

Date: Jan 14, 1998

To: T10 Committee (SCSI)

From: George Penokie (IBM)

Subject: Ballot Resolution on SPI-2 Letter Balot

Comments attached to Yes ballot from Lawrence J. Lamers of Adaptec, Inc.:

Comment 1 Figure A.2 used to show the output current for the lvd driver may be incorrect because there is an unstated assumption regarding the output impedance of the driver. The equations used to generate the output figure do not result in a solution if the impedance is less than 1000 ohms. Also the bias voltage appears to be canceled out in the equations when doing a resistive transformation. The corresponding value for the loaded impedance in Table A.1 is too high to get a valid solution for the equations. The value should be 103 ohms maximum.

Accepted: Added in the following into section A.2.1:

Figure A.2 shall only apply to drivers with source impedances greater than 1000 ohms.

This subclause does not specify requirements for drivers with source impedances less than 1000 ohms.

Comments attached to No ballot from William Ham of Digital Equipment Corp.:

Comment 1:

Section 6 - Editorial change:

Replace " The function of interconnectfor the Q cable" with:

The function of the interconnect is (1) to carry the signals driven by the SCSI device drivers or the SCSI bus terminators to the connectors of the receiving devices or terminators on the bus, (2) to carry the terminator power from TERMPWR sources to the terminators and (3) to provide continuity between reserved pins and ground pins between devices and terminators. Minimum driven signals shall result in received signals that meet the requirements contained in clause 7. Signals for this requirement are DB(0) thru DB(15), DB(P), DB(P1), C/D, I/O, MSG, BSY, SEL, ATN, REQ, ACK, DIFFSENS, and RESET for the A and P cable and the similar signals for the Q cable. Minimum TERMPWR shall be delivered to the terminators from minimum TERMPWR sources per the requirements in section 7.5.

Accepted: New wording now:

The function of the interconnect is to:

- a) carry the signals,**
- b) carry the terminator power from TERMPWR sources to the terminators, and**
- c) to provide continuity between reserved pins and ground pins between devices and terminators.**

Minimum driven signals shall result in received signals that meet the requirements contained in clause 7. Signals for this requirement include DB(0) through DB(31), DB(P), DB(P1), DB(P2), DB(P3), C/D, I/O, MSG, BSY, SEL, ATN, REQ, ACK, DIFFSENS, and RESET. At least minimum TERMPWR shall be delivered to the terminator from minimum sources per the requirements in clause 7.5.

Comment 2:

Section 6.2 - technical problem

Most SCSI cable will not meet the 1.41 dB at 60 MHz requirement for many lengths allowed in the document. Also, at 25 meters the total attenuation is 2.375 dB for the 0.095 dB/m so there is a conflict between the 5 MHz specification and the allowed lengths (specified in other sections). I suggest the following wording to remove the conflicts:

"The maximum 5 MHz differential sine wave test signal attenuation shall be 1.41 dB at the maximum SCSI device driver to SCSI device receiver distance or 0.0564 dB/m." [Note that this is a considerable tightening of the requirement at 5MHz but these numbers are self consistent and I think that they are doable and will work for most existing SCSI cables - needs to be verified].

Accepted: It now reads:

The maximum sine wave signal attenuation shall be 0,095 dB maximum per meter at 5 MHz, measured deferentially or a maximum sine wave signal attenuation of 1,41 dB at 5 MHz for the entire bus measured deferentially.

Comment 3:

Section 6.6 - technical

Replace "Twisted pairtransceivers" with:

"Balanced interconnect media (e.g. twisted flat, discrete wire twisted pair, matched printed circuit board traces) should be used with differential transceivers."

Accepted

Comment 4:

Table 42, section 9.1, section 9.3 - technical

The term "Cable skew delay" is incorrect and inconsistent with other terminology used to describe interconnect properties and requirements in the referenced places in the document. The term "delay" is uniformly and appropriately used elsewhere in the document to describe requirements on SCSI devices where the device is required to wait a "delay period" before doing something. The term "skew" is uniformly and appropriately used elsewhere in the document to denote timing differences between different but nominally identical signals. The interconnect does not have any concept of a "cable skew delay". This would be a delay in the skew appearing in the interconnect.

The interconnect does, however, have a skew property that results from difference in the signal propagation time along different electrical paths. This propagation time is the actual signal path physical length divided by the actual propagation velocity (or more precisely the integral of this quotient along the path). The propagation time is sometimes awkwardly termed propagation time delay. Thus the term "cable delay skew" (NOT "cable skew delay") would be technically accurate as a way to denote the difference in propagation time along different electrical paths (which is the intent of the entries in this document). The term "cable propagation time skew" is less confusing and less awkward.

Recommendation: Globally replace "cable skew delay" with "cable propagation time skew".

Accepted: The name was changed to 'cable skew' and 'delay' was also removed from terms in section 9.3. A cross reference was added to table K.1. Also replaced: 'transmitter delay skew' with 'transmitter skew', 'receiver delay skew' with receiver delay', and 'circuit board delay skew' with 'circuit board delay'.

Comments attached to No ballot from George Penokie of IBM Corp.:

E - Section A.2.5 - A reference should be made to where V_a and V_n are defined. References to figure A.8 and table A.2 should be added.

Accepted

E - Section A.2.5 - The third paragraph should be changed to "The output signal rise or fall times (see t_r in figure A.8) between...'

Accepted

T - Section A.2.5 - figure A.7 - note a - There is no such thing as a 0.1% surface mount metal film type resistor. The tolerance should be made 1%.

Accepted

E - Section A.2.6 - 2nd paragraph - There is an extra . before the $V_{applied}$.

Accepted

E - Section A.2.6 - figure A.8 - The two V_{ss} 's should be changed to V_s to match the text.

Accepted: V_S in the paragraph was changed to V_{SS} .

E - Section A.2.6 - figure A.9 - The following should be added as a note within this figure: 'The longest physical dimension between the device connector pins and any test circuit component shall be no greater than 0,1 meter.'

Accepted

Comments attached to No ballot from Gene Milligan of Seagate Technology:

1) On the cover page change "Any duplication of this document for commercial or for-profit use is strictly prohibited." to "Any commercial or for-profit duplication is strictly prohibited."

Accepted

2) The T10 format uses both an ISO/IEC and a NCITS document number. However the final document is editorially slightly different. If this practice is to continue, SPI-2 should be 14776-112.

Accepted

3) The T10 reflector information should include the sign-up statement.

Accepted

4) Why are the abstract and patent statement not in a formal portion of the document (I presume the page they are on will be discarded by ANSI and certainly will be discarded by ISO/IEC.

Rejected: The way it is now is contains all the correct words the layout used by ANSI is different and the ANSI editors will fix any of this.

5) In the abstract "This standard defines mechanical, electrical, timing requirements, command, and the task management delivery protocol ~~required~~ to transfer commands and data between SCSI devices attached to an SCSI parallel interface." should be changed to "This standard defines mechanical, electrical, timing, command, and the task management delivery protocol requirements to transfer commands and data between SCSI devices attached to an SCSI parallel interface."

Accepted

6) I think "systems integrators" should be "system integrators".

Accepted

7) What did the Chair of T10 conclude regarding the AMD glitch filter patent call response? Why is the long debated SCAM patent response being ignored?

Accepted: The 'there may be patents' patent statement is now being used.

8) Why is termination underlined in the table of contents?

Accepted

9) The editor's notes should be removed and if desired moved to a separate document.

Accepted

10) The separate document should have the Rev 18 changes added.

Rejected: Changes already there under 'Changes to rev 17' heading.

