

INTERNATIONAL STANDARD



**Information technology – Small Computer System Interface (SCSI) –
Part 454: SCSI Primary Commands – 4 (SPC-4)**

(<https://standards.iteh.ai>)
Document Preview

ISO/IEC 14776-454:2018

<https://standards.iteh.ai/catalog/standards/iso/c511791c-bf67-46c7-8d4b-1b6a11745f3b/iso-iec-14776-454-2018>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2018 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
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 - webstore.iec.ch/advsearchform

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 It also gives information on projects, replaced and withdrawn publications.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 21 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 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: sales@iec.ch.

ISO/IEC 14776-454:2018

<https://standards.iteh.ai/catalog/standards/iso/c511791c-bf67-46c7-8d4b-1b6a11745f3b/iso-iec-14776-454-2018>

INTERNATIONAL STANDARD



**Information technology – Small Computer System Interface (SCSI) –
Part 454: SCSI Primary Commands – 4 (SPC-4)**

Document Preview

[ISO/IEC 14776-454:2018](https://standards.iteh.ai/catalog/standards/iso/c511791c-bf67-46c7-8d4b-1b6a11745f3b/iso-iec-14776-454-2018)

<https://standards.iteh.ai/catalog/standards/iso/c511791c-bf67-46c7-8d4b-1b6a11745f3b/iso-iec-14776-454-2018>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 35.200

ISBN 978-2-8322-5595-7

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

Contents

	Page
1 Scope	40
2 Normative references	40
3 Terms, definitions, symbols, abbreviations, and conventions	45
3.1 Terms and definitions	45
3.2 Abbreviations and symbols	65
3.2.1 Abbreviations	65
3.2.2 Symbols	67
3.2.3 Mathematical operators	67
3.3 Keywords	68
3.4 Conventions	69
3.5 Numeric and character conventions	70
3.5.1 Numeric conventions	70
3.5.2 Units of measure	70
3.5.3 Byte encoded character strings conventions	71
3.6 Bit and byte ordering	71
3.7 Notation conventions	73
3.7.1 Notation for procedure calls	73
3.7.2 Notation for state diagrams	74
3.7.3 Notation for flowcharts	75
3.7.4 Notation for UML figures	75
3.7.4.1 Overview	75
3.7.4.2 Class notation	77
3.7.4.3 Class association relationships notation	77
3.7.4.4 Class aggregation relationships notation	78
3.7.4.5 Class generalization relationships notation	80
3.7.4.6 Class dependency relationships notation	81
3.7.4.7 Object notation	81
3.7.5 Notation for EXTENDED COPY command segment descriptors	81
4 General concepts	82
4.1 Introduction	82
4.2 Command Descriptor Block	82
4.2.1 CDB usage and structure	82
4.2.2 Fixed length CDB formats	83
4.2.2.1 Formats for 6-byte CDBs	83
4.2.2.1.1 Generic 6-byte CDB format	83
4.2.2.1.2 Typical 6-byte CDB format	83
4.2.2.2 Formats for 10-byte CDBs	84
4.2.2.2.1 Generic 10-byte CDB format	84
4.2.2.2.2 Typical 10-byte CDB format	85
4.2.2.3 Formats for 12-byte CDBs	86
4.2.2.3.1 Generic 12-byte CDB format	86
4.2.2.3.2 Typical 12-byte CDB format	86
4.2.2.3.3 MAINTENANCE IN CDB format	87
4.2.2.3.4 MAINTENANCE OUT CDB format	88
4.2.2.3.5 SERVICE ACTION IN(12) CDB format	88
4.2.2.3.6 SERVICE ACTION OUT(12) CDB format	89
4.2.2.4 Formats for 16-byte CDBs	89
4.2.2.4.1 Generic 16-byte CDB format	89
4.2.2.4.2 Typical 16-byte CDB format, if eight-byte LBAs not supported	90
4.2.2.4.3 Typical 16-byte CDB format with eight-byte LBAs supported	91
4.2.2.4.4 SERVICE ACTION IN(16) CDB format	92

