

BIST-SCT Command Proposal

December 7, 2004
Revision 1

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Revision History		
Date	Revision	Description
12-Oct-04	0	1. Initial Draft
7-Dec-04	1	1. Removed references to SATA phy counters 2. Changed language to refer to ATA/ATAPI-7 3. Reformatted proposed log page to include a Tag and test time. 4. Made it clear that gathering of BIST Statistics was not required 5. Made it clear that the BIST Statistics Log Page is optional

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1 Introduction

ATA/ATAPI-7 has defined a serial based transport for ATA devices. This transport provides capabilities similar to the Parallel interface for ATA devices. The serial transport has new management capabilities that address the serial nature of the bus. This proposal provides a way to trigger the self-test capabilities (BIST & BERT) that are built into SATA devices.

2 Scope

The purpose of this specification is to provide a standard way to initiate the Built-In Self-Test (BIST) and Bit Error Rate Test (BERT) capabilities of SATA devices, and to return the results of the test.

2.1 Definition of Terms

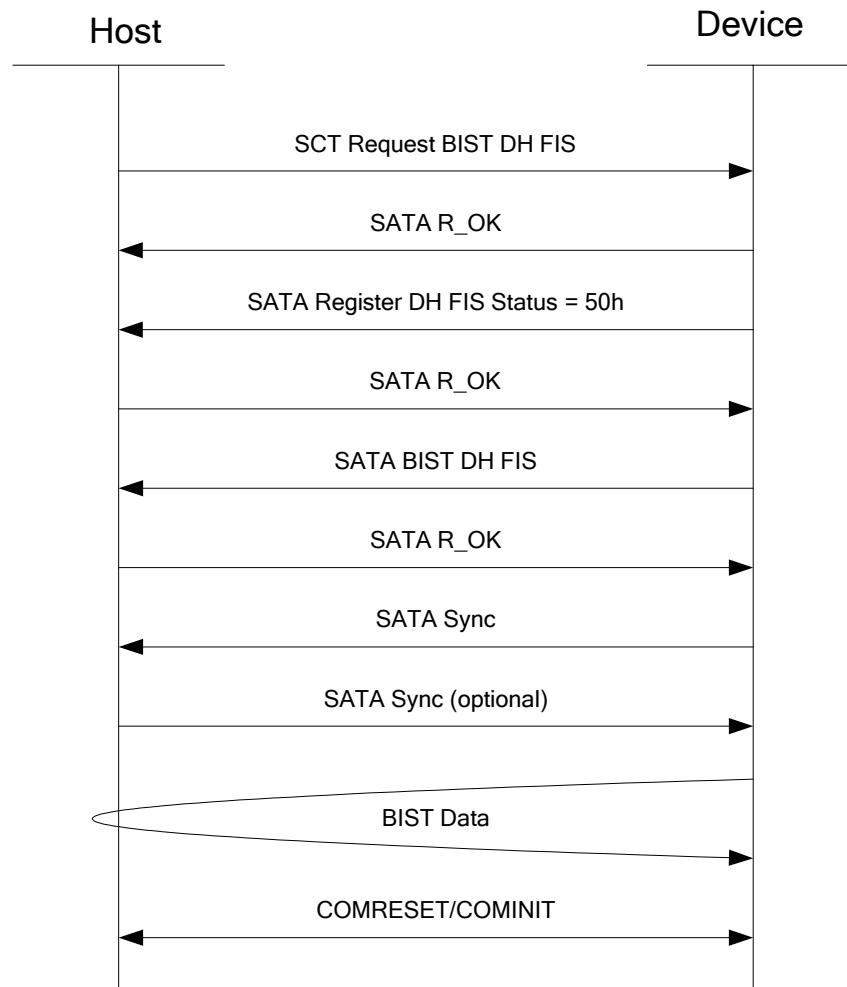
2.1.1 No Terms Yet

3 Overview

BIST allows ATA/ATAPI-7 SATA HBA and an ATA/ATAPI-7 SATA device to test the physical connections by entering a loopback or transmit mode. If the ATA/ATAPI-7 SATA HBA is testing its link with the device, the host driver instructs the HBA to issue a BIST HD FIS to the device. When the device receives the FIS, it responds with R_OK. After some handshaking, the HBA will then begin sending a repeating data pattern when loopback mode was selected. The drive shall return the pattern to the HBA according to the requirements specified in the BIST FIS. This test requires that a driver be able to cause the HBA to issue a BIST HD FIS and that the attached SATA device be able to act on the BIST HD FIS.

