READ ME - NAVIGATOR

1. INTRODUCTION AND DISCLAIMER

This document is the concise definition and explanation of the use of the EAN•UCC data standards within Automatic Data Capture (ADC) technologies. It supersedes all previous ADC technical documents provided by either EAN International or the Uniform Code Council (UCC) and takes immediate effect as the agreed technical basis for the system. It is expected that every organisation will fully conform to these specifications by January 2001.

The January 2001 date has been set to allow time for migration, by some organisations in some countries, where changes may be required to deal with issues such as:

1) The definition of AI 02 (AI 02 has a mandatory association with AI 00 and is used in conjunction with AI 37)) These AIs should only be used when the logistic unit itself has not been given its own GTIN.
2) The '9' being part of the GTIN when used as the first digit of an EAN/UCC-14 number.
3) A GTIN being considered as 14-digit number, right justified with leading zeros as appropriate, in database files.

These specifications were jointly developed by EAN International and UCC and emphasises the commitment of both organisations to global standards. All future development of the EAN•UCC system will be incorporated by updates to this document.

The following changes have been made to the General EAN•UCC Specifications since they were last released in January 1999. This includes the fully incorporated Chapters 5 and 6, which were pre-released in October 1999 and that have since had further changes included.

Chapter 0, paragraph 2.3 – Future Updates – additional words

Chapter 1, New Section 2 – Company Prefix

Chapter 1, page 3, the first paragraph – additional of words.

Chapter 1, page 5 – additional words under Figure 1-1

Chapter 1, page 8 – Components of the Numbering Structure – clarification of company prefix.

Chapter 1, page 12 – additional words under Figure 1-12

Chapter 2, Section 1, sub-section 2.1.2 – Trade item scanned at retail point of sale – clarification of when to use EAN/UPC symbologies

Chapter 2, Section 1, sub-section 2.1.3 – When is an EAN/UCC-8 bar code symbol used? Changes to third and fourth bullet points.

Chapter 2, Section 1, sub-section 2.1.5.6 – 2 digit serial numbers, change to 2nd digit for seasonal period

Chapter 2, Section 1, NEW sub-section 2.1.5.7 – 5 digit serial numbers

Chapter 2, Section 1, sub-section 2.1.6.3 – clarification of when to use EAN/UCC-14 identification numbers when identifying mixed groupings of trade items

Chapter 2, Section 1, sub-section 2.3.3 – Numbering in a geographical area defined by the Numbering Organisation – new note.

Chapter 2, Section 1, sub-section 2.3.5 – Company Internal – EAN•UCC prefix 00 – explanation of acronyms LAC and RZSC.

Chapter 2, Section 1, sub-section 2.4.2 – Identification of variable measure retail items

Chapter 2, Section 1, sub-section 4 – Allocating the Numbers, under 4.1 – General Rules, additional advice on customer specific packaging.

Chapter 2, Section 1, sub-section 4, in paragraph 4.3 Lead time in re-using a GTIN – new advice about use of GTINs for statistical analysis

Chapter 2, Section 1, sub-section 4, in paragraph 4.6.1 Promotional variants changes to third and fourth bullet points

Chapter 2, Section 1, sub-section 4, in paragraph 4.6.2 Product Changes, additional words to third bullet about different languages.

Chapter 2, Section 2, sub-section 4.5 – Technical Specifications in paragraph 4.5.1.2 Magnification of SSCC.

Chapter 2, Section 2, sub-section 4.5 - in paragraph 4.5.2.2 Human translation. Additional information about data tags.

Chapter 2, Section 2, sub-section 4.5 – in paragraph 4.5.3 – Various additional statements clarifying logistics label location on various types of units. Diagrams have been update too.

Chapter, Section 2, sub section 4.5 – NEW paragraph regarding Pallets less than 1 metre in height.

Chapter 2, Section 4 – page 7, paragraph 3.3.1 additional paragraph regarding development of AI 420 and AI 421

Chapter 3 Three NEW AIs included:

AI 251 – Reference to Source Entity

AI 392n – Amount Payable – Single Monetary Area

AI 393n – Amount Payable - with ISO Country Code

Two AIs Re-defined

AI 401 – Consignment Number

AI 402 – Shipment Identification Number

Chapter 4, Table 1.4 Mandatory Association of Element Strings – updated

Chapter 5, Section 1 Character Self-Checking Definition

Chapter 5, Section 1 – Symbol Check Digit, reference to Chapter 3, Appendix 1

Chapter 5, Section 1, Appendix 1 deleted

Chapter 5, Section 1 – re-numbered Appendix 6 – Symbol Versions at Nominal Dimensions – total width added to all symbols where not given before.

Chapter 5, Section 1 – as above, further explanation given for use of “N” in the light margin for UPC-A exception symbol.

Chapter 5, Section 2 Character Self-Checking Definition

Chapter 5, Section 2 – light margins minimum is 10.2 mm

Chapter 5, Section 2, sub-section 1.6 – refer readers to Chapter 5, Section 4, Appendix 5 for H Printability Gauge

Chapter 5, Section 3 – Character Self-Checking Definition

Chapter 5, Section 3, sub-section 4 Dimensional requirements – change to minimum x-dimension.

Chapter 5, Section 3, sub-section 8.5 – Mixing with UCC/EAN-128 with other symbologies – changes to title and content of paragraph.

Chapter 5, Section 3, sub-section 8.7 – Processing UCC/EAN-128 symbols - basic required logic deleted diagram and refer to Chapter 7.

Chapter 5, Section 4, sub section 9 – additional references added

Chapter 6, Section 7 – Added diagrams, words and new paragraph regarding pallets less than one metre in height as per Chapter 2, Section 2, sub section 4.5.

Chapter 7, Section 6 – new sub-section added, 6.3 Linkage of GTINs in a Non Relational Database by Trade Item Manufacturer.

Chapter 7, Section 7.3 - Element Strings Represented in UCC/EAN-128 Symbology, addition of new AIs to the table.

Chapter 8 – Glossary of Terms Additional of definitions for Character Self Checking and Company Number and amplification of definition for Indicator.

Every effort has been made to ensure that the standards are correct, but no representation or warranty, either explicitly or implied is made, and EAN International and UCC hereby expressly disclaim liability for any error in the standards.

In addition no warranty or representation is made that the standards will not require modification due to additions to the system and developments in technology.

2. OVERVIEW

2.1 Who should read these General EAN•UCC Specifications

The target audience are technical experts working with the EAN•UCC system. These General EAN•UCC Specifications provide a global reference document covering all ***technical*** aspects of the EAN•UCC System. Their primary objective is to define the international standard upon which individual EAN Numbering Organisations and the UCC can develop user documentation.

2.2 Electronic Data Interchange

The use of Electronic Data Interchange (EDI) is an integral part of the EAN•UCC philosophy. Full details on the EDI standards are contained in EANCOM. EANCOM is an implementation guideline of the EDIFACT standards (Electronic Data Interchange For Administration, Commerce and Transport) developed under the auspices of the United Nations.

2.3 Future updates

The EAN•UCC system embodies an 'open architecture' approach. It has been carefully designed for modular expansion with minimal disruption to existing applications. Enterprise Resource Planning (ERP) and other supply chain application software are important to drive implementation of the system. New, user driven, applications can be expected and this document will be updated accordingly.

The maintenance of these General EAN•UCC Specifications will be the joint responsibility of EAN International and the Uniform Code Council in line with the four principles of the EAN•UCC System:

1. **OPEN STANDARDS.** The goal is one, open, business led, integrated system of identification and information transfer technology standards that enables effective supply chain management in any company, in any industry, anywhere in the world.

2. **DIFFERENTIATION.** The system is founded on rules based standards which, when followed, ensure globally unique and discrete identification of such things as, but not limited to, products, handling units, assets, or locations. The system includes standard ways to transfer the EAN•UCC identification numbers as well as relevant data related to these numbers.

3. **TRANSPARENCY.** EAN•UCC identification standards must be relevant and applicable to any supply chain, independent of who assigns, receives and processes the standards. This should enable only one way to perform any given function. New features should only be introduced to the standard if they enable new applications or better ways to perform existing functions.

4. **NON-SIGNIFICANCE.** Global uniqueness of EAN•UCC identification is guaranteed only when the standard number is taken as a whole and processed in its entirety. Fixed attributes of an item should be looked up from a computer or other data source using the item's EAN•UCC identification number as a reference.

3. NAVIGATOR

These General EAN•UCC Specifications have been developed as a 'reference' document aimed at EAN Numbering Organisations and the Uniform Code Council (who will themselves produce local language user manuals) and system engineers developing software based upon EAN•UCC data. All aspects of the EAN•UCC system are summarised in ***Chapter 1 Basics and Principles***. It is recommended to those wishing to become familiar with the system logic and terminology.

The sub-sections of ***Chapter 2 Applications*** provide the detailed rules for implementing the EAN•UCC system in business applications. They represent the requirements that must be met by trading partners to meet the international standards.

Each application Chapter mandates the use of system features defined elsewhere in the General EAN•UCC Specifications: check-digits, element string, data carrier, location guidelines, ... and 'linking' will allow the reader to move effortlessly to the relevant Chapter. This method of presentation has the advantage of ensuring consistency and ease of updating (through a single reference) and allows additional functionality to be added without impacting existing applications.

The application sections are:

2.1 Trade items
Sets the international standard for the identification of trade items which are defined as: Any item (product or service) upon which there is a need to retrieve pre-defined information and that may be priced or ordered or invoiced at any point in any supply chain

2.2 Logistic units
Sets the international standard for the identification of logistic units which are defined as: An item of any composition established for transport and/or storage which needs to be managed through the supply chain.

2.3 Locations
Sets the international standard for using EAN•UCC Location Numbers in bar code applications.

2.4 Assets
Sets the international standard for the identification of returnable assets and individual assets.

2.5 Service relationships
Sets the international standard for the identification of service relations.

2.6 Other Applications
2.6.1 Coupons
2.6.2 Refund receipts
2.6.3 Electronic serial identifiers for cellular mobile telephones
2.6.4 Internal applications
2.6.5 Payment Slips
2.6.6 Customer specific articles

All the application sections make reference to other chapters.

3. DEFINITIONS OF THE ELEMENT STRINGS
This Chapter introduces the concept of an Element String:

> A piece of data defined in structure and meaning, comprising an identification part (prefix or *application identifier*) and a data part, represented in a EAN•UCC endorsed *data carrier*.

Each element string, or the data content of a bar code, is unambiguously defined in this Chapter. A single page is dedicated to each 'element string' and the rules associated with its definition, structure, approved data carrier and any system considerations are given. This chapter should be viewed as a 'data dictionary'. It allows the reader to reference the exact meaning of each data element that is defined within the EAN•UCC system.

3.1 [Element Strings in] EAN/UPC Symbology; UPC-A, UPC-E, EAN-13 Symbol Formats
Specifies the exact meaning of the data which can be encoded in these symbol formats.

3.2. [Element Strings in] EAN/UPC Symbology; EAN-8 Symbol Format
Specifies the exact meaning of the data encoded in this symbol format.

3.3. [Element Strings in] EAN/UPC Symbology; 2-digit and 5-digit Add-on
Specifies the exact meaning of data encoded in these add-ons.

3.4 [Element Strings in] ITF-14 Symbology
Specifies the exact meaning of the data which can be encoded in this symbology.

3.5. [Element Strings in] UCC/EAN-128 Symbology
Specifies the exact meaning of the data which can be encoded in this symbology.

4. ASSOCIATION OF ELEMENT STRINGS TO FORM VALID MESSAGES
Provides the rules which allow the unambiguous processing of multiple AIs.

5. DATA CARRIERS

5.0 Data Carriers

5.1. EAN/UPC Symbology Specifications

5.2. ITF-14 Symbology Specifications

5.3. UCC/EAN-128 Symbology Specifications

5.4. Bar Code Production and Quality Assessment

6. SYMBOL PLACEMENT GUIDELINES FOR TRADE ITEMS

7. SYSTEM PROCESSING IN EDP APPLICATIONS
Provides guidelines and hints on developing systems capable of processing EAN•UCC data correctly.

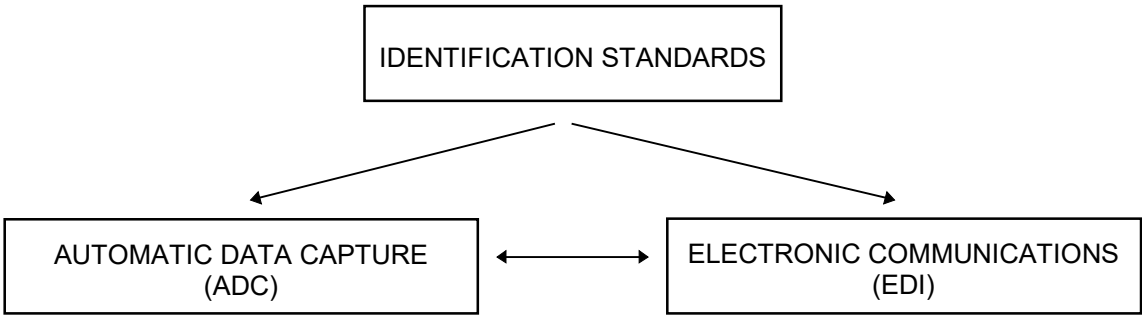
8. GLOSSARY OF TERMS
A standard vocabulary used throughout the document.

Chapter 1:
Basics and Principles of the EAN•UCC System

TABLE OF CONTENTS

1. INTRODUCTION

The system originated in the USA and was established by the Uniform Product Code Council, which is now known, as the Uniform Code Council in 1973. The UCC adopted a 12-digit number, and the first bar codes in open trade were being scanned in 1974. Following the success of the UPC system, the European Article Numbering Association, which is now known as EAN International, was established in 1977 to develop a compatible system for use outside North America. The EAN system was designed as a superset of the UCC system, and principally uses 13 digit numbers. As a consequence of using certain bar codes and numbering structures that represent 14 digits, the system also has 14 digit numbers. Today full global compatibility is achieved by considering all EAN•UCC trade item identification numbers as comprising 14-digits in data base files, right justified and zero filled where necessary.



The EAN•UCC system provides for the use of unambiguous numbers to identify goods, services, assets and locations worldwide. These numbers can be represented in bar code symbols to enable their electronic reading wherever required in business processes. The system is designed to overcome the limitations of using company, organisation or sector specific coding systems, and to make trading much more efficient and more responsive to customers.

These identifying numbers are also used in electronic data interchange. This manual only provides information about the EAN•UCC data standard (ADC) and its application in bar codes. For information about electronic data interchange (EDI), please refer to the EANCOM manual or the appropriate national standard.

As well as providing unique identifying numbers, the system also provides for additional information such as best before dates, serial numbers, and batch numbers to be shown in a bar coded form. At the moment bar code symbols are used as the data carriers but other technologies, such as radio frequency tags might be added. Any change would only take place after wide consultation and be subject to a significant changeover period.

Following the principles and design of the EAN•UCC system means that users can design applications to process EAN•UCC data automatically. The system logic guarantees that data captured from bar codes produces unambiguous electronic messages and processing of them can be fully pre-programmed.

The system is designed to be usable in any industry or trade sector, and any changes to the system are introduced so that they do not harm current users.

2. COMPANY PREFIX

The EAN•UCC company prefix is the part of the international EAN and UCC standard numbering structures consisting of the EAN prefix allocated by EAN International to an EAN Numbering Organisation and the UCC and a company number allocated by the respective Numbering Organisation and/or the UCC.

An EAN•UCC company prefix gives access to all the applications using EAN•UCC identification standards, i.e. identification of items, services, locations, logistic units, returnable containers, etc. And it is a component of each of the numbering structures, other than the EAN/UCC-8, described in Chapter 2.
When a company changes legal status as a result of an acquisition, merger, partial purchase, split or "spin-off" the following guidelines apply. Adaptation to the following guidelines could be done by the numbering organisation if the law of the country makes it absolutely necessary. Companies should notify their Numbering Organisation or the Uniform Code Council to facilitate smooth transition.

2.1 Acquisitions and Mergers

Existing stocks on hand which are numbered before acquisitions or mergers, keep the same GTINs. The Numbering Organisation has to be notified of the acquisition or merger.

Products that are produced after the acquisition or merger may keep the GTIN allocated before it.

A company should be careful when centralising the allocation of all numbers under one company prefix, thus changing the number of the existing products which is otherwise unchanged. This should be an exception, as it results in additional work and data file maintenance for customers.

2.2 Partial Purchase

When a company buys a division, a brand name or a range of items from another company, it may, to begin with, keep the numbers previously allocated by the "selling" company. The rules concerning the use of GTIN should be taken into consideration when drawing up the purchase contract.

However, at the earliest opportunity it should phase in new numbers, from its own range of numbers, to the items whose brand name it has acquired. It will be able to do this, for example, when packaging is redesigned or reprinted, even if the normal rule would be to keep the old number in this case. Trading partners must be notified of the number changes in advance.

During this period, and during the four years following, the selling company must not reallocate the original numbers to other items.

2.3 Split or "spin-off"

When a company splits into two or more separate companies it is necessary for each company prefix assigned to the original company to be transferred to one, and only one, of the new companies. Any company left without a company prefix will need to apply to an EAN numbering authority or UCC to obtain one. A decision, on which of the new companies, should take which of the company prefixes should be made to minimise the number of changes to GTINs that will be required. The decision should be part of the legal arrangements that set up the new companies.

It is not necessary for existing stocks of items to be renumbered. However, when any of the split or spin-off companies has trade items that are numbered from a company prefix that it no longer holds, then it should renumber those items using its own company prefix when new labelling or packaging is produced. Customers should be notified well in advance of the changes.

Split or spin-off companies that retain a company prefix must keep a record of the GTINs created from their prefix that have been allocated to items they no longer own. They must not re-use these GTINs for a period of at least four years after the company that split away owning those items last supplied goods identified by those GTINs. Therefore the company that did not retain the company prefix has to keep the company that did maintain the prefix, informed of the dates on which the goods were last supplied with the previous number or to guarantee a date by which the number change will be made.

3.THE STANDARD NUMBERING STRUCTURES

The EAN•UCC system provides standard numbering structures for different applications. The application will determine how the number is to be used, but regardless of application each number must be used in its entirety and not broken down into constituent parts. The numbering structure guarantees worldwide uniqueness within the relevant area of application.

GLOBAL TRADE ITEM NUMBER (GTIN)

The GTIN is used for the unique identification of trade items worldwide.

A trade item is any item (product or service) upon which there is a need to retrieve pre-defined information and that may be priced or ordered or invoiced at any point in any supply chain. This includes individual items as well as all their different configurations in different types of packaging. The GTIN is defined as a 14-digit number to accommodate all the different structures.

Each of the following four numbering structures provide unique numbers when right justified in a 14-digit field.

EAN/UCC-14 structure

Indicator	EAN•UCC identification of the items contained (without check digit)	Check digit
N_1	N_2 N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12} N_{13}	N_{14}

Figure 1 - 1

EAN/UCC-13 structure

EAN•UCC company prefix → and ← Item reference	Check digit
N_1 N_2 N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}	N_{13}

Figure 1 - 2

UCC-12 structure

UCC company prefix → and ← Item reference	Check digit
N_1 N_2 N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11}	N_{12}

Figure 1 - 3

EAN/UCC-8 structure

EAN/UCC-8 prefix → and ← Item reference	Check digit
N_1 N_2 N_3 N_4 N_5 N_6 N_7	N_8

Figure 1 - 4

The above-mentioned numbering structures provide unique identification when processed in a 14-digit data field as shown below:

Numbering Structures	**14-digit Global Trade Item Number (GTIN) ***													
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
EAN/UCC-14	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}
EAN/UCC-13	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}
UCC-12	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}
EAN/UCC-8	0	0	0	0	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8

Figure 1 - 5

Where T represents the position of each individual digit in a computer file format, N represents the position of each individual digit in a given numbering structure, and 0 represents a filler digit.

Note: This is the file format for the GTIN which is used in all business transactions, especially electronic data interchange, e.g. orders, invoices, price catalogues. All numbers must be right justified in this 14-digit field.

SERIAL SHIPPING CONTAINER CODE (SSCC)

The SSCC is used for the unique identification of logistic (transport) units.

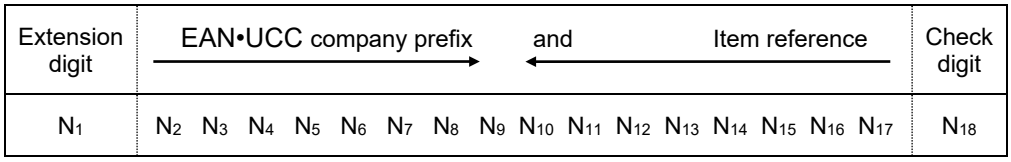


Figure 1 - 6

EAN•UCC **GLOBAL LOCATION NUMBER (GLN)**

The GLN is used to identify uniquely a physical or functional or legal entity.

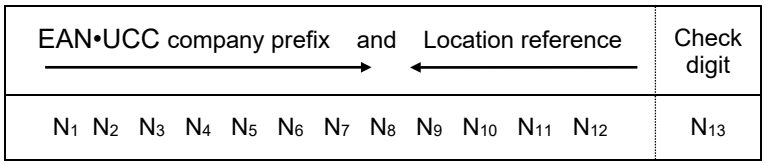


Figure 1 - 7

Note: The GLN uses the same structure as EAN/UCC-13 numbers for GTINs, but must be treated as a separate series of numbers.

GLOBAL RETURNABLE ASSET IDENTIFIER (GRAI)

The GRAI is used to identify a reusable entity, normally used for transport and storage of goods.

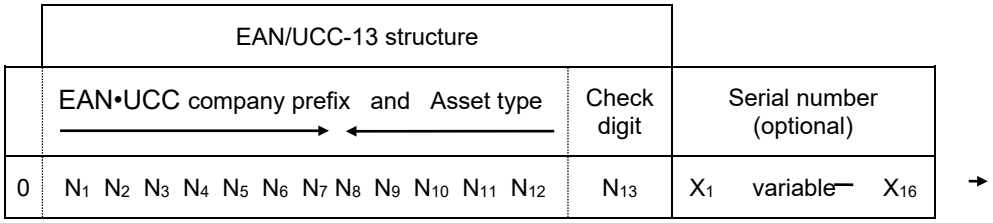


Figure 1 - 8

GLOBAL INDIVIDUAL ASSET IDENTIFIER (GIAI)

The GIAI is used to identify uniquely an entity which is part of the inventory of a given company.

Figure 1 - 9

GLOBAL SERVICE RELATION NUMBER (GSRN)

The GSRN is used to identify the recipient of services in the context of a service relationship.

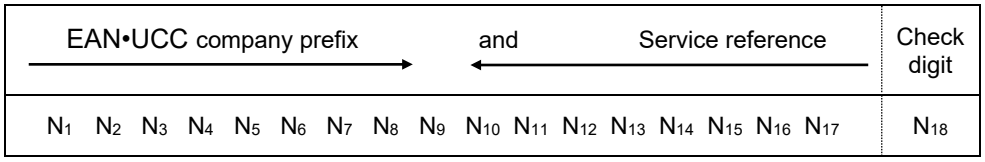


Figure 1 - 10

COMPONENTS OF THE NUMBERING STRUCTURES

The EAN•UCC ***prefix*** is a two or three digit number jointly administered and issued by EAN International and UCC. They are allocated to each numbering organisation and their main purpose is to allow decentralisation of the administration of identification numbers.

The EAN•UCC prefix and the ***company*** number form the EAN•UCC ***company prefix*** which is assigned to each system user by a numbering organisation or UCC.

EAN and UCC assign company prefixes to entities that administer the allocation of the EAN•UCC identification numbers. These entities may be commercial companies, not for profit organisations, governmental agencies, business units within organisations, etc. The criteria to qualify for the assignment of an EAN•UCC Company Prefix are set by the EAN Numbering Organisations and the UCC.

The ***reference*** is assigned by the system user. Rules for its allocation depend on the particular application. EAN/UCC-8 identification numbers are available from numbering organisations.

The ***indicator*** in EAN/UCC-14 allows each user to increase the numbering capacity when identifying similar trade units in different packaging configurations.

The ***extension digit*** is used to increase the capacity of the SSCC. It has the value 0 to 9, and has no meaning.

The ***check digit*** is calculated as explained in Chapter 3 Appendix 1 and it is used to check that the number is correctly composed.

In the above field diagrams 'N_i' represents a digit and 'X_i' represents any character contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3.

