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INTERNATIONAL STANDARD

colour inside

Information technology – Small computer system interface (SCSI) – Part 153: Serial attached SCSI - 2.1 (SAS-2.1)



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INTERNATIONAL STANDARD

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Information technology – Small computer system interface (SCSI) – Part 153: Serial attached SCSI - 2.1 (SAS-2.1)

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CONTENTS

FOREWORD 10
INTRODUCTION 12
General 12
SCSI standards family 12
1 Scope 14
2 Normative references 14
3 Terms, definitions, symbols, abbreviations, keywords, and conventions 16
3.1 Terms and definitions 16
3.2 Symbols and abbreviations 28
3.2.1 Abbreviations 28
3.2.2 Units 30
3.2.3 Symbols 30
3.2.4 Mathematical operators 31
3.3 Keywords 32
3.4 Editorial conventions 33
4 General 34
4.1 Physical links and phys 34
4.2 Phy test functions 34
5 Physical layer 35
5.1 Physical layer overview 35
5.2 Conventions for defining maximum limits for S-parameters 35
5.3 Compliance points 36
5.4 Interconnects 45
5.4.1 SATA connectors and cable assemblies 45
5.4.2 SAS connectors and cables 46
5.4.3 Connectors 49
5.4.4 Cable assemblies 94
5.4.5 Backplanes 118
5.5 TxRx connection characteristics 119
5.5.1 TxRx connection characteristics overview 119
5.5.2 TxRx connection general characteristics 120
5.5.3 Passive TxRx connection S-parameter limits 120
5.5.4 Passive TxRx connection characteristics for untrained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s 122
5.5.5 Passive TxRx connection characteristics for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s 123
5.5.6 TxRx connection characteristics for active cable assemblies 124
5.6 Test loads 126
5.6.1 Test loads overview 126
5.6.2 Zero-length test load 127
5.6.3 TCTF test load 129
5.6.4 Low-loss TCTF test load 133
5.6.5 Reference transmitter test load 134
5.7 Transmitter device and receiver device electrical characteristics 139

5.7.1 General electrical characteristics 139
5.7.2 Transmitter device and receiver device transients 139
5.7.3 Eye masks and the jitter transfer function (JTF) 140
5.7.4 Transmitter device characteristics 144
5.7.5 Receiver device characteristics 155
5.7.6 Spread spectrum clocking (SSC) 170
5.7.7 Non-tracking clock architecture 173
5.8 READY LED signal electrical characteristics 173
5.9 Out of band (OOB) signals 175
5.9.1 OOB signals overview 175
5.9.2 Transmitting OOB signals 176
5.9.3 Receiving OOB signals 178
5.9.4 Transmitting the SATA port selection signal 179

Annex A (normative) – Jitter tolerance pattern (JTPAT) 180

Annex B (normative) – SASWDP 182

Annex C (informative) – StatEye 190

Annex D (informative) – Signal performance measurements 232

Annex E (informative) – Description of the included Touchstone models 253

Annex F (informative) – Mini SAS 4x active cable assembly power supply and voltage detection circuitry 259

