

To: Membership of X3T10

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Subject: Medium Partition Page(1-4) enhancements for SCSI-3.

1.1.1.1 Medium partition page(1)

The medium partition page(1) (see table 1) is used to specify the first group of medium partitions. Additional groups are specified in medium partition pages(2-4).

Table 1 - Medium partition page(1)

Bit Byte	7	6	5	4	3	2	1	0	
0	PS	Rsvd	Page Code (11h)						
1	Page length								
2	Maximum additional partitions								
3	Additional partitions defined								
4	FDP	SDP	IDP	PSUM		Rsvd	CLEAR	ADDP	
5	Medium format recognition								
6	Reserved				Partition units				
7	Reserved								
Partition size descriptor(s)									
+ 0	(MSB)	Partition							
+ 1	size						(LSB)		

The maximum additional partitions field is a logical unit-defined value indicating the maximum number of additional partitions supported by the logical unit. A value of zero returned by MODE SENSE indicates that no additional partitions are present or allowed.

The additional partitions defined field specifies the number of additional partitions to be defined for a volume when the SDP or IDP bit is set to one. The maximum value allowed is the value returned in the maximum additional partitions field. The additional partitions defined value returned by MODE SENSE

shall report one less than the number of partitions on the media when the logical unit is ready. If the unit is not ready, the additional partitions defined field is undefined.

A fixed data partitions (FDP) bit of one indicates that the logical unit shall partition the medium based on its fixed definition of partitions. Setting this bit to one may only be valid at beginning-of-partition and is mutually exclusive with the SDP and IDP bits. The partition size descriptors are ignored by MODE SELECT when the FDP bit is set to one. The logical unit may assign any number of partitions from 1 to (maximum additional partitions + 1). Support for FDP set to one is optional.

Note 1 It is recommended that the partition size descriptors be present in Mode Sense data regardless of the settings of the FDP, SDP or IDP fields to give an estimate of the size of each partition.

A select data partitions (SDP) bit of one indicates that the logical unit shall partition the medium into the number of partitions as specified by the additional partitions defined field (n) using partition sizes defined by the device. The logical unit shall partition the medium into n+1 partitions numbered 0 through n. Setting this bit to one may only be valid at beginning-of-partition and it is mutually exclusive with the FDP and IDP fields. The partition size descriptors are ignored by MODE SELECT when the SDP bit is set to one. Support for SDP set to one is optional.

Note 2 The physical placement and order of medium partitions are not specified by this standard.

An initiator-defined partitions (IDP) bit of one indicates that the logical unit shall partition the medium as defined by the additional partitions defined field and the partition size descriptors. Setting this bit to one may only be valid at beginning-of-partition and is mutually exclusive with the FDP and SDP fields. The number of non-zero partition size descriptors received in medium partition pages(1-4) shall be one more than the maximum additional partitions. The size of partition 0 shall be non-zero. Support for IDP set to one is optional.

A logical unit is not required to retain the method used to partition the medium. The MODE SENSE data shall return one and only one of the IDP, FDP or SDP fields set to one. If partitioned by FDP or SDP, a logical unit may return IDP set to one in the MODE SENSE data.

NOTE 3 Since defining partitions may require reformatting the medium for some implementations, an implicit write to the medium may occur as a result of a MODE SELECT command that supplies any of the fields FDP, SDP, or IDP set to one.

The partition size unit of measure (PSUM) field defines the units of the partition size descriptors. A logical unit is not required to retain the partition size unit of measure used to partition the medium. The PSUM field is defined in table 2.

Table 2 - PSUM

Code	Description	Support
00b	bytes (unit of one)	Optional
01b	kilobytes (10^3 bytes)	Optional
10b	megabytes (10^6 bytes)	Optional
11b	$10^{(\text{Partition units field})}$ bytes	Optional

NOTE 4 The logical unit is not required to maintain the PSUM used to format any given media.

The Partition units field defines the size of the partition size descriptors when the PSUM field is set to 11b. A value of N in the Partition units field shall define the units of the partition size descriptors as 10^N bytes. If the Partition units field is supported, all possible values shall be supported. A logical unit is not required to retain the Partition units used to partition the medium. If PSUM is not equal to 11b, the Partition units field is undefined. The support of the Partition units field is optional.

NOTE 5 Some values of the Partition units field may result in no legal non-zero partition size descriptors.

A CLEAR bit of zero and an ADDP bit of zero indicate SCSI-2 compatibility. The logical unit may logically erase any or all partitions when one of the IDP, FDP, or SDP fields is set to one.