There are occasions where the device needs to initiate BIST in the HBA. This capability allows the device to validate the connections on both sides as well as the HBA Link and HBA phy. There is currently no standard way to cause the device to send a BIST DH FIS. This specification documents a method for initiating BIST mode in an HBA using an ATA/ATAPI-7 SATA device. Figure 1 shows the communication required for performing device initiated BIST:

Figure 1 - BIST Initiation



4 SCT BIST Request

4.1 Description

When the device initiates the BIST process by sending a BIST DH FIS to the host, if the device supports the gathering of error statistics, the device shall clear the statistics prior to sending the first BIST data. Once BIST starts, the statistics may be updated using the BIST data transfer information. If the BIST timer expires, the statistics may be saved in Log Page A0h - BIST Statistics Log Page (See Section 5). The device shall then issue COMINIT to cause the host to exit BIST mode and enter the idle mode. If the host initiates a device driven test with a non-zero timeout, the BIST Statistics Log Page reflects the true test statistics.

If BIST is terminated by COMRESET at any time, the statistics may be saved in the BIST Statistics Log Page, but the statistics may include a random number of errors caused by the COMRESET process.

Both COMRESET and timer expiration properly terminate BIST and allow the statistics to be saved. If BIST is aborted by removing power from the device, then BIST was terminated improperly and the BIST Statistics Log page is not updated to reflect the new statistics.

If an Asynchronous Signal Loss (ASL) occurs, Asynchronous Signal Recovery (ASR) shall not be performed. The device shall not attempt to issue COMINIT until the timeout timer has expired. The HBA shall not exit BIST until a COMINIT is received or the HBA is instructed to exit BIST by the host. ASL may cause inaccurate statistics reporting.

4.2 Inputs

Byte	Name	Value	Description
00h	Action Code	C001h	Begin Self-Test
02h	Function Code	0001h	Request BIST FIS
04h	Modes	DWord	<p>Bit (1) Description</p> <ul style="list-style-type: none"> 31:8 Reserved 7 Far End Transmit Only 6 Align Bypass (Only checked when Bit 7=1) 5 Bypass Scrambling (Only checked when Bit 7=1) 4 Far End Retimed Loopback (2) 3 Far End Analog Loopback (2) 2 Primitive Bit (Only checked when Bit 7=1) 1 Reserved 0 Vendor Specific <p>Notes</p> <p>(1) ATA/ATAPI-7 Volume 3 clause 16.5.7 for the definition of how these bits are used.</p> <p>(2) ATA/ATAPI-7 Volume 3 clause 14.4 for a description of some standard loopback patterns</p>
08h	Pattern 1	DWord	Pattern 1 (Only used when Bit 7=1)
0Ch	Pattern 2	DWord	Pattern 2 (Only used when Bit 7=1)
10h	Timeout	DWord	Test time in seconds. If this field is 0, the device shall perform the requested test until it receives a COMRESET, or a power cycle occurs.
14h	Tag	DWord	Test Tag. Test Tag is provided by the host to identify test results. When BIST is terminated the results are reported in the BIST Statistics Log Page if the drive supports the storing of BIST statistics in a log page. Test Tag is stored in the log page to identify to the host that BIST was terminated in a manner that allowed the test statistics to be stored.

4.3 Outputs

Field Name	Value
Error	See ATA/ATAPI-7
Sector Count	Undefined
LBA Low	Undefined
LBA Mid	Undefined
LBA High	Undefined
Device	Undefined
Status	See ATA/ATAPI-7

5 BIST Statistics Log Page

Western Digital has assigned Vendor Specific Log Page A0h as a holding place for the optional BIST Statistics Log Page. See Table 1 for the formatting of this log page. The statistics are reported in a vendor specific format. If the BIST was properly terminated (by timeout or COMRESET), then the phy/link statistics are reported as they were at the receipt of the last BIST data and are stored in the BIST Statistics Log Page. Note that if BIST is terminated by COMRESET that the COMRESET process may skew BIST statistics. If power is removed from the device prior to BIST completion, then the BIST Statistics Log Page is not updated.

The values in the BIST Statistics Log Page shall always reflect the result of the last properly terminated BIST, even across power cycles. If no BIST has been performed on the device, the BIST Statistics Log Page shall be initialized with all zeros. This condition shall remain until a properly terminated BIST has been performed.

Table 1 - BIST Statistics Log Page

Byte	Type	Description
503:0	Byte	BIST Statistics. 504 bytes are allocated to the reporting of BIST statistics in a vendor specific format
507:504	DWord	Test Time. Test Time is the number of seconds that BIST was performed
511:508	DWord	Test Tag. Test Tag is the Tag provided by the host in the SCT BIST Request