Annex G (informative) – SAS icons 260

Bibliography 262

Figure 1 – SCSI document relationships 12
Figure 2 – ATA document relationships 13
Figure 3 – Physical links and phys 34
Figure 4 – Maximum limits for S-parameters definitions 36
Figure 5 – External cable assembly CT compliance points and CR compliance points 38
Figure 6 – Backplane with SAS Drive connector IT compliance points and IR compliance points 39
Figure 7 – Backplane with SAS Drive connector compliance points with SATA phy attached 40
Figure 8 – SAS multilane internal cable assembly IT compliance points and IR compliance points 41
Figure 9 – SAS multilane internal cable assembly and backplane IT compliance points and IR compliance points 42
Figure 10 – SAS multilane internal cable assembly and backplane IT compliance points and IR compliance points with SATA device attached 43
Figure 11 – SAS Drive cable assembly IT compliance points and IR compliance points 44
Figure 12 – SATA connectors and cables 45
Figure 13 – SAS Drive cable environments 46
Figure 14 – SAS Drive backplane environment 46
Figure 15 – SAS external cable environment 47
Figure 16 – SAS internal symmetric cable environment - controller to backplane 47
Figure 17 – SAS internal symmetric cable environment - controller to controller 47
Figure 18 – SAS internal controller-based fanout cable environment 48
Figure 19 – SAS internal backplane-based fanout cable environment 48
Figure 20 – SAS Drive plug connector 51
Figure 21 – Single-port SAS Drive cable receptacle connector 52
Figure 22 – Dual-port SAS Drive cable receptacle connector 52
Figure 23 – SAS Drive backplane receptacle connector 53
Figure 24 – Micro SAS plug connector 55
Figure 25 – Micro SAS receptacle connector 55
Figure 26 – SAS 4i cable receptacle connector 57
Figure 27 – SAS 4i plug connector 57
Figure 28 – Mini SAS 4i cable plug connector 60
Figure 29 – Mini SAS 4i receptacle connector 60
Figure 30 – Mini SAS HD 4i cable plug connector 63
Figure 31 – Mini SAS HD 8i cable plug connector 64
Figure 32 – Mini SAS HD 4i receptacle connector 65
Figure 33 – Mini SAS HD 8i receptacle connector 66
Figure 34 – Mini SAS 4x cable plug connector 69
Figure 35 – Mini SAS 4x cable plug connector for untrained 1.5 Gbit/s and 3 Gbit/s that attaches to an enclosure out port or an enclosure in port 70
Figure 36 – Mini SAS 4x cable plug connector for untrained 1.5 Gbit/s and 3 Gbit/s that attaches to an enclosure out port 71
Figure 37 – Mini SAS 4x cable plug connector for untrained 1.5 Gbit/s and 3 Gbit/s that attaches to an enclosure in port 71
Figure 38 – Mini SAS 4x cable plug connector for trained 1.5 Gbit/s and 3 Gbit/s that attaches to an enclosure out port or an enclosure in port 72
Figure 39 – Mini SAS 4x cable plug connector for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s that attaches to an enclosure out port 72

Figure 40 – Mini SAS 4x cable plug connector for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s that attaches to an enclosure in port 73
Figure 41 – Mini SAS 4x active cable plug connector that attaches to an enclosure out port or an enclosure in port 73
Figure 42 – Mini SAS 4x active cable plug connector that attaches to an enclosure out port 74
Figure 43 – Mini SAS 4x active cable plug connector that attaches to an enclosure in port 74
Figure 44 – Mini SAS 4x receptacle connector 75
Figure 45 – Mini SAS 4x receptacle connector - end device or enclosure universal port for untrained 1.5 Gbit/s and 3 Gbit/s 76
Figure 46 – Mini SAS 4x receptacle connector - enclosure out port for untrained 1.5 Gbit/s and 3 Gbit/s 77
Figure 47 – Mini SAS 4x receptacle connector - enclosure in port for untrained 1.5 Gbit/s and 3 Gbit/s 77
Figure 48 – Mini SAS 4x receptacle connector - end device or enclosure universal port for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s and for untrained 1.5 Gbit/s and 3 Gbit/s . 78
Figure 49 – Mini SAS 4x receptacle connector - enclosure out port for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s and for untrained 1.5 Gbit/s and 3 Gbit/s 78
Figure 50 – Mini SAS 4x receptacle connector - enclosure in port for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s and for untrained 1.5 Gbit/s and 3 Gbit/s 79
Figure 51 – Mini SAS 4x active receptacle connector - end device or enclosure universal port .. 79
Figure 52 – Mini SAS 4x active receptacle connector - enclosure out port 80
Figure 53 – Mini SAS 4x active receptacle connector - enclosure in port 80
Figure 54 – Mini SAS HD 4x cable plug connector 84
Figure 55 – Mini SAS HD 8x cable plug connector 85
Figure 56 – Mini SAS HD 4x receptacle connector 86
Figure 57 – Mini SAS HD 8x receptacle connector 87
Figure 58 – Mini SAS HD 16x receptacle connector 87
Figure 59 – QSFP+ cable plug connector 90
Figure 60 – QSFP+ receptacle connector 91
Figure 61 – Single-port SAS Drive cable assembly 94
Figure 62 – Dual-port SAS Drive cable assembly 95
Figure 63 – SAS internal symmetric cable assembly - SAS 4i 96
Figure 64 – SAS internal symmetric cable assembly - Mini SAS 4i 97
Figure 65 – SAS internal symmetric cable assembly - Mini SAS HD 4i 98
Figure 66 – SAS internal symmetric cable assembly - Mini SAS HD 8i 99
Figure 67 – SAS internal symmetric cable assembly - SAS 4i to Mini SAS 4i with vendor specific sidebands 100
Figure 68 – SAS internal symmetric cable assembly - SAS 4i controller to Mini SAS 4i backplane with SGPIO 101
Figure 69 – SAS internal symmetric cable assembly - Mini SAS 4i controller to SAS 4i backplane with SGPIO 102
Figure 70 – SAS internal symmetric cable assembly - Mini SAS 4i to Mini SAS HD 4i 103
Figure 71 – SAS internal controller-based fanout cable assembly - SAS 4i 105
Figure 72 – SAS internal controller-based fanout cable assembly - Mini SAS 4i 106
Figure 73 – SAS internal controller-based fanout cable assembly - Mini SAS HD 4i 107
Figure 74 – SAS internal backplane-based fanout cable assembly - SAS 4i 108
Figure 75 – SAS internal backplane-based fanout cable assembly - Mini SAS 4i 109