11) The foreword's statement "The SCSI-3 Interlocked Protocol standard is divided into the following clauses:" although not part of the standard should be revised to address the SPI-2 standard."

Accepted

12) "Committee approval of ~~the~~ standard does not necessarily imply that all committee members voted for approval." should be changed to "Committee approval of this standard does not necessarily imply that all committee members voted for approval."

Accepted

13) Is T10 actually down to three members? I thought it had to be disbanded if it fell below five members.

Accepted: The following statement added 'T10 membership list to be inserted during final ANSI edit.'

14) While "The SCSI protocol is designed to provide an efficient peer-to-peer I/O bus ~~with up to 32 device IDs, including one or more hosts.~~" in the introduction while technically correct is highly misleading of the real world situation. I suggest changing it to "The SCSI protocol is designed to provide an efficient peer-to-peer I/O bus with the maximum number of hosts and peripherals determined by the bus width (typically 8 or 16 with 32 allowed)."

Accepted

15) Why does the list of advantages begin with g and end with h?

Accepted

16) Advantage g appears to be an advantage of SCSI, not of parallel SCSI.

Rejected

17) Advantage h appears more like a requirement than an advantage. Is this all an errant cut and paste?

Rejected

18) The statement "A priority system awards interface control to the highest priority SCSI device that is contending for use of the bus." should be explained to recognize fairness e.g. "A default priority system awards interface control to the highest priority SCSI device that is contending for use of the bus and an optional fairness algorithm is defined."

Accepted

19) ANSI does not agree with the statement "and voting procedures of the American National Standards Institute" and I think the statement should be "and voting procedures accredited by the American National Standards Institute".

Accepted

20) Comment (16 and 17) except for the correct lettering in this case applies to items (a) and (b) in the Scope.

Rejected

21) Because of excessive redundancy between the Introduction and the scope several of the comments above concerning the introduction also apply to the scope. The best solution would be to minimize the redundancy and fix the remainder.

Accepted: Same fix as comment 18.

22) Delete "It indicates the applicability of a standard to the implementation of a given transport."

Accepted

23) The 3.1.14 connection: definition has an extraneous "n".

Accepted

24) In the 3.1.21 fast-5: and 3.1.22 fast-10: definitions change "Previous SCSI standards referred to this transfer ~~rate~~ as slow." to "Previous SCSI standards referred to this transfer range as slow."

Accepted

25) Why is magnitude defined as a positive value and as an absolute value?

Accepted: Wording changed to: The absolute value of a number or quantity

26) In the vendor specific definition change "i.e." to "e.g." and delete "etc."

Accepted

27) The symbol definitions show "*" as the multiplication symbol. But at the last editing session I thought that the difficulty in making the * not be a superscript led to changing it to "x" or "X" (I could not tell which over the phone).

Accepted

28) 3.1.30 invalid:, 3.1.37 mandatory, 3.1.44 optional:, and 3.1.60 reserved: should be deleted in favor of the key word definitions. It may be desirable to capture the compliance statement in the mandatory key word.

Accepted

29) Change "3.3.4 may: A keyword that ~~indicated~~ flexibility of choice with no implied preference." to "A keyword that indicates flexibility of choice with no implied preference."

Accepted

30) Change "3.3.5 obsolete: A keyword indicating that an item was defined in prior SCSI standards but has been removed from this standard." to "A keyword indicating an item that was defined in a prior SCSI standard that has been removed from this standard." or "A keyword indicating an item that is defined in a prior SCSI standard and that has been removed from this standard."

Accepted: Obsolete was removed per Sun comment 3.

31) In 3.3.6 optional: delete "then".

Accepted

32) The desire for recipients not to check for more recent, or inadvertent use, of reserved bits has been in place for a long while. Is it not time to be more blatant than "Recipients may check reserved bits, bytes, words or fields for zero values and report errors if non-zero values are received."?

Accepted: Wording changed to "Recipients may not check reserved bits, bytes, words or fields for zero values."

33) "3.3.8 shall: A keyword indicating a mandatory requirement. Designers are required to implement all such ~~mandatory~~ requirements to ensure interoperability with other products that conform to this standard." should be changed to "A keyword indicating a mandatory requirement. Designers are required to implement all such requirements to ensure interoperability with other products that conform to this standard." or to "~~A keyword indicating a mandatory requirement.~~"

Accepted

34) Change "These words and terms are defined either in ~~3.4~~ or in the text where they first appear." to "These words and terms are defined either in clause 3 or in the text where they first appear."

Accepted

35) Is the definition "Decimal numbers are indicated with a comma(e.g., two and one half is represented as 2,5)." I think it should be "Decimals are indicated with a comma(e.g., two and one half is represented as 2,5)."

Accepted

36) All but the last sentence of the first paragraph of 4.1.1 seems to be in the wrong clause.

Accepted: Moved to new section titled 'Data transfer modes'.

37) Referring to 4.1.3 and in terms of the SPI-2 standard, what does "e) other physical placement descriptions may be used." mean? Is this an instruction to news letter writers?

Accepted: Removed the word 'descriptions'.

38) What does "SCSI bus connectors referred to in this standard use both the functional definition and a physical description (e.g., device stub connector, terminator bus path connector)." mean?

Accepted: New wording is: 'SCSI bus connectors (e.g., device stub connector, terminator bus path connector) referred to in this standard use both the functional definition and a physical placement.'

39) I think the standard would be clearer if "The mating interface of stub connectors is considered to be the stub connection if the path between the true stub connection and the mating interface is contained wholly within the connector housing. Such connectors are termed housing-only connectors." were recast. Elsewhere "housing-only connectors." used in terms of the connection to a SCSI device which seems to be completely contrary to this definition.

Accepted: The following changes were made:

~~The mating interface of stub connectors is considered to be the stub connection if the path between the true stub connection and the mating interface is contained wholly within the connector housing. Such connectors are termed housing-only connectors.~~

The portion of the stub contained within the stub connector that has the stub connection may be ignored.

40) "This standard continues the practice of ignoring the effects of housing-only stub connectors with no device or intermediate interconnect attached since the stub length, leakage and capacitance is very small. It also ignores the effects of bus-path connectors for the same reason." should be deleted.

Accepted

41) What does "For devices that are attached to the bus path with housing-only stub connectors the contribution of the housing-only connector to the stub and load is ignored. In this case the stub begins with the device stub connector. If one adds an intermediate interconnection to connect the device to the bus path this additional interconnect (including its connectors) and the device all contribute to the stub and bus loading. This requires that the performance at the device connector be better than the minimum requirements for stub connections." mean? Does this mean that devices that meet all the mandatory requirements will not work and only better than standard devices will work? Or does this mean that devices will be presented with signals that are better than standard?

Accepted: The following changes were made:

Changed figure 4 by adding an arrow from STUB CONNECTIONS to middle device. Changed 'housing only connector' to CONNECTOR TYPICALLY CONTAINING A STUB CONNECTION.

~~For devices that are attached to the bus path with housing-only stub connectors the contribution of the housing-only connector to the stub and load is ignored. In this case the stub begins with the device stub connector. If one adds an intermediate interconnection is added to connect the device to the bus path this additional interconnect (including its connectors) and the device all contribute to the stub and bus loading. This requires that the performance at the device connector be better than the minimum requirements for stub connections system implementations that use an intermediate interconnect the parameters specified in this standard at the device connector shall apply at the stub connection. In system implementations that use an intermediate interconnect the parameters specified in this standard at the device connector shall apply at the stub connection.~~

42) Regarding Note 3 and Figure 4 is the implication that the stub beyond the terminator is a preferred configuration?