A CLEAR bit of one and an ADDP bit of zero indicates that the logical unit shall logically erase every partition if one of the IDP, FDP, or SDP fields is set to one. No formatting of the medium is implied.

An ADDP bit of one and a CLEAR bit of zero indicates that the logical unit shall not logically erase any existing partitions, even if the size of the partition is changed. If the MODE SELECT partition size descriptor and the current partition size differ, the logical unit shall truncate or extend the partition, whichever is appropriate. If the MODE SELECT partition size is zero and the current partition size is non-zero, the partition shall be logically removed from the medium, resulting in the loss of all data in that partition. If the MODE SELECT partition size is equivalent to the current partition size, no change in the partition size shall result. If the logical unit cannot perform the operation or if such an operation would cause loss of valid data in any partition which exists both before and after the MODE SELECT, the logical unit shall return CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST with the additional sense code set to PARAMETER VALUE INVALID. If the ADDP bit is set to one and either ADDP is not supported or the FDP field is set to one the logical unit shall return CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST with the additional sense code set to INVALID FIELD IN PARAMETER LIST. If both the ADDP and SDP fields are set to one, the logical unit shall add or remove partitions such that the resulting partition count on the medium is equal to the additional partitions defined plus one. An ADDP field set to zero indicates that the logical unit may logically erase any or all partitions if any of the IDP, SDP, or FDP bits is set to one.

If both the ADDP and CLEAR fields are set to one, the logical unit shall logically erase all partitions which differ in size from the corresponding partition size descriptor in the MODE SELECT data. Partitions with the same size as the MODE SELECT data size shall retain all existing data. If the logical unit is incapable of supporting the changes requested without loss of data, the logical unit shall return CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST with the additional sense code set to PARAMETER VALUE INVALID. If setting both ADDP and CLEAR to one is not supported, the sense key shall be set to ILLEGAL REQUEST with the additional sense code set to INVALID FIELD IN PARAMETER LIST.

Support of the CLEAR bit set to one is optional. Support of the ADDP bit set to one is optional.

A MODE SELECT partition size descriptor has the equivalent (same) size as the current partition size if

- 1) The MODE SELECT size, PSUM, and Partition units fields are exactly the same as those returned by MODE SENSE or
- 2) The MODE SELECT size is within plus or minus one of the current size when the current size is converted to the units of the MODE SELECT PSUM or the Partition units field or
- 3) The MODE SELECT size is 0FFFFh and the current size would return 0FFFFh if expressed in the units of the MODE SELECT PSUM or the Partition units field.

The medium format recognition field is a logical unit-defined value indicating the logical unit's capability to automatically identify the medium format and partition information when reading an unknown volume. The medium format recognition field values are shown in table 3.

Table 3 - Medium format recognition

Code	Description
00h	Logical unit is incapable of format or partition recognition.
01h	Logical unit is capable of format recognition only.
02h	Logical unit is capable of partition recognition only.
03h	Logical unit is capable of format and partition recognition.
04h - 0FFh	Reserved

NOTE 6 If a logical unit indicates that it is not capable of medium format recognition, the initiator should supply all necessary parameters for the device to identify the specific format. The value in this field may be different following a medium change.

Partition size descriptors define the approximate size of the respective partitions in the units specified in the PSUM and Partition units fields. Partitions are numbered by their relative position in the partition size descriptor list, starting at 0. Only partition numbers in the range of 0 to N where N is less than or equal to 63 can have size descriptors in this page. Partition N, if present, shall be described by the partition size descriptor at page offsets $8+(2*N)$ and $9+(2*N)$. Partition 0 shall be the default partition. Partition size descriptor 0, shall contain the size of the default partition. The size of partition 0 shall be greater than 0. Up to 64 partitions may be defined using this page. The partition size descriptors for partitions 64 and greater can be defined in medium partition pages(2-4) defined in 1.1.1.2. Partitions not assigned shall have a partition size descriptor of 0. The logical unit may support more partitions than partition size descriptors. A logical unit may support more partition size descriptors than supported by the medium. All partition size descriptors representing a partition number greater than the maximum additional partition count shall be 0. The partition size descriptors are undefined if the logical unit is not ready. A partition size descriptor size of 0FFFFh sent by MODE SELECT requests that the logical unit allocate all remaining partition space to that partition. A MODE SENSE shall return a partition size descriptor of 0FFFFh if the partition size, in units of PSUM or Partition units, is greater than or equal to 0FFFFh. If insufficient space exists on the medium for the requested partition sizes or if multiple partition size descriptors are set to 0FFFFh, the logical unit shall return CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST with the additional sense code set to INVALID FIELD IN PARAMETER LIST. A logical unit may round, as described under Mode Select in SPC, any partition size to the nearest valid partition size.

