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Information technology — Automatic identification and data capture techniques — Bar code scanner and decoder performance testing —

Part 1: Linear symbols

Technologies de l'information — Techniques d'identification automatique et de capture des données — Contrôle de scanner de code à barres et de performance du décodeur —

Partie 1: Symboles linéaires

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 15423 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 15423-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

ISO/IEC 15423 consists of the following parts, under the general title *Information technology — Automatic identification and data capture techniques — Bar code scanner and decoder performance testing*:

— *Part 1: Linear symbols*

— *Part 2: Two-dimensional symbols*

Annex A forms a normative part of this part of ISO/IEC 15423. Annexes B and C are for information only.

Introduction

The technology of bar coding is based on the recognition of patterns encoded in bars and spaces of defined dimensions according to rules defining the translation of characters into such patterns, known as the symbology specification.

Bar code symbols can be produced with a wide variety of printing and other techniques, and the overall symbol dimensions can be uniformly scaled to suit particular requirements.

There is a wide range of bar code reading equipment using various scanning techniques, which enable bar code symbols to be read under many different conditions.

Bar code symbols may be a) "linear" i.e. read in a single dimension, where the height of the bars provides redundancy of information, or b) "two dimensional", either in stacked rows to be read unidimensionally in sequence, or as a matrix of elements requiring two dimensional reading.

Bar code reading equipment must be capable of reliably converting the information represented as a bar code symbol into a form meaningful to the host computer system or otherwise to the user.

Manufacturers of bar code equipment, the producers of bar code symbols and the users of bar code technology, require publicly available standard test specifications for bar code reading equipment to ensure the accuracy and consistency of performance of this equipment.

Information technology — Automatic identification and data capture techniques — Bar code scanner and decoder performance testing — Part 1: Linear symbols

1 Scope

This part of ISO/IEC 15423 defines the test equipment and procedures to be used to determine the performance of bar code scanning and decoding equipment. It defines requirements in respect of techniques for the scanning and decoding of linear symbols. It deals with bar code scanning and decoding equipment both as integrated reading systems and as discrete units. It defines performance of the equipment in a particular configuration (e.g. a specific model) irrespective of the individual components used. It also defines in a normative annex a means of classifying scanners and operational parameters.

NOTE Part 2 of ISO/IEC 15423 covers the requirements for the performance testing of equipment for the scanning and decoding of two-dimensional symbols.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 15423. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO/IEC 15423 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 15416, *Information technology — Automatic identification and data capture techniques — Bar code symbol print quality test specification*.

ISO/IEC 15417, *Information technology — Automatic identification and data capture techniques — Bar code symbology specification — Code 128*.

ISO/IEC 15424, *Information technology — Automatic identification and data capture techniques — Data Carrier Identifiers (including Symbology Identifiers)*.

ISO/IEC 15426-1, *Information technology — Automatic identification and data capture techniques — Bar code verifier conformance specification — Part 1: Linear symbols*.

ISO/IEC 16388, *Information technology — Automatic identification and data capture techniques — Bar code symbology specification — Code 39*.

EN 1556, *Bar coding — Terminology*.

3 Terms and definitions

For the purposes of this part of ISO/IEC 15423, the definitions given in EN 1556 and the following apply.

3.1
contact scanner
A particular type of scanner in which the scanning action takes place with the scanner in actual or near contact with the symbol, e.g. wand or light pen.

3.2
decode redundancy
The acquisition of a predetermined number of identical decodes before acceptance by a decoder of a valid decode. For example, decode redundancy of 2 requires two identical decodes.

3.3
exit window
The datum point from which the reading diagram is measured, lying in the plane normal to the beam midpoint closest to the reading end of the scanner.

3.4
maximum reading distance
The distance from the exit window to the end of the depth of field. See R in figure 2.

3.5
minimum reading distance
The distance from the exit window to the beginning of the depth of field. See A in figure 2.

3.6
raster
The projection of a laser beam to create multiple, nearly parallel, scan lines instead of a single line.

3.7
raster distance
The distance between the two most widely spaced adjacent scan lines projected on a plane at a defined distance from the scanner exit window. See E in figure B.3.

3.8
raster width
The distance between the two outermost scan lines projected on a plane at a defined distance from the scanner exit window. This covers a reading field which depends on the construction of the scanner and on the reading distance. See D in figure B.3.

3.9
reading angle
The angular rotation of a symbol in an axis relative to a scan line. Three different reading angles, tilt, skew and pitch are illustrated in figure 1. Tilt refers to rotation around the z axis, skew to rotation around the x axis and pitch to rotation around the y axis.