Rejected

43) I think it would be better if Figure 4 were drawn with the Terminators at both ends of the connection with all devices branching off between the terminators. I think it would also be clearer if the terminators

were drawn as little boxes similar to the devices.

Accepted in part: Boxes drawn around terminations.

44) In note 4 change "The ~~loop passes~~ the connecting point to the transceivers within the enclosure in such a manner that stub lengths are minimized." to "The loop should pass the connecting point to the transceivers within the enclosure in such a manner that stub lengths are minimized."

Accepted

45) Regarding 4.1.4 what does "Any D.C. leakage within enabled terminators is part of the performance requirements in and ..." mean?

Accepted: Added in the correct cross references.

46) "~~If either the bus termination loading or the bus loading is less than the maximum allowed, the other entity may increase its loading as long as the total for both entities does not exceed the maximum allowed.~~" This is interesting but implies a closed environment rather than an open environment and seems to be prejudicial to interoperability. This statement should be deleted or changed to "If the enabled terminators are within a SCSI device and if either the bus termination loading or the bus loading is less than the maximum allowed, the other entity may increase its loading as long as the total for both entities does not exceed the maximum allowed." However I favor the deletion since this is essentially redundant to the last paragraph of 4.1.5.

Accepted

47) In the first paragraph of 4.1.6 delete "etc." which is redundant to "e.g."

Accepted

48) In 4.1.7 change "SCSI Architecture Model-2 Standard." to "SCSI Architecture Model-2 standard."

Accepted

49) Please add Device Server and Task Manager to the glossary.

Accepted

50) In clause 5 change "This standard fully defines all the supported SCSI device connectors except the 80-contact alternative 4 non-shielded SCSI device connector and the 68-contact alternative 4 shielded SCSI device connector. Those two connectors are defined by EIA (see 2)." to "This standard defines all the supported SCSI device connectors. The 80-contact alternative 4 non-shielded SCSI device connector and the 68-contact alternative 4 shielded SCSI device connector are defined by reference to EIA standards (see 2)."

Accepted

51) Table 13 has two columns referring to Note 3 but Table 13 has only two notes.

Accepted: Changed note 3 to note 2.

52) In Clause 6 change "~~This~~ interconnect is defined as the electrical media (including connectors and passive loads) used to connect the TERMPWR, terminators, and SCSI devices in a SCSI bus." to "The interconnect is defined as the electrical media (including connectors and passive loads) used to connect the TERMPWR, terminators, and SCSI devices in a SCSI bus."

Accepted

53) Change "The function of interconnect is to carry the signals driven by SCSI device drivers and TERMPWR sources to the connectors of the receiving devices on the bus and to the terminators." to "The function of the interconnect is to carry the signals driven by SCSI device drivers and TERMPWR sources to the connectors of the receiving devices on the bus and to the terminators." But I don't think terminators drive signals. I think they bias signals. So better yet change it to "The function of interconnect is to carry the signals driven by SCSI device drivers and biased by TERMPWR sources to the connectors of the receiving devices on the bus and to the terminators."

Accepted: See Digital comment 1.

54) Editorial work is needed for "Minimum driven signals shall result in received signals that meet the requirements contained in clause 7. Signals for this requirement include TERMPWR, DB(0) thru DB(15), DB(P), DB(P1), C/D, I/O, MSG, BSY, SEL, ATN, REQ, ACK, and RESET for the A and P cable and the similar signals for the Q cable." since A cables do not include DB(8) thru DB(15) and thru is spelled through. I suggest changing the requirement to DB(0) through DB(31) and deleting "and the similar signals for the Q cable." as the other Q cable signals are covered by "include".

Accepted: See Digital comment 1. Added DB(P1), DB(P2), and DB(P3). Ended sentence after RESET.

55) Regarding the requirement in 6.1 "If twisted-pair cables are used, the twisted pairs in the cable shall be wired to physically opposing contacts in the connector." the 50 pin alternative 2 connector does not have physically opposing contacts. This requirement needs to be reworked in view of the connector alternatives and the specified contact assignments.

Rejected: The non-opposing contacts are on the backside of the connector and not actually part of standard.

56) Regarding "The items under signal name labeled TERMPWR, TERMPWRQ, and RESERVED are not signals and are not required to meet the cable characteristics for signals in 6.2." why relieve the reserved cable lines from meeting the requirements of signal lines since these lines could be assigned as signals in the future?

Accepted: RESERVED removed from sentence.

57) The note in figure 22 should allow the equal condition for both values.

Rejected: It does.

58) How is Table 17 interpreted if the SCSI devices are 24 pF? If pico Farads needs to be in the table, it is presently abbreviated two different ways both of which I believe are wrong and not consistent with the way it is abbreviated elsewhere in the document.

Accepted: Added following note to table 17:

If the SCSI device(s) have less than 25pF capacitance it may be possible to extend the path length and device count (see note 9 in 7.1.4).

59) Note 3 of Table 17 is defective.

Accepted: Changed 8 to 16.

60) What does Note 4 of Table 17 mean when in one case the maximum distance is a Note on the number of devices? Does Note 4 take precedence over Note 1 or Note 1 over Note 4?

Accepted: Wording changed as follows:

The negotiated transfer rate shall have no effect on the SE maximum distance between terminators.

61) The last paragraph of 6.5 seems to be a system requirement and not strictly a cable requirement. However I have no objection to it if the cable suppliers agree that their cables can overcome any adverse system conditions when connected. I am not suggesting that it be deleted but am asking if there is a more appropriate location for the requirement?

Accepted: Placed the paragraph into a new section titled 'SE ground offset'. Note paragraph was not moved.

62) Note 3 of Table 18 should be changed from "~~3 Values specified by the distance corresponding to the differential maximum distance between terminators shall apply even if a slower transfer rate is negotiated.~~" to "~~Values specified by the distance between terminators corresponding to the differential maximum transfer rate range shall apply even if a slower transfer rate is negotiated.~~"

Accepted

63) It is not clear whether the note in Table 20 and 21 applies to a cable or to the SCSI Bus path with devices connected. I presume it is a cable measurement since it would be problematic to connect term power to all other signals and grounds.

Accepted: Changed both notes as follows:

Media capacitance with no devices attached measured between a signal conductor and ground when all other conductors in the path are connected to ground .

64) The title of Table 22 is "~~Absolute maximum~~Electrical input requirements at the device connector" but it includes minimum requirements as well as maximum requirements.

Accepted: Changed as shown

65) I have repeatedly argued that the voltages specified in Table 22 for HVD are component specifications and are not appropriate for the SCSI environment. They merely lead to FUD about an inadvertent inclusion of another version SCSI device on the HVD bus. In addition to the likely hood that the cables would burn up with these values, if they did occur they would also occur with LVD.

Accepted: The HVD min and max numbers have been removed and replaced with a reference to ISO/IEC 8482. Removed the words after item c "= 1,0 minimum" in table 35 fast-5 row.

66) Regarding Table 23, I do not understand the concept of 20 micro amps of current for the MSE case when Vcc is being connected to both the + and - signal pins. In one instance you get many amps until maximum smoke.

Accepted: The Vcc has been replaced with 4,1 V.

67) In 7.1.1 change "CONFORMING" to "conforming".

Accepted

68) Does "f) the terminator shall not source current to the signal line whenever its terminal voltage is above 3,24 V D.C. except terminators may source current when the voltage is above 3.24 V DC in applications where the bus is less than 0,3 m." imply that terminators shall have a cable length measurement capability along with adaptive circuitry? Or is the real requirement hinge upon the D.C. resistance of the cable?

