3.4 USA - System Identifier 6 (SI6)

This is a numbering system which was offered on a commercial basis by Distribution Codes Inc. in the USA. It uses the same 13 digit field length as EAN with the same check digit calculation, and is represented by the same type of bar code symbol. It is intended for use internationally for non-food items liable to be sold through retail checkouts.

Agreement was reached between DCI and the EAN Council that the SI6 system will use only the values 61, 62 and 65 to 69 in the two left hand digit positions. These values are therefore excluded from use in the EAN system and are not allocated as Prefixes, so that ambiguity will not occur.

3.5 ISBN Numbering

The International Standard Book Numbering system, based on International Standard ISO 2108/1972 is in use throughout the world for the numbering of published books. Agreement has been reached between the EAN Council and the International ISBN Agency for the co-ordination of the EAN and ISBN systems, so that the ISBN number can be represented on books by means of the EAN bar code symbol, without ambiguity.

For this purpose, the Prefix digits 978 have been issued to the ISBN Agency for the exclusive use of book coding throughout the world, and the Prefix digits 979 have been reserved for any possible future extension. (See Appendix 1.) The three prefix digits are followed by the existing 9 digit ISBN number, plus one check digit, to form a 13-digit number which can then be represented by an EAN bar code.

Full operating instructions for the use of the co-ordinated ISBN/EAN system will be issued by the ISBN Agency and its affiliates, and are not given in this Manual.

4.0 LIMITED CIRCULATION NUMBERING

The source numbering systems previously described are intended for use on retail articles which are put into general, unrestricted distribution. The number used for any one article must be totally unique against all others, and the compatibility structures described above are designed to achieve this.

In addition to the requirements of source numbering, both the UPC and EAN systems provide for other number series which will be used only in limited circulation. Such numbers must be unique against source numbers, but may themselves be used non-uniquely. i.e.limited circulation numbers may be used several times over, in separate environments, where they will not clash with each other; and none of them will clash with source numbers. When such numbers are used, the originators assume responsibility for ensuring that circulation is in fact limited, and that numbered items cannot "escape" to cause ambiguity elsewhere.

Any user can freely employ any of these series for his own limited circulation, either as human readable numbers only, for key-entry at the point of sale, or in the form of a standard bar code. Thus ANA members can use either the UPC or the EAN formulas, described below, as most convenient, in appropriate situations. The two principal user situations are : for the coding of redemption coupons; and for the coding in-store of items which have not been numbered at source.

4.1 Redemption Coupons

Two number series have been reserved for the coding of redemption coupons, one in UPC and one in EAN. It should be noted, however, that the use of bar codes for the identification of coupons is the subject of a patent action in the USA and the specification which follows is issued without prejudice as to the legal position.

4.1.1 UPC Coupon Numbering

In the UPC 12 digit number system, the prefix 5 is reserved for use on coupons. This becomes prefix (0)5 in the EAN 13 digit field.

The convention has been adopted in the USA that coupon numbers under this prefix should be structured as follows:

5 digits denoting the issuer of the coupon

2 digits denoting the article group

3 digits denoting the redemption amount

1 digit check digit according to the standard algorithm

Thus :

Prefix	Issuer	Group	Value	Check
(0) 5	S S S S S	G G	V V V	C

It is intended that the coupon number should be represented by the standard type of bar code. The value of this convention to ANA users is that bar code scanning equipment may be supplied programmed as standard to decode coupon numbers under prefix (0)5 in this manner. This will be a matter for agreement between users and their equipment suppliers.

4.1.2 EAN Coupon Numbering

In the EAN 13 digit number system, the prefixes 98 and 99 are reserved for use on coupons.

The EAN specification provides that the ten digits of the number following prefix 99 can be structured entirely at the discretion of each National Coding Authority. In the absence of a National structure, individual users can apply their own coding structure in agreement with suppliers of scanning equipment.

Thus :

Prefix	Coupon Data	Check
99	X X X X X X X X X X	C

In the case of prefix 98, the EAN specification provides that the next following digit shall be reserved to denote the geographical "territory" in which the coupon redemption operates. The nine following digits can then be structured at the discretion of the National Coding Authority or Authorities responsible for the territory.

Prefix	Territory	Coupon Data	Check
98	T	X X X X X X X X X	C

Note that since only the ten values 0 - 9 are available to denote the territory, it will not be possible to issue a separate territory number to all the National Coding Authorities participating in the EAN system. Some National Authorities may have to share a teritory number.

This would not be done where there was a possibility of coupons crossing a common regional boundary between Authorities. Territory numbers will be issued by the EAN Council to National Coding Authorities who request them.

ANA (UK) has not at this stage taken any decision to specify structures for either of these two coupon numbering series, but will respond to the views of interested users in due course. Members who have plans to make use of bar code scanning for coupon redemption are recommended to discuss requirements with ANA (UK).

4.2 UPC In-Store Code, Long Version

In the UPC 12 digit number system the prefix 2 is reserved for in-store use. This becomes prefix (0)2 in the EAN 13 digit field.

The remaining 10 digits plus check digit are therefore available for use in-store entirely at the discretion of the retailer, provided only that the scanning equipment can be programmed accordingly. Thus:

Prefix	In-Store Use	Check
(0) 2	X X X X X X X X X X	C

The principal use for this series of numbers is to deal with variable weight items, ie items sold in random weights against a fixed price per unit weight - typically: fresh meat, fruit and vegetables, cheeses, delicatessen. The available 10 digits can be structured in a variety of ways to represent the product type, and either the net weight or the calculated price. Equipment is commercially available for automatically weighing items, calculating an item price from the unit price, and printing the information in the form of a bar code label. The scanning equipment can then be programmed to use the prefix (0)2 as an instruction to decode the ensuing 10 digits according to the particular structure adopted.

