



# Serial ATA International Organization

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## Serial ATA Interoperability Program Revision 1.4 ULINK MOI for Device Digital Test (ASR, GTR, NCQ, SSP, IPM, DOF)

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## Revision History

Revision	Date	Comments
0.1	01/19/2006	Initial draft
0.2	01/28/2006	Use new format, separate HDD/ATAPI Tests into different chapters
0.9	02/28/2006	Update version number of Drive Master 2006 Pro and SATA-IO IL Digital Scripts
1.0RC	03/02/2006	Approved by Logo Group
1.0	06/19/2006	Revision 1.0 Final for Program Rev 1.0
0.9RC	10/19/2006	Update version number of SATA-IO Digital Script which is modified according to UTD 1.1
0.9RC1	11/06/2006	Update according to MOI review
0.9RC2	01/29/2007	Add Test Procedure
0.9RC3	02/13/2007	Update according to MOI review <ul style="list-style-type: none"> <li>• Added a definition section to cover ATA/ATAPI command usage.</li> <li>• GDR-02: Change "make sure" to say "Set SControl" and issue power cycle and confirm drive ready</li> <li>• GDR-03: Step d: Change "appropriate" to "maximum", Step g, change to indicate 2 tracks written, one with 8K transfers, the 2nd with 1MB transfers.</li> <li>• NCQ-04: Step d: Add text that indicates that only 2nd bullet or 3rd bullet is done, but not both.</li> <li>• SSP-01: Step f: Change "new" to "different"</li> <li>• SSP-02: Step f: Change to "Create Soft Media error using method from step d", Step p: Add step p: "Recover error sector by Write Sector (EXT) to the error address"</li> <li>• SSP-06: Step i: Change "new" to "different" in first bullet,</li> <li>• SSP-11: Step j &amp; k: Change "new" to "different"</li> <li>• IPM-01: Add minimum of 80% passage to confirm a IPM method is valid</li> <li>• IPM-01 / IPM-02: Step e, bullet 1, 1st and 2nd hollow bullet: change "second until Partial" to "second or until Partial". Step f: added reference to pass/fail is in Bus Analyzer MOI.</li> <li>• IPM-05/IPM-06: Step j: add the word "primitives" to after PMACK and PMNAK and reference to Bus Analyzer MOI for pass/fail</li> </ul>
1.0RC	2/15/2007	Approved by Logo Group for Program Rev. 1.1
1.0	3/19/2007	Version 1.0 Final for Program Rev. 1.1
0.7	3/31/2007	<ul style="list-style-type: none"> <li>• Add the support for the changes in UTD 1.2</li> <li>• GTR-01: Use Read Verify Sector to replace Seek</li> <li>• GTR-03: Perform the same data transfer size for Read-only Device as the test does for Write Capability Device</li> <li>• SSP-01: Try more different values for Initialize Device Parameter</li> </ul>
0.9	04/26/2007	Reviewed by Logo Group <ul style="list-style-type: none"> <li>• Update version number of Drive Master 2006 Pro and SATA-IO IL Digital Scripts</li> </ul>
1.0RC	07/17/2007	Approved by Logo Group for Program Rev. 1.2 <ul style="list-style-type: none"> <li>• Update version number of LeCroy CATC Bus Analyzer Digital MOI</li> </ul>
1.0	09/25/2007	Version 1.0 Final for Program Rev. 1.2

0.9	01/03/2008	<ul style="list-style-type: none"> <li>• Test Setup for eSATA</li> <li>• Add Appendix on the monitoring procedure for Finisar Bus Doctor Bus Analyzer</li> </ul>
1.0RC	05/22/2008	<p>Approved by Logo Group for Program Rev. 1.3</p> <ul style="list-style-type: none"> <li>• IPM-11: Add the text to clarify the test will perform checking on both Partial and Slumber state</li> <li>• Finisar ASR-02: Reset the numbering letter</li> <li>• Finisar IPM-05/06: step i: Clarify the number of PMACK should not be greater than 16</li> </ul>
1.0	7/09/2008	Version 1.0 Final for Program Rev. 1.3
1.0.1	9/27/2008	<ul style="list-style-type: none"> <li>• Resource Requirement regarding the supported OS versions</li> <li>• DriveMaster and Script version number update</li> <li>• Test selection message box to allow user to easily select individual test catalog</li> <li>• Power Cycle method message box to allow user to select the power method besides ULINK power supply/hub</li> <li>• HBA Requirement regarding the supported HBAs</li> <li>• Remove the classification of mandatory and optional test in Script Selection</li> <li>• ASR-02: extend the wait time from 2 second to 10 second</li> <li>• IPM-08: extend the loop count from 5 to 10</li> <li>• GTR 03: Reduce the transfer size</li> <li>• SSP-02: Add the support of Write Uncorrectable Ext</li> </ul>
0.88	05/02/2009	<ul style="list-style-type: none"> <li>• Add the support for the changes in UTD 1.4</li> </ul>
0.98	07/02/2009	<ul style="list-style-type: none"> <li>• Add Appendix on the monitoring procedure for SerialTek and Finisar Xgig Protocol Analyzers</li> </ul>
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## REFERENCES

The following documents are referenced in this text:

- [1] Serial ATA Revision 3.0
- [2] Serial ATA Interoperability Program Unified Test Document Revision 1.4
- [3] Serial ATA Interoperability Program Policy Document Revision 1.4
- [4] LeCroy CATC Bus Analyzer Digital MOI Revision 1.2

## DEFINITION

### **WRITE DMA (EXT)**

WRITE DMA command for 28-bit Address HDD  
WRITE DMA EXT command for 48-bit Address HDD

### **READ DMA (EXT)**

READ DMA command for 28-bit Address HDD  
READ DMA EXT command for 48-bit Address HDD

### **WRITE SECTOR (EXT)**

WRITE SECTOR command for 28-bit Address HDD  
WRITE SECTOR EXT command for 48-bit Address HDD

### **READ NATIVE MAX ADDRESS (EXT)**

READ NATIVE MAX ADDRESS command for 28-bit Address HDD  
READ NATIVE MAX ADDRESS EXT command for 48-bit Address HDD

### **WRITE NATIVE MAX ADDRESS (EXT)**

WRITE NATIVE MAX ADDRESS command for 28-bit Address HDD  
WRITE NATIVE MAX ADDRESS EXT command for 48-bit Address HDD

## Test Title: SATA-IO IL ATA tests

**Purpose:** Verify that ATA Device Under Test meets the Digital test requirements described in Serial ATA Interoperability Program Unified Test Document Revision 1.4

### Resource Requirements:

1. Windows XP, 2003 or Vista Operating System
2. 256MB RAM or higher
3. Motherboard with SATA Controller
  - a. iSATA Test: SATA controller should be based on ICH7R or above chipset
  - b. eSATA Test: SATA controller should be based on ICH9R or above chipset
  - c. Gen-3 Test: SATA controller should be based on AMD SB800 chipset
4. Minimum 64 MB video card. 128MB is recommended.
5. At least 150MB free space for system drive
6. Bus Analyzer (or Scope) for ASR/IPM tests
7. ULINK DriveMaster 2010 with USB key
8. ULINK External Power Supply
9. Serial ATA cables
10. SATA HDD Device Under Test

**\*\*Optional:**

*One PCI to ATA or PCI to SATA (Depends on the system drive) add-on card  
See details in Appendix B*

### Hardware Equipment Model Number:

iSATA test: Intel ICH7R or above AHCI

eSATA test: Intel ICH9R or above AHCI

Gen-3 test: AMD SB800 AHCI

*See details in Appendix B*

### Software Revision Number:

ULINK DriveMaster 2010: version 5.0.850

ULINK SATAIO-IL Digital Test Script: version 1.8

**Last Modification:** 05/02/2009

### Test Setup:

1. Connect system drive to add-on controller or Parallel ATA port
2. Connect Device Under Test:
  - a. iSATA Test: Connect Device Under Test via Bus Analyzer or Scope to SATA port 0 on the motherboard using Serial ATA cables
  - b. eSATA Test: Connect Device Under Test via Bus Analyzer or Scope to eSATA port on the motherboard using Serial ATA cables
3. Connect ULINK External power supply to Parallel port or USB port
4. Connect Device Under Test to ULINK External power supply using Serial ATA power adapter cable
5. Insert DriveMaster 2010 Pro USB key into a USB port
6. Connect Bus Analyzer or Scope properly (see detail in corresponding equipment's MOI, e.g. LeCroy CATC Bus Analyzer Digital MOI Revision 1.2 or Appendix E,F,G)

### Test Procedure:

1. Start DriveMaster 2010 by double-clicking "DriveMaster 2010" icon on the desktop or by selecting from the Start Menu:  
Start / All Programs / ULINK DriveMaster 2010 / DriveMaster 2010

2. Wait for “DriveMaster 2010” window to pop up. Click “Yes” if the current selected HBA is the one you want to use for the testing, else click No and select the matching HBA from the list.
3. Under the ‘File’ menu in DriveMaster 2010 , click ‘Open’ to select the script. Select “SATAILMain\_Selective.ens” or “SATAILMain\_Auto.ens” from the folder where the scripts are stored.  
*Note: It is recommended that you choose “SATAILMain\_Selective.ens” to better customize your testing. See details in Appendix A.*
4. Click Run button.
5. Enter Test ID number for Device Under Test, and click OK
6. Select tests from the following message box and click OK.  
1. GTR; 2. NCQ; 3. ASR; 4. SSP; 5. IPM; 6. DOF; 0. All  
*Note: It is recommended that you choose the default setting “0:All” to walk through all the test cases based on the features reported by the Device.  
If the non-zero value is selected, the corresponding catalogue will be tested.*
7. Select Power Cycle method from the following message box and click OK.  
0.ULINK Power Supply/Hub; 1: Others  
*Note: It is recommended to use ULINK Power Supply/Hub which will allow the tests to automatically power cycle the device when needed. If ULINK Power Supply/Hub is not available or the power cycle of the device under test cannot be controlled by ULINK Power Supply/Hub, the tester should correctly power cycle the device as requested by the test script when the following message is prompted:  
Please manually power cycle the device, then click OK when it is done.*
8. When you see the message box “Please start capture”, configure and start recording from Bus Analyzer (or Scope) according to the corresponding equipment’s MOI (e.g. LeCroy CATC Bus Analyzer Digital MOI Revision 1.2 or Appendix E,F,G), then click OK
9. When you see the message box “Please stop capture”, stop recording from Bus Analyzer (or Scope) and collect the necessary test results, then click OK.  
*Note: The messages in Item 7 and 8 will be prompted during ASR/IPM tests.*
10. Exit DriveMaster 2010 when tests are completed.

**Test Results:**

Test results can be retrieved from c:\SATAILTest\DGT according to the Test ID in log and csv format.

**Measurement Tolerance:** N/A

Only PASS/FAIL in Digital Test

**Approximate Execution Time:**

20~30 minutes

**Possible Problems:**

## Test Title: SATA-IO IL ATAPI tests

**Purpose:** Verify that ATAPI Device Under Test meets the Digital test requirements described in Serial ATA Interoperability Program Unified Test Document Revision 1.4

### Resource Requirements:

1. Windows XP, 2003 or Vista Operating System
2. 256MB RAM or higher
3. Motherboard with SATA Controller
  - a. iSATA Test: SATA controller should be based on ICH7R or above chipset
  - b. eSATA Test: SATA controller should be based on ICH9R or above chipset
  - c. Gen-3 Test: SATA controller should be based on AMD SB800 chipset
4. Minimum 64 MB video card. 128 MB is recommended.
5. At least 150MB free space for system drive
6. Bus Analyzer (or Scope) for ASR/IPM tests
7. ULINK DriveMaster 2010 with USB key
8. ULINK External Power Supply
9. ULINK SATA-IO IL TestCD
10. Serial ATA cables
11. SATA ATAPI Device Under Test

**\*\*Optional:**

*One PCI to ATA or PCI to SATA (Depends on the system drive) add-on card  
See details in Appendix B*

### Hardware Equipment Model Number:

iSATA test: Intel ICH7R or above AHCI  
eSATA test: Intel ICH9R or above AHCI  
Gen-3 test: AMD SB800 AHCI  
*See details in Appendix B*

### Software Revision Number:

ULINK DriveMaster 2010 : version 5.0.850  
ULINK SATAIO-IL Digital Test Script: version 1.8

**Last Modification:** 05/02/2009

### Test Setup:

1. Connect system drive to add-on controller or Parallel ATA port
2. Connect Device Under Test:
  - a. iSATA Test: Connect Device Under Test via Bus Analyzer or Scope to SATA port 0 on the motherboard using Serial ATA cables
  - b. eSATA Test: Connect Device Under Test via Bus Analyzer or Scope to eSATA port on the motherboard using Serial ATA cables
3. Connect ULINK External power supply to Parallel port or USB port
4. Connect Device Under Test to ULINK External power supply using Serial ATA power adapter cable
5. Insert DriveMaster 2010 Pro USB key into a USB port
6. Connect Bus Analyzer or Scope properly (see detail in the corresponding equipment's MOI, e.g. LeCroy CATC Bus Analyzer Digital MOI Revision 1.2 or Appendix E,F,G)

### Test Procedure:

1. Start DriveMaster 2010 by double-clicking "DriveMaster 2010" icon on the desktop or by selecting from the Start Menu:  
Start / All Programs / DriveMaster 2010/ DriveMaster 2010

2. Wait for “DriveMaster 2010” window to pop up. Click “Yes” if the current selected HBA is the one you want to use for the testing, else click No and select the matching HBA from the list.
3. Under the ‘File’ menu in DriveMaster 2010, click ‘Open’ to select the script. Select “SATAILMain\_Selective.ens” or “SATAILMain\_Auto.ens” from the folder where the scripts are stored.  
*Note: It is recommended that you choose “SATAILMain\_Selective.ens” to better customize your testing. See details in Appendix A.*
4. Click Run button.
5. Enter Test ID number for Device Under Test, and click OK
6. Select tests from the following message box and click OK.  
1. GTR; 2. NCQ; 3. ASR; 4. SSP; 5. IPM; 6. DOF; 0. All  
*Note: It is recommended that you choose the default setting “0:All” to walk through all the test cases based on the features reported by the Device.  
If the non-zero value is selected, the corresponding catalogue will be tested.*
7. Select Power Cycle method from the following message box and click OK.  
0.ULINK Power Supply/Hub; 1: Others  
*Note: It is recommended to use ULINK Power Supply/Hub which will automatically power cycle the device when needed. If ULINK Power Supply/Hub is not available or the power cycle of the device under test cannot be controlled by ULINK Power Supply/Hub, the tester should correctly power cycle the device as requested by the test script when the following message is prompted:  
Please manually power cycle the device, then click OK when it is done.*
8. When you see the message box “Please insert ULINK SATA-IO IL Test CD”, insert the ULINK SATA-IO IL Test CD and click OK.  
*Note: This message will be prompted during GTR/SSP test.*
9. When you see the message box “Please insert Blank CD Recordable disc”, insert a Blank Recordable/Rewritable CD and click OK.  
*Note: This message will be prompted during GTR test.*
10. When you see the message box “Please start capture”, configure and start recording from Bus Analyzer (or Scope) according to the corresponding equipment’s MOI (e.g. LeCroy CATC Bus Analyzer Digital MOI Revision 1.2 or Appendix E,F,G), then click OK
11. When you see the message box “Please stop capture”, stop recording from Bus Analyzer (or Scope) and collect the necessary test results, then click OK.  
*Note: The messages in Item 9 and 10 will be prompted during ASR/IPM tests.*
12. Exit DriveMaster 2010 when tests are completed.

