Date: November 14, 1991

To: X3T9.2 Membership

From: Lawrence J. Lamers, X3T9.2 Secretary
          John B. Lohmeyer, X3T9.2 Chair

Subject: November 12-13, 1991 X3T9.2 Working Group Meeting Minutes

John Lohmeyer called the meeting to order at 9:00 a.m. November 12, 1991. He thanked Don Tolmie of Los Alamos National Labs for hosting the meeting.

As is customary, the people attending introduced themselves. A copy of the X3T9.2 membership list was circulated for attendance and corrections. Copies of the draft agenda and the recent document register were made available to those attending. Information on X3T9.2 and Mailing Subscription Forms were made available.

John reported that SCSI-2 Rev 10h will be in next mailing, contrary to what was stated at the last plenary meeting. John and Larry had decided that the editorial renumbering of tables caused minor changes on almost every page and thus the full document should be distributed. John gave special thanks to Beth Stephens for making the two-up master to save mailing costs and our backs. The document was also placed in the X3T9 mailing for a forwarding vote at the December X3T9 plenary meeting.

The final agenda was as follows:

1.   PCMCIA/SFF report [McGrath]
2.   CAM Issues (91-140, -162, -169) [Smyers, Burr]
3.   Medium Changer functions... (91-72, -121) [Therrien, Raudebaugh]
4.   Removable Media Support for SCSI-3 (91-88) [Wilhelm]
5.   SCSI Device Identifier [Smyers, Snively, Hagerman]
6.   SCSI-3 dual porting (91-143) [Kolansky, Houlder]
7.   SCSI-3 Queuing Model [Penokie]
8.   Defect Report on ISO 8482 [Milligan]
9.   SCSI-3 S/E Cable/Terminator requirements [Spence]
10.   Fast Single Ended Specification (91-64R1) [Steele]
11.   P1394 Update [Smyers]
12.   SCSI-3 Packetized Protocol (SPP)
13.   1992 Working Group Meeting Schedule
14.   SDTR Issue (91-180) [Houlder]
15.   Proposed connector contact requirements (91-174) [Claude Mosley]
16.   Added SCSI-3 Messages [Teymouri] (91-186)
17.   SCSI Data Phase LRC [Penokie] (91-176R0)

The following people attended the meeting:

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                Name                 Status        Organization
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Mr. Robert C. Herron                   A      3M Company
Mr. Thomas Newman                      S      Adaptec, Inc.
Mr. Sassan Teymouri                    A      Advanced Micro Devices
Mr. Scott Smyers                       P      Apple Computer
Mr. Paul Wolf                          A      Apple Computer
Mr. Dennis Pak                         O      Apple Computer
Mr. Roger Van Brunt                    V      Apple Computer
Mr. Edward Hrvatin                     A      Burndy Corp.
Mr. John Geldman                       S      Cirrus Logic Inc.
Mr. Bill Anderson                      O      DDK Electronics, Inc.
Mr. Norman H. Harris                   P      Digital Equipment Corp.
Dr. William Ham                        A      Digital Equipment Corp.
Mr. Edward A. Gardner                  A      Digital Equipment Corp.
Mr. Rick Muething                      V      Emulex (Consultant)
Mr. Paul R. Nitza                      A      Emulex Corp.
Mr. Skip Jones                         A      Emulex Corp.
Mr. I. Dal Allan                       P      ENDL
Mr. D. W. Spence                       A      ENDL Associates
Mr. Robert Liu                         P      Fujitsu America, Inc.
Mr. Bob Thornton                       O      Fujitsu Components of Amer.
Mr. Kurt Chan                          P      Hewlett Packard Co.
Mr. Jeffrey L. Williams                A      Hewlett Packard Co.
Mr. George Penokie                     P      IBM Corp.
Mr. Gary R. Stephens                   A      IBM Corp.
Mr. Giles Frazier                      S      IBM Corp.
Mr. Claude Mosley                      S      IBM Corp.
Mr. Kevin R. Pokorney                  A      Intellistor, Inc.
Mr. Geoff Barton                       P      Iomega Corp.
Mr. Robert D. Allgood                  V      Iomega Corp.
Mr. Lawrence J. Lamers                 P      Maxtor Corp.
Mr. Bill Kutsche                       O      Murata Erie N.A.
Mr. John Goldie                        V      National Semiconductor
Mr. John Lohmeyer                      P      NCR Corp.
Mr. David Steele                       S      NCR Corp.
Mr. Eddie Williams                     V      NCR Corp.
Mr. Grover Phillips                    V      NCR Corp.
Mr. James McGrath                      P      Quantum Corp.
Mr. Gerald Houlder                     A      Seagate Technology
Mr. Forrest Crowell                    P      SGS-Thomson Microelectronics
Mr. Robert L. Simpson                  P      Sony Corp. of America
Mr. Robert N. Snively                  P      Sun Microsystems, Inc.
Mr. Richard Mourn                      O      Texas Instruments
Mr. Dean Wallace                       O      Texas Instruments
Mr. Arlan P. Stone                     A      UNISYS
Mr. Shishir Shah                       A      Western Digital

