Accredited Standards Committee*
X3, Information Technology

To: Membership of X3T10

From: Bill Ham, SPI-2 Technical Editor
             Ralph Weber, Secretary X3T10
             Larry Lamers, Vicechair X3T10
             John Lohmeyer, Chair X3T10

Subject: Minutes of SPI-2 / EPI Working Group
             May 6, 1996 -- Ft. Lauderdale FL

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Agenda

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Results of Meeting

1.   Opening Remarks

John Lohmeyer, the X3T10 Chair, called the meeting to order at 9:09 a.m., Monday May 6, 1996. He thanked Norm Harris of Adaptec 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 agenda was approved with the following additions:

        4.8.1 Document Strategy [Milligan]

3.   Attendance and Membership

Attendance at working group meetings does not count toward minimum attendance requirements for X3T10 membership. Working group meetings are open to any person or organization directly and materially affected by X3T10's scope of work. The following people attended the meeting:

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          Name             S         Organization          Electronic Mail Address
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Mr. Norm Harris           P   Adaptec, Inc.               nharris@eng.adaptec.com
Mr. Tak Asami             A#  Adaptec, Inc.               asami@itc.adaptec.com
Mr. Richard Moore         V   Adaptec, Inc.               richard_moore@corp.adaptec
                                                          .com
Mr. Wally Bridgewater     V   Adaptec, Inc.               wally@eng.adaptec.com
Mr. George Preputnick     V   AMP, Inc.                   gpreputn@amp.com
Mr. Ron Roberts           A   Apple Computer              rkroberts@aol.com
Mr. Borden Moller         V   CMD Technology              borden@cmd.com
Mr. Louis Grantham        P   Dallas Semiconductor        grantham@dalsemi.com
Mr. Siegfried Schmalz     V   Dallas Semiconductor        schmalz@dalsemi.com
Dr. William Ham           A#  Digital Equipment Corp.     ham@subsys.enet.dec.com
Mr. Ralph O. Weber        P   ENDL Associate              roweber@acm.org
Mr. George Penokie        P   IBM Corp.                   gop@rchvmp3.vnet.ibm.com
Mr. Dan Colegrove         A#  IBM Corp.                   colegrove@vnet.ibm.com
Mr. Dean Wallace          P   Linfinity Micro             75671.3443@compuserve.com
Mr. Edward A. Gardner     P   Ophidian Designs            gardner@acm.org
Dr. Akira James Miura     A   Panasonic Technologies,     miura@tadw.research.
                              Inc                         panasonic.com
Mr. Skip Jones            P   QLogic Corp.                sk_jones@qlc.com
Mr. James McGrath         P   Quantum Corp.               JMCGRATH@QNTM.COM
Mr. Gene Milligan         P   Seagate Technology          Gene_Milligan@notes.
                                                          seagate.com
Mr. Gerald Houlder        A   Seagate Technology          Gerry_Houlder@notes.
                                                          seagate.com
Mr. Dave Guss             P   Silicon Systems, Inc.       dave.guss@tus.ssi1.com
Mr. Robert N. Snively     P   Sun Microsystems Computer   bob.snively@eng.sun.com
                              Co
Mr. John Lohmeyer         P   Symbios Logic Inc.          john.lohmeyer@symbios.com
Mr. Pete Tobias           A   Tandem Computers            tobias_pete@tandem.com
Mr. Kevin Gingerich       V   Texas Instruments           4307725@mcimail.com
Mr. Kenneth J. Hallam     P   UNISYS Corporation          ken.hallam@mv.unisys.com
Mr. Paul D. Aloisi        P   Unitrode Integrated         Aloisi@uicc.com
                              Circuits
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Mr. Douglas C.           V  Wolf, Greenfield, and     ddoskocil@wgslaw.com
Doskocil                    Sacks
Mr. Tom Sullivan         V  Wolf, Greenfield, and
                            Sacks


29 People Present

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

4.1   Test Data (96-141) [Ham]

Bill reported that he had no new test data since the data presented at the previous meeting, two weeks ago. He offered to (and did) repeat the presentation for those not present at the last meeting.