Accepted

69) I think the first paragraph of 7.1.2 should include the OR-tied exclusion for the active negation drivers.

Accepted: Added 'except for or-tied signals (see 8.3)' to the first sentence.

70) Is there a disconnect between the 48 mA of Table 24 and double the terminator current which is greater than 48 mA?

Rejected: The 48 mA current is at 0.5 Volts but the terminator is only allowed to exceed 48 mA at voltages lower than 0.5 Volts. So there is no disconnect.

71) Should the operating area of Figure 23 be increased to include the 50.8 mA resulting from the terminator specifications?

Rejected: Figure 23 has nothing to do with the terminator current it only relates to the driver negation current. So there is no need to change figure 23.

72) In the body text after Figure 23 change "because these signals are vulnerable to ~~double-clocking~~ on the true-to-false transition." to "because these signals are vulnerable to glitches on the true-to-false transition that could lead to false ACK or REQ detection."

Accepted

73) Why does Table 25 have a Note 9 but only one other note which is not numbered?

Accepted: Note 9 moved to end of table and renumbered to note 2.

74) In Note 9 the +/- should not be a subscript.

Accepted

75) Regarding the transient specification below Table 25, why are the equivalent specifications not included in the equivalent HVD and LVD sections?

There was no intent to change the HVD mode from previous standards. The LVD requirements may be defined for SPI-3.

Changed the note in table 1 as follows to cover MSE:

Note-MSE is identical to SE except for the requirements in 7.3 and table 22.

76) Change "The filter period shall not be so long as to mask out the subsequent valid transition edges of the incoming REQ/REQQ and ACK/ACKQ signals." To "If implemented, the glitch filter period shall not be so long as to mask out the subsequent valid transition edges of the incoming REQ/REQQ and ACK/ACKQ signals."

Accepted

77) Table 26 is titled "SE input and output voltage characteristics" but specifies other things such as capacitance and current.

Accepted: Changed 'voltage' to electrical'.

78) It appears that Note 10 would be more appropriate after Table 26.

Accepted

79) In Table 27 the meaning of the blank entries is not clear.

Accepted: Blank entries labeled N/A.

80) Under Figure 31 change "To compensate for the negation biasing effect of the ~~termination~~ of the 2 and 4 assertion pair is stronger than the 1 and 3 negation pair." To "To compensate for the negation biasing effect of the terminators, the 2 and 4 assertion pair is stronger than the 1 and 3 negation pair."

Accepted

81) The meaning of blank entries in Table 30 is not clear. Consider this a global comment.

Accepted: Added 'No glitch management required.' into blank entries.

82) There is an extraneous "I" in Table 31. Sorry it is not an extraneous "I" it is part of a difficult to notice absolute convention. Are taller "I"s available?

Accepted: Made | bigger.

83) Delete "Higher input resistance values are allowed if the system integrator guarantees that the resistor value chosen will overcome all leakage from devices on the bus and will therefore produce reliable SE mode detection (see table 32)." and replace it with a tolerance.

Accepted: Added in a tolerance of 200K to 250K in note of table 32. Deleted sentence.

84) Change "a) the device is capable of full logical operation for at least 100 ms, and" to "a) the device is capable of logical operation for at least 100 ms, and" since devices are not capable of full logical operation while they are in the high impedance state especially if the desired mode is single ended.

Accepted

85) The requirement that "A device shall not change its present signal driver or receiver mode based on the DIFFSENS voltage level unless a new mode is sensed continuously for at least 100 ms." Seems excessive for noise filtering and may lead to MTBF reduction. The noise filtering on the Reset line is 25 microseconds (although this does not seem to be explicitly stated in SPI-2). For greater reliability I suggest changing the requirement to "A device shall not change its present signal driver or receiver mode based on the DIFFSENS voltage level unless a new mode is sensed continuously for at least 25 micro seconds." or to "A device shall not change its present signal driver or receiver mode to a different mode other than high impedance based on the DIFFSENS voltage level unless a new mode is sensed continuously for at least 100 ms "

Rejected

86) Does 7.3.2 countermand the 100 ms requirements?

Accepted: Added the following to section 7.3.2: 'The LVD/MSE multimode transceiver shall meet the requirements in 7.2.5.2.'

87) In 7.3.2 the requirement of the second paragraph is repeated in the fifth paragraph.

Accepted: The second paragraph was deleted and the words '(except DIFFSENS)' added to last sentence of 5th paragraph.

88) Regarding 7.3.4 change "When the ~~multimode~~ alternate is implemented the signal ground connections should be through the ground drivers to allow switching to LVD mode." To "When the MSE alternate is implemented the signal ground connections should be through the ground drivers to allow switching to LVD mode."

Accepted

89) Should the 25 mA for ground drivers and the 25.4 mA for termination match by having the ground drivers at 50.8 mA? I hope not since it seems too late.

There is no requirement for those to match because there are controller ground drivers and a hard ground sinking the positive signal line. Therefore 25 mA is adequate. (No change)

90) In 7.4.1 and elsewhere is termination singular or plural. The verbs do not appear to match.

Accepted: It is singular. Change 'are' to 'is' in 2nd paragraph 2nd to last sentence.

91) In the Normative references and in Table 35 and global change EIA TIA RS-485 to ISO/IEC 8482:1993-12, Standard for Electrical Characteristics of Generators and Receivers for use in Balanced Digital Multipoint Systems.

Accepted

92) Change "Note: ~~these~~ additional requirements for driver asymmetry do not affect the operation of ~~these~~ HVD drivers at fast-20 and lower data transfer rates." To "Note: the additional requirements for driver asymmetry do not affect the operation of HVD drivers at fast-20 and lower data transfer rates."

Accepted

93) Change "~~In~~ the test circuit for testing ~~these~~ characteristics is shown in figure 39 the magnitude of the steady state differential output voltage of a fast-40 HVD driver shall comply with the following requirements:" to "The test circuit for testing the following characteristics is shown in figure 39.

The magnitude of the steady state differential output voltage of a fast-40 HVD driver shall comply with the following requirements:"

Accepted

94) What does " $1 V (|V A | \text{ or } |V N | (6 V \text{ and } 0,42 |V N | + 0,69 V (|V A | (2,49 |V N | - 1,59 V$ where $|V A |$ and $|V N |$ are defined as $V OD$ in figure 39." mean? Why does it begin with 1 V? Why are there only open brackets and no close brackets?

Accepted: The (were all changed to less than or equal symbols.

95) In Table 36 what is "The II requirement"?

Accepted: The II requirement is really I_p .

96) Change "NOTE 17 - LVD SCSI devices are not detected by HVD SCSI devices. On all HVD SCSI devices except ones that have a SCA-2 connector the signals do not match. As a result some drivers are shorted to ground therefore damage may occur to SCSI devices if a HVD SCSI device is plugged into a bus that contains LVD transceivers" to "NOTE 17 - LVD SCSI devices are not detected by HVD SCSI devices not complying to this standard. On all HVD SCSI devices except ones that have a SCA-2 connector the signals do not match. As a result some drivers are shorted to ground therefore damage may occur to SCSI devices if a HVD SCSI device is plugged into a bus that contains LVD transceivers." Including the missing period as missing periods may be problematic. The wording of Note 17 may need to be adjusted depending upon the committee's intent.

Accepted

Was it the intent that new designs of HVD not be burdened with detecting LVD while burdening LVD with detecting HVD?

