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**Information technology — Automatic  
identification and data capture  
techniques — Bar code symbology  
specification — EAN/UPC**

*Technologies de l'information — Techniques d'identification automatique et  
de capture des données — Spécifications pour les symboles des codes à  
barres — EAN/UPC*

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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 International Standard 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 15420 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

Annexes A and B form a normative part of this International Standard. Annexes C to G 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. There are numerous methods of encoding information in bar code form, known as symbologies. EAN/UPC is one such symbology. The rules defining the translation of characters into bar and space patterns, and other essential features of each symbology, are known as the symbology specification.

EAN/UPC bar code symbols are exclusively reserved for encoding identification numbers. The use of the symbology is restricted and subject to compliance with the EAN International (EAN) and Uniform Code Council (UCC) rules and registration procedures. The administration of the numbering system by EAN and UCC ensures that identification codes assigned to particular items are unique world-wide and are defined in a consistent way. The major benefit for the users of the UCC/EAN system is the availability of uniquely defined identification codes for use in their trading transactions. Refer to Annex C for an overview of the UCC/EAN system.

Manufacturers of bar code equipment and users of bar code technology require publicly available standard symbology specifications to which they can refer when developing equipment and software.

# Information technology — Automatic identification and data capture techniques — Bar code symbology specification — EAN/UPC

## 1 Scope

This International Standard specifies the requirements for the EAN/UPC symbology including data character encodation, symbol formats, dimensions, test specifications, and a reference decoding algorithm.

Data content and the rules governing the use of this symbology are defined in the UCC/EAN system specifications.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard 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 646:1991, *Information technology — ISO 7-bit coded character set for information interchange*.

ISO 1073-2:1976, *Alphanumeric character sets for optical recognition — Part 2: Character set OCR-B — Shapes and dimensions of the printed image*.

ISO/IEC 15416:2000, *Information technology — Automatic identification and data capture techniques — Bar code print quality test specification — Linear symbols*.

ISO/IEC 15424:2000, *Information technology — Automatic identification and data capture techniques — Data Carrier Identifiers (including Symbology Identifiers)*.

EN 1556:1996, *Bar coding — Terminology*.

ANSI/UCC-1:1995, *U.P.C. Symbol Specification Manual*.

"General EAN Specifications" (EAN International, Brussels).

## 3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in EN 1556 and the following apply.

### 3.1

#### **add-on symbol**

A symbol used to encode information supplementary to that in the main symbol.

### 3.2

#### **auxiliary pattern**

A pattern of bars/spaces representing non-data components of the symbol - e.g. guard patterns and inter-character delineators.

### 3.3

#### **delineator**

An auxiliary pattern used to separate characters within an add-on symbol.

### 3.4

#### **even parity**

A characteristic of the encodation of a symbol character whereby the character contains an even number of dark modules.

### 3.5

#### **guard pattern**

An auxiliary pattern of bars/spaces corresponding to start or stop patterns in other symbologies, or serving to separate the two halves of a symbol.

### 3.6

#### **magnification factor**

A constant multiplier of the nominal dimensions of an EAN/UPC symbol.

### 3.7

#### **numbering organisation**

An agency responsible for the administration of the UCC/EAN system and maintenance of a number bank within a defined territory.

### 3.8

#### **number set**

A series of ten bar/space patterns of either even or odd parity encoding the digits 0 to 9.

### 3.9

#### **odd parity**

A characteristic of the encodation of a symbol character whereby the character contains an odd number of dark modules.

### 3.10

#### **UCC/EAN System**

A system for the unique numbering and identification of products, handling units, assets, locations, and services according to a set of rules maintained by EAN International and the Uniform Code Council. See Annex C.

### 3.11

#### **variable parity encodation**

The process of encoding additional information in a series of symbol characters by using particular combinations of odd and even parity characters to implicitly encode digits or for checking purposes.

### 3.12

#### **zero-suppression**

The process of removing zeroes from specified positions in a UCC-12 data string in order to encode it in UPC-E format.

## 4 Requirements

### 4.1 Symbology characteristics

The characteristics of EAN/UPC are:

- a) Encodable character set: numeric (0 to 9) i.e. ASCII characters 48 - 57 inclusive, in accordance with ISO 646;
- b) Symbology type: continuous;
- c) Elements per symbol character: 4, comprising 2 bars and 2 spaces, each of 1, 2, 3 or 4 modules in width (auxiliary patterns have differing numbers of elements);
- d) Character self-checking: yes;
- e) Data string length encodable: fixed (8, 12, or 13 characters including check digit depending on specific symbol type);
- f) Omni-directionally decodable: yes;
- g) Symbol check digit: one, mandatory (see A.1);
- h) Symbol character density: 7 modules per symbol character;
- i) Non-data overhead including the check digit, but not including quiet zones:
  - 18 modules for EAN-13, EAN-8 and UPC-A symbols
  - 9 modules for UPC-E symbols

### 4.2 Symbol types

The four types of the EAN/UPC symbol are:

- EAN-13, UPC-A and UPC-E, all of which may be accompanied by an add-on symbol;
- EAN-8.