Note: These standard numbering structures guarantee unique identification within a particular area of application. Please note, for example, that trade items may have the same identification numbers as locations, and each system user must be able to control how data is used.

4. THE DATA CARRIERS

For the time being bar codes are the data carriers used in the EAN•UCC system. Other data carriers may be introduced in the future.

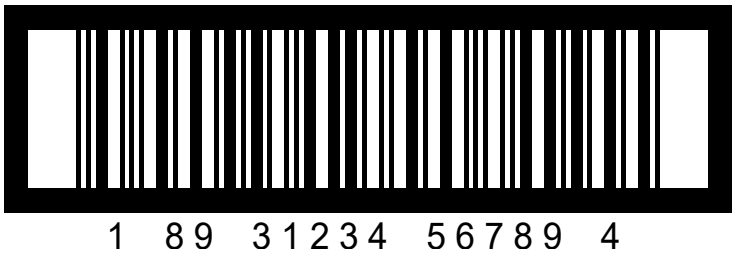
The data that comprises each identification number and any extra information that can be provided using the EAN•UCC ***Application Identifiers*** can be regarded as an element string, and they can all be represented in the bar code symbols endorsed by EAN International and UCC. The EAN•UCC system uses the bar code symbologies described below.

The ***EAN/UPC symbology*** (which forms the basis for the symbols: UPC-A, UPC-E, EAN-13, EAN-8 and the 2 and 5 digit add-ons) is a bar code that can be read omnidirectionally. It must be used for all items which are scanned at the point of sale in retail outlets and may be used on other trade items.

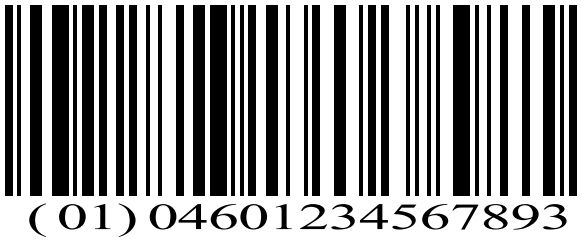
EAN-13

UPC-A

The use of the ***ITF-14 (Interleaved Two of Five) symbology*** is restricted to the bar coding of identification numbers on trade items not passing through retail checkouts. This symbology is better suited for direct printing onto corrugated fibreboard.



The ***UCC/EAN-128 symbology*** is a variant of Code 128 symbology. Its use is exclusively licensed by EAN International and UCC. This extremely flexible symbology is used for the representation of element strings using EAN•UCC ***Application Identifiers.*** It is not intended to be read on items passing through retail checkouts.



5. THE DATA STANDARD

The EAN•UCC system provides various types of standardised data that can be seen as element strings. An element string is defined as data of a particular structure and meaning which is represented in a EAN•UCC endorsed data carrier. It may be

- an EAN/UCC-8, UCC-12, EAN/UCC-13 or EAN/UCC-14 item identification number
- an EAN•UCC prefix and data field(s) for special use of the EAN-13 or UPC-A bar code symbol in a particular environment
- an Application Identifier and data field(s).

The full string consists of the symbology identifier (see Chapter 5) followed by one or more element strings. The symbology identifiers is generated by the reading device and transmitted together with the element strings. The symbology identifier is used to ensure that systems distinguish between the different EAN•UCC data structures and other, none EAN/UCC, bar coded data. The figure below shows how element strings are incorporated in the full string transmitted from a bar code reader to the appropriate software.

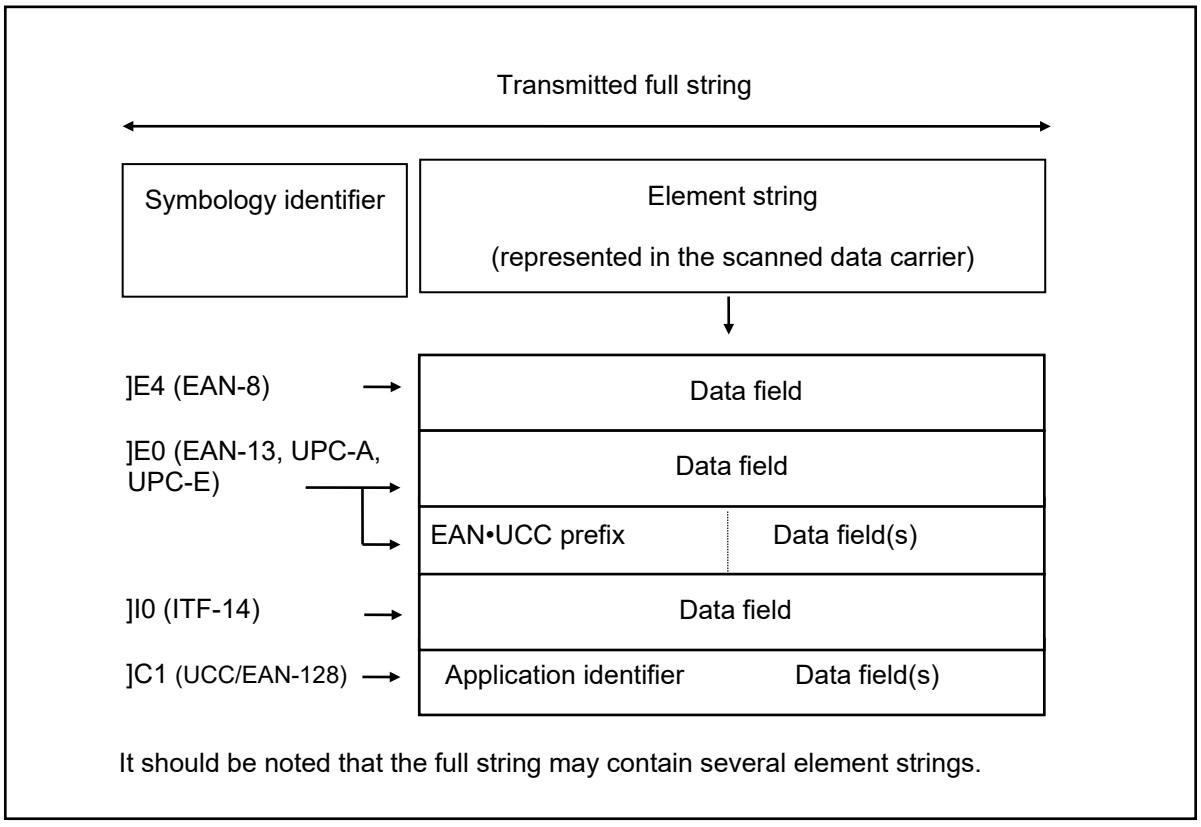


Figure 1 - 11

Each element string, whether consisting of one or several data fields, will have ***unique meaning***, because it is unambiguous and does not depend on other read or stored data or human intervention. Element strings must not be used for purposes other than those assigned to them, or this uniqueness will be lost.

The element strings of the EAN•UCC system will be used mainly for recording transactions in goods handling and in business applications. Some will be applied for administrative purposes in specific environments (e.g. hospitals). The use of specific element strings in system applications is subject to standards and recommendations. Their logical association is described in Chapter 4 and 7.

The meaning of the element strings is determined by a sequence of checks carried out on the information in the transmitted full string (see figure below). Details on symbology identifiers are stated in Chapter 5 (Data Carriers).

Analysis of the significance of an element string represented in a data carrier.

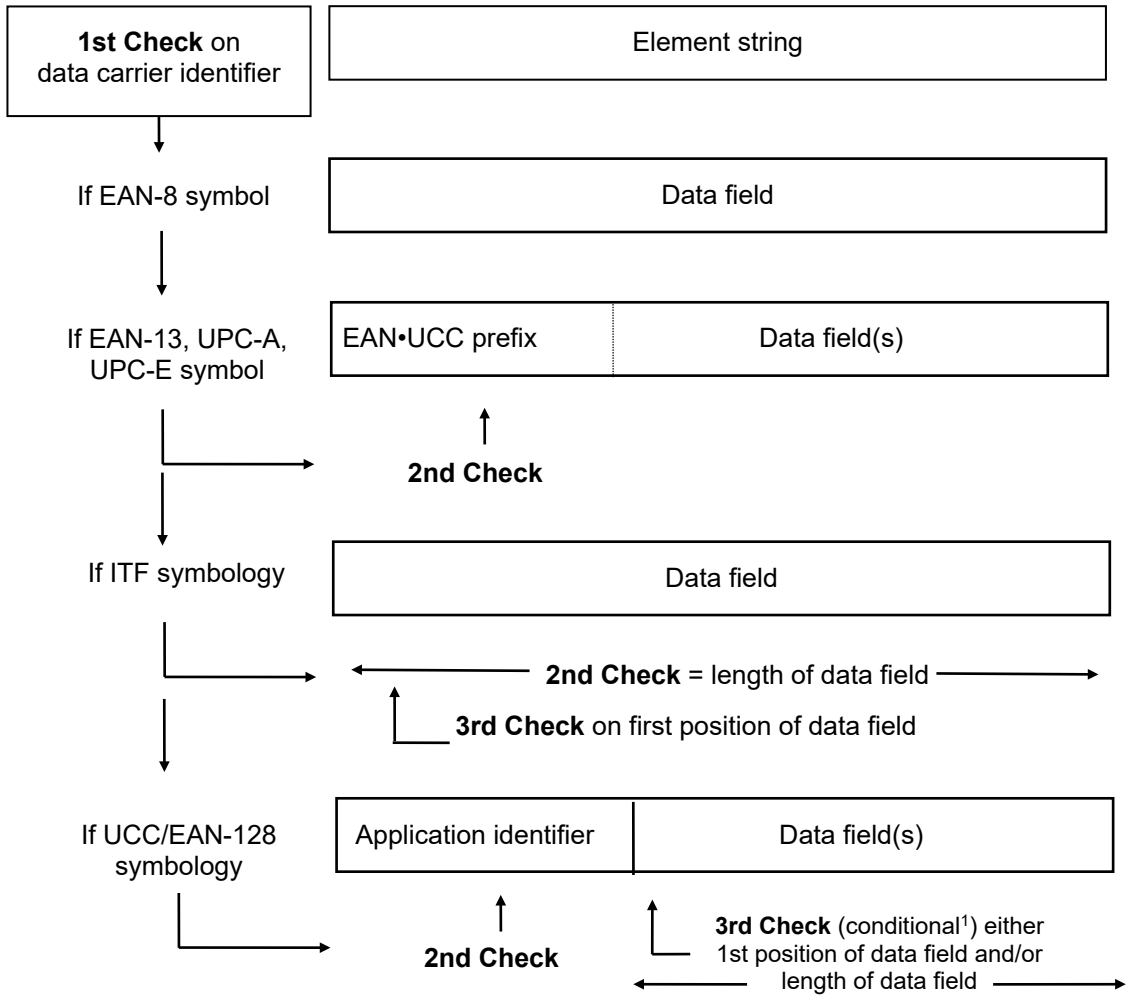


Figure 1 - 12

[1] For Application Identifiers 01 and 02, the digit '9' in the first position indicates a variable measure trade item see Chapter 2, Section 1 (Trade Items).

EAN•UCC prefixes and Application Identifiers are shown in the following tables.

SYNOPSIS OF EAN•UCC **PREFIXES**	
EAN•UCC **prefixes**	**Significance**
000 - 019	UCC standard numbering structure *
02	UCC variable measure item identification for restricted distribution
030 - 039	UCC standard numbering structure
04	UCC item numbering for restricted distribution within a company
05	UCC coupon identification
060 - 099	UCC standard numbering structure
100 - 139	UCC standard numbering using EAN/UCC-13 numbering structure
140 - 199	Reserve
20 - 29	EAN numbering for restricted distribution within a geographic region
300 - 969	EAN standard numbering structure
970 - 976	Reserve
977	ISSN standard numbering (serial publications)
978	ISBN standard numbering (books)
979	ISBN or ISMN standard numbering
980	EAN identification of refund receipts
981-982	EAN coupon identification for common currency areas
983 - 989	Reserved for further EAN coupon identification
99	EAN coupon identification

Figure 1 - 13

* Starting from company prefix 00 00100 to avoid collision with EAN/UCC-8 numbers.

Note: These prefixes all assume a EAN/UCC-13 structure. When UCC identification numbers are shown in U.P.C. symbols the prefixes 00 to 09 will appear as single figures, 0 to 9.

SYNOPSIS OF EAN/UCC-8 PREFIXES	
EAN/UCC-8 prefixes	**Significance**
0	Velocity codes
10 - 13	UCC standard numbering structure
140 - 199	Reserve
2	EAN•UCC numbering for use within a company
300 - 969	EAN standard numbering structure
97 - 99	Reserve

Figure 1 - 14

SYNOPSIS OF APPLICATION IDENTIFIERS	
Application Identifier	**Significance**
0 0	Serial Shipping Container Code (SSCC)
0 1	Global Trade Item Number (GTIN)
0 2	GTIN of trade items contained in a logistic unit
1 0	Batch or lot number
1 1	Production date
1 2	Due date
1 3	Packaging date
1 5	Minimum durability date (Quality)
1 7	Maximum durability date (Safety)
2 0	Product variant
2 1	Serial number
2 2	Secondary data for specific health industry products
2 3 n	Lot number (transitional use)
2 4 0	Additional product identification assigned by the manufacturer
2 4 1	Customer part number
2 5 0	Secondary serial number
3 0	Variable count
3 1 n n - 3 6 n n	Trade measures and logistic measures
3 3 7 n	Kilograms per square metre
3 7	Count of trade items contained in a logistic unit
3 9 0 n	Amount payable – single monetary area
3 9 1 n	Amount payable – with ISO currency code
4 0 0	Customer's purchase order number
4 0 1	Consignment number
4 0 2	Shipment identification number
4 0 3	Routing code
4 1 0	"Ship to -Deliver to" EAN•UCC Global Location Number (GLN)
4 1 1	"Bill to - Invoice to" EAN•UCC Global Location Number (GLN)
4 1 2	"Purchased from" EAN•UCC Global Location Number (GLN)
4 1 3	"Ship for- Deliver for - Forward to" EAN•UCC Global Location Number (GLN)
4 1 4	Identification of a physical location, EAN•UCC Global Location Number
4 1 5	EAN•UCC Global Location Number (GLN) of the invoicing party
4 2 0	"Ship to - Deliver to" postal code within a single postal authority
4 2 1	"Ship to - Deliver to" postal code with 3 digit ISO country code
4 2 2	Country of origin of a trade item
8 0 0 1	Roll products - width, length, core diameter, direction, splices
8 0 0 2	Cellular Mobile Telephone Identifier (CMTI)
8 0 0 3	Global Returnable Asset Identifier (GRAI)
8 0 0 4	Global Individual Asset Identifier (GIAI)
8 0 0 5	Price per unit of measure
8 0 0 6	Global Component of a Trade Item Number (GCTIN)
8 0 0 7	International Bank Account Number (IBAN)
8 0 1 8	Global Service Relation Number (GSRN)
8 0 2 0	Payment slip reference number
8 1 0 0 - 8 1 0 2	UCC coupon extended code
9 0	Information mutually agreed between trading partners (including FACT DI's)
9 1 - 9 9	Company internal information

Figure 1 - 15

6. THE AREAS OF SYSTEM APPLICATION

In order to ensure that element strings are used and interpreted correctly together, they must only be used in the appropriate areas of application. In this way each one will always have the same meaning, enabling automatic processing.

Element strings containing identification numbers provide unique identification within a particular area of application. Each area of application must be distinguished within a database using qualifiers, different fields or even different files.

Area 1: Identification of trade items (see Chapter 2, Section 1)

A trade item is any item (product or service) upon which there is a need to retrieve pre-defined information and that may be priced or ordered or invoiced at any point in any supply chain. This definition covers raw materials through to the end user products and also includes services, all of them having pre-defined characteristics.

EAN/UCC-8, UCC-12, EAN/UCC-13 and EAN/UCC-14 identification numbers are all used to identify trade items, and when right justified in a 14 digit field (as shown above), they can be regarded as 14-digit Global Trade Item Numbers (GTINs). If the item is of variable measure, its identity will need to be completed by measure, or in some instances, price information. Other variable information about trade items (e.g. production, packaging, or expiry dates, lot numbers, serial numbers, etc.) is also available as standardised element strings.

Each trade item, which differs from another, is allocated a unique identification number, which remains the same as long as it is being traded. The same identification number is used for all of these same items. The numbers must be used in their entirety within computer systems and must not be used in parts in accordance with their administrative structure.

Area 2: Identification of logistic units (see Chapter 2, Section 2)

Logistic units are any units which store or transport any combination of trade items, and which need to be identified and managed through the supply chain. Each individual unit is allocated a unique serial number, the serial shipping container code (SSCC), which must be different for every logistic unit. Even if the logistic units contain identical trade items, they still require different SSCCs.

Attributes (gross weight, outside dimensions, etc.) relating to logistic units have also been defined as standardised element strings. Standardised element strings are also available to identify the contents of logistic units that contain a single type of trade item.

Area 3: Identification of assets (see Chapter 2, Section 3)

The Global Returnable Asset Identifier or Global Individual Asset Identifier (GRAI or GIAI) can be used to identify specific assets or types of assets within an asset register, and must not be used for any other purpose.

Area 4: Identification of locations (see Chapter 2, Section 4)

The EAN/UCC-13 numbering structure is used for this purpose, and each location is given a unique EAN•UCC Global Location Number (GLN).

The identification of physical or functional or legal entities is required:

- for EDI messages
- when providing transport information on logistic units
- to enable the bar coding of actual locations (goods inward, warehouse shelving, etc.)

Area 5: Identification of service relations (see Chapter 2, Section 5)

The Global Service Relation Number (GSRN) is used to uniquely identify a receiver of services from a particular service provider, in effect to identify a customer for a particular company or organisation. It does not identify a person or legal entity as such but a relation or action which needs and identification point for storing transaction data.

Area 6: Special system applications (see Chapter 2, Section 6)

These are standardised element strings that may be used for company internal and special applications not covered by the other main application areas.

7. AUTOMATIC PROCESSING OF DECODED DATA

The purpose of entering data from a bar code scanner into a system is to record a transaction. Transaction data can be considered as an electronic message which will be processed according to the meaning of the data transferred. This is possible without any manual intervention.

Although each element string has only one meaning, correct interpretation of the electronic message will also depend on the type of transaction. This implies that the transaction type, although not part of the EAN•UCC system standards, should be considered as an integral part of the processing of EAN•UCC system data. Consequently, the electronic message will be derived from

- the transaction type
- the identification of the bar code symbol
- the data decoded from a bar code, including the Application Identifier(s) or other data identifier(s).

An electronic data interchange (EDI) message has clearly defined components to enable automatic processing, and in the same way, data from a bar code scanner forms a message with a pre-defined structure. Such messages may simply identify an item, but some will also contain further data that supplements the identification.

In order to provide unambiguous and complete messages, it is necessary to define which element strings are required to form a valid electronic message. Valid electronic messages are determined by the systems components and by business practices (system user applications) which together generate the systems logic. System users assembling these electronic messages need an unambiguous way of characterising the element strings which do not have explicit Application Identifiers.

The EAN•UCC system provides standardised data, which, when shown in standardised EAN•UCC bar codes, can be captured, correctly analysed, and processed automatically. The steps in this procedure are

- the bar code reader reads the bar code and transmits the full string of data to the front-end processing program
- the front-end program breaks the full string into element strings and transmits them to the analysing program
- the analysing program assembles the element strings from one or more full strings, any manually entered data and the transaction information collected from the operator or inferred, validates the correctness of the set and transmits the set of data to the application for processing
- the application uses the transaction information, the element strings and a data base to process the information correctly.

The above steps will be repeated as needed at each point in the supply chain.

This whole process is represented in the following diagram:

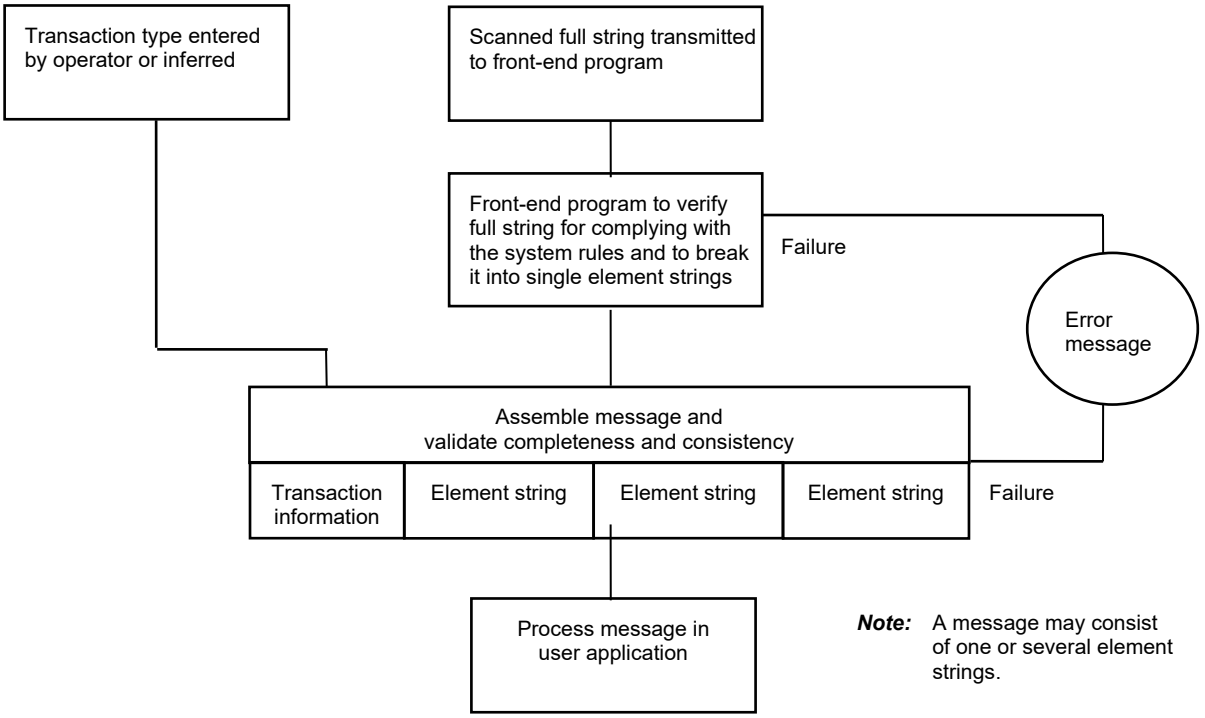


Figure 1 - 16

Note: In principle, all element strings provide their information independent of context. When the element strings are shown in a bar code applied to an item, the information in the element strings is about the item itself. In this way transactions about items can be recorded as the items are scanned. When printed in a document (e.g. in a product catalogue) the information serves for automatic entry of data for a business transaction, such as an order. For example, the element string AI 01 (identification number of a trade item) will be shown in the same bar code whether physically marked on an item or printed in a catalogue.

