

Accredited Standards Committee\*  
**National Committee for Information Technology Standards (NCITS)**

Doc. No.: T10/00-304r0

Date: August 28, 2000

Reply to: John Lohmeyer

To: T10 Membership  
From: Ralph Weber & John Lohmeyer  
Subject: Parallel SCSI Working Group Meeting -- August 24-25, 2000  
Denver, CO

## Agenda

1. Opening Remarks
2. Approval of Agenda
3. Attendance and Membership
4. SPI-4 Physical Topics
  - 4.1 Training Patterns
    - 4.1.1 Data Out Phase (00-272) [Leshay]
    - 4.1.2 Getting Training Started in SPI-4 (00-324) [Penokie]
  - 4.2 Timings
    - 4.2.1 Proposal for revision of the timing tables and definitions in SPI-4 (00-323) [Milligan]
  - 4.3 Other SPI-4 Physical Topics
    - 4.3.1 LVD Driver Balance for Ultra320 SCSI (00-319) [Uber]
    - 4.3.2 PIP & SSM Report (00-301 & 00-302) [Ham]
    - 4.3.3 Requirements for Measuring Receive Signals in SPI-4 and beyond (00-149) [Ham]
    - 4.3.4 Specifying signals at receiver using receiver equalization (00-223) [Uber]
    - 4.3.5 Cable Attenuation (00-235r0) [Uber]
    - 4.3.6 Cable measurements and Calculated Signal Loss (00-276) [Manildi]
    - 4.3.7 Calculated Signal Losses (00-227 and 00-246) [Aloisi]
    - 4.3.8 SPI-4 - Assumptions for the Receiver and Driver levels (00-239) [Aloisi]
    - 4.3.9 Vn for OR-Tied Signals (00-320) [Moore]
    - 4.3.10 Periodic structures on SCSI buses (00-327) [Barnes]
    - 4.3.11 The zero offset problem for receiver equalization (00-201) [Bridgewater]
    - 4.3.12 Losses on LVD Buses (00-331) [Uber]
  - 4.4 Protocol
    - 4.4.1 Assertion handshaking protocol for Ultra320 SCSI (00-271 and 00-311) [Evans and Leshay]
    - 4.4.2 Results of letter ballot on making PPR Pace\_On bit reserved (00-024, 00-292) [Lohmeyer and Penokie]
    - 4.4.3 Conflict in Data IU Exception Handling (reflector messages) [Srinivasan]
    - 4.4.4 Packetized streaming clarification (00-326) [Galloway]
    - 4.4.5 Vendor unique IU type (00-325) [Galloway]
    - 4.4.6 Disabling Precompensation (00-321) [Moore]
    - 4.4.7 QAS without IU in SPI-4 (00-252) [Elliott]
    - 4.4.8 Bidirectional data transfers in SPI-4 (00-314) [Elliott]
    - 4.4.9 Buffer Credits (99-324r0) [Moore]
  - 4.5 Receiver Issues
    - 4.5.1 Receiver Response Requirements (00-332) [Ham]

\*Operating under the procedures of The American National Standards Institute.  
**NCITS Secretariat, Information Technology Industry Council (ITI)**  
1250 Eye Street NW, Suite 200, Washington, DC 20005-3922  
Email: ncits@itic.org Telephone: 202-737-8888 FAX: 202-638-4922

5. SPI-4 review [Penokie]
  - 5.1 SPI-4 Clarifications (00-322) [Moore]
6. Expanders and Domain Validation Topics
  - 6.1 Report on the SCSI Domain Validation Meeting (00-303) [Lohmeyer]
7. New Business
  - 7.1 Standard Is A Functional Description (00-333) [Milligan]
8. Meeting Schedule
9. Adjournment

## Results of Meeting

### 1. Opening Remarks

John Lohmeyer, the T10 Chair, called the meeting to order at 1:00 p.m., Thursday, August 24, 2000. He thanked LSI Logic for hosting the meeting.