It wasn't intended that DIFSENSE HVD transceivers be changed because of the new standard

because it requires a new DIFSENSE HVD transceiver.

97) Referring to Table 38 is 0.2 V dropout regulator correct or should it be a 0.2 V drop regulator?

Rejected: Dropout is the correct regulator term.

98) Change Note 18 from "NOTE 18 - SCSI devices connected with a SE A cable (table 3) ~~is~~ not able to meet the source current requirements in table 38 unless the TERMPWR conductor size is 0,080 98 mm² (28 AWG) minimum because the SE A cable contains only one TERMPWR line." To "NOTE 18 - SCSI devices connected with a SE A cable (table 3) are not able to meet the source current requirements in table 38 unless the TERMPWR conductor size is 0,080 98 mm² (28 AWG) minimum because the SE A cable contains only one TERMPWR line.

Accepted

99) In Note 19 change SCSI device to SCSI devices or to a SCSI device or to the hated an SCSI device.

Accepted

100) Change "10(F" to "10 (F". But the stated reason is correct for the low value and wrong for the high value.

Accepted: wording is now:

It is recommended that the terminator power lines be decoupled at each terminator with a bypass capacitor of at least 2,2 μ F, to improve signal quality, but not greater than 10 μ F. (see 6.3)

101) How did "The TERMPWR lines may be used for distribution of power for purposes other than for SCSI bus termination as long as the voltage delivered to the SCSI bus terminators remains adequate to supply the requirements of the terminators under all conditions of SCSI bus operation and under all conditions of other loading." become accepted? This defeats the specifications that led to "fuse" and wire size requirements.

Comment: There are applications that use term power for powering expanders and parallel port adapters.

102) Regarding Clause 8 what is the difference between an initiator and a initiator port? Equivalent question for a target port. Why add these terms?

Accepted: The initiator port and target port terms changed to initiator and target.

103) the title of 8.3.1 should be Single ended not Signal-ended.

Accepted: Changed signal ended to SE.

104) Note 22 is redundant to earlier material that already presented this concept. Delete it.

Rejected

105) In 8.4 the statement "Any signal other than BSY, SEL, and RST may employ OR-tied or non-OR-tied drivers." see ms to undo requirements of other clauses for REQ and ACK. Delete it.

Accepted: Also deleted:

There is no operational problem in mixing OR-tied and non-OR-tied drivers on signals other than BSY, SEL, and RST.

106) Regarding "No signals other than BSY, SEL, RST, and DB(P,P1,P2,P3) are simultaneously driven by two or more SCSI devices." actually the DB(0-31) signals may be if plug and play SCSI devices intended for SCAM compliant systems are installed in systems not implementing SCAM until someone changes address assignments.

Rejected

107) Is the requirement to not drive DB(0-31) false during the arbitration phase missing? It would be redundant to Table 41 as is the statement about the parity bits. It is confusing to be redundant about one signal and not the others. I always suggest removing the redundancy.

Rejected

108) Why does clause 9 state "The timing specifications in this clause may be applied to SCSI parallel interface."? This is the SCSI parallel interface.

Accepted: Sentence deleted.

109) In Figure 51 change "SEPT" to "SEP T".

Accepted

110) In 10.2 add the requirement for which the title was composed. The text makes no mention of RST.

Accepted: Added the following:

a) RST signal shall be asserted continuously by the initiator during removal or insertion.

111) In 10.3 and 10.4 (d) change "until the transceiver is enabled." to "until the transceivers are enabled."

Accepted

112) Add "g) Resumption of I/O processes is vendor specific but shall not occur sooner than 200 milliseconds after the completion of the insertion or removal event."

Accepted

113) In 10.4 change "a) All I/O processes for the SCSI device being ~~inserted or~~ removed shall be quiesced." to "a) All I/O processes for the SCSI device being removed shall be quiesced prior to removal."

Accepted

and add "h)) Initiation or resumption of I/O processes for a newly inserted or removed SCSI device is vendor specific but shall not occur sooner than 200 milliseconds after the completion of the insertion or removal event."

Accepted

114) In 10.3 and 10.4 (d) change "shall employ transceivers that conform to the requirements in 7.1.2, 7.2.2, 7.3.2, and 7.4.2 for glitch-free power on/off." to "shall employ transceivers that conform to the applicable requirements in either 7.1.2, 7.2.2, 7.3.2, or 7.4.2 for glitch-free power on/off." However take note of comment (73) that 7.2.2, 7.3.2 and 7.4.2 do not include the equivalent requirements as in 7.1.2.

Accepted

115) Why is this requirement of comment (114) included in 10.3 which presumably was structured to allow glitches? Is it concern over RST? If something like this is the concern, why is the 10.4 (g) requirement not

included in 10.3?

Accepted: g of 10.4 (case 4) was added to 10.3 (case 3).

116) Why is note 30 not in all the subclauses except 10.2?

Rejected: Because there is already a reset event because of the RST signal is asserted.

117) I thought that NCR had defined another case which caused BSY to be asserted during an insertion or removal event. Should this case be documented or have I remembered incorrectly?

Rejected: Don't know of any.

118) Since an implementor has no way to cause the bus to be in more than one phase change Clause 11 from "The SCSI bus ~~shall never be~~ in more than one phase at any given time." to "The SCSI bus phases are defined such that the SCSI bus is never in more than one phase at any given time."

Accepted

119) Referring to 11.1.1 what is the difference between "an exception condition" and "an unsuccessful task termination"? In addition does 11.1.1 in this regard conflict with 11.3 "followed by the BUS FREE phase but many such instances are error conditions"?

Accepted: Changed 'error' to 'exception condition'.

120) Which has precedence the provision that a SCSI device may go bus free at any time or the circumstances of Note 34?

Accepted: Note change to read:

Step d) above requires any device that begins arbitration phase to complete the arbitration phase to the point of SEL being asserted if it begins the arbitration phase as stated in step c). This precludes the possibility of the bus being hung.

121) There seems to be a conflict between Note 34 and Note 35. Note 34 states that it is a requirement to wait for SEL and Note 35 states that it is merely a recommendation.

Accepted: See comment 120.

122) Note 36 mistakenly states a mandatory requirement which is redundant to other clauses. This can be fixed by deleting the note or by changing it to informing and referencing the text in the body that already stated the requirement.

Accepted: Changed note into paragraph.

123) Referring to 11.1.5, have REQx and ACKx been defined somewhere?

Accepted: Yes they are defined. Changed 'refer to' to 'apply'.

124) Referring to Note 39 is it beneficial to include in the standard "An initiator is allowed to anticipate a new phase based on the previous phase, the expected new phase, and early information provided by changes in the C/D, I/O, and MSG signals. However, the anticipated phase is not valid until the REQx signal is asserted at the beginning of the next."? Does this go contrary to not being in two phases? Will everything be OK if the target changes the early information again before asserting REQ?

Accepted: Note now reads. Last two sentences have been removed.

A phase is defined as ending when the C/D, I/O, or MSG signals change after the negation of the ACKx signal. The time between the end of a phase and the assertion of the REQx signal beginning a new phase is undefined.

125) In 11.1.5.3 the term "unexpected disconnect" is used. Is it intended that "unexpected disconnect" and "unexpected bus free" be used interchangeably? Is "unexpected disconnect" a special case of "unexpected bus free" applying only after the nexus has been identified? If the answer to the latter is yes, has the standard identified this fact?

Accepted: Term 'unexpected disconnect' changed to 'unexpected bus free'.

126) I think the Target Transfer Disable message should be changed to Obsolete.

Rejected

127) I think the Terminate Task message should be changed to Obsolete.