45 People Present

Status Key:  P      Principal
             A      Alternate
             O      Observer
             S      Special Interest (frequent visitor)
             V      Visitor
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The following documents were distributed and/or discussed at the meeting:

Document	Doc Date	Author	Description of Document
X3T9.2/91-106 Rev 4	11/4/91	D. Pickford	Format Status Log Page
X3T9.2/91-140 Rev 1	10/8/91	Abilay et al	Proposed Additions and Modifications to CAM interface
X3T9.2/91-169	10/18/91	R. Fink	Results of X3T9 LB to forward SCSI-2 CAM as dpANS
X3T9.2/91-176	10/29/91	G. Penokie	SCSI-3 Data Phase LRC proposal
X3T9.2/91-177	11/4/91	B. Spence	Proposed Resistor Values for Low-End S/E Terminator
X3T9.2/91-178	11/4/91	B. Spence	Proposed Specifications for High-End S/E Terminator
X3T9.2/91-179	11/4/91	B. Spence	Proposed Specifications for S/E Shielded Cables
X3T9.2/91-180	11/4/91	G. Houlder	Question on Synchronous Transfer Agreement
X3T9.2/91-184	11/5/91	G. Milligan	Additional Comment on ATA Rev 2.6
X3T9.2/91-185	11/9/91	D. Steele	Voh/Ioh specification for active negation drivers
X3T9.2/91-186	11/1/91	S. Teymouri	Addition of a new Message to SCSI-3 Message Set
X3T9.2/91-187	11/4/91	F. Oprescu	Proposal for a Portable Machine SCSI Bus Termination
X3T9.2/91-188	11/7/91	F. Oprescu	SCSI Active Deassertion
X3T9.2/91-189	11/7/91	S. Smyers	SCSI-3 Common Command Set Mapping to P1394
X3T9.2/91-190	11/8/91	S. Smyers	SCSI3 CCS over P1394 (presentation)
X3T9.2/91-191	11/12/91	Wolf/ Smyers	SCSI-2 CAM Changes Proposal
X3T9.2/91-192		P. Wolf	Apple Late 1991 CAM Proposals Summary
X3T9.2/91-194	11/12/91	B. Spence	Driver and Terminator Terminal Characteristics
X3T9.2/91-196	11/8/91	J. Goldie	Electrical Characteristics Standards (EIA/TIA-485.1983 & ISO 8482.1987)
X3T9.2/91-197	11/8/91	J. Goldie	Comparison of Electrical Char. Stnds: EIA/TIA-485.1983 & ISO 8482.1987
X3T9.2/91-198	11/13/91	R. Muething	Recommendations for consideration into SCSI-3 Parallel Interface (SPI)
X3T9.2/91-202	11/7/91	R. Van Brunt	P1394 (Serial Bus) Physical Layer for Cable Medium

Results of Meeting

1.   PCMCIA/SFF report [McGrath]

Dal Allan and Larry Lamers reported on the Small Form Factor and PCMCIA meeting that had been held the previous day. Larry Lamers provided the following report on the meeting:

> IDEMA - Joan Pindar attended the SFF meeting to announce that IDEMA has received a proposal for a 34mm Finished Disk. The intended use is in a 1.3-inch form factor drive. The relevant specifications are:
>
> | | |
> |---|---|
> | ID | 8.00 +0.05/-0.00 mm |
> | OD | 34.00 +/-0.05 mm |
> | Chamfer Length | 0.10 +/-0.05 mm |
> | Chamfer Angle | 45 +/-5 degrees |
> | Thickness | 0.381 +/-0.025 mm |
>
> Vertical Connectors - Several presentations were made by folks from connector companies on vertical insertion connectors.   Except for a proposal to use elastomeric type connections, the presentations were all for the same basic type of connector. The major drawback to elastomeric type connections is the degradation in performance after several uses. Used as a one time connection in a controlled environment with clean mating

3

surfaces they are excellent. Because they use a silicon rubber base the connection is sealed once made resulting in very good integrity. The silicon rubber also allows the connections to perform well in shock and vibration.

The rest of the proposals focused on a low-profile surface-mounted pin and socket connector. The pin part of the connector is mounted on the component side of the PCB and the pins are fed through the PCB. The pin part of the connector is mounted on the drive; it is the lowest cost and lowest profile part of the connection. It also allows the user a number of options for the socket part of the connector, including guide posts, mounting orientation, and keying. Even though the proposals were very similar, intermateability of the connectors is not assured until a selection is made by the SFF committee and the connector companies can work out the details.

There was a great deal of indecision on selecting a particular connector. After several rounds of voting for features that proved inclusive a general agreement was reached. A 0.050 inch centerline, round pins, 50 contact connector based on drawings to be supplied by AMP is the primary choice. An optional polarized guide post will be specified. A 2.0 mm, square pin, 50 contact connector is the alternate choice. This was made to satisfy 2.5-inch drive manufacturers currently shipping that type connector. Both of these will be included in the next draft document. The existing board edge connector will remain.

SFF Document Focus - It seems the last meeting was a bit too hasty in agreeing to pull out all references to 2.5-inch form factor products. There was strong sentiment at this meeting to put it back in; and so it shall be.

PCMCIA Activity - Tom Hanan of Western Digital and Stan Sharp of PCMCIA reviewed extensions to the PCMCIA document to accommodate disk drives. Stan showed a proposed Type 3 PCMCIA card that utilized a double height bay (this bay would accommodate two Type 1 cards). Adjustments to the rail width to get a 50.8 mm clearance were requested. The overall maximum height was 11.0 mm on Stan's proposal. There was some debate on whether this was too much or too little. It is too little for the Ministor drive which is 12.5 mm high, but seems to be acceptable to others planning 10.0 or 10.8 mm high drives. Stan was going to investigate both of these dimensions.

Tom Hanan stated that the interface would use the PCMCIA connector and the ATA protocol. He envisions an application note style document that would outline how to use PCMCIA and ATA documents to design such a drive. He had no further details because he is awaiting a release clearance from Western Digital lawyers on the document he has prepared. It may be available at the November PCMCIA meeting. There are issues yet to be resolved with the Interrupt 13 decoding, selection of the drive without using the PCMCIA tuples, multiple drive support, and removable drive support.

John Lohmeyer stated that PCMCIA has a bulletin board which has a section to deal with PCMCIA/ATA issues. The board can be reached at 408-720-9388.

2.   CAM Issues (91-140, -162, -169) [Smyers, Burr]

John Lohmeyer read Bill Burr's comments on the CAM document. John recommended the committee accept Bill's advice to resolve the trademark issue.

Schedule - earliest re-forwarding is at Feb plenary, need letter to Bill Burr (JBL action item)

Scott Smyers still has an outstanding action item to investigate his proposed changes to a timer

resolution with other CAM implementors.

John Wolf reviewed the various Apple proposals for CAM contained in documents 91-140r1, 91-191, and 91-192. Document 91-191 requests a variable selection timeout and the addition of a Disconnect Current bit so that priority I/O Processes can be issued. Document 91-192 is a summary of the other two.

Dal suggested that proposal 1 is OS dependent and should not go into the CAM document. Proposal 2 had been accepted for inclusion in the document.