#### **Test Results:**

Test results can be retrieved from c:\SATAILTest\DGT according to the Test ID in log and csv format.

#### **Measurement Tolerance:** N/A

Only PASS/FAIL in Digital Test

#### **Approximate Execution Time:**

20~30 minutes

#### **Possible Problems:**

For CD Write, some ATAPI devices are sensitive to CD-Recordable/Rewritable Medium. This may cause the failure of CD Write test (GTR-03 DMA Protocol Support).

## **Appendix A: SCRIPTS**

### **Scripts Dependency**

ULINK SATA-IO IL Digital Test Scripts v1.8 can only be run on DriveMaster 2010 v5.0.850. If the version number does not have the exact match, the test will exit and an error message will be shown on the log window.

### **Scripts Selection**

SATAILMain\_Selective.ens involves interactive response from the tester. It requires the tester to enter input into the pop-up message box each time to continue the testing.

SATAILMain\_Auto.ens will automatically select the default setting of message box in 30 seconds if there is no response from the tester. It will run all the Mandatory tests and Optional tests based on the features reported by the Device.

## **Appendix B: Additional Resources Details**

### **PCI to ATA/SATA add-on controller card**

If a Parallel ATA hard drive is used as system drive, connect system drive to the Parallel ATA port on the motherboard. If Parallel ATA port is not available, then use a PCI to ATA add-on controller card.

If a Serial ATA Hard Drive is used as system drive, connect system drive to a PCI to SATA add-on controller card.

### **ULINK SATA-IO IL TestCD**

ULINK SATA-IO IL Test CD is full-size Data CD constructed by SATA-IO COMP Data and Identification ID. It is only needed in ATAPI tests.

### **HBA Requirement**

ULINK DriveMaster 2010 supports the following HBAs:

1. Intel ICH4 and above, including IDE, AHCI and RAID modes
2. All the HBAs complied with standard AHCI spec.
3. Silicon Image 3124, 3132, 3531(PCI-E)
4. Marvell 6081(PCI-X), 61xx(PCI-E)
5. All the HBAs complied with the vendor specs. in item 3 and 4
6. VIA VT5324

To minimize the impact to Device under Test from HBAs (such as the limitations or bugs related to the specific HBAs) and maximize the automation of Digital Tests, the HBAs listed in “**Hardware Equipment Model Number**” are currently chosen for this set of tests.

## **Appendix C: Test Procedure**

Purpose: Describe ULINK test procedure which complies with Serial ATA Interoperability Program Unified Test Document Revision 1.4

Last Modification: 05/2/2009

### **GTR-01 : Software Reset**

Note: Each test case will be run in 5 loops

- a. Issue the following commands
  - ATA Device:
    - READ VERIFY SECTOR(S)
    - WRITE DMA
    - READ SECTOR
  - ATAPI Device:
    - TEST UNIT READY
    - INQUIRY
    - READ CD
- b. Check if the command is completed successfully. If yes, go to item c. If not, process error handling
- c. Issue SOFTWARE RESET and make sure this command is issued successfully. If not, process error handling
- d. Wait for the signature being posted by the device in 31 seconds.
- e. When good status (no BSY/DRQ/ERR is set) is detected, check if the signature returned is correct:
  - ATA device signature: 01h, 01h, 00h, 00h
  - ATAPI device signature: 01h, 01h, 14h, EBhIf it is incorrect, the script will log "FAIL" and the current signature returned from device and the expected signature
- f. When all the test cases are passed, log "PASS"

Error handling:

Log the error information with command op-code and loop count. The script will do necessary recovery to make sure the current failure won't affect next command. Also the script will make sure the device is ready for the next command.

For ATAPI read, ULINK SATAIL Test CD is requested

**GTR-02 : Gen-2 or above Signaling Speed Backwards Compatibility**

Note: each test case will be run in 10 loops

- a. Set HBA register SCONTROL to “No speed negotiation restrictions” mode
- b. Power cycle the device and make sure the device is ready. If not, test exits
- c. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- d. Check WORD 76 Bit 1, Bit n ( $n \geq 2$ )
- e. If none of Bit n ( $n \geq 2$ ) is not set, i.e. SATA Gen-2 or above is not supported, test exits
- f. If Bit n ( $n \geq 2$ ) is set, but any of Bit (n-1) ( $n \geq 2$ ) is not set, “FAIL” will be logged
- g. Issue COMRESET, wait for the device signature is posted
- h. When good status (no BSY/DRQ/ERR is set) is detected, check if the signature returned is correct:
  - ATA device signature: 01h, 01h, 00h, 00h
  - ATAPI device signature: 01h, 01h, 14h, EBhIf it is incorrect, the script will log “FAIL” and the current signature returned from device and the expected signature
- i. If the current HBA is Gen-n ( $n \geq 2$ ) Host, limit the speed negotiation to a rate not greater than Gen-(n-1) ( $n \geq 2$ , and the smaller value of maximum signaling speed supported by Host and Device) respectively until Gen-1 communication rate, then re-do item f and g for every speed established
- j. When all the test cases are passed, Log “PASS”

**Error handling:**

The script will do necessary recovery to make sure the failure for the current test case won't affect next test case.

**GTR-03 : DMA Protocol Support**

Note: each test case will be run in 5 loops

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 49 Bit 8, if it is not set to 1, the script will log “FAIL” and current value in WORD 49 and the expected value, then test exits
- c. Check WORD 53 and WORD 88 to find out the Maximum UDMA mode is supported by the device. If no UDMA mode is supported, check WORD 63 to find out the Maximum Multiword DMA mode is supported. If no Multiword DMA mode is supported, the script will log “FAIL” and current setting in WORD 88 and WORD 63, and then test exits
- d. Set maximum DMA mode the device can support by SET FEATURE command
- e. Load Write Buffer with COMP pattern
- f. For ATA device:
  - Issue Write DMA (EXT) with Random LBA and 8K bytes for test requirement of transfer size <= 8K bytes/ 128K bytes for test requirement of transfer size > 8K bytes
  - Issue Read DMA (EXT) with the same Random LBA and sector count
  - If both commands complete successfully, compare the data read back from the device with the data written to the device. If data mismatch is detected, the script will log “FAIL” with LBA and sector count
  - If any command is not completed successfully, the script will log “FAIL” with LBA and sector count, and process error handling
- g. For ATAPI device:
  - Check the device capability on write
  - To simplify the test, if the device is writable, a blank CD-R or CD-RW disc (if re-writable medium is supported by the device) will be requested in this test, and the script will check the disc to make sure it is blank before the following test
  - For the device with write capability:
    - Perform the necessary preparation before the script can start CD write
    - Write the track by issuing number of WRITE 10 commands with the appropriate writable address and transfer size of 8K bytes (for test requirement of transfer size <=8K bytes)/128K bytes (for test requirement of transfer size > 8K bytes)
    - Make sure CD write is successfully completed, If not, the script will log the corresponding sense key information and process Error handling. If yes, continue to next step
    - Read the previous written track by issuing number of READ CD commands with transfer size of 8K bytes (for test requirement of transfer size <=8K bytes)/1M bytes (for test requirement of transfer size > 8K bytes), and compares User data read back from the device with the data written to the device. If data mismatch is detected, the script will log “FAIL” with LBA and Length.
    - If any command is not completed successfully, the script will log “FAIL” with the corresponding sense key information, and process error handling
  - For the device with read-only:
    - ULINK SATAL Test CD is requested
    - Issue one READ CD command with Random LBA and transfer size of 8K bytes (for test requirement of transfer size <= 8K bytes)/128K bytes (for test requirement of transfer size > 8K bytes)
    - Issue the second READ CD command with the same Random LBA and transfer size

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- If both commands complete successfully, compare the data returned from two reads. If data mismatch is detected, the script will log “FAIL” with LBA and Length
- If any command is not completed successfully, the script will log “FAIL” with the corresponding sense key information, and process error handling
- Repeat the above test to achieve the same data transfer size as the test does for the device with write capability.

h. When all the test cases are passed, Log “PASS”

### **Error handling:**

The script will do necessary recovery to make sure the current failure won't affect next command. Also the script will make sure the device is ready for the next command.

**GTR-04 : General SATA Support**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 93 and verify if it is zero. If not, script will log “FAIL” and the current value returned from device and the expected value
- c. Check WORD 76 Bit 1 and verify if it is one. If not, script will log “FAIL” and the current value returned from device and the expected value
- d. Check WORD 76-79 Bit 0 and verify if they are all cleared to zero. If not, script will log “FAIL” and the current value returned from device and the expected value
- e. When both cases are passed, Log “PASS”

**GTR-05 : Unrecognized FIS receipt**

- a. Issue unrecognized FIS (0x88990055, 0x01, 0x02, 0x03, 0x04, 0x05, 0x06) to the device
- b. Check if R\_ERR is returned from the device
- c. If R\_ERR is not detected, the script will log "FAIL". If yes, the script will log "PASS"

**Error handling:**

The script will do necessary recovery to make sure the device is ready for the next command.

**NCQ-01 : Forced Unit Access**

- a. Issue IDENTIFY DEVICE to ATA device
- b. Check WORD 76 Bit 8, if it is cleared to zero, test exits
- c. Check Maximum Queue Depth supported by both Host and Device (WORD 75 Bit 4-0) sides in order that the tag number to be used in the following test is in the valid range (i.e. the smaller one of the above two numbers)
- d. Enable write cache if it is supported by the device
- e. Record the sector count = X and the number of IOs = Y when Maximum Flush time is detected
- f. Issue Y loops of WRITE DMA (EXT) commands with Random LBAs, Sector Count = X and data pattern 0x11
- g. Issue Y loops of READ DMA (EXT) commands with the same Random LBAs, Sector Count = X and verify that all Random locations have been written with the expected data 0x11
- h. Set FUA = 1, issue Y loops of WRITE FPDMA QUEUE commands with the same Random LBAs, Sector Count X and data pattern 0x22
- i. Wait for all the WRITE FPDMA QUEUE commands have been successfully completed
- j. Power cycle the device and make sure that the device is ready.
- k. Issue Y loops of READ DMA (EXT) commands with the same Random LBAs, Sector Count = X and verify that all Random locations have been written with the expected data 0x22
- l. If data mismatch is detected, the script will log "FAIL"; otherwise, "PASS" will be reported.
- m. If any WRITE FPDMA QUEUE command is failed, the test will log "FAIL" and process error handling

**Error handling:**

The script will do necessary recovery to make sure the current failure won't affect next command. Also the script will make sure the device is ready for the next command.

**NCQ-02 : Read Log Ext log page 10h support**

- a. Issue IDENTIFY DEVICE to ATA device
- b. Check WORD 76 Bit 8. If it is cleared to zero, test exits
- c. Check WORD 87 Bit 5. If it is cleared to zero, Log "FAIL"
- d. Issue READ LOG EXT with Page ID = 0. If the command is failed, Log "FAIL"
- e. Read WORD value at offset 20h from the returned data
- f. Check if it is 01h, if not, the script will log "FAIL";
- g. Issue READ LOG EXT with Page ID = 10h. If the command is failed, Log "FAIL"
- h. When all the test cases are passed, "PASS" will be reported.

