



Serial ATA International Organization:
Serial ATA Interoperability Program Revision 1.2
Policy Version 1.01

01-October-2007

SATA-IO Board Members:

Dell Computer Corporation
Hewlett Packard Corporation
Hitachi Global Storage Technologies, Inc.
Intel Corporation
Seagate Technology
Vitesse Semiconductor Corporation
Western Digital Corporation

Serial ATA International Organization: Serial ATA Interoperability Program Unified Test Document is available for download at www.sata-io.org.

DOCUMENT DISCLAIMER

THIS DOCUMENT IS PROVIDED TO YOU "AS IS" WITH NO WARRANTIES WHATSOEVER, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NON-INFRINGEMENT, OR FITNESS FOR ANY PARTICULAR PURPOSE. THE AUTHORS OF THIS DOCUMENT DISCLAIM ALL LIABILITY, INCLUDING LIABILITY FOR INFRINGEMENT OF ANY PROPRIETARY RIGHTS, RELATING TO USE OR IMPLEMENTATION OF INFORMATION IN THIS DOCUMENT. THE AUTHORS DO NOT WARRANT OR REPRESENT THAT SUCH USE WILL NOT INFRINGE SUCH RIGHTS. THE PROVISION OF THIS DOCUMENT TO YOU DOES NOT PROVIDE YOU WITH ANY LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS.

Copyright 2002-2007, Serial ATA International Organization. All rights reserved.

For more information about Serial ATA, refer to the Serial ATA International Organization website at www.sata-io.org.

All product names are trademarks, registered trademarks, or servicemarks of their respective owners.

Serial ATA International Organization contact information:

SATA-IO
3855 SW 153rd Drive
Beaverton, OR 97006
Phone: 1+ 503-619-0505
FAX: 1+ 503-644-6708
E-mail: admin@sata-io.org

Table of Contents

| | | |
|--------|---------------------------------------------------------|----|
| 1. | Overview | 5 |
| 1.1. | References | 5 |
| 1.2. | Definitions, abbreviations, and conventions..... | 5 |
| 1.2.1. | Definitions and abbreviations..... | 5 |
| 1.2.2. | Keywords | 6 |
| 2. | Product Test Requirements | 6 |
| 2.1. | Grandfathering Test Requirements..... | 6 |
| 2.2. | Integrators List Details | 7 |
| 2.3. | Product Classes | 7 |
| 2.4. | Specification Requirement Tests | 8 |
| 2.5. | System Interoperability Tests..... | 8 |
| 3. | Product Test Methods..... | 8 |
| 3.1. | Test Areas | 8 |
| 3.2. | Test Tools and Equipment | 8 |
| 3.2.1. | MOI Approval Process | 9 |
| 3.3. | Serial ATA Interoperability Workshops | 9 |
| 3.4. | Test Lab Enabling | 9 |
| 3.4.1. | Requirements for Test Lab Approval | 10 |
| 3.4.2. | Request for Approval | 11 |
| 3.4.3. | Approval Decision Process | 11 |
| 3.4.4. | Audit Process | 12 |
| 3.4.5. | Appeal Process..... | 12 |
| 3.4.6. | Listing of Approved Test Labs | 13 |
| 4. | Product Certification Process | 13 |
| 4.1. | Request for Certification..... | 13 |
| 4.2. | Submission Acceptance Process..... | 13 |
| 4.2.1. | Appeal Process | 14 |
| 4.2.2. | Waiver Request | 14 |
| 4.2.3. | Re-submissions of Products | 14 |
| 4.3. | Qualification by Similarity | 14 |
| 4.3.1. | Family of Products qualification | 15 |
| 4.3.2. | Single Family Listing | 15 |
| 4.4. | Requirements for Re-test..... | 15 |
| 5. | Building Block Testing & Listing Process | 16 |
| 5.1. | Request for Building Blocks Certification | 17 |
| 5.1.1. | Testing Subset | 17 |
| 5.2. | Submission Acceptance Process..... | 17 |
| 5.2.1. | Re-submissions of Products | 18 |
| 5.3. | Integration of Building Blocks into Final Product | 18 |

1. Overview

This document describes the policies and procedures developed for the Serial ATA Interoperability Program revision 1.2 by the Serial ATA International Organization (SATA-IO). The detailed Serial ATA specification requirements and Integrators List (IL) requirements will not be outlined in this document.

1.1. References

The policies and procedures defined here are constructed in reference to the following other documentation:

- Serial ATA Revision 2.5
- Serial ATA Interoperability Program Unified Test Document revision 1.2

For information regarding future plans of test development and support for the Interoperability Program, please refer to the Serial ATA Interoperability Program Description Document revision 1.2.