Scott Smyers covered the portable machine SCSI bus termination proposal, document 91-187. The proposal significantly reduces the power needed for termination. Power consumption is 5 mA when there is no bus activity. Dal recommended that since this is a restricted environment it does not need be in the standard.

3.   Medium Changer functions... (91-72, -121) [Therrien, Raudebaugh]

No interested parties were present -- carried over.

4.   Removable Media Support for SCSI-3 (91-88) [Wilhelm]

No interested parties were present -- carried over.

5.   SCSI Device Identifier [Smyers, Snively, Hagerman]

Bob Snively drew the only acceptable icon that came out of the artists concepts. Bob felt that the several other variations were not of much use. He suggested that it may not be a problem for which a consensus can be reached. Bob promised to bring a proposal to the next meeting.

6.   SCSI-3 dual porting (91-143) [Kolansky, Houlder]

Since some or all of Gerry Houlder's 90-136 document has been included in SIP, Gerry agreed to revise his 91-143 document to give changes against this documents instead of against SCSI-2.

Jim McGrath argued against the standard legislating an implementation that requires two protocol chips. However, systems integrators may or may not accept a solution that shares significant logic between the two ports.

Dal requested that Jim work with Gerry Houlder to achieve wording that does not require a specific implementation, but does require that both ports respond with correct protocol regardless of activity on the other port.

7.   SCSI-3 Queuing Model [Penokie]

George Penokie reported on the Tuesday evening queuing meeting. Please see X3T9.2/91-201 for more information.

8.   Defect Report on ISO 8482 [Milligan] (91-196, 91-197)

John Goldie of National Semiconductor in response to a request from Gene Milligan researched the RS-485/ISO 8482 issue.

John reported the findings of his research (see 91-196 for details). There are significant differences; approximately 20 changes are needed to ISO 8482 to make it equivalent to RS-485. Since ISO 8482 is due for reveiw in 1992, the plan is to request the changes needed to make it compliant with RS-485. It is possible that ISO will generate a new standard for RS-485 compatibility if the requested changes to ISO 8482 are not accepted.

As a side note, John stated that EIA and TIA have merged and are in the process of seeking accreditation by ANSI.

9.   SCSI-3 S/E Cable/Terminator requirements [Spence]

Bill Spence presented Florin Oprescu's paper (91-188) that derived theoretical models for the active negation circuit. The paper defines the active negation circuit as three models containing an ideal voltage source, an ideal current source, and a finite output resistance voltage source. From these he derived a set of I-V plane lines that define the acceptable range of output circuits.

David Steele said that these models are only first-order approximations of the real-word situation and that the ideal circuits are not practical due to the large transistors that would be required. Significant signal quality improvements can be obtained with much lower output currents. David was also concerned about power supply bounce problems and EMI problems.

Robert Allgood suggested that limiting open circuit voltage to 3.0 volts can signifcantly help with driver assertion because there is less energy to dissipate.

Rick Muething, a transmission-line consultant representing Emulex, presented his paper giving recommendations for improvements SCSI-3 single-ended signal quality. Bill Spence noted that many of these recommendations have already been made, however they have not been communicated effectively outside the committee.

Two SPI Working Group meetings were scheduled for December 10, 1991 following the X3T9.2 Plenary meeting and on January 14, 1992 from 1:00 p.m. until 9:00 p.m. Bill Spence agreed to chair these meetings.

10.   Fast Single Ended Specification (91-64R1) [Steele]

There was considerable debate over limiting fast single-ended to 3 meters. David agreed to re-work his documents to provide guidelines that will work at 3 meters inside a cabinet, and may work on longer cables, but with no gaurantee. Robert Allgood stated that he believes the cable length is the least of the problems and fixing other things can yield satisfactory results on longer cable lengths.

David noted that his test setup failed at 6 meters, but others had obtained success at 6 meters by eliminating stubs, sorting devices for low input capcitance (<15 pf), using polyolefin cables, and matching the impedance of traces on the host.

David agreed to prepare a Rev 2 of 91-064 in a form ready for inclusion in SPI.

11.   P1394 Update [Smyers]

Scott introduced Roger Van Brunt who is an expert on the P1394 physical issues. Roger gave a presentation on the features of P1394 (see 91-202).

