

4.26 READ FORMAT CAPACITIES command

The READ FORMAT CAPACITIES command allows the host to request a list of the possible format capacities for an installed random-writable media. This command also has the capability to report the capacity for a media when it is installed. If this command is required by an implemented Feature, this command *shall* function independently of the state of that Feature’s Current bit.

Table 701 - READ FORMAT CAPACITIES Command Descriptor Block

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

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

Table 702 - Read Format Capacities Data Format

Bit Byte	7	6	5	4	3	2	1	0
0-3	Capacity List Header							
4-11	Current/Maximum Capacity Descriptor							
Formattable Capacity Descriptor(s)								
0	Formattable Capacity Descriptor 0							
7								
...	Formattable Capacity Descriptor n							
n * 8								
n * 8 + 7								

Table 703 - Capacity List Header

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

The Capacity List Length specifies the length in bytes of the Capacity Descriptors that follow. Each Capacity Descriptor is eight bytes in length, making the Capacity List Length equal to eight times the number of descriptors. Values of $n * 8$ are valid, where $0 < n < 32$.

Table 704 - Current/Maximum Capacity Descriptor

Bit Byte	7	6	5	4	3	2	1	0
4	(MSB) Number of Blocks (LSB)							
5								
6								
7								
8	Reserved					Descriptor Type		
9	(MSB) Block Length (LSB)							
10								
11								

The Number of Blocks indicates the number of addressable blocks for the capacity defined by each Descriptor Type. The Descriptor Type field indicates the type of information the descriptor contains. The values are shown in Table 705.

Table 705 - Descriptor Type field definition

Descriptor Type value	Definition	Description
00b	Reserved	Reserved
01b	Unformatted media	The reported value is for the Maximum formattable capacity for this media. The blank media <i>shall</i> be reported as “Unformatted media” with Descriptor Type = 01b.
10b	Formatted media	The reported value is the current media’s capacity. In the case of sequential recorded media, the number of blocks field indicates the number of addressable blocks between the first Lead-in and the last Lead-out or Border-out. When the sequential recorded media has no closed session or Border, it <i>shall</i> be reported as “Unknown capacity media” with Descriptor Type = 11b.
11b	No media present or Unknown capacity media	The reported value is for the maximum capacity of a media that the logical unit is capable of reading. The quick formatted DVD-RW/HD DVD-RW media <i>shall</i> be reported as “Unknown capacity media” with Descriptor Type = 11b.

The Block Length specifies the length in bytes of each logical block.

Table 706 - Formattable Capacity Descriptor(s)

Bit Byte	7	6	5	4	3	2	1	0	
0	Number of Blocks								
1									
2									
3									(LSB)
4	Format Type					Reserved			
5	Type Dependent Parameter								
6									
7									(LSB)

The Format Type field indicates the type of information for formatting.

Table 707 - Format Types

Format Type	Description	Type Dependent Parameter
00h	Full Format: The Number of Blocks field indicates the number of addressable blocks and the Type Dependent Parameter field indicates the block size used for formatting the whole media. If multiple formatting for the whole media is possible, each capacity/block size combination <i>shall</i> be reported as a separate descriptor.	Block Length in bytes
01h	Spare Area Expansion: The Number of Blocks field indicates the number of addressable blocks and the Type Dependent Parameter field indicates the block size used for formatting the whole media. If multiple formatting for the whole media is possible, each capacity/block size combination <i>shall</i> be reported as a separate descriptor.	Block Length in bytes
02h-03h	Reserved	
04h	Zone Reformat: The Number of Blocks field indicates the number of addressable blocks in the zone and the Type Dependent Parameter field indicates the zone number used by zoned formatting for a zone of the media, where the size of zone is not constant for each zone. The information for each zone <i>shall</i> be reported as a separate descriptor.	Zone Number of the descriptor
05h	Zone Format: The Number of Blocks field indicates the number of addressable blocks per zone and the Type Dependent Parameter field indicates the zone number of the highest numbered zone. This descriptor is used for zoned formatting of the media, where the size of zone is constant for each zone.	Zone Number of the last zone
06h-0Fh	Reserved	
10h	C/DVD/HD DVD-RW Full Format: The Number of Blocks field indicates the maximum number of addressable blocks and the Type Dependent Parameter field indicates the maximum packet size that can be used to fully format C/DVD/HD DVD-RW media. The packet size and number of addressable blocks may be adjusted downward by the host before sending this descriptor back via the FORMAT UNIT command.	Fixed Packet Size in sectors/ ECC block size in sectors

Table 707 - Format Types (Continued)