4.2.1 UPC Standard Variable Weight Format

In the USA, a standard structure for variable weight codes under number system (0)2 has been adopted. This permits equipment to be constructed and programmed to a standard, at reduced cost. The US standard allows only for a 4-digit field for item price, which is not generally sufficient for use with all European currencies, nor in particular in the UK. However, any retailer wishing to make use of this system in-store, in agreement with his equipment supplier, can find full details in the UPC Guidelines Manual.

4.2.2 EAN Standard Variable Weight Format

In order to achieve similar standardisation in Europe, the EAN Council recommends the following format using number system (0)2 to give item code and five digits calculated price for variable weight items. It is hoped that equipment suppliers will be able to adopt this format as standard for the European market.

2 digits Prefix always having the value 02

4 digits In-Store Code Number for the item, assigned at store discretion

1 digit Verifier Digit for the following price digits, calculated according to the special algorithm given in Section 4.2.3.

5 digits Price of the item, calculated from weight and unit price, and expressed in the currency of the country (in the UK, this will be ££.pp.0/5)

1 digit Check digit calculated over all the previous digits according to the standard algorithm in Section 2.1.1.

Thus:

Prefix	In-Store Code	Verifier	Price	Check
(0)2	I I I I	V	P P P P P	C

Note: While this format is recommended as a standard for the programming of equipment, it is still open to a retailer to make use of number system (0)2 in any other way in-store, in agreement with the equipment supplier; eg to show weight instead of price, with or without a verifier digit.

4.2.3 Algorithm for Price Verifier Digit

The recommended algorithm for the price verifier digit is as follows:

* Each of the 5 price digit positions has a numerical coefficient or weighting factor assigned to it:

  Price digit position 1 is weighted by 5+
  2 is weighted by 2-
  3 is weighted by 5-
  4 is weighted by 5+
  5 is weighted by 2-

* To obtain the 2- weighted product of a digit, first multiply the digit by 2. If the product is greater than 9, subtract 1 from the product; otherwise subtract 0 from the product. The units position of the difference is the weighted product.

Thus:

Table 1

Digit	Calculation	2- Weighted Product
0	0 x 2 = 0 - 0 = 0	0
1	1 x 2 = 2 - 0 = 2	2
2	2 x 2 = 4 - 0 = 4	4
3	3 x 2 = 6 - 0 = 6	6
4	4 x 2 = 8 - 0 = 8	8
5	5 x 2 = 10 - 1 = 9	9
6	6 x 2 = 12 - 1 = 1 1	1
7	7 x 2 = 14 - 1 = 1 3	3
8	8 x 2 = 16 - 1 = 1 5	5
9	9 x 2 = 18 - 1 = 1 7	7

* To obtain the 5+ weighted product of a digit, first multiply the digit by 5. The sum of the digits in the product yields the 5+ weighted product.

* To obtain the 5- weighted product of a digit, take the ten's complement of the 5+ weighted product of that digit.

Thus:

Table 2

Digit	Calculation	5+ Weighted Product	5- Weighted Product
0	0 x 5 = 0	0	0
1	1 x 5 = 5	5	5
2	2 x 5 = 10; 1 + 0	1	9
3	3 x 5 = 15; 1 + 5	6	4
4	4 x 5 = 20; 2 + 0	2	8
5	5 x 5 = 25; 2 + 5	7	3
6	6 x 5 = 30; 3 + 0	3	7
7	7 x 5 = 35; 3 + 5	8	2
8	8 x 5 = 40; 4 + 0	4	6
9	9 x 5 = 45; 4 + 5	9	1

* To find the Price Verifier digit:

STEP 1 : Compute the weighted product for each price digit position using the above rules. For example, given a 5 digit price field containing the values 31546:

Position	Digit	Weight	Weighted Product
1	3	5+	6
2	1	2-	2
3	5	5-	3
4	4	5+	2
5	6	2-	1

STEP 2 : Sum the weighted products found in STEP 1. (In the example given above, the result is 6+2+3+2+1 = 14)

STEP 3 : Take the ten's complement of the units position of the sum found in STEP 2. (In the example given the ten's complement of 4 is 6)

STEP 4 : Find from Table 2 the number whose 5- weighted product is the same as the result of STEP 3. (In the example, 6 is the 5- weighted product of 8)

The result of STEP 4 is the Price Verifier Digit.

4.3 EAN In-Store Code, Long Version

In the EAN 13 digit number system the prefix 2 is reserved for in-store use. No further structure is specified; a total of 11 digits is therefore available for use in-store entirely at the discretion of the retailer. Thus:

Prefix	In-Store use	Check
2	X X X X X X X X X X X	C

The intention of this number series is that retailers should have the maximum flexibility to work out with their equipment suppliers any non-standard encodation they require. In particular, it can be used for variable weight items where more digits are required than provided for in the EAN recommended version in Section 4.2.2. It could also be used for in-store coding of item identity and price, for scanning at point of sale without price look-up.

Retailers should note that there is no advantage in using this number series unless more than 6 significant digits are actually required. Short version systems are available - see below.

4.4 UPC-E Local Assigned Codes (LAC)

In the UPC system, certain values of the 12 digit number series can be represented by a short version bar code. This is achieved by the suppression of zeros in the bar code. When the full-length number contains several zeros in a particular position, these zeros are omitted from the bar code, and the scanner is programmed to reinstate the zeros when reading the bar code. Full details are given in Sect. 5.7. The short version bar code is almost half the size of the standard version.

Of the zero-suppressible numbers, certain particular values have been reserved for in-store use and are therefore available for this purpose to ANA members. In a 13 digit field, these values are :

Prefix	In-Store Use			Check
(0) 0	from 01000 to 07999	0000	from 5 to 9	C

(It will be seen from Sect 3.3 that these values have been excluded from the issue of manufacturer numbers, and therefore will not be encountered on source marked articles).

