
2	2448	Raw data with P-W sub-channel appended	yes
3	2448	Raw data with raw P-W sub-channel appended	yes
8	2048	Mode 1 (ISO/IEC 10149)	yes
9	2336	Mode 2 (ISO/IEC 10149)	yes
10	2048	Mode 2 (CD-ROM XA, form 1)	yes
11	2056	Mode 2 (CD-ROM XA, form 1)	yes
12	2324	Mode 2 (CD-ROM XA, form 2)	yes
13	2332	Mode 2 (CD-ROM XA, form 1, form 2, or mixed form)	yes

The drive supports writing of DVD and CD. Each media needs different value of Link Size field in Write Parameters page. Current value of parameter can not change by mounted media automatically. But Default value of Link Size field is changed by mounted media. If DVD media is mounted, Link Size field of default value in Write Parameter page is set to 10h. If CD media is mounted, it is set to 07h. It recommends following step to setting the Write Parameters page.

1. Get default value of Write Parameters by using MODE SELECT command. (Page Control (PC) field = 10b)

2. Modify the necessary field on above parameter.

3. Send the modified parameter by using MODE SELECT command.

4.12.2.6 C/DVD Capabilities and Mechanical Status Page

The C/DVD Capabilities and Mechanical Status Page format is defined as shown in following list.

Table 29 - 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 = 3Eh							
2	Reserved		DVD-RAM Read	DVD-R/-Read	DVD-ROM Read	Method 2	CD-RW Read	CD-R Read
	00b		1	1	1	1	1	1
3	Reserved		DVD-RAM Write	DVD-R Write	Reserved	Test Write	CD-RW Write	CD-R Write
	00b		1	1	0	1	1	1
4	BUF	Multi-session	Mode2 Form2	Mode2 Form1	Digital Port(2)	Digital Port(1)	Composite	Audio Play
	1	1	1	1	0	0	0	1
5	Read Bar Code Capable	UPC	ISRC	C2 Pointers Supported	R-W D&C	R-W Supported	CDDA Stream Accurate	CD-DA
	0	1	1	0	0	0	1	1
6	LMT			Reserved	Eject	Prevent Jumper	Lock State	Lock
	001b			0	1	0	current state	1
7	Reserved		R-W in Lead-in Readable	Side Change Capable	S/W Slot Selection (SSS)	Supports Disc Present (SDP)	Separate Channel Mute	Sep. vol.
	00b		1	0	0	0	1	1
8	(MSB)	Maximum Read Speed Supported						
9								(LSB)
10	(MSB)	Number of Volume Levels Supported = 0100h						
11								(LSB)
12	(MSB)	Buffer Size supported by Logical Unit = 07D0h						
13								(LSB)
14	(MSB)	Current Read Speed						
15								(LSB)
16	Reserved = 00h							
17	Reserved		Length		LSBF	RCK	BCKF	Reserved
	00b		00b		0	0	0	0
18	(MSB)	Maximum Write Speed Supported						
19								(LSB)
20	(MSB)	Current Write Speed						
21								(LSB)
22	(MSB)	Copy Management Revision Supported = 0001h						
23								(LSB)
24	Reserved = 00h							
25	Reserved = 00h							
26	Reserved = 00h							
27	Reserved						Rotation Control Selected	
	000000b						00b	
28	(MSB)	Current Write Speed Selected						
29								(LSB)
30	(MSB)	Number of Logical Unit Write Speed Performance Descriptor Tables						
31								(LSB)
32	Reserved = 00h							
33	Reserved							Rotation Control #1

Bit Byte	7	6	5	4	3	2	1	0
			000000b				00b	
34	(MSB)							
35			Write Speed Supported #1					(LSB)
36 - 59	Logical Unit Write Speed Performance Descriptors #2 - #7							
60	Reserved = 00h							
61	Reserved						Rotation Control #8	
			000000b				00b	
62	(MSB)							
63			Write Speed Supported #8					(LSB)

The Maximum Read Speed Supported field does not reflect the maximum read speed for each medium type and format. If no disc is mounted in the drive, the field is set to the same value as CD.

The Current Read Speed filed does not reflect the actual read speed. If no disc is mounted in the drive, the field is set to the same value as CD.

The Maximum Write Speed Supported field is set to the same value of the Write Speed Descriptor #1 data which is returned for the GET PERFORMANCE command.

The Current Write Speed filed is set to the same value of the Write Performance data which is returned for the GET PERFORMANCE command.

The Number of Logical Unit Write Speed Performance Descriptor Tables and The Logical Unit Write Speed Performance Descriptors #1 - #8 are set to the suitable values by using the same algorism as the GET PERFORMANCE command.

4.13 PLAY CD Command

This command is defined in a legacy specification (MMC-2 Revision 10a).

