

To: INCITS Technical Committee T10

From: Kevin Butt, IBM

Date: August 21, 2004

Document: T10/04-271r2

Subject: SPC: Time Of Day Settings

## 1. Revisions

04-271r0 - Initial Version

04-271r1 - Added a model section, change time base of clock to 48.16 (48 bits for seconds.16 bits for fractional seconds). Improve definition of clock format, have a descriptor for each clock that has been set returned.

04-271r2 - Incorporate comments from George Penokie. Also resolves comments from several others on the time-of-day format.

Use definition from OSD

## 2. Introduction

The intended use of this Time-Of-Day (TOD) setting is for capture in device logs such that they can be correlated to other devices in the system as well as application logs on the host. As such we see no need for guaranteeing no loss in precision from the transmit time. (i.e. Any losses to accuracy incurred by the time on the link are negligible and need not be accounted for.)

The ADI working group, in answering ADC Letter Ballot comments HP-139 and IBM Roberts-3 (both related to setting time of day to the device) has determined that this belongs in SPC and has given me an action to write and present this proposal to CAP. The direction suggested was to use a Maintenance-In and Maintenance-Out command for SET TIME OF DAY and GET TIME OF DAY commands. In working through this proposal, it is apparent that there are also mode parameters required to make this unambiguous. A model section seems also to be required.

## 3. Proposal

Add the following sections to SPC-3.

**[3.1.121 universal time \(UT\): The time at longitude zero, colloquially known as Greenwich Mean Time.](http://aa.usno.navy.mil/faq/docs/UT.html)** See <http://aa.usno.navy.mil/faq/docs/UT.html>.

**[5.12 Device Clocks](#)**

**[5.12.1 Time Stamp overview](#)**

A timestamp may be used by a device server to assist in correlating the device logs to system logs and application logs. The method in which this correlation is done is outside the scope of this standard.

If the timestamp is not initialized it shall represent the time since power-on. The timestamp may be initialized by the SET TIMESTAMP command or by methods outside the scope of this standard. Once a timestamp is initialized it shall begin counting from that time forward.

### **5.12.2 Timestamp format**

The TIMESTAMP is represented as a 64-bit unsigned fixed-point number in big-endian format. The timestamp is divided into two 32 bit fields (see table 39). They are the INTEGER field and the FRACTIONAL field.

**TABLE 39. TIMESTAMP Format**

<u>Byte</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>
<u>0</u> <u>:</u> <u>5</u>	<u>MILLISECOND</u>							
<u>6</u> <u>7</u>	<u>Reserved</u>							

If a device uses a timestamp the timestamp shall contain the number of milliseconds that have elapsed since midnight, 1 January 1970 UT (see 3.1.121). Application clients that set the timestamp shall use this definition. The device server shall use this definition.

### **6.xx REPORT TIMESTAMP command**

The REPORT TIMESTAMP command (see table xy) requests the the value of the devices timestamp.

The REPORT TIMESTAMP command is a service action of the MAINTENANCE IN command. Additional MAINTENANCE IN service actions are defined in SCC-2 and in this standard. The MAINTENANCE IN service actions defined in SCC-2 apply only to logical units that return a device type of 0Ch or the SCCS bit equal to one in their standard INQUIRY data (see 6.4.2).

**TABLE xyz. REPORT TIMESTAMP command**

<u>Byte</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>
<u>0</u>	<u>OPERATION CODE (A3h)</u>							
<u>1</u>	<u>Reserved</u>			<u>SERVICE ACTION (0Fh)</u>				
<u>2</u> <u>5</u>	<u>Reserved</u>							
<u>6</u> <u>9</u>	<u>ALLOCATION LENGTH</u>							
<u>10</u>	<u>Reserved</u>							

**TABLE xyz. REPORT TIMESTAMP command**

<b>Byte</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
<b>11</b>	<u>CONTROL</u>							

The ALLOCATION LENGTH field indicates how many bytes have been allocated for the returned parameter data. If the length is not sufficient to contain all the parameter data, the first portion of the data shall be returned. This shall not be considered an error. The actual length of the parameter data is available in the TIMESTAMP PARAMETER DATA LENGTH field in the parameter data. If the remainder of the parameter data is required, the application client should send a new REPORT TIMESTAMP command with an ALLOCATION LENGTH field large enough to contain all the data.

The format of the parameter data returned by the REPORT TIMESTAMP command is shown in table yyy.

**TABLE xxx. Timestamp descriptor**

<b>Byte</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
<b>0</b>	<u>TIMESTAMP PARAMETER DATA LENGTH (n-1)</u>							
<b>1</b>								
<b>2</b>	<u>Reserved</u>				<u>TIM</u>			
<b>3</b>	<u>Reserved</u>							
<b>4</b>	<u>TIMESTAMP</u>							
<b>11</b>								

The timestamp initialization method (TIM) field reports the method used to initialize the TIMESTAMP value returned

**TABLE xx. Timestamp Initialization Method Field**

<u>Value</u>	<u>Definition</u>
000b	<u>Time from power-on</u>
001b	<u>Reserved</u>
010b	<u>Timestamp value of the clock initialized by the SET TIMESTAMP command</u>
011b	<u>Timestamp value of the clock initialized by methods outside the scope of this standard</u>
100b - 111b	<u>Reserved</u>

The TIMESTAMP field contains the current value of the timestamp.

**6.yy SET TIMESTAMP command**

The SET TIMESTAMP command (see table xx) provides the initial value of the Timestamp. The Timestamp set by this command shall remain in effect until one of the following occurs:

- a) Another SET TIMESTAMP command is received;

- b) A method outside the scope of this standard occurs as defined in the STM field (see 7.4.7); or
- c) Hard reset.

