

## **H. ISBN New Two:**



**International Standard Book Number (ISBN)** - Ten digit numbers used internationally by publishers to identify their books. Every book has a unique ISBN.

The ISBN barcode format is an example of a previously established numbering system being linked to a barcode symbology. In this case, it is linked to the International Article Number Association's (EAN) barcode system administered by **EAN International**. The combination of these two identification systems was achieved in 1980 when a contract was drawn up between the **International ISBN Agency** and EAN International.

The ISBN numbering system has been established internationally over a number of years as a method of cataloguing each new book title and edition. The adoption of the EAN number allows books to be scanned through stores under the same symbology as that used for general goods. This number is represented by the **EAN-13** barcode symbol. Also refer [A. EAN-13](#).

The ISBN number is a 10-digit number consisting of 4 groups, each separated by a hyphen:

1. **Group Identifier:** The first part of the ISBN identifies a country, area or language area participating in the ISBN system. A group identifier may consist of up to 5 digits.
2. **Publisher Identifier:** The second part of the ISBN, the publisher identifier may be between two and seven digits in length, and identifies a particular publisher within a group. The larger a publisher's output, the smaller its publisher identifier will be, allowing more digits for all the titles it publishes. Publisher identifiers are assigned by the ISBN agency responsible for the management of the ISBN system within the country, area or language area where the publisher is officially based.
3. **Title Identifier:** The third part of the ISBN identifies a specific edition or title of a publication of a specific publisher. A title identifier may consist of up to six digits.
4. **Check Digit:** The check digit is the last digit of an ISBN. It is calculated (based on the preceding nine digits) on a modulus 11 with weights 10 to 2, using X in lieu of 10 where ten would occur as a check digit. (See *Calculating the ISBN Check Digit* below).

An ISBN is usually allocated to:

- printed books and pamphlets
- book readings on cassette and educational videos
- microfiche publications
- computer software
- multimedia kits containing printed material.

An ISBN should be assigned the first time a book is published. A separate ISBN must be assigned to every edition of a book but NOT to an unchanged reprint of the same book.

A re-issued book is considered a different edition if, for instance

- it has a different format (such as printed, microform, large print)
- it has a different binding (such as paperback, hardbound)
- the type has been reset
- the publisher has changed, or
- there has been a change in size, or an addition of, text or illustrations.

An ISBN should also be assigned to the whole set of volumes of a multi-volume work as well as to each individual volume in the set.

### **Correct Presentation of the ISBN**

The ISBN is divided into four parts of variable length, each part separated by a hyphen. The precise positioning of the hyphens have been determined for the various group agencies and is available from the *International ISBN Agency*, Berlin, Germany. For English speaking countries, ie. Australia, Canada, Ireland, New Zealand, Puerto Rico, South Africa, Swaziland, UK, USA and Zimbabwe, the *Group Identifier* is **0** or **1**, for which the following algorithms are relevant.

### **Procedure for Correct Presentation of ISBN if the Group Identifier is 0:**

Look up the appropriate hyphen locations in the table below.

----- 2nd & 3rd digit	Insert hyphens after: -----
00-19	1st, 3rd and 9th digits
20-69	1st, 4th and 9th digits
70-84	1st, 5th and 9th digits
85-89	1st, 6th and 9th digits

90-94	1st, 7th and 9th digits
95-99	1st, 8th and 9th digits

Example: 0123456789

Inset hyphens: 0-12-345678-9

Prefix the number string with the letters ISBN: **ISBN 0-12-345678-9**

**Procedure for Correct Presentation of ISBN if the Group Identifier is 1:**

Look up the appropriate hyphen locations in the table below.

From - To (inclusive)	Insert hyphens after:
00-54999	Not assigned
55000-86979	1st, 6th and 9th digits
86980-998999	1st, 7th and 9th digits
999000-9999999	1st, 8th and 9th digits

Example: 1552095320

Inset hyphens: 1-55209-532-0

Prefix the number string with the letters ISBN: **ISBN 1-55209-532-0**

**OCR-B**

The ISBN number string must always be presented on a single line and positioned above the barcode symbol. The Human Readable Characters (HRC) are positioned at the base of the barcode. A recommended font for the ISBN number string and HRC is the OCR-B.