Note 7 It is recommended, but not required, that the number of partition size descriptors available through medium partition pages(1-4) equal at least the number of maximum addition partitions + 1. This provides a mechanism for the logical unit to disclose the current partition sizes.

1.1.1.2 Medium partition page(2-4)

The medium partition page(2-4) (see table 4) is used to specify additional groups of medium partitions. The first group is specified in the medium partition page(1) (see 1.1.1.1).

Table 4 - Medium partition page(2-4)

Bit Byte	7	6	5	4	3	2	1	0	
0	PS	Rsvd	Page Code (12h, 13h, 14h)						
1	Page length								
	Partition size descriptor(s)								
+ 0	(MSB)	Partition							
+ 1		size							(LSB)

The additional page codes defined for partition size definition are 12h, 13h, and 14h. Up to a maximum of 64 partitions can be defined in each of these pages. The partitions size descriptors are numbered from $N*64+0$ to $N*64+63$ where N is equal to the medium partition page(2-4) minus 11h. The partition size descriptor for partition number P is located at bytes $(P-N*64)*2+2$ and $(P-N*64)*2+3$. The partition size is defined by the value of the partition size field. The units of size used by the partition size field is specified in the PSUM field of the medium partition page(1) (see 0.0.0.1).

Medium partition page(2) (page 12h) defines partitions numbered from 64 to 127.

Medium partition page(3) (page 13h) defines partitions numbered from 128 to 191.

Medium partition page(4) (page 14h) defines partitions numbered from 192 to 255.

If any of the medium partition pages(2-4) (pages 12h, 13h, and 14h) are supported, then each lower-numbered medium partition page shall be supported with the maximum length. Support of pages 12h, 13h, and 14h is not required if either:

- 1) The medium partition page defines only partitions which are invalid for the logical unit or
- 2) The logical unit does not support IDP set to one as defined in the medium partition page(1) (see 0.0.0.1).

NOTE 8 For a logical unit with N additional partitions, $N+1$ partitions may exist. Therefore, up to 63 additional partitions are supported by page 11h, and up to 128 partitions by both pages 11h and 12h. A maximum of 256 partitions are supported by pages 11h through 14h.

Note 9 It is recommended, but not required, that sufficient medium partition pages be supported to included all possible partitions when IDP is not supported. Support of medium partition pages (2-4) provides a mechanism for the logical unit to disclose the partition sizes.

NOTE 10 Since defining partitions may require reformatting the medium for some implementations, an implicit write to the medium may occur as a result of a MODE SELECT command that supplies these parameters.

If a MODE SELECT contains at least one of the medium partition pages(2-4) but does not contain medium partition page(1), the logical unit shall do one of the following:

- a) Use the current values of PSUM, ADDP, and CLEAR to determine the method of partitioning. IDP is assumed to be set to one. If a conflict exists between ADDP and the partition size descriptors, the logical unit shall return CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST with the additional sense code set to INVALID FIELD IN PARAMETER LIST.
- b) or the logical unit shall return CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST with the additional sense code set to INVALID FIELD IN PARAMETER LIST.

NOTE 11 The ADDP and CLEAR fields do not reflect the state of the media. These fields depend on settings provided by the initiator.

If a MODE SELECT contains the medium partition page(1) and one or more of the medium partition pages(2-4), the logical unit shall process the data as one request. The logical unit shall not partition the medium more than once for a single MODE SELECT. If the initiator sends duplicate medium partition pages, the logical unit shall use the last one of each medium partition page and ignore the partition size descriptors of the duplicated pages. The logical unit shall validate all medium partition page fields and return CHECK CONDITION status if any fields are invalid.

If a MODE SELECT contains the medium partition page(1) with the IDP field set to one and any of the supported medium partition pages(2-4) are not present in the Mode data, the logical unit shall:

- a) If ADDP is set to zero, the logical unit shall define the partitions as given in medium partition page(1) with partitions greater than 63 defined as non-existent (zero length). The Additional Partitions Defined field is checked for legality as if the logical unit supported a maximum of 63 Additional Partitions.
- b) If ADDP is set to one, the logical unit shall define the partitions as given in medium partition page(1) and the current values for medium partition pages (2-4). The Additional Partitions Defined field is checked for legality based on the number of non-zero partition size descriptors in the new medium partition page (1) and the existing medium partition pages (2-4).

NOTE 12 It is strongly suggested that Mode Select either send no medium partition pages or send all supported medium partition pages.