It is absolutely essential that only these values should be used in the allocation of in-store numbers. In particular, if values other than 5 to 9 are used for the last digit, the short version bar code cannot be used.

All numbers from this series can be encoded for in-store use by means of a short version bar-code. In-store label-printing machines are commercially available, which produce short-version bar codes, using only the permissible numerical values. When zero-suppressed, these numerical values become

010005 to 9	to	079995 to 9

When using such a system, it must be remembered that while the label shows only a short code and a short number, the scanner will reconstitute this to a full-length number again. Therefore it is the full-length form of the number which must be entered to the price look-up file. For example, a short form in-store bar code with the apparent numeric value

012345

would have to be entered to a 13-digit price look-up file in the form

000123400005(C)

See Section 5.7.2.

The UPC-E LAC format provides a total of 35,000 item number combinations for use in-store.

Note that this version of short bar code is not available in the UK or in Europe for source numbering.

4.5 EAN In-Store Code, Short Version

See Sect. 3.2.

In the EAN-8 number series, the prefix value 2 is reserved for in-store use. As explained previously, the EAN-8 number must be right justified in a 13 digit field; therefore the format for in-store use is:

Prefix	In-Store Use	Check
(00000) 2	X X X X X X	C

This gives a total of six significant digits available for structuring entirely at the retailer's discretion, in agreement with the equipment supplier. This form of number can be represented by a short version bar code (See Sect. 5.6).

4.6 EAN Velocity Code

Referring to the previous section, in the EAN-8 number series, the prefix value 0 is also reserved for in-store use. Thus :

Prefix	In-Store Use	Check
(00000) 0	X X X X X X	C

Numbers in this form can be represented by the short version bar code described in Sect. 5.6.

However, numbers in this form are also particularly suitable for key entry. The six significant digits for in-store use can be allocated to items in sequence according to rate of sale, ie "velocity coding" in which the lowest number values are given to the fastest moving items. Since the prefix is zero, only zeros appear on the

left of the velocity code, which may itself be as little as one significant digit, plus the check digit. The left-hand zeros need not be keyed in. Thus a large volume of item movement may be captured with a minimum of key-entry strokes.

If the fastest moving item in-store is coded No.1 this would be represented in the price look-up file:

Prefix	Velocity Code	Check
(00000) 0	0 0 0 0 0 1	7
	Key-Entry	
Short-version bar code		

Only the figures 1 and 7 need to be key-entered? *

The advantage of this system is that it enables retailers to operate simultaneously with key-entered velocity codes and with machine scanning of source marked bar codes, both sharing the same price look-up file. Ambiguity between the two is excluded.

Retailers may therefore find it advantageous to start point of sale data capture by installing electronic cash registers for key entry of human-readable velocity codes to a price look-up file. This file should be of 13 digit field length in the first place. As and when source marked bar codes become common, scanning equipment can be added and source marked items read in to the existing price file without systems change.

4.7 Supplementary Encodations

The foregoing Sections describe all the mutually compatible numbering systems and standard formulations known to be current at the present time, and likely to be in any way relevant to members and users of the ANA system. Note that all these numbering structures use the same check digit calculation in the right hand position. Description in this specification does not imply that any particular piece of equipment will necessarily be programmed for a given structure. This must be a matter for agreement between users and equipment suppliers.

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* Keyboard functions are not part of the ANA specification and operating procedures must be agreed with each equipment manufacturer.

Various "supplementary encodations" have been formulated by equipment manufacturers for more or less specialised applications, and no doubt this process will continue. Users are invited to discuss any specialised requirements they may have with ANA (UK), so that if warranted supplementary specifications can be agreed at national or international level.

5.0 BAR CODE SYMBOL SPECIFICATIONS

5.1 Standard Features

The ANA number system, and associated number systems, described in the previous sections are all capable of being represented by various versions of a machine readable bar code. All versions of the bar code have the following characteristics in common :

- Bar code symbols are of overall rectangular shape, made up of a series of light and dark parallel bars perpendicular to an imaginary base line or reference line, with a light margin on all sides.
- The light and dark bars are composed of modules of uniform width, light or dark. (In the following descriptions a dark module is represented by 1 and a light module by 0.)
- Characters in the bar code representing numerical digits are made up of 7 modules light or dark.
- In these characters the modules are grouped into bars, with each digit represented by 2 dark bars and 2 light spaces.
- A dark bar or a light space may comprise from 1 to 4 modules.
- In addition to the digit characters, there are auxiliary characters, comprising fewer modules, used as guard bars or centre bars for beginning, ending, and separation.
- The symbol is designed to be read omni-directionally by a fixed-position scanner. It can also be read uni-directionally by a hand held wand or light pen.
- The symbol size is variable between limits in magnification, to accommodate the ranges in quality achievable by the various printing processes.
- Dimensions are specified for one particular size of symbol, known as the nominal size. Magnification limits are from 0.8 to 2.0 times the nominal size.

5.2 Number sets

Digital values are represented in the bar code symbols by 7-module characters arranged in different number sets known as A, B, and C, as follows:

VALUE OF CHARACTER	REPRESENTATION IN SET A	REPRESENTATION IN SET B	REPRESENTATI IN SET C
0	0 0 0 1 1 0 1	0 1 0 0 1 1 1	1 1 1 0 0 1 0
1	0 0 1 1 0 0 1	0 1 1 0 0 1 1	1 1 0 0 1 1 0
2	0 0 1 0 0 1 1	0 0 1 1 0 1 1	1 1 0 1 1 0 0
3	0 1 1 1 1 0 1	0 1 0 0 0 0 1	1 0 0 0 0 1 0
4	0 1 0 0 0 1 1	0 0 1 1 1 0 1	1 0 1 1 1 0 0
5	0 1 1 0 0 0 1	0 1 1 1 0 0 1	1 0 0 1 1 1 0
6	0 1 0 1 1 1 1	0 0 0 0 1 0 1	1 0 1 0 0 0 0
7	0 1 1 1 0 1 1	0 0 1 0 0 0 1	1 0 0 0 1 0 0
8	0 1 1 0 1 1 1	0 0 0 1 0 0 1	1 0 0 1 0 0 0
9	0 0 0 1 0 1 1	0 0 1 0 1 1 1	1 1 1 0 1 0 0

Characters in Number set A comprise an odd number of dark modules. These are known as characters with odd parity.