Chapter 2:

Areas of System Application

Introduction

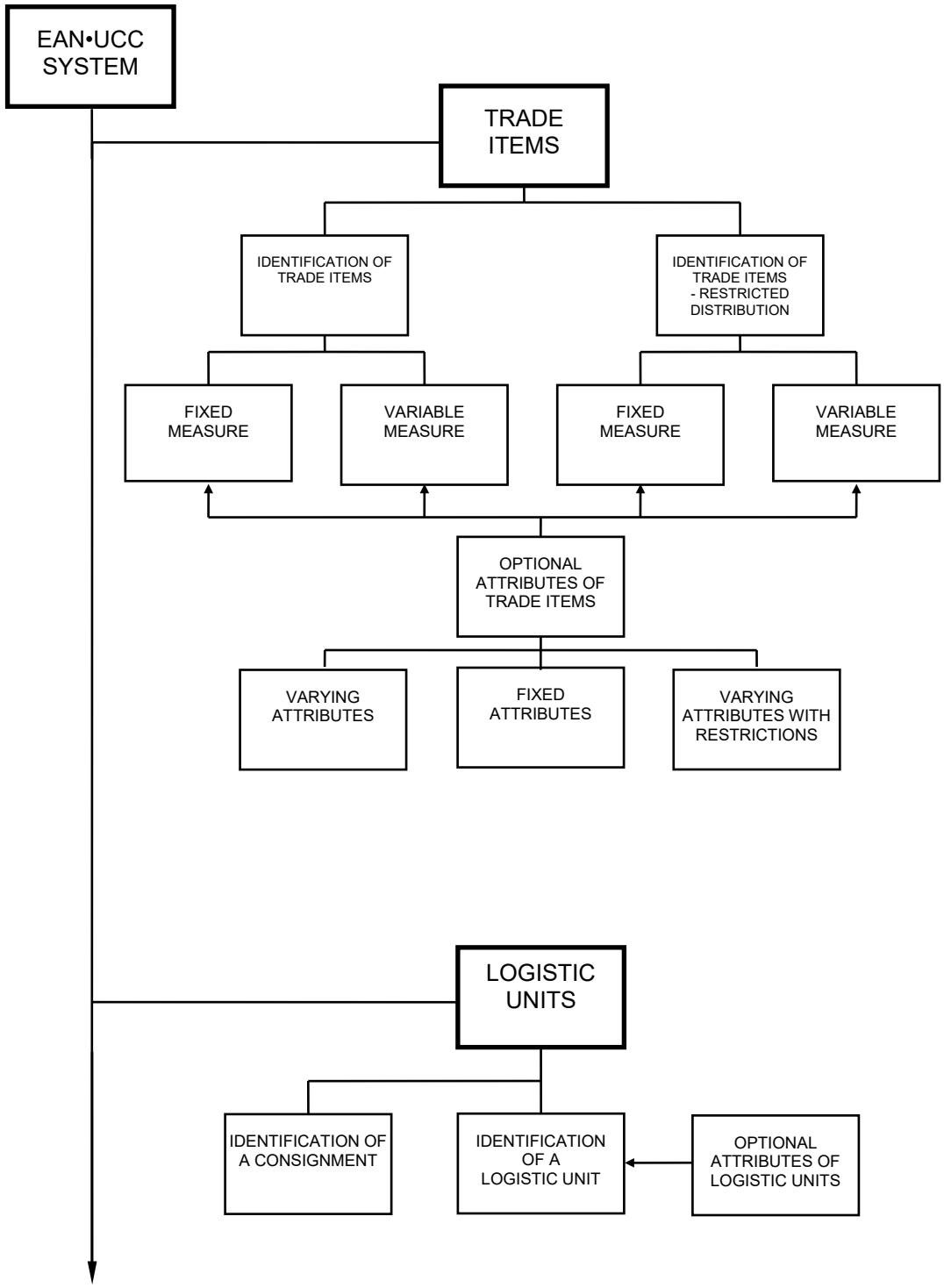
The EAN•UCC System is an identification system. It comprises a standard numbering system and other standardised identification data for worldwide unambiguous use. Represented in data carriers, currently bar code symbols, it may be applied on goods, documents, physical locations etc. for automatic data capture and processing in electronic data processing applications.

Chapter 2 “Areas of System Application” describes the rules and regulations for the proper use of the numbering standard and element strings in the six areas of ***system*** application, outlined below. These rules and regulations must be observed by all system users to ensure the integrity of the EAN•UCC system.

System users are continually developing real business applications of the EAN•UCC system. It is neither possible nor desirable to outline here all the real world solutions that are based upon the use of EAN•UCC standards. However, all the system elements in the EAN•UCC system have been developed to meet user-requests in line with the EAN•UCC objective *to improve the efficiency of integrated logistics while contributing added value to partners involved, as well as to consumers.*

It should be noted that unique and unambiguous identification is guaranteed within the particular area of application only. The current six areas of application supported by this standard should only be applied in instances that fit the application as defined. If new, differing requirements arise the definition of a new area of application is required rather than adapting an existing application to fit.

Synopsis of the Areas of System Application



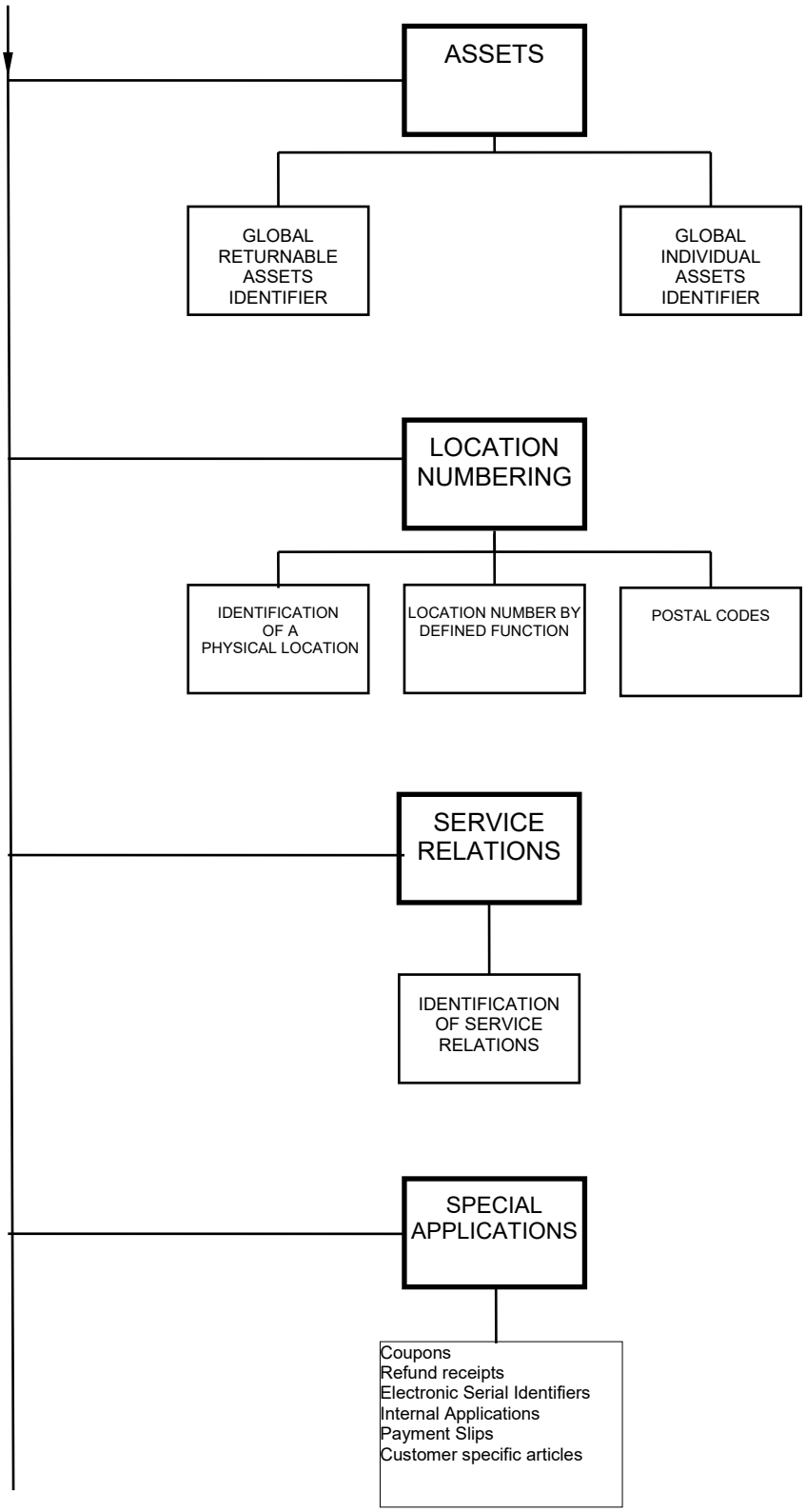

ASSETS
GLOBAL RETURNABLE ASSETS IDENTIFIER
GLOBAL INDIVIDUAL ASSETS IDENTIFIER
LOCATION NUMBERING
IDENTIFICATION OF A PHYSICAL LOCATION
LOCATION NUMBER BY DEFINED FUNCTION
POSTAL CODES
SERVICE RELATIONS
IDENTIFICATION OF SERVICE RELATIONS
SPECIAL APPLICATIONS
Coupons
Refund receipts
Electronic Serial Identifiers
Internal Applications
Payment Slips
Customer specific articles

Figure 2 - 1

Chapter 2, Section 1:

Numbering and symbol marking of trade items

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Definitions and principles

A trade item is defined as *any item (product or service) upon which there is a need to retrieve pre-defined information and that may be priced or ordered or invoiced at any point in any supply chain.* This definition covers raw materials through to the end user products and also includes services, all of them having pre-defined characteristics.

The identification and symbol marking of trade items enables the automation of the retail point of sale (through price look up files), of goods receiving, inventory management, automatic re-ordering, sales analysis, and a wide range of other business applications.

EAN/UCC-8, UCC-12, EAN/UCC-13 and EAN/UCC-14 numbering structures are used for the identification of trade items. All of them can be considered as 14-digit Global Trade Item Identification Numbers (GTIN).

Numbering Structures	14-digit Global Trade Item Number (GTIN)													
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
EAN/UCC-14	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}
EAN/UCC-13	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}
UCC-12	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}
EAN/UCC-8	0	0	0	0	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8

Figure 2.1 - 1

If the item is of variable measure the respective measure or price information will often be of critical importance to business applications. Attributes (dates, lot number, etc.) relating to trade items are also available as standardised element strings.

Each trade item, different from another in design and/or content, is allocated a unique identification number, which remains the same as long as it is traded. The same identification number is given to all trade items sharing the same key characteristics. Such numbers must be treated in their entirety throughout the supply chain.

Basic principles for the identification of trade items

1. Each trade item which is different from another must be allocated a separate, unique Global Trade Item Number (GTIN).

2. The GTIN does not carry any information except for variable measure items. Information related to the trade item must be communicated by EDI, or other means, to all business partners by the brand owner who is responsible for assigning the GTIN.

3. An assigned GTIN must never be changed as long as the item is not modified so that it needs to be discriminated from the initial trade item for ordering, stocking or billing. Exceptions to this rule may occur only when regulatory or legal requirements mandate a change.

1.2 Types of trade items

Trade items cover a broad variety of things, which may be bar coded with a GTIN. Different standard solutions apply depending on the nature of the item and on the scope of the users' applications. Consideration of the following is important to determine the identification and symbol marking rules applicable to a particular trade item.

1.2.1 Physical or non-physical items

Non-physical trade items are usually called services. Services may be identified with standard numbers for open trade applications or in restricted distribution environments.

1.2.2 Open or restricted distribution

The main benefit of the EAN•UCC system for numbering trade items is that it provides them with a unique and unambiguous identification number worldwide, thus enabling to reference the items in open environments. However, the system provides for other number series, which may be used only in restricted distribution (for example national use, company internal use, etc.) Restricted distribution identification numbers are available to EAN Numbering Organisations and UCC to develop solutions applicable within their territory.

1.2.3 Fixed or variable measure

Fixed measure trade items are those which are always produced in the same version and composition (type, size, weight, contents, design, etc.). Like a ***fixed*** measure trade item, a ***variable*** measure trade item is an entity with pre-defined characteristics, e.g. the nature of the product or its contents. Unlike a ***fixed*** measure trade item, a ***variable*** measure trade item has at least one characteristic which varies whilst other characteristics of the trade item remain the same. The variable characteristic may be weight, dimension, number of items contained or volume information. The complete identification of a variable measure trade item consists of both an identification number and information about the variable data.

1.2.4 Retail or non-retail

Scanning at the retail point of sale is a major application of the EAN•UCC system and trade items that are intended to cross a retail point of sale are subject to specific rules.

1.2.5 Books and serial publications

Published material (newspapers, magazines and books) requires special consideration due to the following factors:

1. A solution for published material should address the requirement to process returns (sorting and counting) to wholesalers and publishers. This implies the reading of a supplementary number that is not required for item identification.
2. The international systems, ISSN and ISBN, already handle the numbering of publications and books.
3. Because of the large number of titles involved and the problems of creating and updating price look-up files, price may be encoded within the EAN•UCC trade item identification number.

1.2.6 Single item or grouping of items

A trade item may be a single, non-breakable unit. It may also be a standard and stable grouping of a series of single items. Such a unit may be presented in a wide variety of physical forms: a fibreboard case, a covered or banded pallet, a film wrapped tray, a crate with bottles, etc. Trade items consisting of a single unit are identified with a GTIN. Standard groupings of identical or different units, each identified with a GTIN, are identified with a separate GTIN.

1.2.7 Single trade items composed of several physical parts

Because of its physical nature, a trade item may be packed in separate physical parcels. For example, furniture equipment may be composed of several pieces, e.g. a sofa and two armchairs, which can not be ordered or sold separately. A specific standard solution is available to identify and symbol mark each component of a trade item composed of several physical parts.

1.2.8 Quality of substrate

The choice of the data carrier (bar code symbology) used to symbol mark a trade item depends on the nature of the item and on the environment in which the symbol will be scanned. It also depends on the quality of the substrate on which the bar code symbol will be marked.

1.2.9 Size of the package

The space available on a package to symbol mark a trade item may be limited. Standard solutions are available to cater for these situations, under strictly defined rules.

2. IDENTIFICATION OF TRADE ITEMS

2.1 Fixed measure trade items

2.1.1 General numbering and symbol marking rules

Fixed measure trade items are those which are always produced in the same version and composition (type, size, weight, contents, design, etc.). The identification number identifies the item unambiguously. Every trade item that is different from another in any respect is assigned a separate EAN•UCC identification number. The EAN•UCC ***prefixes 000 to 019, 030 to 039, 060 to 099, 100 to 139, 300 to 969, 977 to 979*** are used for all trade item numbers described in this section.

The following options are available to number and symbol mark fixed measure trade items:

Number format	***Bar code symbol***	***Reference to element strings in Chapter 3***	***Comments***
EAN/UCC-8	EAN/UPC - EAN-8 version	Section 3.1	Only for small items
UCC-12	EAN/UPC - UPC-E version	Section 2.1	Only for small items
UCC-12	EAN/UPC - UPC-A version	Section 2.1	For all items
EAN/UCC-13	EAN/UPC - EAN-13 version	Section 2.1	For all items
UCC-12	ITF-14	Section 5.1	Not for retail point of sale
EAN/UCC-13	ITF-14	Section 5.1	Not for retail point of sale
EAN/UCC-14	ITF-14	Section 5.2	Not for retail point of sale
UCC-12	UCC/EAN-128 (AI 01)	Section 6.2	Not for retail point of sale
EAN/UCC-13	UCC/EAN-128 (AI 01)	Section 6.2	Not for retail point of sale
EAN/UCC-14	UCC/EAN-128 (AI 01)	Section 6.2	Not for retail point of sale

Figure 2.1 - 2

Any bar code symbol which is intended for conveyorized scanning (unattended, fixed mount scanning environments, where items are scanned automatically as they pass by on a conveyor) should be a minimum of 32 mm in height and be printed at the higher end of the permissible magnification factor.

2.1.2 Trade items scanned at retail point of sale

A trade item that is intended to cross the point of sale in a retail outlet must be bar coded using the EAN/UPC symbology. Consequently, these trade items support only EAN/UCC-8, UCC-12 or EAN/UCC-13 identification numbers.

Some retail point of sale scanning systems may be able to handle symbologies other than EAN/UPC. However in an open environment, it is not possible to predict the type of scanner that will be used. Therefore, the rule is that items intended to be scanned at point of sale in a retail outlet must be marked with the EAN/UPC symbology.

Although a sunrise date of January 2005 has been set for the global acceptance of EAN/UCC-13, the UCC-12 standard numbering structure represented in an UPC-A or UPC-E symbol is required for items sold at the retail point of sale in the USA and Canada. This is because many North-American users cannot (yet) accommodate EAN/UCC-13 identification numbers in their files.

2.1.3 When is an EAN/UCC-8 bar code symbol appropriate?

The EAN/UCC-8 bar code symbol is available for items whose packaging does not include enough available space to permit the use of another symbol. This bar code symbol requires the use of EAN/UCC-8 identification numbers (see figure 2.1 – 3) that are assigned individually by EAN Numbering Organisations and the UCC on request.

EAN/UCC-8 structure

EAN/UCC-8 prefix and Item reference	Check digit
N_1 N_2 N_3 N_4 N_5 N_6 N_7	N_8

Figure 2.1 - 3

The following guidelines should be observed:

Before deciding to use an EAN/UCC-8 identification number, the user should consider - usually jointly with his printer - all available options for using an EAN/UCC-13 identification number. They may include:

- Whether the symbol can be reduced in size, i.e. printed at a lower magnification, taking into account the minimum bar code print quality requirements.

- Whether the label can reasonably be changed (label means the total printed design surface, whether or not affixed separately) enabling the printer's recommended size of standard EAN/UPC symbol to be included. For example: by redesigning the label, by increasing the label size, especially where the existing label is small in comparison with the pack area or by the use of an additional label.

- Whether a truncated symbol can be used. A truncated symbol (a symbol of normal length, but of reduced height) may only be used if there is absolutely no possibility of printing a symbol in full size. Truncation removes the omni-directional scanning capability. A symbol with excessive truncation will not be of any practical use. Users considering this option are advised to consult their customers to see if an acceptable compromise can be reached.

Possible options with respect to pack size constraints are:

- The use of a EAN/UCC-8 number is authorised when the EAN-13 bar code symbol, in the size required as a result of print quality studies, exceeds either 25 % of the printed label area or 12.5 % of the total printable area.

- The use of a EAN/UCC-8 number is authorised when either the largest side of the printed label < 40 cm² or the total printable area < 80 cm².

- The use of an EAN/UCC-8 number is authorised on cylindrical products with diameter < 3 cm.

2.1.4 When is an UPC-E bar code symbol appropriate?

Only UCC Company prefixes beginning with zero can be used to construct UPC-E symbols. Distribution of UCC company prefixes in this range is restricted to proven need only (e.g. for items whose packaging does not include enough available space to permit the use of another symbol). Companies with these prefixes are encouraged to manage their finite resource carefully.

Technical details of UPC-E representation of UCC-12 identification numbers are described in Chapter 3, Appendix 2. Further details are available from the UCC.

2.1.5 Books, serials & printed sheet music

2.1.5.1 General principles adopted in the solutions provided

The solutions adopted for books and serials introduce an alternative between an application incorporating the existing international numbering systems (ISBN, ISMN or ISSN) on the one hand and the application of the EAN/UCC-13 numbering structure on the other hand. It should be stressed that the decision to introduce the ISBN, ISMN and ISSN systems into the framework of the EAN•UCC numbering structure does not stem in any way from consideration for a specific sector of products but from the sole consideration of international systems whose specific characteristics justified their inclusion.

EAN makes available, through these specifications, a general framework of solutions, which can be considered by the EAN Numbering Organisations, working in liaison with publishers and trade associations concerned.

The numbering and symbol marking rules for books and serials sold in USA and Canada are available from UCC.

2.1.5.2 Identification of books, paperbacks & printed sheet music

The first option is to identify books, paperbacks and printed sheet music in the same way as any other trade item, using the EAN/UCC-13 or UCC-12 standard numbering structure.

The second option is to make use of the ISBN and ISMN numbering systems. The EAN•UCC prefix 978 is used for encoding the ISBN number assigned to a particular item, without its check digit. The EAN•UCC prefix 979 is used for encoding either the ISBN number or the ISMN number of a particular item, without check digit.

EAN•UCC prefix	ISBN number (exclusive of ISBN check digit)	Check digit
9 7 8	N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}	N_{13}

EAN•UCC prefix	ISBN or ISMN number (without its check-digit)	Check digit
9 7 9	N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}	N_{13}

Figure 2.1 - 4

Note: For ISMN the N_4 (which is represented by "M" in the ISMN) takes the value "0" (zero). N_5 to N12 are the first eight digits of the ISMN number.

2.1.5.3 Symbol marking of books, paperbacks & printed sheet music

The books, paperbacks or printed sheet music number is marked with the EAN-13 bar code symbol and has to comply with the print quality specifications applicable to EAN/UPC bar code symbols. In addition, this marking is subject to the following constraints or recommendations as to its location:

- The EAN/UPC bar code symbol must not be reduced in height.
- The bar code symbol must appear on the outside cover of the book, to facilitate payment, and possibly inside the cover as well, for books which are subject to return.

2.1.5.4 Supplementary information for books, paperbacks & printed sheet music

Some publishers may wish to express information additional to the title in bar coded form in order to meet their internal requirements. For example, it can be an edition variant (i.e. unchanged reprint, price increase, etc.), which is not distinguished by the ISBN or ISMN number or by an EAN/UCC-13 type of number. These EAN•UCC specifications allow for a number with two or five digits, to be shown in an additional symbol, called an "add-on" and located to the right of the EAN/UPC symbol and parallel to it.

The conditions are as follows:

- The add-on should not contain information, which should properly appear in the main EAN-13 number, which identifies the product unambiguously.
- The reading of the add-on by the retailer's point of sale system is optional.
- The use of the add-on is the responsibility of each publisher and to ends, which are peculiar to him. This use is of course optional.

2.1.5.5 Identification of serial publications

The first option is to identify serial publications in the same way as any other trade item, using the EAN/UCC-13 standard numbering structure.

The second option consists of an EAN•UCC prefix of Numbering Organisations, the publication number and the price of the publication provided that the national legislation allows it. In this case, the price is placed in clearly defined positions, and is directly usable in the country of publication. On the other hand, as soon as the item leaves the country, the price has no direct significance, and the GTIN must be interpreted in a general way, without being broken down internally.

The third option is to make use of the ISSN numbering system. The EAN•UCC prefix 977 is used for encoding the ISSN number assigned a particular item, without its check digit.

EAN•UCC prefix	ISSN number (exclusive of ISSN check digit)	Variant	Check digit
9 7 7	N_4 N_5 N_6 N_7 N_8 N_9 N_{10}	N_{11} N_{12}	N_{13}

Figure 2.1 - 5

The variant digits, N_{11} & N_{12}, may be used to express variants of the same title for issues with a different price, or possibly to identify different issues of a daily within one week. Normal title takes value 00.

2.1.5.6 2-digit serial number

Serial publications are identified with one of the three solutions described above. A 2-digit serial number encoded in a 2-digit "add-on" bar code symbol is also available. The system for assigning the serial number is at the initiative of each EAN Numbering Organisation or the UCC. EAN International and UCC nevertheless recommend the use of the following number assignment:

- Dailies (or more generally publications with several issues a week): The publications of each day of the week are considered as separate trade items that must be identified with a separate identification number represented in an EAN/UPC bar code symbol. The 2-digit serial number is only to be used to represent the applicable week, which, together with the EAN/UCC-13 identification number, enables to establish the day within the year.

- Weeklies: Number of the week (01 – 53)

- Bi-weeklies: Number of the 1st week of the respective period (01 – 53)

- Monthlies: Number of the month (01 – 12)

- Bi-monthlies: Number of the 1st month of the respective period (01 – 12)

- Quarterlies: Number of the 1st month of the respective period (01 – 12)

- Seasonal period: 1st digit = last digit of the year
  2nd digit = 1 spring, 2 summer, 3 autumn, 4 winter

- Bi-annual period: 1st digit = last digit of the year
  2nd digit = number of the 1st season of the respective period

- Annuals : 1st digit = last digit of the year
  2nd digit = 5

- Special intervals: Consecutively numbered from 01 to 99.

The serial number is encoded in a 2-digit "add on" bar code symbol that is placed to the right of the main EAN/UPC symbol and parallel to it. It has to comply with the print quality specifications applicable to EAN/UPC bar code symbols. Its presence does not change the general process in any way.

In particular, it should be noted that the magnification factor (theoretically between 0.8 and 2.0) applied to the main EAN/UPC bar code symbol must also be applied to the "add-on" bar code symbol.

2.1.5.7 5-digit serial number

Serial publications can also use a 5-digit serial number encoded in a 5-digit “add-on” bar code symbol. The add-on is not mandatory to read at a point of sale and must not be used to encode information, which should be contained within the main symbol. It provides more information about a particular publication of a printed item, and it is the publisher’s responsibility to define the coding scheme. In addition when using a 5-digit add-on, a 2- digit add-on cannot be used.

Information that can be encoded in the five-digit add-on includes the actual date of issue, in order to differentiate between successive issues.

The serial number is encoded in a 5-digit “add-on” bar code symbol that is placed to the right of the main EAN/UPC symbol and parallel to it. It has to comply with the print quality specifications applicable to EAN/UPC bar code symbols. Its presence does not change the general process in any way.

In particular it should be noted that the magnification factor (theoretically between 0.8 and 2.0) applied to the main EAN/UPC bar code symbol must also be applied to the “add-on” bar code symbol.

2.1.6 Groupings of trade items not crossing a retail point of sale

2.1.6.1 General identification rules for groupings of trade items

Every trade item that is different from another in any respect is assigned a separate GTIN. This includes groupings of trade items, which are also themselves trade items.