There was some discussion of the jitter budget. The margins are:

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    Speed:              100 Mbit/sec        200 Mbit/sec

    Without
    isolation:          2.9 ns (58%)        0.4 ns (0.16%)

    With isolation
    transformer:        2.3 ns (46%)        (Does not work)
```

Usage at 400 mHz will require work to tighten up the jitter budget. This will probably involve using a Bi-CMOS process and other changes.

12.   SCSI-3 Packetized Protocol (SPP)

Scott Smyers presented his approach to mapping the SCSI command sets to P1394 (see 91-189 and 91-190). His approach uses a subset of the P1212 architecture which makes part or all of each device's address space available to the other devices. Thus a target reads and writes directly from or to the host memory.
There was some concern about vulnerbility of external devices directly accessing host and peripheral memory. Scott pointed out that people who are concerned about this can use hardware protection so that only specified address ranges are accessible.

John and Dal expressed concern about the amount of overhead to do all of the manipulation of managing queues of pending I/Os. Scott said that the overhead to transfer a command is about 25 usec plus the overhead to wake-up a target is about 27 usec for a total of 52 usec. However, one could transfer more than one command and then wake-up the target, sharing the wake-up overhead.

John said that the SCSI architecture requires less than 20 usec total overhead for a READ command with one disconnect, not including data transfer time. The fastest current silicon achieves 50 to 100 usec overhead. These numbers are not easily compared, but it appears that P1394 overhead will be higher than SPI/SIP overhead.

John Lohmeyer asked the three people who have submitted packetized documents why Gary Stephens document is so much larger that Bob Snively's and Scott Smyers's documents. The answer was that Gary's document also includes multi-pathing features and that Bob's and Scott's documents still omit several sections.

A lengthy debate ensued with neither side giving much ground. Dal pointed out that while the sides appeared to be violently opposed on some issues, they really were much more the same than different. In particular, they all attempt to preserve the CAM or CAM-like interface in the host system.

Gary stressed that his approach uses the fewest turn-arounds, which is important for long distance applications. Bob and Scott said their approaches were less disruptive of the existing hardware implementations.

Since it appears that both approaches to packetization (tightly coupled to the underlying transport

interface and transport interface independent) are likely to be needed for different markets, the strategy will be to document all three proposals in the SPP document, perhaps using normative annexes for each of the three proposals.

13.   1992 Working Group Meeting Schedule

The following meeting schedule was set for the X3T9.2 meetings at the January Working Group week. Please see 91-175 for meeting hotel arrangements.

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Monday      January 13, 1992
----------------------------------------------------------------
Same  / Small Form Factor (40 people)        8:00a -  1:00p
Room <  DADI Working Group (20 people)       1:00p -  6:00p
OK    \ SCSI-3 Queuing (30 people)           6:00p -  9:00p

        SPI Contact Specification (20 people) 1:00p -  6:00p

Tuesday     January 14, 1992
----------------------------------------------------------------
Same  / SCSI Working Group (40 people)       9:00a -  1:00p
Room \  SPI Working Group (40 people)        1:00p -  9:00p

Wednesday    January 15, 1992
----------------------------------------------------------------
Same  / SCSI Working Group (40 people)       8:00a - 10:00a
Room <  SPP Working Group (40 people)       10:00a -  6:00p
OK    \ FC-Loop (40 people)                  6:00p -  9:00p

Thursday     January 15, 1992
----------------------------------------------------------------
        SCSI Editor's Meeting (10 people)    8:00a -  5:00p
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14.   SDTR Issue (91-180) [Houlder]

Gerry Houlder's question was, "Will any reasonable design that is set up to expect fast data always work with data conforming to the original (slow) timing?"

Paul Nitza pointed out that the mode is picked at the negotiation. If the target accepted a fast negotiation it runs at fast timings even if it transfers at slow rates.

Kurt Chan agreed to add a note to the SCSI-3 SIP document that will hopefully remove any ambiguity.

15.   Proposed connector contact requirements (91-174) [Claude Mosley]

Claude Mosley gave a presentation on requirements for connector contact design to insure a high-quality connection.

