

To: INCITS T10 Committee

From: Paul Entzel, Quantum

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Subject: ADC Device Specific MODE Page

## 1. General

One of the most important features provided by the ADC command set is the ability for the Automation device to control the service delivery ports and the logical units in the target device that supports this device type. This proposal was written as an alternative approach from proposal T10/02-234 to provide this control.

This proposal uses a MODE page to report and change operating parameters of the target device. Instead of using a fixed page, multiple sub-pages are used, each containing one or more descriptors. This method is based on the concept of sub-pages introduced in SPC-3 and the concept of descriptors used in INQUIRY VPD Page 83h. The concept of a variable length MODE page has precedence in the definition of the Medium Partition Page described in SSC.

## 2. Proposal

This proposal defines a new MODE page for the ADC device type. The MODE page can be named "Target Device Control Page". There are several sub-pages defined for this page, shown in the following table:

Sub-page code	Description	Number of descriptors
01h	Node descriptor sub-page	1
02h	Service Delivery Port descriptor sub-page	1 or more
03h	Logical Unit descriptor sub-page	1 or more

### 2.1 Node descriptor sub-page

This MODE page is fixed length and contains a descriptor of the target device Node. The page is defined as follows:

Bit	7	6	5	4	3	2	1	0
Byte								
0	SP	SPF(1)	Page Code					
1	Sub-page code (01h)							
2 - 3	Page Length (0Ch)							
4	Reserved						MNN	
5 - 7	Reserved							
8 - 15	WWN							

The Modify Node\_name (MNN) field is used to modify and report modifications to the device's Node\_name, as defined in the following table:

MNN	MODE SENSE	MODE SELECT
00b	The value in the WWN field is the manufacturer assigned Node_name.	Do not modify the node's world wide name. The WWN field shall be ignored.
01b	The value in the WWN field has been modified from the manufacturer's assigned value.	Used the World Wide Name for logical unit 0 as the Node_Name. The value in the WWN field shall be ignored..
10b	Invalid value for a MODE SENSE.	Set the node's world wide name to the manufacturer's default value. The value in the WWN field shall be ignored.
11b	Invalid value for a MODE SENSE.	Set the node's world wide name to the value in the WWN field.

## 2.2 Service Delivery Port descriptor sub-page

### 2.2.1 Page overview

The Service Delivery Port descriptor sub-page is variable length, and consists of a mode sub-page header followed by one or more descriptors. The descriptors may be included in any order. On a MODE SENSE command, all descriptors supported by the device shall be returned. On a MODE SELECT command, any number of the supported descriptors may be included. Any descriptor included must be included in its entirety.

### 2.2.2 Sub-page header

The following table describes the Target Device Control Mode Page Header

Bit	7	6	5	4	3	2	1	0
Byte								
0	SP	SPF(1)	Page Code					
1	Sub-page code (02h)							
2 - 3	Page Length							
4 - N	Service Delivery Port Descriptors							

### 2.2.3 Descriptor Header

The service delivery port descriptors vary between different protocols. Each descriptor contains a common header to facilitate parsing of the descriptors:

Bit	7	6	5	4	3	2	1	0
Byte								
0	Port Index							
1	Port Type							
2 - 3	Additional Descriptor Length (N - 4)							
4 - N	Service Delivery Port parameters							

The Port Index field contains a value assigned by the device. Once assigned, the Port Index value for a port shall not be changed as long as the port remains on the device.

The Port Type indicates the type of protocol supported by the port. Values for this field are a subset of those defined in SPC-3 PROTOCOL IDENTIFIER values table. Legal values for this field can be found in the following table:

Port Type	Transport layer type
00H	Fibre Channel (FCP, FCP-2)
01H	Parallel SCSI (SPI, SPI-2, SPI-3, SPI-4,...)
02H – FFH	Reserved

## 2.2.4 Parallel SCSI Descriptor

The following table defines the fields in the SPI Descriptor:

Bit	7	6	5	4	3	2	1	0
Byte	Reserved							PE
4	Reserved							
5 - 6	Reserved							
7	SCSI Address							

The Port Enable (PE) bit is set to one to enable the port to respond to selections on the SCSI bus. When set to zero, the port will not respond to or attempt selections or reselections on the SCSI bus.

The SCSI Address field indicates the address that the port shall respond to on the SCSI bus. A device that receives a MODE SELECT command that attempts to change this value when the port is already enabled shall return Check Condition. The Sense Key shall be Illegal Request, and the additional sense code shall be Invalid Field in Parameter List. If the port is disabled, it shall not be an error to change the SCSI Address and enable the port with the same MODE SELECT command.

NOTE: Other fields to consider for this descriptor:

- Mode of operation (HVD, SE, LVD).
- Parity checking enabled.
- Force narrow.
- Maximum allowable negotiated transfer rate.