1.2. Definitions, abbreviations, and conventions

1.2.1. Definitions and abbreviations

1.2.1.1. ATAPI device

A Serial ATA device (storage peripheral) supporting the PACKET Command feature set.

1.2.1.2. Product

General reference to any SATA product supportable by the Interop Program for testing.

1.2.1.3. Device

A product falling under the Device product class which is a storage peripheral. This includes both hard disk drives and ATAPI devices.

1.2.1.4. Frame Information Structure (FIS)

The user payload of a frame, does not include the SOF, CRC, and EOF delimiters.

1.2.1.5. Frame

A frame is an indivisible unit of information exchanged between a host and device. A frame consists of a SOF primitive, a Frame Information Structure, a CRC calculated over the contents of the FIS, and an EOF primitive.

1.2.1.6. Host

A Host or Host Bus Adapter (HBA) is a product that connects to the host system's expansion bus to provide connectivity for devices. Host Bus Adapters are also often referred to as controller cards or merely controllers

1.2.1.7. SATA-IO Member Test Lab

A SATA-IO member test lab is an entity approved for execution of SATA Interoperability Testing for submissions & considerations of product certifications. See section 3.4 for test lab requirements. There are several types of test labs that may be approved:

- "independent" : test lab where product manufacturers are customers of the test lab, and such test lab does not manufacture SATA products
- "self-certification" or "self-cert" : test lab resourced & maintained by SATA product manufacturer

1.2.2. Keywords

Several keywords are used to differentiate between different levels of requirements and optionality.

1.2.2.1. mandatory

A keyword indicating items to be implemented as defined by this standard.

1.2.2.2. may

A keyword that indicates flexibility of choice with no implied preference.

1.2.2.3. optional

A keyword that describes features that is not required by this standard. However, if any optional feature defined by the standard is implemented, the feature shall be implemented in the way defined by the standard.

1.2.2.4. shall

A keyword indicating a mandatory requirement. Designers and/or test labs are required to implement all such mandatory requirements to ensure interoperability with other standard conformant products.

1.2.2.5. should

A keyword indicating flexibility of choice with a strongly preferred alternative. Equivalent to the phrase “it is recommended”.

2. Product Test Requirements

The Interoperability Program is not intended to define new specification requirements for Serial ATA, but is intended to develop and define the tests used to verify product adherence to the subset of requirements governed by the Interoperability Program requirements and test procedures.

Each Device or Host product submitted will be tested in two areas – specification requirements and system interoperability. Both areas of testing shall be completed for consideration to be included on the SATA-IO Integrators List, see section 3 for details. Each Cable product will be tested per the identified specification requirements.

It is required that all test results for a product are collected through an approved testing medium, including approved SATA-IO member test labs or Interoperability Workshops. Results submitted for a review for a specific product which were gathered outside of an approved medium will not be considered for posting a product on the Integrators List.

Over time, the Interoperability Program documentation may be updated to modify existing test requirements or addition of new test requirements through the advancement of Serial ATA technology and development of the specification. With that in mind, it is expected that through this growth there will be revisions of the Interop documentation at major releases.

2.1. Grandfathering Test Requirements

Due to the dynamic evolutions and wide proliferation of Serial ATA products, there is a need for “Grandfathering” for Interoperability Program. “Grandfathering” allows a SATA product, if so supported, to be validated and listed using any single UTD revision out of the currently available set. In general, each revision of the testing requirements will be effective as long as the corresponding version of the Integrators List is effective. But due to the actual test equipment vendors’ product life support policies, certain product firmware may ONLY have a limited life time, thus up-level firmware can be utilized unless not compatible with existing MOIs. During the release of a new major level of the Interoperability Program document, there will be a review to identify whether some of the previous UTD revisions of the test requirements should be obsolete.

The process for making a UTD revision obsolete would be through the typical documentation process, including proposal developed by Logo group, review by SATA-IO membership, and final ratification by SATA-IO Board of Directors.

“Grandfathering” testing service is optionally support by any Serial ATA Test Lab, this is a business driven decision between each Serial ATA Test Lab and the company is requesting such service. All “Grandfathering” testing costs, including the additional administrative SATA-IO cost for SATA-IO Integrators List, are to be paid by the requesting company.

For the SATA-IO Interoperability Workshop, there will ONLY be testing the latest SATA-IO Interoperability Program Unified Test Document revision testing, and NO “Grandfathering” testing is allow.

2.2. Integrators List Details

The Integrators List is a database on the SATA-IO website which holds the information of products that have passed the Serial ATA Interoperability Program testing. All products that have been approved based on test results are listed on the Integrators List.

The Integrators List will contain both product information and vendor contact information. It also contains information on approved test labs.

The listing of approved products from SATA-IO member companies on the Integrators List comes at no cost above the cost of testing itself. For non-members, there is a \$1000.00 fee (per listing of product/family) to post an approved product listing on the Integrators List.