**NCQ-03 : Intermix of Legacy and NCQ commands**

- a. Issue IDENTIFY DEVICE to ATA device
- b. Check WORD 76 Bit 8. If it is cleared to zero, test exits
- c. Check Maximum Queue Depth supported by both Host and Device (WORD 75 Bit 4-0) sides in order that the tag number to be used in the following test is in the valid range (i.e. the smaller one of the above two numbers).
- d. Issue number of READ FPDMA QUEUE commands with Random LBAs
- e. Issue the following commands for each test case:
  - IDENTIFY DEVICE
  - WRITE SECTOR
  - READ DMA
  - Read Log Ext with Page 10h
- f. Check D2H Register FIS,
  - Log current Status, Error and I Bit information returned from the device.
  - Check if I Bit/ERR Bit/ABRT Bit/DRDY Bit are set to one
  - Check if BSY Bit/DRQ Bit/DF Bit is cleared to zero.
  - If any of the above setting is incorrect, log “FAIL”, the current setting and the expected setting.
- g. Check if new SDB FIS is not received to make sure that command processing shall not be continued. If new SDB FIS is received, Log “FAIL”, new SDB FIS and expected SDB FIS information
- h. If the expected error is detected, issue READ LOG EXT with Page 10h
- i. If READ LOG EXT with Page 10h is successful,
  - check SDB FIS response to this command
    - Log current Status, Error, I Bit and SACTIVE in SDB FIS information returned from the device.
    - Check if DF Bit/ERR Bit/I Bit are cleared to zero
    - Check if DRDY Bit is set to one
    - Check if Reserved BIT 7 (BSY)/BIT 3 (DRQ) are cleared to zero
    - Check if SACTIVE field in SDB FIS is set to 0xFFFFFFFF
  - Check READ LOG EXT with Page 10h contents
    - Log non-Reserved fields from the returned contents
    - Check if NQ Bit is set
    - Check if the checksum is correct
  - If any of the above setting is incorrect, log “FAIL”, the current setting and the expected setting.
- j. If READ LOG EXT with Page 10h is failed, Log “FAIL” with Timeout or Status/Error information and process Error handling
- k. When all the test cases are passed, Log “PASS”

**Error handling:**

The script will do necessary recovery to make sure the current failure won't affect next command. Also the script will make sure the device is ready for the next command.

**NCQ-04 : Device response to malformed NCQ command**

- a. Issue IDENTIFY DEVICE to ATA device
- b. Check WORD 76 Bit 8. If it is cleared to zero, test exits
- c. Check Maximum Queue Depth supported by both Host and Device (WORD 75 Bit 4-0) sides in order that the tag number to be used in the following test is in the valid range (i.e. the smaller one of the above two numbers).
- d. Specified LBA is out of the device supported range:
  - Issue READ FPDMA QUEUE with the LBA which is out of Maximum LBA (WORD 60-61 or WORD 100-103) supported by the device, Tag Number is zero
  - Perform one of the following two checks
    - Check D2H FIS, if ERR Bit in Status is set, check the following information
      - Log current Status, Error and I Bit information returned from the device.
      - Check if I Bit/ERR Bit/DRDY Bit are set to one
      - Check if ABRT Bit or IDNF Bit is set to one
      - Check if BSY Bit/DRQ Bit/DF Bit is cleared to zero.
      - If any of the above setting is incorrect, log “FAIL”, the current setting and the expected setting.
    - Check SDB FIS, if ERR Bit in Status is set, check the following information
      - Log current Status, Error and I Bit information returned from the device.
      - Check if I Bit/ERR Bit/DRDY Bit are set to one
      - Check if ABRT Bit or IDNF Bit is set to one
      - Check if BSY Bit/DRQ Bit/DF Bit is cleared to zero.
      - If any of the above setting is incorrect, log “FAIL”, the current setting and the expected setting.
  - Check if new SDB FIS is not received to make sure that command processing shall not be continued. If new SDB FIS is received, Log “FAIL” and expected SDB FIS information
  - If the expected error is detected, issue READ LOG EXT with Page 10h
  - If READ LOG EXT with Page 10h is successful,
    - check SDB FIS response to this command
      - Log current Status, Error, I Bit and SACTIVE in SDB FIS information returned from the device.
      - Check if DF Bit/ERR Bit/I Bit are cleared to zero
      - Check if DRDY Bit is set to one
      - Check if Reserved BIT 7 (BSY)/BIT 3 (DRQ) are cleared to zero
      - Check if SACTIVE field in SDB FIS is set to 0xFFFFFFFF
    - Check READ LOG EXT with Page 10h contents
      - Log non-Reserved fields from the returned contents
      - Check if Tag Number is zero
      - Check if NQ Bit is cleared to zero
      - Check if LBA value in the content is the LBA issued in READ FPDMA QUEUE command
      - Check if ERR Bit/DRDY Bit is set to one
      - Check if ABRT Bit or IDNF Bit is set to one
      - Check if DF Bit is cleared to zero
      - Check if the checksum is correct
    - If any of the above setting is incorrect, log “FAIL”, the current setting and the expected setting.

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- If READ LOG EXT with Page 10h is failed, Log “FAIL” with Timeout or Status/Error information and process Error handling
- e. Duplicate Tag value for outstanding NCQ command
  - Issue number of READ FPDMA QUEUE commands with Random LBAs and valid Tag number. (If Maximum Tag range is not less than one, the valid Tag number to be used is not less than one. If Maximum Tag range is one, the valid Tag number is zero when it is available)
  - Issue READ/WRITE FPDMA QUEUE at the same Tag number = 0
  - Check D2H FIS
    - Log current Status, Error and I Bit information returned from the device.
    - Check if I Bit/ERR Bit/ABRT Bit/DRDY Bit are set to one
    - Check if BSY Bit/DRQ Bit/DF Bit is cleared to zero.
    - If any of the above setting is incorrect, log “FAIL”, the current setting and the expected setting.
  - Check if new SDB FIS is not received to make sure that command processing shall not be continued. If new SDB FIS is received, Log “FAIL”, new SDB FIS and expected SDB FIS information
  - If the expected error is detected, issue READ LOG EXT with Page 10h
  - If READ LOG EXT with Page 10h is successful,
    - check SDB FIS response to this command
      - Log current Status, Error, I Bit and SACTIVE in SDB FIS information returned from the device.
      - Check if DF Bit/ERR Bit/I Bit are cleared to zero
      - Check if DRDY Bit is set to one
      - Check if Reserved BIT 7 (BSY)/BIT 3 (DRQ) are cleared to zero
      - Check if SACTIVE field in SDB FIS is set to 0xFFFFFFFF
    - Check READ LOG EXT with Page 10h contents
      - Log non-Reserved fields from the returned contents
      - Check if Tag Number is zero
      - Check if NQ Bit is cleared to zero
      - Check if ERR Bit/DRDY Bit is set to one
      - Check if ABRT Bit is set to one
      - Check if DF Bit is cleared to zero
      - Check if the checksum is correct
    - If any of the above setting is incorrect, log “FAIL”, the current setting and the expected setting.
  - If READ LOG EXT with Page 10h is failed, Log “FAIL” with Timeout or Status/Error information and process Error handling
- f. Tag value is out of the device supported range
  - If the Maximum Queue Depth of the Device is not less than 32, this test case exits
  - If the Maximum Queue Depth of the Device is not less than the Maximum Queue Depth of the HBA, this test case exits
  - Issue READ FPDMA QUEUE command with Tag Number = Maximum Device Queue Depth
  - Check D2H FIS
    - Log current Status, Error and I Bit information returned from the device.
    - Check if I Bit/ERR Bit/ABRT Bit/DRDY Bit are set to one
    - Check if BSY Bit/DRQ Bit/DF Bit is cleared to zero.
    - If any of the above setting is incorrect, log “FAIL”, the current setting and the expected setting.

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- Check if new SDB FIS is not received to make sure that command processing shall not be continued. If new SDB FIS is received, Log “FAIL”, new SDB FIS and expected SDB FIS information
- If the expected error is detected, issue READ LOG EXT with Page 10h
- If READ LOG EXT with Page 10h is successful,
  - check SDB FIS response to this command
    - Log current Status, Error, I Bit and SACTIVE in SDB FIS information returned from the device.
    - Check if DF Bit/ERR Bit/I Bit are cleared to zero
    - Check if DRDY Bit is set to one
    - Check if Reserved BIT 7 (BSY)/BIT 3 (DRQ) are cleared to zero
    - Check if SACTIVE field in SDB FIS is set to 0xFFFFFFFF
  - Check READ LOG EXT with Page 10h contents
    - Log non-Reserved fields from the returned contents
    - Check if Tag Number is Maximum Device Queue Depth
    - Check if NQ Bit is cleared to zero
    - Check if ERR Bit/DRDY Bit is set to one
    - Check if ABRT Bit is set to one
    - Check if DF Bit is cleared to zero
    - Check if the checksum is correct
  - If any of the above setting is incorrect, log “FAIL”, the current setting and the expected setting.
- If READ LOG EXT with Page 10h is failed, Log “FAIL” with Timeout or Status/Error information and process Error handling

g. When all the test cases are passed, Log “PASS”

### Error handling:

The script will do necessary recovery to make sure the current failure won't affect next command. Also the script will make sure the device is ready for the next command.

**NCQ-05 : DMA Setup Auto-Activate**

- a. Issue IDENTIFY DEVICE to ATA device
- b. Check WORD 76 Bit 8. If it is cleared to zero, test exits
- c. Check Maximum Queue Depth supported by both Host and Device (WORD 75 Bit 4-0) sides in order that the tag number to be used in the following test is in the valid range (i.e. the smaller one of the above two numbers).
  
- d. Check WORD 78 Bit 2, if it is cleared to zero, test exits
- e. Issue SET FEATURE with Feature = 10h, Sector Count = 02h
- f. Issue IDENTIFY DEVICE, check WORD 79 Bit 2, if it is cleared to zero, Log "FAIL", test exits
- g. Issue number of WRITE FPDMA QUEUE commands with Random LBAs
- h. Wait for all the commands have been successfully completed. If any command is failed, the script will log "FAIL" and process Error handling
- i. If all the test cases are passed, Log "PASS"

**Error handling:**

The script will do necessary recovery to make sure the current failure won't affect next command. Also the script will make sure the device is ready for the next command.

**ASR-01 : COMINIT response interval**

- a. A Message Box “Please start capture from Bus-Analyzer or Scope, then click OK!” will be prompted
- b. When Bus Analyzer or Scope has set up ready, and OK is clicked by user, the script will continue
- c. Issue COMRESET and wait for the device being ready for communication
- d. This will be run in 5 loops, then a Message Box “Please stop capture from Bus-Analyzer or Scope, then click OK!” will be prompted
- e. User should click “OK” to move onto the next test
- f. Verify the device responding COMINIT within 10 ms by checking the capture from Bus Analyzer or Scope (see detail in the corresponding equipment’s MOI, e.g. LeCroy CATC Bus Analyzer Digital MOI Revision 1.2 or Appendix E,F,G)

**ASR-02 : COMINIT OOB Interval**

- a. A Message Box “Please start capture from Bus-Analyzer or Scope, then click OK!” will be prompted
- b. When Bus Analyzer or Scope has set up ready, and OK is clicked by user, the script will continue
- c. Put Host into Phy Offline mode and wait for 10 second
- d. A Message Box “Please stop capture from Bus-Analyzer or Scope, then click OK!” will be prompted
- e. After user click “OK”, get Host back to normal communication mode
- f. Verify the device sending COMINIT repeatable and no faster than 10 ms by checking the capture from Bus Analyzer or Scope (see detail in the corresponding equipment’s MOI, e.g. LeCroy CATC Bus Analyzer Digital MOI Revision 1.2 or Appendix E,F,G)

**SSP-01 : Initialize Device Parameters**

- a. Issue IDENTIFY DEVICE to ATA device
- b. Check WORD 78 Bit 6, if it is cleared to zero, test exits
- c. Check WORD 53 Bit 0, if it is cleared to zero, test exits
- d. Power cycle the device and make sure that the device is ready.
- e. Issue IDENTIFY DEVICE to ATA device, read values from WORD 54-58
- f. Issue INITIALIZE DEVICE PARAMETERS with different values, and check if this command is completed successfully with any of these different values. If not, Log “NOT TEST” and test exits
- g. Issue IDENTIFY DEVICE to ATA device, check if WORD 53 Bit 0 is set to one. If not, Log “NOT TEST” and test exits
- h. Read values from WORD 54-58 and compare it with the value in item e. If these two values are same, Log “NOT TEST” and test exits
- i. Issue COMRESET and make sure that the device is ready
- j. Issue IDENTIFY DEVICE to ATA device, read WORD 53 Bit 0 and WORD 54-58
- k. Check if WORD 53 Bit 0 is set to one and if WORD 54-58 value is the same as the value in item h. If any of the expected value is incorrect, Log “FAIL”, the current values and the expected values. If all these values are correct, Log “PASS”
- l. Power cycle the device and make sure that the device is ready

**SSP-02: Read/Write Stream Error Log**

- a. Issue IDENTIFY DEVICE to ATA device
- b. Check WORD 78 Bit 6, if it is cleared to zero, test exits
- c. Check WORD 84 Bit 4, if it is cleared to zero, test exits
- d. Check if READ/WRITE LONG or SCT READ/WRITE LONG or Write Uncorrectable Ext is supported by the device. If not, Log “NOT TEST” and test exits
- e. Power cycle the device and make sure that the device is ready.
- f. Create soft media error using the method from step d
- g. Issue CONFIGURE STREAM and READ STREAM DMA EXT at the location with ECC error
- h. Check SE Bit in Status, and Log the information if SE is cleared to zero
- i. Issue READ LOG EXT with Page ID = 22h, and check if the command is completed successfully. If not, Log “NOT TEST” and test exits
- j. Check the error count in the content, if the error count is cleared to zero, Log “NOT TEST” and test exits. If the error count is not zero, save the content.
- k. Issue CONFIGURE STREAM and READ STREAM DMA EXT at the location with ECC error
- l. Check SE Bit in Status, and Log the information if SE is cleared to zero
- m. Issue COMRESET and make sure that the device is ready
- n. Issue READ LOG EXT with Page ID = 22h, and check if the command is completed successfully. If not, Log “NOT TEST” and test exits
- o. Compare the current content with the content in item i, if mismatch is detected, Log “FAIL”, current content and the expected content; if the contents match, Log “PASS”
- p. Recover the error sector by WRITE SECTOR (EXT) to the error address