For example each of the following packaging types, if traded, is assigned a separate GTIN:

Trade Item	Numbering option to construct GTIN			
	EAN/UCC-8	**UCC-12**	**EAN/UCC-13**	**EAN/UCC-14**
Single Product A	X	X	X	
50 x Product A (standard case)		X	X	X
50 x Product A (display case)		X	X	X
100 x Product A (standard case)		X	X	X
Single Product B	X	X	X	
50 x Product A 50 x Product B		X	X	

Figure 2.1 - 6

2.1.6.2 Identification of uniform groupings of trade items

A uniform grouping of trade items is a standard and stable grouping of a series of identical units identified by a EAN/UCC-8, UCC-12, EAN/UCC-13 or EAN/UCC-14 number. If it is itself a trade item, it must be identified with an UCC-12, an EAN/UCC-13 or an EAN/UCC-14 number.

2.1.6.3 Identification of mixed groupings of trade items

A mixed grouping of trade items is a standard and stable grouping of a series of different units identified by a different GTIN. If this mixed grouping is itself a trade item, it must be identified with either an UCC-12, or an EAN/UCC-13 identification number.

The EAN/UCC-14 identification number is valid for mixed groupings only when the mix is identified with a unique trade item number, using an EAN-8, UCC-12 or EAN-13, which is subsequently put into a packaging configuration.

For example:

- GTIN A, GTIN B and GTIN C (a mixed grouping) are identified by GTIN D
- GTIN D could then be used to construct an EAN/UCC-14 identification number for a traded unit made up of a grouping of trade items identified by GTIN D.

2.1.6.4 Symbol marking groupings of trade items

The EAN/UPC symbology may be used to encode the UCC-12 or EAN/UCC-13 identification number of the trade item grouping.

The ITF-14 symbology may be used on groupings of trade items where printing conditions require the application of a less demanding symbology. It can encode the UCC-12, EAN/UCC-13 or EAN/UCC-14 identification number of the item.

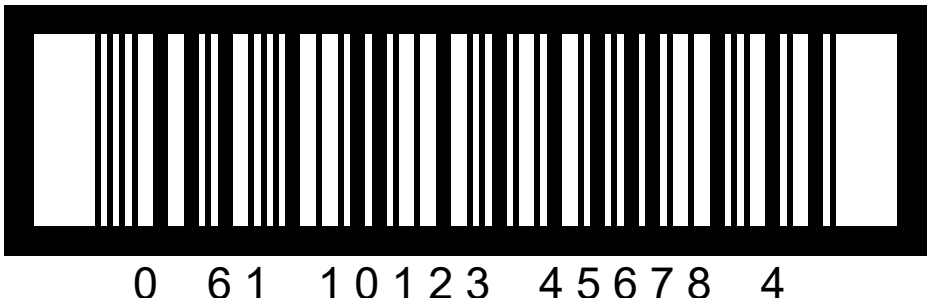
The UCC/EAN-128 symbology with Application Identifier 01 may be used to encode the UCC-12, EAN/UCC-13 or EAN/UCC-14 number identifying the trade item if the printing conditions allow. The choice of this symbology is particularly relevant if there is a need to encode attribute information in addition to the identification number.

Examples:

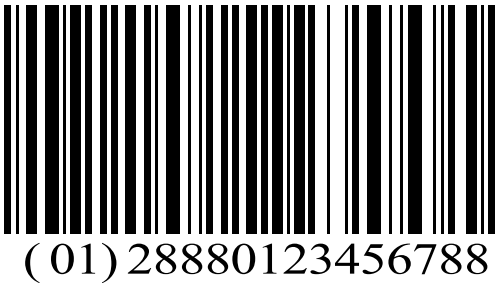
EAN-13

UPC-A

ITF-14



UCC/EAN-128 (AI 01)



2.1.7 Identification of a trade item composed of several parts

The EAN•UCC system provides for an element string Application Identifier 8006 described in Chapter 3, Section 6.47) to be used to identify a trade item that does not cross a retail point of sale and which, due to its nature, is packed in several physical units. Each individual component is marked with a UCC/EAN-128 bar code presenting the element string, consisting of the GTIN of the trade item, the sequence number of the particular component and the total number of components of the trade item. If an attribute appears on more than one component its value must be the same.

The use of the element string AI 8006 to identify a trade item excludes the application of the element string AI 01 on the same unit.

This solution is not applicable for trade items passing a retail checkout using slot scanners.

2.2 Variable measure trade items not crossing a retail point of sale

2.2.1 General numbering and symbol marking rules

This Section concerns only trade items not intended to be scanned at retail checkouts. Currently, there is no international solution available for numbering and marking such items. This is because only EAN/UPC bar code symbols can be scanned at retail checkouts. Their limited capacity does not permit representation of a GTIN and the price or measure.

Trade items may be of variable measure either because the production process does not guarantee consistency in weight, size or length (carcasses of meat, whole cheeses etc.) or because the items are created to meet a special order which states a quantity (e.g. textiles ordered by the metre, glass ordered by the square metre).

Only trade items, which are sold, ordered or produced in quantities, which can vary continuously, are covered by the rules outlined in this section. Trade items, which are sold in discrete and pre-defined bands (e.g. as a nominal weight), are treated as fixed measure trade items.

A trade item must be considered to be variable measure if its measure is variable at any point in the supply chain. For example, a supplier may sell and invoice chickens in standardised cases of 15 kg each; therefore the quantity of contained chickens will vary. The customer, a retailer in this example, may need to know the exact number of chickens contained in each case in order to organise the distribution to his stores. In this example, the supplier should source mark the trade item by using a variable measure Global Trade Item Number (see Figure 2.1 - 7) and the variable count element string (see Chapter 3, Section 6.20).

The following options are available to number and symbol mark variable measure trade items:

Number format	*Bar code symbol*	*Reference to element strings in Chapter 3*	*Comments*
EAN/UCC-14	ITF-14	Section 5.3	Not for retail point of sale
EAN/UCC-14	UCC/EAN-128 (AI 01)	Section 6.3	Not for retail point of sale

Figure 2.1 - 7

The EAN/UCC-14 identification number with the indicator “9” is used to identify a variable measure trade item. The presence of the variable measure information is mandatory for the complete identification of a particular variable measure trade item. The digit "9" in the first position is an integral part of the 14-digit trade item number.

2.2.2 Trade measures required to complete the identification of variable measure trade items

The EAN/UCC-14 identification number identifies a variable measure trade item with respect to its fixed attributes or characteristics. To complete the identification of a variable measure trade item the presence of an element string representing a trade measure is mandatory. Applicable trade measures depend on the nature of the product. They may be a quantity, a weight or any dimension.

For details on element strings for trade measures see Chapter 3, Sections 6.20 and 6.21.

2.2.2.1 Variable count (AI 30)

This element string is used if the variable measure of the trade item is the number of items contained. In order to generate a short bar code symbol it is recommended to always enter an even number of digits in the data field "count of items" by inserting a leading zero. Concatenation of this element string with the EAN/UC-14 identification number of the item enhances the accuracy of the application.

Note: This element string should ***never*** be used to indicate the quantity contained in a ***fixed*** measure trade item. However, if it appears on a fixed measure trade item it should not invalidate the trade item identification.

2.2.2.2 Trade measures (AI 31nn, 32nn, 35nn, 36nn)

These element strings are used if the variable measure of the respective trade item is weight, dimension, area or volume. Only one element string of a given unit of measure may be applied on a particular item. Several element strings containing trade measures are possible on a particular item if the item is available in either unit of measure and if the applicable unit of measure must not be distinguished for ordering and billing. This might apply if weight must be expressed in kg and pounds.

Note: The 4th (and last) digit of the AI indicates the ***implied*** decimal point position. The value “0” means that the measurement is expressed in the basic unit of measure associated to the AI (for example kilograms). Value “1” decreases the measurement by a factor of 10, value “2” by a factor of 100, etc. For example, this enables metric weights to be represented from 999 999 kilograms to 1/1000 of a milligram.

2.2.2.3 Roll products - Width, Length, Core Diameter, Direction, Splices (AI 8001)

The EAN/UCC-14 identification number denotes the basic roll product. The element string AI 8001 contains the pre-defined variable fields of a roll product. It may be used for those variable roll products where the standard trade measures (AI 31nn, 32nn, 35nn, 36nn) are not sufficient.

This element string must never be used together with other element strings representing standard trade measures.

2.2.3 Types of variable measure items

Any trade item of a given composition where the quantity/measure information cannot be pre-determined for any reason is a variable measure trade item. The most frequent types are stated below.

Type	Item Description
A	**Items traded in bulk**, neither portioned nor pre-packed for retail sale, ordered in any quantity and delivered as a non-standardised trade item. Examples: Fish, fruit, vegetables, cables, carpets, timber, fabrics, etc. The identification number denotes the item as a trade entity containing any quantity of the given product and, if applicable, the form of packaging. Weight or dimensions complete the identification of the individual unit.
B	**Trade items ordered and delivered by piece** (wrapped or unwrapped) and invoiced by weight or measure because weight or measure varies due to the nature of the product or due to the manufacturing process. Examples: A whole cheese, a side of bacon, a beef carcass, a fish, a sausage, a ham, a chicken, a cauliflower, motion picture films, etc. The identification number denotes the item as a particular pre-defined entity and, if applicable, the form of packaging. Price or weight or dimensions complete the identification of the individual item.
C	**Portioned trade items,** pre-packed for **sale by weight** to the consumer, not standardised in quantity. Examples: Meat, cheese, vegetables, fruit, fillet of fish, sliced poultry, cold cuts, etc. The identification number denotes the item type according to business practice and the form in which it is packed. Price or weight completes the identification of the individual unit.
D	**Standardised trade items with selectable dimensions** where EAN•UCC standard numbering does not make sense to cover the multiplicity of all variations. Examples: Wooden planks, carpets etc. The identification number denotes the pre-defined basic trade item. The applicable dimension(s) complete(s) the identification of the individual unit.
E	**Standardised composition of a fixed number of trade items type B or C.** Examples: Trade item containing 10 chickens (Item type B). The identification number denotes the standardised trade item as an entity and, if applicable, its form of packaging. The total weight of all items contained completes the identification of the particular trade item.

Figure 2.1 - 8

2.2.4 Examples of numbering and symbol marking of variable measure trade items

Remarks on the examples:

- In order to be illustrative all examples show the same presentation, i.e. price list, order, delivery, invoice and recording in a data file.
- The symbology used in the examples is UCC/EAN-128. The Application Identifiers used are indicated in bold/italic figures.
- The examples are given to demonstrate the correct use of a given Application Identifier when used. When AI 02 is not used, the information about the shipment must be received using EDI, or other means, prior to its physical receipt.

2.2.4.1 Example 1, traded by piece

This example shows an order and delivery of an item traded by piece and invoiced by weight.

- The supplier's catalogue contains one entry: 1 salami weighing ~ 500 g
- The order for 100 units is delivered in three boxes. Each box is marked with an SSCC and, optionally, with information on the content of the box, expressed as follows:
  - AI 02 indicates the variable measure GTIN of the units contained within the box;
  - AI 3101 indicates the total weight of the items contained within the box;
  - AI 37 indicates the count of items contained within the box.
- The three boxes may be stored on a pallet that may itself be marked with an SSCC and, optionally, with information on the contents of the pallet, expressed as follows:
  - AI 02 indicates the variable measure GTIN of the units contained within the pallet;
  - AI 3101 indicates the total weight of the items contained within the pallet;
  - AI 37 indicates the count of items contained within the pallet.
- The invoice refers to the GTIN and quantity delivered and shows the total weight and the price per kg. The GTIN and quantity of the invoice match the GTIN and quantity of the order.

Process	***Description***	***Element strings used / Symbol marking of the items***
Supplier's catalogue	1 Salami ~ 500 g	GTIN 97612345000018
Order	100 salamis	100 x 97612345000018
Delivery	3 logistic units Unit 1 = 33 salamis, 16.7 kg Unit 2 = 33 salamis, 16.9 kg Unit 3 = 34 salamis, 17.1 kg	Unit 1: ***00*** 376123450000010008 ***02*** 97612345000018 ***3101*** 000167 ***37*** 33 Unit 2: ***00*** 376123450000010015 ***02*** 97612345000018 ***3101*** 000169 ***37*** 33 Unit 3: ***00*** 376123450000010022 ***02*** 97612345000018 ***3101*** 000171 ***37*** 34
	If delivery is made on a pallet	Pallet: ***00*** 376123450000010039 ***02*** 97612345000018 ***3101*** 000507 ***37*** 0100
Invoice	GTIN of items and the total weight (50.7 kg) + the price per kg	100 x 97612345000018; 50.7 kg x price per kg

Data file logistic units	Identification of logistic unit (SSCC)	GTIN of contained trade items	Total trade weight of content (gr.)	Number of units contained
Either pallet	376123450000010039	97612345000018	50700	100
or individual units	376123450000010008	97612345000018	16700	33
	376123450000010015	97612345000018	16900	33
	376123450000010022	97612345000018	17100	34

Data file trade items	GTIN of trade item	Total trade weight (gr.)	Number of trade items
1 Record per identification number	97612345000018	50700	100

Figure 2.1 - 9

2.2.4.2 Example 2, traded by standard grouping

This example shows an order and delivery of an item traded by standard grouping and invoiced by weight.

- The supplier's catalogue contains one entry: 1 case of 20 steaks weighing ~ 200 g each.
- The order is for 3 cases. Each case delivered is marked with the GTIN of a single case followed by the actual weight of the items contained.
- The three cases may be stored on a pallet that may itself be marked with an SSCC and, optionally, with information on the contents of the pallet, expressed as follows:
  - AI 02 indicates the variable measure GTIN of the units contained within the pallet;
  - AI 3102 indicates the total weight of the items contained within the pallet;
  - AI 37 indicates the count of cases contained within the pallet.
- The invoice refers to the GTIN and quantity delivered and shows the total weight and the price per kg. The GTIN and quantity of the invoice match the GTIN and quantity of the order.

Process	***Description***	***Element strings used / Symbol marking of the items***
Supplier's catalogue	1 case of 20 steaks ~ 200 g, vacuum packed	GTIN 97612345000117
Order	3 cases	3 x 97612345000117
Delivery	3 trade items Unit 1: weight = 4.150 kg Unit 2: weight = 4.070 kg Unit 3: weight = 3.980 kg	 Unit 1: ***01*** 97612345000117 ***3102*** 000415 Unit 2: ***01*** 97612345000117 ***3102*** 000407 Unit 3: ***01*** 97612345000117 ***3102*** 000398
	If delivery is made on a pallet	Pallet: ***00*** 376123450000010091 ***02*** 97612345000117 ***3102*** 001220 ***37*** 03
Invoice	GTIN of items and the total weight (12.20 kg) + the price per kg	3 x 97612345000117; 12.2 kg x price per kg

Data file logistic units	Identification of logistic unit (SSCC)	GTIN of contained trade items	Total trade weight of content (gr.)	Number of units contained
Pallet	376123450000010091	97612345000117	12200	3

Data file trade items	GTIN of trade item	Total trade weight	Number of trade items
1 Record	97612345000018	12200	3

Figure 2.1 - 10

2.2.4.3 Example 3, traded in bulk

This example shows an order and delivery of an item traded in bulk.

- The supplier's catalogue contains one entry: cabbage unwrapped sold in bulk by kg.
- The order is for 100 kg. It is delivered in two cases. Each case is marked with the GTIN of the cabbage followed by the actual weight of the items contained.
- The two cases may be stored on a pallet that may itself be marked with an SSCC.
- The invoice refers to the GTIN as ordered and shows the total weight and the price per kg. The delivered weight may be verified as being close to the ordered quantity.

Process	***Description***	***Element strings used / Symbol marking of the items***
Supplier's catalogue	Cabbage unwrapped sold in bulk by kg	GTIN 97612345000049
Order	100 kg of cabbage	100 kg x 97612345000049
Delivery	2 trade items Unit 1: weight = 42.7 kg Unit 2: weight = 57.6 kg	 Unit 1: ***01*** 97612345000049 ***3101*** 000427 Unit 2: ***01*** 97612345000049 ***3101*** 000576
	If delivery is made on a pallet	Pallet: ***00*** 376123450000010107
Invoice	GTIN of item and the total weight (100.3 kg) + the price per kg	97612345000049 100.3 kg x price per kg

Data file logistic units	Identification of logistic unit (SSCC)	GTIN of contained trade items	Total trade weight of content (gr.)	Number of units contained
Pallet	376123450000010107	97612345000049	42700	1
		97612345000049	57600	1

Data file trade items	GTIN of trade item	Total trade weight	Number of trade items
1 Record per trade item	97612345000049	42700	1
	97612345000049	57600	1

Figure 2.1 - 11

2.2.4.4 Example 4, traded by standard grouping

This example shows ordering standardised variable measure trade items by case while being invoiced by the number of pieces delivered.

- The supplier's catalogue contains one entry: 1 case of ~ 10 cabbages sold by piece.
- The order is for 2 cases. Each case delivered is marked with the GTIN of a single case followed by the actual count of the items contained.
- The two cases may be stored on a pallet that may itself be marked with an SSCC and, optionally, with information on the contents of the pallet, expressed as follows:
  - AI 02 indicates the variable measure GTIN of the units contained within the pallet;
  - AI 30 indicates the total count of the items contained within the pallet;
  - AI 37 indicates the count of cases contained within the pallet.
- The invoice refers to the GTIN as ordered and delivered and total count of items.

Process	***Description***	***Element strings used / Symbol marking of the items***
Supplier's catalogue	Case containing ~10 cabbages sold by pieces	GTIN 97612345000285
Order	2 cases	2 x 97612345000285
Delivery	Unit 1: 11 pieces Unit 2: 12 pieces	Unit 1: ***01*** 97612345000285 ***30*** 11 Unit 2: ***01*** 97612345000285 ***30*** 12
	If delivery is made on a pallet	Pallet: ***00*** 376123450000010138 ***02*** 97612345000285 ***30*** 23 ***37*** 02
Invoice	GTIN of the trade item and the total quantity	2 x 97612345000285 23 pieces x price per piece

Data file logistic units	Identification of logistic unit (SSCC)	GTIN of contained trade items	Total number of pieces contained in the trade item	Number of units contained
Pallet	376123450000010138	97612345000285	23	2

Data file trade items	GTIN of trade item	Total number of pieces	Number of trade items
1 Record	97612345000285	23	2

Figure 2.1 - 12

2.2.4.5 Example 5, traded in bulk

This example shows a product, which can be purchased from a supplier or sold to a customer by any length in metres.

- The supplier's catalogue contains one entry: cable T49 sold in metres.
- The order is for one length of cable of 150 metres. The delivered package is marked with the GTIN of the cable followed by the actual length of cable contained.
- The invoice refers to the GTIN as ordered and delivered and the total length.

Process	***Description***	***Element strings used / Symbol marking of the items***
Supplier's catalogue	Cable T49 sold in any length in metres	GTIN 97612345000063
Order	1 trade item of 150 metres	97612345000063 x 150 metres
Delivery	1 trade item, 150 metres	***01*** 97612345000063 ***3110*** 000150
Invoice	GTIN of the trade item and the total quantity	1 x 97612345000063 150 x price per metre

Data file trade items	GTIN of trade item	Total trade length
1 Record	97612345000063	150

Figure 2.1 - 13

2.3 Fixed measure trade items - Restricted distribution

2.3.1 Definition

This section describes applications where the item identification is defined only in a closed environment. Therefore, the distribution of trade items marked in this way is restricted to a given geographic region or for use within a company. However, within their closed environment they may be processed along with trade items identified with identification numbers (GTIN) defined for open trade.

Some regulations established by Numbering Organisations for their country or assigned area have to be observed for the allocation of identification numbers for restricted distribution.

When assigned to company internal use, structure and management of the number represented in the element strings of this section are the responsibility of the user. Number changes and re-use of expired numbers must be managed by the user in line with his requirements.

When centrally administrated within a geographic area, the relevant administration body determines the structure and manages the number allocation in line with user requirements.

2.3.2 Company internal numbering - EAN/UCC-8 prefix 0 or 2

This element string, described in Chapter 3, Section 3.2, uses the EAN/UCC-8 prefix of 0 or 2. It provides two million identification numbers, which can be assigned, for internal use in a company. When the EAN/UCC-8 prefix is 0, the element string is called a "velocity code" because it is quicker to key enter.

Note 1: Besides trade item identification, this data element may be used for any purpose, which is supported by the company's equipment supplier (see Chapter 2, Section 6.4).

Note 2: In some environments, where numbers may have to be key entered, the EAN/UCC-8 version of the EAN/UPC symbol encoding EAN/UCC-8 numbers with a prefix 0 may be confused with the numbers encoded into an UPC-E symbol. If such a risk exists, it is preferable to use the EAN•UCC prefix 2 capacity for internal use.

2.3.3 Numbering in a geographic area defined by the Numbering Organisation - EAN/UCC-13 prefixes 20 to 29

The EAN•UCC prefixes 20 - 29 are reserved for identification purposes within a restricted geographic area. Each Numbering Organisation is entitled to assign the prefixes to be used for these element strings (see Chapter 3, Section 2.2) in its country or assigned area:

- for the central administration of the identification of fixed measure trade items within the country or assigned area of the Numbering Organisation;

- for internal numbering of fixed measure trade items by a particular company within the country or assigned area of the Numbering Organisation.

Note 1: Under the control of a particular Numbering Organisation EAN•UCC prefixes 20 - 29 are also being used for the identification of ***variable*** measure trade items for restricted geographic distribution and for any other company internal purpose.

Note 2: Besides trade item identification, this data element may be used for any other company internal purpose (See Chapter 2, Section 6.4).

Note 3: It is recommended that suppliers manufacturing own label products for several customers used unique EAN•UCC numbering to distinguish them. If this is not done, the supplier will not be able to use EDI or electronic catalogues.

2.3.4 Company internal numbering - EAN•UCC prefix 04

Any company in the world may use this element string for company internal trade item numbering. If the EAN•UCC prefix 04 is being applied the User Company may structure the trade item number.

Note: Besides trade item identification, this data element may be used for any other company internal purpose (See Chapter 2, Section 6.4).

2.3.5 Company internal - EAN•UCC prefix 00 - LAC and RZSC

The EAN•UCC prefix 00 provides for company internal numbering named LAC (Locally Assigned Codes) and RZSC (Retailer Zero Suppressed Codes), to be represented in a UPC-E bar code symbol. “Company prefixes” 00 00000, 00 01000 to 00 07999 are used in this feature. For details see Chapter 3, Appendix 2.

2.4 Variable measure retail items - Restricted circulation

2.4.1 Definition

Variable measure retail items are those sold in random quantity against a fixed price per unit quantity and intended to cross a retail point of sale. For example apples sold at a fixed price per kilogram.

These items are either marked in store by the retailer or may be marked at source by the supplier. Only national solutions are available for this purpose.

EAN•UCC prefixes 02, 20 to 29 are available to Numbering Organisations to devise rules for the marking of variable measure retail items in their territory. Numbering Organisations should make part of this capacity available to user companies for company internal applications.

The data fields available after the relevant EAN•UCC prefix (defined by the appropriate Numbering Organisation) can be structured in a variety of ways to represent the product type, and the net weight, the calculated price, or the number of units. Equipment is commercially available for automatically weighing items, calculating an item price from the unit price, and printing the information as a bar code label. The scanning equipment can then be programmed to use the prefix as an instruction to decode the ensuing data fields according to the particular structure adopted.

2.4.2 Identification of variable measure retail items

It is recommended that EAN Numbering Organisations assign one, or several, of the EAN•UCC prefixes 02 and 20 through 29 for the identification of variable measure retail items.

Although each Numbering Organisation and/or user is perfectly free to develop its solution for the coding of variable measure retail items, EAN•UCC provides recommended structures aiming at some degree of standardisation of equipment. These formats may include an item reference number, the retail price of the item and a price verifier digit. The recommended structures are:

EAN•UCC prefix*	Recommended data structures (exact structure determined by Numbering Organisation)	Check digit
0 2	I I I I I V P P P P	C
or	I I I I V P P P P P	C
2 0 - 29	I I I I I I P P P P	C
	I I I I I P P P P P	C

Figure 2.1 - 14

∗ The EAN•UCC prefix is selected by the Numbering Organisations to denote a particular structure within their territory.

Where: I..I = Item number
V = Price verifier-digit calculated according to the algorithm specified in Chapter 3, Appendix 1
P..P = Price in local currency
C = ***Check digit*** calculated according to the standard algorithm in Chapter 3, Appendix 1

Note: The price field may contain 0, 1 or 2 implied decimal places depending on the monetary unit used. The decimal point, which is not symbol marked, must nevertheless be taken into account by the marking equipment when printing the human readable information on the label.