The Integrators List is posted in a public location on the SATA-IO website.

There is a designation on the Integrators List for which revision of testing requirements each product has been tested against and approved for. It is not to be assumed that if a product is listed for a specific revision, that it is also certified against other newer or later revisions of testing requirements. As an example, if Product A is listed as certified against Revision 1.1 testing requirements it is not implied as certified against Revision 1.0 or 1.2 testing requirements. In order to accommodate listing of multiple revisions for any given product (or family) it is required that the differences (deltas) in testing definition for the revisions are completed for that product. If for instance a single new test was added in a subsequent revision, the minimum requirement for a previously listed product would be to submit results for the newly defined test and not necessarily be re-tested for items which were unchanged.

Any product listed on the Integrators List which may be a result of Qualification by Similarity as defined in section 4.3 may be noted appropriately, without specifically identifying what products are similar.

2.3. Product Classes

Due to the difference in architecture and design of Serial ATA Products, the test requirements will distinguish among the following Product classes:

- Hard disk drive
- ATAPI device
- Host controllers (e.g. chipsets, add-in HBA, embedded)
- Cable/Connector

Each test requirement associated with a specification requirement may have separately defined required behavior(s) for each of the above Product classes. In each case, there may be different methodology for both testing the requirement and determining the pass/fail criteria.

2.4. Specification Requirement Tests

Many of the tests consist of verifying a specific subset of SATA specification requirements that are critical for Product interoperability. These make up the foundation used to determine the expected behavior and intended functionality of Serial ATA technology. Each requirement includes an expected behavior, measurement requirements, and clear pass/fail criteria. The specification requirement testing will be directly tied to the defined test procedures in the Serial ATA Interoperability Program Unified Test Document revision 1.2.

There are three total test areas that a product shall be tested for specification requirement testing, including Phy, Digital, and CabCon specific requirements. A product under test shall be verified across all applicable test procedures as defined for the Interoperability Program. Please refer to Table 1 of the Unified Test Document for details on which tests are required for testing per product type (hard disk, ATAPI, host, cable, etc...).

2.5. System Interoperability Tests

System interoperability testing is a separately defined test scenario designed to verify real-world behavior of a Serial ATA product in a system environment. The platforms used for the system testing are pre-defined with known behaviors. The product under test is inserted into the individual defined platform configurations to verify the defined required behavior at the system level.

The Interoperability testing will also be directly tied to the defined test procedures in the Serial ATA Interoperability Program Unified Test Document revision 1.2.

There is only a single test that a product shall be test against for system interoperability testing. A product under test shall be verified within all platform configurations as defined for the Interoperability Program. The System Interoperability Tests are required for the Device and Host product types. No System Interoperability testing is required for Cable products.

3. Product Test Methods

There are currently two mechanisms for testing products for Serial ATA Integrators List inclusion – approved SATA-IO member test labs and Serial ATA Interoperability Workshops. Final consideration on a product's inclusion in the Integrators List is based on the results from one or more of the two mechanisms.

3.1. Test Areas

There are two major categories of Interoperability Testing – specification requirement tests and system interoperability tests. For the specification requirement testing, there are three total test areas that a product shall be tested for, including Phy, Digital, and CabCon specific requirements. When a submission for IL inclusion is made, the interested party shall supply test results for all four areas of testing (Phy, Digital, CabCon, and System Interoperability), where appropriate depending on the product being tested. Please refer to Table 1 of the Unified Test Document for details on which tests are required for testing per product type (hard disk, ATAPI, host, cable, etc...).

3.2. Test Tools and Equipment

Within the Serial ATA Interoperability Program Unified Test Document, there are defined Methods of Implementation (MOI). These are specific details developed and documented for use of test equipment for the purpose of Interoperability Testing. All test labs interested in being approved for execution of Interoperability Tests shall use existing approved MOIs, or present new draft MOIs for approval by the SATA-IO. In either case, there shall be a complete set of MOIs defined for each test area in which a test lab is requesting to be approved for. Multiple MOIs may be used to gain complete test area coverage.

MOIs shall be in support of the specific MOI classes, as described in the Unified Test Document. The SATA-IO will keep a list of approved MOIs which are available for Interoperability testing. At times, the SATA-IO may revisit the existing list to understand if any procedures or equipment are out-of-date. Upon determination that an existing approved MOI is out-of-date or unusable for the current state of Interoperability Testing, the SATA-IO may elect to remove said MOI from the approved list. This will ensure that test labs are utilizing the most appropriate equipment and procedures for the defined testing.

