ISO/IEC 14776-326

Edition 2.0 2015-09

INTERNATIONAL STANDARD

Information technology – Small computer system interface (SCSI) – Part 326: Reduced block commands (RBC)

ISO/IEC 14776-326:2015-09(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 35.200

ISBN 978-2-8322-2861-6

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FOREWORD

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International Standard ISO/IEC 14776-326 was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This second edition cancels and replaces the first edition published in 2002 and constitutes a minor revision.

This second edition provides additional explanations and corrects mistakes with respect to the first edition.

A list of all parts in the ISO/IEC 14776 series, published under the general title *Information technology – Small computer system interface (SCSI)*, can be found on the IEC website.

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.

INFORMATION TECHNOLOGY – SMALL COMPUTER SYSTEM INTERFACE –

Part 326: Reduced block commands (RBC)

1 Scope

This part of ISO/IEC 14776 defines a Reduced Block Command set for logical block devices. The Reduced Block Commands along with the required SPC-2 commands and their restrictions described in this standard, fully specify the complete command set for RBC logical block devices.

The purpose of this part of ISO/IEC 14776 is to provide a command set of reduced requirements and options from SCSI Block Commands (SBC) (ISO/IEC 14776-321) for block devices. The reduced command set is intended to more closely match the functionality required for simple block logical units. The specified commands place no restrictions on device performance. The initial focus of this command set was to enable rigid disks and removable media devices attached to Serial Bus and utilizing SBP-2 (ISO/IEC 14776-232) for command and control.

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 13213:1994, *Information technology – Micoprocessor systems – Control and Status Registers (CSR) Architecture for microcomputer buses*

ISO/IEC 14776-232:2001, *Information technology – Small computer system interface (SCSI) – Part 232: Serial Bus Protocol 2 (SBP-2)*

ISO/IEC 14776-321:2001, *Information technology – Small Computer System Interface (SCSI-3) – Part 321: Block commands (SBC)*

ISO/IEC 14776-362:2006, *Information technology – Small computer system interface (SCSI) – Part 362: Multimedia commands-2 (MMC-2)*

ISO/IEC14776-412, *Information technology – Small computer system interface (SCSI) – Part 412: SCSI, Architecture model-2 (SAM-2)*

ISO/IEC 14776-452:2005, *Information technology – Small computer system interface (SCSI) – Part 452: Primary commands-2 (SPC-2)*

IEEE Standard 1394-1995, *High Performance Serial Bus*

IEEE Standard 1394A-2000, *High Performance Serial Bus Amendment 1*

3 Terms, definitions, abbreviations, keywords, and conventions

3.1 Terms and definitions

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

3.1.1
additional sense code
ASC
field in the sense data

Note 1 to entry: See 7.20.2 in ISO/IEC 14776-452:2005.

[SOURCE: ISO/IEC 14776-452:2005, 3.1.2, modified – Reference to SPC-2 added.]

3.1.2
additional sense code qualifier
ASCQ
field in the sense data

Note 1 to entry: See 7.20.2 in ISO/IEC 14776-452:2005.

3.1.3
byte
B
eight bit of data

[SOURCE: ISO/IEC 14776-452:2005, 3.1.9, modified – Definition simplified.]

3.1.4
command descriptor block
CDB
structure of up to 16 B in length used to communicate a command from an initiator to a device

[SOURCE: ISO/IEC 14776-452:2005, 3.1.11, modified – Definition changed.]

3.1.5
EVENT field
byte 0 of the sense data INFORMATION field

Note 1 to entry: See Table 24 for the Event Status INFORMATION field format when the sense code indicates EVENT STATUS NOTIFICATION (38h).

3.1.6
logical unit
part of the device that is an instance of a device model

Note 1 to entry: For example mass storage, CD-ROM or a printer are device models.

Note 2 to entry: In devices that implement one or more logical units, the device type of the logical units may differ.

[SOURCE: ISO/IEC 14776-452:2005, 3.1.30, modified – Definition and explanatory information changed.]

3.1.7
sense data
data describing an error or exceptional device condition that a device delivers to an initiator

[SOURCE: ISO/IEC 14776-452:2005, 3.1.47, modified – Definition simplified and explanatory information deleted.]