EAN Numbering Organisations may choose to implement a “national” solution for variable measure trade items branded by the supplier for retail. Any national branded variable measure solution requires EAN Numbering Organisations to manage the allocation of the “item number” at a national level.

3. ATTRIBUTES OF TRADE ITEMS

3.1 General considerations

3.1.1 Types of trade item attributes

Trade item attributes are classified in three categories:

- ***Varying*** attributes, the use of which is determined by business practices.
- ***Fixed*** attributes or characteristics of trade items. They are generally to be communicated between trading partners by EDI or other means and should thus not be marked on the goods. However, some fixed attributes have been made available for ***transitional*** use in order to provide temporary help for particular business applications.
- ***Varying attributes with restrictions*** have been established to fulfil special functions in particular applications. Their use only makes sense for the issuing company or a within a specific user sector.

3.1.2 Symbol marking of trade item attributes

Attributes of trade items shall be symbol marked using a UCC/EAN-128 bar code symbol. The only exceptions are the 2-digit and 5-digit Add-ons that use the EAN/UPC symbology.

3.2 Varying trade item attributes

3.2.1 Batch or lot number (AI 10)

This element string provides the batch or lot number of the trade item on which it is applied. It is used for tracking trade items with particular manufacturing characteristics wherever required. Complete tracking includes the item identification number.

Note: This element string must not be used to express characteristics of a trade item that should be considered in the item identification number. It is further recommended to use non-significant (shorter) data for batch or lot numbers leading to shorter element strings.

3.2.2 Dates

These element strings are used to differentiate identical trade items by date information where this is required for business practices. The following types of dates are available:

- Production date (AI 11)
- Packaging date (AI 13)
- Minimum durability date (Quality) (AI 15)
- Maximum Durability date (Safety) (AI 17)

It is left to the discretion of the user to interpret a particular date type in the sense of his business practices. Such interpretation may change according to the product range for which a date is being applied

Since the data field "year" consists of two positions, the century is established by the following procedure.

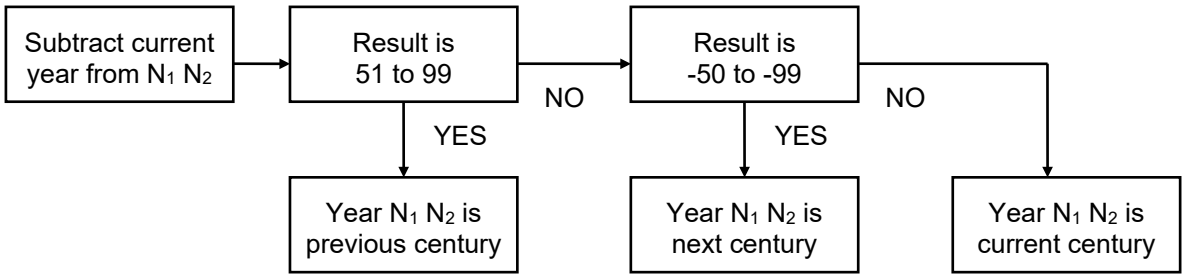


Figure 2.1 - 15

Note: The element string can only specify a date in the range from 49 years in the past to 50 years in the future of the current year.

3.2.3 Serial number (AI 21)

This element string represents the serial number of a trade item. It is used for tracking a trade item with a particular serial number. Proper tracking must include the trade item identification number.

3.2.4 Secondary data for specific health industry products (AI 22)

This element string is mainly used in the USA. It contains a special arrangement of supplementary data required for health industry products. For details see Chapter 7, Section 8.

3.2.5 Lot number (transitional use) (AI 23n)

The purpose of this element string is identical to the batch or lot number (AI 10). However, it provides only numeric lot numbers. It was created to enable concatenation without using the FNC1 symbol character as a separator. It is considered a temporary system component that will be discontinued at some time in the future.

3.2.6 Secondary serial number (AI 250)

This element string is used for tracking a particular component contained in a trade item and if used element string AI 21 must appear on the trade item also. The secondary serial number may refer to any of the components contained. It is an attribute of the trade item identification number. It is the task of the company using this element string to communicate to all concerned to which component of a given trade item a secondary serial number relates.

For example, the secondary serial number may be used to mark the serial number of the chassis of a television set on the outside of the television set.

3.2.7 Logistic measures (AI 33nn, 34nn, 35nn, 36nn) for variable measure trade items)

Logistic measures for ***fixed*** measure trade items remain unchanged for each item. Consequently, they are considered as fixed characteristics of them and should not be symbol marked on the trade item.

Logistic measures for ***variable*** measure trade items, however, can change according to the varying size or weight of such items. This element string may be used to represent the logistic measure of a particular variable measure trade item.

3.2.8 Kilograms per square metre (AI 337n)

This element string is used to differentiate identical trade items by the effective weight per square metre. It is a varying attribute of the trade item and it is ***not*** a variable measure of the trade item concerned.

For example, depending upon the production conditions, the actual weight of standard paper expressed in grams per square metre may vary slightly. The trade item identification number remains unchanged but it may be useful to mark the actual weight per square metre on the trade item.

3.2.9 Country of origin of a trade item (AI 422)

This element string may be used on a physical unit to denote the country of origin of the trade item, the identification number of which is represented in either AI 01 or AI 02.

3.3 Fixed trade item attributes

3.3.1 Additional product identification assigned by the manufacturer (AI 240)

This element string has been created for the representation of an existing (non-EAN/UCC) trade item identification number of a company.

It may be marked on the same item together with the EAN•UCC identification number (AI 01) in order to facilitate migration to the EAN•UCC system. There must be a one to one relationship between the contents of AI 240 and AI 01.

Note: The use of this element string must be based on an agreement between the users concerned for a limited period. In no way should a company supply internal item identification of any other kind via AI 240, which would violate the EAN•UCC identification principles. It is not a substitute for the GTIN.

3.3.2 Customer part number (AI 241)

This element string has been created to facilitate the conversion from the business use of a customer assigned part number to a manufacturer's GTIN.

3.4 Varying trade item attributes with restrictions

3.4.1 Serial number for serial publications - EAN/UPC-2 Add on symbol

A unique item identification number identifies each title of a serial publication. This element string, used to provide supplementary identification on serial publications, is not designed to be scanned at retail checkouts or other points-of-sale. The item identification number alone is to provide the necessary data for correct price capture.

This element string is applied for the processing of returns of serial publications requiring additional identification beyond the level provided by the item identification number. When it is scanned it is always processed together with the item identification number.

3.4.2 Supplementary information for books, paperbacks and printed sheet music - EAN/UPC-2 or EAN/UPC-5 Add on symbol

A unique item identification number identifies each title of a book or paperback. This element string is used to track a particular edition of a book, not discriminated otherwise via the trade item identification number.

Note: This element string must ***not*** be used for representing the ***price of the book*** for several reasons. First, the applied bar code symbol does not ensure the reading reliability needed for price capture. Secondly, there is no currency indicator available so that price misinterpretation for imported or exported books cannot be excluded. Thirdly, the system logic does not provide a means to distinguish whether the EAN/UPC-5 bar code symbol represents the price or the supplementary information of the particular book.

3.4.3 Product variant (AI 20)

EAN•UCC system application rules state clearly that each trade item being different from another must be assigned a unique item identification number. However, there are cases where a difference is not significant outside the manufacturing company and, therefore, no separate identification number is required.

This element string is a means to handle variations of trade items, which are significant only for the producer of the item.

3.4.4 Price per unit of measure (AI 8005)

This element string is used to discriminate groupings of price marked ***variable*** measure trade items and to inform about the price per unit of measure marked on the individual units contained in the trade item. It should in no way be used for price marked ***fixed*** measure trade items, in which groupings of trade items ***not to be scanned at retail checkouts*** require a unique EAN•UCC identification number for each separate price or a product variant (AI 20).

4. ALLOCATING THE NUMBERS

4.1 General rules

The general rule is that a different unique number must identify each different trade item. This implies that each variant must be assigned a different number. Example: each different size or colour of a garment is allocated a separate, unique, GTIN.

The brand owner of the trade item normally assigns the GTIN.

When a product is made specifically for a customer and orderable only by this customer, it is permissible for a GTIN to be assigned by the customer, using the customer's prefix.

It is recommended that the numbers be allocated sequentially by users to the trade items that need to be identified.

The GTIN should not contain any internal product number, which could change for reasons other than the valid reasons for changing *a G*TIN.

Different languages on the package normally require the allocation of a different GTIN. However, if another can substitute an item, the same GTIN can be used. Example: product marked in French only can have the same GTIN as a product marked in French and German. It is the manufacturer's responsibility to distinguish the same GTINs for packages marked in different languages.

Additional rules may be defined by the Numbering Organisations regarding the assignment of GTINs to comply with national legislation or other regulations.

4.2 Introduction of new products

A new GTIN should be allocated when a product is introduced. This rule also applies to sample or test products, which are distributed in an open environment.

4.3 Lead time in re-using a GTIN

GTINs allocated to trade items which have become obsolete must not be re-used for another trade item until at least 48 months have elapsed from the date the original trade item was last supplied by the brand owner. In the case of garments, the minimum retention period is reduced to 30 months.

A longer period may be needed depending upon the type of goods. For example steel beams may be stored for many years before entering the supply chain. Brand owners should consider what would be a reasonable period of time for the trade item to remain in the supply chain cycle before re-using GTINs

In addition, when contemplating the re-use of a GTIN, consideration should also be given to the use of data associated with the original GTIN by trading partners for statistical analysis or service records, which may continue long after the original trade item was last supplied.

4.4 Data alignment

When a new GTIN is assigned to a trade item, it is essential that the party allocating the number, normally the manufacturer provides detailed information to his trading partners about the characteristics of the new trade item identification number. This information should be provided ***at least thirty days*** before the product is actually traded.

4.5 Pre-priced merchandise

Pre-pricing is discouraged as a trade practice as it introduces complexity for trade item file maintenance through the supply chain. If however, the price is marked on the item, the GTIN should be changed when the priced marked on the item changes.

Note: National, federal or local regulations may apply and take precedence over this guideline.

4.6 Trade item variants

The guidelines below indicate when a different number must be assigned in case of promotions or in case of changes in the trade item. They are based on the principle of reducing trade item number changes whenever possible.

4.6.1 Promotional variants

- Promotional variants of trade items, which affect the size, or the weight of the product, must be allocated a separate unique GTIN. Examples: Free quantity, free gift attached.

- Promotional variants of trade items where a price reduction is explicitly specified on the pack (flash packs) must be allocated a separate unique GTIN, unless local trade practices or price marking legislation dictate otherwise. Examples: 10 cents off.

- Each seasonal promotions of a trade item should be allocated a separate unique GTIN. Example: candy especially over-wrapped for Easter.

- Other promotional variants should not be allocated a separate unique GTIN. Examples: Money off coupon, free gift inside, "send for" offer, competition offer.

4.6.2 Product changes

By "product changes" are meant: any change or improvement during the life of a product, decided by the manufacturer of the product. In the cases described below, the assumption is made that the "new" product replaces the old one. Should the manufacturer decide to create a variant (e.g. with different ingredient) in parallel with the standard product, then a separate unique number has to be allocated.

- Minor product changes or improvements do not require the allocation of a different GTIN. Examples: label artwork redesign, minor product description change with contents unchanged, minor ingredients change.

- When the product changes affect the product quantity, the product dimensions, the packaging type, the product name or brand, the product description, a separate unique GTIN must be allocated.

4.6.3 Trade item variants for groupings

- Trade items which are a standard and stable grouping of a series of units identified by a GTIN, must also be allocated a separate GTIN whenever there is a change to the GTIN of any of the units contained.

- For trade items containing units which are themselves promotional variants or minor product variants of trade items whose GTINs remain unchanged, the rule is the following:

    - If the trade item has to be distinguished for effective ordering, handling and tracking, a separate GTIN must be allocated to the trade item. Examples: Promotions that are limited to certain geographical areas date specific promotions, different languages on the package.

    - If the identification of minor product variants is only relevant to the manufacturer, they should distinguish these variants by using the attribute Product Variant (AI 20). Examples: Minor package design changes, side loading as opposed to top loading cases.

Chapter 2, Section 2:

Numbering and symbol marking of Logistic Units

TABLE OF CONTENTS

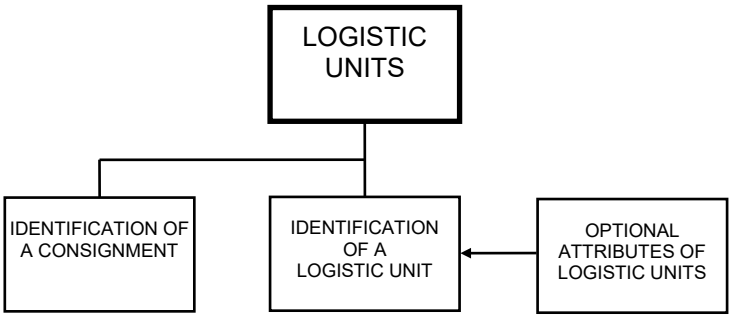
1. INTRODUCTION

A logistic unit is an item of any composition established for transport and/or storage which needs to be managed through the supply chain.

Tracking and tracing of logistic units in the supply chain is a major application of the EAN•UCC system. Scanning the standard identification number, marked on each logistic unit, allows the physical movement of units to be individually tracked and traced by providing a link between the physical movement of items and the associated information flow. It also opens up the opportunity to implement a wide range of applications such as cross docking, shipment routing, automated receiving, etc.

The requirement for logistic units is that they are identified with a standard EAN•UCC identification number known as the Serial Shipping Container Code (SSCC). The construction of the SSCC ensures that logistic units are identified with a number that is unique worldwide.

Attribute information, such as a consignment number, may be optionally encoded using internationally agreed data structures and a bar code symbology that allow unambiguous interpretation.



2. DEFINITION AND IDENTIFICATION OF LOGISTIC UNITS

A logistic unit is an item of any composition established for transport and/or storage which needs to be managed through the supply chain. The identification and symbol marking of logistic units enables a large number of user applications. In particular the SSCC provides a link between bar coded information on a logistic unit and information pertaining to the unit communicated between trading partners using EDI.

The Serial Shipping Container Code (SSCC), element string AI 00, is used for the identification of logistic units (see Chapter 3, Section 6.1). Each individual logistic unit is allocated a unique number which remains the same as for the life of the logistic unit. In principle this unique reference number can be used as the key to access information regarding the logistic unit in computer files. However, attributes (ship to information, logistic weights, etc.) relating to the logistic unit are also available as standardised element strings.

2.1 Element Strings used on logistic units

The use of the following attribute information is optional. However, when used the attribute information should be processed with the SSCC which identifies the logistic unit.

2.1.1 Identification of trade items contained in a logistic unit (AI 02 and AI 37)

When a logistic unit is a grouping of trade items, it is sometimes useful to indicate the GTIN of the contained items in association with the SSCC. The element string AI 02 (which has a mandatory association with AI 37) may be used only on a unit which is not itself a trade item and if all trade items that are contained have the same GTIN.

2.1.2 Logistic measures (AI 33nn, 34nn, 35nn, 36nn)

The EAN•UCC system provides standards for logistic weights and measures in metric and other units of measure. In principle a particular logistic measure should be applied in only one unit of measure on a given logistic unit. However, application of the same attribute in several units of measure does not impede the correct processing of the transmitted data.

2.1.3 Consignment number (AI 401)

The consignment number is a number assigned by the carrier or, with prior agreement of the carrier, by the shipper to identify a logical grouping (one or more physical entities) of goods that has been consigned to that carrier and is intended to be transported as a whole.

2.1.4 Shipment identification number (AI 402)

The shipment identification number is a number assigned by the shipper. It provides a globally unique number which identifies a logical grouping of physical units for the purpose of a transport shipment. It may be used by all parties in the transport chain as a communication reference, in say EDI messages, as a shipment reference and/or a shipper's bill of lading number.

2.1.5 Routing code (AI 403)

The routing code is assigned by a parcel carrier. It is intended to provide a migration path to the adoption of a, yet to be defined, international, multi-modal solution. The Routing Code must not be used to encode information which could be encoded in a separate AI (such as a Ship to Postal Code).

2.1.6 "Ship to - Deliver to" EAN•UCC Global Location Number (AI 410)

This element string has been designed to allow the automatic sortation of logistic units using the EAN•UCC Global Location Number.

2.1.7 "Ship for - Deliver for - Forward to" EAN•UCC Global Location Number (AI 413)

This element string has been designed to allow the cross docking of logistic units using the EAN•UCC Global Location Number. It is used in conjunction with the element string AI 410, to indicate the cross docking station, and indicated the final destination of the logistic unit.

2.1.8 "Ship to - Deliver to" Postal code within a single Postal Authority (AI 420)

This element string has been designed to allow the automatic sortation of logistic units using the postal code in a single postal area.

2.1.9 "Ship to - Deliver to" Postal Code with 3 digit ISO country code (AI 421)

This element string has been designed to allow the automatic sortation of logistic units using the postal code. As the postal code is prefixed by the ISO country code, it may be used internationally.

3. SPECIAL CONSIDERATIONS

By their nature units which "need to be tracked and traced individually in a supply chain" require a unique identification number. The Serial Shipping Container Code provides this identification number.

As each logistic unit **must** be assigned its own unique SSCC, the pre-printing of the bar code symbol containing the SSCC on the packaging of the logistic unit is not practical. A more logical approach is to create a label, which will be attached to the logistic unit, at the time the logistic unit is constructed.

Further, a logistic unit may also be a unit of trade and hence be subject to the EAN•UCC specifications for "Trade Items". If this is the case, it is logical to generate a single label containing all the bar coded information required.

EAN International and the UCC along with representatives of manufacturers, retailers, transporters and EAN Numbering Organisations have developed a voluntary standard for bar code label applications: The EAN•UCC Logistics label. The SSCC, and its application on logistic units, is the central focus of the EAN•UCC logistics label and is presented in full below.

4. THE EAN•UCC LOGISTICS LABEL

This document is a reference for the design of logistics labels. The specifications contained within constitute the basis for all EAN•UCC compliant logistics labels, and are endorsed by EAN International and the Uniform Code Council, Inc. More detailed guidelines should view this standard as a source.

Other standards support and complement this standard, most notably the standards for element strings using the UCC/EAN-128 symbology. This complementary standard is an important component of logistics labels, and applies to all of the specifications in this standard. EAN•UCC standards are voluntary.

4.1 Scope

The structure and layout for logistics labels is explained and specified. Emphasis is given to the basic requirements for practical application in an open trade environment. Primary topics include:

- the unambiguous identification of logistic units
- the efficient presentation of text and machine-readable data
- the information requirements of the key partners in the supply chain - suppliers, customers, and carriers
- technical parameters to ensure systematic and stable interpretation of the labels

4.2 Definitions

Carrier	The party that provides freight transportation services.
Concatenation	Multiple element strings combined into one bar code symbol.
Customer	The party that receives, buys, or consumes an item or service.
Data titles	A standard abbreviated description of a data field.
Human readable	Text representing the content of bar code symbols, used as an Interpretation diagnostic or in case the bar code fails to scan. Application Identifiers and data content are included.
Human translation	Text designed to support manual operations and to facilitate key entry in menu driven systems. Data titles and data content are included.
Supplier	The party that produces, provides, or furnishes an item or service.

4.3 Concepts

4.3.1 Logistics information flow

As a logistic unit moves through the supply chain, a series of events occur that defines the information related to the unit. The whole supply chain process of manufacturing, finished goods distribution, transportation, and deployment into the marketplace adds layers of information in relation to the logistic unit.

For example, the physical content of the unit is typically defined at finished goods distribution. At that point in time the identification of the logistic unit as an entity is possible. Other elements of information, such as final destination or the composition of a multi-unit shipment, are not typically known until later in the supply chain process. In a trading relationship, different elements of information are generally known and applied by the supplier, carrier, and customer.

4.3.2 Representation of information

The information presented on logistics labels takes two basic forms. Human oriented information is meant to be utilised by people, and is comprised of text and graphics. Machine-readable information is designed for automatic data capture. Bar codes, as machine-readable symbols, are a secure and efficient method for conveying structured data, while human text allows general access to basic information at any point in the supply chain. Both methods provide value to logistics labels, and often co-exist on the same label.

4.3.3 Specific bar code structures

UCC/EAN-128 is the bar code standard for EAN•UCC logistics labels. This bar code standard consists of both a bar code symbology and a data format. The symbology used is Code 128, which is a highly refined, secure, and space efficient alpha-numeric symbology. The data formats are the element strings using Application Identifiers (see Chapter 3). Each AI is a two, three, or four digit prefix which defines the meaning of the data which follows. AI's allows data to be represented in bar codes in a form which is unambiguously and securely interpreted when scanned.

4.3.4 Identification of a Logistic Unit

The one mandatory field for all logistics labels is the Serial Shipping Container Code (SSCC). The SSCC is an identification number which is unique to each specific logistic unit. The SSCC is represented by the AI 00, and in principle is sufficient for all logistics applications.

In an environment where Electronic Data Interchange (EDI) is used to transmit the detailed information about the logistic unit, or where that information is already resident in a data base, the SSCC acts as a reference pointer to information.

However, when EDI is not available at each point in the supply chain, or when redundancy is desired, certain additional elements of information are desirable. Each of these is also represented through the use of AI's.

4.4 Label Design

The layout of the logistics label accounts for the supply chain process by grouping information into three logical sections for the supplier, customer, and carrier. Each label section may be applied at a different point in time as the relevant information becomes known. Additionally, within each section bar codes are segregated from text information to facilitate separate processing by machines and people.

The labeller, the organization responsible for the printing and application of the label, determines the content, format, and dimensions of the label. The SSCC is the single mandatory element for all EAN•UCC logistics labels. Other information, when required, should comply with the specifications of this document, and with the Application Identifier system.

4.4.1 Supplier, customer, carrier sections

A section is a logical grouping of information that is generally known at a particular time. There are three label sections each representing a group of information. Generally, the order of the sections, from top to bottom, is: carrier, customer, and supplier. However, this order and top/down alignment may vary depending on the size of the logistic unit and business process being served.

4.4.1.1 Supplier Section

This section contains information that is generally known at the time of packaging by the supplier. The mandatory SSCC is applied here as the unit identifier. Trade item identification (GTIN) would also be applied here when used.

Other information which may be of primary interest to the supplier, but might also be useful for customers and carriers, can be applied. This includes product related information such as product variant; dates such as production, packaging, expiration, and best-before dates; and lot, batch and serial numbers.

4.4.1.2 Customer Section

This section contains information that is generally known at the time of order and order processing by the supplier. Typical information includes the ship-to-location, purchase order number, and customer-specific routing and handling information.

4.4.1.3 Carrier Section

This section contains information that is generally known at the time of shipment, and is typically related to transport. Typical information includes ship-to-postal codes, consignment numbers, and carrier-specific routing and handling information.

4.4.2 Bar code and human readable layout

Bar codes are represented in the lower part of each section, while text is shown in the upper part of the section. This facilitates access to each component as required.

Figure 2.2 - 1

4.4.3 Label dimensions

The physical dimensions of the label are determined by the labeller, but the size of the label should be consistent with the data requirements in all sections of the label. Factors influencing label dimensions include the amount of data required, the content and magnification of the bar codes used, and the dimensions of the logistic unit to be labelled.

The standard A6 (105 mm x 148 mm) or 4 x 6 inch formats are sufficient for most requirements and are the predominant label sizes used. Other dimensions are typically variations driven by data requirements or logistic unit size. As a guideline to users, the width of the label is best held constant at 105 mm (4”) while the height of the label varies depending on data requirements.

4.5 Technical Specifications

4.5.1 Bar codes

The UCC/EAN-128 symbology shall be used for all bar codes on the EAN•UCC logistics label.

4.5.1.1 Concatenation

Concatenation is an effective means for presenting multiple element strings in a single bar code, and should be used to conserve label space and optimise scanning operations whenever possible. The exception is the SSCC, which is the identifier for the logistic unit and the most fundamental element of the label. Due to the larger magnification recommended for the SSCC, concatenation may not be feasible on a standard width label.

4.5.1.2 Magnification

The recommended magnification factor range is 50% to 84%. 50% is the minimum magnification recommended for the SSCC, and if one is using an SSCC in a common label format the maximum magnification is 84% due to the width of the label.

The reliability of scanning will always be enhanced by selecting a magnification factor at the higher end of the specified range. However, if the information required cannot be accommodated in the space available, a lower magnification factor may be used. In any case, the magnification factor shall not be lower than 25%. Lower magnification factors reduce reading distance and make the production of quality symbols more difficult to maintain.