The four symbol types are described in 4.4.1 to 4.4.4 and the optional add-on symbols are described in 4.4.5.

### 4.3 Symbol encodation

#### 4.3.1 Symbol character encodation

Symbol characters shall encode digit values in 7-module characters selected from different number sets known as A, B and C, as in Table 1:

Table 1: Number sets A, B and C

Digit value	Set A Element Widths				Set B Element Widths				Set C Element Widths			
	S	B	S	B	S	B	S	B	B	S	B	S
0	3	2	1	1	1	1	2	3	3	2	1	1
1	2	2	2	1	1	2	2	2	2	2	2	1
2	2	1	2	2	2	2	1	2	2	1	2	2
3	1	4	1	1	1	1	4	1	1	4	1	1
4	1	1	3	2	2	3	1	1	1	1	3	2
5	1	2	3	1	1	3	2	1	1	2	3	1
6	1	1	1	4	4	1	1	1	1	1	1	4
7	1	3	1	2	2	1	3	1	1	3	1	2
8	1	2	1	3	3	1	2	1	1	2	1	3
9	3	1	1	2	2	1	1	3	3	1	1	2
NOTE S denotes a space (light), B denotes a bar (dark), and the element widths are in modules.												

Annex D illustrates Table 1 graphically. The sum of the bar modules in any symbol character determines its parity. Symbol characters in number set A are odd parity characters. Symbol characters in number sets B and C are even parity characters. Number set C characters are mirror images of number set B characters.

Symbol characters in number sets A and B always begin on the left with a light module and end on the right with a dark module. Symbol characters in number set C begin on the left with a dark module and end on the right with a light module.

A data character shall normally be represented by a symbol character. However in certain specific instances defined below (see 4.4.1, 4.4.4, 4.4.5) the combination of number sets in a symbol may itself represent either data or a check value. This technique is referred to as variable parity encoding.

### 4.3.2 Auxiliary pattern encodation

Auxiliary patterns shall be composed as shown in Table 2.

**Table 2: Auxiliary patterns**

Auxiliary pattern	Number of modules	Element widths in modules					
		S	B	S	B	S	B
Normal guard pattern	3		1	1	1		
Centre guard pattern	5	1	1	1	1	1	
Special guard pattern	6	1	1	1	1	1	1
Add-on guard pattern	4		1	1	2		
Add-on delineator	2	1	1				
NOTE: S denotes a space (light) element, B denotes a bar (dark) element.							

Annex D illustrates these patterns graphically.

The normal guard pattern corresponds to the start and stop patterns in other symbologies and the special guard pattern is used as a stop pattern in UPC-E symbols.

## 4.4 Symbol formats

### 4.4.1 EAN-13 symbols

The EAN-13 symbol shall be made up as follows, reading from left to right:

- a left quiet zone;
- a normal guard pattern;
- 6 symbol characters from number sets A and B;
- a centre guard pattern;
- 6 symbol characters from number set C;
- a normal guard pattern
- a right quiet zone.

The rightmost symbol character shall encode the check digit calculated in accordance with Annex A.1.

Since the EAN-13 symbol comprises only 12 symbol characters but encodes 13 digits of data (including the check digit), the value of the additional digit, which is the character in the leftmost position in the data string, shall be encoded by the variable parity mix of number sets A and B for the 6 symbol characters in the left half of the symbol. The coding system for values of the leading digit is specified in Table 3. Figure 1 is an example of an EAN-13 bar code symbol.

**Table 3: Left half of EAN-13 symbol**

Leading digit, implicitly encoded	Number sets used for coding left half of EAN-13 symbol					
	Symbol character position					
	1	2	3	4	5	6
0*	A	A	A	A	A	A
1	A	A	B	A	B	B
2	A	A	B	B	A	B
3	A	A	B	B	B	A
4	A	B	A	A	B	B
5	A	B	B	A	A	B
6	A	B	B	B	A	A
7	A	B	A	B	A	B
8	A	B	A	B	B	A
9	A	B	B	A	B	A

NOTE: The leading digit value "0" is reserved for symbols encoding UCC-12 data strings.

**Figure 1: EAN-13 bar code symbol**

#### 4.4.2 EAN-8 symbols

The EAN-8 symbol shall be made up as follows, reading from left to right:

- a left quiet zone;
- a normal guard pattern;
- 4 symbol characters from number set A;
- a centre pattern;