3.1.8
sense key
field in the sense data

Note 1 to entry: See 7.20.3 in ISO/IEC 14776-452.

[SOURCE: ISO/IEC 14776-452:2005, 3.1.48, modified – Definition changed.]

3.1.9
status
response information sent from a device to an initiator upon completion of each command

[SOURCE: ISO/IEC 14776-452:2005, 3.1.52, modified – Definition simplified and explanatory information deleted.]

3.1.10
unit attention condition
condition that a logical unit maintains while it has asynchronous status information to report to one or more initiators

[SOURCE: ISO/IEC 14776-452:2005, 3.1.58, modified – "State" has been replaced by "condition" and refence information has been deleted.]

3.1.11
vendor specific
bit, field, code value, etc., not defined in this standard, that may be vendor defined

[SOURCE: ISO/IEC 14776-452:2005, 3.1.59, modified – Minor editorial change of the definition.]

3.2 Abbreviations

The following abbreviations are used in this standard:

ASC	Additional Sense Code
ASCQ	Additional Sense Code Qualifier
CDB	Command Descriptor Block
MMC-2	Multi-Medial Commands 2
RBC	Reduced Block Commands (this standard)
SAM-2	SCSI Architecture Model 2
SBC	SCSI Block Commands
SBP-2	Serial Bus Protocol 2
SPC-2	SCSI Primary Commands 2

3.3 Keywords

Several keywords are used to differentiate levels of requirements and options, as follows.

3.3.1
expected
keyword used to describe the behavior of the hardware or software in the design models assumed by this standard. Other hardware and software design models may also be implemented.

3.3.2
ignored
keyword that describes bits, bytes, quadlets, or fields whose values are not checked by the recipient

3.3.3
mandatory
keyword that indicates items required to be implemented as defined by this standard

3.3.4
may
keyword that indicates flexibility of choice with no implied preference

3.3.5
optional
keyword that describes features which are not required to be implemented by this standard. However, if any optional feature defined by the standard is implemented, it shall be implemented as defined by the standard.

3.3.6
reserved
keyword used to describe objects (eg., bits, bytes, and field) or the code values assigned to these objects in cases where either the object or the code value is set aside for future standardization. Usage and interpretation may be specified by future extensions to this or other standards. A reserved object shall be zeroed or, upon development of a future standard, set to a value specified by such a standard. The recipient of a reserved object shall not check its value. The recipient of a defined object shall check its value and reject reserved code values.

3.3.7
shall
keyword that indicates a mandatory requirement. Designers are required to implement all such mandatory requirements to assure interoperability with other products conforming to this standard.

3.4 Conventions

The following conventions shall be understood by the reader in order to comprehend this standard.

3.4.1 Non-numeric values

Lowercase is used for words having the normal English meaning. Certain words and terms used in this standard have a specific meaning beyond the normal English meaning. These words and terms are defined either in Clause 3 or in the text where they first appear.

The names of abbreviations, commands, and acronyms are in all uppercase (e.g., TEST UNIT READY command).

Fields are shown in small caps (e.g., LOGICAL BLOCK ADDRESS).

Fields containing only one bit are usually referred to as the NAME bit instead of the NAME field.

Formal lists connoted by letters (e.g., a) red; b) blue; c) green) are in an arbitrary order. Formal lists connoted by numbers (e.g., 1) red; 2) blue; 3) green) are in a required sequential order.

If a conflict arises between text, tables, or figures, the order of precedence to resolve conflicts is text; then tables; and finally figures. Not all tables or figures are fully described in text. Tables show data format and values. Notes do not constitute any requirements for implementations.

3.4.2 Numeric values

The ISO convention of numbering is used (i.e., the thousands and higher multiples are separated by a space and a comma is used as the decimal point as in 65 536 or 0,5).

Decimal numbers are represented by Arabic numerals without subscripts or by their English names (e.g., 42, or twelve).

Hexadecimal numbers are represented by digits from the character set 0 to 9 and A to F followed by the lower-case h (e.g., 2Ah).

Binary numbers are represented by digits from the character set 0 and 1 followed by the lower-case b (e.g., 0010 1010b).

The most significant bit of a binary quantity is shown on the left side and represents the highest algebraic value position in the quantity.