4.5.1.3 Bar code height

Taller symbols present a better target for readers. The recommended bar code height is at least 27 mm, and a height of at least 32 mm (1.25”) is preferred for the SSCC. Space constraints may not allow a bar code to be printed at the recommended height, but in no case shall a bar code be less than 13 mm (0.5”) high.

4.5.1.4 Quiet zones

Bar codes should be printed with leading and trailing quiet zones at least 10 modules wide.

4.5.1.5 Orientation & placement

Bar codes shall be in a picket fence orientation to the logistic unit. The bars and spaces shall be perpendicular to the base on which the logistic unit stands. In all cases, the SSCC symbol shall be placed in the lowest portion of the label.

4.5.1.6 Human readable interpretation

In order to provide a fall back key entry and a diagnostic, a human readable interpretation of each bar code symbol shall be provided above or below the bar code. It includes Application Identifiers and data content but no representation of special symbol characters or symbol check digits (but includes data check digits).

To facilitate key entry, AI's should be set apart from the data content through the use of parentheses.

This interpretation shall be no less than 3 mm high and clearly legible, and preferably below the symbol.

4.5.2 Text

4.5.2.1 Plain text

Text that has no bar code equivalent is often required on a label. The name and address of the sender and receiver are typical examples. In many instances companies may also wish to add specific text to a label, e.g. company logos. All text shall be clearly legible and no less than 3 mm high.

4.5.2.2 Human translation

Human translation is text designed to support manual operations and to facilitate key entry in menu driven systems. It is the equivalent of data elements represented in bar codes, and is comprised of data titles and data content. Data Tags must be printed in English. As an option left at the discretion of the labeller a second language can be added. Application Identifiers are not included in human translation. Human translation should be at least 7 mm in height.

4.5.2.3 Data titles

Data titles are the standard abbreviated descriptions of data fields. They are used as prefixes in human translation to support manual interpretation of data fields. They can also be used adjacent to other text or bar codes to clarify content, such as "From" adjacent to a sender's address.

All data titles are shown in Chapter 3, Appendix 4.

4.5.3 Label Location

The label should ideally be located on all four vertical sides of the logistic unit. However, if this is not possible or practical, two labels fixed to adjacent sides is preferred. The minimum is one label per logistic unit.

4.5.3.1 Units less than 1 metre in height

For cartons and other units less than 1 metre (39 in) in height pallets excluded, labels should be placed so that the lowest edge of the SSCC is 32 mm (1.25 in) from the base of the unit. Including light margins (quiet zones) the symbol should at least 19 mm (0.75 in) from the vertical edge.

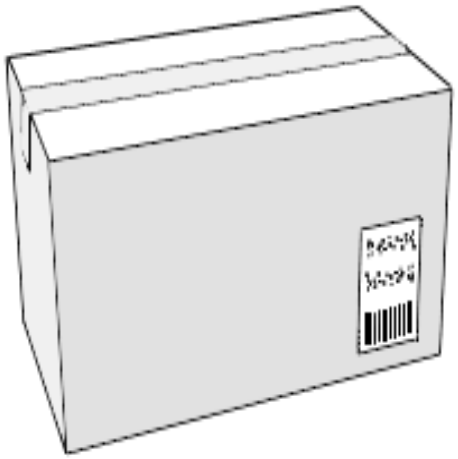


Figure 2.2 - 2

If the unit is already marked with an EAN-13, UPC-A, ITF-14, or UCC/EAN-128 symbol for trade item identification purposes, the label shall be placed so as not to obscure the pre-existing bar code. The preferred location for the label in this case is to the side of the pre-existing bar code, so that a consistent horizontal location is maintained.

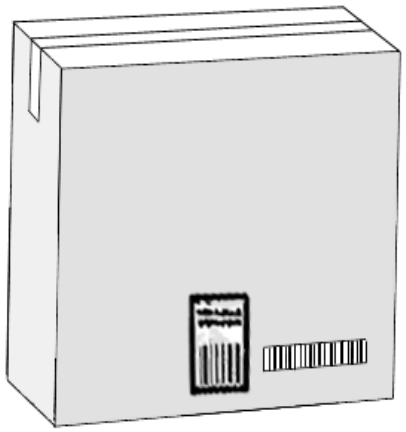


Figure 2.2 - 3

4.5.3.2 For pallets less than 1 metre in height

For pallets less than 1 metre (39 in) in height, symbols should be placed as high as possible but not more than 800 mm (32 in) from the base of the unit.

4.5.3.3 Units greater than 1 metre in height

For pallets and other units greater than 1 metre in height pallets excluded, labels should be placed so that all the bar code symbols are at a height between 400 mm (16 in) and 800 mm (32 in) from the base of the unit, and no closer than 50 mm (2 in) from the vertical edge.

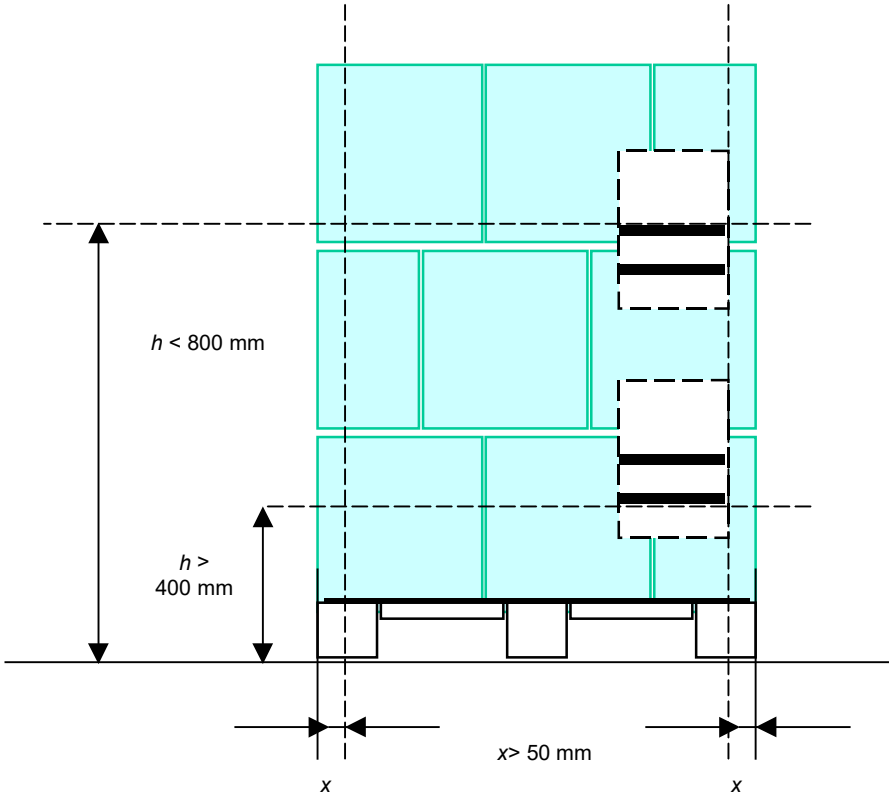


Figure 2.2 -4

4.6 Label examples

Figure 2.2 - 4

The basic label: An SSCC

Figure 2.2 - 5

A label with supplier and carrier sections

Figure 2.2 - 6

A label with supplier section with concatenated data

Figure 2.2 - 7

A label with supplier, customer, and carrier sections

Chapter 2, Section 3:

Numbering and symbol marking of assets

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1. INTRODUCTION

The EAN•UCC system provides a system for the identification of assets. The object of asset identification is to identify a physical entity as an inventory item. Asset identifiers should not be used for any other identification purpose.

Each company or organisation holding an EAN•UCC company prefix may assign asset identifiers to the assets of their organisation. The EAN•UCC Asset Identifier acts as a key to access the characteristics of an asset stored in a computer file and/or to record movements of assets.

Asset Identification Numbers may be used for simple applications, such as the location and usership of a given fixed asset (e.g. a Personal Computer), or for complex applications such as recording the characteristics of a returnable asset (e.g. a reusable beer keg), its movements, its life-cycle history and any relevant data for accounting purposes.

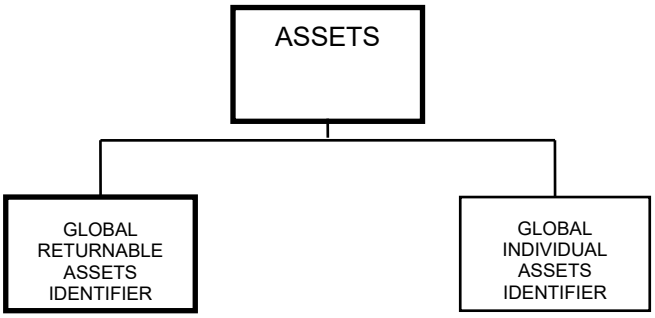
2. DATA CARRIER

The only data carrier used to represent the EAN•UCC Asset Identifier is the UCC/EAN-128 bar code symbology. When encoding an Asset Identifier, the UCC/EAN-128 symbols should be printed at a magnification factor between 0.25 and 1.20.

3. APPLICATION OVERVIEW

3.1 Identification of an Asset

3.1.1 Global Returnable Asset Identifier - GRAI (AI 8003)



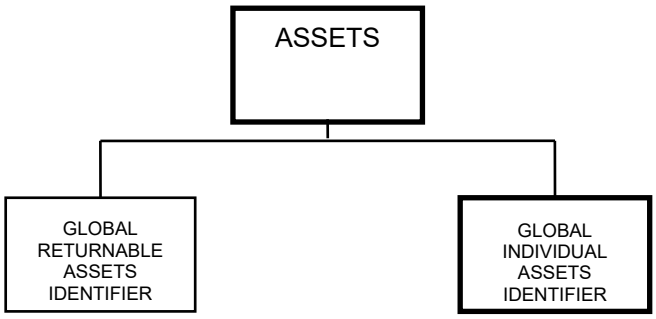
A returnable asset is a reusable package or transport equipment of a certain value, such as a beer keg, a gas cylinder, a plastic pallet or crate. The EAN•UCC identification of a returnable asset (GRAI) enables tracking as well as recording of all relevant data.

The element string comprises the Asset Identification Number and an optional Serial Number (see Chapter 3, Section 6.44). The Asset Identification Number is composed of the company prefix of the company assigning the asset identifier and of the asset type. The latter is assigned to identify – together with the company prefix - uniquely a particular kind of asset. The asset identification number remains the same for all identical returnable assets. Although consecutive numbering is recommended, the structure is left to the discretion of the assigning company. The optional serial number may be used to distinguish individual assets within a given asset type.

A typical application using this element string is in returnable beer kegs. The owner of the beer keg bar codes the GRAI identification number using a permanent marking technique. This bar code is read whenever the keg is supplied ‘full’ to a customer and scanned again when returned ‘empty’. This simple scanning operation allows the beer keg owner to automatically capture the life-cycle history of a given keg and to operate a ‘deposit’ system if required.

Note: This element string identifies a physical entity as a returnable asset. When such a physical entity is used to transport or to contain a trade item the element string AI 8003 must never be used to identify the entity as a trade item.

3.1.2 Global Individual Asset Identifier - GIAI (AI 8004)



In the EAN•UCC system an individual asset is considered as a physical entity of any characteristics.

This element string identifies a particular physical entity as an asset. It must not be used for other purposes and must be unique for period well beyond the lifetime of the relevant asset records. Whether or not the assigned GIAI may remain with the physical item when changing hands depends on the particular business application. If it remains with the physical item then it must never be re-used.

The GIAI comprises the EAN•UCC company prefix of the company assigning the asset identifier and an individual asset reference (see Chapter 3, Section 6.45). The individual asset reference is alphanumeric. Its structure is left to the discretion of the company applying the element string (see Note below).

This element string might, for example, be used to record the life-cycle history of aircraft parts. By symbol marking the GIAI (AI 8004) on a given part, aircraft operators are able to automatically update their inventory database and track assets from acquisition until retirement.

4. ALLOCATING EAN•UCC ASSET IDENTIFIERS

4.1 General rule

EAN•UCC Asset identifiers can be used to identify any fixed asset of an organisation. It is left to the discretion of the issuer to determine whether the GRAI (AI 8003) or GIAI (AI 8004) is most suitable for the application concerned.

Asset Identifiers must not be used for any other purpose and must remain unique for a period well beyond the lifetime of the relevant records.

4.1.1 Allocating GRAIs (AI 8003)

The structure of the GRAI is made of a mandatory part: the Asset Identification Number, and an optional part: the Serial Number (see Chapter 3, Section 6.44).

	Format of the element string		
	Application identifier	Asset Identification Number	Serial number (optional)
		EAN•UCC Company prefix → ← Asset type, Check digit	
(UCC-12)	8 0 0 3	0 0 N_1 N_2 N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}	X_1 — variable → X_{16}
(EAN/UCC-13)	8 0 0 3	0 N_1 N_2 N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12} N_{13}	X_1 — variable → X_{16}

Figure 2.3 - 1

The exact method used to allocate the Asset Identification Number is left at the discretion of the issuing organisation. However, a unique number must be assigned for each asset type being identified and, for ease of administration, EAN•UCC recommend that numbers are allocated sequentially and do not contain ‘classifying’ elements.

Where it is not possible to assign asset classification numbers (for example museum exhibits), or where the asset type is not required by the application (for example when used for a single asset type), then the GIAI (AI 8004) should be used.

4.1.1.1 Asset Identification Number

An identical asset identification number should be assigned to a series of identical assets. For example:

Asset type	Asset Identification Number
50 litre aluminium beer keg	0 12345 6789 00**0** 5
10 litre aluminium beer keg	0 12345 6789 00**1** 2
10 litre wooden beer keg	0 12345 6789 00**2** 9

Figure 2.3 - 2

4.1.1.2 Serial number (optional)

The owner of the asset assigns the optional Serial Number. It denotes an individual asset with a given asset type number. The field is alphanumeric and is used to distinguish individual assets among the same asset type.

4.1.2 Allocating GIAIs (AI 8004)

The GIAI is structured as follows (see Chapter 3, Section 6.45):

Format of the element string					
Application identifier	Individual asset identifier				
	EAN•UCC company prefix →		Individual asset reference →		
8 0 0 4	N_1 ...	N_i	X_{i+1} ...	variable length	$X_{j\ (j<=30)}$

Figure 2.3 - 3

The exact method used to allocate the GIAI is left at the discretion of the issuing organisation. However, each GIAI must be unique for each individual asset being identified and, for ease of administration, EAN•UCC recommend that GIAIs are allocated sequentially and do not contain 'classifying' elements.

4.2 Change of asset ownership

If a company sells (possibly because of liquidation) an asset to another party who may or may not be using EAN•UCC Asset Identification Numbers, the EAN•UCC Asset identifier issued by the previous owner should be deleted.

4.3 Information associated with a EAN•UCC Asset Identifier

The attributes of the asset should be established on a computer file using the EAN•UCC Asset Identifier as the key to the information. An example of the type of information held would be the full name and address of the party who owns the asset, the value of the asset, the location of the asset, the life-cycle history of the asset, etc.

Chapter 2, Section 4:

Numbering and symbol marking of Locations

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1. INTRODUCTION

The EAN•UCC Global Location Number (GLN) makes possible the unique and unambiguous identification of physical or functional or legal entities. The EAN/UCC-13 standard numbering structure is used for this purpose and the represented numbers are non-significant. There is no restriction for the allocation of the same EAN/UCC-13 identification number to a trade item and to a location.

In business operations location numbers are meaningless if they are not associated with a particular function or purpose. All element strings described in this section indicate the particular function of the location number represented in the bar code symbol.

Each company or organisation holding an EAN•UCC company prefix may assign EAN•UCC Global Location Numbers to its own locations. It is the responsibility of a company using GLNs to keep business partners informed of all numbers issued and its name and address details. Special care is needed if the ownership of the company changes.

The use of location numbers is a pre-requisite for efficient Electronic Data Interchange (for example EANCOM). Special procedures may be applied to provide EAN•UCC Global Location Numbers for small companies or businesses that have not been assigned an EAN•UCC company prefix.

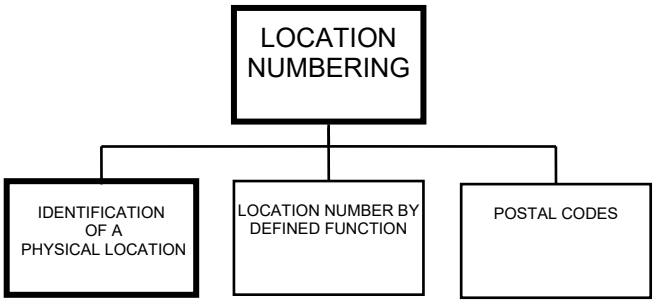
In addition to the GLN, the EAN•UCC system provides for a standard data structure to encode the official postal code of the "Ship To" address. Postal codes are normally maintained by the national postal body in conjunction with the Universal Postal Union (UPU).

2. DATA CARRIER

The only data carrier used to represent the GLN is the UCC/EAN-128 bar code symbology. When encoding the GLN, the UCC/EAN-128 bar code symbols should be printed at a magnification factor between 0.25 and 1.20. However, if the GLN is bar coded onto an EAN•UCC Logistics Label the recommendations contained in Chapter 2, Section 2 (Logistics Units) apply.

3. APPLICATION OVERVIEW

3.1 Identification of a Physical Location



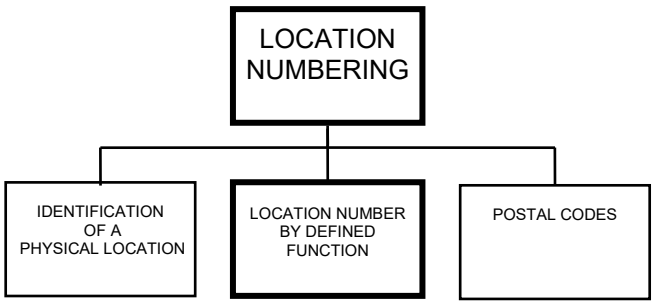
3.1.1 EAN•UCC Global Location Number to identify a physical location (AI 414)

The function assigned to this element string is the identification of a physical location. This implies that this element string is represented in a data carrier on the location itself. Physical locations may for example be a room, a door of a warehouse, an x-ray room in a hospital, a control point or a particular machine.

This element string may be used to record and confirm presence at a given location for any purpose.

A typical application using this element string is the identification of “storage locations” within a warehouse. The forklift driver scans the GLN identifying the storage location whenever an item is brought to, or taken from, the identified location. The electronic message from the scanner would then be used to automatically update the warehouse’s stock management system.

3.2 Location Numbering by Defined Function



3.2.1 "Ship to – Deliver to" EAN•UCC Global Location Number (AI 410)

This element string represents the EAN•UCC Global Location Number of the recipient of a transport unit. The location number refers to the address where a particular consignment shall be delivered. This element string is typically used in single leg transport operations. A transport unit may be bar coded with the GLN of its intended destination. When scanning this element string the data transmitted may be used to retrieve the related address and/or to sort the item by destination.

3.2.2 "Bill to - Invoice to" EAN•UCC Global Location Number (AI 411)

This element string represents the EAN•UCC Global Location Number of the addressee of an invoice. The location number refers to name and address of the business partner to which an entity shall be invoiced. It is accounting related information that may be used wherever required.

3.2.3 "Purchased from" EAN•UCC Global Location Number (AI 412)

In business it is sometimes important to know from where a particular trade item was purchased. Applied on a trade item this element string provides the EAN•UCC Global Location Number of the company that supplied and invoiced the item. The location number always refers to the Global Trade Item Number of the trade item on which the element string has been applied.

3.2.4 "Ship for - Deliver for - Forward to" EAN•UCC Global Location Number (AI 413)

This element string is used by the consignee for determining the internal or subsequent final destination of a physical unit.

A typical application using this element string is in cross docking. At the point of creation a logistic item is symbol marked with the element string AI 410 to direct the goods to the intermediary destination (say a distribution centre) and with the element string AI 413 to direct the goods to the final destination (say a retail store served by the distribution centre).

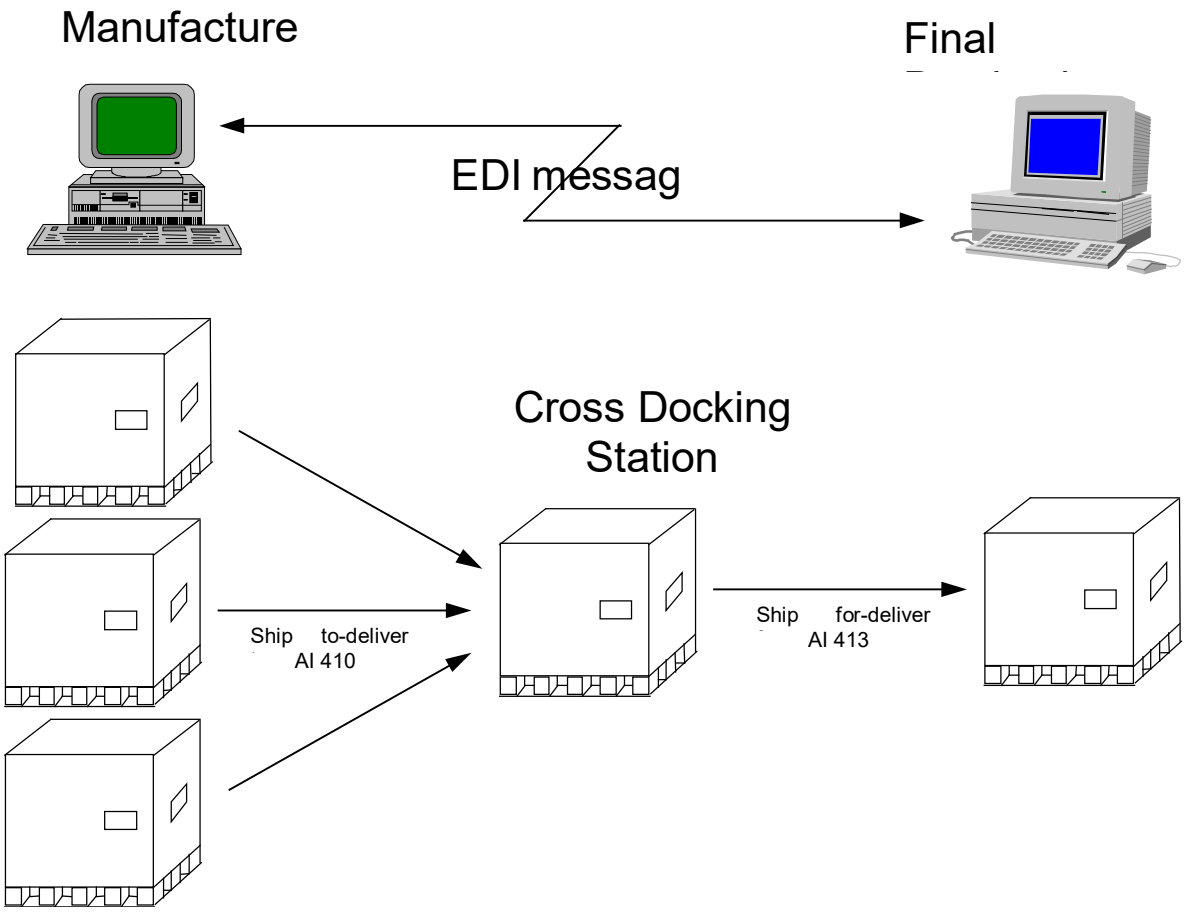
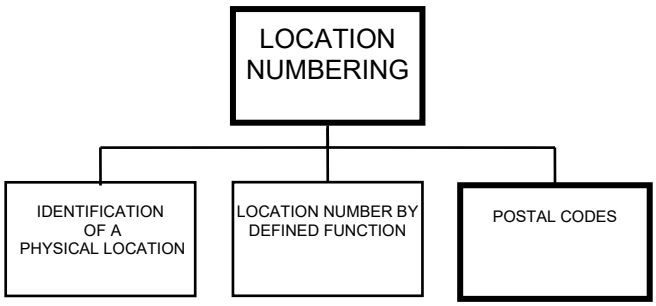


Figure 2.4 - 1

3.2.5 EAN•UCC Global Location Number of the invoicing party (AI 415)

This element string is used to indicate the EAN•UCC Global Location Number of the invoicing party. It is a mandatory information for the payment slip application (see Chapter 2, Section 6.5).

3.3 Postal Codes



Within the EAN•UCC system it is possible to encode the official postal code of the "Ship To" address. The element strings are:

3.3.1 “Ship to - Deliver to” Postal code within a single postal authority (AI 420)

This element string represents the postal code of a given unidentified postal authority. It may not be used for items leaving the area of the concerned postal authority. The element string has been designed to allow the automatic sorting of logistic items.

