Accredited Standards Committee*
X3, Information Technology

To: Membership of X3T10

From: Ralph Weber, Secretary X3T10
             Larry Lamers, Vice-chair X3T10
             John Lohmeyer, Chair X3T10

Subject: Minutes of SPI-2 Working Group
             January 6, 1997 -- Dallas, TX

Agenda

1. Opening Remarks

2. Approval of Agenda

3. Attendance and Membership

4. Universal backplane [Wallace/Barnes]

5. LVD case 4 hot plugging [Barnes]

6. Changing driver modes when hot plugging (96-270) [Penokie]

7. Single-ended termination (96-245) [Wallace]

8. Proposed clarification to Fig. 24 [Ham]

9. Integration Issues [Lohmeyer/Lamers/Ham]

10. Bus Set Delay Reduction [Ham]

11. Meeting Schedule

12. Adjournment

Results of Meeting

1.   Opening Remarks

John Lohmeyer, the X3T10 Chair, called the meeting to order at 9:04 a.m., Monday January 6, 1997. He thanked Jim McGrath and Mary Turco of Quantum for hosting and arranging 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:

>   9. Integration Issues [Lohmeyer/Lamers/Ham]
>   10. Bus Set Delay Reduction [Ham]

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. Lawrence J. Lamers  A  Adaptec, Inc.              ljlamers@aol.com
Ms. Lisa Huff           V  AMP, Inc.                  lisa.huff@amp.com
Mr. Ron Roberts         A  Apple Computer             rkroberts@aol.com
Mr. Richard Wagner      P  Cable Design Technologies  rwagner@montrose-cdt.com
Mr. Edward Haske        P  CMD Technology             haske@cmd.com
Mr. Siegfried Schmalz   A  Dallas Semiconductor       schmalz@dalsemi.com
Mr. Bruce McLaren       V  Dallas Semiconductor       bruce.mclaren@dalsemi.com
Dr. William Ham         A# Digital Equipment Corp.    ham@subsys.enet.dec.com
Mr. Roger Cummings      P  Distributed Processing     cummings_roger@dpt.com
                           Tech.
Mr. George Penokie      P  IBM Corp.                  gop@rchvmp3.vnet.ibm.com
Mr. Dean Wallace        P  Linfinity Micro            75671.3443@compuserve.com
Mr. Louis Grantham      A  Linfinity Micro            lgdatcom@ix.netcom.com
Mr. E. Jake Berzon      P  NEC Electronics, Inc.      jberzon@asic.mtv.nec.com
Mr. Skip Jones          P  QLogic Corp.               sk_jones@qlc.com
Mr. Richard Uber        V  Quantum Corp.              duber@tdh.qntm.com
Mr. Gene Milligan       P  Seagate Technology         Gene_Milligan@notes.
                                                      seagate.com
Mr. Gerald Houlder      A  Seagate Technology         Gerry_Houlder@notes.
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Mr. John Lohmeyer       P  Symbios Logic Inc.         john.lohmeyer@symbios.com
Mr. Ralph O. Weber      A  Symbios Logic Inc.         roweber@acm.org
Mr. Paul D. Aloisi      P  Unitrode Corporation       aloisi@unitrode.com
Mr. Gregory Kapraun     V  Western Digital Corp.      kapraun@wdroc.wdc.com
Mr. Doug Piper          P  Woven Electronics          doug.piper@internetmci.com

23 People Present

Status Key:  P    -  Principal
             A,A# -  Alternate
             O    -  Observer
             L    -  Liaison
             V    -  Visitor
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4.   Universal backplane [Wallace/Barnes]

John Lohmeyer asked what happens next (after the very through discussion in Palm Springs). Bill Ham expressed the belief that an informative annex will be written. John asked for volunteer(s) to write the annex. Other possible locations for the information were discussed. Dean Wallace volunteered to write the annex, provided Larry Barnes agrees to review it.

