

ISO/IEC 14776-153:2015-02 (E)

Information technology - Small Computer System Interface (SCSI) - Part 153: Serial Attached SCSI - 2.1 (SAS-2.1)

Contents	Page
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