

6.1 Scope

Within a SCSI domain, test vendor specified analog margins of I/O drivers that have variable analog driver settings. This is accomplished by validating the entire domain then testing the margins of the analog drivers that make up each driver-receiver connection.

6.2 Assumptions

1. Topology discovery is left to the application client developer.
2. Disk drives of any maximum synchronous SCSI transfer rate will be tested.
3. Disk drives that do not have variable analog driver settings will provide a graceful rejection of any inappropriate message.
4. All adapter and peripheral settings were set to allow the maximum SCSI transfer rate which they are capable.

6.3 Domain Validation

6.3.1 Test Order

Before Margining is executed, the domain should be tested to insure that Margin tests will return valid results.

1. Execute the Basic Integrity Check as shown in Section 5.2.1.1.
2. Execute the Enhanced Integrity Check as shown in Section 5.2.2.1.

6.3.2 Test Conditions

The entire domain will be validated on a target by target basis.

1. Each target will be tested individually in order from lowest SCSI ID to highest SCSI ID.
2. Basic and Enhanced integrity checks will be executed on each target consecutively. This can be worked into a bus scan sequence.
3. If Basic or Enhanced integrity checks fail, a fall-back setting will be set and the test executed again. Fall-back order: Fast-160, Fast-80, Fast-40 (with DT clocking enabled), Fast-40 (with ST clocking enabled), Fast-20, Fast-10.
4. Recommended data patterns for Enhanced integrity check:
 - a) Counting (0001h, 0203h, 0405h,...);
 - b) Alternating ones and zeros (0000h, FFFFh, 0000h, FFFFh,...);
 - c) Cross-talk (5555h, AAAAh, 5555h, AAAAh, ...);
 - d) Shifting bit (0000h, FFFeh, 0000h, FFFDh,...then FFFFh, 0001h, FFFFh, 0002h, ...);

6.3.3 Test Criteria

1. The Basic Integrity Check fails when the first 36 bytes of data returned at the negotiated synchronous speed does not compare to the data received at the asynchronous speed. A CRC error (or parity error for non-DT clocking) or a transaction timeout are considered errors as well.
2. Due to potential changes in the target's condition, it is recommended that the basic integrity check be repeated if a failure is encountered.
3. The Enhanced Integrity Check fails if the data used in the R/W Buffer command fails to compare, has a CRC error (or parity error for non-DT clocking), or encounters a transaction timeout.
4. It is recommended that "Echo" R/W Buffer command be used. If the "Echo" function is not available, the application client may use file R/W commands.

6.3.4 Test Output

1. If no issues were encountered, no user interaction is required.
2. It is recommended that Margining not be executed if any negotiated synchronous setting for any target is set to a fall-back setting.
3. If issues were encountered, actions that may be taken.
 - a) Recommend a course of debug activity based on the application client's determination of the topology.
 - b) Submit an error to the operating system's event notification log.

6.4 Margining

6.4.1 Assumption

The topology has been ascertained by the application client.

6.4.2 Test Order

1. Margin the driver-receiver connections on the segment directly connected to the initiator.
2. Continue to expand the Margin tests to the driver-receiver connections at the far port of the first layer of expanders, i.e., those expanders directly connected to the initiator. See Figure 5 and note the expanders connected to SCSI Bus Segment 0.
3. Continue to expand the Margin tests to the driver-receiver connections at the far port of the second layer (and so on) of expanders, i.e., those expanders directly connected to the first layer of expanders. See Figure 5 and note the expander between SCSI Bus Segment 1 and SCSI Bus Segment 4.

6.4.3 Test Conditions

1. The test flow may be based on all driver-receiver connections within an individual segment (segment), as detailed herein.
2. After a segment has completed Margin tests, all analog drivers, whether delivering data to or from a target or expander, are set to nominal. See Figure 5 and consider Target 5, Initiator, and the near port of all expanders connected to SCSI Bus Segment 0 as set to nominal when Margin tests are complete on Segment 0 driver-receiver connections.
3. A segment has not completed testing until one SCSI target on the far side of all connected expanders has been tested using nominal analog driver settings on the far port of the appropriate expander and the target under test. This will ensure that the signal reaching each driver-receiver connection is legitimate. NOTE: This test will not be valid unless the target under test is capable of achieving the maximum speed of the expander.
4. It is expected that a SCSI Bus Reset will be used to recover from any hang conditions. This should set all initiator, target, and expander analog driver settings to nominal.

6.4.4 Test Combinations

1. Run Margin tests to (from) each target while manipulating only one parameter at a time, on one driver-receiver connection at a time. Execute Margin tests at each register setting of each parameter while holding all other parameters at nominal.
2. For combination testing, the application client may be responsible for too many combinations. Restraint is recommended. For instance, an application client could test the minimum and the maximum of a set of analog driver settings. Manipulation of four parameters would result in sixteen tests. It is possible that maximum and minimum may be user defined to be something other than the full swing the hardware can apply.
3. Run Margin tests to (from) each target while manipulating minimum and maximum settings on all driver-receiver connections along the path to (from) each target.

6.4.5 Test Direction

1. All of the above must be ran through an outbound data path “TO” a particular target and inbound “FROM” a particular target. It is recommended that no simultaneous action of inbound and outbound margining exist.
2. Use of mode pages will allow application client to set multiple analog driver settings within the target.

6.4.6 Test Criteria

1. A test executed to a device that is operating with DT clocking, is determined to have failed when a CRC error is detected, or data miscompares, or a transaction timeout occurs.
2. A test executed to a device that is operating without DT clocking, is determined to have failed when a parity error is detected, or data miscompares, or a transaction timeout occurs.
3. Margin tests are intended to be run on disk drives that support Fast-10 or higher operation.
4. It is recommended that “Echo” R/W Buffer command be used. If the “Echo” function is not available, the application client may use file R/W commands.

6.4.7 Test Output

1. Upon completion of Margin tests, all analog driver settings in the domain will be set to nominal.
2. It is expected that a test report will be issued to the display.
3. If issues were encountered, several actions may be taken.
 - a) Suggest that the user reduce the peripheral’s maximum negotiated SCSI transfer rate. See Section 6.3.2 for recommended SCSI transfer rate reduction.
 - b) Recommend a course of debug activity based on the application client’s determination of the topology.
 - c) Submit an error to the operating system’s event notification log.

6.4.8 Flow Chart