Dean asked how much of the "text book" material should be in the annex. Bill stated a preference for all of it. Others (perhaps the uninformed) suggested that the "how to build backplanes" information could be included by reference. This idea and several others were discussed. Dean received no clear guidance on the subject.

5.   LVD case 4 hot plugging [Barnes]

John Lohmeyer announced that he had not received Larry Barnes' simulation data and thought that it had not been completed due to software problems. John noted that he will discuss the simulation with Larry when he returns to the office. John said Larry had been assigned to other projects and may not have time to finish the simulation. Larry Lamers asked if the data input for the simulation were available. John thought he could obtain the data.

Bill Ham, Dean Wallace, Larry Lamers and John discussed the usefulness of the simulation (and laboratory testing, for that matter). It seemed that simulation and testing provided valuable starting points, but could be overturned by "real world" experience. The details of the simulation methodology also were discussed.

John agreed that the item will remain on the agenda for at least one more meeting.

6.   Changing driver modes when hot plugging (96-270) [Penokie]

George Penokie presented (96-270) a document proposing additions to various SCSI standards that provide for software notification of changes in transceiver operating mode (particularly LVD to SE; Low-Voltage Differential to Single-Ended). John Lohmeyer raised concerns over the asymmetric nature of the required notifications. In particular, notification is required for LVD to SE but not for SE to LVD. In addition, George received several editorial corrections. After much discussion, George agreed to add symmetrical requirements for notification of changes from SE to LVD.

Gene Milligan suggested that once a bus changes from LVD to SE, the only way to change back would be a power-cycle. The group questioned this concept and discussed the matter at length. Gene stated that the reason for his statement was that once a device enters single-ended mode, it drives DIFFSENS to ground. Several other people argued that multi-mode devices would not drive DIFFSENS to ground while in SE mode; they would continue to source current on DIFFSENS to attempt to re-enter LVD mode. Gene mentioned that some muli-mode devices might have a jumper to force single-ended mode. The group agreed that such devices should ground the DIFFSENS line when the jumper forces single-ended mode, because such devices effectively are only single-ended devices.

John Lohmeyer also discussed the timing issues around transition testing on the DIFFSENS line. John reviewed the discussion as recent editing meetings. He noted that the most recent editing meeting agreed that the 100 millisecond transition delay should remain (unchanged) to guarantee filtering of 50/60 Hz noise on the DIFFSENS line.

The group discussed issues concerning transitions to and from LVD operation at length. The discussion was complicated by the introduction of bus expanders to the proposed configurations to be covered. The discussion was lengthy and detailed. Virtually all present participated in the discussion at one time or another. Bus expanders appeared to present the greatest difficulty.

Eventually, the group agreed that a device (initiator or target) that senses change in DIFFSENS mode shall generate an internal reset. The group further agreed that a bus expander that senses a change in DIFFSENS mode shall generate a hard reset on the other bus.

George agreed to generate a revision 1 of the proposal, including all the resolutions reached during this meeting. George will bring the revised proposal to the next working group meeting.

7.   Single-ended termination (96-245r1) [Wallace]

Dean Wallace reported that several comments were received regarding the first revision of the proposal. He drew the figure and described the changes proposed and the comments received from Seagate and others regarding the proposed changes.

Bill Ham raised two additional concerns. Part of Bill's issue was that he was willing to make old terminators illegal in SPI-2, while Dean was interested in making minor changes that allow old terminators to comply with SPI-2. Bill pressed for resolution of four issues: maximum current, minimum current, sinking current, and linearity. Dean noted that the proposal must be revised further to meet Bill's requirements. The idea of basing terminators on 80 ohms or 70 ohms (instead of 110 ohms) was also discussed.

Dean agreed to integrate the changes discussed by the working group into a new revision of the proposal.

