

To: Membership of X3T9.2

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

0.0.0.1 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	Reserved	Page code (11h)						
1	Page length								
2	Maximum additional partitions								
3	Additional partitions defined								
4	FDP	SDP	IDP	PSUM	Reserved	REFORMAT	ADDP		
5	Medium format recognition								
6	Reserved								
7	Reserved								
Partition size descriptor(s)									
0	(MSB)	Partition size							
1								(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 device assigns partitions 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).

Note 20a It is recommended that the partition size descriptors be present to give an estimate of the size of each partition since they are not required to be the same size.

A select data partitions (SDP) bit of one indicates that the device is to partition the medium into the number of partitions as specified by the additional partitions defined field using partition sizes defined by the device. 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.

Note 20b It is recommended that the partition size descriptors be present to give an estimate of the size of each partition since they are not required to be the same size. All partitions from 0 to additional partitions defined are assigned. Therefore, none of these entries may be 0.

Note 20c A logical unit may pick and choose any set of additional partitions defined from the available additional partitions when assigning partitions by SDP. A MODE SENSE may be used to determine which partitions exist (partition size descriptor not equal to 0).

An initiator-defined partitions (IDP) bit of one indicates that the initiator is defining the number and size of the data partitions using 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 initiator-defined partitions bit shall return 0 for MODE SENSE. The number of non-zero partition size descriptors received in medium partition pages(1-4) shall be one more than the maximum additional partitions.

Note 20d When assigning partition sizes with IDP, an initiator should send any required medium partition pages(2-4) before sending medium partition page(1). If the medium partition pages(2-4) are not received prior to the medium partition page(1) with IDP set to one, the logical unit will use undefined values, possibly creating an error.

NOTE 21 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 these parameters.

A MODE SENSE command may return at most one of the FDP, SDP, and IDP fields set to one.

NOTE 21a Some logical unit implementations may format the medium when one of FDP, SDP, or IDP fields is set to one. By allowing the option of not returning any of FDP, SDP, or IDP set to one, a MODE SENSE followed by MODE SELECT of this page will not cause reformatting.

Partition size unit of measure (PSUM) field defines the units in which the partition size descriptors select the partition size. The values 00b, 01b, 10b, and 11b define the units as bytes (unit of one), kilobytes (10^3 bytes), megabytes (10^6 bytes), and gigabytes (10^9 bytes), respectively. A MODE SENSE command may return any of the defined values for PSUM, regardless of the last partition assignment by MODE SELECT.

A REFORMAT bit of zero and an ADDP bit of zero indicates SCSI-2 compatibility. The logical unit may reformat any or all partitions when IDP, FDP, or SDP is set to one.

A REFORMAT bit of one and an ADDP bit of zero indicates that the logical unit shall logically reformat every partition if one of the IDP, FDP, or SDP fields is set to one.

An ADDP bit of one and a REFORMAT bit of zero indicates that the logical unit shall not reformat 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 addition sense code set to PARAMETER VALUE INVALID if a partition size descriptor cannot be processed. 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 reformat any or all partitions if any of the IDP, SDP, or FDP bits is set to one.

If both the ADDP and REFORMAT fields are set to one, the logical unit shall reformat all partitions which differ in size from the MODE SELECT data. Partitions with the same size as the MODE SELECT data size shall not be reformatted. If the logical unit is incapable of supporting the changes requested without reformatting partitions with the same sizes, 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 REFORMAT 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.

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

- 1) The MODE SELECT size and PSUM 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
- 3) The MODE SELECT size is 0FFFFh and the current size would return 0FFFFh if expressed in the units of the MODE SELECT PSUM.

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

Values for the medium format recognition field shall be assigned as follows:

- a) 00h Logical unit is incapable of format or partition recognition.
- b) 01h Logical unit is capable of format recognition only.
- c) 02h Logical unit is capable of partition recognition only.
- d) 03h Logical unit is capable of format and partition recognition.
- e) 04h - FFh Reserved.

NOTE 22 If a logical unit indicates that it is not capable of medium format recognition, the initiator must 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 size of the respective partitions in the units specified in the PSUM field. Partitions are numbered by their position in the partition size descriptor list. 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+N and 9+N. Partition 0 shall be the default partition. Partition size descriptor 0, if present, 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. If additional partitions need to be defined, up to 64 partitions can be defined in each of the medium partition pages(2-4) defined in 0.0.0.2. Partitions not assigned shall have a partition size descriptor of 0. There is no requirement that the logical unit support sufficient partition size descriptors to describe the default partition and each additional partition. A MODE SENSE shall return the sizes of the respective partitions, regardless of the method used to create them. 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, 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 in section ? of SPC, any partition size to the nearest valid partition size.

Note 22c 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 additional partitions + 1. This provides a mechanism for the logical unit to disclose the current partition sizes.

Note 22d A logical unit may have more partition size descriptors than the number of maximum additional partitions + 1. In that case, one or more of the partition size descriptors equals 0 (except for the partition size descriptor for partition 0).

Note 22e It is not technically necessary to state the requirement that no more than one partition size descriptor can be set to 0FFFFh. If one partition requires the rest of tape, there will (probably) be insufficient space to allocate the second partition since the first will presumably take up all of the remaining space.

0.0.0.2 Medium partition page(2-4)

The medium partition page(2-4) (see table 2) is used to specify additional groups of medium partitions. The first group is specified in the medium partition page(1) (see 0.0.0.1).

Table 2 - Medium partition page(2-4)

Bit Byte	7	6	5	4	3	2	1	0	
0	PS	Reserved	Page code (12h, 13h, 14h)						
1	Page length								
	Partition size descriptor(s)								
0	(MSB)	Partition size							
1								(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 side 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 22b 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 22c 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 23 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 REFORMAT 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 23a The ADDP and REFORMAT 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 format 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 pages for all other 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 none of medium partition pages(2-4) and the logical unit supports one or more of medium partition pages(2-4), the logical unit shall:

- a) If the number of addition partitions defined is equal to one more than the number of non-zero partition size descriptors and ADDP is set to zero, the logical unit shall define the partitions as given with partitions greater than 63 defined as non-existent (zero length).
- b) If the number of addition partitions defined is equal to one more than the number of non-zero partition size descriptors and ADDP is set to one, the logical unit shall return CHECK CONDITION status if any partition with number on the medium greater than 63 is defined as non-zero in length.
- c) If both ADDP and REFORMAT are set to zero, the logical unit shall either reformat the medium as specified by medium partition page(1) or perform either a) or b), whichever applies.
- d) If REFORMAT is set to one, the logical unit shall reformat the medium as specified by medium partition page(1).
- e) If both ADDP and REFORMAT are set to zero, the logical unit shall either perform one of a) or b), whichever applies, or the logical unit may perform c).