4.14 READ (10), READ (12) Command

The RelAdr bit is not supported and must set to 0.

If the Streaming bit in the CDB of the READ (12) command is set to one, the FUA bit shall be set to zero. The setting of the Streaming bit is no effect on the operation.

4.15 READ BUFFER Command

This command is used for checking the drive.

The specifications of this command are vendor unique.

4.16 READ BUFFER CAPACITY Command

The Block bit is supported.

When a CD medium is inserted in the drive, or no medium is inserted in the drive, the Length of Buffer field in the READ BUFFER CAPACITY data is set to 131800h. When a DVD medium is inserted in the drive, the Length of Buffer field in the READ BUFFER CAPACITY data is set to 188000h.

If a WRITE command whose Transfer Length exceeds the Blank Length of Buffer value divided by 800h (or Available Buffer value), the drive terminates the WRITE command with the Check Condition status, and set the SK/ASC/ASCQ values to NOT READY/LONG WRITE IN PROGRESS (2/04/08)

4.17 READ CAPACITY Command

The RelAdr bit is not supported and must set to 0.

If empty disc is mounted, the Logical Block Address field in the Read Capacity Data is set to zero.

If a DVD-RAM disc is mounted, the value set by the Logical Block Address field in the Read Capacity Data was decided in Format Unit Command.

If a non-blank +RW disc is mounted, the Logical Block Address field in the Read Capacity Data is set to 23053Fh.

If a disc which is not a DVD-RAM/+RW and has no Complete Session is mounted, Logical Block Address field in the Read Capacity Data is set to zero.

When a CD-R/RW disc is mounted, if it is recorded by Track-at-once, the Logical Block Address field in the Read Capacity Data is set to the LBA immediately behind of the outermost Lead-out, so 2 Run-out blocks will be encountered.

4.18 READ DISC INFORMATION Command

For +R/+R DL media, the Last Session Lead-in Start Address is the LBA of where the next Intro shall be recoded. If no session exists on the disc, then the value returned is 00000000h. If the disc has complete status, then the value returned is FFFFFFFFh.

For +R media, the Last Possible Lead-out Start Address is the LBA found in the ADIP of the disc's lead-in. If the disc has complete status, then the value returned is FFFFFFFFh.

For +R DL media, the Last Possible Lead-out Start Address is set as follows.

1) In case of the disc which has no complete status, it is set to the following value.

The value = (L0 Data Zone Capacity + 1 − 30000h) x 2 − Extended Partial Lead-out Size

As for the L0 Data Zone Capacity,
if it has not been changed from the default value, it is set to the Last Possible Physical Sector of the Data Zone on Layer 0 in ADIP,
and if it has been changed from the default value, it is set to the Actual last PSN of Data Zone on Layer 0 in TOC.

As for the Extended Partial Lead-out Size,
if the disc has an Extended Partial Lead-out, it is 30000h,
and if the disc has no Extended Partial Lead-out, it is 0.

2) In case of the disc which has a complete status, it is set to FFFFFFFFh.

LBA found in the ADIP of the disc's lead-in.

the LBA found in the ADIP of the disc's lead-in. If the disc has complete status, then the value returned is FFFFFFFFh.

The OPC table is not supported for +R/+RW/+R DL media.

4.19 READ DISC STRUCTURE Command

Following Format codes are supported.

Table 30 - Format Code for READ DISC STRUCTURE command

Format Code	Returned Data	Description
00h	Physical	Returns information in the DVD Lead-in area
01h	Copyright	Returns the Copyright information from DVD Lead-in
02h	Disc Key	Returns the Disc Key obfuscated by using a Bus Key on the DVD-ROM media
03h	BCA	Returns the BCA/NBCA information on DVD media
04h	Manufacturer's	Returns the Disc Manufacturing information from DVD Lead-in
05h	CGMS, CPM	Returns CGMS, CPM information from specified sector
06h	Media Identifier	Returns Media Identifier protected by using Bus Key
07h	Media Key Block	Returns Media Key Block protected by using Bus Key
08h	Disc Definition Structure	Returns the Defect Controls of the DVD-RAM media Lead-in
09h	DVD-RAM Status Information	Returns DVD-RAM Status Information that can do a recording
0Ah	Spare Area Information	Returns Number of Unused Primary Spare Blocks, Number of Unused Supplementary Spare Blocks and Number of Allocated Supplementary Spare Blocks
0Bh	Recording Type Information	Returns Recording Type Information, which of real-time data and general data the sector includes
0Ch	RMD in last Border-out	Returns the Field of RMD in last Border-out of the DVD-R/-RW disc
0Dh	RMD	Returns RMD sectors which recorded in RMA of the DVD-R/-RW disc
0Eh	Pre-recorded information	Returns Pre-recorded information in Lead-in of the DVD-R/-RW disc
0Fh	Unique Disc Identifier	Returns Unique Disc Identifier of the DVD-R/-RW disc
10h	Physical in the Lead-in	Returns Physical format information of Control Data zone in the Lead-in
11h	ADIP Information	Returns ADIP Information of +R/+RW/+R DL disc
20h	Layer Boundary Information	Returns Layer Boundary information
21h	Shifted Middle Area Start Address	Returns the Start Logical Block Address of the Shifted Middle Area on Layer 0
22h	Regular Interval Layer Jump Size	Returns the Interval Size of Regular Interval Layer Jump
23h	Manual Layer Jump Address	Returns the Start Logical Block Address of the Manual Layer Jump
24h	Remapping Address	Returns one Remapping Information of the specified anchor point
30h	Disc Control Blocks	Returns the Disc Control Block identified by the Content Descriptor
C0h	Write Protection	Return the Write Protection Status
FFh	Structure List	Returns a list of DVD structure present in the specified Layer