Characters in Number sets B and C comprise an even number of dark modules. These are known as characters with even parity.

These characters are shown in enlarged schematic form in Appendix 3.

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. Characters in Number set C begin on the left with a dark module and end on the right with a light module. Taken in conjunction with the modules for guard pattern and centre pattern, it will be seen later that every character in a symbol begins and ends with a different module, light or dark, from its neighbour to left or right. This means that the boundary between two characters can always be visually distinguished, which is essential for unambiguous decoding.

5.3 Auxiliary Characters

Auxiliary characters are composed as follows:

Auxiliary Character	Number of Modules	Module Set
Normal guard pattern	3	101
Centre pattern	5	01010
"E" version right guard pattern	6	010101

These characters are shown in enlarged schematic form in Appendix 4.

5.4 Nominal Dimensions of Characters

In the nominal size (ie, when the magnification = 1.0), the ideal theoretical width of a character module is 0.33 mm.

The corresponding width of characters is:

- Number set characters : 7 modules = 2.31 mm
- Auxiliary characters:
  - normal guard pattern : 3 modules = 0.99 mm
  - centre pattern : 5 modules = 1.65 mm
  - "E" version right guard : 6 modules = 1.98 mm

The ideal theoretical dimensions of all characters in the nominal size are given in Appendix 5.

Note 1: The internal dimensions for number characters with the values 1, 2, 7 and 8 do not exactly correspond to multiples of the module width of 0.33 mm. This is not an error. For these characters, some of the bars and spaces are reduced or enlarged by 1/13 of a module to provide a uniform distribution of bar width tolerances and to improve scanning reliability.

Note 2: The width of number characters is measured from the one visually indicated edge (comprising a dark bar) to the visually indicated edge of the adjacent character.

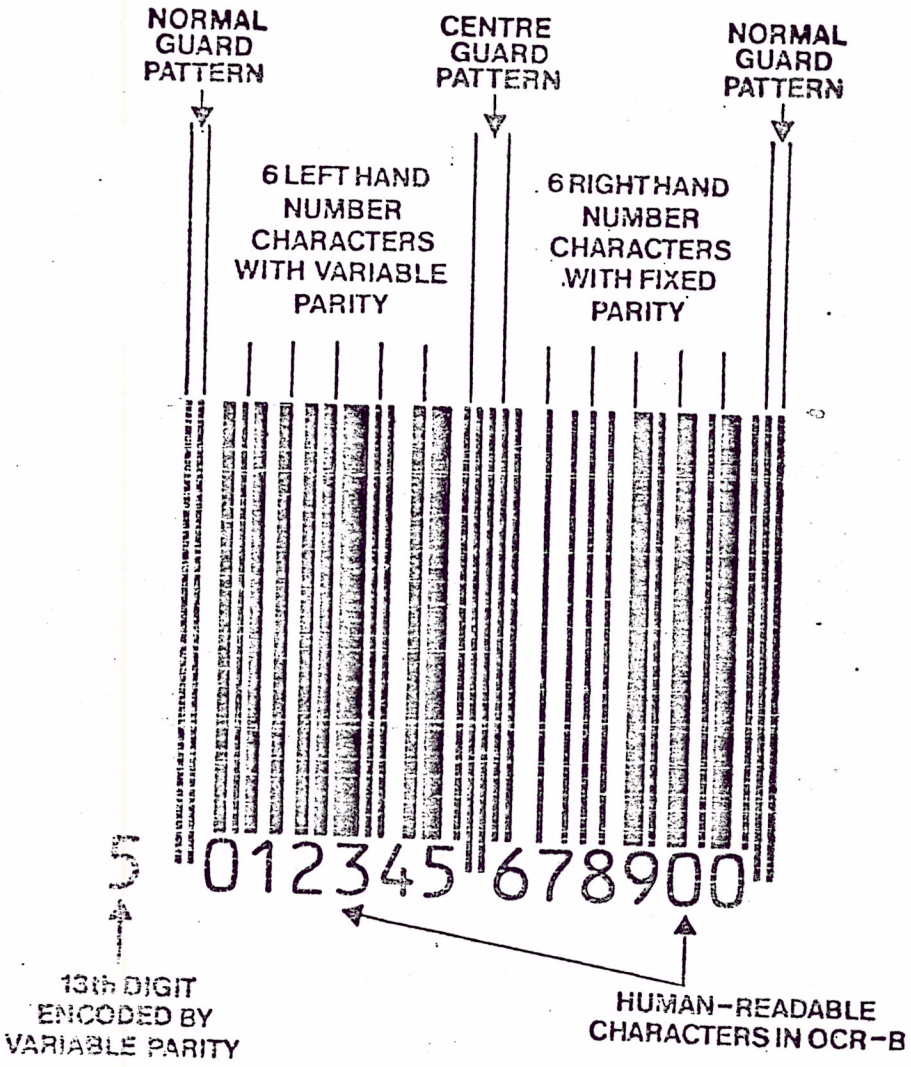


FIG.1

12 CHARACTER BAR CODE

Note 3: The width of auxiliary character end patterns is measured from a visually indicated edge to the edge of the light margin surrounding the symbol.

Note 4: All dimensions given are ideal, theoretical dimensions corresponding to the nominal size of symbols. These dimensions are not intended to be used directly in the preparation of symbols. Production aspects and tolerances are dealt with in Sect.6.0 seq.