Rejected

128) Referring to 11.7 what are "SCSI-3 interlaced protocol devices"?

Accepted: 'interlaced protocol' changed to 'parallel'.

129) Move the second period above Table 68 to above Table 67.

Accepted

130) In A.2 change "The driver requirements are defined in terms of the voltages and currents ~~defined~~ in figure 41." to "The driver requirements are defined in terms of the voltages and currents depicted in figure 41."

Accepted

131) In A.2.1 change "To assure sufficient voltage to define a valid logic state at any device connection on a fully loaded LVD bus a minimum differential output voltage shall be generated." to "~~To assure sufficient voltage to establish a valid logic state at any device connection on a fully loaded LVD bus a minimum differential output voltage shall be generated.~~" But does this prohibit generating a maximum differential output? To solve this problem make the change to "To assure sufficient voltage to define a valid logic state at any device connection on a fully loaded LVD bus at least a minimum differential output voltage shall be generated."

Accepted

132) Change "~~There shall also be upper limits to the differential output voltages and to the symmetry of the differential output voltage magnitudes between logic states to define the maximum voltage that is able to be attained and assure a first-step transition to the opposite logic state.~~" to "The SCSI device shall also comply with the upper limits for the differential output voltages and to the symmetry of the differential output voltage magnitudes between logic states in order to assure a first-step transition to the opposite logic state." Breaking this into several sentences would be even better.

Accepted

133) Does the statement "Because the applied V1 and V2 simulates the effects of the bus termination bias, the assertion drivers and negation drivers shall have different strengths to achieve the near equality in V A and V N shown in figure A.2. This test is therefore a requirement for asymmetrical drivers." add anything that has not already been specified? If yes, clarify the statement. If no, delete it. If clarifying it, different strengths are not required because of simulation and which is this test?

Accepted: Moved paragraph to above table A.2. Changed the paragraph as follows:

The assertion drivers and negation drivers require different strengths to achieve the near equality in V_A and V_N shown in figure A.2 because the applied $V1$ and $V2$ simulate the effects of the bus termination bias.

134) In A.2.2 change "This requirement is shown graphically in figure A.4." to "See figure A.4."

Accepted

135) In A.2.4 change "To limit the maximum steady-state voltage at any device connector, ~~the driver output voltage shall be restricted. The highest output voltage occurs with no output current.~~

The voltage between each output terminal of the driver circuit and its common shall be between 0 V and 3,6 V when measured in accordance with figure A.6. This requirement shall be met in all logical or high impedance states ($0\text{ V} < V_{O-(OC)} < 3,6\text{V}$ and $0\text{ V} < V_{O+(OC)} < 3,6\text{ V}$)." to

"To limit the maximum steady-state voltage at any device connector, the voltage between each output terminal of the driver circuit and its common shall be between 0 V and 3,6 V when measured in accordance with figure A.6. This requirement shall be met in all logical or high impedance states ($0\text{ V} < V_{O-(OC)} < 3,6\text{V}$ and $0\text{ V} < V_{O+(OC)} < 3,6\text{ V}$). The highest output voltage occurs with no output current." or to:

~~"To limit the maximum steady state voltage at any device connector, the voltage between each output terminal of the driver circuit and its common shall be between 0 V and 3,6 V when measured in accordance with figure A.6. This requirement shall be met in all logical or high impedance states ($0\text{ V} < V_{O-(OC)} < 3,6\text{V}$ and $0\text{ V} < V_{O+(OC)} < 3,6\text{ V}$)." "~~

Accepted

136) In A.2.5 change "The slew rates specified above are requirements for a driver when using the LVD test circuit in figure A.7 they are not the observed rise rate or fall rate that would be observed on an actual SCSI bus." to "The slew rates specified above are requirements for a driver when using the LVD test circuit in figure A.7. They are not the observed rise or fall rates on an actual SCSI bus."

Accepted:

137) Change "Measurement equipment used for ~~compliance~~ testing shall provide a bandwidth of 2 GHz minimum." to "Measurement equipment used for rise and fall rate testing shall provide a bandwidth of 2 GHz minimum."

Accepted

138) To avoid the confusion that occurred with the SE test circuit, add the device connector to all the test circuits with specified capacitance and a lack of device connector location (e.g. figure A.7).

Accepted: All test circuits in annex a will add connector symbols.

139) In (d) is 40 Hz correct? I think it should be 40 MHz.

Accepted: Should be 40 MHz.

140) Is it intended that the rise and fall times are measured with respect to the overshoot values rather than the steady state values?

Rejected: t_r is 20% of V_{SS} to 80% V_{SS} as shown in figure A.8.

141) In A.2.6 change "Measurement equipment used for ~~compliance~~ testing shall provide a bandwidth of 400 MHz minimum." to "Measurement equipment used for dynamic signal output balance testing shall provide a bandwidth of 400 MHz minimum."

Accepted

142) What does "The requirements in this section apply only to the signals that implement the state transition type." mean? When it's meaning is clarified if it remains change section to clause or subclause depending upon the meaning.

Accepted: The sentence now reads:

The requirements in this subclause apply only to the applicable state transitions. ~~signals that implement the state transition type.~~

143) In A.3 change "Table A.5 defines the voltages and currents used for the requirements in this ~~section.~~" to "Table A.5 defines the voltages and currents for the requirements in this subclause."

Accepted

144) In Table A.6 with reference to voltages "(input voltage - referenced to circuit common)" the "-" is confusing. I suspect this should be "(input voltage referenced to circuit common)".

Accepted

145) What is the purpose of A.3.3? Is it only to add another note to the standard?

Yes

146) In A.4.1 delete "The limits in this subclause will be controlled by table 22 in all cases."

Accepted

147) What does "The maximum applicable current from table 22 is I_{max} ." mean?

Accepted: Form changed to from.

148) Because of "Transceiver output/input currents, I_{I-L} and I_{I+L} " and because of the definition of "off" it is very confusing what is being measured.

Accepted: Sentence now reads :

With the transceiver in an off condition (i.e., not transmitting) and the + and - signals connected to a variable voltage source, $V_{applied}$, the output leakage currents I_{I-L} and I_{I+L} shall not exceed the applicable values in table 22 over the range $0,00\text{ V} \leq V_{applied} \leq 3,6\text{ V}$ (see figure A.11). The maximum applicable current from table 22 is I_{max} .

149) Change "NOTE 54 - SCAM devices with assigned ID's neither recognize, respond to nor initiate SCAM selection." to "NOTE 54 - SCAM devices with assigned ID's neither recognize, respond to, nor initiate SCAM selection."

Accepted

150) In Figure B.1 for HVD and LVD devices what does "Note - Signals are shown asserted low." mean. Does it mean asserted towards the bottom of the page?

Accepted: Added 'asserted' to figure B.1.

151) The mandatory requirement of Note 66 needs to be moved to the body text.

Accepted

152) With regard to C.2 is "~~The SCSI parallel protocol~~ requires that between ~~3000~~ nsec and 3600 nsec from ~~RST~~ being released, the SCSI ID for all arbitrating SCSI devices shall appear on the bus." true? I think the only requirements are to not place the SCSI ID on the bus before a specified time. As far as I know the SCSI devices can take 37 weeks after the release of RST to first put their IDs on the bus.

Accepted: The sentence has been changed as follows: 'This standard requires that between 2800 nsec (bus settle delay+bus free delay+bus set delay) and 3600 nsec (bus settle delay+bus free delay+arbitration delay) from BSY and SEL being released, the SCSI ID for all arbitrating SCSI devices shall appear on the bus.'