Figure 76 – SAS internal backplane-based fanout cable assembly - Mini SAS HD 4i 110
Figure 77 – Mini SAS 4x external cable assembly 111
Figure 78 – Mini SAS 4x active external cable assembly 112
Figure 79 – SAS external cable assembly with Mini SAS 4x cable plug connectors 113
Figure 80 – SAS external cable assembly - Mini SAS HD 4x 114
Figure 81 – SAS external cable assembly with Mini SAS HD 4x cable plug connectors 115
Figure 82 – SAS external cable assembly - Mini SAS HD 8x 116
Figure 83 – SAS external cable assembly with Mini SAS HD 8x cable plug connectors 117
Figure 84 – SAS external cable assembly - Mini SAS HD 4x to Mini SAS 4x 118
Figure 85 – Passive TxRx connection $|S_{DD22}|$, $|S_{CD22}|$, $|S_{CD21}|$, and NEXT limits 122
Figure 86 – Example passive TxRx connection compliance testing for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s 123
Figure 87 – Active cable S-parameter limits 126
Figure 88 – Zero-length test load for transmitter device compliance point 127
Figure 89 – Zero-length test load for receiver device compliance point 127
Figure 90 – Zero-length test load $|S_{DD21}(f)|$ requirements 128
Figure 91 – TCTF test load 129
Figure 92 – TCTF test load $|S_{DD21}(f)|$ and ISI loss requirements at IT for untrained 3 Gbit/s ... 130
Figure 93 – TCTF test load $|S_{DD21}(f)|$ and ISI loss requirements at CT for untrained 3 Gbit/s .. 131
Figure 94 – TCTF test load $|S_{DD21}(f)|$ and ISI loss requirements at IT for untrained 1.5 Gbit/s 132
Figure 95 – TCTF test load $|S_{DD21}(f)|$ and ISI loss requirements at CT for untrained 1.5 Gbit/s 133
Figure 96 – Low-loss TCTF test load 133
Figure 97 – Low-loss TCTF test load $|S_{DD21}(f)|$ and ISI loss requirements 134
Figure 98 – Reference transmitter test load $|S_{DD21}(f)|$ up to 6 GHz 135
Figure 99 – Reference transmitter test load pulse response 136
Figure 100 – Reference transmitter test load impulse response 137
Figure 101 – Reference transmitter test load D24.3 response 138
Figure 102 – Transmitter device transient test circuit 140
Figure 103 – Receiver device transient test circuit 140
Figure 104 – Transmitter device eye mask 142
Figure 105 – Receiver device eye mask 142
Figure 106 – Deriving a receiver device jitter tolerance eye mask for untrained 1.5 Gbit/s and 3 Gbit/s 143
Figure 107 – Transmitter device common mode voltage limit 149
Figure 108 – Transmitter device $|S_{CC22}|$, $|S_{DD22}|$, and $|S_{CD22}|$ limits 151
Figure 109 – Reference transmitter device 152
Figure 110 – Reference transmitter device termination S-parameters 153
Figure 111 – Transmitter equalization measurement 154
Figure 112 – Applied SJ for untrained 1.5 Gbit/s and 3 Gbit/s 160
Figure 113 – Receiver device $|S_{CC11}|$, $|S_{DD11}|$, and $|S_{CD11}|$ limits 162
Figure 114 – Reference receiver device 163
Figure 115 – Reference receiver device termination S-parameters 164
Figure 116 – Stressed receiver device jitter tolerance test block diagram 165
Figure 117 – Stressed receiver device jitter tolerance test D24.3 eye opening 167
Figure 118 – Applied SJ for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s without SSC support 168