5.5 Format of 12-character Bar Code

ANA standard 13 digit numbers, other numbers in the EAN-13 series, UPC-A series numbers and SI-6 series numbers are all represented by a 12 character bar code. This bar code is made up as follows, reading from left to right:

1) A normal guard pattern

2) 6 digit characters from Number sets A or B, comprising the "left half" of the symbol

3) A centre pattern

4) 6 digit characters from Number set C, comprising the "right half" of the symbol

5) A normal guard pattern

An enlarged version of this code is shown in Fig.1.

The bar code comprises only 12 digit characters and therefore the 13th digit in the above number series is not represented directly by a digit character. The 13th digit which is not so represented will always be the digit in the leftmost position of the 13 digit number. The remaining 12 digits in the number are represented by the characters in the bar code, in the same sequence left to right.

5.5.1 Variable Parity Coding of 13th Digit

The value of the 13th digit is encoded by permutation in the use of Number Sets A and B to represent the 6 characters in the left half of the symbol. This is known as using variable parity in the left half: i.e. Number Set A is of odd parity, Number Set B is of even parity, and the left half is composed of a permutation of both odd and even parity characters.

The coding system for values of the 13th digit is as follows:

Value of 13th Digit	Number Sets used for Coding left half of symbol					
	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

5.5.2 Parity Mix of ANA Codes

Since all numbers in the ANA series always commence with a prefix digit 5 in the left hand position, the 13th digit to be encoded by variable parity in the ANA system will always have the value 5. Therefore ANA 12 character symbols will always have the same parity mix in the left half. From the previous table this will be:

A B B A A B

For example:

ANA number 50-26451-73885-4 will be coded by:

Number Set:		A B B A A B		C C C C C C	
Characters:	Guard Pattern	0 2 6 4 5 1 Parity value = 5	Centre pattern	7 3 8 8 5 4	Guard pattern

5.5.3 Fixed Parity of UPC Codes

It will also be noticed that a value of 0 for the 13th digit is assigned to the permutation which consists of Number Set A for all 6 characters in the left half. As stated in Section 3.3 UPC codes were originally conceived as consisting of 12 digits only, with no need to encode a 13th digit. UPC symbols are specified simply as composed of Number Set A for

the left half and Number Set C for the right half. This particular fixed parity sequence has therefore been used to represent a value of zero, and to give to UPC codes the implied 13th digit value of zero which is required for compatibility with EAN-13 series numbers.

5.5.4 Human Readable Characters

The numerical value of the code in human readable characters is printed underneath the symbol with each digit below the corresponding bar code character. (See Fig.1) The 13th digit encoded by variable parity is printed outside the guard bar pattern on the left. OCR-B font is specified for the human readable characters: specimens are given in Fig.2. This font is adopted only as a convenient standard typeface and it is not intended that these characters should be machine read.

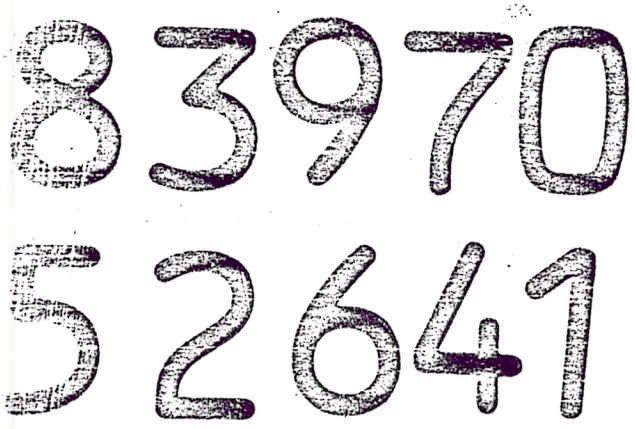


FIG.2 - OCR-B FONT

5.5.5 Nominal Dimensions of the 12 Character Bar Code

The dimensions for the 12 character symbol in the nominal size are shown diagrammatically in Appendix 6. These dimensions correspond to the nominal size module width of 0.33 mm.

12 number characters x 7 modules = 84

2 guard patterns x 3 modules = 6

1 centre pattern x 5 modules = 5

95 modules

Width of code bars in nominal size symbol:

95 modules x 0.33 mm = 31.35 mm

The height of the bars in the nominal size symbol is 22.85 mm. This dimension is not modular, but is an essential function of the width in order to ensure omni-directional scanning.

The light margin which must surround the code bars (the printing zone) is indicated by the four corner marks (which need not themselves be printed).

The light margin area corresponds to a minimum of:

- 7 module widths to the right of the symbol
- 11 module widths to the left of the symbol
- 1 module width above the symbol
- 1 module width between the lower edge of the number bars and the OCR-B placed below them.

The height of the OCR-B figures in the nominal size symbol is 2.75 mm.

The centre pattern and guard patterns extend below the lower edge of the bars representing the number characters. This extension is equal to 1.65 mm which corresponds to 5 module widths.

5.5.6 UPC Bar Code Differences

The 12 character bar code used for the source marking of UPC numbers is the same in all essentials as that described in Sections 5.5.4 and 5.5.5 with only the following minor differences:

- the 13th digit derived from the left hand parity (value 0 in this case) is not shown in human readable characters
- the OCR-B digit corresponding to the first bar code number character is printed to the left of the bar code

- the last bar code character (the check digit) is not printed at all in human readable characters

- the first and last bar code number characters are extended in depth.

These differences are quite immaterial to the scanning process and are described merely for the guidance of users who may encounter UPC bar codes on imported merchandise. When numbers from the UPC series are used in-store in bar code form (See Sections 4.1.1 and 4.2.) the bar code symbol and OCR-B figures can be constructed in exactly the same format as described in Sections 5.5.4 and 5.5.5.