3.2.1. MOI Approval Process

It is requested that MOIs are submitted to the SATA-IO for review 30 days prior to the next Interop Workshop in this case. The final approval of an MOI in this scenario would complete following the Interop Workshop. Although this is one method for approving an MOI, it is not required that an MOI be test run through an Interop Workshop to be approved.

Either a test tool vendor (i.e. manufacturer of a specific test tool) or a test lab may submit a drafted MOI for approval in use for Interoperability Testing. Contents of the MOI shall follow the requirements as outlined in the Unified Test Document. The SATA-IO will review the MOI for completeness and clarity, along with ensuring appropriate coverage and applicability to the appropriate tests. Once an MOI has been approved, the latest revision will be available on the SATA-IO website.

3.3. Serial ATA Interoperability Workshops

The Interoperability Program testing at an Interoperability Workshop will be hosted by SATA-IO representatives or SATA-IO member test labs. It is not a requirement that all independent test labs participate in a particular Workshop, but it will be required that all approved independent test labs host the SATA-IO test suite(s) on occasion. Selection of staffing for a SATA-IO test suite(s) at a workshop is done by the SATA-IO.

It is recommended that test labs participate in the Interoperability Workshops for the following reasons:

- 1) Demonstrate procedures are correct (i.e. re-approval).
- 2) Be positioned to serve as a back-up site to the SATA-IO test suite(s)

Test labs which are selected to support the SATA-IO test suite(s) will not be required to supply the test equipment needed for the event. The test lab shall supply the SATA-IO with an appropriate list of test equipment needed. The SATA-IO will then work to ensure that equipment is made available at the event in support of the test suite.

Results gathered in the SATA-IO test suite will be supplied to the vendor with the product under test at the Interoperability Workshop.

Testing at an Interoperability Workshop is open only to SATA-IO member companies.

3.4. Test Lab Enabling

An individual SATA-IO member test lab may be approved to execute Serial ATA Interoperability testing. This section outlines the process for how a test lab is approved to execute the testing for the Interoperability Program.

Test labs which have been approved, and their list of testing capabilities, will be made available on the SATA-IO website. The website listing will contain details relevant to which types of products they may accept testing submissions for.

Vendors who are not members of SATA-IO may submit their products to SATA-IO member test labs for verification in the Serial ATA Interoperability Program. There is no difference in the submission process of a non-member product from a member product through an SATA-IO member test lab, although the test lab may ultimately decide whether to accept non-member submissions.

3.4.1. Requirements for Test Lab Approval

Test Labs shall be Contributor level members in good standing of the SATA-IO organization.

There are two methods for approving a test lab to execute the testing for the Interoperability Program. The first method involves participation in an Interoperability Workshop. The second method involves obtaining results to be compared to existing approved test labs not necessarily taken at an Interoperability Workshop.

Any costs associated with either method outlined above for approval of a test lab are the responsibility of the lab in question (e.g. registration at Interop Workshop, or product submission to a separate lab for comparison). The exception to this is the case where a test lab is hosting suites at an IW on behalf of SATA-IO.

It is feasible that a test lab be approved for one or more specification requirement test areas (Phy, Digital, CabCon, System Interoperability) in addition to one or more product classes (hard drive, ATAPI, host, cable/connector). It is not required for a lab to be approved to execute more than one test area or product class, but submissions for product certification shall only be based on results for tests which are approved for certification from that lab.

It is required that the test lab supply the necessary MOI references which they intend to use for the appropriate test areas. This can be done by utilizing already approved MOIs or by creating or using approved release candidate (RC) MOIs.

For each product class for which a test lab is interested in being approved, a minimum of 3 different products for each product class shall be tested. In the case which a lab is interested in being approved to test both hard drives & ATAPI devices, this shall be 3 hard drives and 3 ATAPI devices – 6 total devices. The products to be tested and used for lab approval will be negotiated between the SATA-IO and the test lab. In some cases, the products may be supplied by the SATA-IO or alternatively by the test lab or another source.

If possible, the comparative results will be gathered by SATA-IO in an IW test suite (or other test lab) using common MOIs to the test lab being approved.

Test labs are required to incorporate in to their test process any updates or errata that are made to the MOIs or errata to the Unified Test Requirements document they use within 30-days of final approval (minimum of 60-days from approval of RC).

3.4.1.1. Approval through Interoperability Workshop

The products that are selected by the SATA-IO are among products that are to be tested in the SATA-IO test suite during the Interoperability Workshop. This assures that the results gathered by the test lab under question may be compared to the test results of the same product as tested in the SATA-IO test suite(s) gathered at the same event.

Note that in the Interop Workshop testing environment it is optional for a product vendor to visit a test lab suite. In some cases, it may be possible that a test lab attends an Interop Workshop and is not able to completely test and submit results for the required number of products for its approval. If a test lab is not able to complete testing on the required number of products during the Interop Workshop for their approval, it is the test lab's responsibility to ensure it is able to supply results for the remaining number of products at some point. The test lab may work with the SATA-IO to

identify whether the additional products will be tested at a future Interop Workshop or otherwise as outlined in section 3.4.1.2.

