

6.1 Scope

Within a SCSI domain, the Margin test measures the response of the Initiator/Target connection to changes in driver-receiver connection properties. This is accomplished by characterizing the entire domain then testing the margins of the analog drivers and receivers that make up each driver-receiver connection.

6.2 Assumptions

1. Topology discovery, including the ability of specific devices to support margin testing, is left to the application client.
2. Devices capable of any synchronous SCSI transfer rate are tested.
3. Devices that do not have variable analog driver and receiver settings should reject or ignore the attempt to change the settings (i.e., do not hang the bus).
4. All devices were set (e.g., through firmware) to allow their maximum synchronous SCSI transfer rate.
5. Settings negotiated during Enhanced testing remain in effect during Margin testing.

6.3 Domain Validation

6.3.1 Test Order

The following test order is recommended.

1. Execute Basic tests as shown in Section 5.2.1.1.
2. Execute Enhanced tests as shown in Section 5.2.2.1.

6.3.2 Test Conditions

The entire domain is evaluated, on a target-by-target basis, from the perspective of each initiator in the domain.

1. Each initiator-target connection is tested individually.
2. Basic and Enhanced tests are executed on each target consecutively.
3. If Basic or Enhanced tests fail, a fall-back setting is set and the tests are executed again. The recommended fall-back order is: Fast-160, Fast-80, Fast-40 (with DT clocking enabled), Fast-40 (with ST clocking enabled), Fast-20, Fast-10, asynchronous
4. Recommended data patterns for Enhanced test are:
 - a) Counting (0001h, 0102h, 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, ...);
 - e) User defined pattern (e.g., psuedo random pattern).

6.3.3 Test Criteria

1. The Basic test fails when the first 36 bytes of data returned at the negotiated synchronous speed does not match the data received at the asynchronous speed. A CRC error (or parity error for non-DT clocking) or a timeout are considered errors as well.
2. If a failure is encountered, it is recommended that the basic test be repeated.
3. The Enhanced test fails if the data used in the READ/WRITE Buffer command fails to compare, has a CRC error (or parity error for non-DT clocking), or encounters a timeout.
4. The Echo READ/WRITE Buffer command should be used. If the Echo function is not available, the application client may use normal READ/WRITE Buffer commands or file READ/WRITE commands.

6.3.4 Test Output

1. If no issues are encountered, then no user interaction is required and Margin tests may proceed.
2. If any negotiated synchronous setting for any target is set to a fall-back setting it is recommended that margin tests be executed at the fall-back settings for that target.
3. If issues are encountered, actions that may be taken are:
 - a) Recommend a course of debug activity based on the application client's determination of the topology. This could be displayed to the user in a dialog box or stored in a file for future access.
 - b) Submit an error to the operating system event notification log.

6.4 Margining

6.4.1 Assumptions

The application client has ascertained the topology and performed the Basic and Enhanced tests.

6.4.2 Test Order

The following test order identifies all driver-receiver connections involved with a specific initiator:

1. Margin the driver-receiver connections directly connected to the initiator.
2. Continue to expand the Margin tests to the driver-receiver connections at the far port (see SPI-4, Annex G) of the first layer of expanders, i.e., those expanders directly connected to the initiator. See Figure 7 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 7 and note the expander between SCSI Bus Segment 1 and SCSI Bus Segment 4.

6.4.3 Test Conditions

1. After each Margin test is completed, the application client should set all margin parameter offset adjustments to zero.
2. A Margin test to a near port (see SPI-4, Annex G) of an expander is not completed until one SCSI target on or beyond the far port of the expander has been tested.
3. Use of mode pages allows the application client to set multiple analog driver settings within a target.
4. Use of Expander Communication Protocol allows the application client to set multiple analog driver settings within an expander.
5. If a SCSI Bus Reset is used to recover from any hang conditions, this should set all initiator, target, and expander margin offset adjustments to zero.
6. To avoid unnecessary failures, respond to check condition, if issued after Read Echo Buffer command. Check sense data for Echo Buffer Overridden. This should indicate a corrupted Echo Buffer.

6.4.4 Test Combinations

1. Execute 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 margin offset parameter adjustments at zero.
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. Execute 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 executed 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.

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 ran on devices that support Fast-10 or higher operation.
4. It is recommended that Echo READ/WRITE Buffer command be used. If the Echo function is not available, the application client may use file READ/WRITE commands.

6.4.7 Test Output

1. Upon completion of Margin tests, all analog driver settings in the domain are to be set to zero.
2. A test report should 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. This could be displayed to the user in a dialog box or stored in a file for future access.
 - c) Submit an error to the operating system’s event notification log.

6.4.8 Flow Chart