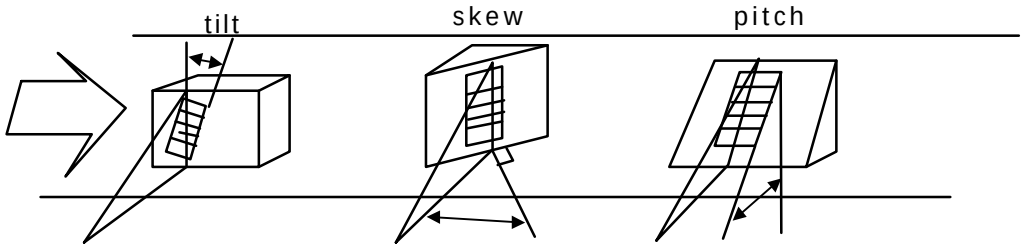

Figure 1 — Reading angles

3.10
reading diagram
The graphical representation of the reading zone for a specific X dimension (or other parameters) of the bar code symbol.

The parameters of the reading diagram are:

— Measurements made from the exit window of the reader

— Reading distance, measured on the z axis

— X dimension (in mm)

— Skew, tilt and pitch angles

— Symbol contrast value

— Ambient light level

— Symbology.

See Annex B.

3.11
reading zone
The whole area in front of the exit window of a non-contact scanner in which defined symbols can be read. See zone MNOP in Figure 2.

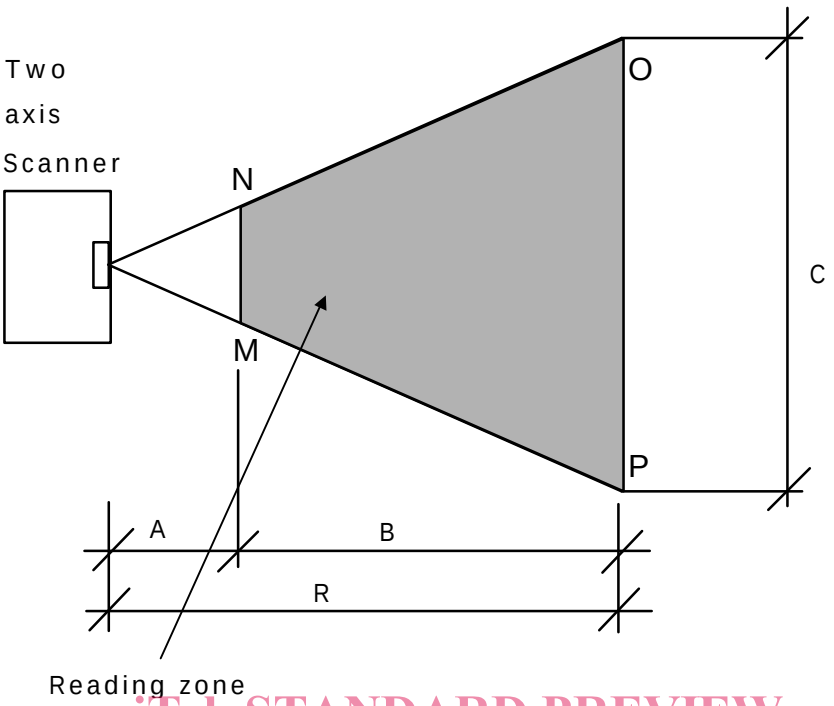

Figure 2 — Example of reading zone (MNOP)

NOTE Certain application requirements, for example in automated conveyor scanning systems, may restrict the effective reading zone to that shown in Figure 3 (MNO'P').

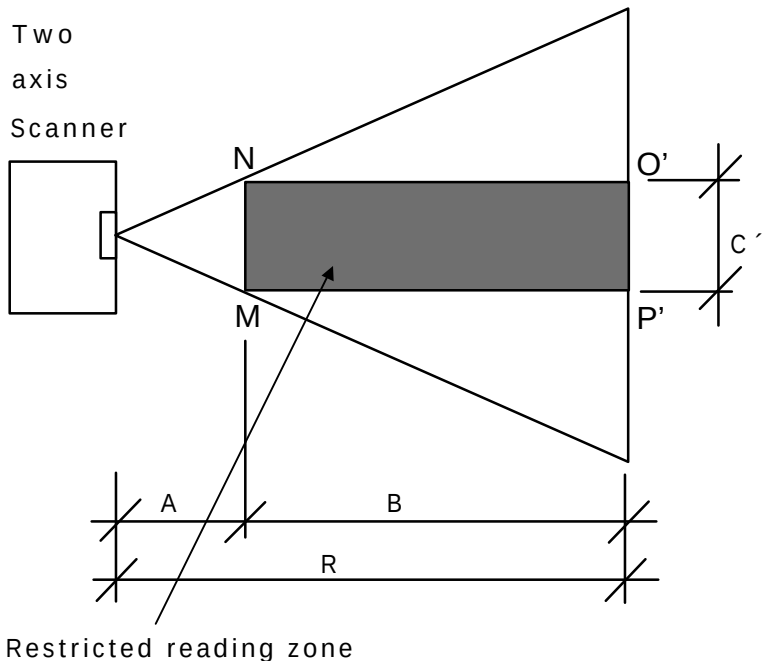

Figure 3 — Example of restricted reading zone (MNO'P')

3.12
read rate
The percentage representing the number of good reads per 100 attempts to read a particular symbol.

3.13
resolution
The width of the narrowest element capable of being read by the equipment under test.

3.14
scan
(Noun): A single pass of the scanning beam over the symbol or a portion of the symbol, or a single image capture with an image capture device.

(Verb): To pass the scanning beam over the symbol or a portion of the symbol, or to capture a single image with an image capture device.

3.15
scan attempt
A single pass of the scanner relative to the symbol (or vice versa), or a single activation of the scanner for a period not exceeding two seconds, e.g. triggering, depending on the application.

3.16
scanning rate
The number of times the bar code symbol is scanned per second. It is expressed in scans per second, or scan lines per second.

3.17
scanning speed
The speed at which the scanning spot of a scanner with a single axis reading diagram is passed across a bar code symbol.

4 Symbols and abbreviated terms

CCD is an abbreviation of "Charge Coupled Device".

5 Categories of scanning equipment

In order to enable the most appropriate set of tests for a given scanning device or unit to be selected, scanners are grouped for the purposes of this part of ISO/IEC 15423 into three categories. The basis for this categorisation is the nature of the reading diagram applicable. Examples of various types of scanners are given in Annex B. Each category may be further subdivided into 'continuously operating' scanners, in which the scanning operation is already in progress when the symbol enters the reading zone, and 'triggered' scanners, where the symbol is already in the reading zone when the scanning operation is initiated.

5.1 Scanners with single axis reading diagram

These are defined as scanners with a reading diagram which extends as a single line from the exit window of the scanner to the maximum reading distance along the z axis. The scanning action therefore has to be created by moving either the scanner or the symbol relative to the other in a direction nominally perpendicular to the height of the bars.

The reading diagram for such scanners can be represented as a single line extending outwards from the exit window of the scanner. See Figure B.1.

5.2 Scanners with two axis reading diagram

These are defined as scanners with a reading diagram which extends in a single plane from the exit window of the scanner to the maximum reading distance along the z axis and perpendicularly in both directions along the x axis. The scanning action is created either by sweeping the scanner beam across the symbol in a direction nominally perpendicular to the height of the bars, or by electronically sampling in turn individual elements of a photosensitive array on which an image of the bar code symbol is focussed.

The reading diagram for such scanners can be represented in a two-dimensional form. See Figure B.2.

5.3 Scanners with three axis reading diagram

These are defined as scanners with a reading diagram which extends in multiple planes from the exit window of the scanner to the maximum reading distance along the z axis, and perpendicularly to this in both directions along the x and y axes which are also perpendicular to each other. The scanning action is created either by sweeping the scanner beam across the symbol in a series of nominally parallel scans in a direction nominally perpendicular to the height of the bars or in a pattern of scan lines at various angles, or by electronically sampling in turn individual photosensitive elements of an area array on which an image of the bar code symbol is focussed.

The reading diagram for such scanners is the representation of a three-dimensional solid. See Figure B.3.

6 Test requirements

6.1 Test methods

Manufacturers' test procedures should be in accordance with the requirements of ISO 9001 or ISO 9002 as appropriate.

Tests should wherever possible be carried out on a complete reading system comprising both scanner and decoder.

Where it is required to report the performance of a scanner or a decoder independently, the unit shall be tested in conjunction with one or more representative decoder or scanner unit(s) respectively, but only the parameters relative to scanning or decoding performance, as applicable, shall be reported. The decoder or scanner units used shall be reported with the test results.

Manufacturers may optionally test scanner or decoder performance independently using the equipment defined in 6.5.4.1 or 6.5.4.2 but it should be noted that the results may not correspond exactly to those obtained when tested as a complete system.

6.2 Selection of equipment for testing

Tests shall be carried out on at least one unit which has been selected from a production batch in accordance with the manufacturer's quality control sampling scheme.

NOTE It is in the manufacturer's interest to ensure that the unit selected is representative of its type. Guidance on sampling is given in ISO 2859-1.

6.3 Test conditions

6.3.1 Environment

Tests shall be conducted under manufacturer-specified environmental conditions (power supply, temperature, relative humidity and ambient light conditions) and the test conditions shall be recorded as part of the test report.

Test charts to be used shall have been stored under the temperature and humidity conditions specified for a sufficient time to ensure their dimensional stability during the test period.

6.3.2 Equipment configuration

The following information on the installation of the equipment under test shall be recorded:

— Description of configuration, including type/model of scanner and decoder, and other measuring equipment;

— Physical conditions, e.g. type of interface, etc.;

— Logical conditions such as the type of output by the scanner, or sent to the decoder e.g. analogue waveform, digital output (where a scanner or decoder is being tested rather than a complete reader).

6.4 Test Charts

A set of bar code test charts is defined, which shall be used for tests indicated in the following sections. Test charts shall be measured in accordance with ISO/IEC 15416, using a verifier complying with ISO/IEC 15426-1 and shall achieve overall symbol grade 3,5 or better (in the case of test chart no. 2 the grades for symbol contrast, edge contrast and modulation shall be ignored and an overall grade shall be calculated based on remaining parameters).