153) In Note 71 I think "the arbitration process which ~~could~~ immediately precede a subsequent arbitration which this SCSI device may participate in." should be changed to "the arbitration process which immediately precedes a subsequent arbitration which this SCSI device may participate in."

Accepted

154) Change "The fairness algorithm shall be ~~followed~~ as described in the following steps:" to "The fairness algorithm shall be accomplished as described in the following steps:" or to "~~The fairness algorithm shall be per the following steps:~~"

Accepted

155) With regard to "3) Remove SCSI IDs greater than or equal to the SCSI devices own SCSI ID from fairness register." how can there be an equal ID? Does this algorithm also provide a method to double the number of targets on the bus?

Accepted: Changed 3 to:

Remove SCSI IDs greater than the SCSI devices own ID and the SCSI devices own ID from fairness register.

156) In the second step (2) and (3) change "This ~~insures~~ that this SCSI device" to "This ensures that this SCSI device". But what does "This insures that this SCSI device does unfairly participate in consecutive arbitrations, (as the case for a multi-LUN SCSI device or queueing implementations)." mean?

Accepted: Changed 'does unfairly' to 'does not unfairly'.

157) I think Note 73 is describing requirements stated elsewhere. If this is the case reword it to eliminate the "shall". Otherwise move the requirement to the body text.

Accepted: Shalls removed

158) I think Note 74 should be moved to after the third step (2) to make it clear that step (4) has substance.

Accepted: Moved the note to down after 4-2.

159) May a device which is permanently configured as device 0 claim compliance with the fairness algorithm without implementing it?

Yes

160) Add ASTM D-4566 to the informative references.

Accept: Added 'Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable. ASTM D-4566' to informative references.

161) Change "NOTE 77 - NOTE: The details" to "NOTE 77 - The details".

Accepted

162) Reword Annex I to eliminate the eight "must"s.

Accepted: Changed the musts to shalls and made this annex normative.

163) Clause 1 physical interconnects should include SPI.

Rejected: SPI is not required for this standard.

164) Change "3.1.1 A cable: A 50-conductor cable (see 3.1.45 and 3.1.51) that provides an primary 8-bit DATA BUS and control signals." to "3.1.1 A cable: A 50-conductor cable (see 3.1.45 and 3.1.51) that provides a primary 8-bit DATA BUS and control signals."

Accepted

165) Change "3.1.14 connection: An initial connection or reconnection. A connection only occurs between one initiator and one target on the same bus. A connection begins with an initial connection or a reconnection and n ends with the next disconnect." to "3.1.14 connection: An initial connection or reconnection. A connection only occurs between one initiator and one target on the same bus. A connection begins with an initial connection or a reconnection and ends with the next disconnect."

Accepted: This is a GEM repeat. See GEM 23.

166) But even after deleting the extraneous "n" the connection definition is a circular definition.

Accepted: The term connection, as used in the protocol section, has been renamed to 'initial connection and/or reconnection. The term 'connection' has been removed from the glossary.

167) Regarding "3.1.19 driver: The circuitry used to force the state of the bus." in some cases drivers do not force both states of the bus. The OR-tied drivers do not force the false state.

Accepted: Changed the word 'force' to 'control'.

168) Change "3.1.21 fast-5: Negotiated to receive synchronous data at a transfer rate less than or equal 5 megatransfers per second. Note: Previous SCSI standards referred to this transfer rate as slow." to "3.1.21 fast-5: Negotiated to receive synchronous data at a transfer rate less than or equal to 5 megatransfers per second. Note: Previous SCSI standards referred to this transfer rate as slow."

Accepted

169) Shouldn't there be some explanation of the relationship of nexus and task?

Accepted: Added 'A task causes the nexus to be generated' to task glossary definition. Added 'This relationship is formed as the result of a task.' to nexus glossary definition.

170) Regarding 3.1.78 is it true that all upper level protocols are application specific. Are SCSI drivers not upper level protocols?

Accepted: Removed 'application specific'.

171) Add EIA 364-23A (low-level contact resistance test procedure for electronic connectors) as a

normative reference.

Accepted

172) Regarding clause 6.5 shouldn't there be a reference to a figure which shows what the cable core is?

Rejected: We had one but it was considered too restrictive and therefore was removed.

173) In 7.3.1 "A multimode terminator switches to the termination mode that is appropriate for the bus based on the value of the DIFFSENS input voltage." should be changed to "A multimode terminator shall switch to the termination mode that is appropriate for the bus based on the value of the DIFFSENS input voltage."

Accepted

174) Regarding Note 12, is "conventional single-ended" defined somewhere?

Accepted: Removed 'conventional'.

Comments attached to No ballot from Robert Snively of Sun Microsystems Computer Co:

1)Intro, Abstract, Clause 1: Documents this standard will replace.

At present, there is no mention in the abstract, scope, or introduction of precisely which documents this standard is to replace. While it is implicit from the list of physical interconnects that SCSI-2, SPI, SPI amendment, SIP, and Fast-20 are replaced by this document, it is nowhere explicit that this is true. It would be helpful to the user to have this information made explicit.

That issue has been deferred until this standard has moved forward. (i.e., after public review)

2)3.2, 7.0, 7.1, 7.2, and 7.3 "MSE" and special requirements.

MSE is defined as multimode single ended in the abbreviation section. No hint is given as to what those modes might be.

In section 7.0, this nomenclature is again used while defining allowable input voltage ranges. Notable by its absence from tables 22 and 23 is a specification for non-multimode Single Ended operation.

However, a new term is invented in section 7.3 to describe what I believe is the intent of the term MSE. That term is "LVD/SE multimode" alternative. Reference is made to a multimode terminator and a multimode transceiver. No additional parameters are provided, because it is assumed that when operating in single ended mode, the single ended parameters should be used.

It seems to me that the simplest mechanism to resolve this is to remove the concept of "multimode single ended" and simply recognize that multimode transceivers shall meet the single-ended requirements. This requirement is already met, although rather unclearly, for fast-5 and fast-10 in table 22 and 23. For fast-20, there appears to be an explicit requirement in table 22 that disallows the presence of any fast-5 or fast-10 devices on the same bus. I do not believe that is the intent, since speed behavior can be negotiated once a device is installed. I believe that to make all this work properly, the MSE input voltage specified in table 22 will also have to be increased to 5.5 volts.

An alternative solution is to create a new definition for fast-20 single-ended that is incompatible with fast-5 and fast-10 operation, while still eliminating the concept of MSE. Then multimode transceivers supporting fast-5 and fast-10 LVD and SE would support "slow single ended" parameters, while multimode transceivers supporting fast-20 LVD and SE would support "fast single ended" parameters. I believe that

this solution is undesirable.

Accept: Added SE into table 22. Changed the term SE to MSE in several places in section 7.3. The following has been added:

0.0.1 multimode single-ended (MSE): A signalling alternative for multimode SCSI devices that employs MSE (see 7.3) drivers and receivers to allow multimode SCSI devices to operate when SE SCSI devices are present on the bus.

Removed the following from section 7.3.4:

~~When the SE alternate is implemented the signal ground connections are provided by a hard ground.~~

Changed section 7 to read as follows:

The SCSI parallel interface may use the following transmitter implementations:

- a) SE passive negation;
- b) SE active negation;
- c) HVD;
- d) LVD.

LVD/MSE transmitters support SE active negation. LVD/MSE device may be damaged if exposed to SE passive negation voltages.

If a transceiver fully complies with the requirements of more than one of the above transmitter implementations then it may interoperate with those transceiver types.