For the sake of legibility, binary and hexadecimal numbers are separated into groups of four digits separated by spaces.

4 RBC device model

4.1 General

RBC logical units store blocks of data for later retrieval. Each block of data is stored at a unique location. Initiators send WRITE commands to store the blocks of data (i.e., write operations) and READ commands to retrieve the blocks of data (i.e., read operations). Other commands sent by the initiator may cause write and read operations to occur.

A write operation causes one or more blocks of data to be written on the medium. A read operation causes one or more blocks of data to be read from the medium. A verify operation confirms that one or more blocks of data were correctly written and may be read without error from the medium.

Blocks of data are stored by a process that causes localized changes or transitions within the medium. The changes made to the medium to store the blocks of data may be volatile (i.e., not retained through off/on power cycles) or non-volatile (retained through off/on power cycles). The medium may be divided in parts that are used for data blocks, parts that are reserved for defect management, and parts that are reserved for use by the target for the management of the logical unit.

4.2 Removable medium device

The medium in a RBC device may be removable (e.g., used in a floppy disk drive) or non-removable (e.g. used in a fixed disk drive). Typically, removable medium is contained within a cartridge (or jacket) to prevent damage to the recording surfaces.

A removable medium has an attribute of being mounted or de-mounted on a suitable transport mechanism. A removable medium is mounted when the device/media combination is capable of performing write or read operations and the initiator is informed of this status. A removable medium is de-mounted at any other time (e.g., during loading, unloading, or storage).

Initiators may determine whether a RBC removable medium device is capable of performing read or write operations by one of three methods:

a) enabling Asynchronous Event Reporting (see SPC-2) in the device and examining the event information transmitted from the device;
b) issuing a TEST UNIT READY command and examining the returned status information; or
c) issuing a MODE SENSE command for Mode Page 06h (see 5.9.4) and examining the state of the READD bit or WRITED bit. If the READD bit is set to one, then the media is not readable. If the WRITED bit is set to one, then the media is not writable.

Until the RBC removable medium device and media are ready to be accessed, a READ(10) command shall cause the device to return status of CHECK CONDITION (02h), sense key of NOT READY (02h), and an ASC of LOGICAL UNIT NOT READY (04h). The ASCQ shall reflect the current state of the device/media.

When the device becomes ready, a unit attention condition shall be established. The sense key value shall be set to UNIT ATTENTION (06h), and the ASC/ASCQ to event STATUS NOTIFICATION/MEDIA CLASS EVENT (38h/04h). The EVENT field contained within the sense data INFORMATION field shall be set to NEW MEDIA READY FOR ACCESS (02h). When the unit attention condition is delivered to the initiator, the status shall be set to CHECK CONDITION (02h).

4.3 Command usage

4.3.1 General

RBC devices are not required to support the REQUEST SENSE command or the SEND DIAGNOSTIC command. Devices that do not provide the Auto Sense function, Asynchronous Event Reporting, or the GET EVENT/STATUS NOTIFICATION command (see MMC-2) shall implement the REQUEST SENSE command.

All sense key, ASC, and ASCQ names and values contained in this standard are defined in SPC-2. No additional or alternative meaning is intended by the use of such names and values in this standard.

4.3.2 Using the INQUIRY command

The INQUIRY command (see SPC-2 and 6.2) may be used by an initiator to determine the configuration of a logical unit. RBC devices return information that includes type and standard version. The device may also return the vendor identification number, model number, and other vendor specific information. It is recommended that devices provide the capability to return this information upon completing power-on initialization. A device may take more time to return certain portions of this information, especially if the information shall be retrieved from the medium.

4.3.3 Using the REQUEST SENSE command

Whenever a command completes with CHECK CONDITION status and Auto Sense data is not provided, the initiator that received the error status should send a REQUEST SENSE command to acquire the sense data describing the cause of the condition. If the initiator sends a command other than REQUEST SENSE, the sense data is lost.

Devices may be required to support the REQUEST SENSE command if they are unable to provide command progress information by any other method.

4.3.4 FORMAT UNIT command progress determination

The FORMAT UNIT command (see 5.2) requires IMMED bit support because it may consume significantly more time to complete than normal read or write commands. If the IMMED bit is set to one, the device is required to return status as soon as the command descriptor block is