When these AIs were developed the national applications (AI420) used a different schema than the international and had been created to give more detail, for instance down to the level of the household, while for international post codes this level of detail had not been felt necessary.

3.3.2 "Ship to - Deliver to” Postal code with 3 digit ISO country code (AI 421)

This element string represents the postal code of a postal authority identified by the ISO country code. It may be used for items leaving the area of the concerned postal authority. The element string has been designed to allow the automatic sorting of logistic items worldwide.

This element string represents the national postal codes preceded by the ISO country code. It may be used as logistic information in the international logistic operations wherever appropriate.

A typical application using this element string is in a single leg transport operation. A logistic unit may be bar coded with the international version of the postal code of its intended destination. The electronic message from the scanner would then be used to automatically “route” the logistic unit.

4. ALLOCATING EAN•UCC GLOBAL LOCATION NUMBERS

4.1 General rule

EAN•UCC Global Location Numbers can be used to identify anything that can be addressed. Some examples of this would include companies, departments, functions, rooms, factories, shelves, delivery points, EDI network addresses, etc. A separate unique number is required to identify each different location. Once assigned at source, i.e. in general by the party owning the location, the EAN•UCC Global Location Number becomes a unique and universal reference that can be used by all.

4.2 Location changes

From time to time the details related to an EAN•UCC Global Location Number may change. The location identified by the EAN•UCC Global Location Number may change ownership or the address may close and the business carried out at that address may be transferred to a new address. The following are general cases on the use (re-use) of location numbers due to a change in the circumstances in which the number was originally set up.

If a company sells (possibly because of liquidation) a location to another party who may or may not be using EAN•UCC Global Location Numbers, the EAN•UCC Global Location Number for the address which is associated with the previous owner should be closed. If the new owner of the address wishes to identify the location with an EAN•UCC Global Location Number, a new number needs to be assigned.

If a company closes one address and opens up a similar operation at a new address the company may either transfer the existing EAN•UCC Global Location Number to the new address, or assign a new EAN•UCC Global Location Number for the new address. The reason for requesting a new location number may be that the owner wants to maintain records on his computer files which show the performance of the old location. At a later date this performance may be compared with the performance of the new location.

If a function identified by an EAN•UCC Global Location Number changes, the details associated with the EAN•UCC Global Location Number should be changed by the party responsible for the location number on the related computer file record.

A location number which has stopped being used should remain so for at least three years before being reallocated. The delay must allow time for all references of the old location number to be removed from trading partners' files. When the location number is re-used, the details relating to the new party and/or location must be retransmitted (for example, using a PARTIN EANCOM message).

4.3 Recommendation on allocating EAN•UCC Global Location Numbers

The exact method used to allocate the EAN•UCC Global Location Number is at the discretion of the issuing organisation. The GLN must be unique for each individual location being identified.

For ease of administration, EAN International and UCC recommend that GLNs are allocated sequentially and do not contain ‘classifying’ elements.

4.4 Information associated with an EAN•UCC Global Location Number

The characteristics of a party or location should be established on a computer file using the EAN•UCC Global Location Numbers as the key to the information.

An example of the type of information held would be the full name and address of the party, bank details and account number, sales department dealing with the party, profile of a company, etc.

Chapter 2, Section 5:

Numbering and symbol marking of service relationships

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1. INTRODUCTION

The Global Service Relation Number (GSRN) may be used to identify the recipient of services in the context of a service relationship. It provides a unique and unambiguous identification number for the service provider to store data relevant to service(s) provided to the recipient. The GSRN is the key to access information stored on computer systems or reference information transferred via EDI.

The GSRN can be used to identify the service relationships in:

- a hospital admission, used to identify the patient for recording room charges, medical tests, patient charges, ...
- a membership in a Frequent Flyer Programme, used for recording awards, claims and preferences, ...
- a membership in a Loyalty Scheme, used for recording visits, purchase value, awards, ...
- a membership in a club, used for recording entitlements, use of facilities, subscription, ...
- a service agreement e.g. for a TV or a computer, used for managing agreed services, ...

2. DATA CARRIER

The only data carrier used to represent the GSRN is the UCC/EAN-128 symbology. When encoding the GSRN, the UCC/EAN-128 bar code symbols should be printed at a magnification factor between 0.25 and 1.20.

3. APPLICATION OVERVIEW

3.1 Global Service Relation Number – GSRN (AI 8018)

The GSRN is a non-significant number used to identify a data base entry for recording recurring services. These services are considered activities carried out by a service provider for a service user, based upon a bilateral agreement. Consequently, the GSRN identifies a particular service arrangement with reference to a particular service provider and to a particular user. It may in some instances identify the user as a participant (member) in a programme or scheme. However, it never constitutes a person's personal identification number because it is always related to a given service arrangement.

A typical application using this element string is the identification of “membership” within a student library. The library would issue all “members” with a card bar coded with a unique GSRN identifying the relationship between the library and a student. The library would then scan the GSRN, or membership number, whenever a book was lent or returned. The electronic message from the scanner would then be used to automatically update the library’s stock management database.

The major benefit of using the, worldwide unique, GSRN number for this hypothetical application is that it may also be used in ‘other’ applications. For example to give access to other student libraries where the two libraries have concluded some form of co-operation agreement.

It should be noted that the GSRN is not meant to identify a single service as a trade item. Neither is it used to identify a physical unit as a trade item but it may identify a physical unit for service purposes (for example a computer with a service agreement).

3.1.1 Typical example of a bar coded GSRN

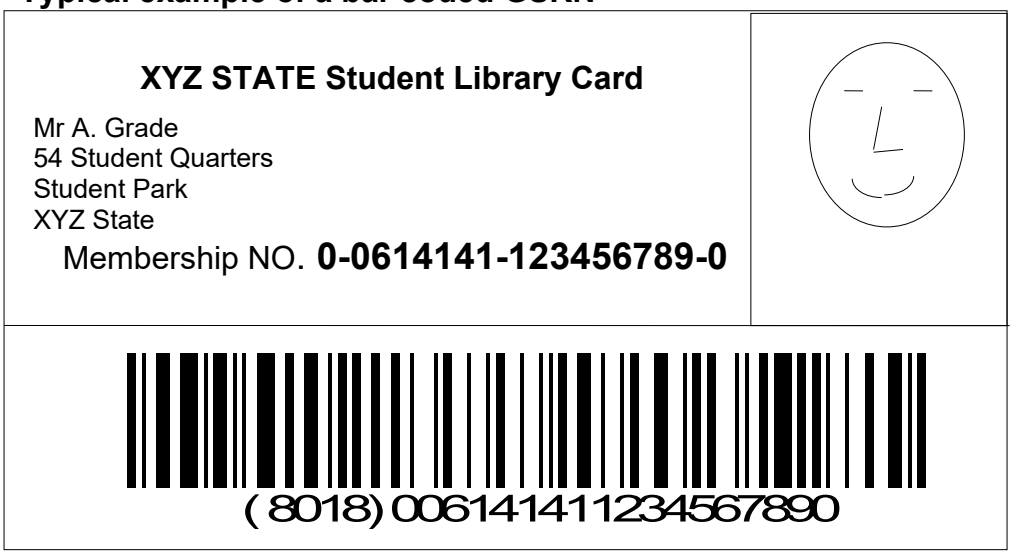

Figure 2.5 - 1

4. ALLOCATING GLOBAL SERVICE RELATION

4.1 General rule

The Global Service Relation Number can be used to identify any service relationship. A separate unique number can be issued, normally by the service provider, to identify any given service relationship. Once assigned the GSRN becomes a unique and universal reference that can be used by all.

4.2 Changes in a service relationship

From time to time the details related to a GSRNs may change. The following are general cases which may occur if the circumstances under which the GSRN was originally set up change:

- If a service provider ceases trading (possibly because of liquidation) any GSRN's allocated by that organisation should be phased out. If the activity covered by the GSRN is transferred, the new service provider may continue to use existing GSRNs, but should allocate further GSRNs from their own number bank.

- If the range of services identified by a GSRN changes, the service provider should change the details associated with the GSRN on the related computer file record. The assignment of a new GSRN is not required in this case.

- A GSRN used to identify a particular service relationship that has terminated should not be reallocated for a period well beyond the lifetime of the relevant records.

4.3 Recommendation on allocating Global Service Relation Numbers

The exact method used to allocate the GSRN is left to the discretion of the issuing organisation. However, the GSRN must be unique for each individual service recipient and remain unique for a period well beyond the lifetime of the records relevant to the service relationship.

For ease of administration, EAN International and UCC recommend that GSRNs be allocated sequentially and do not contain 'classifying' elements.

4.4 Information associated with a Global Service Relation Number

The GSRN is a standalone element string. All information required by the service provider should be established on a computer file using the GSRN as the key to access the information. The type of information stored will be determined by the nature of the service relationship. Typical information would include the service recipients: full name and address, details on services rendered, etc.

Chapter 2, Section 6:
Numbering and symbol marking for special applications

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1. COUPONS

1.1 Introduction

A coupon is a voucher that can be redeemed at the point of sale for a cash value or free item. Coupon identification is organised on national level and, therefore, is not unambiguous worldwide. The determination of the data structure of a coupon is the responsibility of the Numbering Organisations for their area of jurisdiction.

The purpose of coupon numbering and symbol marking is to automate and speed up coupon handling procedures at the point of sale. Moreover, coupon issuers and retailers will have the possibility to reduce the costs involved in sorting coupons, administering manufacturers' payments and producing reports on redemption.

All EAN•UCC coupon standards presented here allow for "coupon validation", i.e. to check whether the item(s) covered by the coupon are within the customer's order.

If either validation or value look up is performed, manufacturers must advise their distributors and retailers of the impending issue of a coupon so that retailers' files can be updated to process the information at the point of sale.

1.2 Application overview

A EAN•UCC Coupon number is used for coding promotional coupons for manufacturers and retailers as well as tokens with monetary value such as: gift tokens, book tokens, foodstamps, record vouchers, luncheon vouchers, social security tokens, etc.

The structure of EAN•UCC Coupon numbers ensures uniqueness against all other EAN•UCC numbers only when used within the monetary area of the appropriate Numbering Organisation(s).

1.3 EAN•UCC Coupon identification for restricted geographic distribution

1.3.1 EAN•UCC Coupon identification for restricted geographic distribution (EAN•UCC prefix 99)

The prefix 99 has been released for use with coupon numbers.

The internationally agreed standard for EAN•UCC coupon numbers is:

EAN•UCC prefix	Coupon data (structure determined by Numbering Organisation)	Check digit
9 9	N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}	N_{13}

Figure 2.6 - 1

Within this structure each Numbering Organisation is perfectly free to develop its national coupon solution. EAN•UCC provides four "recommended standards" aiming at some degree of standardisation of equipment.

These recommended structures are:

EAN•UCC prefix	Recommended coupon data structures (exact structure determined by Numbering Organisation)	Check digit
9 9	Y Y Y Y R R R V V V	C
9 9	Y Y Y R R R V V V V	C
9 9	Y Y Y Y Y R R R T T	C
9 9	Y Y Y Y Y R R R R R	C

Figure 2.6 - 2

Where : Y = Coupon issuer number allocated (issued by EAN Numbering Organisation).
R = Coupon reference number (allocated by coupon issuer)
V = Redemption value
T = Value code (standardised by the Numbering Organisation)
C = **Check digit** calculated according to the standard algorithm

Numbering Organisations or retailers may require that the third digit of the coupon numbers (990 to 999) be programmable, in order to cope with specific demands such as:

- taxable or non-taxable coupons
- different currencies
- indication of the decimal position - etc...

1.3.2 EAN•UCC Common currency coupon identification (EAN•UCC prefixes 981 and 982)

The prefixes 981 and 982 have been released for use with coupons expressing a value in a common currency.

The internationally agreed standard for EAN•UCC common currency coupon numbers is:

EAN•UCC prefix	Coupon data (structure determined in agreement with EAN International)	Check digit
9 8 1 or 9 8 2	N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}	N_{13}

Figure 2.6 - 3

Within this structure Numbering Organisations in a common currency area should develop a common coupon solution that is valid throughout the common currency area.

1.3.2.1 Use of EAN•UCC Common currency coupon for the euro

At present the only application of the EAN•UCC prefixes 981 and 982 are for the 'euro'. The euro is a new currency that will begin to replace the national currencies of some countries on 1 January 1999. A migration period of several years, with bank notes and coins only being introduced in 2002, is planned.

Within the euro-area, coupon issuer numbers are administered by:

EAN BELGIUM•LUXEMBOURG
Rue Royale 29
1000 Brussels
Belgium

Tel: + 32.2.229.18.80, Fax: + 32.2.217.43.47, Email <icodif@eanbelgilux.be>

The coupon data structure for the euro area is as follows:

EAN•UCC prefix	Coupon data			Check digit
9 8 1	Y_1 Y_2 Y_3 Y_4	R_1 R_2	E E , E	C
9 8 2	Y_1 Y_2 Y_3 Y_4	R_1 R_2	E , E E	C

Figure 2.6 - 4

Where : Y = Coupon issuer number (issued by EAN Numbering Organisation).
R = Coupon reference number (allocated by coupon issuer).
E = Redemption value (expressed in euro). A value '000' indicates free gift.
C = **Check digit** calculated according to the standard algorithm.

1.3.3 UCC coupon identification for use in North America (EAN•UCC prefix 05)

The use of prefix 05 is reserved for use in North America only. The structure is given in Chapter 3, Section 2.6.

Coupons using the EAN•UCC prefix 05 are constructed using the UCC prefix assigned to a given organisation. For UCC company prefixes beginning with a digit other than zero, the presence of one of the element strings AI 8100, 8101or 8102 is required.

The UCC Coupon Code Manual provides detailed information on the data content and applied coded.

1.3.3.1 UCC coupon extended code (AI 8100 – 8102)

These element strings represents supplementary data related to a particular UCC coupon using the EAN•UCC prefix 05. It is never used as a stand-alone element string.

The element string AI 8100 enables to represent an "offer code" and to extend the use of UCC coupons to companies, the company prefix of which does not begin with the UCC prefix 0.

The element string AI 8101 enables to represent an "offer code" and "expiration data" and to extend the use of UCC coupons to companies, the company prefix of which does not begin with the UCC prefix 0.

The element string AI 8102 enables to extend the use of UCC coupons to companies, the company prefix of which does not begin with the UCC prefix 0.

The UCC Coupon Code Manual provides detailed information on data content and applied codes.

1.4 Symbol marking of coupons

A coupon with the EAN•UCC prefix 99, 981 or 982 is represented in EAN/UPC symbology, EAN-13 symbol format.

A coupon with the EAN•UCC prefix 05 is represented in EAN/UPC symbology, UPC-A symbol format.

The UCC extended coupon code (AI 8101 – 8103) is represented in UCC/EAN-128 symbology.

1.5 Allocating EAN•UCC coupon data

1.5.1 General rule

EAN•UCC coupon identification specifications are flexible and have been designed to cater for current as well as anticipated future requirements.

Due to the nature of coupon numbering the solution offered is a national solution defined by the respective Numbering Organisations. National coupon solutions are not unique worldwide and must be operated in the restricted area defined by the Numbering Organisation.

When adapting National specifications, Numbering Organisations are advised to include appropriate mention of all EAN•UCC recommended numbering structures, in the interest of consistency and to avoid misinterpretation by equipment vendors.

Coupon reference numbers must not be re-used for a period of three years.

1.5.2 Recommendation on allocating coupon reference numbers

The exact method used to allocate EAN•UCC coupon reference numbers is left at the discretion of the issuing organisation. However, the coupon number must be unique for each individual promotion.

For ease of administration, EAN•UCC recommend that coupon reference numbers be allocated sequentially.

2. REFUND RECEIPTS

2.1 Introduction

Refund receipts are vouchers produced to automate the payment for returned empty containers.

The purpose of a bar coded refund receipt is to automate and speed up the handling of empty containers (bottles, crates) which have a refund value in a retail store.

When customers return empty containers (which have a refund value), the containers have to be checked and valued. This process can either be done manually or by automated equipment capable of handling empty containers. When the returned containers have been valued a refund receipt is printed and given to the customer. The refund receipt is then presented by the customer at the store checkout and the corresponding amount is refunded in cash or deducted from the customer's bill

An EAN-13 bar code symbol can be printed on the refund receipt to encode the number including a security number and the monetary value.

~~1.~~2.2 Application overview

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The structure of EAN refund receipt numbers ensures uniqueness against all other EAN•UCC numbers only when used within the restricted environment defined by the appropriate EAN Numbering Organisation or the UCC.

2.2.1.1 EAN•UCC Identification of refund receipts - Restricted geographic distribution (EAN•UCC prefix 980)

The EAN•UCC prefix 980 has been released for use with refund receipt data.

The internationally agreed standard for EAN•UCC refund receipt data is:

EAN•UCC prefix	Refund receipt data (structure determined by Numbering Organisation)	Check digit
9 8 0	N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}	N_{13}

Figure 2.6 - 5

Within this structure each Numbering Organisation is perfectly free to develop its own national refund receipt solution. EAN provides the following recommended structure aiming at some degree of standardisation of equipment.

The recommended structure is:

Prefix	Recommended structure	Check Digit
9 8 0	S S S S S V V V V	C

Figure 2.6 - 6

Where : S = Security number. This number is used to provide some security in the handling of the refund receipt. It consists for example in a sequential number incremented by 1 for each ticket generated. The point of sale system will in this case be able to recognise a receipt which had already been refunded. The security number can also include a 2-digit machine number and a 3-digit sequential number, in the case where several machines are available to the customers at the same location.

V = Monetary value of the refund. The scale factor (decimal places) will depend on the currency used.

C = **Check digit** calculated according to the standard algorithm.

2.3 Symbol marking of refund receipts

A refund receipt is represented in EAN/UPC symbology, EAN-13 symbol format.

2.4 Allocating EAN•UCC refund receipt numbers

2.4.1 General rule

EAN refund receipt identification specifications are flexible and have been designed to cater for current as well as anticipated future requirements.

Due to the nature of refund receipt identification the solution offered is a national solution defined by the respective Numbering Organisations or the UCC. National refund receipt solutions are not unique worldwide and must be operated in the restricted circulation defined by the national Numbering Organisation.

3. ELECTRONIC SERIAL IDENTIFIER FOR CELLULAR MOBILE TELEPHONES (CMTI)

3.1 Introduction

The purpose of an Electronic Serial Identifier for cellular mobile telephones (CMTI) is to uniquely identify a cellular mobile phone within a given jurisdiction.

The resulting bar coded information can be used to automate and speed up the capture of the CMTI as required.

~~1.2~~3.2 Application overview

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The CMTI is usually assigned by a national or pluri-national authority. Issuing authorises must ensure that the electronic serial identifier is unique for each cellular mobile phone. However, as Electronic Serial Identifiers are assigned by different issuing authorities, they are not unique worldwide.

~~1.3~~3.3 Electronic Serial Number for Cellular Mobile telephones (AI 8002)

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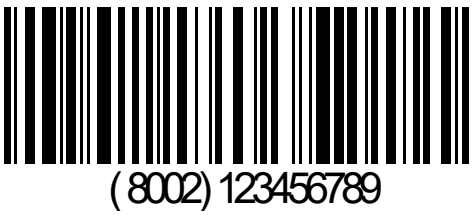
The internationally agreed standard for encoding the Electronic Serial Number for Cellular Mobile Telephones is using Application Identifiers 8002:

The Electronic Serial Identifier **123456789** would be encoded in a UCC/EAN-128 symbol as follows:



~~1.4~~3.4 Allocating Electronic Serial Numbers

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This number, assigned by the appropriate national or pluri-national body can then be symbol marked onto the telephone. The Electronic Serial Identifier is unique for each cellular mobile telephone

4. INTERNAL APPLICATIONS

4.1 Introduction

The EAN•UCC System has been established as an open standard. The primary benefits derived from the EAN•UCC System are that the same bar code and worldwide unique identification numbers are used by all participants in the supply chain. This significantly reduces supply chain costs by standardising the data exchanged between trading partners and allowing label once-scan many operations.

However, organisations which have the capability to process EAN•UCC data may have the requirement to encode, in machine readable form, data for company internal purposes. EAN•UCC makes available the following guidelines to meet purely internal applications. This guideline is compatible with the overall EAN•UCC System, but to avoid the possibility of causing ambiguity elsewhere in the supply chain, it is strongly recommended to destroy any bar coded data, using internal numbering systems, before the items leave the organisation.

4.2 Application overview

4.2.1 Definition

An internal application is broadly defined as any numbering and symbol marking system which is restricted to within the operations of a user company.

Facilities are available within the EAN•UCC System to bar code items with numbers which are unique only within the operations of a user company. In these cases, the identified units are limited to a **restricted distribution** as the identification numbers they bear are not unique worldwide.

4.2.2 Data Carrier

The data carriers used to represent EAN•UCC Internal application codes are the EAN/UPC and the UCC/EAN-128 bar code symbologies.

4.3 Allocating EAN•UCC internal application numbers

4.3.1 General rule

EAN•UCC company internal application specifications are flexible and leave the choice of coding structure, following the appropriate EAN•UCC prefix or Application Identifier, completely at the discretion of the organisation which raised the codes. Due to the nature of company internal applications the solution offered is purely internal to the issuing company.

4.4 Company internal applications using EAN/UPC symbology

4.4.1 Company internal applications using EAN•UCC prefixes

Full details related to using EAN•UCC prefixes 02, 20 to 29 for internal applications can be found in Chapter 2, Section 1.

Organisations wishing to use these EAN•UCC prefixes for purely company internal applications should contact their local numbering organisation for the guidelines prevailing in their territory.

4.5 Internal applications using UCC/EAN-128 symbology

In addition to the EAN•UCC prefixes above, EAN•UCC makes available application identifiers for company internal applications. Like all other coding structures using application identifiers, internal application AIs may only be encoded using the UCC/EAN-128 symbology.

4.5.1 Information Mutually Agreed Between Trading Partners (Including FACT Data Identifiers) (AI 90)

This element string may be used to represent any information that has been mutually agreed between two trading partners. This agreement may include the use of FACT DI's (Data Identifiers). If a FACT DI is used, it should appear immediately after the AI 90 with the appropriate data following. It should be noted that the use of these structures gives little security to users.

The bar code containing this element string should be removed from any item which leaves the jurisdiction of the trading partners. Failure to remove the bar code may cause problems if another trading partner, using the same (internal) AI for a separate internal application, scans the item.

4.5.2 Company internal information (AIs 91 to 99)

These element strings may contain any internal information relevant for a company's internal applications.

The bar code containing this element string should be removed from any item which leaves the jurisdiction of the company. Failure to remove the bar code may cause problems if a trading partner, using the same (internal) AI for a separate internal application, scans the item.

5. NUMBERING AND SYMBOL MARKING FOR PAYMENT SLIPS

Foreword

EAN International in conjunction with representatives of banks, utility service providers and retailers have developed this voluntary standard for applications of bar codes on Payment Slips.

This standard is based on the use of EAN•UCC Application Identifiers and utilises the UCC/EAN-128 bar code symbology. It is a complement to and should be read in conjunction with:

- Other Chapters of these General EAN•UCC Specifications.
- EANCOM, the Electronic Data Interchange (EDI) standard providing implementation guidelines of UN/EDIFACT messages.

Organisations wishing to automate the Payment Process may use this standard as a basis to produce specific implementation guidelines pertinent to their particular application. These implementation guidelines will consider issues such as domestic vs international payments and local banking laws.

5.1 Introduction

5.1.1 Business demand for the application

The use of the EAN•UCC numbering and bar coding standards has led to major innovations in the retail sector. The use of EAN•UCC bar codes has enabled the automation of the retail Point of Sale (POS). Studies have shown that the bar coding of goods reduces the amount of time required to process a transaction, increases the accuracy of data and enables efficient Electronic Data Interchange (EDI).

This success has led other industries to introduce EAN•UCC bar code scanning and EDI into their business processes. One such application of the EAN•UCC system is the automation of the payment for billable services.

Utility companies (electricity, gas, water, ...) and other service providers (insurance, government agencies, ...) have sought to improve their customer service through automating the payment system. This requires that the information needed by all partners involved in the payment process be in a form that can be automatically captured. One of the most cost-effective methods for doing this is to use bar codes.

The information flow that accompanies the physical payment demand is communicated between trading partners by various means. Electronic Data Interchange (EDI) is the optimal way to transmit information. In practice, however, fully automated communication channels that make it possible to rely exclusively on electronic files for retrieving information are not always available.