The SE and HVD alternatives are electrically incompatible and cannot operate on the same bus.

The LVD and HVD alternatives are mutually exclusive and damage may occur to SCSI devices if a HVD SCSI device is plugged into a bus that contains LVD transceivers (see 7.4).

For each transmitter implementation one or more different receiver and capacitance specifications may apply.

Table 22 was changed as follows:

Table 1 - Electrical input requirements at the device connector

Value	Minimum	Maximum	Notes
<u>SE (passive negation) input voltage</u>	-0,5 V D.C.	5,5 V D.C.	Absolute maximum at all operating conditions, including the DIFFSENS connection for <u>SE (passive negation)</u> SCSI devices meeting the fast-5 and fast-10 requirements in table 2.
<u>SE (active negation) and MSE input voltage</u>	-0,5 V D.C.	4,1 V D.C.	Absolute maximum at all operating conditions, including the DIFFSENS connection for <u>SE (active negation)</u> , and LVD/MSE SCSI devices, for SCSI devices meeting the fast-20 requirements in table 2.
LVD input voltage (D.C. V + or - signal to local ground)	-0,5 V D.C.	4,1 V D.C.	Absolute maximum at all operating conditions all signals except DIFFSENS.
HVD input voltage (D.C. V + or - signal to local ground)			<u>See the ISO/IEC 8482:1993-12</u> for the absolute maximum at all operating conditions.
HVD input voltage DIFFSENS	-7 V	17.25 V	Absolute maximum at all operating conditions.

Table 24 was changed as follows:

Table 2 - SE steady state output voltage characteristics

Driver Type	Maximum transfer rate	SE steady state output voltage characteristics
Passive negation	Fast-5, Fast-10	a) V_{OL} (low-level output voltage) = 0,0 V D.C. to 0,5 V D.C. at $I_{OL} = 48$ mA (signal asserted); b) V_{OH} (high-level output voltage) = 2,5 V D.C. to 5,25 V D.C. (signal negated)
Active negation	Fast-5, Fast-10, Fast-20	a) V_{OL} (low-level output voltage) = 0,0 V D.C. to 0,5 V D.C. at $I_{OL} = 48$ mA (signal asserted); b) V_{OH} (high-level output voltage) = 2,5 V D.C. to 3,7 V D.C. (signal negated)
Note: SE steady state output voltage characteristics specified by transfer rate shall apply even if a slower transfer rate is negotiated.		

The following note was added to tables 25 and 26:

All values apply to both active negation and passive negation devices.

3)3.3.5, obsolete keyword is unused.

The "obsolete" keyword is unused at present. I actually believe it should be used for a few cases (see 9

below).

Accepted: The term obsolete removed from list.

4)Section 7.1.4, Table 26

It appears to me that this table is mis-titled and some of the notes are inappropriate. The table references input and output voltage when it should be referencing capacitance.

Accepted: Name and note changed see GEM 77.

5)Section 8.1, signal descriptions

In the description of REQ, REQQ, ACK, and ACKQ, the plural form "buses" is used where the possessive form "bus's" should be used. This is also true in

Accepted

6)Section 8.3.3, differential description

In the single ended description the "released" state is defined. This state is equally relevant in the differential case, but is inadvertently omitted.

Accepted: Added 'A signal that is released goes to the false state because the bias of the terminator pulls the signal false.' to section 8.3.3.

7)Section 9.1, reference to LVD timing requirements

In the timing description, a reference to Table 29 should be made so that people understand that there are additional timing requirements not specified in this section that are very important to proper operation. Historically, the LVD glitches have also been found in some HVD implementations.

Accepted: The following wording has been added to section 9

Timing requirements relating to glitches are defined in clause 7.2.4.1.

8)Section 10, introductory text inadequate

It should be clearly noted in this section that these cases are distinguished for compatibility reasons and in most cases describe a system environment independent of the SCSI standard. This is a taxonomy to be used by SCSI implementors, not a standards requirement.

Accepted: Wording now states:

It should also be noted that the cases listed are distinguished for compatibility reasons and in most cases describe a system environment independent of this standard.

9)Section 11.5.2, Some link control message codes should be obsolete

The CONTINUE TASK and TARGET TRANSFER DISABLE link control message codes should be promoted to obsolete. In practice, they have been rarely used and have frequently resulted in vendor specific work-arounds to make them operate correctly. The precise use of these messages and the precise relationship to other machine states is incompletely defined and may result in non-interoperable SCSI devices. This is made amply clear by the cautions and warnings associated with each of these commands.

Rejected

10)11.5.4.2, ABORT TASK SET

The ABORT TASK SET message is defined as fulfilling the requirements of SAM. However, SAM-2 allows a variant in the definition of task set which is very important and should also be referenced.

Accepted: Replaced SAM with SAM-2.

11)Table 64, Term Routing

It is not quite clear what "term routing" means. Perhaps a fuller explanation of what is intended would make this clearer. My first guess from the context and from my general SCSI knowledge is that the routing refers to where the object is first known and to the users of that object, but any number of other conflicting interpretations may be equally intended. Curiously enough, many of the terms are not used within the body of this standard at all, but are only used in the description of the procedures already defined by SAM. An example is "command byte count". I assume that these are included just so that the parallels with SAM can be defined without requiring reference to SAM.

Accepted: Added the following wording:

The routing shows:

- a) the originating object of the term,**
- b) the object that is the final destination of the term, and**
- c) the objects that the term moves through to reach the final destination object.**

12)Annex B, SCAM should be obsolete

SCAM should be obsoleted. It unnecessarily adds to the cost of disk devices that do not otherwise require it.

Rejected: The committee has voted more than once to keep SCAM.

13)Annex K, overlapped commands I believe "overlapped command" is the SCSI-2 term and "incorrect initiator connection" is the SPI-2 term.

Accepted: Overlapped command and incorrect initiator connection are used the same way in SPI-2 and SCSI-2 so the line was removed from the table.

14)Annex C, 4th paragraph, correction of first sentence."of it's" should be " if its".

Accepted

15)Annex C, 5th paragraph, correction of possessive. "it's" should be "its".

Accepted

16)Annex C, Clause C3, Step 5), substep 4), Note 77, last sentence "it's" should be "its".

Accepted

Comments received after letter ballot closed:

1) Change the 0.5 capacitance to 1.5.

Accepted - Changed the 0,5 maximum in table 29 and table 37 to 1,5 pf. and the following note was added to the table footnote:

note:

It is recommended that implementors design capacitive loads to be as small as practical.

2) Changed section 11.5.3 to read as follows:

Two byte task attribute messages are used to specify an identifier, called a tag, for a task which establishes the I_T_L_Q nexus. The TAG field is an 8-bit unsigned integer assigned by the application client and sent to the initiator in the send SCSI command phase. The tag for every task for each I_T_L nexus shall be uniquely assigned by the application client. There is no requirement for the task manager to check whether a tag is currently in use for another I T L nexus. If the task manager check and receives a tag that is currently in use for the I_T_L nexus, then it shall respond as defined in 11.6.2. A tag becomes available for reassignment when the task ends. The numeric value of a tag is arbitrary, providing there are no outstanding duplicates, and has no effect on the order of execution.

3) Changed table 26 fast-20 a) to as follows:

a) I_L (Leakage current) = -20 μ A to + 20 μ A at $V_I = 0,0$ V D.C. to 4,1 V D.C. (high-impedance state);

4) In table 35 the fast-20 and fast-40 rows have the following requirement added:

a) V_{OD} (HVD output voltage) = 1,0 V minimum;