A SATA-IO representative may choose to be present in the test suite under question during testing, only as an observer.

A standard test report containing the necessary results shall be completed for each product that is tested in the suite. The same format test report will be completed by the SATA-IO test suite(s) during to the Interoperability Workshop. It is a requirement that the exact samples used in testing the products are used in both test labs. A comparison of results between the two test suites will be done using the recorded results. Results are reviewed for completeness and consistency as compared to existing approved SATA-IO test suite(s).

It is feasible that a test lab is approved for executing Interoperability Program testing after attending a single Interoperability Workshop.

The test lab under question is only responsible for supplying the test results which were found in its test suite. The SATA-IO test suite(s) will be responsible for delivering comparison test results.

3.4.1.2. Approval through Comparison

A SATA-IO representative may choose to be present in the test suite under question during testing, only as an observer.

The same results reporting and comparison from the Interop Workshop approval process is also used here.

The test lab under question is responsible for supplying the gathered test results which were found in its test lab. The location of where comparative results are gathered is to be negotiated in advance between SATA-IO and the test lab in question.

3.4.2. Request for Approval

Test labs should contact the SATA-IO for Interoperability Program testing approval. Specific information from the test lab may be required at the beginning of the process, such as contact information and areas of testing for which the lab is interested in being approved.

The SATA-IO can assist the test lab in determining which approval process is used for the requested testing. Once the testing has been completed, the test lab will submit the results in the standard templates to the SATA-IO for review.

3.4.3. Approval Decision Process

Upon receipt of completed test results, the SATA-IO will determine whether a test lab is approved for execution of the appropriate Interoperability Program tests. The test lab in question will receive confirmation (by email) to the supplied main contact within 3 days of request receipt. Final disposition on approval for a test lab will happen within 30 day target of request receipt.

To be considered for approval, the number of tests proven consistent shall be no less than 100%. There is an appeal process available for contention of consistency and approval decisions, see section 3.4.5.

Additionally, the test lab under question shall also execute the appropriate contract agreement(s) for executing the Interoperability Testing on behalf of SATA-IO.

At the time that a test lab is approved for testing, their approval will be valid for 15 months.

3.4.4. Audit Process

The purpose of the audit process is to show the continued capability of a test lab to execute the currently approved testing.

An audit of test lab execution for the Interoperability Program may happen approximately every 12 months. The test lab under question will be notified by the SATA-IO when an audit is necessary, this will happen at least 3 months prior to the next Interoperability Workshop. There are three methods in which a test lab may choose to support an audit of its testing procedures.

The first method consists of the following:

- Upon receipt of the audit notice, the test lab will be required to bring a previously tested product (randomly chosen by SATA-IO from last 6 months of certified products from that test lab) to the next Interoperability Workshop. The previously gathered test results will already be available to the SATA-IO. The SATA-IO will test the same physical sample that was previously tested (e.g. serial number) at an upcoming Interop Workshop or other test lab for comparison.
 - Note : if the test lab has not submitted certification for any products for at least 6 months, then the most recent certified product from that lab will be used for audit.
- The test labs are responsible for ensuring the sample availability in the event of an audit request.

The second method consists of the following:

- Upon receipt of the audit notice, the test lab will host at test suite at the next Interoperability Workshop with their own test lab equipment. Several products running through the SATA-IO test suite will also be scheduled into the test suite under question for comparison of results. The results from both test suites -- test suite under question and SATA-IO test suite -- are compared. This method is very similar to the initial approval process.

The third method consists of the following:

- If the test lab agrees, then the SATA-IO may choose to request additional testing details from a test lab based on an individual product submission, including such things as equipment calibration reports or raw data available from equipment used to do testing. Such details may be used in consideration of test lab audit or re-approval.

In the case that a test lab has not been audited within 12 months of its approval date, it is the responsibility of the test lab to work with the SATA-IO to ensure it obtains re-approval before the 15 month deadline occurs. If a test lab has not been re-approved when the 15 month deadline occurs, it may not submit any new product certifications until re-approval occurs. All product certifications submitted by the lab prior to the 15 month deadline will be valid for review by the SATA-IO.

If an audit results in a test lab not being re-approved for test support, the test lab may not submit any new product certifications until re-approval occurs. If the test lab is interested in future support of SATA Interoperability Testing, it may work with the SATA-IO to resolve any remaining issues identified resulting from the audit and eventually be re-approved through the appropriate processes outlined in previous sections.