**SSP-03: Security Mode State**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 78 Bit 6, if it is cleared to zero, test exits
- c. Check WORD 82 Bit 1, if it is cleared to zero, test exits
- d. Perform necessary process to make the device in Security Disabled mode
- e. Issue SET SECURITY PASSWORD to bring the device to SEC5
- f. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- g. Check WORD 85 Bit 1, if it is cleared to zero, Log “NOT TEST”, and test exits
- h. Check WORD 128 Bit 3:1, if it is not set to one, Log “NOT TEST”, and test exits
- i. Issue the following commands and check if the device works in SEC5 state.
  - For ATA device, issue Read DMA and Write Sector, these commands shall complete successfully
  - For ATAPI device, issue Inquiry, it shall complete successfully
- j. Issue COMRESET and make sure that the device is ready
- k. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- l. Check WORD 85 Bit 1, and WORD 128 Bit 3:1, if both of them are set to one, Log “PASS”, otherwise, Log “FAIL”, current settings and expected settings
- m. Issue the following commands and check if the device works in SEC5 state. If the following commands cannot work successfully in item i, Log “NOT TEST” for this checking of command process, otherwise, if the following commands cannot work successfully in item m, Log “FAIL”.
  - For ATA device, issue Read DMA and Write Sector, these commands shall complete successfully
  - For ATAPI device, issue Inquiry, it shall complete successfully
- n. Perform necessary process to make the device in Security Disabled mode

**SSP-04: Set Address Max**

- a. Issue IDENTIFY DEVICE to ATA device
- b. Check WORD 78 Bit 6, if it is cleared to zero, test exits
- c. Check WORD 82 Bit 10, if it is cleared to zero, test exits
- d. Power cycle the device and make sure that the device is ready
- e. Issue IDENTIFY DEVICE to ATA device
- f. Read value from WORD 60:61 and WORD 100:103
- g. Issue READ NATIVE MAX ADDRESS (EXT)
- h. Issue SET NATIVE MAX ADDRESS (EXT) with new volatile Address
- i. Issue IDENTIFY DEVICE to ATA device
- j. Read value from WORD 60:61 and WORD 100:103
- k. If the device only supports 28-Bit address, compare WORD 60:61 with the corresponding data in item f  
If the device supports 48-Bit address, compare WORD 100:103 with the corresponding data in item f. If the capacity of device is less than 28-Bit address, compare WORD 60:61 with the corresponding data in item f  
If the data keep unchanged, Log "NOT TEST", and test exits
- l. Issue COMRESET and make sure that the device is ready
- m. Issue IDENTIFY DEVICE to ATA device
- n. Read value from WORD 60:61 and WORD 100:103
- o. Compare WORD 60:61 with the corresponding data in item k, if 48-Bit address is supported, further compare WORD 100:103 with the corresponding data in item k
- p. If any mismatch is detected, Log "FAIL", current settings and expected settings. If all the data match, Log "PASS"
- q. Power cycle the device and make sure that the device is ready

**SSP-05: SET FEATURES - Write Cache Enable/Disable**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 78 Bit 6, if it is cleared to zero, test exits
- c. Check WORD 82 Bit 5, if it is cleared to zero, test exits
- d. Power cycle the device and make sure that the device is ready
- e. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- f. Check WORD 85 Bit 5, if it is set to one, issue SET FEATURE with 82h; if it is cleared to zero, issue SET FEATURE with 02h
- g. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- h. Check WORD 85 Bit 5, and compare the current value with the one in item f. If the value keeps unchanged, Log “NOT TEST”, and test exits
- i. Issue COMRESET and make sure that the device is ready
- j. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- k. Check WORD 85 Bit 5, and compare the current value with the one in item h. If mismatch is detected, Log “FAIL”, current setting and the expected setting. If data match, Log “PASS”

**SSP-06: SET FEATURES - Set Transfer Mode**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 78 Bit 6, if it is cleared to zero, test exits
- c. Check WORD 49 Bit 8, if it is cleared to zero, test exits
- d. Check WORD 53 Bit 2, flag if UDMA is supported
- e. Power cycle the device and make sure that the device is ready
- f. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- g. Check WORD 63 and WORD 88, get Maximum and current Multiword DMA mode, and Maximum and current UDMA mode if UDMA is supported
- h. If the support of Multiword DMA and UDMA mode are all cleared to zero, Log “NOT TEST”, and test exits
- i. If UDMA mode is supported,
  - Issue SET FEATURE with different UDMA transfer mode
  - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
  - Check WORD 88, if the value is the same as the value in item g., Log “NOT TEST”, and test exits
  - Issue COMRESET and make sure that the device is ready
  - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
  - Check WORD 88, if the value is not the same as the new transfer mode, Log “FAIL”, current setting and the expected setting
  - If the new transfer mode is kept unchanged, perform read test, and make sure the device can properly process the following test
    - For ATA device, issue READ DMA (EXT) with Random LBA
    - For ATAPI device, ULINK SATAIL Test CD is requested. Issue Read CD with Random LBA
- j. Check Multiword DMA,
  - Issue SET FEATURE with different Multiword DMA transfer mode
  - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
  - Check WORD 63, if the value is the same as the value in item g., Log “NOT TEST”, and test exits
  - Issue COMRESET and make sure that the device is ready
  - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
  - Check WORD 63, if the value is not the same as the new transfer mode, Log “FAIL”, current setting and the expected setting
  - If the new transfer mode is kept unchanged, perform read test, and make sure the device can properly process the following test
    - For ATA device, issue READ DMA (EXT) with Random LBA
    - For ATAPI device, ULINK SATAIL Test CD is requested. Issue Read CD with Random LBA
- k. If no failure is detected, Log “PASS”

**SSP-07: SET FEATURES - Advanced Power Management Enable/Disable**

- a. Issue IDENTIFY DEVICE to ATA device
- b. Check WORD 78 Bit 6, if it is cleared to zero, test exits
- c. Check WORD 83 Bit 3, if it is cleared to zero, test exits
- d. Power cycle the device and make sure that the device is ready
- e. Check WORD 86 Bit 3, if it is set to one
  - Check WORD 91, and set the new value other than the current setting
  - Issue SET FEATURE with 05h and new APM value
  - Issue IDENTIFY DEVICE to ATA
  - Check WORD 91, if the new value is set correctly,
    - Issue COMRESET and make sure that the device is ready
    - Issue IDENTIFY DEVICE to ATA
    - Check WORD 91, if WORD 91 is not kept, Log “FAIL”, current setting and expected setting
  - Issue SET FEATURE with 85h
  - Issue IDENTIFY DEVICE to ATA
  - Check WORD 86 Bit 3, if it is set to one, Log “NOT TEST”, and test exits
  - Issue COMRESET and make sure that the device is ready
  - Issue IDENTIFY DEVICE to ATA
  - Check WORD 86 Bit 3, if it is set to one, Log “FAIL”, current setting and expected setting
- f. If WORD 86 Bit 3 is cleared to zero
  - SET FEATURE with 05h
  - Issue IDENTIFY DEVICE to ATA
  - Check WORD 86 Bit 3, if it is cleared to zero, Log “NOT TEST”, and test exits
  - Check WORD 91, verify APM level is set correctly
  - Issue COMRESET and make sure that the device is ready
  - Issue IDENTIFY DEVICE to ATA
  - Check WORD 86 Bit 3, if it is cleared to zero, Log “FAIL”, current setting and expected setting
  - If APM level is set correctly in previous step, check WORD 91, if the current setting is not the value set by SET FEATURE, Log “FAIL”, current setting and expected setting
- g. If not failure is detected, Log “PASS”

**SSP-08: SET FEATURES - ReadLook-Ahead**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 78 Bit 6, if it is cleared to zero, test exits
- c. Check WORD 82 Bit 6, if it is cleared to zero, test exits
- d. Power cycle the device and make sure that the device is ready
- e. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- f. Check WORD 85 Bit 6, if it is set to one, issue SET FEATURE with 55h; if it is cleared to zero, issue SET FEATURE with AAh
- g. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- h. Check WORD 85 Bit 6, and compare the current value with the one in item f. If the value keeps unchanged, Log “NOT TEST”, and test exits
- i. Issue COMRESET and make sure that the device is ready
- j. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- k. Check WORD 85 Bit 6, and compare the current value with the one in item h. If mismatch is detected, Log “FAIL”, current setting and expected setting. If data match, Log “PASS”

**SSP-09: SET FEATURES - Release Interrupt**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 78 Bit 6, if it is cleared to zero, test exits
- c. Check WORD 82 Bit 7, if it is cleared to zero, test exits
- d. Power cycle the device and make sure that the device is ready
- e. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- f. Check WORD 85 Bit 7, if it is set to one, issue SET FEATURE with DDh; if it is cleared to zero, issue SET FEATURE with 5Dh
- g. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- h. Check WORD 85 Bit 7, and compare the current value with the one in item f. If the value keeps unchanged, Log “NOT TEST”, and test exits
- i. Issue COMRESET and make sure that the device is ready
- j. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- k. Check WORD 85 Bit 7, and compare the current value with the one in item h. If mismatch is detected, current setting and expected setting. If data match, Log “PASS”

**SSP-10: SET FEATURES - Service Interrupt**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 78 Bit 6, if it is cleared to zero, test exits
- c. Check WORD 82 Bit 8, if it is cleared to zero, test exits
- d. Power cycle the device and make sure that the device is ready
- e. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- f. Check WORD 85 Bit 8, if it is set to one, issue SET FEATURE with DEh; if it is cleared to zero, issue SET FEATURE with 5Eh
- g. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- h. Check WORD 85 Bit 8, and compare the current value with the one in item f. If the value keeps unchanged, Log “NOT TEST”, and test exits
- i. Issue COMRESET and make sure that the device is ready
- j. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- k. Check WORD 85 Bit 8, and compare the current value with the one in item h. If mismatch is detected, current setting and expected setting. If data match, Log “PASS”

**SSP-11: Set Multiple Mode**

- a. Issue IDENTIFY DEVICE to ATA device
- b. Check WORD 78 Bit 6, if it is cleared to zero, test exits
- c. Check WORD 47 Bit 7:0, if it is cleared to zero, test exits
- d. Issue SET MULTIPLE MODE with the supported Multiple count
- e. Issue IDENTIFY DEVICE to ATA device
- f. Check WORD 59 Bit 8, if it is cleared to zero, test exits
- g. Power cycle the device and make sure that the device is ready
- h. Issue IDENTIFY DEVICE to ATA device
- i. Check WORD 59 Bit 7:0
- j. Issue SET MULTIPLE MODE with the different supported Multiple Count
- k. If the different supported Multiple Count is not found, Log "NOT TEST", and test exits
- l. Issue IDENTIFY DEVICE to ATA device
- m. Check WORD 59 Bit 8, if it is cleared to zero, Log "NOT TEST", and test exits
- n. Check WORD 59 Bit 7:0, if it is the same as the one in item i, Log "NOT TEST", and test exits
- o. Issue COMRESET and make sure that the device is ready
- p. Issue IDENTIFY DEVICE to ATA device
- q. Check WORD 59 Bit 8, if it is cleared to zero, Log "FAIL", current setting and expected setting.
- r. Check WORD 59 Bit 7:0, if it is not the same as the one in item n, Log "FAIL", current setting and expected setting.
- s. If no failure is detected, Log "PASS"

**SSP-11: Write Read Verify**

- a. Issue IDENTIFY DEVICE to ATA device
- b. Check WORD 86 Bit 15, if it is cleared to zero, test exits
- c. Check WORD 119 Bit 1, if it is cleared to zero, test exits
- d. Issue Set Feature with the proper settings to get all the possible supported modes.
- e. Power Cycle the device and make sure that the device is ready
- f. Issue IDENTIFY DEVICE to ATA device
- g. Check WORD 120 Bit 1, if it sets to one,
  - Record the current settings
  - Issue Set Feature with 8Bh
  - Issue IDENTIFY DEVICE to ATA device,
  - Check WORD 120 Bit 1, if it is set to one, Log “NOT TEST”, and go to the item i
  - Issue COMRESET and make sure that the device is ready
  - Issue IDENTIFY DEVICE to ATA
  - Check WORD 120 Bit 1, if it is set to one, Log “FAIL”, current setting and expected setting
- h. If WORD 120 Bit 1 is cleared to zero,
  - Issue Set Feature with 0Bh with one supported mode
  - Issue IDENTIFY DEVICE to ATA device,
  - Check WORD 120 Bit 1, if it is cleared to zero, Log “NOT TEST” , and go to the item i
  - Issue COMRESET and make sure that the device is ready
  - Issue IDENTIFY DEVICE to ATA
  - Check WORD 120 Bit 1, if it is cleared to zero, Log “FAIL”, current setting and expected setting
- i. Walk through the supported modes found in the item d.,
  - Issue Set Feature with 0Bh with the proper settings
  - Issue IDENTIFY DEVICE to ATA device,
  - Check WORD 220, and WORD 210-211 if it is mode 3, if any of the settings is not correct, Log “NOT TEST”, and go to the next supported mode
  - Issue COMRESET and make sure that the device is ready
  - Issue IDENTIFY DEVICE to ATA
  - Check WORD 220, and WORD 210-211 if it is mode 3, if any of the settings is not correct, Log “FAIL”, current setting and expected setting
- j. If no failure is detected, Log “PASS”

**IPM-01: Partial State exit latency (Host Initiated)**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 76 Bit 9, if it is cleared to zero, test exits
- c. If WORD 76 Bit 9 is set to one, HIPM is supported
  - A Message Box “Please start capture from Bus-Analyzer or Scope, then click OK!” will be prompted
  - When Bus Analyzer or Scope has set up ready, and OK is clicked by user, the script will start the following test in 10 loops
  - Issue PMREQ\_P, check and log IPM status
  - If Partial state is detected, issue COMWAKE
  - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device. If the command is failed, Log “FAIL”
  - The script may process necessary recovery to make sure the device is ready for next command
  - A Message Box “Please stop capture from Bus-Analyzer or Scope, then click OK!” will be prompted when 10 loops are done
  - User should click “OK” to move onto the next test
- d. Verify exit latency from Partial State is within 10 us by checking the capture from Bus Analyzer or Scope (see detail in the corresponding equipment’s MOI, e.g. LeCroy CATC Bus Analyzer Digital MOI Revision 1.2 or Appendix E,F,G)

**IPM-02: Slumber State exit latency (Host Initiated)**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 76 Bit 9, if it is cleared to zero, test exits
- c. If WORD 76 Bit 9 is set to one, HIPM is supported
  - A Message Box “Please start capture from Bus-Analyzer or Scope, then click OK!” will be prompted
  - When Bus Analyzer or Scope has set up ready, and OK is clicked by user, the script will start the following test in 10 loops
  - Issue PMREQ\_S, check and log IPM status
  - If Slumber state is detected, issue COMWAKE
  - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device. If the command is failed, Log “FAIL”
  - The script may process necessary recovery to make sure the device is ready for next command
  - A Message Box “Please stop capture from Bus-Analyzer or Scope, then click OK!” will be prompted when 10 loops are done
  - User should click “OK” to move onto the next test
- d. Verify exit latency from Slumber State is within 10 ms by checking the capture from Bus Analyzer or Scope (see detail in the corresponding equipment’s MOI, e.g. LeCroy CATC Bus Analyzer Digital MOI Revision 1.2 or Appendix E,F,G).