1 2 3 4 5 6 7 8 9 0

The OCR-B font

**Magnification Factor**

The ISBN/EAN-13 symbol is described by the *Magnification Factor*. The allowable limits being 80% to 200%. For each magnification there is a recommended (or nominal) height. This *height* is recommended to ensure symbol readability when read by a multi-directional scanner, therefore any reduction in height (or truncation)

should only be attempted if absolutely necessary. Refer EAN•UCC-13 barcode size charts.

ISBN/EAN-13 has a set of allowed tolerances for the quality of the printed code. These measurements relate to the maximum variation in the width of a single bar or space and vary according to magnification factor:

<b>Magnification Factor</b>	<b>Tolerance u (microns)</b>
80%	+/-35u
85%	+/-53u
90%	+/-68u
95%	+/-86u
<b>100%</b>	<b>+/-101u</b>
105%	+/-109u
110%	+/-116u
115%	+/-124u
120%	+/-132u
125%	+/-139u
130%	+/-147u
135%	+/-154u
140%	+/-162u
150%	+/-177u
160%	+/-193u
170%	+/-208u
180%	+/-223u
190%	+/-238u
200%	+/-256u

As the above table shows, the tolerances allowed reduce rapidly for magnification factors below 100%. For this reason, the final print method should be considered carefully when choosing a magnification factor. For example, some printing presses are too variable to consistently print small (eg. 80%) ISBN/EAN-13 codes.

### **Calculating the ISBN Check Digit**

The purpose of the check digit is to provide an arithmetic check of a string of numbers in order to detect the common errors usually associated with handling numbers. This operation is generally known as a check digit validation. These errors include transcription, transposition, 'shift' (usually adding or omitting a zero in a string of numbers) and random errors.

### **Modulo-11 algorithm**

The ISBN check digit differs from the EAN check digit as it is a **Modulo-11** number. (The numerals are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 and the letter X).

The nine digits of the ISBN number (ie. without the check digit) are multiplied by a weighting factor. The weighting factor varies according to the position of the digit and is 10 for the first digit, 9 for the second, 8 for the third, 7 for the fourth, 6 for the fifth, 5 for the sixth, 4 for the seventh, 3 for the eighth and 2 for the ninth digit. The results of the above nine multiplications are added together.

The result is divided by 11 and the remainder is used to find the check digit according to the following table:

Remainder	Check Digit
0	0
1	X
2	9
3	8
4	7
5	6
6	5
7	4
8	3
9	2
10	1

The following example shows how the calculation works for the ISBN number 012345678.

Step 1 Enter the basic digits of the ISBN (ie. the first nine without the check digit):

0 1 2 3 4 5 6 7 8

Step 2 Enter the constant weighting factors associated with each position of the ISBN:

10 9 8 7 6 5 4 3 2

Step 3 Multiply each digit by its associated weighting factor:

0 9 16 21 24 25 24 21 16

Step 4 Sum the products of the multiplication:

0 + 9 + 16 + 21 + 24 + 25 + 24 + 21 + 16

Total = **156**

Step 5 Divide the sum by the modulo number (11) to find the remainder:

156 divided by 11 = 14 remainder 2

Step 6 Look up the appropriate check digit for the particular remainder in the table above.

Remainder 2 on the above table gives 9 as the check digit. Therefore, the full ISBN number is **ISBN 0-12-345678-9**.

Note: the hyphens have been inserted using the '*Procedure for Correct Presentation of ISBN if the Group Identifier is 0*'.

### **Converting ISBN to EAN**

The EAN-13 number is derived from the ISBN number in the following manner:

- Remove the hyphens and the ISBN check digit (the last digit in the ISBN number)
- Add the EAN Prefix **978** to the number
- Calculate the EAN-13 check digit using *Modulo-10* (refer *Calculating the EAN Check Digit* below).

### **EAN Prefix 979 Reserved for Future Use with the ISBN System**

As part of the contractual arrangements between the International ISBN Agency and EAN International, another Prefix, **979** has been reserved for future use with the ISBN system. The purpose of the 979 prefix is to enable future extensions of the ISBN system, beyond its present structure, to be made machine-readable within the EAN system.