4.2.2.4.5 SERVICE ACTION OUT(16) CDB format	92
4.2.2.4.6 SERVICE ACTION BIDIRECTIONAL CDB format	93
4.2.3 Variable length CDB formats	93
4.2.3.1 Generic variable length CDB format	93
4.2.3.2 Typical 32-byte variable length CDB format	95
4.2.4 Extended CDBs	96
4.2.4.1 XCDB model	96
4.2.4.2 The XCDB format	96
4.2.5 Common CDB fields	98
4.2.5.1 Operation code	98
4.2.5.2 Service action	98
4.2.5.3 Logical block address	98
4.2.5.4 Transfer length	99
4.2.5.5 Parameter list length	99
4.2.5.6 Allocation length	99
4.3 Data field requirements	99
4.3.1 ASCII data field requirements	99
4.3.2 Null data field termination and zero padding requirements	100
4.3.3 Variable type data field requirements	100
4.3.4 Port identifier field requirements	100
4.4 Secure random numbers	101
4.5 Sense data	101
4.5.1 Sense data introduction	101
4.5.2 Descriptor format sense data	102
4.5.2.1 Descriptor format sense data overview	102
4.5.2.2 Information sense data descriptor	104
4.5.2.3 Command-specific information sense data descriptor	105
4.5.2.4 Sense key specific sense data descriptor	106
4.5.2.4.1 Sense key specific sense data descriptor overview	106
4.5.2.4.2 Field pointer sense key specific information	107
4.5.2.4.3 Actual retry count sense key specific information	108
4.5.2.4.4 Progress indication sense key specific information	108
4.5.2.4.5 Segment pointer sense key specific information	109
4.5.2.4.6 Unit attention condition queue overflow sense key specific information	109
4.5.2.5 Field replaceable unit sense data descriptor	110
4.5.2.6 Another progress indication sense data descriptor	110
4.5.2.7 Forwarded sense data	111
4.5.2.8 Vendor specific sense data descriptors	112
4.5.3 Fixed format sense data	113
4.5.4 Returning a value in the INFORMATION field in the sense data	114
4.5.5 Returning a value in the COMMAND-SPECIFIC INFORMATION field in the sense data	115
4.5.6 Current information	115
4.5.7 Deferred errors	116
4.5.8 Sense key and additional sense code definitions	117
5 Model common to all device types	136
5.1 Introduction to the model common to all device types	136
5.1.1 Overview	136
5.1.2 Important commands for all SCSI device servers	136
5.1.2.1 Commands implemented by all SCSI device servers	136
5.1.2.2 Commands recommended for all SCSI device servers	136
5.1.2.3 Using the INQUIRY command	136
5.1.2.4 Using the REPORT LUNS command	136
5.1.2.5 Using the TEST UNIT READY command	137
5.1.2.6 Using the REQUEST SENSE command	137
5.1.3 Implicit head of queue	137
5.2 Device clocks and timestamps	137

5.3 Device specific background functions	138
5.3.1 Introduction	138
5.3.2 Suspending and resuming device specific background functions	139
5.4 Downloading and activating microcode	140
5.4.1 Downloading microcode	140
5.4.2 Activating microcode	144
5.5 Error history	145
5.5.1 Error history overview	145
5.5.2 Retrieving error history with the READ BUFFER command	145
5.5.3 Adding application client error history with the WRITE BUFFER command	148
5.5.4 Clearing error history with the WRITE BUFFER command	148
5.6 Identifying information	149
5.7 Medium auxiliary memory	149
5.8 Parameter rounding	150
5.9 Parsing variable length parameter lists and parameter data	151
5.10 Pollable condition information	152
5.10.1 Information that does not represent an exception condition	152
5.10.2 REQUEST SENSE pollable sense data	152
5.10.2.1 Making information available for the REQUEST SENSE command	152
5.10.2.2 Selecting pollable sense data to return	152
5.10.2.3 Returning one or more progress indications	152
5.10.3 Log parameter pollable device condition information	153
5.11 Power management	153
5.11.1 Power management overview	153
5.11.2 Power consumption management	153
5.11.3 Power conditions management	154
5.11.4 Active power condition	155
5.11.5 Idle power conditions	155
5.11.6 Standby power conditions	156
5.11.7 Power condition pollable sense data	156
5.11.8 Power condition state machine	157
5.11.8.1 Power condition state machine overview	157
5.11.8.2 PC0:Powered_On state	158
5.11.8.2.1 PC0:Powered_On state description	158
5.11.8.2.2 Transition PC0:Powered_On to PC4:Active_Wait	159
5.11.8.3 PC1:Active state	159
5.11.8.3.1 PC1:Active state description	159
5.11.8.3.2 Transition PC1:Active to PC5:Wait_Idle	159
5.11.8.3.3 Transition PC1:Active to PC6:Wait_Standby	159
5.11.8.4 PC2:Idle state	159
5.11.8.4.1 PC2:Idle state description	159
5.11.8.4.2 Transition PC2:Idle to PC4:Active_Wait	160
5.11.8.4.3 Transition PC2:Idle to PC5:Wait_Idle	160
5.11.8.4.4 Transition PC2:Idle to PC6:Wait_Standby	160
5.11.8.5 PC3:Standby state	160
5.11.8.5.1 PC3:Standby state description	160
5.11.8.5.2 Transition PC3:Standby to PC4:Active_Wait	161
5.11.8.5.3 Transition PC3:Standby to PC6:Wait_Standby	161
5.11.8.6 PC4:Active_Wait state	161
5.11.8.6.1 PC4:Active_Wait state description	161
5.11.8.6.2 Transition PC4:Active_Wait to PC1:Active	162
5.11.8.7 PC5:Wait_Idle state	162
5.11.8.7.1 PC5:Wait_Idle state description	162
5.11.8.7.2 Transition PC5:Wait_Idle to PC2:Idle	162
5.11.8.8 PC6:Wait_Standby state	163
5.11.8.8.1 PC6:Wait_Standby state description	163
5.11.8.8.2 Transition PC6:Wait_Standby to PC3:Standby	163