5.6 Format of 8 character bar code

This shorter version bar code is used to represent the ANA standard short number and the EAN-8 short version number described in Sections 2.2, 3.2 and 4.5. It is made up as follows, reading from left to right:

1) A normal guard pattern

2) 4 digit characters from Number Set A comprising the "left half" of the symbol

3) A centre pattern

4) 4 digit characters from Number Set C comprising the "right half" of the symbol

5) A normal guard pattern

An enlarged version of this code is shown in Fig.3.

The 8 digit characters in this bar code directly represent the 8 digits in the EAN-8 number series, in the same sequence left to right. There is no parity variation from the fixed pattern in the left and right halves of the symbol.

5.6.1 Human Readable Characters

The numerical value of the code in human readable characters is printed underneath the symbol, with each digit below the corresponding bar code character. OCR-B font is specified, the same as for the 12 character code - see Section 5.5.4. Again, this font is adopted only as a convenient standard typeface and it is not intended that these characters should be machine read.

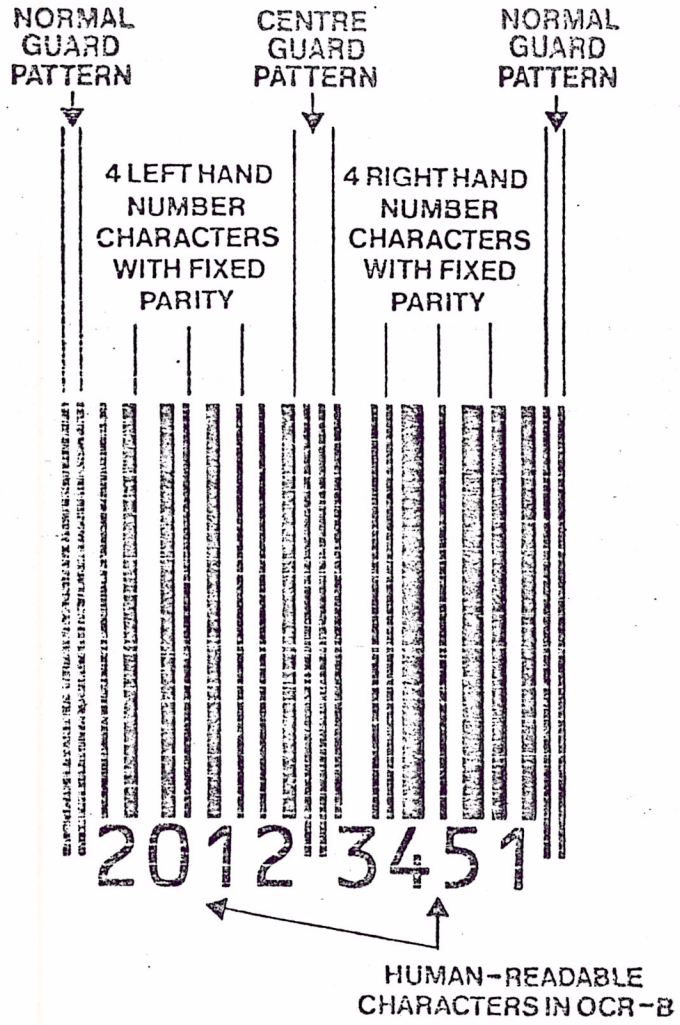


FIG.3

8 CHARACTER BAR CODE

5.6.2 Nominal Dimensions of the 8 Character bar code

The dimensions for the 8 character symbol in the nominal size are shown diagrammatically in Appendix.7. These dimensions correspond to the nominal size module width of 0.33 mm.

8 number characters x 7 modules	=	56
2 guard patterns x 3 modules	=	6
1 centre pattern x 5 modules	=	5
		67 modules

Width of code bars in nominal size symbol:

67 modules x 0.33 mm	=	22.11 mm

The height of the bars in the nominal size symbol is 18.23 mm. This dimension is not modular, but is an essencial function of the width in order to ensure omni-directional scanning.

The light margin which must surround the code bars (the printing zone) is indicated by the four corner marks (which need not themselves be printed).

This light margin area corresponds to a minimum of:

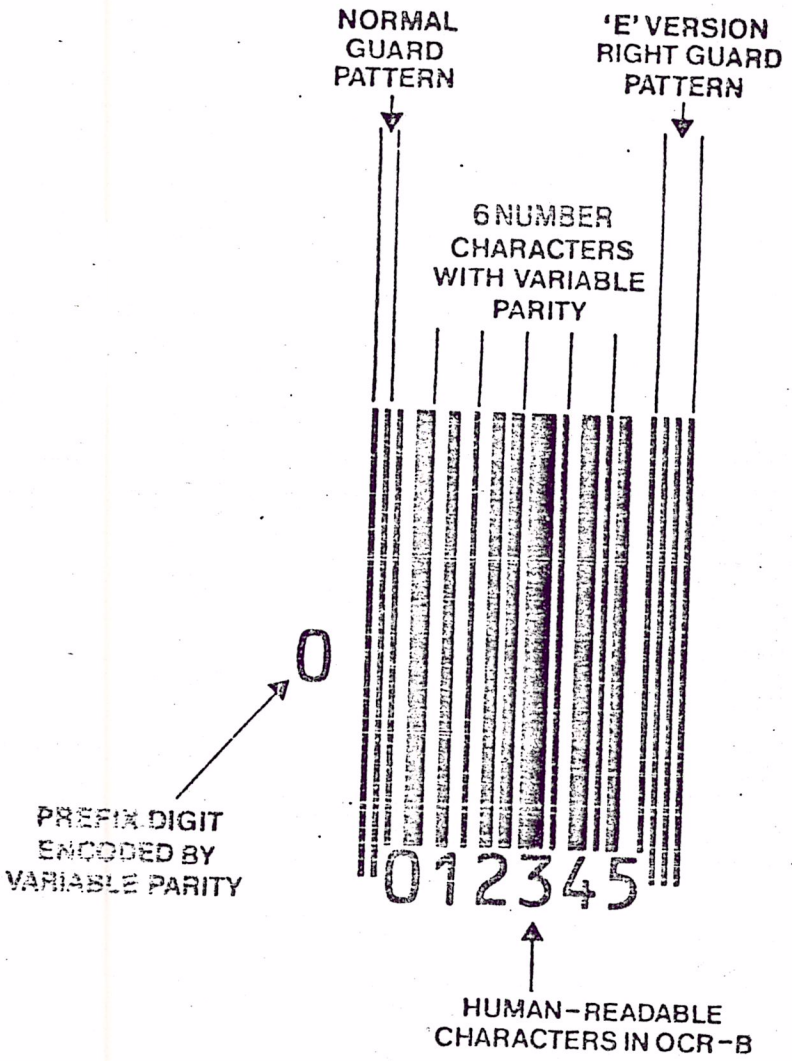
- 7 module widths to the right and left of the symbol
- 1 module width above the symbol
- 1 module width between the lower edge of the number bars and the OCR-B figures placed below them.

