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Information technology — Automatic identification and data capture techniques — Han Xin Code bar code symbology specification

Technologies de l'information — Techniques d'identification et de capture de données automatiques — Spécification des symboles du code à barres de Han Xin

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Foreword

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

Han Xin Code is a two-dimensional matrix symbology which is made up of an array of nominally square modules arranged in an overall square pattern, including a Finder Pattern located at four corners of the symbol that are intended to assist in easy locating of its position, size and inclination. Alignment Patterns and Assistant Alignment Patterns are also used in Versions 4 to 84 symbols. A wide range of size of symbols is provided together with four error correction levels. Module dimension is user-specified to produce symbols by a wide variety of techniques.

Manufacturers of bar code equipment and users of the technology require publicly available standard symbology specifications to which they can refer when developing equipment and application standards. This document is published to meet this request.

Information technology — Automatic identification and data capture techniques — Han Xin Code bar code symbology specification

1 Scope

This document defines the requirements for the symbology known as Han Xin Code. It specifies the Han Xin Code symbology characteristics, data encoding process, symbol structure, dimensions and print quality requirements, error correction rules, reference decoding algorithm, and user-selectable application parameters.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 646, *Information technology — ISO 7-bit coded character set for information interchange*

ISO/IEC 15415:2011, *Information technology — Automatic identification and data capture techniques — Bar code symbol print quality test specification — Two-dimensional symbols*

ISO/IEC 15416, *Automatic identification and data capture techniques — Bar code print quality test specification — Linear symbols*

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

ISO/IEC 19762, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

GS1 General Specifications

3 Terms, definitions, and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1.1
assistant alignment pattern
non-data pattern located in the perimeter of the Han Xin Code symbol and intended to provide additional reference points to synchronize modules for reading

3.1.2
data bit stream
binary sequence that comprises the *information bit stream* (3.1.9) and the *error correction bit stream* (3.1.4)

3.1.3
data codeword
codeword that is used to encode information codewords and error correction codewords.

3.1.4
error correction bit stream
binary sequence used to correct errors, made by error correction encoding from the *information bit stream* (3.1.9)

3.1.5
Unicode
international encoding standard for use with different languages and scripts, by which each letter, digit, or symbol applies across different platforms and programs.

Note 1 to entry: The repertoire of Unicode is synchronized with ISO/IEC 10646, and both are code-for-code identical.

3.1.6
GS1 mode
encoding *mode* (3.1.10) used for representing GS1 data in Han Xin Code

3.1.7
URI mode
encoding *mode* (3.1.11) used for representing uniform resource identifier (URI) described in RFC 3986 in Han Xin Code

3.1.8
Unicode mode
encoding *mode* (3.1.11) used for representing text data in *Unicode* (3.1.5) encoding/charset in Han Xin Code.

3.1.9
information bit stream
binary sequence made up of *mode* (3.1.11) encodings from the original input data

3.1.10
masking
XOR processing of the bit pattern in the information encoding region of the symbol with an algorithmically determined pattern to provide a symbol with more evenly balanced numbers of dark and light modules and to reduce the occurrence of patterns which would interfere with fast processing of the image

3.1.11
mode
method of representing a specific character set as a binary bit stream

3.1.12
mode indicator
bit sequence indicating in which *mode* (3.1.11) the following data sequence is encoded

3.1.13
mode terminator
bit sequence used to terminate the bit sequence representing an encoding *mode* (3.1.11)

3.1.14
padding bit
bit "0", appended to the *information bit stream* (3.1.9) to meet the requirements of the error correction algorithm

3.1.15
position detection pattern
one of the four pattern components of the Finder Pattern in Han Xin Code symbols

3.1.16
position detection center
center of the 3 × 3 dark modules in the *position detection pattern* (3.1.15)

3.1.17
position detection pattern separator
one-module wide non-data pattern, made up of all light modules, used to separate the *position detection pattern* (3.1.15) from the *structural information* (3.1.18) region

3.1.18
structural information
bit stream of data used to record *version* (3.1.20), error correction level and *masking* (3.1.10) solution

3.1.19
symbol padding bit
bit "0", not representing data, used to fill the empty positions of the symbol when the information encoding region cannot be fully filled with 8-bit codewords

3.1.20
version
size of the symbol represented in terms of its position in the sequence of permissible sizes for Han Xin Code symbols, from 23 × 23 modules (Version 1) to 189 × 189 modules (Version 84)

3.2 Mathematical and logical symbols

d	number of error correction codewords
e	number of erasures
k	total number of information codewords
n	total number of data codewords
t	number of errors
X	horizontal width of a module
Y	vertical distance from the center line of modules in one row to the center line of modules in an adjacent row
$(\ldots)_{bin}$	data in ( ) is figured in binary system
...HEX	data is figured in hexadecimal
$(\ldots)_{hex}$	data in ( ) is figured in hexadecimal

div is the integer division operator

mod is the integer remainder after division

XOR is the exclusive-or logic function whose output is one only when its two inputs are not equivalent

NOTE Without any specific statement, a byte usually comprises 8 binary bits and the byte's contents are represented in hexadecimal.

4 Symbology description

4.1 Symbology characteristics

4.1.1 Basic characteristics

4.1.1.1 General

Han Xin Code is a two-dimensional matrix symbology with the following basic characteristics:

4.1.1.2 Encodable characters

(1) Numeric characters (digits 0~9)

(2) ASCII characters (refer to ISO/IEC 646)

(3) Chinese characters (refer to GB18030)

(4) Octet bytes such as graphic and audio information, etc.

(5) GS1 data used in GS1 system

(6) Uniform Resource Identifier (URI)

(7) Any text data reference to a encoding/charset (such as Unicode, JIS, etc.)

4.1.1.3 Representation of data

A dark module is a binary one and a light module is a zero, Howerver, dark module is zero and a light module is one for the reflectance reversal symbols. See 4.1.2 for details of reflectance reversal.

4.1.1.4 Symbol size in modules

23 modules × 23 modules to 189 modules × 189 modules (Version 1 to 84, increasing in steps of two modules per side).

4.1.1.5 Maximum data capacity

(1) Numeric data: 7827 characters

(2) ASCII characters: 4350 characters

(3) Common Chinese Characters in Regions One and Two of GB18030: 2174 characters

(4) 2-byte Chinese characters data: 1739 characters

(5) 4-byte Chinese characters data: 1044 characters

(6) Binary byte data: 3261 bytes

4.1.1.6 Selectable error correction

Four levels of Reed-Solomon error correction and their error correction abilities of symbol codewords are shown as follows:

L1	8 %
L2	15 %
L3	23 %
L4	30 %

4.1.2 Summary of additional features

The following are additional inherent and optional features of Han Xin Code:

a. Masking: (Inherent) Masking pattern is used to the proportions of dark modules and light modules in the symbols and decrease the occurrences of images preventing fast processing.

b. Reflectance reversal: (Inherent) Symbols are intended to be read when marked so that the image is either dark on light or light on dark (see Figure 1).

c. Extended Channel Interpretations: (Optional) This mechanism enables characters from other character sets (e.g. Arabic, Cyrillic, Greek, Hebrew) and other data interpretations or industry-specific requirements to be represented.

a. Dark on light

b. Light on dark

Figure 1 — Examples of Hanxin Code symbol encoding the text "Han Xin Code Symbol"

4.2 Symbol structure

4.2.1 General

Each Han Xin Code symbol shall be constructed of n × n nominally square modules set out in a regular square array and shall consist of an information encoding region, Structural Information regions and Fixed Pattern region. Fixed Pattern region include Finder Pattern, Position Detection Pattern separators, Alignment Pattern and Assistant Alignment Patterns. The symbol shall be surrounded by a quiet zone. Figure 2 illustrates a Version 24 Han Xin Code symbol. Figure 3 illustrates the structure of a Version 24 symbol.

Figure 2 — Han Xin Code symbol (Version 24)

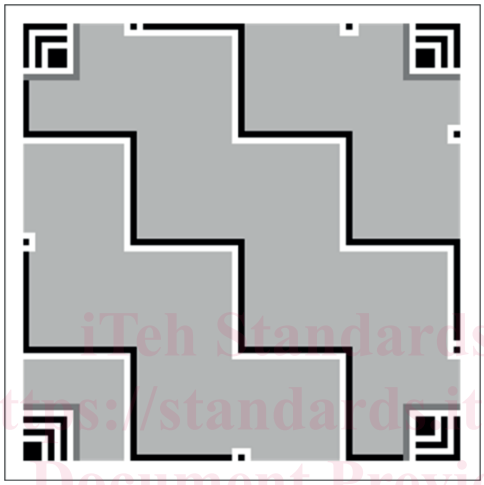

Figure 3 — Structure of a Version 24 Han Xin Code symbol

4.2.2 Symbol Versions and Sizes

There are eighty-four sizes of Han Xin Code symbol referred to as Version 1, Version 2 … Version 84 respectively. Version 1 measures 23 modules × 23 modules, Version 2 measures 25 modules × 25 modules and so on, increasing in steps of 2 modules per side up to Version 84 which measures 189 modules × 189 modules. Figure 4 to Figure 9 illustrate the symbols of Versions 1, 4, 24, 40, 62 and 84.

Figure 4 — Version 1 symbol

Figure 5 — Version 4 symbol