



ISO/IEC 14776-251

Edition 1.0 2014-04

INTERNATIONAL STANDARD

**Information technology – Small computer system interface (SCSI) –
Part 251: USB Attached SCSI (UAS)**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2014 ISO/IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about ISO/IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 14 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 55 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.



ISO/IEC 14776-251

Edition 1.0 2014-04

INTERNATIONAL STANDARD



**Information technology – Small computer system interface (SCSI) –
Part 251: USB Attached SCSI (UAS)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

B

ICS 35.200

ISBN 978-2-8322-1507-4

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	6
INTRODUCTION	8
SCSI standards family	8
1 Scope	10
2 Normative references	10
3 Terms, definitions, symbols, abbreviations and conventions	10
3.1 Terms and definitions.....	10
3.2 Symbols and abbreviations	13
3.3 Keywords.....	13
3.4 Editorial conventions.....	14
3.5 Numeric and character conventions	15
3.5.1 Numeric conventions.....	15
3.5.2 Byte encoded character strings conventions.....	15
3.6 Sequence figure notation	16
3.7 Notation for procedures and functions.....	16
4 Model	17
4.1 Overview.....	17
4.2 Tag handling.....	18
4.3 Data transfers	18
4.4 UAS domain.....	19
4.5 Addressing.....	20
4.6 World wide name	20
4.7 Resets	20
4.8 I_T Nexus loss	21
4.9 Target power loss expected	21
4.10 USB error handling	21
5 USB.....	22
5.1 Overview.....	22
5.2 USB resource requirements	22
5.2.1 Overview	22
5.2.2 USB class specific requests	22
5.2.3 USB descriptors	22
6 Transport.....	27
6.1 Overview.....	27
6.2 IUs.....	27
6.2.1 Overview	27
6.2.2 COMMAND IU.....	28
6.2.3 READ READY IU	29
6.2.4 WRITE READY IU	29
6.2.5 SENSE IU	30
6.2.6 RESPONSE IU.....	30
6.2.7 TASK MANAGEMENT IU	31
6.3 Information unit sequences	33
6.3.1 Overview	33

6.3.2	Non-data command/sense sequence.....	34
6.3.3	Non-data command/response sequence	35
6.3.4	Data-out command sequence.....	36
6.3.5	Data-in command sequence	37
6.3.6	Task management function sequence	37
6.3.7	Bi-directional command sequence.....	38
6.3.8	Multiple command example	38
6.4	Transport requirements.....	41
7	SCSI Application Layer transport protocol services.....	42
7.1	SCSI transport protocol services overview	42
7.2	Send SCSI Command transport protocol service	43
7.3	SCSI Command Received transport protocol service	44
7.4	Send Command Complete transport protocol service.....	44
7.5	Command Complete Received transport protocol service	45
7.6	Send Data-In transport protocol service	46
7.7	Data-In Delivered transport protocol service	46
7.8	Receive Data-Out transport protocol service	46
7.9	Data-Out Received transport protocol service	47
7.10	Terminate Data Transfer transport protocol service.....	47
7.11	Data Transfer Terminated transport protocol service.....	48
7.12	Send Task Management Request transport protocol service.....	48
7.13	Task Management Request Received transport protocol service	49
7.14	Task Management Function Executed transport protocol service	49
7.15	Received Task Management Function Executed transport protocol service	51
7.16	USB Acknowledgement.....	52
8	Device server error handling.....	53

Figure 1 – SCSI document structure	8
Figure 2 – Example Sequence figure	16
Figure 3 – USB Model	17
Figure 4 – Example Simple UAS domain	19
Figure 5 – Example Complex UAS Domain.....	20
Figure 6 – UAS sequence figure notation	34
Figure 7 – Non-data transfer with Sense.....	34
Figure 8 – Non-data Transfer with Response.....	35
Figure 9 – Write Data Transfer	36
Figure 10 – Read Data Transfer	37
Figure 11 – Task management	37
Figure 12 – Bi-directional Data Transfer	38
Figure 13 – Multiple Command example	40

Table 1 – Numbering conventions	15
Table 2 – Device descriptor	22
Table 3 – Configuration descriptor	23
Table 4 – Interface Descriptor	24
Table 5 – Bulk-in endpoint descriptor	24
Table 6 – Bulk-out endpoint descriptor	25
Table 7 – Pipe Usage Descriptor	25
Table 8 – Pipe ID	26
Table 9 – IU ID field summary	27
Table 10 – IU Header	27
Table 11 – COMMAND IU	28
Table 12 – TASK ATTRIBUTE field	28
Table 13 – READ READY IU	29
Table 14 – WRITE READY IU	29
Table 15 – SENSE IU	30
Table 16 – RESPONSE IU	30
Table 17 – RESPONSE CODE field	31
Table 18 – TASK MANAGEMENT IU	31
Table 19 – task management function field	32
Table 20 – Execute Command procedure call transport protocol services	42
Table 21 – Execute Command procedure call transport protocol services	43
Table 22 – Send SCSI Command transport protocol service arguments	43
Table 23 – SCSI Command Received transport protocol service arguments	44
Table 24 – Send Command Complete transport protocol service arguments	45
Table 25 – Command Complete Received transport protocol service arguments	45
Table 26 – Send Data-In transport protocol service arguments	46
Table 27 – Data-In Delivered transport protocol service arguments	46
Table 28 – Receive Data-Out transport protocol service arguments	47
Table 29 – Data-Out Received transport protocol service arguments	47
Table 30 – Terminate Data Transfer transport protocol service arguments	48
Table 31 – Data Transfer Terminated transport protocol service arguments	48
Table 32 – Send Task Management Request transport protocol service arguments	48
Table 33 – Task Management Request Received transport protocol service arguments	49
Table 34 – Task Management Function Executed transport protocol service arguments	50
Table 35 – Received Task Management Function Executed transport protocol service arguments	51
Table 36 – USB Acknowledgement	52
Table 37 – Delivery Result to additional sense code mapping	53