Figure 119 – Applied SJ for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s with SSC support 169
Figure 120 – Center-spreading tolerance buffer 173
Figure 121 – OOB signal transmission 177
Figure 122 – SATA port selection signal 179
Figure C.1 – StatEye result 230
Figure D.1 – A simple physical link 232
Figure D.2 – Transmitter device details 233
Figure D.3 – Receiver device details 234
Figure D.4 – De-embedding of connectors in test fixtures 236
Figure D.5 – Measurement conditions for signal output at the transmitter device 237
Figure D.6 – Transmitter device signal output measurement test fixture details 237
Figure D.7 – Measurement conditions for signal tolerance at the transmitter device 238
Figure D.8 – Calibration of test fixture for signal tolerance at the transmitter device 238
Figure D.9 – Measurement conditions for signal output at the receiver device 239
Figure D.10 – Measurement conditions for signal tolerance at the receiver device 239
Figure D.11 – Calibration of test fixture for signal tolerance at the receiver device 240
Figure D.12 – S-parameter port naming conventions 241
Figure D.13 – Four single-ended port or two differential port element 242
Figure D.14 – S-parameters for single-ended and differential systems 242
Figure D.15 – Measurement conditions for S_{22} at the transmitter device connector 243
Figure D.16 – Measurement conditions for S_{11} at the receiver device connector 244
Figure D.17 – Measurement conditions for S_{11} at IT or CT 245
Figure D.18 – Measurement conditions for S_{22} at IR or CR 246
Figure E.1 – Reference transmitter device and reference receiver device termination circuit model 253
Figure E.2 – Generic return loss circuit model 255
Figure E.3 – Generic return loss model $|S_{11}|$ 256
Figure E.4 – Reference transmitter test load measurement setup 257
Figure E.5 – Reference transmitter test load $|S_{DD21}(f)|$ up to 20 GHz 258
Figure F.1 – Dual comparator design for active cable assembly detection 259
Figure G.1 – SAS primary icon 260
Figure G.2 – SAS alternate icon 260
Figure G.3 – SAS alternate icon with SAS letters 261

