

**TO:** T10 Membership  
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**DATE:** 2 July 2003  
**SUBJECT:** T10/03-202r1, ADC Informative Annex: DTD Configuration Example

**Revision 1:**

Changes from 30 June 2003 teleconference, 03-225r0, discussion item a:

- State that discovery and configuration is performed after power cycle or hard reset by automation device or DTD.
- Reorganize presentation of mode parameters.
- Remove block descriptor and use MODE SENSE (10) parameter format.

**Revision 0:**

- Initial rough draft.

This proposal is offered as a sample of the commands and data that would be exchanged between an automation application client and an ADC device server to configure the data transfer device for operation.

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## **Annex A**

(Informative)

### **Example of DTD Configuration**

#### **A.1 Introduction**

One of the purposes of the Automation Drive Interface standards is to enable automation devices to discover and configure data transfer devices automatically, i.e., without manual configuration of the DTD before it is placed in the automation device. Because DTD configuration information is presented and modified in a standard manner, automation devices can implement one discovery and configuration process that will accommodate all compliant DTDs without need for DTD-specific changes.

Typical configuration information to be set includes:

- Target ID (e.g., SCSI ID or Fibre Channel Loop Identifier)
- Other transport-specific configuration items
- World wide names and other identifiers
- Autoload mode and other RMC-specific parameters
- Enabling or disabling of bridging

Configuration must be performed when the automation device or a data transfer device is powered on or performs a hard reset. At that time, the automation application client will typically discover the DTD and if necessary modify its configuration prior to enabling its primary port(s). This ensures that the configuration is correct when the RMC device server is first accessed by application clients via the DTD primary port(s), thus avoiding confusing the application clients by changing the target ID or other parameters that they have already discovered.

While different DTDs may save different sets of parameters across power cycles and resets, the port enable (PE) field in the DTD primary port descriptors is the one that is required for the operation described above. When this bit is set to zero in the saved mode parameters, a power cycle or hard reset will leave the DTD primary ports disabled. The automation device server can then set the entire configuration and enable the DTD primary ports by setting the current mode parameters, which can be done with a single MODE SELECT command. In fact, if the DTD configuration is known *a priori* to be acceptable, then this single command will be the only one necessary

Note that if the DTD detects that it is not connected to an automation device (by means beyond the scope of this standard), it may override a PE bit of zero and enable the port upon power on or hard reset. This will allow the DTD primary ports to operate when the DTD is in a standalone mode.

This annex presents a recommended sequence of commands for setting the DTD's configuration, and points out specific items to be configured.

## A.2 Command Sequence

The recommended sequence of commands for the automation application client to issue to the DTD is shown in Table A.1. This process should be carried out anytime either the automation device or data transfer device is powered on or performs a hard reset.

**Table A.1 – Configuration command sequence**

Command	LUN Addressed	Purpose
REPORT LUNS	0	Discover logical units supported by the DTD
INQUIRY	Each reported LUN	Determine type of each device server
TEST UNIT READY	ADC LUN	Clear Unit Attention conditions
MODE SENSE (10)	ADC LUN	Obtain saved mode parameter values
MODE SENSE (10)	ADC LUN	Obtain changeable mode parameter mask
MODE SELECT (10)	ADC LUN	Set saved mode parameter values
MODE SENSE (10)	ADC LUN	Obtain current mode parameter values
MODE SELECT (10)	ADC LUN	Set current mode parameter values

If the automation application client knows *a priori* that the LUNs, device types, and saved mode page settings are correct, then the only necessary command will be the final MODE SELECT (10). The ten-byte forms of the MODE SENSE and MODE SELECT commands should be used because they are mandatory and will be available on all DTDs. The six-byte forms are optional and thus may not be supported.

## A.3 Configuration process steps

### A.3.1 Obtaining saveable mode parameters

Once the automation application client has determined which logical unit has the ADC device server, it can then begin to determine the characteristics of the DTD. Automation firmware need

make no assumptions about the type of media handled by the drive, the number and types of primary ports, identifiers reported by it, etc.

To obtain the current values of the relevant parameters, the automation application client should issue a MODE SENSE (10) command with the page control (PC) field set to Saved Values (11b). The data received must then be parsed to determine which parameters are supported. If none of these parameters need to be changed, then the automation application client can skip to clause A.3.4 below.

### **A.3.2 Determining changeable parameters**

To obtain a mask denoting the changeable parameters, the automation application client should issue a MODE SENSE (10) command with the page control (PC) field set to Changeable Values (01b). While obtaining the mask is not the only way to determine which parameters are changeable, the alternative is to attempt to change parameters and have the device server reject the command for invalid parameter data. This is less efficient than using the mask.