If the DVD-RAM Recording has not been supported, the Format Code 08h to 0Bh are not supported.

If the Layer Jump Recording has not been supported, the Format Code 21h to 24h are not supported.

4.20 READ HEADER Command

This command is defined in a legacy specification (MMC-2 Revision 10a).

4.21 READ TOC/PMA/ATIP Command

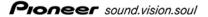The ADR/Control field for DVD media is always set to 14h.

4.22 READ TRACK/RZONE INFORMATION Command

The Track/RZone Information data is defined as shown in following list.

Table 31 – Track/RZone Information returned

Bit / Byte	7	6	5	4	3	2	1	0
0	(MSB)							
1			Track/RZone Information length					(LSB)
2	Track/RZone Number (LSB)							
3	Session/Border Number (LSB)							
4	Reserved							
5	LJS		Damage	Copy	Track Mode			
6	RT	Blank	Packet/Inc	FP	Data Mode			
7	Reserved						LRA_V	NWA_V
8	(MSB)							
9								
10			Track/RZone Start Address					
11								(LSB)
12	(MSB)							
13								
14			Next Writable Address					
15								(LSB)
16	(MSB)							
17								
18			Free Blocks					
19								(LSB)
20	(MSB)							
21			Fixed Packet Size/					
22			Blocking Factor					
23								(LSB)
24	(MSB)							
25								
26			Track/RZone Size					
27								(LSB)
28	(MSB)							
29								
30			Last recorded Address					
31								(LSB)
32	Track/RZone Number (MSB)							
33	Session/Border Number (MSB)							
34	Reserved							
35	Reserved							
36	(MSB)							
37								
38			Read Compatibility LBA					
39								(LSB)
40	(MSB)							
41			Next Layer Jump Address					
42								
43								(LSB)
44	(MSB)							
45			Last Layer Jump Address					
46								
47								(LSB)

If the Layer Jump Recording is supported, the size of Track/RZone Information returned is 48 bytes and the Track/RZone Information length field is set to 2Eh.

If the Layer Jump Recording has not been supported, the size of Track/RZone Information returned is changed for the inserted media. If +R Double Layer media is mounted, the size of Track/RZone Information returned is 40 bytes and the Track/RZone Information length field is set to 26h. If any other media is mounted, the size of Track/RZone Information returned is 44 bytes and the Track/RZone Information length field is set to 22h.

The Damage bit is supported for DVD-R/-RW media. It is always set to zero for the other media.

The Copy bit is not supported. It is always set to zero.

The Track Mode field is constantly set to 4h for DVD and +R/+RW/+R DL media.

The RT, Blank, Packet/Inc, and FP bits are set as following list. The Packet/Inc and FP bits are always set to zero for +R/+RW/+R DL.

The LJS field is set as following list.

Table 32 – Track/RZone Status Indications for CD-ROM/R/RW and DVD-ROM/-R/-RW/-R DL