The Timestamp set by this command shall not be affected by an I\_T nexus loss or a Logical Unit reset.

The SET TIMESTAMP command is a service action of the MAINTENANCE OUT command. Additional MAINTENANCE OUT service actions are defined in SCC-2 and in this standard. The MAINTENANCE OUT service actions defined only in SCC-2 apply only to logical units that return a device type of 0Ch or the sccs bit equal to one in their standard INQUIRY data..

**TABLE xx. SET TIMESTAMP command**

Byte	7	6	5	4	3	2	1	0
0	OPERATION CODE (A4h)							
1	Reserved			SERVICE ACTION (0Fh)				
2	Reserved							
5								
6	PARAMETER LIST LENGTH							
9								
10	Reserved							
11	CONTROL							

The PARAMETER LIST LENGTH field specifies the length in bytes of the SET TIMESTAMP parameters that shall be transferred from the application client to the device server. A parameter list length of zero indicates that no data shall be transferred, and that no change shall be made to the timestamp.

**TABLE xxx. SET TIMESTAMP parameter list format**

Byte	7	6	5	4	3	2	1	0
0	ADDITIONAL LENGTH (n-1)							
1								
2	Reserved							
3	Reserved							
4	TIMESTAMP							
11								

The ADDITIONAL LENGTH field indicates the number of bytes that follow in the SET TIMESTAMP parameter list.

The TIMESTAMP field shall contain the initial value of the timestamp in the timestamp format (see Table 39).. If the high order byte is greater than F0h, the device server shall return CHECK

[CONDITION status with the sense key set to ILLEGAL REQUEST and an additional sense code of INVALID FIELD IN PARAMETER LIST.](#)

#### 7.4.7 Control Extension mode page

The Control Extension mode page (see table 233) is a subpage of the Control mode page (see 7.4.6) provides controls over SCSI features that are applicable to all device types. The mode page policy (see 6.7) for this subpage shall be shared. If a field in this mode subpage is changed while there is a task already in the task set, it is vendor specific whether the old or new value of the field applies to that task.

**TABLE 239. Control Extension mode page**

Byte	7	6	5	4	3	2	1	0
0	PS	SPF (1b)	PAGE CODE (0Ah)					
1	SUBPAGE CODE (01h)							
2	PAGE LENGTH (1Ch)							
3								
4	Reserved		<a href="#">STM</a>		<a href="#">TCMOS</a>	<a href="#">TCS</a>	IALUAE	
5	Reserved				INITIAL PRIORITY			
6	Reserved							
31								

The PS bit, SPF bit, PAGE CODE field, SUBPAGE CODE field, and PAGE LENGTH field are described in 7.4.5.

An implicit asymmetric logical unit access enabled (IALUAE) bit set to one specifies that implicit asymmetric logical unit access state changes (see 5.8.2.7) are allowed. An IALUAE bit set to zero specifies that implicit asymmetric logical unit access state changes be disallowed and indicates that implicit asymmetric logical unit access state changes are disallowed or not supported.

[A timestamp changeable via SCSI \(TCS\) bit set to one specifies that the timestamp may be changed using a SET TIMESTAMP command. A TCS bit set to zero specifies the the device server shall reject a SET TIMESTAMP command with a CHECK CONDITION and shall return CHECK CONDITION status with the sense key set to ILLEGAL REQUEST and an additional sense code of INVALID FIELD IN PARAMETER LIST.](#)

[A timestamp changeable by methods outside this standard \(TCMOS\) bit set to one specifies that the timestamp may be initialized my methods outside the scope of this standard. A TCMOS bit set to zero specifies that the time-of-day clock shall not be changed by any method except those defined by this standard.](#)

[A set timestamp method \(STM\) field \(see table x\) specifies the method used to set the timestamp.](#)

**TABLE X. TIMESTAMP METHOD Field**

<u>Value</u>	<u>Definition</u>
<a href="#">000b</a>	<a href="#">The device server shall set the timestamp to zero at power on</a>
<a href="#">001b</a>	<a href="#">The device server shall initialize the timestamp to the last value received by either the SET TIMESTAMP command or a method outside the scope of this standard.</a>
<a href="#">010b</a>	<a href="#">The device server shall initialize the timestamp to the last value received by the SET TIMESTAMP command.</a>
<a href="#">011b</a>	<a href="#">The device server shall initialize the timestamp to the last value received by any method outside the scope of this standard.</a>
<a href="#">100b - 111b</a>	<a href="#">Reserved</a>

The INITIAL PRIORITY field specifies the priority that may be used as the task priority (see SAM-3) for tasks received in any I\_T\_L nexus where a priority has not been modified by a SET PRIORITY command (see 6.29). If a MODE SELECT command specifies an initial priority value that is different than the current initial priority then the device server shall set any priorities that have not be set with a SET PRIORITY command to a value different than the new initiator priority value to the new priority. The device server shall generate a unit attention condition for any I\_T\_L nexus that receives a new priority with an additional sense code of PRIORITY CHANGED.

### ADCr06b

Add the following rows to Table 5.

**TABLE 5. — Command set for automation drive interface**

<b>Command name</b>	<b>Operation code</b>	<b>Required</b>	<b>Reference</b>	<b>Notes</b>
<a href="#">REPORT TIMESTAMP</a>	<a href="#">A3h/0Fh</a>	<a href="#">Optional</a>	<a href="#">SPC-3</a>	
<a href="#">SET TIMESTAMP</a>	<a href="#">A4h/0Fh</a>	<a href="#">Optional</a>	<a href="#">SPC-3</a>	