3.4.5. Appeal Process

A written appeal of a SATA-IO decision will be delivered within 30 days of the disposition. The SATA-IO will respond with its disposition of the appeal within 30 days. Appeals shall include relevant information or data to support their position. This information could have been obtained at a prior Interop Workshop or other testing.

3.4.6. Listing of Approved Test Labs

Upon approval of a test lab to execute Interoperability Program testing, the test lab company will be listed on the SATA-IO website. The website will include information on what items the lab was approved to test (i.e. test areas, product classes, etc...), in addition to relevant contact information.

4. Product Certification Process

This section outlines the process for acceptance or rejection of product submissions to be listed on the Integrators List.

4.1. Request for Certification

Vendors who are interested in having their products Interoperability Program certified shall only use a certified test source.

Possible Certified test sources are:

1. Participating in a SATA-IO Interoperability Workshop
2. Testing through an approved test lab or set of test labs

In all cases, a unique test ID shall be assigned to a product prior to testing being started. In the case that testing is done by an approved test lab, the test lab shall request a unique test ID be assigned to the product in question. Included in the request will be specific information related to the product to be tested to ensure proper tracking of the correct product through testing.

The unique test ID assists in the anonymity of vendors and specific products when results are being reviewed and discussed. The unique test ID will be assigned by the SATA-IO.

Test results and information will be treated confidentially by SATA-IO. Information in the standard submission form is handled as non-confidential. Only at the time that a product has been approved for Integrators List testing will product details actually be visible.

4.2. Submission Acceptance Process

All product submissions shall use current and approved result templates for the revision being submitted against. Upon receipt of a product test results, the SATA-IO will determine whether the submission is accepted. This determination will be based on results completeness, clarity, and other factors. Upon submission receipt, the vendor with the product in question, and the test lab when applicable, will receive confirmation (by email) to the supplied main contact within 3 days of request receipt. Final disposition on certification for a product will happen within 30 day target of request receipt.

In the case where results were gathered by a manufacturer from several test labs, the product submission will not be considered until all relevant and required results are submitted collectively. It is the responsibility of the manufacturer (in conjunction with the test labs) to ensure the results for its product are complete for its submission for certification. In the case where multiple labs were used to gather results, one of the associated labs must be responsible for keeping the test sample for future reference (audits, etc...).

To be considered for certification, the number of tests passed shall be no less than 100%. There is a waiver and appeal process available for contention of results and certification decisions (see sections 4.2.1 and 4.2.2).

Any submission that has been approved by the SATA-IO (i.e. product certification) will be added to the Integrators List. The results and any SATA-IO final resolution comments will be delivered to the vendor of the product submitted. The product sample which was used in the testing of an

accepted product to be listed on the Integrators List will be kept by the test lab which executed the tests for at least 6 months.

A product may also be removed from the IL per request by the manufacturer of that product.

As the Interoperability Program evolves, there will be differentiation among products on the Integrators List outlining which scope of testing (by revision or other denotation) for what it has been approved.

If a submission is rejected, the results report and SATA-IO final resolution comments will be delivered to the vendor. The vendor has the opportunity to appeal the resolution from the SATA-IO within 30 days after the results report is issued. Upon final determination of submission rejection, including waiver considerations, the product test samples will be returned to the vendor.

In the case that testing was completed at a test lab, the lab will also receive the appropriate confirmations and status of certification. In addition, the test lab will keep all results for tested products on record for at least 12 months.

4.2.1. Appeal Process

A written appeal to a SATA-IO decision shall be delivered within 30 days of disposition. The SATA-IO has 30 days to respond to the appeal. Appeals shall include relevant information or data to support their position. This information could have been obtained at a prior Interop Workshop or other testing.

4.2.2. Waiver Request

Waiver Requests are only applicable to test failures for specification requirement testing. There will be no consideration for waivers regarding failures of products in the system interoperability testing. Any request submitted shall contain waiver justification, which may consist of additional test support data from a certified test source or other details associated with relevant impact of the failed tests with regards to interoperability.

All Waiver Requests will be reviewed by the SATA-IO for validity and judgment on the effect of the product's potential incompatibilities with other Serial ATA products.

Any test failures that are not accompanied by a Waiver Request are grounds for finalizing submission rejection.

4.2.3. Re-submissions of Products

If a product submission is rejected due to test failures and sufficient Waiver details are not resolved, the same product family or modified product may be re-submitted a future date assuming the past issues leading to failures are resolved. In these cases, a completely new submission process is required including a new unique test ID being allocated to the product and tests re-executed. For tracking purposes, it may be helpful to ensure the old unique test ID is available.