RT	Blank	Packet/Inc	FP	LJS	DVD-ROM/-R/-RW/-R DL		CD-ROM/-R/-RW	
					Write Method	RZone Status	Write Method	Status
0	0	0	-	00b	Pre-mastered / DAO	Complete	Pre-mastered	Complete
0	0	1	0	00b	Incremental	Incomplete or Complete	Variable	Incomplete
0	0	1	0	01b	Layer Jump	Incomplete or Complete	-	(Invalid)
0	0	1	1	00b	Restricted Overwrite	Complete or Incomplete	Fixed	Incomplete
0	1	0	-	00b	DAO	Invisible	TAO/ Variable/Fixed	Invisible
0	1	1	0	00b	Incremental	Invisible	-	(Invalid)
0	1	1	0	01b	Layer Jump ; Neither MLJ address nor RI size is specified	Invisible	-	(Invalid)
0	1	1	0	10b	Layer Jump ; MLJ address is specified	Invisible	-	(Invalid)
0	1	1	0	11b	Layer Jump ; RI size is specified	Invisible	-	(Invalid)
0	1	1	1	00b	Restricted Overwrite	Invisible	-	(Invalid)
1	0	0	-	00b	-	(Invalid)	TAO/SAO	Complete
1	0	1	0	00b	Incremental	Partially Recorded Reserved	Variable	Complete/ Partially Recorded Reserved
0	0	1	0	01b	Layer Jump	Partially Recorded Reserved	-	(Invalid)
1	0	1	1	00b	-	(Invalid)	Fixed	Complete/ Partially Recorded Reserved
1	1	0	-	00b	DAO	Empty Reserved	TAO	Empty Reserved
1	1	1	0	00b	Incremental	Empty Reserved	-	(Invalid)
1	1	1	0	01b	Layer Jump	Empty Reserved	-	(Invalid)
1	1	1	1	00b	-	(Invalid)	-	(Invalid)

Table 33 – Track/RZone Status Indications for +R/+RW/+R DL

RT	Blank	+R/+R DL		+RW
		Disc Status	Fragment Status	Disc Status
0	0	Incomplete or Complete	Non-blank Incomplete or Complete	Partially/Full Formatted
0	1	Incomplete or Empty	Blank Incomplete	Empty
1	0	Incomplete	Partially Recorded Reserved	(invalid)
1	1	Incomplete	Blank Reserved	(invalid)

The LRA_V bit is always set to one for DVD-RAM, and the value set in The Last Recorded Address fields was decided in Format Unit Command.

The NWA_V bit is always set to zero for +RW because the Next Writable Address field is invalid for such type of media.

The LRA_V bit is always set to zero for +R/+RW because the Last Recorded Address field is invalid for such type of media.

For CD-R/RW media written by SAO, the Track Size is computed as follows; TrackSize = PMAStopTime – PMAStartTime – 2. This means the last 2 blocks are not encountered as same as the track written by TAO.

If the track is the incomplete track (i.e. RT=0), the Read Compatibility LBA is present. Read Compatibility LBA is an approximation of a logical block address at or beyond a 30mm disc radius on L0. The host can use this address as a minimal pad limit prior to closing the current session in order to maximize compatibility with read-only devices. If the L0 The host can also use this address as a lower limit for the Layer Jump address.

4.23 REQUEST SENSE Command

The drive returns the 22 bytes of Sense Data.

When Sense Key, Additional Sense Code and Additional Sense Code Qualifier field is set to 2/3A/00 MEDIUM NOT PRESENT or 2/04/01 LOGICAL UNIT IS IN PROCESS OF BECOMING READY, the Loading information is set to Byte 21 in the Sense Data as following.

Table 34 – Loading Status

Byte 21	Loading Status
00h	Tray Open
01h	Loading
02h	Unloading
03h	Tray Close and no media
04h	Reserved
05h	Tray Close and Setup
10h	Tray Close (or 02-3A-00)
11h	Tray ERROR

4.24 RESERVE TRACK/RZONE Command

For +R/+R DL media, up to 15 or 16 fragments can exist in every session. When the session is opened by a WRITE command, up to 15 fragment can exist. When the session is opened by a RESERVE TRACK/RZONE command, up to 16 fragment can exist. Because the last fragment in each session cannot be reserved, the limit number of fragments which can be reserved in a session is 14 or 15. When the limit number of complete or reserved fragments are already exist in the session, the RESERVE TRACK/RZONE command is terminated with Check Condition and SK/ASC/ASCQ will be set to ILLEGAL REQUEST/NO MORE RESERVATION (5/72/05).

4.25 SEND DIAGNOSTIC Command

This command is defined in a legacy specification (SCSI-2).

4.26 SEND DISC STRUCTURE Command

The Format field indicates the type of information that is sent to the device.

Table 35 - Format Code definitions for SEND DISC STRUCTURE Command

Format Code	Data	Description
04h	User Specific Data	Send User Specific Data to the RMD cache
05h	Copyright Management Information	Send CPR_MAI
0Fh	Timestamp	Send data to the RMD cache
20h	L0 Data Zone Capacity	Send L0 data zone capacity for +R DL
21h	Shifted Middle Area Start Address	Send the Start Logical Block Address of the Shifted Middle Area on Layer 0
22h	Regular Interval Layer Jump Size	Send the Interval Size of Layer Jump
23h	Manual Layer Jump Address	Send Logical Block Address for Layer Jump on Layer 0
24h	Remapping Address	Send Logical Block Address for Remapping anchor point
C0h	Write Protection	Send PWP status

If the Layer Jump Recording has not been supported, the Format Code 21h to 24h are not supported.