It is recommended that if mode parameters are modified, then the parameter data written back be in exactly the organization of the data, rather than dropping unchanged parameters, re-ordering parameters, etc. This avoids the complexity of re-calculating descriptor lengths.

### **A.3.3 Saving mode parameters**

Mode parameters are saved using the MODE SELECT (10) command with the save pages (SP) bit set to one. Different data transfer devices may allow saving of different parameters. It is recommended that at a minimum the port enable (PE) bit for each primary port be saveable. If these bits are set to 0 and saved, it will permit the automation application client to configure the DTD before it can be accessed through its primary ports.

### **A.3.4 Obtaining current mode parameters**

The automation application client can now set the DTD parameters to the values desired during operation. To obtain the current values of the relevant parameters, the automation application client should issue a MODE SENSE (10) command with the page control (PC) field set to Current Values (00b). The data received must then be parsed to determine which parameters are supported. If any of these parameters need to be changed – such as setting the port enable (PE) bits in the DTD primary port descriptors to zero – the automation application client should obtain the changeable parameters mask (see clause A.3.2), if it has not already done so.

### **A.3.5 Setting operational parameter values**

The second MODE SELECT (10) command will typically set all of the operation parameter values and enable the DTD's primary ports. It is done with the save pages (SP) field set to zero.

If the automation uses the OFFLINE field of the RMC logical unit descriptor to leave the device offline after the DTD primary ports are enabled, then an additional MODE SELECT (10) will be necessary to bring the device on line.

## **A.4 Sample mode parameters**

This clause presents a example of configuring the operational (changeable) parameters of a data transfer device. The DTD contains an SSC (tape) device server and two Fibre Channel ports. The values shown here are those set in clause A.3.5 above.

Note to ADC Editor: The byte numbers in the following tables were set using automatic paragraph numbering. Please check for correct conversion in Frame.

#### A.4.1 Mode parameter header and block descriptor

Bit Byte	7	6	5	4	3	2	1	0
0	(MSB)	MODE DATA LENGTH						(LSB)
1								
2		MEDIUM TYPE (00h)						
3		DEVICE-SPECIFIC PARAMETER (00h)						
4		Reserved						LONGLBA
5		Reserved						
6	(MSB)	BLOCK DESCRIPTOR LENGTH (0064h)						(LSB)
7								

#### A.4.2 Node descriptor subpage

If the automation device wishes to change the world wide node name, then it should set the WORLD WIDE NODE NAME field to the new value (0123456789ABCDEFh) and set the MNN field to 11b. For other choices, see Table 24.

8	PS	SPF (1b)	PAGE CODE (0Eh)
9	SUBPAGE CODE (01h – Node descriptor subpage)		
10	(MSB)	PAGE LENGTH (0Ch)	
11		(LSB)	
12	Reserved		MNN (11b)
13	Reserved		
14	Reserved		
15	Reserved		
16	(MSB)	WORLD WIDE NODE NAME	
		(0123456789ABCDEFh)	
23		(LSB)	

#### A.4.3 DTD primary port descriptor subpage

This example DTD has two Fibre Channel ports, so the subpage contains two Service Delivery Port descriptors. There should be no changeable information in the sub page header.

24	PS	SPF (1b)	PAGE CODE (0Eh)
25	SUBPAGE CODE (02h – service delivery port descriptor subpage)		
26	(MSB)	PAGE LENGTH (20h)	
27		(LSB)	

### A.1.1.1 Port A port descriptor

The automation application client may wish to change a number of fields in each port descriptor. The ports are configured as follows:

- Point-to-point mode enabled (P2P = 1) but not required (TOPLOCK = 0)
- Loop ID 00h requested (FC-AL LOOP ID = 00h) but not required (RHA = 0)
- Speed set to 2 Gb/sec (SPEED = 001b) but negotiation to other speeds is allowed (SPDLOCK = 0)
- Port name set to 0123456789ABCDE0h (MPN = 11b)
- Port enabled (PE = 1)

28	RELATIVE TARGET PORT (00h)						
29	PORT TYPE (00h – Fibre Channel)						
30	(MSB)						
31	ADDITIONAL DESCRIPTOR LENGTH (0Ch)						
32	P2P (1)	TOPLOCK (0)	RHA (0)	LIV (1)	MPN (11b)	Rsvd	PE (1)
33	Reserved				SPDLOCK (0)	SPEED (001b)	
34	Reserved						
35	Rsvd	FC-AL LOOP ID (00h)					
36	(MSB)						
	PORT NAME						
	(0123456789ABCDE0h)						
43	(LSB)						

### A.1.1.2 Port B port descriptor

The parameters for port B are set the same as port A's, except that the port name is 0123456789ABCDE1h.