As is customary, the people attending introduced themselves and a copy of the attendance list was circulated.

### 2. Approval of Agenda

The draft agenda was approved with the no changes.

The following items were added/revised during the course of the meeting:

- 4.3.12 Losses on LVD Buses (00-331) [Uber]
- 7.1 Standard Is A Functional Description (00-333) [Milligan]

### 3. Attendance and Membership

Attendance at working group meetings does not count toward minimum attendance requirements for T10 membership. Working group meetings are open to any person or organization directly and materially affected by T10's scope of work. The following people attended the meeting:

Name	S	Organization	Electronic Mail Address
Mr. Ron Roberts	A	Adaptec, Inc.	Ron_Roberts@adaptec.com
Mr. Mike F. Allen	A	AMP / Tyco Electronics	mallen@tycoelectronics.com
Mr. Michael D. Galloway	V	AMP / Tyco Electronics	mdgallow@tycoelectronics.com
Mr. Vince Bastiani	V	Bass Technology	bass.tech@gte.net
Mr. Bill Galloway	P	BREA Technologies, Inc.	billg@breatech.com
Dr. William Ham	A	Compaq Computer Corp.	bill_ham@ix.netcom.com
Mr. Ralph O. Weber	A	ENDL Texas	roweber@acm.org
Mr. George O. Penokie	P	IBM Corp.	gop@us.ibm.com
Mr. John Lohmeyer	P	LSI Logic Corp.	lohmeier@t10.org
Mr. Larry Barnes	V	LSI Logic Corp.	larry.barnes@lsil.com
Mr. Michael Bratvold	V	LSI Logic Corp.	mike.bratvold@lsil.com

Mr. Brian Day	V	LSI Logic Corp.	brian.day@lsil.com
Mr. Frank Gasparik	V	LSI Logic Corp.	frank.gasparik@lsil.com
Mr. Jeffrey J. Gauvin	V	LSI Logic Corp.	jeff.gauvin@lsil.com
Mr. Alan Littlewood	V	LSI Logic Corp.	alanl@lsil.com
Mr. David Noeldner	V	LSI Logic Corp.	dave.noeldner@lsil.com
Mr. Sriram Srinivasan	V	LSI Logic Corp.	sriram.srinivasan@lsil.com
Mr. Richard Moore	A#	QLogic Corp.	r_moore@qlc.com
Mr. Richard L. Romaniec	V	QLogic Corp.	r_romaniec@qlc.com
Mr. Tim Hsia	V	QLogic Corp.	t_hsia@qlc.com
Mr. Henry Kuo	V	QLogic Corp.	h_kuo@qlc.com
Mr. Mark Evans	P	Quantum Corp.	mark.evans@quantum.com
Mr. Bruce Leshay	V	Quantum Corp.	bleshay@tdh.qntm.com
Mr. Richard Uber	V	Quantum Corp.	duber@tdh.qntm.com
Mr. Gene Milligan	P	Seagate Technology	Gene_Milligan@notes.seagate.com
Mr. Mayank R. Patel	V	Seagate Technology	mayank_r_patel@notes.seagate.com
Mr. Paul D. Aloisi	P	Texas Instruments	Paul_Aloisi@ti.com
Mr. Mike Kosco	V	Texas Instruments	mike@mvbbuilders.com

28 People Present

Status Key: P - Principal  
 A,A# - Alternate  
 O - Observer  
 L - Liaison  
 V - Visitor

## 4. SPI-4 Physical Topics

### 4.1 Training Patterns

#### 4.1.1 Data Out Phase (00-272) [Leshay]

Bruce Leshay ask that discussion of this topic be deferred to the next meeting.

#### 4.1.2 Getting Training Started in SPI-4 (00-324) [Penokie]

George Penokie presented a compilation of all the various proposals and discussions of training requirements in SPI-4 (00-324r0). Bill Galloway suggested that the ordering of activities be compared to some kind of absolute time T0 (the beginning of training). The goal was to provide some way of referencing when something happens to replace phrases such as “simultaneously”, “after” and “immediately after”. George agreed to include something based on Bill’s suggestion along with other corrections in the next revision of the proposal.