The Format Code 20h does not work for DVD-R DL disc.

The Format Code 21h to 24h does not work for +R DL disc.

4.27 SET CD SPEED Command

The drive can not specify the reading speed by any Packet command. The setting of Logical Unit Read Speed field is ignored. The reading speed is determined by the drive.

This command changes the writing speed for CD-R/RW media. It does not effect to the writing speed for DVD-R/-RW/RAM and +R/+RW/+R DL media.

The available writing speed may be restricted by the drive when the characteristic of media is not suitable for the speed.

Table 36 – Available Writing speed for each media

Media	Available Writing Speed	Comments
CD-R	40x CAV, 32x ZCLV/PVAV, 24x ZCLV/PCAV, 16x CLV, 10x CLV, 4x CLV	
CD-RW (1 - 4x)	4x CLV	
CD-RW High Speed	10x CLV, 4x CLV	
CD-RW Ultra Speed	24x ZCLV, 20x ZCLV, 16x CLV, 10x CLV	
CD-RW Ultra Speed+	32x ZCLV, 24x ZCLV, 20x ZCLV, 16x CLV, 10x CLV	

Table 37 – Parameters to set Writing speed for CD-R/RW

Logical Unit Writing Speed	CD-R Writing Speed	CD-RW Writing Speed	DVD-R/-RW and +R/+RW Writing Speed
0000h – 06E3h	4x CLV	4x CLV	
06E4h – 0B05h	10x CLV	10x CLV	
0B06h – 0DC7h	16x CLV	16x CLV	Remains previous setting
0DC8h – 1088h		20x ZCLV	
1089h – 160Bh	24x ZCLV/PCAV	24x ZCLV	
160Ch – 1B8Fh	32x ZCLV/PCAV	32x ZCLV	
1B90h – FFFFh	40x CAV		

4.28 SET STREAMING Command

The Drive can not specify the reading speed by any Packet command.

The reading speed may be automatically reduced by the drive in order to retry to read a block which has not been corrected errors.

Table 38 – Available Reading speed for each media

Media	Reading Speed	Comments
CD-DA/R/RW (play audio)	9.3x CAV - 4x CLV	
CD-ROM/R/RW (read mode2form2)	9.3x CAV - 4x CLV	
CD-DA/ROM/R (other operations)	40x CAV - 4x CLV	
CD-RW (other operation)	32x CAV – 4x CLV	
CD-ROM/R/RW (8cm with adapter)	9.3x CAV- 4x CLV	After writing reading speed becomes same speed as writing speed
DVD-ROM Single Layer	16x CAV - 1x CLV	
DVD-ROM Dual Layer	12x CAV - 1x CLV	
DVD-R	12x CAV - 1x CLV	After writing reading speed becomes same speed as writing speed
DVD-R DL	8x CAV – 1x CLV	After writing reading speed becomes same speed as writing speed
DVD-RW	8x CAV – 1x CLV	After writing reading speed becomes same speed as writing speed
DVD-RAM	5x CLV	After writing reading speed becomes same speed as writing speed
+R	12x CAV – 2.4x CLV	After writing reading speed becomes same speed as writing speed
+R DL	8x CAV – 2.4x CLV	After writing reading speed becomes same speed as writing speed
+RW	8x CAV – 2.4x CLV	After writing reading speed becomes same speed as writing speed
DVD-ROM/-R/-RW (8cm with adapter)	3.4x CAV - 1x CLV	After writing reading speed becomes same speed as writing speed

The drive can specify the writing speed by the SET STREAMING Command.

The performance setting is persistent and remains until a new descriptor is sent, so even if the disc is changed, the previously set writing speed is available. However, only for CD media, the writing speed can be set also by a SET CD SPEED command.

The performance settings for CD and DVD are not independent from each other.

The available writing speed may be restricted by the drive when the characteristic of media is not suitable for the speed.

Table 39 – Available Writing speed for each media

Media	Available Writing Speed	Comments
CD-R	40x CAV, 32x ZCLV/PCAV, 24x ZCLV/PCAV, 16x CLV, 10x CLV, 4x CLV	
CD-RW (1 - 4x)	4x CLV	
CD-RW High Speed	10x CLV, 4x CLV	
CD-RW Ultra Speed	24x ZCLV, 20x ZCLV, 16x CLV, 10x CLV	
CD-RW Ultra Speed+	32x ZCLV, 24x ZCLV, 20x ZCLV, 16x CLV, 10x CLV	
DVD-R (1x)	1x CLV	
DVD-R (1 - 4x)	4x CLV, 2x CLV, 1x CLV	
DVD-R (1 - 8x)	(12x ZCLV), 8x ZCLV, 6x CLV, 4x CLV	Writing speed of 12x is only available for specific media.
DVD-R (1 – 16x)	(16x CAV), (12x ZCLV/PCAV), (8x ZCLV/PCAV), 6x CLV,	Writing speed of 16x, 12x and 8x is only available for specific media.