Table 1 – Numbering conventions 33
Table 2 – Compliance points 37
Table 3 – Connectors 49
Table 4 – Connector categories 51
Table 5 – SAS Drive connector pin assignments 54
Table 6 – Micro SAS connector pin assignments 56
Table 7 – Controller SAS 4i connector pin assignments and physical link usage 58
Table 8 – Backplane SAS 4i connector pin assignments and physical link usage 59
Table 9 – Controller Mini SAS 4i connector pin assignments and physical link usage 61
Table 10 – Backplane Mini SAS 4i connector pin assignments and physical link usage 62
Table 11 – Controller Mini SAS HD 4i connector pin assignments and physical link usage 66
Table 12 – Backplane Mini SAS HD 4i connector pin assignments and physical link usage 67
Table 13 – Mini SAS 4x cable plug connector and Mini SAS 4x active cable plug connector icons, key slot positions, and key positions 70
Table 14 – Mini SAS 4x receptacle connector icons, key positions, and key slot positions 76
Table 15 – Mini SAS 4x connector pin assignments and physical link usage 81
Table 16 – Mini SAS 4x active connector pin assignments and physical link usage 82
Table 17 – Mini SAS 4x active cable supplied power requirements 83
Table 18 – Mini SAS HD 4x connector pin assignments and physical link usage 88
Table 19 – Management interface connection requirements 89
Table 20 – QSFP+ connector pin assignments 92
Table 21 – TxRx connection general characteristics 120
Table 22 – Maximum limits for S-parameters of the passive TxRx connection 121
Table 23 – Passive TxRx connection characteristics for trained 6 Gbit/s 123
Table 24 – Active cable assembly output electrical characteristics for trained 6 Gbit/s 124
Table 25 – Maximum limits for S-parameters for active cable assemblies 125
Table 26 – General electrical characteristics 139
Table 27 – JTF parameters 141
Table 28 – Transmitter device general electrical characteristics 144
Table 29 – Transmitter device termination characteristics 145
Table 30 – Transmitter device signal output characteristics for untrained 1.5 Gbit/s and 3 Gbit/s as measured with the zero-length test load at IT and CT 145
Table 31 – Transmitter device signal output characteristics for untrained 1.5 Gbit/s and 3 Gbit/s as measured with each test load at IT and CT 147
Table 32 – Transmitter device signal output characteristics for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s at IT and CT 148
Table 33 – Transmitter device common mode voltage limit characteristics 149
Table 34 – Maximum limits for S-parameters at IT_s or CT_s 150
Table 35 – Recommended transmitter device settings at IT and CT 151
Table 36 – Reference transmitter device characteristics at IT and CT 152
Table 37 – Transmitter device signal output characteristics for OOB signals 155
Table 38 – Receiver device general electrical characteristics 156
Table 39 – Receiver device termination characteristics 157
Table 40 – Delivered signal characteristics for untrained 1.5 Gbit/s and 3 Gbit/s as measured with the zero length test load at IR and CR 158
Table 41 – Maximum delivered jitter for untrained 1.5 Gbit/s and 3 Gbit/s at IR and CR 159

Table 42 – Receiver device jitter tolerance for untrained 1.5 Gbit/s and 3 Gbit/s at IR and CR 160
Table 43 – f_{min}, f_c, and f_{max} for untrained 1.5 Gbit/s and 3 Gbit/s 161
Table 44 – Delivered signal characteristics for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s at IR and CR 161
Table 45 – Maximum limits for S-parameters at IR or CR 162
Table 46 – Stressed receiver device jitter tolerance test characteristics 166
Table 47 – Number of bits received per number of errors for desired BER 167
Table 48 – f_{min}, f_c, and f_{max} for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s without SSC support 169
Table 49 – f_{min}, f_c, f_{max}, and SJ_{lf} for trained 1.5 Gbit/s, 3 Gbit/s, and 6 Gbit/s with SSC support 169
Table 50 – Delivered signal characteristics for OOB signals 170
Table 51 – SSC modulation types 170
Table 52 – SAS phy transmitter SSC modulation types 171
Table 53 – Expander phy transmitter SSC modulation types 171
Table 54 – Receiver SSC modulation types tolerance 172
Table 55 – Expander device center-spreading tolerance buffer 172
Table 56 – Output characteristics of the READY LED signal 174
Table 57 – OOB signal timing specifications 175
Table 58 – OOB signal transmitter device requirements 176
Table 59 – OOB signal receiver device burst time detection requirements 178
Table 60 – OOB signal receiver device idle time detection requirements 178
Table 61 – OOB signal receiver device negation time detection requirements 178
Table 62 – SATA port selection signal transmitter device requirements 179
Table A.1 – JTPAT for RD+ 180
Table A.2 – JTPAT for RD- 181
Table D.1 – High frequency jitter source amplitudes 249
Table D.2 – Low frequency jitter source calibration amplitudes 251
Table D.3 – Low frequency jitter attenuation targets 252

INFORMATION TECHNOLOGY –
SMALL COMPUTER SYSTEM INTERFACE (SCSI) –

Part 153: SERIAL ATTACHED SCSI - 2.1 (SAS-2.1)

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This International Standard has been approved by vote of the member bodies and the voting results may be obtained from the address given on the second title page.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2, as far as is practicable.