**IPM-03: Speed matching upon Resume (Host Initiated)**

Note: Each test case will be run in 10 loops

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 76 Bit 9, if it is cleared to zero, test exits
- c. Set HBA register SCONTROL to “No speed negotiation restrictions” mode
- d. Power cycle the device and make sure that the device is ready
- e. Check the current speed
- f. If WORD 76 Bit 9 is set to one, HIPM is supported
  - Resume from Partial State
    - Issue PMREQ\_P, check IPM status
    - If Partial state is detected, issue COMWAKE
    - The script may process necessary recovery to make sure the device is ready for next command
    - Check the current speed, if it is not the same as item d., Log “FAIL”, current setting and expected setting
  - Resume from Slumber State
    - Issue PMREQ\_S, check IPM status
    - If Slumber state is detected, issue COMWAKE
    - The script may process necessary recovery to make sure the device is ready for next command
    - Check the current speed, if it is not the same as item d., Log “FAIL”, current setting and expected setting
- g. If the device supports Gen-2 and above signaling speed, and the current HBA is Gen-n ( $n \geq 2$ ) Host, limit the speed negotiation to a rate not greater than Gen-(n-1) ( $n \geq 2$ , and the smaller value of maximum signaling speed supported by Host and Device) respectively until Gen-1 communication rate, re-do the item e and f for every speed established.
- h. If all the test cases are passed, Log “PASS”

**IPM-04: Lack of IPM support**

Note: Each test case will be run in 10 loops

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 76 Bit 9, if it is set to one, HIPM is supported, test exits.
- c. Check the device response to PMREQ\_P
  - Issue PMREQ\_P, check and log IPM status
  - If Partial state is detected, issue COMWAKE, and Log “FAIL”
  - The script may process necessary recovery to make sure the device is ready for next command
- d. Check the device response to PMREQ\_S
  - Issue PMREQ\_S, check and log IPM status
  - If Slumber state is detected, issue COMWAKE, and Log “FAIL”
  - The script may process necessary recovery to make sure the device is ready for next command
- e. If no failure is detected, Log “PASS”

**IPM-05: Device response to PMREQ\_P**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 76 Bit 9, if it is cleared to zero, test exits.
- c. A Message Box “Please start capture from Bus-Analyzer or Scope, then click OK!” will be prompted
- d. When Bus Analyzer or Scope has set up ready, and OK is clicked by user, the script will start the following test in 10 loops
- e. Issue PMREQ\_P, check and log IPM status
- f. If Partial state is detected, issue COMWAKE
- g. The script may process necessary recovery to make sure the device is ready for next command
- h. A Message Box “Please stop capture from Bus-Analyzer or Scope, then click OK!” will be prompted when 10 loops are done
- i. User should click “OK” to move onto the next test
- j. Verify there are at least 4 PMACK primitives or PMNAK primitive to respond PMREQ\_P by checking the capture from Bus Analyzer or Scope (see detail in the corresponding equipment’s MOI, e.g. LeCroy CATC Bus Analyzer Digital MOI Revision 1.2 or Appendix E,F,G).

**IPM-06: Device response to PMREQ\_S**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 76 Bit 9, if it is cleared to zero, test exits.
- c. A Message Box “Please start capture from Bus-Analyzer or Scope, then click OK!” will be prompted
- d. When Bus Analyzer or Scope has set up ready, and OK is clicked by user, the script will start the following test in 10 loops
- e. Issue PMREQ\_S, check and log IPM status
- f. If Slumber state is detected, issue COMWAKE
- g. The script may process necessary recovery to make sure the device is ready for next command
- h. A Message Box “Please stop capture from Bus-Analyzer or Scope, then click OK!” will be prompted when 10 loops are done
- i. User should click “OK” to move onto the next test
- j. Verify there are at least 4 PMACK primitives or PMNAK primitive to respond PMREQ\_S by checking the capture from Bus Analyzer or Scope (see detail in the corresponding equipment’s MOI, e.g. LeCroy CATC Bus Analyzer Digital MOI Revision 1.2 or Appendix E,F,G).

**IPM-07: Default setting for device Initiated requests**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 78 Bit 3, if it is cleared to zero, test exits.
- c. Power cycle the device and make sure that the device is ready
- d. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- e. Check WORD 79 Bit 3, if it is set to one, Log “FAIL”, current setting and expected setting
- f. Issue SET FEATURE with Feature 10h and Sector Count 03h
- g. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- h. Check WORD 79 Bit 3, if it is cleared to zero, Log “WARNING”, test exits
- i. Issue COMRESET and make sure that the device is ready
- j. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- k. Check WORD 79 Bit 3, if it is set to one, Log “FAIL”, current setting and expected setting
- l. If no failure is detected, Log “PASS”

**IPM-08: Device Initiated Power Management enable/disable**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 78 Bit 3, if it is cleared to zero, test exits.
- c. Power cycle the device and make sure that the device is ready
- d. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- e. Check WORD 79 Bit 3, if it is set to one, Log “FAIL”, current setting and expected setting
- f. Issue SET FEATURE with Feature 10h and Sector Count 03h
- g. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- h. Check WORD 79 Bit 3,
  - if it is cleared to zero, Log “FAIL”
  - If it is set to one, check if DIPM can be invoked:
    - Wait up to 10 seconds
      - Issue SET FEATURE with Feature 10h and Sector Count 03h
      - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
      - Check WORD 79 Bit 3, make sure DIPM is enabled
      - Wait for up to 10 second or until Partial or Slumber state is detected, then wake up the device
      - Run the above sequences for 5 loops
      - If one Partial or Slumber state is detected, this method is valid; otherwise, this method is invalid
    - Standby Immediate
      - Check WORD 82 Bit 3, if it is cleared to zero, this method is invalid, exit
      - Issue SET FEATURE with Feature 10h and Sector Count 03h
      - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
      - Check WORD 79 Bit 3, make sure DIPM is enabled
      - Issue STANDBY IMMEDIATE and wait for up to 10 second or until Partial or Slumber state is detected, then wake up the device, and make sure the device is in Active mode
      - Run the above sequences for 10 loops
      - If one Partial or Slumber state is detected, this method is valid; otherwise, this method is invalid
    - If fail to find the method that Partial or Slumber State will be invoked by device, Log “WARNING”
- i. Issue SET FEATURE with Feature 90h and Sector Count 03h
- j. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- k. Check WORD 79 Bit 3,
  - if it is set to one, Log “FAIL”
  - If it is cleared to zero, check if DIPM can be invoked:
    - Wait up to 10 seconds
      - Issue SET FEATURE with Feature 90h and Sector Count 03h
      - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
      - Check WORD 79 Bit 3, make sure DIPM is disabled
      - Wait for up to 10 second or until Partial or Slumber state is detected, then wake up the device
      - Run the above sequences for 5 loops
      - If one Partial or Slumber state is detected, this method is valid; otherwise, this method is invalid
    - Standby Immediate

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- Check WORD 82 Bit 3, if it is cleared to zero, this method is invalid, exit
  - Issue SET FEATURE with Feature 90h and Sector Count 03h
  - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
  - Check WORD 79 Bit 3, make sure DIPM is disabled
  - Issue STANDBY IMMEDIATE and wait for up to 10 second or until Partial or Slumber state is detected, then wake up the device, and make sure the device is in Active mode
  - Run the above sequences for 10 loops
  - If one Partial or Slumber state is detected, this method is valid; otherwise, this method is invalid
  - If success to find the method that Partial or Slumber State will be invoked by device, Log "FAIL"
1. If no failure is detected, Log "PASS"

**IPM-09: Partial State exit latency (Device Initiated)**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 78 Bit 3, if it is cleared to zero, test exits
- c. If WORD 78 Bit 3 is set to one, DIPM is supported
  - Find out the method that Partial State will be invoked by device:
    - Wait up to 10 seconds
      - Issue SET FEATURE with Feature 10h and Sector Count 03h
      - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
      - Check WORD 79 Bit 3, make sure DIPM is enabled
      - Wait for up to 10 second or until Partial state is detected, then wake up the device
      - Run the above sequences for 10 loops and get the Maximum value of the timer.
      - If Partial state is detected at 80% or above, this method is valid; otherwise, this method is invalid
    - Standby Immediate
      - Check WORD 82 Bit 3, if it is cleared to zero, this method is invalid, exit
      - Issue SET FEATURE with Feature 10h and Sector Count 03h
      - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
      - Check WORD 79 Bit 3, make sure DIPM is enabled
      - Issue STANDBY IMMEDIATE and wait for up to 10 second or until Partial state is detected, then wake up the device, and make sure the device is in Active mode
      - Run the above sequences for 10 loops and get the Maximum value of the timer
      - If Partial state is detected at 80% or above, this method is valid; otherwise, this method is invalid
  - If fail to find the method that Partial State will be invoked by device, test exits
  - A Message Box “Please start capture from Bus-Analyzer or Scope, then click OK!” will be prompted
  - When Bus Analyzer or Scope has set up ready, and OK is clicked by user, the script will start the following test in 10 loops
  - Using the method that Partial State will be invoked by the device, check and log IPM status
  - If Partial state is detected, wake up the device, and make sure the device is in Active mode
  - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device. If the command is failed, Log “FAIL”
  - The script may process necessary recovery to make sure the device is ready for next command
  - A Message Box “Please stop capture from Bus-Analyzer or Scope, then click OK!” will be prompted when 10 loops are done
  - User should click “OK” to move onto the next test
- d. Verify exit latency from Partial State is within 10 us by checking the capture from Bus Analyzer or Scope (see detail in the corresponding equipment’s MOI, e.g. LeCroy CATC Bus Analyzer Digital MOI Revision 1.2 or Appendix E,F,G)

**IPM-10: Slumber State exit latency (Device Initiated)**

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 78 Bit 3, if it is cleared to zero, test exits
- c. If WORD 78 Bit 3 is set to one, DIPM is supported
  - Find out the method that Slumber State will be invoked by device:
    - Wait up to 10 seconds
      - Issue SET FEATURE with Feature 10h and Sector Count 03h
      - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
      - Check WORD 79 Bit 3, make sure DIPM is enabled
      - Wait for up to 10 second or until Slumber state is detected, then wake up the device
      - Run the above sequences for 10 loops and get the Maximum value of the timer
      - If Slumber state is detected at 80% or above, this method is valid; otherwise, this method is invalid
    - Standby Immediate
      - Check WORD 82 Bit 3, if it is cleared to zero, this method is invalid, exit
      - Issue SET FEATURE with Feature 10h and Sector Count 03h
      - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
      - Check WORD 79 Bit 3, make sure DIPM is enabled
      - Issue STANDBY IMMEDIATE and wait for up to 10 second or until Slumber state is detected, then wake up the device, and make sure the device is in Active mode
      - Run the above sequences for 10 loops and get the Maximum value of the timer
      - If Slumber state is detected at 80% or above, this method is valid; otherwise, this method is invalid
  - If fail to find the method that Slumber State will be invoked by device, test exits
  - A Message Box “Please start capture from Bus-Analyzer or Scope, then click OK!” will be prompted
  - When Bus Analyzer or Scope has set up ready, and OK is clicked by user, the script will start the following test in 10 loops
  - Using the method that Slumber State will be invoked by the device, check and log IPM status
  - If Slumber state is detected, wake up the device, and make sure the device is in Active mode
  - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device. If the command is failed, Log “FAIL”
  - The script may process necessary recovery to make sure the device is ready for next command
  - A Message Box “Please stop capture from Bus-Analyzer or Scope, then click OK!” will be prompted when 10 loops are done
  - User should click “OK” to move onto the next test
- d. Verify exit latency from Slumber State is within 10 ms by checking the capture from Bus Analyzer or Scope (see detail in the corresponding equipment’s MOI, e.g. LeCroy CATC Bus Analyzer Digital MOI Revision 1.2 or Appendix E,F,G).