	4x CLV	
DVD-R DL (2 -4x)	(8x ZCLV), (6x CLV), (4x CLV), 2x CLV	Writing speed of 8x, 6x and 4x is only available for specific media.
DVD-RW (1x)	1x CLV	
DVD-RW (1 - 2x)	2x CLV, 1x CLV	
DVD-RW (2 - 4x)	4x CLV, 2x CLV	
DVD-RW (2 - 6x)	6xCLV,4x CLV, 2x CLV	
DVD-RAM (2x)	2x CLV	
DVD-RAM (2 – 3x)	3x CLV, 2x LCV	
DVD-RAM (2 – 5x)	5x CLV, 3x CLV, 2x CLV	
+R (1 - 2.4x)	2.4x CLV	
+R (1 - 4x)	4x CLV, 2.4x CLV	
+R (1 - 8x)	(12x ZCLV), 8x ZCLV, 6x CLV, 4x CLV	Writing speed of 12x is only available for specific media.
+R (1 - 16x)	(16x CAV), (12x ZCAV/PCAV), (8x ZCAV/PCAV), 6x CLV, 4x CLV	Writing speed of 16x, 12x and 8x is only available for specific media.
+R DL (2 -4x)	(8x ZCLV), (6xCLV),(4x CLV), 2.4x CLV	Writing speed of 8x, 6x and 4x is only available for specific media.
+RW (1 - 2.4x)	2.4x CLV	
+RW (1 – 4x)	4x CLV, 2.4x CLV	
+RW (3.3x – 8x)	(8x CLV),(6x CLV) ,3.3x CLV	Writing speed of 8x and 6x is only available for specific media.

The setting of the RDD, Exact and MRW bits and the Start LBA, End LBA, Read Size and Read Time fields are ignored. The specified writing speed will apply to whole disc area.

It is recommended to use the following values in order to set the write speed;

Table 40 – Parameters to set Writing speed for CD-R/RW media

Write Size	Write time	CD-R Writing Speed	CD-RW Writing Speed
0000h	0001h – FFFFh	40x CAV	32x ZCLV
03E8h	0000h – 06E3h	4x CLV	4x CLV
	06E4h – 0B05h	10x CLV	10x CLV
	0B06h – 0DC7h	16x CLV	16x CLV
	0DC8h – 1088h	16x CLV	20x ZCLV
	1089h – 160Bh	24x ZCLV/PCAV	24x ZCLV
	160Ch – 1B8Fh	32x ZCLV/PCAV	32x ZCLV
	1B90h – FFFFh	40x CAV	32x ZCLV

Table 41 – Parameters to set Writing speed for DVD-R/RW/R DL media

Write Size	Write time	DVD-R Writing Speed	DVD-RW/-R DL Writing Speed
0000h	0001h – FFFFh	16x CAV	8x ZCLV
03E8h	0000h – 0AD1h	1x CLV	1x CLV
	0AD2h – 15A3h	2x CLV	2x CLV
	15A4h – 2075h	4x CLV	4x CLV
	2076h – 2B47h	6x CLV	6x CLV
	2B48h – 40EBh	8x ZCLV/PCAV	8x ZCLV
	40ECh – 568Fh	12x ZCLV/PCAV	8x ZCLV
	5690h – FFFFh	16x CAV	8x ZCLV

Table 42 – Parameters to set Writing speed for +R/+RW/+R DL media

Write Size	Write time	+R Writing Speed	+R DL Writing Speed	+RW Writing Speed
0000h	0001h – FFFFh	16x CAV	8x ZCLV	8x ZCLV
03E8h	0000h – 15A3h	2.4x CLV	2.4x CLV	2.4x CLV
	15A4h – 2075h	4x CLV	4x CLV	4x CLV
	2076h – 2B47h	6x CLV	6x CLV	6x CLV

2B48h – 40EBh	8x ZCLV/PCAV		
40ECh – 568Fh	12x ZCLV/PCAV	8x ZCLV	8x ZCLV
5690h – FFFFh	16x CAV		

The writing speed is set to the drive regardless of currently mounted media. Even if no media is mounted in the drive, the writing speed can be set. If the set writing speed cannot be applied for mounted media in a write operation, the actual writing speed is reduced to the writing speed which is applicable to the media.