8.   Proposed clarification to Fig. 24 [Ham]

Bill Ham reviewed the proposed clarification for SPI-2 (rev 11) figure 24. He noted that some might view the change as technical, but Bill expressed the belief that the change is not significant (about 30 pico-seconds in the timing budget). After a brief discussion, the group agreed to distribute the proposal as a separately numbered X3T10 document for review and consideration.

9.   Integration Issues [Lamers]

1. Active negation - map of existence (see X3T10/95-295); map of intensity (use F20 envelope)
    The group agreed that this issue was considered and resolved at the last working group meeting (see 96-257).

2. SE termination, max/min current & sinking of current (see X3T10/96-222r1); suggest min current 20 milliamps at 0.2 v DC and a max of 25.4 milliamps at 0.2 v DC; don't require driver to sink this to avoid re-qualify; add a min at 0.5 v DC; how to deal with non-linear terminators; do we need a duty-cycle spec? suggest 20 asserted signals for wide, 12 on narrow, 37 on 32-bit. Add exception for a contained bus (e.g., laptop) of less than 0.3 meters. Add a 12.5 pf max capacitance for terminator.
    The group agreed that this issue was considered and resolved at the last working group meeting (see 96-257).

3. Leakage spec increased for LVD multi-mode drivers to 20 micro-amps - Resolve by specifying one for each driver type.
    The group agreed that this issue was considered and resolved at the last working group meeting (see 96-257).

4. Latching & counting - require that they be an atomic action for hot plugging - possibly an annex or implementation note.
    The group agreed that this issue was considered and resolved at the last working group meeting (see 96-257).

5. Ground - power, logic & ground drivers (25-pin power & ground connected (SFF-8040)), signal ground and ground ground for tables defining SE signals.
    The group agreed that this issue was considered and resolved at the last working group meeting (see 96-257).

6. SE Receiver - hysterisis (.3), input levels (adopt F20), pin leakage (same), glitch filtering (enable of first detection of a transition for 'x' duration). Need an algorithm to determine 'x'.

    The group discussed the desire to use the tighter Fast-20 requirements (not SPI) for the described values. Gene Milligan raised concerns about historical definitions of the requirements on the DIFFSENS line (for historical High-Voltage Differential implementations). Patent issues related to glitch filters were discussed; it

is important that the standard not require a specific implementation to avoid various glitch filter patents that may exist.

The group agreed to propose that Fast-10 SCSI use the same glitch filtering that SPI has, except that glitch filtering would be required for the assertion edge, as well as the negation edge. For Fast-20, glitch filtering would be required for the assertion edge, as well as the negation edge, and that the time during which signal reversals shall be ignored would be 7 ns, instead of 10 ns. Fast-40 would have all the properties of Fast-20 with a glitch filtering interval of 4 ns.   Thus, x will be 10 for Fast-10 and 7 for Fast-20 and 4 for Fast-40. The group agreed that filtering would apply only to the REQ and ACK receivers.

John asked that the silicon folks examine the above proposal (for REQ and ACK glitch filtering) and provide input on its feasibility at the March SPI-2 meeting.

7. SE Drivers - slew rate (use F20 specs)
    The group agreed to used the Fast-20 specs for slew rate.

8. 16 or 32 devices? 32-bit data path? Is it a single segment draft? Should expanders be included? Suggest that SPI-2 is 16 loads per segment max; allow 32-bit data path and 32 SCSI IDs addressability when using VHDCI connectors with primary and secondary cables

    Larry raised the question of how SCSI is described in the foreword and scope of the SPI-2 standard. The group discussed various aspects of the issue; including cables, protocol chips, bus expanders and several other hardware components. Most of the discussion concerned implementation of 32 bit wide parallel SCSI busses.

    The group agreed to leave the 32-bit data path and stick with a limit of 16 devices per segment.

9. Case 4 hot plugging - requires SCA-2 connectors to allow pre-charge, a resistive contact may also work, needs research to determine max disturbance.