Bill's bottom line point was that the transmission line properties of the bus segment are very important (especially for drivers with rise/fall times less than 1 ns). Using normal SCSI cable the device load spacing should be limited to not less than to 8 inch centers, i.e. at least 8 inches between connections to the bus. Using backplane applications where the capacitance per foot is higher the spacing may be reduced to 4". 15 meter overall lengths were shown to have good signal integrity with maximum loading per the above formulas. Only cable data presently exists. The backplane spacing recommendation extrapolates from the cable data.

These rules are written in the latest revision of SPI-2 (rev 07).

4.2   LVD SCSI Driver Specification Presentation (96-145r0) [Moore]

Richard presented his latest driver requirements information. The requirements were discussed at length and modified slightly. The result was a set of curves that define the driver test performance requirements and significantly tighten the requirements on driver asymmetry. Detailed discussions were held between TI and Adaptec and a mutually agreeable set of requirements resulted. These will be placed into rev 08 of the SPI-2 document.

4.3   Standing Waves [Bridgewater]

Wally requested that the discussion of standing waves be deferred until the July meeting.

4.4   Glitch Avoidance on Selection and Reselection Timeouts (96-158r0) [Lohmeyer]

John presented a list of conditions under which release glitches can occur. Bill noted that a proposed change in the handling of the REQ signal during bus release has been included in revision 7 of the SPI-2 document. This left a third case, that occurs during selection and reselection. John described two options for handling the third case and Bill agreed to add the needed wording to the applicable section of the SPI-2 document revision.

4.5   Transmission Line Model (96-___r0) [Gingerich]

Kevin presented a table summarizing several specific cases and results from his transmission line model. The agreements resulting from item 4.2 were compared against this model and a final set of Excel curves were generated for inclusion in Rev 08.

4.6   Timing Budget [Ham]

Bill asked that the timing budget topic be removed from the agenda as this was covered in detail at the last meeting. He noted that any discussion of the timing budget can be handled as part of the document review.

4.7   Hot Plugging [Ham]

Bill reviewed the hot plugging discussion that occurred at the last meeting. The group discussed the history of hot plugging solutions and how they might or might not apply to LVD SCSI. Substantial problems were discussed regarding hot plugging on active busses.

Two active bus protection options were discussed: 1) implementation of an error checking scheme, such as LRC or CRC; or 2) implementation of physical bus isolation schemes using multiple segments. In the absence of one of these two protection schemes, Bill stated that bus activity must be stopped before a hot plugging action can be initiated.

It was recommended that SPI-2 document the hot plugging cases that are feasible and not try to introduce special error detection/correction schemes into the protocol.

4.8   SPI-2 Document Review (X3T10/1142D) [Ham]

Bill led a review of revision 7 of the SPI-2 document. He started at clause 9 and worked to the end of the document. This started the discussion at the timing requirements.

Timing budget, clause 9, fig 15:

Gene Milligan asked why the test data pattern was not specified. He stated that changing the data pattern could allow folks to pass the test without meeting the standard. After considerable discussion it was pointed out that effects of the data pattern are implicitly contained in the definitions for the timings where signal amplitude effects are included. The conclusion was to add a statement noting that the driver test circuit in section 10.1.5 is to be used when making the timing measurements at the driver. The definitions for the timings at the receiver are not affected by test circuits.

Wally Bridgewater proposed that the 16 mV in 10.1.2 be changed to 50 mV based on his simulation of voltage mode drivers. The need for asymmetrical drivers is part of the reason for the change. This will reduce the ground shift allowed to around 300 mV. This is really a driver balance test. The "balance" in this test really related to the accuracy of the scaling between the assertion and negation drivers. It is not clear how the present models for transistor behavior are written. This issue is similar to the ability to match the behavior of transistors on the same die of the same wafer but adds the matching of the size scaling. It seems reasonable to assume that one will not get quite as good a prediction when the scaling is considered. How much should be allowed is the key question. Since the 16 mV assumes symmetrical drivers the group agreed to accept Wally's increase to 50 mV pending further data.