4.29 TEST UNIT READY Command

The TEST UNIT READY Command is terminated with Check Condition on the following conditions.

Table 43 - Error Code of Test Unit Ready Command

Sense Key	ASC	ASCQ	Description	Condition
02	04	01	LOGICAL UNIT IS IN PROCESS OF BECOMING READY	While Tray Loading and set-up operation
02	04	04	LOGICAL UNIT NOT READY, FORMAT IN PROGRESS	Format operation for CD-RW or DVD-RW is performing or foreground format operation is performing for +RW
02	04	07	LOGICAL UNIT NOT READY, OPERATION IN PROGRESS	Blank operation is performing
06	29	00	POWER ON, RESET, OR BUS DEVICE RESET OCCURRED	Unit Attention has generated.
06	28	00	NOT READY TO READY CHANGE, MEDIUM MAY HAVE CHANGED	Transition from Not Ready to Ready has occurred
02	3A	00	MEDIUM NOT PRESENT	Compatible Media is not exist

Note 1: When write operation is performing, the TEST UNIT READY Command returns Good status. Completion of the write operation is identified by the READ DISC INFORMATION or READ TRACK/RZONE INFORMATION Command. When write operation is performing, these command is terminated with Check Condition status, LOGICAL UNIT NOT READY, OPERATION IN PROGRESS (2/04/07). When write operation is completed, these command returns Information data and Good status.

Note 2: When background format operation is performing, the TEST UNIT READY Command returns Good status. Completion of the write operation is identified by the READ DISC INFORMATION Command. When BG format operation is performing, the BG Format Status field in the Disc Information Block is set to 10b (A background format is in progress. A format has been started or restarted and is not yet completed). When BG format operation is completed, it is set to 11b (Formatting has completed. A fully formatted +RW disc is currently mounted). However, if the BG format operation is interrupted, it may be set to 01b (A background format was started but is not currently running and is not complete).

4.30 VERIFY (10) Command

The RelAdr bit, BytChk bit and DPO bit are not supported and must be set to zero.

4.31 WRITE (10), WRITE (12) Command

The RelAdr bit is not supported and must be set to zero.

If the Streaming bit in the CDB of the WRITE (12) command is set to one, the FUA bit shall be set to zero. The setting of the Streaming bit is no effect on the operation.

When a formatted CD-RW disc or a formatted DVD-RW disc or a DVD-RAM disc or a +RW disc is mounted, if the WRITE (10), WRITE (12) Command that cause the writing buffer over run condition is received, the execution of these commands is deferred until the blank area of the buffer grows to be able to receive the data.

When the other disc is mounted, if the WRITE (10), WRITE (12) Command that cause the writing buffer over run condition is received, these command is terminated with Check Condition status, LOGICAL UNIT NOT READY, LONG WRITE IN PROGRESS (2/04/08). If the Host receives this error code, the Host waits several time and needs to resend same command.

The minimum waiting time shows in following list. If this value is used, the size of empty area on the Writing Buffer becomes 128KBytes or more.

Table 44 - Value of Minimum Waiting Time

MEDIA	WRITING SPEED	Minimum waiting time (msec)
DVD-R/RW	16x	6
	8x	12
	4x	25
	2x	50
	1x	100
CD-R/RW	32x	27
	24x	36
	16x	55
	8x	110
	4x	220

4.32 WRITE BUFFER Command

This command is used for checking the drive or firmware update.

The specifications of this command are vendor unique.

5 Error Code

Following lists all error codes that may return from the drive.