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INTRODUCTION

General

The SCSI family of standards provides for many different transport protocols that define the rules for exchanging information between different SCSI devices. This standard specifies the functional requirements for the Serial Attached SCSI (SAS) physical interconnect, which is compatible with the Serial ATA physical interconnect. The SAS Protocol Layer (SPL) standard documents the SAS protocol layer corresponding to the Serial Attached SCSI - 2.1 (SAS-2.1) and beyond, defining the rules for exchanging information between SCSI devices using a serial interconnect. Other SCSI transport protocol standards define the rules for exchanging information between SCSI devices using other interconnects.

SCSI standards family

Figure 1 shows the relationship of this standard to the other standards and related projects in the SCSI family of standards.

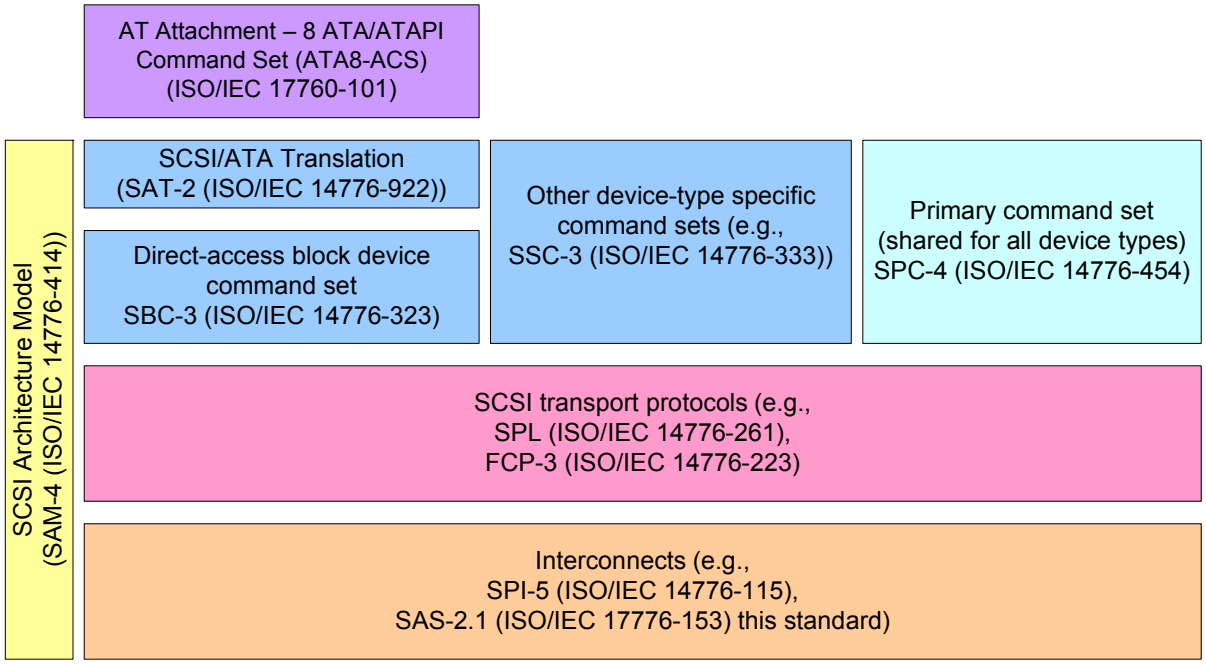


Figure 1 — SCSI document relationships

Figure 2 shows the relationship of this standard to other standards and related projects in the ATA family of standards.