## 2.2.5 Fibre Channel Descriptor

The following table defines the fields in the SPI Descriptor:

Bit	7	6	5	4	3	2	1	0
Byte	P2P	TopLock	Reserved		UHA	MPN		PE
4	Reserved				SpdLock	Speed		
5	Reserved							
6	Reserved							
7	FC-AL Hard Address							
8 - 15	WWN							

The Port Enable (PE) bit is set to one to enable the port. When set to zero, the port will not be enabled its drivers onto the Fibre.

The Automatic Port Enable (APE) bit is set to one to automatically enable the port after power on, without waiting for a command. When set to zero, the port will not be enabled until a MODE SELECT command is received with the PE bit set to one.

The Modify Port Name (MPN) field is used to modify and report modifications to the device's port name, as defined in the following table:

MPN	MODE SENSE	MODE SELECT
00b	The value in the WWN field is the manufacturer assigned port name.	Do not modify the port's world wide name. The WWN field shall be ignored.
01b	The value in the WWN field has been modified from the manufacturer's assigned value.	Do not modify the port's world wide name. The WWN field shall be ignored.
10b	Invalid value for a MODE SENSE.	Set the port's world wide name to the manufacturer's default value. The value in the WWN field shall be ignored.
11b	Invalid value for a MODE SENSE.	Set the port's world wide name to the value in the WWN field.

If the Use Hard Address (UHA) bit is set to one, the value in the FC-AL Hard Address field indicates the arbitrated loop hard address that the port shall request during a LIHA process. If the UHA bit is set to zero the FC-AL Hard Address field is ignored and the port will not select a hard address during LIHA phase.

The Point To Point (P2P) is set to one to indicate the port is configured to operate in point to point mode. When set to zero, the port is configured to operate in arbitrated loop mode.

The Topology Lock (TopLock) bit is set to one to force the port to only operate in the mode selected by the P2P bit. When set to zero, the port may negotiate the topology and select the appropriate one. When this bit is set to 0 on a MODE SELECT command, the P2P bit is ignored.

The Speed field indicates the bit rate that the port is configured to operate in. The valid values can be found in the following table:

Value	Speed
000b	1 GB/Sec
001b	2 GB/Sec
010b – 111b	Reserved

The Speed Lock (SpdLock) bit is set to one to force the port to only operate in the speed selected by the Speed field. When set to zero, the port may negotiate the speed and select the appropriate one. When this bit is set to 0 on a MODE SELECT command, the Speed field is ignored.

NOTE: Other fields to consider for this descriptor:

## **2.3 Logical Unit descriptor sub-page**

### **2.3.1 Page overview**

The Logical Unit descriptor sub-page is variable length, and consists of a mode sub-page header followed by one or more descriptors. The descriptors may be included in any order. On a MODE SENSE command, all Logical Units supported by the device other than W-LUNs shall have descriptors returned. On a MODE SELECT command, any number of the supported descriptors may be included. Any descriptor included must be included in its entirety.

### 2.3.2 Sub-page header

The following table describes the Target Device Control Mode Page Header

Bit	7	6	5	4	3	2	1	0
Byte								
0	SP	SPF(1)	Page Code					
1	Sub-page code (02h)							
2 - 3	Page Length							
4 - N	Logical Unit Descriptors							

### 2.3.3 Descriptor Header

The service delivery port descriptors vary between different protocols. Each descriptor contains a common header to facilitate parsing of the descriptors:

Bit	7	6	5	4	3	2	1	0
Byte								
0	Logical Unit Index							
1	Device Type							
2 - 3	Additional Descriptor Length (N - 4)							
4 - N	Logical Unit Descriptors							

The Logical Unit Index field contains a value assigned by the device. Once assigned, the Logical Unit Index value for a logical unit shall not be changed.

The Device Type indicates the type of command set supported by the logical unit. This field contains the same value that would be returned by the logical unit in the Peripheral Device Type field for an INQUIRY command.

The Additional Descriptor Length field contains a count of additional bytes used by the descriptor.

The Logical Unit Number field can be used to change the logical unit number of the device.

### 2.3.4 Stream Device Descriptor

The descriptor for a stream device (Device Type = 01h) is defined by the following table:

Bit	7	6	5	4	3	2	1	0	
Byte									
0	Logical Unit Index								
1	Device Type (01h)								
2 - 3	Additional Descriptor Length (14h)								
4 - 5	Logical Unit Number								
6	MLUN	Reserved				Offline	Enable		
7	Reserved		AUH	SUHO	AMO	Autoload Mode			
8	FUE	DRMode	Reserved			DenOvr	WP		
9	Current Density								
10	Selected Write Density								
11 - 15	Reserved								
16 - 23	WWN								

If the Enable bit is set to 1 it indicates the Logical Unit is reported and supported. When it is set to 0, the logical unit is not reported to a REPORT LUNS command and does not respond to commands.