5.12 Reservations.....	163
5.12.1 Persistent Reservations overview	163
5.12.2 Third party persistent reservations	168
5.12.3 Exceptions to SPC-2 RESERVE and RELEASE behavior	168
5.12.4 Persistent reservations interactions with IKEv2-SCSI SA creation	169
5.12.5 Preserving persistent reservations and registrations.....	169
5.12.5.1 Requirements for preserving persistent reservations and registrations	169
5.12.5.2 Preserving persistent reservations and registrations through power loss	169
5.12.5.3 Nonvolatile memory considerations for preserving persistent reservations and registrations ..	170
5.12.5.4 Loss of persistent reservation information	170
5.12.5.4.1 Loss of persistent reservation information overview	170
5.12.5.4.2 Recoverable loss of persistent reservation information	170
5.12.5.4.3 Unrecoverable loss of persistent reservation information overview	171
5.12.6 Finding persistent reservations and reservation keys	171
5.12.6.1 Summary of commands for finding persistent reservations and reservation keys	171
5.12.6.2 Reporting reservation keys	171
5.12.6.3 Reporting the persistent reservation.....	171
5.12.6.4 Reporting full status.....	172
5.12.7 Registering	172
5.12.8 Registering and moving the reservation	176
5.12.9 Reserving	177
5.12.10 Persistent reservation holder.....	178
5.12.11 Releasing persistent reservations and removing registrations	178
5.12.11.1 Releasing persistent reservations, removing registrations, and lost reservation information ..	178
5.12.11.2 Service actions that release persistent reservations and remove registrations.....	179
5.12.11.2.1 Service actions that release persistent reservations and remove registrations overview ...	179
5.12.11.2.2 Releasing.....	180
5.12.11.2.3 Unregistering	180
5.12.11.2.4 Preempting	182
5.12.11.2.4.1 Commands that preempt reservations	182
5.12.11.2.4.2 Failed persistent reservation preempt	184
5.12.11.2.4.3 Preempting persistent reservations and registration handling.....	184
5.12.11.2.5 Removing registrations	185
5.12.11.2.6 Preempting and aborting	185
5.12.11.2.7 Clearing	186
5.12.11.3 Replacing lost reservations	187
5.13 Security features.....	188
5.13.1 Security goals and threat model	188
5.13.1.1 Introduction.....	188
5.13.1.2 Security goals	188
5.13.1.3 Threat model	189
5.13.1.4 Types of attacks	189
5.13.1.5 SCSI security considerations.....	190
5.13.2 Security associations	190
5.13.2.1 Principles of SAs	190
5.13.2.2 SA parameters	192
5.13.2.3 Creating an SA	194
5.13.3 Key derivation functions	195
5.13.3.1 KDFs overview	195
5.13.3.2 IKEv2-based iterative KDF	195
5.13.3.3 HMAC-based KDFs	196
5.13.3.4 AES-XCBC-PRF-128 IKEv2-based iterative KDF	197
5.13.4 Using IKEv2-SCSI to create an SA	198
5.13.4.1 Overview.....	198
5.13.4.2 IKEv2-SCSI Protocol summary	201
5.13.4.3 IKEv2-SCSI Authentication.....	204
5.13.4.3.1 Overview.....	204