For similar reasons the test limits in 10.1.6 relating to dynamic output signal balance will be changed to 100 mV from the present 50 mV.

Richard Moore presented modified values for the driver test limits in 10.1.1 that were less pessimestic than his earlier projections. Part of the reason for the changes was the realization that it is really impossible to have the effects of a loaded bus segment appear instantly at the driver connector. There will always be a length of unloaded cable before reaching the loading effect at the next device. This prevents requiring a driver from actually driving both ways into heavily loaded segments. The revised model will be in the mailing.

The assumptions concerning loading, receiver overdrive and other important features that lead to the test limits will be added to Annex B.

Add a new figure to accurately capture the additional constraints and substantially replaces clause 10.1.1.

Connector wording in SPI-2 Rev 07 was not challenged:- blesses SCA-2 and VHDCI as SCSI connectors by a reference to EIA documents as the normative standard..

Leakage requirements for singled-ended were changed to 20 micro amps to allow the universal transceiver to use the more aggressive silicon technology.

LVD configuration rules based on last meeting's discussion were reviewed and accepted.

Term power - LVD should interoperate with single-ended. May operate down to 2.7 volts, open system requires 4.0 volts. Change in philosophy from what is sourced to what is delivered to terminator. Needs to be reviewed for next meeting. Allows use of term power for other than terminators. Proposed 500 mA min for two LVD terminators at 3 volts.

An Annex still needs to be developed for the TERMPWR distribution profiles.

Do we want to document a 'universal terminator'? The 20 ohm ground driver needs an allowance to go to 100 ohms at the terminator. Inclination to develop a 'picture' for the next revision similar to that used for the universal transceiver.

Tak Asami raised a question on table 10 regarding the signals released from active negation. The wording will be clarified.

Requirements on data and parity not needed because they are clocked by REQ/ACK. Add requirement that data and parity are level signals and aren't released until the data changes or bus free is detected after entering information transfer phase. Table 10 needs some flushing out to be clear on how active negation is used. Need to check SIP.

Recommendation to accept these changes and generate revision 8.

4.8.1   Document Strategy [Milligan]

This item was deferred to the plenary on Thursday, May 9, 1996.

5.   EPI Topics

5.1   SCSI Bus Arbitration Fairness (Lohmeyer)

By agreement of the group, discussion of this topic was deferred to the SCSI Working Group meeting on Tuesday.

5.2   Document Review (Ham)

As there was no meeting time left this subject was deferred until the July.meeting.

6.   Summary of Meeting Results

The technical parts of the sections included in SPI-2 rev 07 (as modified in rev 08) appear to be nearly stable in all areas. There are still some residual concerns about the effects of voltage mode drivers, driver slew rates, and the possibility of resonance conditions that could result in "standing waves". Data is expected before the next meeting on the voltage mode drivers and possibly the slew rates (Digital at least).

The inclusion of EPI with SPI-2 does not appear to be a good strategy and Bill Ham requested that these meetings be separated since the interested parties are largely different people. This request was not acted on for the July meeting week, but will be considered for September.

7.   Meeting Schedule

The next meeting of SPI-2 / EPI Working Group will be Thursday-Friday June 6-7 in Colorado Springs, CO at the Embassy Suites Hotel (719-599-9100) hosted by Symbios Logic. This meeting will focus on the LVD remaining LVD specifications and a detailed document review. Another meeting of this group was requested to be held in conjunction with the X3T10 plenary week in July (also in Colorado Springs, but at the Red Lion Hotel, 719-576-8900).

8.   Adjournment

The meeting was adjourned at 6:30 p.m. on Monday May 6, 1996.