If the Offline bit is set to 1, the device shall return Check Condition to all commands that require the device to be ready. The Sense Key shall be Not Ready. The addition sense code shall be Logical Unit Not Ready, Operation In Progress (this ASC is subject to debate). If the Offline bit is set to 0, the logical unit shall respond normally to commands.

The Modify Logical Unit Name (MLUN) field is used to modify and report modifications to the logical unit's world wide name, as defined in the following table:

MLUN	MODE SENSE	MODE SELECT
00b	The value in the WWN field is the manufacturer assigned WWN.	Do not modify the logical unit's world wide name. The WWN field shall be ignored.
01b	The value in the WWN field has been modified from the manufacturer's assigned value.	Do not modify the logical unit's world wide name from the current value. The WWN field shall be ignored.
10b	Invalid value for a MODE SENSE.	Set the logical unit's world wide name to the manufacturer's default value. The value in the WWN field shall be ignored.
11b	Invalid value for a MODE SENSE.	Set the logical unit's world wide name to the value in the WWN field.

The Autoload Mode Override (AMO) field can be used to override the Autoload Mode settings for the logical unit controlled with the Control mode page for the logical unit. When set to 1, the load process shall be controlled by the Autoload Mode field in this page, overriding the settings in the Control mode page. When set to zero, the settings in the Control mode page shall be used to control the load process.

The AUTOLOAD MODE field specifies the action to be taken when a medium is inserted. This field is ignored on the MODE SELECT if the AMO bit is set to 0. The field is defined in the following table:

Value	Definition
000b	Medium shall be loaded for full access.
001b	Medium shall be loaded for medium auxiliary memory access only.
010b	Medium shall not be loaded.
011b – 111b	Reserved.

The SCSI Unload Hold Override (SUHO) bit shall be set to 1 to override the Hold bit in the SCSI UNLOAD command. When set to one, the Hold bit in a SCSI UNLOAD command shall be ignored and the medium shall not be ejected. When set to 0, the Hold bit in the SCSI UNLOAD command shall control if the medium is ejected or not.

The Automatic Unload Hold (AUH) bit shall be set to 1 to disable ejecting the medium when it is unloaded due to device specific conditions. These conditions can include such conditions as cleaning complete, invalid medium type, firmware update complete, unsupported format, or other error conditions detected by the device. This bit does not affect the unload operation initiated by the front panel.

The Write Protect (WP) bit shall write protect the medium when set to one. This bit shall be set to 0 by the device each time a medium is unloaded.

The Density Override (DenOvr) bit is use to override the Density Code field in the Mode Descriptor Block used by the device. When set to 1, any write operation that the device is capable of selecting a density by using the Mode Descriptor Block shall use the density in the Select Write Density field. When the DenOvr field is set to 0, the density shall be selected through other means and the Select Write Density field shall be ignored. The DenOvr bit shall be set to 0 by the device each time a medium is unloaded. On a MODE SENSE command, the Select Write Density field shall contain the density code that will be used by the device should a write operation be started such that the device is capable of selecting a density.

The Firmware Update Enable (FUE) bit shall be set to one to prepare the device to accept a medium containing a firmware image. This bit shall be set to 0 by the device once the firmware update process is complete or aborted.

The Disaster Recovery Mode (DRMode) bit shall be set to 1 to place the device into Disaster Recovery Mode. When set to 0, the device shall operate in normal mode. The definition of Disaster Recovery mode is beyond the scope of this standard.

The Current Density field shall be set to the density code indicating the density in which the device is currently operating. This field shall be ignored by the device on MODE SELECT commands.

### 2.3.5 Medium Changer Descriptor

The descriptor for a Medium Changer device (Device Type = 08h) is defined by the following table:

Bit	7	6	5	4	3	2	1	0
0	Logical Unit Index							
1	Device Type (08h)							
2 - 3	Additional Descriptor Length (4h)							
4 - 5	Logical Unit Number							
6	Reserved							Enable
7	Reserved							

If the Enable bit is set to 1 it indicates the Logical Unit is reported and supported. Commands received for this logical unit shall be passed on to the automation using the ADI interface. When it is set to 0, the logical unit is not reported to a REPORT LUNS command and does not respond to commands.

### 2.3.6 Automation Drive Descriptor

The descriptor for an Automation Drive device (Device Type = 12h) is defined by the following table:

Bit	7	6	5	4	3	2	1	0
0	Logical Unit Index							
1	Device Type (12h)							
2 - 3	Additional Descriptor Length (4h)							
4 - 5	Logical Unit Number							
6	Reserved							Enable
7	Reserved							

If the Enable bit is set to 1 it indicates the Logical Unit is reported and supported on the primary interface. Commands received for this logical unit shall be passed on to the automation drive command set device server. When it is set to 0, the logical unit is not reported to a REPORT LUNS command and does not respond to commands on the primary interface. This mode page has no effect on the availability of the ADC device server on the ADT Service Delivery Port if one is available on the device.