44	RELATIVE TARGET PORT (01h)							
45	PORT TYPE (00h – Fibre Channel)							
46	(MSB)	ADDITIONAL DESCRIPTOR LENGTH (0Ch)						(LSB)
47								
48	P2P (1)	TOPLOCK (0)	RHA (0)	LIV (1)	MPN (11b)		Rsvd	PE (1)
49	Reserved				SPDLOCK (0)	SPEED (001b)		
50	Reserved							
51	Rsvd	FC-AL LOOP ID (00h)						
52	(MSB)	PORT NAME						(LSB)
	(0123456789ABCDE1h)							
59								(LSB)

#### A.4.4 Logical unit descriptor subpage

If it is supported, the logical unit descriptor subpage will contain at least one device descriptor. In this example, all three device descriptors are present.

60	PS	SPF (1b)	PAGE CODE (0Eh)
61	SUBPAGE CODE (03h – logical unit descriptor subpage)		
62	(MSB)	PAGE LENGTH (2Ch)	
63			(LSB)

##### A.1.1.3 RMC device descriptor

If the automation device wishes the RMC device server to appear on its primary interface ports, it must set the LOGICAL UNIT NUMBER field to the desired value and set the ENABLE field to one. Otherwise, it must set the ENABLE field to zero. Typically, the LUN will be 0000h and ENABLE will be 1. During normal operation, the OFFLINE bit will be 0.

This example is for a Stream (tape) device, so the DEVICE TYPE field contains 01h. Other parameters are:

- The LUN is not changed from that assigned by the manufacturer (MLUN = 00b)
- The drive will be online when the DTD primary ports are enabled (OFFLINE = 0)
- The SSC device server is enabled (ENABLE = 1)

Other parameters are not described.

64	LOGICAL UNIT INDEX (00h)			
65	DEVICE TYPE (01h – Stream device)			
66	(MSB)	ADDITIONAL DESCRIPTOR LENGTH (16h)		
67				(LSB)
68	(MSB)	LOGICAL UNIT NUMBER (0000h)		
69				(LSB)
70	MLUN (00b)	Reserved		
			OFFLINE (0)	ENABLE (1)
71	Reserved	AUH	SUHO	AMO
			AUTOLOAD MODE	
72	FUE	DRMODE	Reserved	
			DENOVN	WP
73	CURRENT DENSITY			
74	SELECT WRITE DENSITY			
75	Reserved			
76	Reserved			
77	Reserved			
78	Reserved			
79	Reserved			

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Editor's Note: Adjust additional descriptor length value and logical unit number field position depending upon outcome of working group discussion.

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### A.1.1.3.1 Identification descriptors

Identification descriptors are part of the RMC device descriptor. The T10 vendor identifier is set to that of the mythical vendor Fubarica. Because this identifier is not associated with a particular SCSI transport protocol, the protocol identifier valid (PIV) bit is zero.

80	PROTOCOL IDENTIFIER (0h)			CODE SET (2h)
81	PIV (0)	Rsvd	ASSOCIATION (0h)	IDENTIFIER TYPE (1h)
82	Reserved			
83	IDENTIFIER LENGTH (08h)			
84	IDENTIFIER ("FUBARICA")			
91				

### A.1.1.4 Medium Changer device descriptor

This DTD supports ADI bridging (*insert reference*), so the mode data includes a Medium Changer device descriptor with a logical unit number of 1. In this case automation does not wish to enable bridging, so it sets the ENABLE field to zero.

If multiple logical units are enabled for reporting on the primary ports, then the drive must ensure that their logical unit numbers are different. If the LUN field in the RMC descriptor is the same as that for another logical unit, then it is recommended that the drive report an invalid field in the parameter data, with sense data indicating the LUN field in a descriptor other than that for the RMC logical unit.

92	LOGICAL UNIT INDEX (01h)		
93	DEVICE TYPE (12h – Medium Changer device)		
94	(MSB)	ADDITIONAL DESCRIPTOR LENGTH (0002h)	
95			(LSB)
96	(MSB)	LOGICAL UNIT NUMBER (0001h)	
97			(LSB)
98	Reserved		ENABLE (0)
99	Reserved		

### A.1.1.5 Automation Drive device descriptor

This DTD reports the ADC device server at LUN 2. Because the automation device does not wish the ADC device server to appear on the primary ports, it sets the ENABLE field to zero.

100	LOGICAL UNIT INDEX (02h)			
101	DEVICE TYPE (08h – Automation Drive device)			
102	(MSB)	ADDITIONAL DESCRIPTOR LENGTH (0002h)		(LSB)
103				
104	(MSB)	LOGICAL UNIT NUMBER		(LSB)
105				

106	Reserved	ENABLE (0)
107	Reserved	