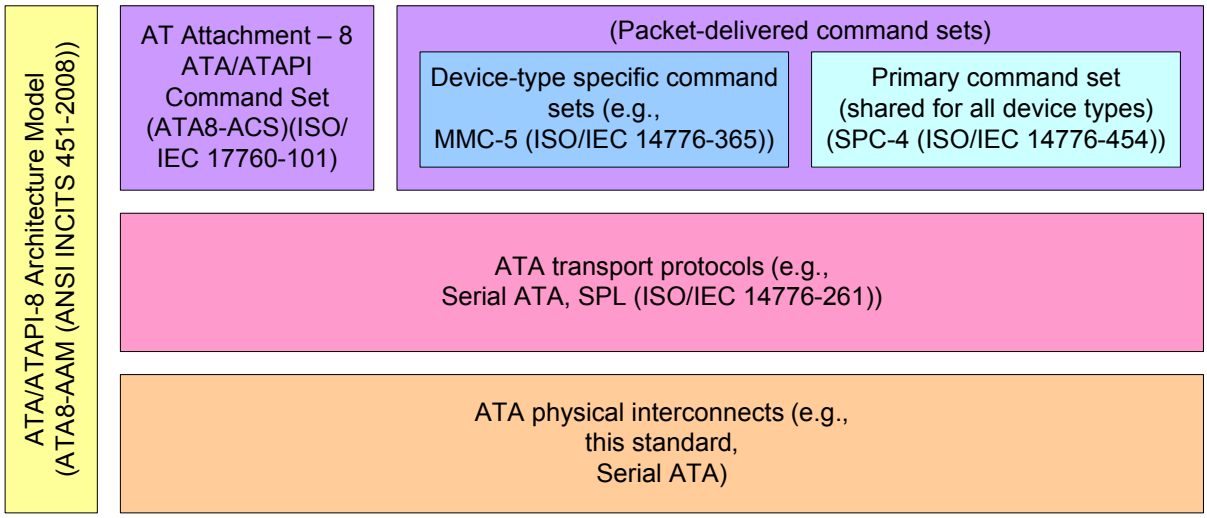


Figure 2 — ATA document relationships

Figure 1 and figure 2 show the general relationship of the documents to one another, and do not imply a relationship such as a hierarchy, protocol stack or system architecture.

These standards specify the interfaces, functions and operations necessary to ensure interoperability between conforming implementations. This standard is a functional description. Conforming implementations may employ any design technique that does not violate interoperability.

INFORMATION TECHNOLOGY – SMALL COMPUTER SYSTEM INTERFACE (SCSI) –

Part 153: SERIAL ATTACHED SCSI - 2.1 (SAS-2.1)

1 Scope

This part of ISO/IEC 14776 defines the physical layer of the Serial Attached SCSI (SAS) interconnect.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 14165-117, *Information technology – Fibre channel – Part 117: Methodologies for jitter and signal quality (MJSQ)*[1] [2]

ISO/IEC 14776-261, *Information technology – Small Computer System Interface (SCSI) – Part 261: SAS Protocol Layer (SPL)*[3]

ISO/IEC 14776-414, *Information technology – Small Computer System Interface (SCSI) – Part 414: SCSI Architecture Model - 4 (SAM-4)*

ANSI INCITS 451-2008, *Information technology – AT Attachment-8 ATA/ATAPI Architecture Model (ATA8-AAM)*

For information on the current status of the listed documents, or regarding availability, contact the indicated organization.

Serial ATA Revision 3.0 (SATA). 2 June 2009

NOTE 1 For more information on Serial ATA international Organization, see www.sata-io.org.

SFF-8086, *Compact Multilane Series: Common Elements*

SFF-8087, *Compact Multilane Series: Unshielded*

SFF-8088, *Compact Multilane Series: Shielded*

SFF-8147, *54mm x 71mm Form Factor w/micro SAS Connector*

SFF-8223, *2.5" Drive Form Factor with Serial Connector*

SFF-8323, *3.5" Drive Form Factor with Serial Connector*

SFF-8410, *HSS Copper Testing and Performance Requirements*

SFF-8416, *Measurement and Performance Requirements for HPEI Bulk Cable*

SFF-8436, *QSFP+ Copper and Optical Modules*

SFF-8449, *Mini Multilane Series Management Interface*

SFF-8460, *HSS Backplane Design Guidelines*

SFF-8482, *Unshielded Dual Port Serial Attachment Connector*

1.ANSI INCITS TR-35-2004
2.When MJSQ is referenced from this standard, the FC Port terminology used within MJSQ should be substituted with SAS phy terminology.
3.T10/2124-D