George walked the group through clause 10.8.4.3.3 in SPI-4 revision 1. The group agreed on changes that clarify when a DT DATA IN phase without training starts. George agreed to make several other changes in the draft SPI-4 before distributing revision 1.

## 4.2 Timings

### 4.2.1 Proposal for revision of the timing tables and definitions in SPI-4 (00-323) [Milligan]

Gene Milligan presented proposed revisions to the timing definitions in SPI-4 (00-323r1). The group discussed the method by which the timings were calculated. Gene noted several clarifications in the wording of definitions in the proposal.

Upon completing the review of the proposal, Gene asked if the group wished to document the timings using method 1 or method 2. (See 00-323r1 for a definition of method 1 and method 2.) Bill Galloway noted that method 2 will be impossible to test in the lab using an oscilloscope. Gene noted that method 1 is going to have unexpected values in the setup and hold times. George commented that documenting method 1 will be harder than documenting method 2, however, George supported use of method 1 because of the need for people to use direct content from the standard to evaluate products under development something that probably would be impossible if the standard adopted method 2. In the absence of any objections, the group agreed to use method 1.

The group discussed whether to remove the Fast-80 (Reference) column from the Fast-160 Timing Budget Template table. In the absence of any objections, the group agreed to remove the column.

## 4.3 Other SPI-4 Physical Topics

### 4.3.1 LVD Driver Balance for Ultra320 SCSI (00-319) [Uber]

Richard Uber raised questions (00-319r0) about the practicality of the driver asymmetry equations agreed at the last meeting (00-276r0). While the group shared Richard's concerns about the impossibility of building drivers that meet the 276 requirements, several of those present wished to carefully review the proposed changes before agreeing to them. It was also noted that making the changes proposed in 00-319 would adversely affect the timing budget.

Richard notified the group he intended to request approval of 00-319r0 for inclusion in SPI-4 at the September meetings.

### 4.3.2 PIP & SSM Report (00-301 & 00-302) [Ham]

Bill Ham asked that this item be deleted from future agendas.

### 4.3.3 Requirements for Measuring Receive Signals in SPI-4 and beyond (00-149) [Ham]

Bill Ham asked that discussion of this topic be deferred to the next meeting.

### 4.3.4 Specifying signals at receiver using receiver equalization (00-223) [Uber]

Richard Uber asked that discussion of this topic be deferred to the next meeting.

### 4.3.5 Cable Attenuation (00-235r0) [Uber]

Richard Uber asked that discussion of this topic be deferred to the next meeting.

### 4.3.6 Cable measurements and Calculated Signal Loss (00-276) [Manildi]

Bruce Manildi was unable to attend and discussion of this topic was deferred.

#### 4.3.7 Calculated Signal Losses (00-227 and 00-246) [Aloisi]

Paul showed the 00-227r7 spreadsheet noting that the bottom line is not acceptable to some. Paul proposed that the strong driver level be required to be from 500 mV to 800 mV and the fallback be 50% and showed the effects of this change in 00-227r8. Bruce Leshay questioned the use of such a large fallback range.

Paul concluded by noting that the r8 changes focus on getting more margin across all the silicon that is coming out. Brian Day noted that the ability of the weak signal to go below 300 mV and other aspects of the r8 need careful consideration.

Paul reviewed the specific proposed SPI-4 changes in 00-246r4 (matching the 00-227r8 spreadsheet). The group discussed details of the proposed changes and Paul noted areas needing correction.

Gene suggested that the timing diagram is overloaded with level information and that the level information can be placed in the mask diagrams.

The "System Level Requirements" table and the notes for the table required substantial editing.

Paul stated that the proposals will be revised and cleaned up for the September meeting. He asked for feedback from all involved to help get the proposals in a condition that works for everybody. George urged everybody to review 00-246r5 carefully so that a vote can be taken at September meeting.

