

Date: January 13, 2005  
To: T10 Technical Committee  
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Subject: SAS-1.1 External Cable Electrical Specification

The attached proposal defines the electrical specification for the SAS 4x external cable assembly. The values in the table are common with the electrical specification for the similar cable assembly defined by SATAii.

Rev 0: Initial draft. Only includes the specification table and applicable notes, many in the same format as proposal 04-195r5, SAS-1.1 Internal Wide Connector/Cable Electrical Requirements. This revision does not include text references that will be proposed to be included in earlier paragraphs of Section 5. The table may eventually be combined with the internal wide cable specification to reduce note duplication.

Rev 1: Updated table to correct insertion loss value, updated crosstalk to add two frequency ranges and aggressor pair locations.

Proposed additional table below:

**Table xx. External cable/connector impedance requirements**

<b>Requirement</b>	<b>Units</b>	<b>1,5 Gbps</b>	<b>3,0 Gbps</b>
Time domain reflectometer rise time <sup>a,b</sup>	ps	70 (max)	70 (max)
<b>Media (cable)</b>			
Differential impedance <sup>b,c,d</sup>	ohm	100 +/- 5	100 +/- 5
Differential impedance imbalance <sup>b,c,d,e</sup>	ohm	+/- 5	+/- 5
Common mode impedance <sup>b,c,d</sup>	ohm	32,5 +/- 7,5	32,5 +/- 7,5
<b>Mated connectors</b>			
Differential impedance <sup>b,c,d</sup>	ohm	100 +/-10	100 +/-10
<b>Mated cable assembly</b>			
Maximum insertion loss <sup>b,f</sup>	dB	16	16
Maximum near-end crosstalk <sup>b,f,g,k</sup>	dB	-30	-30
Maximum near-end crosstalk <sup>b,f,g,l</sup>	dB	-36	-36
Maximum near-end crosstalk <sup>b,f,g,m</sup>	dB	-40	-40
Maximum near-end crosstalk <sup>b,g,k,n</sup>	dB	-24	-24
Maximum near-end crosstalk <sup>b,g,l,n</sup>	dB	-30	-30
Maximum near-end crosstalk <sup>b,g,m,n</sup>	dB	-40	-40
Maximum rise time <sup>b,g,h</sup>	ps	150	150
Maximum inter-symbol interference <sup>b,j</sup>	ps	60	60
Maximum intra-pair skew <sup>b,g,j</sup>	ps	20	20

**Notes:**

- a) Filtering may be used to obtain the equivalent rise time. The filter consists of the two-way launch/return path of the test fixturing, two-way launch/return path of the test cable, and the software or hardware filtering of the time domain reflectometer scope. The equivalent rise time is the rise time of the time domain reflectometer scope output after application of all filter components. When configuring software or hardware filters of the time domain reflectometer scope to obtain the equivalent rise time, filtering effects of test cables and test fixturing shall be included.
- b) All measurements are made through mated connector pairs.
- c) The media impedance measurement identifies the impedance mismatches present in the media when terminated in its characteristic impedance. This measurement excludes mated connectors at both ends of the media, when present, but includes any intermediate connectors or splices. The mated connectors measurement applies only to the mated connector pair at each end, as applicable.
- d) Where the media has an electrical length of > 4 ns the procedure detailed in SFF-8410, or an equivalent procedure, shall be used to determine the impedance.
- e) The difference in measured impedance to ground on the plus and minus terminals on the interconnect, transmitter or receiver, with a differential test signal applied to those terminals.
- f) The range for this frequency domain measurement is 10 MHz to 2250 MHz.
- g) The far end of the mated cable assembly shall be terminated in its characteristic impedance. Insertion loss variations (i.e. cable length) may change the measurement result.
- h) Connect the TDR step impulse response generators to the near end of the cable assembly and measure the output rise time at the far end. The input rise time shall be 35 ps maximum.
- i) The procedure detailed in SFF-8410, or an equivalent procedure, shall be used to determine the intra-pair skew.
- j) Measured DJ at the far end of the cable assembly under test using a lone bit pattern at 3,0 Gbps.
- k) Crosstalk from aggressor pairs offset by one position (adjacent).
- l) Crosstalk from aggressor pairs offset by two positions.
- m) Crosstalk from aggressor pairs offset by more than two positions.
- n) The range for this frequency domain measurement is 2250 MHz to 4500 MHz.