4.3. Qualification by Similarity

A submission for inclusion on the IL may include reference to an already submitted test report or certified product, and offer its results in lieu of some or all of the results of the required tests. Such a submission shall be made using the standard "Re-testing form" and shall include the written permission of the original submitting company (if different). The submission shall state if it is claimed there are no material digital or electrical changes, or if there are some. Where there are no material SATA changes, as covered under the re-testing requirements section below, no further testing is required. If approved, this additional product, or set of products, would also be added on the Integrators List.

4.3.1. Family of Products qualification

Also, it is possible that a family of products may be approved for IL listing in similar cases to the above, with the requirement that one of the products within the family is approved and that no SATA specific characteristics differences exist among the family of products. Below are descriptions for family considerations based on product type.

For Cables, a Product Family is denoted as a set of cable assembly products consisting of cables which differ only in their length (the connector design, cable construction, and assembly method is identical).

For Devices & Hosts, a Product Family is denoted as a set devices of products which consist of no SATA specific characteristics differences. If one of the products within the family is approved with no SATA specific characteristics differences existing among the family of products, then the entire family is considered to be passing. An example would be a family of hard disk drive products which only differ in their storage capacity, but whose SATA characteristics and capabilities match across the different device part number.

4.3.2. Single Family Listing

Some product vendors may offer a large number of products that are only different by model # or part #, or firmware # to support branding partners (OEMs, company partnerships, etc), multiple marketing brands and to identify the sales / support channel. In order to maintain the usefulness of the Integrators List, if a vendor requests more than 10 products to be listed under a single family qualification they shall be required to support a single family listing on the Integrators list. The following are the requirements of a "Single Family Listing":

- 1) No SATA-impacting material differences can exist between any of the products, except for the presence of SATA optional features.
- 2) No products covered by the Single Family Listing shall have additional SATA optional features other than the original tested product
- 3) Part number definition. The single family part number scheme definition shall be provided and defined in 40 text characters or less
- 4) Model number definition. The single family model number scheme definition shall be provided and defined in 40 text characters or less.
- 5) Firmware revision definition. The single family firmware revision scheme definition shall be provided and defined in 40 text characters or less.
- 6) The vendor agrees to not create any products that require any "Re-testing" (as defined in a Re-Testing section) that would fall under the Single Family Listing definition.

The Integrators List shall appropriately indicate Single Family Listings, and also indicate that some products under the Single Family Listing may not have all optional SATA features enabled.

4.4. Requirements for Re-test

Any product that has non-SATA impacting material changes and has changed the vendor or model #, or firmware revision, shall perform one of the following actions: If the changed product meets all the requirements of an existing "Single Family Listing", no further action is required, if not a Re-Testing form shall be submitted with all the updated information, indicating no material SATA changes have been made.

Any SATA impacting material changes to a product already on or about to be listed on the Integrators List shall submit a completed standard Re-testing form, with a MINIMUM of the following test data from a certified testing source:

| Change Type: | Product Type | Re-Test form and Action required |
|-------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Longer or shorter cable length not already tested in previous family testing | Cable | Run complete cable electrical tests |
| Connector construction (orientation angle, crimp vs solder, physical size) | Cable | Run complete cable electrical & mechanical tests |
| No material SATA change – different vendor or model #, bezel color, capacity. | Device/Host | No re-testing required. |
| Additional source of connector, PCB or support components (AC caps, etc) | Device/Host | No re-testing required IF additional source has the same characteristics and does not cause a PCB layout change. Shall declare same characteristics on Re-test form |
| Connector | Device/Host | Run PHY/TSG/OOB/RSG, RX/TX, System Interop and applicable MDx or MHx tests |
| PCB SATA layout, stack up, geometry or material type | Device/Host | Run PHY/TSG/OOB/RSG, RX/TX, System Interop tests |
| SATA interface silicon | Device/Host | Run PHY/TSG/OOB/RSG, RX/TX, Digital, System Interop tests |
| SATA interface non-silicon parts (AC caps, etc) | Device/Host | Run PHY/TSG/OOB/RSG, RX/TX, System Interop tests |
| Firmware – SATA interface impact (SSC, signal level, edge rate, etc) | Device/Host | Run PHY/TSG/OOB/RSG, RX/TX, System Interop tests |
| Firmware – Link layer (DIPM, etc) | Device/Host | Run Digital, System Interop tests |
| Firmware – New or changed SATA Feature sets (NCQ, etc) | Device/Host | Run Digital, System Interop tests |
| Firmware – Removal of optional SATA features | Device/Host | No re-testing required |
| Firmware – Non SATA impacting (additional removable media vendor support) | Device/Host | No re-testing required |
| External material changes (change in size or shape of exterior contains the mounting or surrounds ? the SATA connector) | Device/Host | Run applicable MDx and MHx tests |

The “Re-testing” form will request the following (minimum) information:

- Declaration of the change
- Justification of why test results from the previous product can be used
- Required test data, as listed above, from a certified test source
- Previous product identification (Vendor, Model, part number, firmware)
- Family Model, part number, firmware number if applicable
- Single family definitions, if applicable

5. Building Block Testing & Listing Process

This section outlines the process for acceptance or rejection of “building block” submissions to be listed separately from complete product submissions (i.e. Integrators List). A “building block” is defined as a silicon solution which may be developed and available outside of a complete end product solution, such as an interface bridge solution on a daughter board. Another example of a “building block” may be IP silicon solutions integrated onto a prototype PCB.

The intent of this process is to allow testing of “product ready” silicon or IP solutions for enabling of final end products. These silicon products are listed in a separate website area from the Integrators List under the “Building Blocks” title. The building blocks website list will be available

to members only. Additionally, the listing of a building block must have some method of tracking which revision of Interoperability Testing requirements with which it was tested.

5.1. Request for Building Blocks Certification

Vendors who are interested in having their silicon solutions certified as SATA building blocks shall use certified test labs. These test labs are intended to be the same as those that verify complete end products as referenced in Section 4.1 above. It is not intended that building block testing is supported at Interoperability Workshops, although this may be supported depending on availability of resources.

In all cases, a unique test ID shall be assigned to a silicon building block prior to testing being started. The submission & test ID assignment process is as specified in Section 4.1.

5.1.1. Testing Subset

Due to the nature of the silicon building blocks, the set of testing requirements for these solutions is a subset of the existing tests available for end products. It is intended that building blocks may be tested against any of the existing defined Interoperability testing areas, specifically PHY/TSG/OOB/RSG, TX/RX, Digital, System Interop, or Mechanical. A building block may choose to be tested in one or more of the areas listed above, but must be tested completely to an individual test area to be listed. As a part of the website "building block" listing, there will be details included as to which test areas were verified and completed successfully for that product.

Along with the test area, vendors shall claim any interest in being listed as supporting applicable optional features (e.g. SSC) which were implemented & supported within the building block solution during the submission.

It is required that approved MOIs are used in the testing of building blocks in the same manner as final end products. There are no special accommodations or changes to the process of developing an approving an MOI for testing of building blocks.

5.2. Submission Acceptance Process

All building block submissions shall use current and approved result templates for the revision being submitted against. Upon receipt of building block test results, the SATA-IO will determine whether the submission is accepted. This determination will be based on results completeness, clarity, and other factors. Upon submission receipt, the vendor with the solution in question, and the test lab when applicable, will receive confirmation (by email) to the supplied main contact within 3 days of request receipt. Final disposition on certification for a building block will happen within 30 day target of request receipt.

In the case where results were gathered by a manufacturer from several test labs, the submission will not be considered until all relevant and required results are submitted collectively. It is the responsibility of the manufacturer (in conjunction with the test labs) to ensure the results for its solution are complete for its submission for certification. In the case where multiple labs were used to gather results, one of the associated labs must be responsible for keeping the test sample for future reference (audits, etc...).

To be considered for certification, the number of tests passed shall be no less than 100%. There is a waiver and appeal process available for contention of results and a certification decision, which is the same as the process identified for complete end products (see Sections 4.2.1 and 4.2.2 above).

Any submission that has been approved by the SATA-IO (i.e. building block certification) will be added to the SATA Building Blocks List. The results and any SATA-IO final resolution comments will be delivered to the vendor of the solution submitted. The sample which was used in the

testing of an accepted building block to be listed on the SATA Building Blocks List will be kept by the test lab which executed the tests for at least 6 months.

A building block solution may also be removed from the Building Block list per request by the manufacturer of that solution.

If a submission is rejected, the results report and SATA-IO final resolution comments will be delivered to the vendor. The vendor has the opportunity to appeal the resolution from the SATA-IO within 30 days after the results report is issued. Upon final determination of submission rejection, including waiver considerations, the test samples will be returned to the vendor.

In the case that testing was completed at a test lab, the lab will also receive the appropriate confirmations and status of certification. In addition, the test lab will keep all results for tested products on record for at least 12 months.

5.2.1. Re-submissions of Products

If a building block submission is rejected due to test failures and sufficient Waiver details are not resolved, the same building block solution or modified solution may be re-submitted a future date assuming the past issues leading to failures are resolved. In these cases, a completely new submission process is required including a new unique test ID being allocated to the solution and tests re-executed. For tracking purposes, it may be helpful to ensure the old unique test ID is available.

5.3. Integration of Building Blocks into Final Product

It is intended that when manufacturers choose to integrate previously certified building blocks into their end product solutions, that the test results gathered on the building block may not be leveraged for final approval for the Integrators List. Any final end product which may integrate an already listed building block is still required to complete all of the appropriate Interoperability Tests as required of other similar products.