#### 4.3.8 SPI-4 - Assumptions for the Receiver and Driver levels (00-239) [Aloisi]

Paul Aloisi reviewed the written assumptions document (00-239r3) matching the 00-227r7 spreadsheet as well as the 00-239r4/00-227r8 pair covering the new ideas brought forward in the last couple of days. Concerns were raised about how SPI-4 can go about specifying the receiver filtering behavior.

#### 4.3.9 V<sub>n</sub> for OR-Tied Signals (00-320) [Moore]

Richard Moore presented a proposal describing problems with SPI-4 requirements on device leakage current and terminator impedance and bias properties.

Gene Milligan asked if this should be made into an erratum to SPI-3. Richard stated that the issue was raised as a letter ballot comment on SPI-3 that was rejected. Therefore, Gene suggested that SPI-4 be written in such a way as to indicate that SPI-3 was incorrect (or at least incomplete).

The group recommend that the change in V<sub>n</sub> for OR-Tied Signals be accepted with a note indicating that SPI-3 failed to account for leakage current. Paul Aloisi agreed to reflect the group's agreement in his document, eliminating the need for further processing on 00-320.

#### 4.3.10 Periodic structures on SCSI buses (00-327) [Barnes]

Larry Barnes presented a method for modeling the behavior of a SCSI bus that might help get better margins for SCSI bus and backplane structures. He noted that much work remains to be done, however, he felt that the tools presented may be helpful in the future.

#### 4.3.11 The zero offset problem for receiver equalization (00-201) [Bridgewater]

Vince Bastiani asked that discussion of this topic be deferred to the next meeting.

#### 4.3.12 Losses on LVD Buses (00-331) [Uber]

Richard Uber presented a discussion of loss problems in LVD busses (00-331) with the goal that several new concepts be taken into account in future analyses of DC noise margins.

### 4.4 Protocol

#### 4.4.1 Assertion handshaking protocol for Ultra320 SCSI (00-271 and 00-311) [Evans and Leshay]

Bruce Leshay proposed that the acknowledgment signal (REQ or ACK) run at the clock rate but with an additional requirement that only the leading edge be counted (or that the trailing edge may be ignored) and that each leading edge represent 32 bits of data. Bruce noted that the change affects the meaning of the REQ/ACK Offset, doubling the number of bits represented by a given REQ/ACK Offset value.

Mark Evans moved that 00-311r1 be accepted for inclusion in the next revision of SPI-4. Bill Galloway seconded the motion. Ron Roberts requested the ability request reconsideration of the proposal at the September meeting in the event that his engineers have issues and George agreed to give him that option. The motion passed on a vote of 5:0:3.

#### 4.4.2 Results of letter ballot on making PPR Pace\_On bit reserved (00-024, 00-292) [Lohmeyer and Penokie]

John Lohmeyer announced the results of the PPR Pace\_On letter ballot, results in 00-024. The ballot passed on a vote of 34:0:2:3. On letter ballot comment (from IBM) requested incorporating 00-292r1 in place of r0. Gene Milligan objected to incorporating r1 without a review of the changes in r1. In the review, some instances where "paced" was changed to "DT data" were questioned. Other wording problems were raised and George agreed to make changes in 00-292r2.

George Penokie moved that the working group recommend resolution of the letter ballot comments in 00-024 by recommending inclusion of 00-292r2 (r1 as revised) for inclusion in SPI-4. Bill Galloway seconded the motion. The motion passed by a vote of 8:0:1.

#### 4.4.3 Conflict in Data IU Exception Handling (reflector messages) [Srinivasan]

George Penokie explained the history of IU error retry handling including the decision that IU error handling will not include performing retries. Sriram Srinivasan explained that SPI-4 allows retries and should continue to do so. George noted that the text referenced by Sriram was left in SPI-4 in error and proposed that it be removed.

Sriram brought up two other issues that George Penokie agreed to review after the meeting and report on via the T10 Reflector. Further discussion of the issues was deferred to the next meeting.