The height of the OCR-B figures in the nominal size symbols is 2.75 mm.

The centre pattern and guard patterns extend below the lower edge of the bars representing the number characters. This extension is equal to 1.65 mm which corresponds to 5 module widths.

5.7 Format of the UPC-E bar code

This short version bar code consists of only six number characters, and can be used only to represent zero suppression numbers in the UPC series. It is described here only for the guidance of retailers who may be concerned with it in two ways:



SHORT VERSION BAR CODE REPRESENTING
UPC NUMBER 0-01234-00005-7
BY ZERO SUPPRESSION

FIG. 4

UPC-E BAR CODE

- it may be used for in-store symbol marking of articles (See Section 4.4)

- it may be encountered on imported merchandise source-marked under the UPC system

(The warning is repeated that this bar code cannot be used for source marking in the ANA system).

The UPC-E bar code is made up as follows, reading from left to right:

1) A normal guard pattern

2) 6 digit characters from number sets A or B

3) An "E" version right guard pattern (See Section 5.3)

An enlarged version of this code is shown in Fig.4.

5.7.1 Variable Parity Coding of Prefix and Check Digit for UPC-E

The UPC-E bar code represents directly only 6 digit values from the 6 digit characters. Two additional digit values are encoded by permutation in the use of Number sets A and B to represent the 6 digit characters. This is known as using variable parity; i.e. Number set A is of odd parity, Number set B is of even parity, and the bar code is composed of a permutation of both odd and even parity characters.

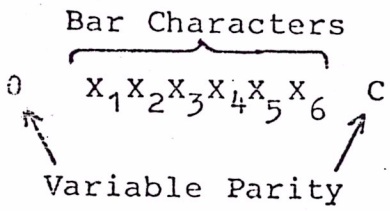
The two digit values thus encoded by variable parity are used to supply a Prefix digit and a Check Digit respectively. The value of the Prefix Digit is always zero. The coding system for the two digit values is as follows:

Value of Prefix Digit	Value of Check Digit	Number Sets used for Prefix Symbol Characters					
		1	2	3	4	5	6
0	0	B	B	B	A	A	A
0	1	B	B	A	B	A	A
0	2	B	B	A	A	B	A
0	3	B	B	A	A	A	B
0	4	B	A	B	B	A	A
0	5	B	A	A	B	B	A
0	6	B	A	A	A	B	B
0	7	B	A	B	A	B	A
0	8	B	A	B	A	A	B
0	9	B	A	A	B	A	B

See also Section 5.5.1. Note that the variable parity coding systems for 12 character bar codes and for UPC-E bar codes are different.

5.7.2 Decoding a Zero-Suppression Symbol

The UPC-E symbol, on being scanned, yields 8 digit values : 6 values directly from the bar characters, and 2 values from the variable parity. Thus:



The value of the last bar code character X_6 is then used to determine the way in which zeros are inserted in order to reconstitute a full-length number, as shown in the following table.

SYMBOL	DECODED NUMBER	
Character Values	Manufacturer	Item
0 $X_1X_2X_3X_4X_5$ 0 C	0 $X_1X_2$0 0 0	0 0 $X_3X_4X_5$C
0 $X_1X_2X_3X_4X_5$ 1 C	0 $X_1X_2$1 0 0	0 0 $X_3X_4X_5$C
0 $X_1X_2X_3X_4X_5$ 2 C	0 $X_1X_2$2 0 0	0 0 $X_3X_4X_5$C
0 $X_1X_2X_3X_4X_5$ 3 C	0 $X_1X_2X_3$0 0	0 0 0 X_4X_5C
0 $X_1X_2X_3X_4X_5$ 4 C	0 $X_1X_2X_3X_4$0	0 0 0 0 X_5C
0 $X_1X_2X_3X_4X_5$ 5 C	0 $X_1X_2X_3X_4X_5$	0 0 0 0 5 C
0 $X_1X_2X_3X_4X_5$ 6 C	0 $X_1X_2X_3X_4X_5$	0 0 0 0 6 C
0 $X_1X_2X_3X_4X_5$ 7 C	0 $X_1X_2X_3X_4X_5$	0 0 0 0 7 C
0 $X_1X_2X_3X_4X_5$ 8 C	0 $X_1X_2X_3X_4X_5$	0 0 0 0 8 C
0 $X_1X_2X_3X_4X_5$ 9 C	0 $X_1X_2X_3X_4X_5$	0 0 0 0 9 C

Note 1: The check digit is calculated over the full-length reconstituted number.

Note 2: The above table shows short codes reconstituted to full length numbers in the UPC series, ie 12 digits in length. As explained in Section 3.0, all numbers are treated as right justified in a 13 digit field. Therefore these reconstituted numbers can be considered as having an additional 13th (left hand) digit of value 0.