**IPM-11: Speed matching upon Resume (Device Initiated)**

Note: Each test case will be run in 10 loops

- a. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 78 Bit 3, if it is cleared to zero, test exits
- c. Set HBA register SCONTROL to “No speed negotiation restrictions” mode
- d. Power cycle the device and make sure that the device is ready
- e. Check the current speed
- f. If WORD 78 Bit 3 is set to one, DIPM is supported

Note: The following test performs on both Partial and Slumber State if supported.

- Find out the method that Partial/Slumber State will be invoked by device:
  - Wait up to 10 seconds
    - Issue SET FEATURE with Feature 10h and Sector Count 03h
    - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
    - Check WORD 79 Bit 3, make sure DIPM is enabled
    - Wait for up to 10 second or until Partial/Slumber state is detected, then wake up the device
    - Run the above sequences for 10 loops and get the Maximum value of the timer
    - If Partial/Slumber state is detected at 80% or above, this method is valid; otherwise, this method is invalid
  - Standby Immediate
    - Check WORD 82 Bit 3, if it is cleared to zero, this method is invalid, exit
    - Issue SET FEATURE with Feature 10h and Sector Count 03h
    - Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
    - Check WORD 79 Bit 3, make sure DIPM is enabled
    - Issue STANDBY IMMEDIATE and wait for up to 10 second or until Partial/Slumber state is detected, then wake up the device, and make sure the device is in Active mode
    - Run the above sequences for 10 loops and get the Maximum value of the timer
    - If Partial/Slumber state is detected at 80% or above, this method is valid; otherwise, this method is invalid
- If fail to find the method that Partial/Slumber State will be invoked by device, test exits
- Resume from Partial/Slumber State
  - Using the method that Partial/Slumber State will be invoked by the device, check IPM status
  - If Partial/Slumber state is detected, wake up the device, and make sure the device is in Active mode
  - The script may process necessary recovery to make sure the device is ready for next command
  - Check the current speed, if it is not the same as item d., Log “FAIL”, current setting and expected setting
- g. If the device supports Gen-2 and above signaling speed, and the current HBA is Gen-n ( $n \geq 2$ ) Host, limit the speed negotiation to a rate not greater than Gen-(n-1) ( $n \geq 2$ , and the smaller value of maximum signaling speed supported by Host and Device) respectively until Gen-1 communication rate, re-do the item e and f for every speed established.
- h. If all the test cases are passed, Log “PASS”

**DOF-01: Asynchronous Notification**

Note: Each test case will be run in 5 loops

- a. Issue IDENTIFY PACKET DEVICE to ATAPI device
- b. Check WORD 78 Bit 5. If it is cleared to zero, tests exit.
- c. Power cycle the device and make sure that the device is ready
- d. Check WORD 79 Bit 5. If it is set to one, Log “FAIL”, current setting and expected setting
- e. Issue SET FEATURE with Feature 10h and Sector Count 05h
- f. Issue IDENTIFY PACKET DEVICE to ATAPI device
- g. Check WORD 79 Bit 5,
  - if it is cleared to zero, Log “FAIL”
  - If it is set to one,
    - Press Eject button to let Tray/Medium out
      - Wait for SDB FIS sent from the device
      - If SDB FIS is received from the device,
        - Check if N Bit/I Bit set to one. If any of the settings are incorrect, Log “FAIL”, current setting and expected setting
        - Issue Get Event/Status Notification command to acknowledge the notification
      - If SDB FIS is not received, Log “FAIL”
    - Press Eject button or push Tray/Medium in
      - Wait for SDB FIS sent from the device
      - If SDB FIS is received from the device
        - Check if N Bit/I Bit set to one. If any of the settings are incorrect, Log “FAIL”, current setting and expected setting
        - Issue Get Event/Status Notification command to acknowledge the notification
      - If SDB FIS is not received, Log “FAIL”
    - If SDB FIS is received in all the above loops, Log “PASS”
- h. Issue SET FEATURE with Feature 90h and Sector Count 05h
- i. Issue IDENTIFY PACKET DEVICE to ATAPI device
- j. Check WORD 79 Bit 5,
  - if it is set to one, Log “FAIL”
  - if it is cleared to zero,
    - Press Eject button to let Tray/Medium out
      - Wait for SDB FIS sent from the device,
      - If SDB FIS is received from the device, Log “FAIL”
        - Issue Get Event/Status Notification command to acknowledge the notification
    - Press Eject button or push Tray/Medium in
      - Wait for SDB FIS sent from the device
      - If SDB FIS is received from the device, Log “FAIL”
        - Issue Get Event/Status Notification command to acknowledge the notification
    - If no SDB FIS is received in all the above loops, Log “PASS”

**DOF-02: Phy Speed Indicator**

- a. Set HBA register SCONTROL to “No speed negotiation restrictions” mode
- b. Power cycle the device and make sure the device is ready. If not, test exits
- c. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- d. Record all the supported speeds by the device
- e. Check the capability of HBA and record all the supported speeds by the HBA
- f. Record the current speed established
- g. Issue IDENTIFY DEVICE to ATA device or IDENTIFY PACKET DEVICE to ATAPI device
- h. Check WORD 77 bit 3-1,
  - If it is not cleared to zero,
    - Check if it is the same as the current speed established
    - If not, Log “FAIL”, current setting and expected setting
- i. If the device supports Gen-2 and above signaling speed, and the current HBA is Gen-n ( $n \geq 2$ ) Host, limit the speed negotiation to a rate not greater than Gen-(n-1) ( $n \geq 2$ , and the smaller value of maximum signaling speed supported by Host and Device) respectively until Gen-1 communication rate, re-do the item f, g and h for every speed established.
- j. If WORD 77 bit 3-1 is cleared to zero for all the speeds established, Log “NOT TEST”
- k. If WORD 77 bit 3-1 is not cleared to zero and has been set correctly for all the speeds established, Log “PASS”

## **Appendix E: Monitoring Procedure for Finisar Bus Doctor**

**Purpose:** Describe the monitoring procedure for Finisar Bus Doctor

**Resource Requirements:**

- A system with Finisar Bus Analyzer software installed
- Finisar Bus Doctor SATA Protocol Analyzer

Last Modification: 01/03/2008

### **ASR-01: COMINIT Response Interval**

- Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- In the Finisar Bus Doctor window, select “File” menu -> “New Analyzer Window...”, “Select Analyzer” window will be prompted. Choose the appropriate Bus Doctor, and then click “Use Selected Analyzer” button.
  - Click “Config” button on the tool bar, “Analyzer Configuration” window will be prompted.
  - Under “Buffer Size” tab, it is recommended to set “Size of Each Segment” to “32 Meg Events”.
  - Under “State/Timing” tab
    - Select “State Mode”
    - Check “Frames”, “Primitives”, “Errors”, and “OOB Signals” for both “Host -> Device” and “Device -> Host”
    - Set “Speed” to “3.0 Gb/s” or “1.5 Gb/s” properly
  - Under “Trigger/Stop” tab,
    - Select “Stop After Trigger”
    - Set “Trigger On” to “OOB Signaling”, and check “H->D COMRESET” ONLY
    - Set “Pre/Post Trigger Capturing” to “Pre Trigger = 10%” and “Post Trigger = 90%”
  - Click “OK” to close the “Analyzer Configuration” window.
- Click the “Run” button on the tool bar in the Bus Doctor CE application
- Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, then, click OK!”
- In the Finisar Bus Doctor window, click the “Stop” button on the tool bar. Allow the trace to upload to the Host System. Save the trace.
- Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- In the trace displayed in the Finisar Bus Doctor window, identify the “Store #” for the first COMINIT signal sent from Device under Test.
- Next identify the “Store #” for the previous COMRESET sent from the Host System before the first COMINIT from the Device, then right-click to select “Set Timestamp Origin”. The “Timestamp” in the selected “Store #” will change to “0 ns.”
- The “Timestamp” on the “Store #” of first COMINIT signal sent from Device under Test will display the time from the beginning of the COMRESET from the host to the beginning of the COMINIT from the device.
- Subtract 0.000988 msec (a nominal COMINIT time) from the value in item j.
- Repeat item h to k for all five intervals.
- If none of the time calculated in the above steps will be larger than 10 ms, this case will be passed.
- Report the worst-case result (the largest) in the result summary sheet.

**ASR-02: COMINIT OOB Interval**

- a. Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- b. In the Finisar Bus Doctor window, select “File” menu -> “New Analyzer Window...”, “Select Analyzer” window will be prompted. Choose the appropriate Bus Doctor, and then click “Use Selected Analyzer” button.
  - Click “Config” button on the tool bar, “Analyzer Configuration” window will be prompted.
  - Under “Buffer Size” tab, it is recommended to set “Size of Each Segment” to “32 Meg Events”.
  - Under “State/Timing” tab
    - Select “State Mode”
    - Check “Frames”, “Primitives”, “Errors”, and “OOB Signals” for both “Host -> Device” and “Device -> Host”
    - Set “Speed” to “3.0 Gb/s” or “1.5 Gb/s” properly
  - kUnder “Trigger/Stop” tab,
    - Select “Stop After Trigger”
    - Set “Trigger On” to “OOB Signaling”, and check “D->H COMINIT” ONLY
    - Set “Pre/Post Trigger Capturing” to “Pre Trigger = 10%” and “Post Trigger = 90%”
  - Click “OK” to close the “Analyzer Configuration” window.
- c. Click the “Run” button on the tool bar in the Bus Doctor CE application
- d. Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- e. Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, then, click OK!”
- f. In the Finisar Bus Doctor window, click the “Stop” button on the tool bar. Allow the trace to upload to the Host System. Save the trace.
- g. Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- h. In the trace displayed in the Finisar Bus Doctor window, identify the “Store #” for the first through tenth COMINIT signals sent from Device under Test.
- i. Select the first “Store #” of two consecutive COMINIT, then right-click to select “Set Timestamp Origin”. The “Timestamp” in the selected “Store #” will change to “0 ns.”
- j. The “Timestamp” on the second “Store #” of two consecutive COMINIT will display the time from the beginning of the first COMINIT to the beginning of the second COMINIT from Device under Test.
- k. Add 0.000988 msec (a nominal COMINIT time) to the value in item j.
- l. If none of the time calculated in the above steps will be faster (smaller) than 10 ms, this case will be passed.
- m. Report the worst-case result (the smallest) in the result summary sheet.

**IPM-01: Partial State exit latency (Host Initiated)**

**IPM-09: Partial State exit latency (Device Initiated)**

- a. Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- b. In the Finisar Bus Doctor window, select “File” menu -> “New Analyzer Window...”, “Select Analyzer” window will be prompted. Choose the appropriate Bus Doctor, and then click “Use Selected Analyzer” button.
  - Click “Config” button on the tool bar, “Analyzer Configuration” window will be prompted.
  - Under “Buffer Size” tab, it is recommended to set “Size of Each Segment” to “64 Meg Events”.
  - Under “State/Timing” tab
    - Select “State Mode”
    - Check “Frames”, “Primitives”, “Errors”, and “OOB Signals” for both “Host -> Device” and “Device -> Host”
    - Set “Speed” to “3.0 Gb/s” or “1.5 Gb/s” properly
  - Under “Trigger/Stop” tab,
    - Select “Stop After Trigger”
    - Set “Trigger On” to “Primitive”, and select “PMREQ\_P” from “Any Primitive” drop down list
    - Select “H -> D” (IPM-01)/“D -> H” (IPM-09) under the “Direction”
    - Set “Pre/Post Trigger Capturing” to “Pre Trigger = 10%” and “Post Trigger = 90%”
  - Click “OK” to close the “Analyzer Configuration” window.
- c. Click the “Run” button on the tool bar in the Bus Doctor CE application
- d. Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- e. Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, and then click OK!”
- f. In the Finisar Bus Doctor window, click the “Stop” button. Allow the trace to upload to the Host System. Save the trace.
- g. Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- h. In the trace displayed in the Finisar Bus Doctor window, under “Command Listing” window, first identify the “COMWAKE” signal transmitted by the Host system after PMREQ\_P.
- i. And then right-click on “COMWAKE OOB” to select “Set Timestamp Origin”. Next identify “COMWAKE” signal transmitted by the DUT after the previous COMWAKE. The corresponding time displayed in “Timestamp” field is the measured time of waking up.
- j. Subtract 0.549 usec (a nominal COMWAKE time) from the measured value in item i.
- k. Repeat item h to j for all ten intervals.
- l. If none of the time calculated in the above steps will be larger than 10 us, this case will be passed.
- m. Report the worst-case result (the largest) in the result summary sheet.

**IPM-02: Slumber State exit latency (Host Initiated)**

**IPM-10: Slumber State exit latency (Device Initiated)**

- a. Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- b. In the Finisar Bus Doctor window, select “File” menu -> “New Analyzer Window...”, “Select Analyzer” window will be prompted. Choose the appropriate Bus Doctor, and then click “Use Selected Analyzer” button.
  - Click “Config” button on the tool bar, “Analyzer Configuration” window will be prompted.
  - Under “Buffer Size” tab, it is recommended to set “Size of Each Segment” to “64 Meg Events”.
  - Under “State/Timing” tab
    - Select “State Mode”
    - Check “Frames”, “Primitives”, “Errors”, and “OOB Signals” for both “Host -> Device” and “Device -> Host”
    - Set “Speed” to “3.0 Gb/s” or “1.5 Gb/s” properly
  - Under “Trigger/Stop” tab,
    - Select “Stop After Trigger”
    - Set “Trigger On” to “Primitive”, and select “PMREQ\_S” from “Any Primitive” drop down list
    - Select “H -> D” (IPM-02)/“D -> H” (IPM-10) under the “Direction”
    - Set “Pre/Post Trigger Capturing” to “Pre Trigger = 10%” and “Post Trigger = 90%”
  - Click “OK” to close the “Analyzer Configuration” window.
- c. Click the “Run” button on the tool bar in the Bus Doctor CE application
- d. Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- e. Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, and then click OK!”
- f. In the Finisar Bus Doctor window, click the “Stop” button. Allow the trace to upload to the Host System. Save the trace.
- g. Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- h. In the trace displayed in the Finisar Bus Doctor window, under “Command Listing” window, first identify the “COMWAKE” signal transmitted by the Host system after PMREQ\_S.
- i. And then right-click on “COMWAKE OOB” to select “Set Timestamp Origin”. Next identify “COMWAKE” signal transmitted by the DUT after the previous COMWAKE. The corresponding time displayed in “Timestamp” field is the measured time of waking up.
- j. Subtract 0.549 usec (a nominal COMWAKE time) from the measured value in item i.
- k. Repeat item h to j for all ten intervals.
- l. If none of the time calculated in the above steps will be larger than 10 ms, this case will be passed.
- m. Report the worst-case result (the largest) in the result summary sheet.

**IPM-05: Device response to PMREQ\_P**

**IPM-06: Device response to PMREQ\_S**

- a. Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- b. In the Finisar Bus Doctor window, select “File” menu -> “New Analyzer Window...”, “Select Analyzer” window will be prompted. Choose the appropriate Bus Doctor, and then click “Use Selected Analyzer” button.
  - Click “Config” button on the tool bar, “Analyzer Configuration” window will be prompted.
  - Under “Buffer Size” tab, it is recommended to set “Size of Each Segment” to “32 Meg Events”.
  - Under “State/Timing” tab
    - Select “State Mode”
    - Check “Frames”, “Primitives”, “Errors”, and “OOB Signals” for both “Host -> Device” and “Device -> Host”
    - Set “Speed” to “3.0 Gb/s” or “1.5 Gb/s” properly
  - Under “Trigger/Stop” tab,
    - Select “Stop After Trigger”
    - Set “Trigger On” to “Primitive”, and select “PMREQ\_P”(IPM-05)/“PMREQ\_S”(IPM-06) from “Any Primitive” drop down list
    - Select “H -> D” under the “Direction”
    - Set “Pre/Post Trigger Capturing” to “Pre Trigger = 10%” and “Post Trigger = 90%”
  - Click “OK” to close the “Analyzer Configuration” window.
- c. Click the “Run” button on the tool bar in the Bus Doctor CE application
- d. Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- e. Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, and then click OK!”
- f. In the Finisar Bus Doctor window, click the “Stop Recording” button. Allow the trace to upload to the Host System. Save the trace.
- g. Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- h. In the trace displayed in the Finisar Bus Doctor window, identify the first “PMREQ\_P” (IPM-05)/“PMREQ\_S” (IPM-06) which is triggered on. Next identify whether PMNAK or PMACK primitive is transmitted by Device under Test in response to the “PMREQ\_P” (IPM-05)/“PMREQ\_S” (IPM-06).
- i. If PMNAK or at least 4 PMACK primitives are transmitted in each of ten loops, the test will be “passed”.

## **Appendix F: Monitoring Procedure for SerialTek BusXpert**

**Purpose:** Describe the monitoring procedure for SerialTek BusXpert

### **Resource Requirements:**

- A system with SerialTek BusXpert software installed
- SerialTek BusXpert Protocol Analyzer

Last Modification: 05/30/2009

### **ASR-01: COMINIT Response Interval**

- Wait for DriveMaster prompt a message box "Please start capture from Bus-Analyzer or Scope, and then click OK!"
- In the SerialTek BusXpert "Select an Analyzer" window, choose the appropriate Analyzer, and then click "OK" button.
  - Click "Analyzer" button to launch "Analyzer Setting" page,
    - Set "Stop Mode" to "Trigger"
    - Set "Trigger Position" to 10%
    - Set "Buffer Size" to 10%
    - Set "Rate" to "6.0 Gbps" or "3.0 Gbps" or "1.5 Gbps" properly
  - Click "Filter" button to launch "Filter Setting" page,
    - Check "Host/Device" for the field of "Specify options by:"
    - Under "All links" column
      - Check "Capture this link"
      - Check "OOB events"
      - Check "Primitives"
  - Click "Trigger" button to launch "Trigger" page,
    - Drag and drop OOB from left side list into "Wait for 1 of those events" field in "State1" window on "Sequencer1" tab
    - Select "Host->Device" from "Any direction" dropdown list
    - Check "COMINIT/COMRESET" ONLY
- Click the "Start Capture" button in the BusXpert Application
- Click "OK" in DriveMaster for message box in item a to let DriveMaster continue
- Wait for DriveMaster prompt a message box "Please stop capture from Bus-Analyzer or Scope, then, click OK!"
- In the SerialTek BusXpert window, click the "Stop Capture" button. Allow the trace to upload to the Host System. Save the trace.
- Click "OK" in the DriveMaster for the message in item f to let DriveMaster continue
- In the "Spreadsheet View" displayed in the SerialTek BusXpert window, identify the first COMINIT signal sent from Device under Test, then right-click to select "Set O"
- Next identify the previous COMRESET sent from the Host System before the first COMINIT from the Device, then right-click to select "Set X".
- On the status bar which is at the bottom of the window, "Time X->O" field will display the time from the beginning of the COMRESET from the host to the beginning of the COMINIT from the device.
- Subtract 0.00230 msec (a nominal COMINIT time) from the value in item j.
- Repeat item h to k for all five intervals.
- If none of the time calculated in the above steps will be larger than 10 ms, this case will be passed.
- Report the worst-case result (the largest) in the result summary sheet.

**ASR-02: COMINIT OOB Interval**

- a. Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- b. In the SerialTek BusXpert “Select an Analyzer” window, choose the appropriate Analyzer, and then click “OK” button.
  - Click “Analyzer” button to launch “Analyzer Setting” page,
    - Set “Stop Mode” to “Trigger”
    - Set “Trigger Position” to 10%
    - Set “Buffer Size” to 10%
    - Set “Rate” to “6.0 Gbps” or “3.0 Gbps” or “1.5 Gbps” properly
  - Click “Filter” button to launch “Filter Setting” page,
    - Check “Host/Device” for the field of “Specify options by:”
    - Under “All links” column
      - Check “Capture this link”
      - Check “OOB events”
      - Check “Primitives”
  - Click “Trigger” button to launch “Trigger” page,
    - Drag and drop OOB from left side list into “Wait for 1 of those events” field in “State1” window on “Sequencer1” tab
    - Select “Device->Host” from “Any direction” dropdown list
    - Check “COMINIT/COMRESET” ONLY
- c. Click the “Start Capture” button in the BusXpert Application
- d. Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- e. Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, then, click OK!”
- f. In the SerialTek BusXpert window, click the “Stop Capture” button. Allow the trace to upload to the Host System. Save the trace.
- g. Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- h. In the “Spreadsheet View” displayed in the SerialTek BusXpert window, identify the first through tenth COMINIT signals sent from Device under Test.
- i. Select the first of two consecutive COMINIT, then right-click to select “Set X”. Select the second of two consecutive COMINIT, then right-click to select “Set O”.
- j. On the status bar which is at the bottom of the window, “Time X->O” field will display the time from the beginning of the first COMINIT to the beginning of the second COMINIT from Device under Test.
- k. Add 0.00230 msec (a nominal COMINIT time) to the value in item j.
- l. If none of the time calculated in the above steps will be faster (smaller) than 10 ms, this case will be passed.
- m. Report the worst-case result (the smallest) in the result summary sheet.

**IPM-01: Partial State exit latency (Host Initiated)**

**IPM-09: Partial State exit latency (Device Initiated)**

- a. Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- b. In the SerialTek BusXpert “Select an Analyzer” window, choose the appropriate Analyzer, and then click “OK” button.
  - Click “Analyzer” button to launch “Analyzer Setting” page,
    - Set “Stop Mode” to “Trigger”
    - Set “Trigger Position” to 10%
    - Set “Buffer Size” to 10%
    - Set “Rate” to “6.0 Gbps” or “3.0 Gbps” or “1.5 Gbps” properly
  - Click “Filter” button to launch “Filter Setting” page,
    - Check “Host/Device” for the field of “Specify options by:”
    - Under “All links” column
      - Check “Capture this link”
      - Check “OOB events”
      - Check “Primitives”
  - Click “Trigger” button to launch “Trigger” page,
    - Expand “Primitive” folder, drag and drop “PMREQ\_P” from left side list into “Wait for 1 of those events” field in “State1” window on “Sequencer1” tab
    - Select “Host -> Device” (IPM-01)/“Device -> Host” (IPM-09) from “Any direction” dropdown list
- c. Click the “Start Capture” button in the BusXpert Application
- d. Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- e. Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, and then click OK!”
- f. In the SerialTek BusXpert window, click the “Stop Capture” button. Allow the trace to upload to the Host System. Save the trace.
- g. Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- h. In the “Spreadsheet View” displayed in the SerialTek BusXpert window, first identify the “COMWAKE” signal transmitted by the Host system after PMREQ\_P, then right-click to select “Set X”.
- i. Next identify “COMWAKE” signal transmitted by the DUT after the previous COMWAKE, then right-click to select “Set O”. On the status bar which is at the bottom of the window, “Time X->O” field will display the measured time of waking up.
- j. Subtract 1.21 usec (a nominal COMWAKE time) from the measured value in item i.
- k. Repeat item h to j for all ten intervals.
- l. If none of the time calculated in the above steps will be larger than 10 us, this case will be passed.
- m. Report the worst-case result (the largest) in the result summary sheet.

**IPM-02: Slumber State exit latency (Host Initiated)**

**IPM-10: Slumber State exit latency (Device Initiated)**

- a. Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- b. In the SerialTek BusXpert “Select an Analyzer” window, choose the appropriate Analyzer, and then click “OK” button.
  - Click “Analyzer” button to launch “Analyzer Setting” page,
    - Set “Stop Mode” to “Trigger”
    - Set “Trigger Position” to 10%
    - Set “Buffer Size” to 10%
    - Set “Rate” to “6.0 Gbps” or “3.0 Gbps” or “1.5 Gbps” properly
  - Click “Filter” button to launch “Filter Setting” page,
    - Check “Host/Device” for the field of “Specify options by:”
    - Under “All links” column
      - Check “Capture this link”
      - Check “OOB events”
      - Check “Primitives”
  - Click “Trigger” button to launch “Trigger” page,
    - Expand “Primitive” folder, drag and drop “PMREQ\_S” from left side list into “Wait for 1 of those events” field in “State1” window on “Sequencer1” tab
    - Select “Host -> Device” (IPM-02)/“Device -> Host” (IPM-10) from “Any direction” dropdown list
- c. Click the “Start Capture” button in the BusXpert Application
- d. Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- e. Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, and then click OK!”
- f. In the SerialTek BusXpert window, click the “Stop Capture” button. Allow the trace to upload to the Host System. Save the trace.
- g. Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- h. In the “Spreadsheet View” displayed in the SerialTek BusXpert window, first identify the “COMWAKE” signal transmitted by the Host system after PMREQ\_S, then right-click to select “Set X”.
- i. Next identify “COMWAKE” signal transmitted by the DUT after the previous COMWAKE, then right-click to select “Set O”. On the status bar which is at the bottom of the window, “Time X->O” field will display the measured time of waking up.
- j. Subtract 1.21 usec (a nominal COMWAKE time) from the measured value in item i.
- k. Repeat item h to j for all ten intervals.
- l. If none of the time calculated in the above steps will be larger than 10 ms, this case will be passed.
- m. Report the worst-case result (the largest) in the result summary sheet.

**IPM-05: Device response to PMREQ\_P**

**IPM-06: Device response to PMREQ\_S**

- a. Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- b. In the SerialTek BusXpert “Select an Analyzer” window, choose the appropriate Analyzer, and then click “OK” button.
  - Click “Analyzer” button to launch “Analyzer Setting” page,
    - Set “Stop Mode” to “Trigger”
    - Set “Trigger Position” to 10%
    - Set “Buffer Size” to 10%
    - Set “Rate” to “6.0 Gbps” or “3.0 Gbps” or “1.5 Gbps” properly
  - Click “Filter” button to launch “Filter Setting” page,
    - Check “Host/Device” for the field of “Specify options by:”
    - Under “All links” column
      - Check “Capture this link”
      - Check “OOB events”
      - Check “Primitives”
  - Click “Trigger” button to launch “Trigger” page,
    - Expand “Primitive” folder, drag and drop “PMREQ\_P”(IPM-05)/“PMREQ\_S”(IPM-06) from left side list into “Wait for 1 of those events” field in “State1” window on “Sequencer1” tab
    - Select “Host -> Device” from “Any direction” dropdown list
- c. Click the “Start Capture” button in the BusXpert Application
- d. Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- e. Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, and then click OK!”
- f. In the SerialTek BusXpert window, click the “Stop Capture” button. Allow the trace to upload to the Host System. Save the trace.
- g. Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- h. In the “Spreadsheet View” displayed in the SerialTek BusXpert window, identify the first “PMREQ\_P” (IPM-05)/“PMREQ\_S” (IPM-06) which is triggered on. Next identify whether PMNAK or PMACK primitive is transmitted by Device under Test in response to the “PMREQ\_P” (IPM-05)/“PMREQ\_S” (IPM-06).
- i. If PMNAK or at least 4 PMACK primitives are transmitted in each of ten loops, the test will be “passed”.

## **Appendix G: Monitoring Procedure for Finisar Xgig**

**Purpose:** Describe the monitoring procedure for Finisar Xgig

### **Resource Requirements:**

- A system with Finisar Xgig software installed
- Finisar Xgig SAS/SATA Protocol Analyzer

Last Modification: 07/02/2009

### **ASR-01: COMINIT Response Interval**

- Wait for DriveMaster prompt a message box "Please start capture from Bus-Analyzer or Scope, and then click OK!"
- Get Xgig setup properly, click "Configure Devices (ports)" button on the toolbar
  - In "Size Options" section
    - Set "Number of Segments" to 1
    - Set "Trace Size (MB)" to 128
    - Set "Post Trigger Fill (%)" to 90
  - In "Signal Regeneration and Link Speed" section
    - Set "Speed" to "6.0 Gb/s", "3.0 Gb/s" or "1.5 Gb/s" properly
  - Select "Stop capture after trigger" from the right bottom drop-down list
  - In "Capture" tab, select "Capture ONLY".
  - Select "SAS Port (1,1,1)" from "My Domain" section
  - Select "Tigger" tab,
    - Select "On..." in "Tigger the ports in the domain"
    - Open "Finisar Library" folder from "Available Templates"
    - Open "OOB&Speed Negotiation"\ "OOB signals" folder
    - Drag and drop "COMINIT-COMRESET" to the window in "Tigger" tab
  - In "SAS/SATA" tab,
    - In "Out of Band & Speed Negotiation" section, select "Capture all OOB & Speed Negotiation"
    - In "Always exclude the following checked primitives:" section, check
      - SATA\_HOLD, SATA\_HOLDA and SATA\_R\_IP
      - ALIGNs and NOTIFYs that are outside OOB and speed negotiation
      - SAS Scrambled Idle Dwords and SATA\_SYNC
    - In "When random Dwords are captured...", select "Compress to a count of Dwords"
- Click the "Start Capture" button on the tool bar in the Xgig application
- Click "OK" in DriveMaster for message box in item a to let DriveMaster continue
- Wait for DriveMaster prompt a message box "Please stop capture from Bus-Analyzer or Scope, then, click OK!"
- In the Finisar Xgig Trace Control window, click the "Stop" button on the tool bar. Allow the trace to upload to the Host System. Save the trace.
- Click "OK" in the DriveMaster for the message in item f to let DriveMaster continue
- In the Finisar Xgig TraceView window, select "Tools\Delta Calculator ...". In Delta Calculator window, select "Delta Stop Time:" field, then identify the first COMINIT signal sent from Device under Test in the trace window, the corresponding time stamp should be shown in "Delta Stop Time" field
- In Delta Calculator window, select "Delta Start Time:" field, then identify the previous COMRESET sent from the Host System before the first COMINIT from the Device, the corresponding time stamp should be shown in "Delta Start Time" field

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- j. The “Delta Time:” shown at the top of Delta Calculator window will be the time from the beginning of the COMRESET from the host to the beginning of the COMINIT from the device.
- k. Subtract 0.00230 msec (a nominal COMINIT time) from the value in item j.
- l. Repeat item h to k for all five intervals.
- m. If none of the time calculated in the above steps will be larger than 10 ms, this case will be passed.
- n. Report the worst-case result (the largest) in the result summary sheet.

**ASR-02: COMINIT OOB Interval**

- a. Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- b. Get Xgig setup properly, click “Configure Devices (ports)” button on the toolbar
  - In “Size Options” section
    - Set “Number of Segments” to 1
    - Set “Trace Size (MB)” to 128
    - Set “Post Trigger Fill (%)” to 90
  - In “Signal Regeneration and Link Speed” section
    - Set “Speed” to “6.0 Gb/s” ,“3.0 Gb/s” or “1.5 Gb/s” properly
  - Select “Stop capture after trigger” from the right bottom drop-down list
  - In “Capture” tab, select “Capture ONLY”.
  - Select “SAS Port (1,1,2) from “My Domain” section
  - Select “Tigger” tab,
    - Select “On...” in “Tigger the ports in the domain”
    - Open “Finisar Library” folder from “Available Templates”
    - Open “OOB&Speed Negotiation”\“OOB signals” folder
    - Drag and drop “COMINIT-COMRESET” to the window in “Tigger” tab
  - In “SAS/SATA” tab,
    - In “Out of Band & Speed Negotiation” section, select “Capture all OOB & Speed Negotiation”
    - In “Always exclude the following checked primitives:” section, check
      - SATA\_HOLD, SATA\_HOLDA and SATA\_R\_IP
      - ALIGNs and NOTIFYs that are outside OOB and speed negotiation
      - SAS Scrambled Idle Dwords and SATA\_SYNC
    - In “When random Dwords are captured...”, select “Compress to a count of Dwords”
- c. Click the “Start Capture” button on the tool bar in the Xgig application
- d. Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- e. Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, then, click OK!”
- f. In the Finisar Xgig Trace Control window, click the “Stop” button on the tool bar. Allow the trace to upload to the Host System. Save the trace.
- g. Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- h. In the trace displayed in the Finisar Xgig TraceView window, identify the first through tenth COMINIT signals sent from Device under Test.
- i. In the Finisar Xgig TraceView window, select “Tools\Delta Calculator ...”. In Delta Calculator window, select “Delta Start Time: ” field, then identify the first of two consecutive COMINIT in the trace window, the corresponding time stamp should be shown in “Delta Start Time” field
- j. In Delta Calculator window, select “Delta Stop Time:” field, then identify the second of two consecutive COMINIT in the trace window, the corresponding time stamp should be shown in “Delta Stop Time” field
- k. The “Delta Time:” shown at the top of Delta Calculator window will be the time from the beginning of the first COMINIT to the beginning of the second COMINIT from Device under Test.
- l. Add 0.00230 msec (a nominal COMINIT time) to the value in item k.
- m. If none of the time calculated in the above steps will be faster (smaller) than 10 ms, this case will be passed.
- n. Report the worst-case result (the smallest) in the result summary sheet.

**IPM-01: Partial State exit latency (Host Initiated)**

**IPM-09: Partial State exit latency (Device Initiated)**

- a. Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- b. Get Xgig setup properly, click “Configure Devices (ports)” button on the toolbar
  - In “Size Options” section
    - Set “Number of Segments” to 1
    - Set “Trace Size (MB)” to 256
    - Set “Post Trigger Fill (%)” to 90
  - In “Signal Regeneration and Link Speed” section
    - Set “Speed” to “6.0 Gb/s”, “3.0 Gb/s” or “1.5 Gb/s” properly
  - Select “Stop capture after trigger” from the right bottom drop-down list
  - In “Capture” tab, select “Capture ONLY”.
  - Select “SAS Port (1,1,1)”(IPM-01)/“SAS Port (1,1,2)”(IPM-09) from “My Domain” section
  - Select “Tigger” tab,
    - Select “On...” in “Tigger the ports in the domain”
    - Open “Finisar Library” folder from “Available Templates”
    - Open “Primitives”\“STP-SATA” folder
    - Drag and drop “SATA\_PMREQ\_P” to the window in “Tigger” tab
  - In “SAS/SATA” tab,
    - In “Out of Band & Speed Negotiation” section, select “Capture all OOB & Speed Negotiation”
    - In “Always exclude the following checked primitives:” section, check
      - SATA\_HOLD, SATA\_HOLDA and SATA\_R\_IP
      - ALIGNs and NOTIFYs that are outside OOB and speed negotiation
      - SAS Scrambled Idle Dwords and SATA\_SYNC
    - In “When random Dwords are captured...”, select “Compress to a count of Dwords”
- c. Click the “Start Capture” button on the tool bar in the Xgig application
- d. Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- e. Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, and then click OK!”
- f. In the Finisar Xgig Trace Control window, click the “Stop” button on the tool bar. Allow the trace to upload to the Host System. Save the trace.
- g. Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- h. In the Finisar Xgig TraceView window, select “Tools\Delta Calculator ...”. In Delta Calculator window, select “Delta Start Time:” field, then identify COMWAKE signal transmitted by the Host system after PMREQ\_P in the trace window, the corresponding time stamp should be shown in “Delta Start Time” field
- i. In Delta Calculator window, select “Delta Stop Time:” field, then identify COMWAKE signal transmitted by the DUT after the previous COMWAKE in the trace window, the corresponding time stamp should be shown in “Delta Stop Time” field
- j. The “Delta Time:” shown at the top of Delta Calculator window will be the measured time of waking up.
- k. Subtract 1.21 usec (a nominal COMWAKE time) from the measured value in item j.
- l. Repeat item h to k for all ten intervals.
- m. If none of the time calculated in the above steps will be larger than 10 us, this case will be passed.
- n. Report the worst-case result (the largest) in the result summary sheet.

**IPM-02: Slumber State exit latency (Host Initiated)**

**IPM-10: Slumber State exit latency (Device Initiated)**

- a. Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- b. Get Xgig setup properly, click “Configure Devices (ports)” button on the toolbar
  - In “Size Options” section
    - Set “Number of Segments” to 1
    - Set “Trace Size (MB)” to 256
    - Set “Post Trigger Fill (%)” to 90
  - In “Signal Regeneration and Link Speed” section
    - Set “Speed” to “6.0 Gb/s”, “3.0 Gb/s” or “1.5 Gb/s” properly
  - Select “Stop capture after trigger” from the right bottom drop-down list
  - In “Capture” tab, select “Capture ONLY”.
  - Select “SAS Port (1,1,1)”(IPM-02)/“SAS Port (1,1,2)”(IPM-10) from “My Domain” section
  - Select “Tigger” tab,
    - Select “On...” in “Tigger the ports in the domain”
    - Open “Finisar Library” folder from “Available Templates”
    - Open “Primitives”\“STP-SATA” folder
    - Drag and drop “SATA\_PMREQ\_S” to the window in “Tigger” tab
  - In “SAS/SATA” tab,
    - In “Out of Band & Speed Negotiation” section, select “Capture all OOB & Speed Negotiation”
    - In “Always exclude the following checked primitives:” section, check
      - SATA\_HOLD, SATA\_HOLDA and SATA\_R\_IP
      - ALIGNs and NOTIFYs that are outside OOB and speed negotiation
      - SAS Scrambled Idle Dwords and SATA\_SYNC
    - In “When random Dwords are captured...”, select “Compress to a count of Dwords”
- c. Click the “Start Capture” button on the tool bar in the Xgig application
- d. Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- e. Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, and then click OK!”
- f. In the Finisar Xgig Trace Control window, click the “Stop” button on the tool bar. Allow the trace to upload to the Host System. Save the trace.
- g. Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- h. In the Finisar Xgig TraceView window, select “Tools\Delta Calculator ...”. In Delta Calculator window, select “Delta Start Time:” field, then identify COMWAKE signal transmitted by the Host system after PMREQ\_S in the trace window, the corresponding time stamp should be shown in “Delta Start Time” field
- i. In Delta Calculator window, select “Delta Stop Time:” field, then identify COMWAKE signal transmitted by the DUT after the previous COMWAKE in the trace window, the corresponding time stamp should be shown in “Delta Stop Time” field
- j. The “Delta Time:” shown at the top of Delta Calculator window will be the measured time of waking up.
- k. Subtract 1.21 usec (a nominal COMWAKE time) from the measured value in item j.
- l. Repeat item h to k for all ten intervals.
- m. If none of the time calculated in the above steps will be larger than 10 us, this case will be passed.
- n. Report the worst-case result (the largest) in the result summary sheet.

**IPM-05: Device response to PMREQ\_P**

**IPM-06: Device response to PMREQ\_S**

- a. Wait for DriveMaster prompt a message box “Please start capture from Bus-Analyzer or Scope, and then click OK!”
- b. Get Xgig setup properly, click “Configure Devices (ports)” button on the toolbar
  - In “Size Options” section
    - Set “Number of Segments” to 1
    - Set “Trace Size (MB)” to 256
    - Set “Post Trigger Fill (%)” to 90
  - In “Signal Regeneration and Link Speed” section
    - Set “Speed” to “6.0 Gb/s” ,“3.0 Gb/s” or “1.5 Gb/s” properly
  - Select “Stop capture after trigger” from the right bottom drop-down list
  - In “Capture” tab, select “Capture ONLY”.
  - Select “SAS Port (1,1,1)” from “My Domain” section
  - Select “Tigger” tab,
    - Select “On...” in “Tigger the ports in the domain”
    - Open “Finisar Library” folder from “Available Templates”
    - Open “Primitives”\“STP-SATA” folder
    - Drag and drop “SATA\_PMREQ\_P”(IPM-05)/“SATA\_PMREQ\_S”(IPM-06) to the window in “Tigger” tab
  - In “SAS/SATA” tab,
    - In “Out of Band & Speed Negotiation” section, select “Capture all OOB & Speed Negotiation”
    - In “Always exclude the following checked primitives:” section, check
      - SATA\_HOLD, SATA\_HOLD\_A and SATA\_R\_IP
      - ALIGNs and NOTIFYs that are outside OOB and speed negotiation
      - SAS Scrambled Idle Dwords and SATA\_SYNC
    - In “When random Dwords are captured...”, select “Compress to a count of Dwords”
- c. Click the “Start Capture” button on the tool bar in the Xgig application
- d. Click “OK” in DriveMaster for message box in item a to let DriveMaster continue
- e. Wait for DriveMaster prompt a message box “Please stop capture from Bus-Analyzer or Scope, and then click OK!”
- f. In the Finisar Xgig Trace Control window, click the “Stop” button on the tool bar. Allow the trace to upload to the Host System. Save the trace.
- g. Click “OK” in the DriveMaster for the message in item f to let DriveMaster continue
- h. In the trace displayed in the Finisar Xgig TraceView window, identify the first “PMREQ\_P” (IPM-05)/“PMREQ\_S” (IPM-06) which is triggered on. Next identify whether PMNAK or PMACK primitive is transmitted by Device under Test in response to the “PMREQ\_P” (IPM-05)/“PMREQ\_S” (IPM-06).
- i. If PMNAK or at least 4 PMACK primitives are transmitted in each of ten loops, the test will be “passed”.