#### 4.4.4 Packetized streaming clarification (00-326) [Galloway]

Bill Galloway proposed adding a one-sentence recommendation for streaming implementations. The group requested changes and Bill agreed to revise the proposal. Bill Galloway moved that 00-326r1 (r0 as revised) be accepted for inclusion in SPI-4. Brian Day seconded the motion. In the absence of any objections, the motion passed unanimously.

#### 4.4.5 Vendor unique IU type (00-325) [Galloway]

Bill Galloway proposed that 16 IU type codes be changed from reserved to vendor unique. Bill Galloway moved that 00-325r0 be accepted for inclusion in SPI-4. Gene Milligan seconded the motion. The group discussed how to support the new type codes when the content of the IU is unknown without agreeing on any specific changes. The motion passed on a vote of 7:2:1.

#### 4.4.6 Disabling Precompensation (00-321) [Moore]

Richard Moore proposed that the sense of the precompensation bit in the PPR message be reversed to have a bit value of 1 mean "disable precompensation". Reversing the sense of the bit was not acceptable, but other wording clarifications found some acceptance. The group requested changes in the proposal (including keeping the sense of the precompensation bit unchanged) and Richard agreed to provide a revised proposal. Richard Moore moved that 00-321r1 (r0 as revised) be accepted for inclusion in SPI-4. Mark Evans seconded the motion. The motion passed on a vote of 10:0:1.

#### 4.4.7 QAS without IU in SPI-4 (00-252) [Elliott]

Rob Elliott (via email) asked that discussion of this topic be deferred to the next meeting.

#### 4.4.8 Bidirectional data transfers in SPI-4 (00-314) [Elliott]

Rob Elliott (via email) asked that discussion of this topic be deferred to the next meeting.

#### 4.4.9 Buffer Credits (99-324r0) [Moore]

Richard Moore proposed changes to the acknowledgment mechanism similar to the proposal presented in item 4.4.1. On a suggestion from Gene Milligan, Richard agreed to withdraw the proposal as it has been overtaken by events. Richard also agreed to return with the proposal near the beginning of SPI-5 development if the general direction of that work might benefit from reconsideration of the proposal.

### 4.5 Receiver Issues

#### 4.5.1 Receiver Response Requirements (00-332) [Ham]

Bill Ham announced that he received no official responses from Seagate, LSI Logic, Adaptec, and Quantum. Therefore, he wrote his own proposal, 00-332 with some unofficial assistance from Frank Gasparik for which Bill expressed appreciation. Bill informed the group that the document will be presented at the September meeting and proposed for incorporation in SPI-4 at that time.

## 5. SPI-4 review [Penokie]

### 5.1 SPI-4 Clarifications (00-322) [Moore]

Richard Moore presented two proposed clarifications for SPI-4. The group asked for the opportunity to review the proposal with their engineers. Richard agreed to bring the proposal back to the September meeting. He noted that he may remove the figure from the September revision of the proposal.

## 6. Expanders and Domain Validation Topics

### 6.1 Report on the SCSI Domain Validation Meeting (00-303) [Lohmeyer]

John Lohmeyer reported on the activities of the Domain Validation working group (minutes in 00-303).

## **7. New Business**

### **7.1 Standard Is A Functional Description (00-333) [Milligan]**

Gene Milligan presented a very preliminary statement intended for the Scope clause of all SCSI standards. The intent of the statement is that any implementation that conforms to the interoperability requirements of the standard is okay. The group asked that the proposal be discussed at the September CAP meeting.

## **8. Meeting Schedule**

The next meeting of the Parallel SCSI Working Group will be Tuesday September 12, 2000 commencing at 9:00 a.m. in Huntington Beach, CA.

The group agreed to add an agenda item titled "ATN timing for Paced Transfers" to the September meeting agenda and Bill Galloway agreed to draft a proposal for discussion under that topic.

## **9. Adjournment**

The meeting was adjourned at 12:20 p.m. on Friday August 25, 2000.