Table 45 - All Error Codes

Sense Key	ASC	ASCQ	Description
08	00	00	BLANK CHECK
0B	00	06	I/O PROCESS TERMINATED, PLAY OPERATION ABORTED
02	04	01	LOGICAL UNIT IS IN PROCESS OF BECOMING READY
02	04	03	LOGICAL UNIT NOT READY, MANUAL INTERVENTION REQUIRED
02	04	04	LOGICAL UNIT NOT READY, FORMAT IN PROGRESS
02	04	07	LOGICAL UNIT NOT READY, OPERATION IN PROGRESS
02	04	08	LOGICAL UNIT NOT READY, LONG WRITE IN PROGRESS
04	08	00	LOGICAL UNIT COMMUNICATION FAILURE
04	08	01	LOGICAL UNIT COMMUNICATION TIME-OUT
04	08	03	LOGICAL UNIT COMMUNICATION CRC ERROR
04	09	02	FOCUS SERVO FAILURE
04	09	03	SPINDLE SERVO FAILURE
03	0C	00	WRITE ERROR
03	0C	02	WRITE ERROR - AUTO REALLOCATION FAILED
03	0C	08	WRITE ERROR - RECOVERY FAILED
03	0C	09	WRITE ERROR - LOSS OF STREAMING
03	11	00	UNRECOVERED READ ERROR
03	11	01	READ RETRIES EXHAUSTED
03	11	05	L-EC UNCORRECTABLE ERROR
03	11	06	CIRC UNRECOVERED ERROR
03	11	0B	UNRECOVERED READ ERROR - RECOMMEND REASSIGNMENT
03	11	0D	DE-COMPRESSION CRC ERROR
03	15	00	RANDOM POSITIONING ERROR
03	15	02	POSITIONING ERROR DETECTED BY READ OF MEDIUM
01	18	05	RECOVERED DATA - RECOMMEND REASSIGNMENT
03	19	00	DEFECT LIST ERROR
05	1A	00	PARAMETER LIST LENGTH ERROR
04	1B	00	SYNCHRONOUS DATA TRANSFER ERROR
05	20	00	INVALID COMMAND OPERATION CODE
05	21	00	LOGICAL BLOCK ADDRESS OUT OF RANGE
05	21	02	INVALID ADDRESS FOR WRITE
05	24	00	INVALID FIELD IN CDB
05	25	00	LOGICAL UNIT NOT SUPPORTED
05	26	00	INVALID FIELD IN PARAMETER LIST
07	27	04	PERSISTENT WRITE PROTECT
06	28	00	NOT READY TO READY CHANGE, MEDIUM MAY HAVE CHANGED
06	29	00	POWER ON, RESET, OR BUS DEVICE RESET OCCURRED
06	2A	01	MODE PARAMETERS CHANGED
05	2C	00	COMMAND SEQUENCE ERROR
02	30	00	INCOMPATIBLE MEDIUM INSTALLED
05	30	02	CANNOT READ MEDIUM - INCOMPATIBLE FORMAT
05	30	05	CANNOT WRITE MEDIUM - INCOMPATIBLE FORMAT
05	30	10	MEDIUM NOT FORMATTED

Sense Key	ASC	ASCQ	Description
03	31	00	MEDIUM FORMAT CORRUPTED
03	31	01	FORMAT COMMAND FAILED
02	3A	00	MEDIUM NOT PRESENT
04	3E	02	TIMEOUT ON LOGICAL UNIT
05	43	00	MESSAGE ERROR
04	44	00	INTERNAL TARGET FAILURE
04	47	00	SCSI PARITY ERROR
0B	48	00	INITIATOR DETECTED ERROR MESSAGE RECEIVED
0B	49	00	INVALID MESSAGE ERROR
0B	4C	00	LOGICAL UNIT FAILED SELF-CONFIGURATION
0B	4E	00	OVERLAPPED COMMANDS ATTEMPTED
03	51	00	ERASE FAILURE
03	51	01	ERASE FAILURE - Incomplete erase operation detected
04	53	00	MEDIA LOAD OR EJECT FAILED
05	53	02	MEDIUM REMOVAL PREVENTED
05	55	00	SYSTEM RESOURCE FAILURE
03	57	00	UNABLE TO RECOVER TABLE-OF-CONTENTS
05	64	00	ILLEGAL MODE FOR THIS TRACK
05	64	01	INVALID PACKET SIZE
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 ESTAB-LISHED
05	6F	03	READ OF SCRAMBLED SECTOR WITHOUT AUTHENTICATION
05	6F	04	MEDIA REGION CODE IS MISMATCHED TO LOGICAL UNIT REGION
05	6F	05	DRIVE REGION MUST BE PERMANENT/REGION RESET COUNT ERROR
03	72	00	SESSION FIXATION ERROR
03	72	01	SESSION FIXATION ERROR WRITING LEAD-IN
03	72	02	SESSION FIXATION ERROR WRITING LEAD-OUT
05	72	03	SESSION FIXATION ERROR - INCOMPLETE TRACK IN SESSION
05	72	04	EMPTY OR PARTIALLY WRITTEN RESERVED TRACK
05	72	05	NO MORE RZONE RESERVATIONS ARE ALLOWED
01	73	01	POWER CALIBRATION AREA ALMOST FULL
03	73	02	POWER CALIBRATION AREA IS FULL
03	73	03	POWER CALIBRATION AREA ERROR
03	73	04	PROGRAM MEMORY AREA/RMA UPDATE FAILURE
03	73	05	PROGRAM MEMORY AREA/RMA IS FULL
01	73	06	PROGRAM MEMORY AREA/RMA IS (almost) FULL

6 Notes

6.1 Skip information in PMA

The Skip information is not written to the TOC.

6.2 Fixed Packet Size

Fixed Packet Size for writing on CD-R/RW media allows 64KByte only.

6.3 Pre-gap

The Pre-gap size is fixed to 2 sec (150 Block). For CD Mastering, Session at once Write Type must be used.

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