His conclusions were:

1)   any connector system with pore-free plating, contact geometry, and normal force to support the minimum required contact pressure should pass both acclerated life and environmental tests.

2)   the connector supplier should maintain consistent processes to ensure that the quality of the parts remain at the level evaluated or better.

What needs to be done in SCSI-3 SPI are:

8

1)   specify requirements
2)   provide minimum specifications for manfucturers
3)   promote quality before cost

In Claude's opinion the following are the set of attributes that must be specified to assure a good connector:

1)   connector to be multi-wipe system.
2)   connector contacts to be plated with a minumum of 0.000762 gold over 0.00127 nickel or equivalent.

3)   surface finish of N5 (ra of 0.0004).
4)   contact retention in housing shall be a minimum of 25 Newtons.
5)   connector system shall have a minumum mating wipe length of 1.25mm.
6)   receptacle contact geometry shall not allow mating to the corner of the pin.
7)   contact geometry and normal force shall produce sufficient contact pressure to break through surface films during mating.
8)   connector system to be capable of a minimum of 50 cycles of mating and unmating without wear through of the noble plating surface.
9)   insertion force to be less than 1 Newton per contact.
10)   insulation resistance to be 1000 megohms minimum.
11)   dielectric withstanding voltage to be 800 VAC RMS minimum.

He suggested that a formed contact would improve the existing SCSI high-density connector. This would require a change in the wide of the blade from 0.024 to 0.016 inches to allow for the formed contact. This later point was challenged; it may be possible to have a formed contact without changing the blade dimensions.

A Connector Contact Specification Working Group meeting was set for Monday, January 13, 1992 from 1:00 pm to 6:00 pm at the next working group week in Houston, TX.

Interested people can contact Claude at:

>   Claude J. Mosley
>   Staff Engineer
>   Advanced Business Systems
>   MS 549/050-3
>   Highway 52 North and NW 37th Street
>   Rochester, MN 55901
>   TEL: 507-253-4064   FAX: 507-253-2486
>   EMAIL (care of George Penokie): GOP@RCHVMP3.vnet.IBM.com

16.   Added SCSI-3 Messages [Teymouri] (91-186)

This proposal is for a set of messages to control active negation drivers. John Lohmeyer questioned whether a standard method needs to be defined for this function or could it be done outside of SCSI. Two possible needs were identified:

1)   power management on notebook computers
2)   comparability issues in mixed transceiver systems

George Penokie suggested that the power management could be incorporated in his power management proposal. Dal Allan suggested that a trigger could be that running fast turns active

negation on and running slow turns active negation off.

The idea that switching modes might be necessary to find the lowest error rate was deemed presumptuous and repugnant. The proposal was put on hold for the time being until the SPI Working Group addresses active negation drivers.

17.   SCSI Data Phase LRC [Penokie] (91-176R0)

This proposal would add a longitudinal redundancy check (LRC) to the data phase on the SCSI bus. An LRC would be sent at the end of the transmission of all the data for an I/O process. This topic generated some lively debate.

The issues to be resolved were summarized as follows:

    1) Phase(s) to which error code applies:

            command+data
            data
            some data

    2) Initialization mechanism:
            negotiation (e.g., like fast & wide)
            Mode Select
            Control Byte
            Jumper

    3) Periodicity
            e.g., 512 bytes (how to setup?)
            I/O Process

    4) LRC vs. CRC vs. Reed-Solomon

The debate did not lead to a real consensus. There were some people who felt we should strive to fix the physical issues that may cause errors, others who only wanted to protect fast synchronous data transfers, and others who felt that all bytes transferred should be protected by the error detection code. There were also issues about how often the code should be examined -- it does little good to discover at the end of a WRITE command that the data may have been written to the wrong (and unknown) logical block.

There was some consensus achieved on two points:

1)   The protection scheme should not impact drivers in existing implementations.
2)   The protection scheme should be possible to implement in the hardware to avoid performance penalties.

Kurt Chan suggested that we should understand the error mechanisms before selecting a protection scheme.

John Lohmeyer requested George to present a summary of the discussion at the next plenary meeting. Alternative error control methods, if desired, should be prepared by interested parties.