### **Calculating the EAN Check Digit**

In common with most other barcode implementations, ISBN/EAN-13 symbols also have a check digit which is the last number on the right. It is used to check for an error in scanning or data entry. The most common error found with the transcribing or keying of data is that of transposition (reversing the order of two digits). Therefore, the following mathematical formula (*Modulo-10*) is used:

### **Modulo-10 algorithm**

ISBN/EAN-13 without check digit: 9 7 8 0 1 2 3 4 5 6 7 8

Step 1 Starting with the first number on the right, add all the alternate numbers. Multiply the result by three.

$$8 + 6 + 4 + 2 + 0 + 7 = 27 \times 3 = \mathbf{81}$$

Step 2 Starting with the second number on the right, add all the alternate numbers.

$$7 + 5 + 3 + 1 + 8 + 9 = \mathbf{33}$$

Step 3 Add the results of steps 1 and 2.

$$\text{Total} = \mathbf{114}$$

Step 4 The check digit is the smallest number which when added to the total in Step 3, produces an exact multiple of ten.

In this example,  $114 + 6 = 120$ , therefore the check digit is **6**.

ISBN/EAN-13 with check digit: 9 7 8 0 1 2 3 4 5 6 7 8 **6**

Note: If the result of Step 3 is an exact multiple of 10, then the check digit is 0 (not 10).

## ISBN Versions

There are 4 current versions of the ISBN/EAN barcode:



The *ISBN New Two* and *ISBN New Five* variants have an add-on code which is used to carry in-house supplementary information. The *ISBN New K* version has a five digit add-on which is used to encode price.

### **Light Margins**

All barcode types require a certain amount of light space (or quiet zone) to the left and right of the code. This enables the scanner to differentiate between the barcode and surrounding graphics. Should the wrong type of graphic image or colour intrude on the light margin, there is a risk that the barcode will not decode, or worse, will decode incorrectly.

### **Minimum Light Margins (ISBN/EAN-13):**

<b>Left Light Margin (minimum)</b>	<b>Magnification Factor</b>	<b>Right Light Margin (minimum)</b>
2.91mm	80%	1.85mm
3.09mm	85%	1.97mm
3.27mm	90%	2.08mm
3.45mm	95%	2.20mm
<b>3.63mm</b>	<b>100%</b>	<b>2.31mm</b>
3.82mm	105%	2.43mm
4.00mm	110%	2.55mm
4.18mm	115%	2.66mm
4.36mm	120%	2.78mm
4.54mm	125%	2.89mm
4.72mm	130%	3.01mm
4.91mm	135%	3.12mm
5.09mm	140%	3.24mm
5.45mm	150%	3.47mm
5.81mm	160%	3.70mm
6.18mm	170%	3.93mm
6.54mm	180%	4.16mm
6.90mm	190%	4.39mm
7.26mm	200%	4.62mm



## **EAN Member Organisations and other relevant Organisations**

### **International ISBN Agency**

Staatsbibliothek zu Berlin  
-Preussischer Kulturbesitz-  
D-10772 Berlin  
GERMANY  
Telephone (+ 49 30) 266-2496, -2338  
Fax (+ 49 30) 266-2378, -2800  
e-mail [isbn@sbb.spk-berlin.de](mailto:isbn@sbb.spk-berlin.de)  
URL <http://www.isbn-international.org>

### **EAN (European Article Number) International**

145 rue Royale  
B – 1000 Brussels  
BELGIUM  
Telephone 32 2 227 10 20  
Fax 32 2 227 10 21  
e-mail [info@ean-int.org](mailto:info@ean-int.org)  
URL <http://www.ean-int.org>

### **EAN Australia Customer Service**

National Number 1300 366 033  
e-mail [anaust@ean.com.au](mailto:anaust@ean.com.au)  
URL <http://www.ean.com.au>

#### **Melbourne**

Axxess Corporate Park  
Unit 100/45 Gilby Road  
Mt Waverley Vic. 3149  
AUSTRALIA

#### **Sydney**

Lakes Business Park  
Building 4B, 2-4 Lord Street  
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