Note 3: All numbers reconstituted from the scanning of a UPC-E short symbol therefore commence with 2 zeros in a 13 digit field. As explained in Section 3.3, such numbers are reserved for the UPC grocery series. Therefore the UPC-E short symbol cannot be used for any other series of source numbering in Europe.

Note 4: The UPC-E symbol can be used for in-store labelling in the UK only if composed from the restricted range of numbers assigned for this purpose. See Section 4.4.

Scanning equipment which is available commercially will normally be programmed to decode a six character bar code in accordance with the rules in this section.

5.7.3 Human Readable Characters for UPC-E

The UPC specification provides that the numerical values of the bar characters are printed underneath in OCR-B typeface, with the Prefix digit outside the guard bar pattern on the left. The check digit is not shown in human readable form at all. The UPC-E symbol will therefore appear in this form on imported source marked merchandise.

UPC-E symbols used for in-store marking in the UK may follow this convention, or use any other convenient form of human readable characters, provided the dimensional requirements are respected.

5.7.4 Nominal dimensions of the UPC-E bar code

The dimensions of the UPC-E code in the nominal size are shown diagrammatically in Appendix 8. These dimensions correspond to the nominal size module width of 0.33 mm.

6 number characters x 7 modules	= 42
1 normal guard pattern x 3 modules	= 3
1 "E" version right guard pattern x 6 modules	= 6
	51 modules

Width of code bars in nominal size symbol:

51 modules x 0.33 mm = 16.83 mm

The height of the bars in the nominal size symbol is 22.85 mm. This dimension is the same as for the nominal size of the 12 character bar code.

The light margin which must surround the code bars (the printing zone) is indicated by the four corner marks (which need not themselves be printed).

The light margin corresponds to a minimum of:

- 5 module widths to the right of the symbol
- 11 module widths to the left of the symbol
- nil above the symbol
- 1 module width between the lower edge of the number bars and the OCR-B figures placed below them.

The height of the OCR-B figures in the nominal size symbol is 2.75 mm.

The guard patterns extend below the lower edge of the bars representing the number characters. This extension is equal to 1.65 mm which corresponds to 5 module widths.

5.8 Add-on Bar Codes

Certain industries may wish to have the facility of encoding supplementary information in bar code form, for internal purposes, in addition to the unique identification number for the item which is embodied in the main bar code. The use of this facility has so far been agreed for publishers of books and periodicals, in order to identify particular issues and editions of a publication for purposes of inventory control and returns. To avoid confusion other industries should not make use of this facility without prior discussion with the ANA Council.

The EAN and ANA organisations have therefore adopted standard specifications for two types of "add-on" bar codes, representing 2 digits and 5 digits respectively. These specifications are identical with specifications issued by the UPC Council in the USA. This standardisation is intended to encourage the economical production of equipment capable of scanning add-on codes for those who require it.

Note 1: the use of such extra scanning equipment is purely optional at retail: retailers with normal point-of-sale scanning equipment will not be able to read add-on codes

Note 2: the add-on code must not be used for identifying item differences which should be distinguished in the main code: see Section 2.6

Note 3: The add-on codes can be used only with 12-character main codes, and not with the short form 8-character codes

The ANA Council has not adopted any rules governing the ways in which these supplementary digits can be used to represent information. Individual industries may wish to choose conventions for use within their own industry.

5.8.1 Format of 2-digit Add-on Bar Code

2-digit add-on numbers are represented by a bar code made up as follows, reading from left to right:

1) a special left-hand guard pattern comprising modules 1011

2) a 1st digit character from Number sets A or B

3) a special Delineator pattern between digits, comprising modules 01

4) a 2nd digit character from Number sets A or B

There is no right hand guard pattern.

5.8.2 Variable parity check, 2 digits

There is no explicit check digit for the 2 digit add-on code. Checking is done, however, through the choice of the number set (A or B) used for the two digits. This choice is linked to the value of the add-on code in the way shown by the following table:

Value of the Add-on Code	Number Set	
	Left hand digit	Right hand digit
Multiple of 4, ie : 00, 04, 08 96	A	A
(Multiple of 4) + 1, ie: 01, 05, 09 97	A	B
(Multiple of 4) + 2, ie: 02, 06, 10 98	B	A
(Multiple of 4) + 3, ie: 03, 07, 11 99	B	B

5.8.3 Format of 5-digit Add-on Bar Code

5-digit add-on numbers are represented by a bar code made up as follows, reading from left to right:

1) a special left hand guard pattern comprising modules 1011

2) a 1st digit character from Number sets A or B

3) a special Delineator pattern between digits, comprising modules 01

4) a 2nd digit character from Number sets A or B

5) Delineator pattern 01

6) a 3rd digit character from Number sets A or B

7) Delineator pattern 01

8) a 4th digit character from Number sets A or B

9) Delineator pattern 01

10) a 5th digit character from Number sets A or B

There is no right hand guard pattern

5.8.4 Variable parity check, 5 digits

There is no explicit check digit for the 5-digit add-on code. Checking is done, however, by calculating a check value for the five digits in a manner similar (but not identical) to that used in calculating the check digit for Standard ANA numbers as in Section 2.1.1; and then using this check value to determine the choice of number set (A or B) used for each of the five digits.

For example, if the add-on code is 86104:

Step 1: Starting at the end, sum the alternate digits:
8 + 1 + 4 = 13

Step 2: Multiply the result of Step 1 by 3:
13 x 3 = 39

Step 3: Sum the remaining digits:
6 + 0 = 6

Step 4: Multiply the result of Step 3 by 9:
6 x 9 = 54

Step 5: Add the results of Step 2 and Step 4:
39 + 54 = 93

Step 6: The check value is the units position of Step 5:
X = 3

The number set can now be determined by using the following table: