INTERNATIONAL STANDARD

ISO/IEC 24778

First edition
2008-02-15

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

Technologies de l'information — Techniques d'identification automatique et de capture des données — Spécification pour la symbologie de code à barres du code Aztec

© ISO/IEC 2008

ISO/IEC 24778:2008(E)

COPYRIGHT PROTECTED DOCUMENT

Contents

Page

ISO/IEC 24778:2008(E)

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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. 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 document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 24778 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

Introduction

Aztec Code is a two-dimensional matrix symbology whose symbols are nominally square, made up of square modules on a square grid, with a square bullseye pattern at their center. Aztec Code symbols can encode from small to large amounts of data with user-selected percentages of error correction.

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. The publication of standardised symbology specifications is designed to achieve this.

INTERNATIONAL STANDARD ISO/IEC 24778:2008(E)

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

1 Scope

This International Standard defines the requirements for the symbology known as Aztec Code. It specifies the Aztec Code symbology characteristics including data character encodation, rules for error control encoding, the graphical symbol structure, symbol dimensions and print quality requirements, a reference decoding algorithm, and user-selectable application parameters.

2 Normative references

The following referenced documents are indispensable for the application 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 646:1991, *Information technology — ISO 7-bit coded character set for information interchange*

ISO/IEC 15415:2004, *Information technology — Automatic identification and data capture techniques — Bar code print quality test specification — Two-dimensional symbols*

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

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

AIM Inc. International Technical Specification: Extended Channel Interpretations

– Part 1, Identification Schemes and Protocols

– Part 2, Registration Procedure for Coded Character Sets and Other Data Formats

– Character Set Register

3 Terms, definitions, symbols and functions

3.1 Terms and definitions

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

3.1.1
bullseye
set of concentric square rings used as the finder pattern in Aztec Code

1

ISO/IEC 24778:2008(E)

3.1.2
checkword
codeword which is included in a symbol for error correction and/or error detection

3.1.3
dataword
codeword which is part of the data message encoded in a symbol

3.1.4
domino
2-module sub-structure of the symbol character in Aztec Code which is the elemental entity used in graphical encoding of the symbol

3.1.5
Mode Message
short fixed-length, error-corrected subsidiary message within an Aztec Code symbol which directly encodes the symbol's size and data message length

3.2   Symbols and functions

3.2.1   Mathematical symbols

For the purposes of this document, the following mathematical symbols apply.

B   the number of bits in each codeword

C_b the symbol capacity in number of bits

C_w the symbol capacity in number of codewords

D   the number of data (message) codewords in the symbol

K   the number of error correction codewords in the symbol, equal to C_w - D

L   the number of data layers (1 to 32) in the symbol, defining its size

m   the symbology identifier modifier value

X   the X-dimension or nominal square grid spacing

x   a general variable used to express error correction polynomials

(x,y)   Cartesian coordinates within the module grid

3.2.2   Mathematical functions and operations

For the purposes of this document, the following mathematical functions and operations apply.

abs()   is the absolute value function

div   is the integer division operator

max(a,b) is the greater of a and b

mod   is the remainder after integer division

2

4   Symbology characteristics

4.1   Basic characteristics

Aztec Code is a two dimensional matrix symbology with the following basic characteristics:

a.   Encodable character set:

    1.   All 8-bit values can be encoded. The default interpretation shall be:

        a. for values 0 to 127, in accordance with the U.S. national version of ISO/IEC 646;

        (NOTE: This version consists of the GO set of ISO/IEC 646 and the CO set of ISO/IEC 6429 with values 28 to 31 modified to FS, GS, RS and US respectively.)

        b. for values 128 - 255, in accordance with ISO/IEC 8859-1.

    This interpretation corresponds to ECI 000003.

    2.   Two non-data characters can be encoded, FNC1 for compatibility with some existing applications and ECI escape sequences for the standardized encoding of message interpretation information.

b.   Representation of data: A dark module is a binary one and a light module is a binary zero.

c.   Symbol size:

    1.   The smallest Aztec Code symbol is 15 x 15 modules square, and the largest is 151 x 151.

    2.   No quiet zone is required outside the bounds of the symbol.

d.   Data capacity (at recommended error correction level):

    1.   The smallest Aztec Code symbol encodes up to 13 numeric or 12 alphabetic characters or 6 bytes of data.

    2.   The largest symbol encodes up to 3832 numeric or 3067 alphabetic characters or 1914 bytes of data.

e.   Selectable error correction:

    1.   User-selectable, from 5 % to 95 % of the data region, with a minimum of 3 codewords.

    2.   Recommended level is 23 % of symbol capacity plus 3 codewords.

f.   Code type: Matrix

g.   Orientation independent: Yes

4.2   Summary of additional features

The following summarizes additional features that are inherent or optional in Aztec Code:

a.   Reflectance Reversal (Inherent): Though Aztec Code symbols are shown and described in this specification always with the finder's center dark and with dark modules encoding binary 1s throughout, symbols exhibiting the opposite reflectance characteristics are easily autodiscriminated and decoded with the standard reader.

b.   Mirror Image (Inherent): Images which contain an Aztec Code symbol in mirror reversal, either because they are obtained using a reflected optical path, a reversed scan direction, or from behind through a clear substrate, are easily autodiscriminated and decoded with the standard reader.

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

d.   Structured Append (Optional): Structured Append allows files of data to be represented logically and continually in up to 26 Aztec Code symbols. The symbols may be scanned in any sequence to enable the original data to be correctly reconstructed.

e.   Reader Initialization Symbols (Optional): A distinct format of Aztec Code symbol is available for use in barcode menus for reader initialization. The encoded message in these special symbols is never passed on to an application.

f.   Aztec "Runes" (Optional): a series of 256 small, machine-readable marks compatible with Aztec Code are available for special applications. See Annex A.

5   Symbol description

Aztec Code symbols are nominally square, made up of square modules on a square grid, with a square bullseye pattern at their center. Figure 1 shows two representative Aztec Code symbols, a small 1-layer symbol on the left which encodes 12 digits with 47 % error correction and a larger 6-layer symbol on the right which encodes 168 text characters with 30 % error correction.

Figure 1 — Representative Aztec Code symbols

These symbols illustrate the two basic formats of Aztec Code symbols: on the left is a "compact" Aztec Code symbol, visually characterized by a 2-ring bullseye, useful for encoding shorter messages efficiently, while on the right is a "full-range" Aztec Code symbol, visually characterized by a 3-ring bullseye, which supports much larger symbols for longer data messages. Since encoders can autoselect and decoders autodiscriminate between the two formats, a seamless transition is achieved to cover the full spectrum of applications.

5.1   Symbol structure

The underlying structure of a compact Aztec Code symbol is shown in Figure 2, and that of a full-range Aztec Code symbol is shown in Figure 3. In both cases, the Aztec Code symbol has at its center a Core Symbol which is then surrounded by data fields on all four sides.
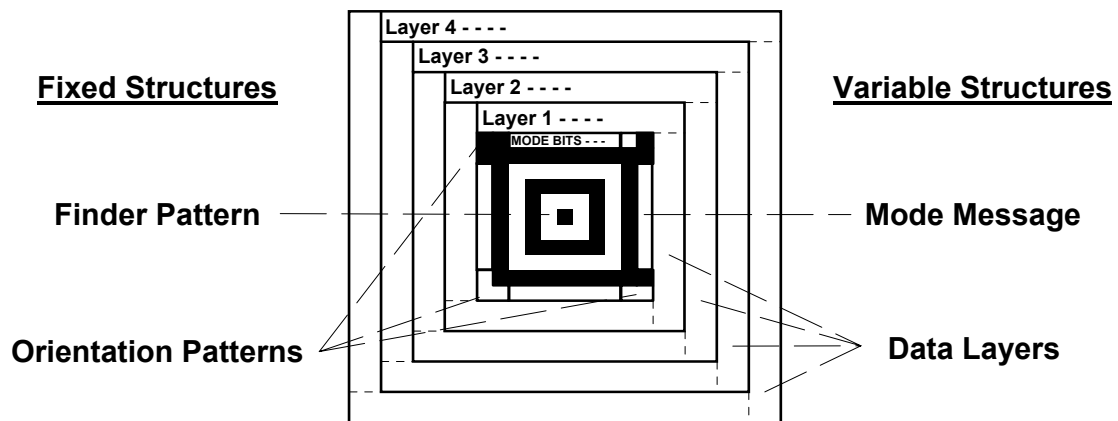

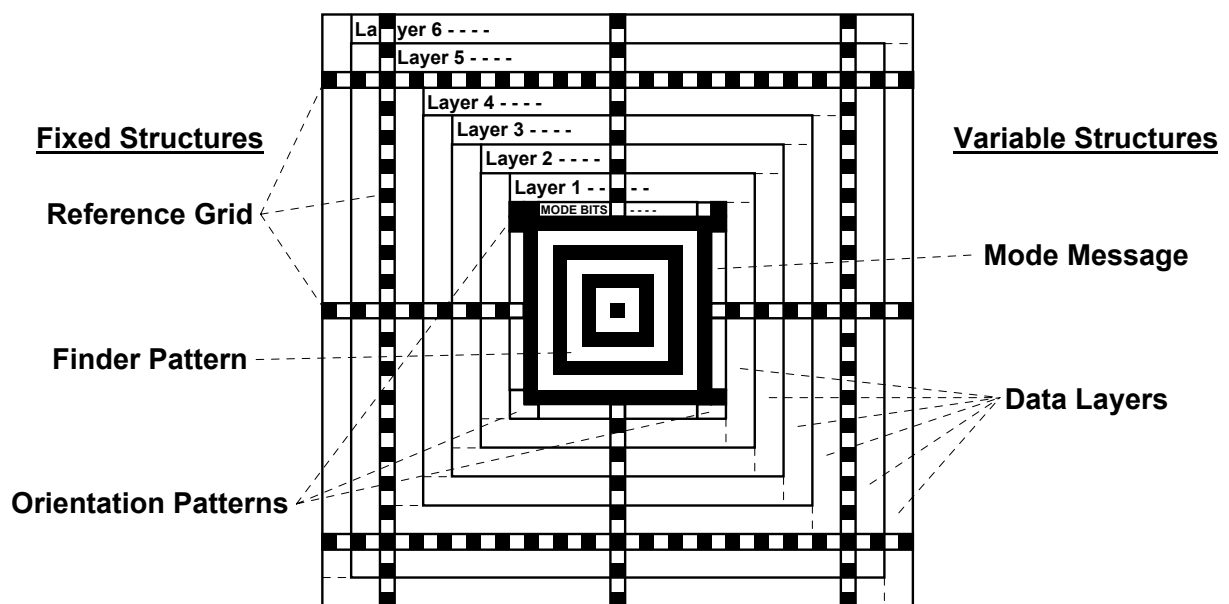**Figure 2 — Structure of a "compact" Aztec Code symbol**

Figure 3 — Structure of a "full-range" Aztec Code symbol

5.1.1   Core Symbol

The Core Symbol, always square and at the exact center of an Aztec Code symbol, consists of a finder pattern, orientation patterns, and a Mode Message. This core covers an 11x11 module area in compact symbols and a 15x15 module area in full-range symbols. It is called the Core "Symbol" because it must be successfully found and decoded before decoding can proceed into the surrounding data fields.