SFF-8484, *Multi-Lane Unshielded Serial Attachment Connectors*

SFF-8485, *Serial GPIO (SGPIO) Bus*

SFF-8486, *Serial Attachment Micro Connector*

SFF-8523, *5.25" Drive Form Factor with Serial Connector*

SFF-8643, *Mini Multilane Series: Unshielded HD Integrated Connector*

SFF-8644, *Mini Multilane Series: Shielded HD Integrated Connector*

NOTE 2 For more information on the current status of SFF documents, contact the SFF Committee at 408-867-6630 (phone), or 408-867-2115 (fax). To obtain copies of these documents, contact the SFF Committee at 14426 Black Walnut Court, Saratoga, CA 95070 at 408-867-6630 (phone) or 408-741-1600 (fax) or see http://www.sffcommittee.org.

ASTM Standard B 258-02, 2002, *Standard specification for standard nominal diameters and cross-sectional areas of AWG sizes of solid round wires used as electrical conductors*, ASTM International, West Conshohocken, PA, USA.

NOTE 3 For more information on ASTM International standards, see www.astm.org.

PANTONE® Color Formula Guide

NOTE 4 Pantone® and PANTONE MATCHING SYSTEM® are registered trademarks of Pantone, Inc. For more information on Pantone colors, contact Pantone, Inc. (see http://www.pantone.com). This information is given for the convenience of users of this standard and does not constitute an endorsement by [ISO or IEC] of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Touchstone® File Format Specification. Revision 1.1. IBIS Open Forum.

NOTE 5 Touchstone® is a registered trademark of Agilent Corporation. For more information on the Touchstone specification, contact the IBIS Open Forum (see http://www.eigroup.org). This information is given for the convenience of users of this standard and does not constitute an endorsement by [ISO or IEC] of the product named. Equivalent products may be used if they can be shown to lead to the same results.

MATLAB® 7 Programming Fundamentals. Release 2008b.

NOTE 6 MATLAB® is a registered trademark of The MathWorks, Inc. For more information on MATLAB, contact The Mathworks, Inc. (see http://www.mathworks.com). This information is given for the convenience of users of this standard and does not constitute an endorsement by [ISO or IEC] of the product named. Equivalent products may be used if they can be shown to lead to the same results.

3 Terms, definitions, symbols, abbreviations, keywords, and conventions

3.1 Terms and definitions

For the purposes of this document the following terms and definitions apply.

3.1.1
active cable assembly
cable assembly (see 3.1.9) that requires power for internal circuitry used in the transmission of the signal through the cable assembly

3.1.2
AT Attachment
ATA
standard for the internal attachment of storage devices to hosts

Note 1 to entry: See ATA8-AAM.

3.1.3
baud rate
nominal signaling speed, expressed as the maximum number of times per second that the signal (see 3.1.87) may change the state of the physical link (see 3.1.66)

Note 1 to entry: Each state change produces a transition (i.e., signal edge).

Note 2 to entry: The baud rate is the reciprocal of the *UI* (i.e., $f_{baud} = 1 / UI$) (see 3.1.103).

3.1.4
bit error ratio
BER
number of logical bits output from a receiver circuit that differ from the correct transmitted logical bits, divided by the number of transmitted logical bits

Note 1 to entry: The BER is computed on the raw bit stream before 10b8b decoding.

Note 2 to entry: The BER is usually expressed as a coefficient and a power of 10 (e.g., 2 erroneous bits out of 100 000 bits transmitted is expressed as 2 out of 10^5 or 2×10^{-5}).

Note 3 to entry: See MJSQ.

3.1.5
bit time
nominal duration of a signal transmission bit (e.g., 666,6 ps at 1,5 Gbit/s, 333,3 ps at 3 Gbit/s, and 166,6 ps at 6 Gbit/s)

3.1.6
bounded uncorrelated jitter
BUJ
part of DJ (see 3.1.23) not aligned in time with the signal being measured; specifically, BUJ excludes ISI (see 3.1.47) and duty cycle distortion

Note 1 to entry: See MJSQ.

3.1.7
burst time
part of an OOB signal (see 3.1.60) where the OOB burst (see 3.1.56) is transmitted (see 5.9)