Format Type	Description	Type Dependent Parameter
11h	C/DVD-RW/HD DVD Grow Session/Border: The Number of Blocks field indicates the maximum number of addressable blocks and the Type Dependent Parameter field indicates the packet size which can be used to expand (grow) the last complete session/Border of C/DVD/HD DVD-RW media. The number of addressable blocks may be adjusted downward by the host before sending this descriptor back via the FORMAT UNIT command.	Fixed Packet Size in sectors/ ECC block size in sectors
12h	C/DVD-RW Add Session/Border: The Number of Blocks field indicates the maximum number of addressable blocks and the Type Dependent Parameter field indicates the maximum packet size which can be used to add a new session/Border to a C/DVD-RW media. The packet size and number of addressable blocks may be adjusted downward by the host before sending this descriptor back via the FORMAT UNIT command.	Fixed Packet Size in sectors/ ECC block size in sectors
13h	DVD-RW/HD DVD Quick Grow Border: The Number of Blocks field indicates the maximum number of addressable blocks and the Type Dependent Parameter field indicates the ECC block size which can be used to expand (grow) the last complete Border of DVD-RW media as an intermediate state. The number of addressable blocks may be adjusted downward by the host before sending this descriptor back via the FORMAT UNIT command.	ECC block Size in sectors
14h	DVD-RW Quick Add Border: The Number of Blocks field indicates the maximum number of addressable blocks and the Type Dependent Parameter field indicates the ECC block size which can be used to add a new intermediate state Border to a DVD-RW media. The number of addressable blocks may be adjusted downward by the host before sending this descriptor back via the FORMAT UNIT command.	ECC block Size in sectors
15h	DVD-RW/HD DVD Quick Format: The Number of Blocks field indicates the maximum number of addressable blocks and the Type Dependent Parameter field indicates ECC block size that can be used to fully format DVD/HD DVD-RW media as an intermediate state. The number of addressable blocks may be adjusted downward by the host before sending this descriptor back via the FORMAT UNIT command.	ECC block Size in sectors
16h	HD DVD-R Test Zone Expansion: The descriptor <i>shall not</i> be reported. This Format type is used for extending Test zone in HD DVD-R media by using FORMAT UNIT command.	-
17h	HD DVD-R/RW Dual Layer Instant Recording Setup for L1: The Formattable Capacity Descriptor <i>shall not</i> be reported.	-
18h	Reserved	Reserved
19h	HD DVD-RW Fragment recording Format: The Number of Blocks field indicates the number of addressable blocks and the Type Dependent Parameter field indicates the block size	ECC block Size in sectors
1Ah-1Fh	Reserved	Reserved
20h	Full Format with sparing parameters: The Number of Blocks field indicates the maximum number of addressable blocks and the Type Dependent Parameter field indicates the sparing parameters to be used.	M and N (sparing parameters)
21h-23h	Reserved	Reserved
24h	MRW Format: See MMC	See MMC
25h	Reserved	Reserved

Table 707 - Format Types (Continued)

Format Type	Description	Type Dependent Parameter
26h	DVD+RW Basic Format: See MMC	See MMC
27h-2Fh	Reserved	Reserved
30h	BD-RE Format with Spare Areas: See MMC	See MMC
31h	BD-RE Format without Spare Areas: See MMC	See MMC
32h	BD-R Format with Spare area: See MMC	See MMC
33h-3Fh	Reserved	Reserved

The Number of Blocks field indicates the number of addressable blocks for the capacity defined by each Format Type.

The Type Dependent Parameter contents are as specified for each Format Type in Table 707. In the case of Format Type 20h, M specifies SL where $SL = 2^M$, $4 \leq M \leq 15$ or $SL = 0$ if $M = 0$ and N identifies SI where $SI = 2^N$, $4 \leq N \leq 24$. The Type Dependent Parameter *shall* be set to $M * 10000h + N$, effectively placing M in byte offset 5 and N in byte offset 7, and making byte 8 reserved. The logical unit *shall* supply its default values for M and N.

The logical unit *shall* only return Formattable Capacity Descriptors that apply to the installed media. If there is no medium installed, the logical unit *shall* return only the Current/Maximum Capacity Descriptor, with the maximum capacity of a medium that the logical unit is capable of reading.

A Formattable Capacity Descriptor of Format Type 00h *shall* be reported if any other Formattable Capacity Descriptor is reported.

The descriptors *shall* be returned in ascending order of Format Type. For Format Types other than 04h and 05h, if multiple format descriptors exist, they *shall* be returned in logical unit preferred order. For Format Types 04h and 05h, the format descriptors *shall* be returned in ascending order of Zone number.

Formattable Capacity Descriptors for media that can be read, but cannot be formatted by the logical unit *shall not* be reported.

Table 708 - Returned Current/Maximum Descriptor for Combination of drive and media

		Media			
		No Media	ROM Media	Sequential Writable Media	Random Writable Media
Drive	ROM	Descriptor Type = 11b	Descriptor Type = 10b	Descriptor Type = 10b or 11b	Descriptor Type = 10b
	Sequential Writable			Descriptor Type = 10b	Descriptor Type = 10b
	Random Writable			Descriptor Type = 10b or 11b	Descriptor Type = 01b or 10b plus Formattable Capacity Descriptor(s)

Note: This command is not mandatory for all drive types shown in Table 708; the table indicates the values returned if the command is implemented.

Table 709 describes errors that may occur during the operation of the command or which may cause a CHECK CONDITION status to be reported.

Table 709 - READ FORMAT CAPACITIES command errors

Error Description
<i>D-1.1, "Deferred Error Reporting" on page 670</i>
<i>Table 744 - Basic Error Codes on page 683</i>
<i>Table 745 - Media Access Error Codes on page 686</i>

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