    It was noted that the glitch filter decisions (taken earlier in this meeting) tightens restrictions on case 4 hot plugging, at least with respect to reflected glitches. Bill Ham expressed the belief that better glitch filtering will not help resolve the case 4 problem. Larry Lamers suggested that this means that minimizing the disturbance produced by hot plugging is the only avenue to a solution. Lisa Huff indicated that disturbance reduction via resistive contacts was not fully designed and tested yet.

    The group determined that additional research is required on this subject.

10. Cable specifications - impedance (loaded & unloaded), skew, wire gauge, attenuation

    Larry Lamers and Bill Ham asked if SPI-2 should use SPI or LVD/SPI-2 cable requirements. Bill Ham proposed that cable vendors be asked, "If you did use the Fast-20 spec cable, what would that do to LVD?" and "Do the Fast-20 specs defining the cable and the equivalent requirements in SPI-2/LVD describe the same cable?" and "If the two cables are different, what is required to make them the same?"

    The group agreed to "go for the best cable and one cable for everything." Bill noted that this may result in SPI-2 requiring a cable that is different from all previously specified cables.

11. Add Q-cable pinouts

    The group agreed to just do it.

12. Micro SCSI pinouts

    Bill Ham and George Penokie discussed the usefulness of the micro SCSI connector. Substantial resistance was encountered for including the micro SCSI connector. The group agreed to remove the wording

describing the micro SCSI connector from the work list for SPI-2. It was noted that SFF will document the micro SCSI connector.

13. Reserved lines

Bill Ham proposed that SPI-2 clearly describe reserved lines as being ungrounded, continuous from end-to-end, and not terminated. The group agreed with most of Bill's proposal, but final resolution of reserved line handling in the terminator was left open for additional discussion at a future meeting.

14. Fair Arbitration

John Lohmeyer described the "Fair Arbitration" issue as a placeholder, noting that inclusion of fair arbitration is a work item for the final SPI-2 document. A previous working group has recommended that the IBM fairness algorithm be included in SPI-2; work is still needed to convert the proposal's terminology to SPI-2 terminology.

10.   Bus Set Delay Reduction (97-116) [Ham]

Bill Ham presented a proposal to change the Bus Set Delay from 1800 ns to 1600 ns. He described the reasoning behind his proposal. In a pathological case, the 1800 ns Bus Set Delay limits the maximum one way domain propagation time to 300 ns, under the worst condition. The existing, preferred, one way domain propagation delay is 400 ns.

John Lohmeyer described the SCSI timing model, from which the 1800 ns time was derived. He expressed the belief that Bill should consider modifying the inputs to the SCSI timing model, the spreadsheet for the model, which John agreed to send to Bill. In the process of discussing the model, Bill discovered that many other interesting parameters could be modified, if inputs to the model are adjusted. A key input to the model was the accuracy of the clock signal provided to a chip that is running the parallel SCSI protocol.

The group digressed to a lengthy discussion of reducing arbitration overhead. Changing model inputs was only one topic discussed during the digression. Other, more significant, changes to reduce overhead also were discussed.

Eventually, the group agreed that representatives of SCSI protocol chip makers will discuss the proposed reduction of Bus Set Delay with their design engineers. Bill agreed to revise 97-116 based on the discussions at this working group meeting.

11.   Meeting Schedule

The next meeting of SPI-2 Editors is scheduled for Thursday February 6, 1997 in San Jose, CA with X3T11 hosted by Sun Microsystems. A subsequent working group meeting is planned for Monday March 10, 1997 in San Diego, CA.

The group discussed the need for every-month meetings. The need for monthly meetings appeared to be diminishing. Still, the group decided to continue monthly meetings for another bi-monthly cycle. Based on this decision, John will schedule a meeting in conjunction with the X3T11 meeting in April in Palm Springs, CA, hosted by Brocade at the Hyatt Suites (specifics of the meeting to be announced during the March X3T10 meeting week).

12.   Adjournment

The meeting was adjourned at 5:52 p.m. on Monday January 6, 1997.