For this reason, there may be a need to indicate relevant information on the Payment Slip, in addition to an identification number of the Invoicing Party and a Reference Number for the Payment Slip. The various fields of information, which must be communicated, need to be organised in a standard way in order to facilitate their interpretation and processing by the partners involved.

5.2 Potential Benefits

The following potential benefits of bar coded Payment Slips are envisaged:

For the Customer (Invoicee):

- Flexible Payment Facilities: Payment can be made in banks, post offices, Automatic Teller Machine (ATM), supermarkets, over the internet, etc.

- Increased quality in the capture of payment reference information for use in (say) international banking.

For the Issuer of the Invoice (Invoicing Party):

- By using bar codes to represent the data which is critical for the invoicing party and the payment agent to process the payment, the possibility of error through keying in mistakes is greatly reduced. Scanning bar coded data is one of the most cost efficient and accurate forms of automatic data capture.

- By providing its customers with more locations for payment, the issuer of the invoice provides an increased service level to the customer.

For the Payment Receiving Agency:

- The possibility to use their investment in scanning technology to provide a payment collection service to customers while being able to charge the Invoicing Party a collection fee.

- For retailers the provision of such a service could provide a commercial advantage as customers may choose to use a retailer who provide such a service over one that does not.

For the Bank:

- The opportunity to use bar code and scanning technology (both of which have matured to a stage where critical mass has been reached and solutions are available off-the-shelf) at the cashiers desk to process such payments quickly and accurately. In addition this technology could be extended to ATM type machines installed in bank lobbies which allow the customers to pay their bills 24 hours a day.

- The opportunity, in some countries, to offer new services to batch payments issued by the Payment Receiving Agency on behalf of large invoice issuers (e.g. utility suppliers).

5.3 Application Rules

5.3.1 Definition of a Payment Slip

A Payment Slip is that part of a paper invoice used to facilitate payment. This covers a wide range of payment demands such as telephone bills, electricity bills, insurance renewal, etc. The Payment Slip is normally issued by a service provider, the Invoicing Party, to a final customer, the Invoicee, and represents a payment demand. Normally the Payment Slip would outline, in human readable form:

- Details of the customer
- Details of the service provider
- A detailed invoice for the service(s) provided
- A reference number
- The amount payable
- The payment conditions (pay before date, where to pay, ...)

5.3.2 Bar Code Symbology

The data carrier used to represent the encoded data on Payment Slips is the UCC/EAN-128 bar code symbology. Bar coded data is used to automate the capture of relevant information. It in no way replaces the need for human readable information.

~~1.1.3~~5.3.3 Bar Coded Data

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5.3.3.1 EAN•UCC Global Location Number of the Invoicing Party

The Application Identifier to indicate **EAN•UCC Global Location Number of the Invoicing Party** is **AI 415**.

The **EAN•UCC Global Location Number of the Invoicing Party** identifies the issuer of the Payment Slip. It is used as a key to access data base information on the Invoicing Party (normally held by the Payment Receiving Agency). The same EAN•UCC Global Location Number is used for all Payment Slips issued by the Invoicing Party *under identical payment conditions.* The EAN•UCC Global Location Number of the Invoicing Party is then used by the Payment Receiving Agency to reference the characteristics of the contract with the Invoicing Party, such as:

- Can the Payment be accepted
- Contact details of the Invoicing Party
- Action to take if the Due Date has expired
- Transfer arrangement of funds to Invoicing Party's bank
- .....

A different EAN•UCC Global Location Number shall be used whenever the payment conditions are different (see Chapter 2, Section 6, Appendix 2 - Guideline on the use of EAN•UCC Global Location Numbers).

5.3.3.2 IBAN (International Bank Account Number)

The Application Identifier to indicate the **International Bank Account Number** is **AI 8007**.

The **Bank account identifier of the invoicing party (IBAN)** is defined in ISO 31616. It may be used to identify where to send the payment and in the receiving country which bank is the account holding bank, for international bank payment.

5.3.3.3 Payment Slip Reference Number

The Application Identifier to indicate **Payment Slip Reference Number** is **AI 8020.**

By their nature Payment Slips need to be individually tailored for the Invoicee and therefore require a unique reference number: **The Payment Slip Reference Number**. Reminder notices should use the same number as the original. The Payment Slip Reference Number is issued by the invoicing party and is a unique number in the system. It is recommended that Payment Slip Reference Numbers are sequentially allocated for this purpose.

The **Payment Slip Reference Number** identifies, uniquely, the Payment Slip when used in conjunction with the EAN•UCC Global Location Number of the Invoicing Party. It is used to communicate details of payment between all the partners involved: Invoicing Party, Invoicee, Payment Receiving Agency and Bank(s). It may also be used as a key to access locally held information.

5.3.3.4 Amount Payable

There are two Application Identifiers to indicate the **Amount Payable**:

- **AI 390n** Amount Payable- single monetary area
- **AI 391n** Amount Payable - with ISO 3-digit currency code

  n = indicates the implied decimal point position.

If the Amount Payable is bar coded, it is recommended to use AI 391n as this ensures that the currency of the payment can be automatically processed, and verified, by the system. However, if the currency is *unambiguously implied* by the system, AI 390n may be used. To avoid ambiguity, only one AI encoding the amount payable may be used and the currency must be clearly indicated in human readable form.

Scanning systems should have the facility to override the amount payable. This functionality is required should the Invoicee wish to make the 'minimum' required payment, which could be less than the total amount due. The amount due is attribute information and, when used, must be processed with the EAN•UCC Global Location Number of the Invoicing Party.

5.3.3.5 Due Date

The Application Identifier to indicate the **Due Date** is **AI 12**.

The Due Date indicates the date by which the invoice should be paid (by the invoicee). It is attribute information and, when used, must be processed with the EAN•UCC Global Location Number of the Invoicing Party.

NOTE: While the bar coded due date must be represented YYMMDD. The human readable data can be presented in whatever form is appropriate.

5.4 Application overview

5.4.1 Application requirements

This application guideline is an international standard outlining the EAN•UCC standards available for use, in an open environment, for the area of Payment Slips. It provides information on how to use bar codes on Payment Slips and how these can then be used to help automate the payment process. The application guideline is based upon the simplified model below.

NOTE: Legislation, in certain countries, may require the Payment Receiving Agency to be a bank.

5.4.2 Overview of the key steps when using bar coded Payment Slips

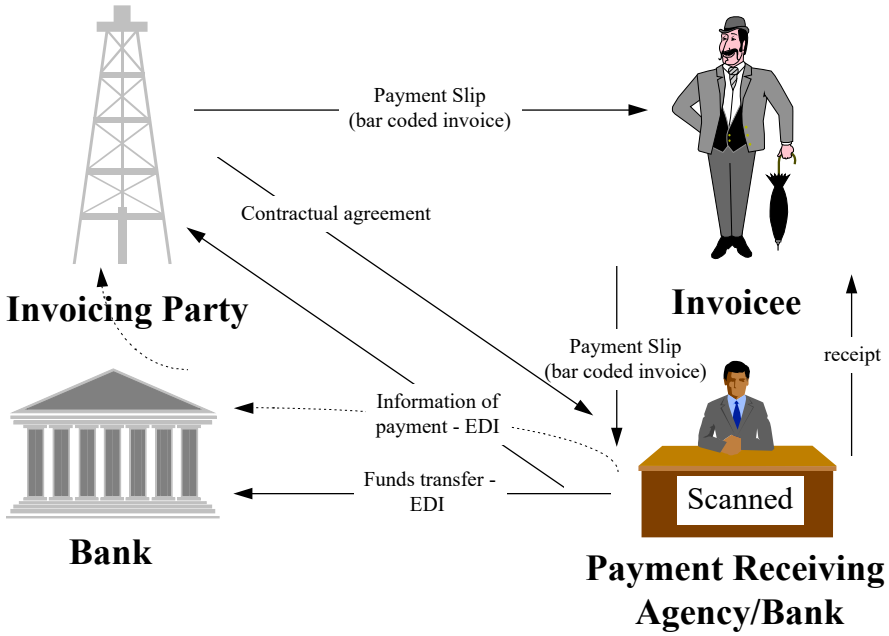

Figure 2.6 - 7

Step 1 Invoicing Party and Payment Receiving Agency must conclude a working agreement, under the appropriate legal framework, regarding the system for receiving payment on an agency basis.

Step 2 Payment Receiving Agency informs and trains all receiving points on the processing of Payment Slips. The EAN•UCC Global Location Number of the Invoicing Party is used to discriminate between Payment Slips which can and can not be accepted.

Step 3 Invoicing Party issues bar coded Payment Slips to customer (Invoicee)

Step 4 Invoicee takes the Payment Slip to the Payment Receiving Agency. The Payment Slip is scanned, the payment is made and a receipt is issued.

Note: The working agreement between the Invoicing Party and Payment Receiving Agency should cover the appropriate action if the “due date” has expired.

Step 5 The Payment Receiving Agency logs all Payment Slips received using the Payment Slip Reference Number. This information is collated centrally and transmitted to the relevant Invoice Issuing Party directly, or via the banking system, after an agreed time frame. The funds are then transferred to the designated bank account.

Step 6 The Invoicing Party updates their database information using the Payment Slip Reference Number.

NOTE: This is a simplified model and may not be applicable in all countries or for international payments. Alternative models may equally apply.

Appendix 1 - Example of a Payment Slip

Figure 2.6 - 8

UCC/EAN-128 symbols

To facilitate efficient scanning, all bar code symbols shall be printed at a magnification factor between 25 and 50% and be a minimum of 13mm in height.

UCC/EAN-128 symbols explained

All bar code symbols on Payment Slips should use the UCC/EAN-128 symbology. As UCC/EAN-128 is a reserved symbology it allows scanning systems to discriminate between these and all other bar code symbols. This, along with the mandatory use of Application Identifiers, greatly improves the security of the scanning system.

(415) 5412345678908 AI 415 indicates the EAN•UCC Global Location Number of the Invoicing Party.

The EAN•UCC Global Location Number is a fixed length 13-digit number terminated by a standard check digit. The rules for allocating EAN•UCC Global Location Numbers ensures that this number is unique worldwide. This data element is used by the Payment Receiving Agent to distinguish between payment slips that can and cannot be accepted.

(12) 010425 AI 12 indicates the due date by which the payment should made.

The due date is always encoded YYMMDD, however other format may well be used for the human readable equivalent. The use of the Due Date is optional, but if used the Payment Receiving Agent and the Invoicing Party should reach agreement about what action should be taken if the due date has expired.

(3911) 710125 AI 391**1** indicates the Amount Payable with ISO Currency Code. From ISO 4217: "710" indicates South African Rand.

It is strongly recommended to use the ISO currency number when encoding this optional data element. The fourth digit of this AI is the 'decimal point indicator', 391**1** indicates one digit after the decimal point, 391**2** indicates two digits after the decimal point, etc.

(8020) ABC123AI 8020 indicates the Payment Slip Reference Number

The Payment Slip Reference Number is a mandatory data element for this application. It is processed with the EAN•UCC Global Location Number of the Invoicing Party and provides a unique reference for all communications between the Payment Agent and the Invoicing Party.

Appendix 2 - Guideline on the use of EAN•UCC Global Location Numbers

Introduction

On a daily basis information related to parties and locations is generated and communicated throughout the business world in vast quantities. Names and addresses are put on envelopes, the point to which a delivery is to be made is put on transport documentation, the bank account number of the payee is identified on an invoice, etc. These are just a few examples of the many applications in existence, which identify parties in everyday business communications.

With the advent of electronic communication, and particularly automatic data capture and EDI, the need for coded identification of parties and locations has become more acute. The use of coded identification instead of full alpha numeric names and addresses is key to the successful implementation of an automated payment project. EAN•UCC Global Location Numbers offer an internationally recognised standard solution to the identification of parties and locations.

Full information on EAN•UCC Global Location Numbers is available from the Uniform Code Council or the local EAN Numbering Organisation. This appendix aims to give a simple overview of their use vis-à-vis Payment Slips.

What is an EAN•UCC Global Location Number?

EAN•UCC Global Location Numbers are reference keys to computer files. When scanned or received in an EDI transmission, the EAN•UCC Global Location Number is used as the key to look up all the relevant information in a computer database.

EAN•UCC Global Location Numbers are unique, non-significant, and international in their application and have strictly defined rules assigned to them. In short, an EAN•UCC Global Location Number must always be numeric and have a fixed length of thirteen digits. Each location number contains, in the thirteenth position, a digit known as the 'check digit' which ensures the correctness of the number. Once assigned at source, usually by the invoicing party, the EAN•UCC Global Location Number becomes a unique and universal reference that can be used by all.

What information is associated with an EAN•UCC Global Location Number?

The attributes of an EAN•UCC Global Location Number should be established on a computer file using the location number as the key to the information. The type of attribute information held by the Payment Agent would be the invoicing party's full name and address, bank details and account number, contractual payment conditions, action to be taken if due date has expired, etc. Whenever any of this attribute information changes, the Invoicing Party should assign a new EAN•UCC Global Location Number.

The use of the EAN•UCC Global Location Number is based upon the assumption that the Payment Agent maintains a computer database to 'look-up' information related to the Invoicing Party. Where the Payment Agent is a bank, the Invoicing Parties International Bank Account Number (IBAN) and Payment Slip Reference Number may be sufficient to process the payment.

Are EAN•UCC Global Location Numbers used in EDI?

The EDIFACT Interchange Header segment (UNB) is used in all EDI interchanges complying with the EDIFACT syntax rules. The identity of the sender and receiver of the interchange must be specified in this segment. The use of EAN•UCC Global Location Numbers is mandatory in EANCOM for the identification of EDI parties at this level.

How to obtain an EAN•UCC Global Location Number?

EAN•UCC Global Location Numbers are available through any one of the EAN Numbering Organisations or the Uniform Code Council.

Appendix 3 - Introduction to the International Bank Account Number (IBAN)

The International Bank Account Number (IBAN) is defined by ISO 13616. The standard specifies the elements of an IBAN which are used in order to facilitate processing of data, internationally, in financial environments as well as within other industries.

The IBAN is constructed using the Basic Bank Account Number (BBAN). The BBAN is the identifier used by financial institutions in individual countries as part of the National Account Numbers Scheme. This ensures the unique identification of a bank account of a customer within a country. The BBAN is used to construct the IBAN as follows:

a) The first 2 letters (a2) shall always be the 2 character Country Code (alpha version), as defined in ISO 3166, of the county in which the bank branch servicing/maintaining the IBAN resides.

b) the 3rd and 4th characters (n2) shall be the check digits as calculated from the defined scheme (see ISO 13616).

c) In electronic transmission of the IBAN (including in bar code form) the remaining character shall be the BBAN without separators or “special” characters (see ISO 13616)

EXAMPLES

Country: Canada (ISO 3166 two character country code **CA**)

BBAN : 012323456-123 123456789012

IBAN : **CA95**012323456123123456789012

Country: Belgium (ISO 3166 two character country code **BE**)

BBAN : 320-0347134-41

IBAN : **BE88**320034713441

It should be noted that only the financial institution which services (maintains) the account is allowed to generate its IBAN (including check digit).

6. CUSTOMER SPECIFIC ARTICLES

6.1 Introduction

The EAN•UCC guidelines for Trade Items (see Chapter 2, Section 1) state that each item of trade is assigned a non-significant number which uniquely identifies the item in an unrestricted environment. The same number is used to identify a series of identical items, with every variant being allocated a separate unique identification number whenever the variation is, in any way, apparent and significant between partners in the supply chain or to the final user.

This is an efficient system of identification in a global trading environment and is a key to enable Automatic Data Capture and efficient Electronic Data Interchange. However, in a number of business sectors the following holds true:

"Due to the vast number of possible different manifestations of certain made-to-order articles, pre-allocation of Global Trade Item Numbers at the lowest level is not feasible"

For organisations which trade in such *made-to-order* products, EAN International, in association with representatives of trade, have developed the following guideline. This guideline has been designed to improve supply chain efficiency by enabling the implementation of Automatic Data Capture (ADC) techniques and, in particular, efficient ordering via Electronic Data Interchange (EDI).

The guideline outlined below is fully compatible with, and should be treated as a special case of, the EAN•UCC recommendations for the numbering and symbol marking of Trade Items.

6.2 Application overview

6.2.1 Definition

A Customer Specific Article, or CSA, is broadly defined as any item where the supplier defines *all possible manifestations of the article*, from which the customer may *choose* AND the (otherwise more efficient) *pre-allocation of article numbers at the lowest level is not feasible*. CSAs are never made for stock, and hence always made-to-order. However, made-to-order articles are not necessarily customer specific, but could be standard.

A typical example of a CSA could be a chair with the choice of 300 different types of upholstery for the seat, the back and the armrest. This listing could also be used for other types of furniture the supplier makes available. In this example there will be 300 x 300 x 300 = 27.000.000 possibilities for the chair. Typically the supplier of the "chair" would produce a paper catalogue listing a generic style of chair and the 300 different types of upholstery available for the seat, the back and the armrest. The customer would then choose the style of chair and then select an upholstery type for the seat, the back and the armrest from the catalogue.

On receipt of order, the supplier would produce the *customer specific* chair and make it available to the customer. Because the supplier has defined exactly the degree of freedom for the customer and because the customer must specify their choices, the order contains all the information the supplier requires to manufacture the chair.

This simple example highlights four separate process steps:

* The supplier makes available all the possible manifestations of an article
* The customer specifies the actual article required using the supplier catalogue
* The supplier manufactures the article in accordance with the customer's specifications
* The customer specific article is delivered

EAN/UCC, through this guideline, provides a *formalism* for these process steps to enable efficient ADC and EDI within the framework of the EAN•UCC System. The CSA data model is based on the assumption that the supplier "defines" the possible components (either in a paper or electronic catalogue) and the customer "specifies" the actual article required.

The process for **Identification** of the article actually produced and the process for **Ordering** the article are dealt with separately. Each process, while linked together, requires separate consideration in an open system.

6.2.2 Customer Specific Articles Data Flow

The data flow model is organised on a series of assumptions, designed to ensure that the model is independent of the type of article and even of the sector: it is a **generic model.** Many different procedures may be applied by the various manufacturers, and the generic model will not always resemble these applications in a 1:1 manner. However, the advantage of using the formalism is that companies can communicate in a standard way and (re)organise the automated handling of the specification process of CSAs according to this guideline.

The model assumes that the supplier informs the customer of all available possibilities. This is achieved by means of an electronic catalogue (see figure below). From this catalogue the customer can determine which article(s) to order. In the order message the Base Article Number and the chosen specifications are communicated.

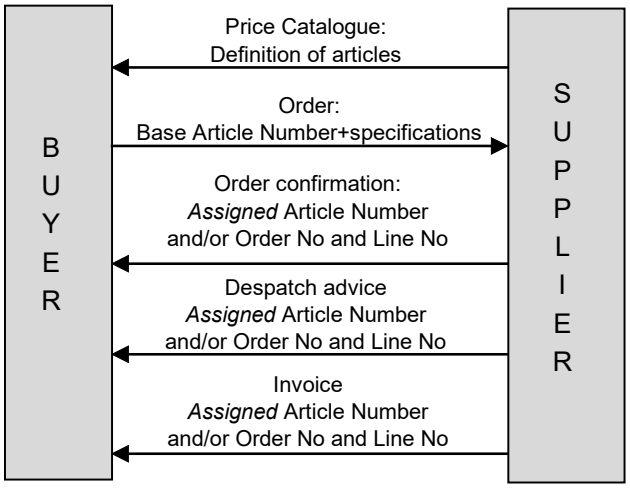

Figure 2.6 - 9

In the order confirmation the supplier may confirm that the article ordered indeed can be manufactured (that is, that the buyer has made a correct combination of specifications). This should be expected if the customer has up-to-date data base information. The order confirmation may also be used to notify the customer of the "assigned article number". The assigned article number may then be used in all subsequent communications. For example the "Despatch advice" and "Invoice" messages, when used, utilise the assigned article number and, if required, the "order number + order line number" in order to establish an unambiguous link with the CSA.

It should be noted that the article produced may not be coded with a string of codes, representing the Base Article Number plus the applicable specifications (see Chapter 2, Section 6.3.3).

6.3 Allocating EAN•UCC numbers for Customer Specific Articles

6.3.1 General rule

The general rule is that each different product must be identified by a different unique number. This implies that each variant of a product must be assigned a different number. For example, each different size or colour of a garment has its own individual identification number. It is recommended that article numbers be sequentially allocated for this purpose.

6.3.2 Ordering of Customer Specific Articles

The ordering process of CSA's: which is the customer specification process, is based on the supplier definitions in a catalogue. These recommendations, which are based upon the principle of "open" systems, seek to avoid systems based on internal identification as these are often manual, and become complex and prone to error as the number of trading partners increase.

The proposed structure of the (electronic) catalogue relies upon the use of EAN•UCC identification numbers, which are guaranteed to be unique worldwide. The use of internal codes can be cumbersome, inflexible and prone to duplication between different suppliers.

A "Customer Specific Articles EANCOM User Profile" for the price catalogue (PRICAT), orders (ORDERS) and the response to order (ORDRSP) messages has been published that utilises the numbering system outlined below.

6.3.2.1 Base Article Number

A supplier assigned "Base Article Number" is given to each generic product type for ordering purposes. An EAN/UCC-13 identification number is used for this functionality. The EAN/UCC-13 identification number is defined by the supplier and must be unique with respect to all other EAN•UCC identification numbers. The Base Article Number will never appear in bar coded form on an article, but exists solely for the purposes of ordering as it does not fully identify an item.

The "Base Article Number" indicates to the customer that a number of "supplier defined" questions have to be answered. These specifications (questions and associated answers), which are relevant to a Base Article Number, are communicated via an (electronic) catalogue. The specifications available with each different Base Article are defined by the supplier.

6.3.2.2 Specifications

Specifications are linked to the different Base Article Numbers for the purposes of ordering. The same specifications may be used with different Base Article Numbers. Specifications fall into one of the following categories: -

~~1.1.1.1.1~~6.3.2.2.1 Option

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An Option is defined as a specification with a discrete value, pre-defined by the supplier and associated with a Base Article Number.

Each Option may be identified with an EAN/UCC-13 identification number. The EAN-13 identification number is defined by the supplier and must be unique with respect to all other UCC/EAN identification numbers. The Option identification number will never appear in bar coded form on an article, but exists solely for the purposes of communication.

Options, such as red leather seat cover, may be valid for different base articles.

~~1.1.1.1.2~~6.3.2.2.2 Parameter

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A Parameter is defined as a specification within a range of values (like dimensions), ranging between a minimum and a maximum and including a step size.

Each Parameter may be identified with an EAN/UCC-13 identification number. The EAN-13 identification number is defined by the supplier and must be unique with respect to all other EAN•UCC identification numbers. The Parameter identification will never appear in bar coded form on an article, but exists solely for the purposes of ordering.

The Parameters should be communicated using the standard EANCOM syntax and be related to a Base Article Number.

6.3.2.2.3 Part

A Part is defined as a physical article which may also be ordered separately.

Each part is identified with a Global trade item identification number (GTIN) as they are already individual articles, which could be ordered separately. The EAN/UCC-13 identification number for the part may be used in association with a Base Article Number to create a "composite" (an article made up of one or more individual parts).

A part may be associated with a number of different base articles.

6.3.2.2.4 External References

An external reference is often required for a customer designed or custom made item. It is specified through a separate, non-EDI communication channel, like a fax or CAD/CAM drawing. A secondary source would be used to communicate a set of customer defined specifications (not pre-defined by the supplies).

6.3.2.3 Data Carrier

EAN•UCC identification numbers for identifying CSAs for ordering purposes (Base Article Numbers and Specifications) may never appear in bar code form on the physical article. However, supplier may wish to utilise bar code scanning as part of the order process. This may be achieved by representing Base Article and Specification identification numbers in machine-readable form in a paper catalogue. EAN•UCC *recommends that the* UCC/EAN-*128 bar code symbology, utilising an application identifier for internal applications, be used for this purpose.*

6.3.3 Identification of physical article actually produced

In environments with automated systems the physical article needs to be identified and the identification of the produced article is required in machine readable form (bar coded). The "identification" of the physical article must be communicated from the supplier to the customer. Both supplier and customer should be able to use the same identification number and each would need to keep a record of this number. This is identical to the steps required for Trade Items in general.

For open systems, the most appropriate identification number is the EAN/UCC-13 identification number. The identification of the physical article with an EAN-13 or UPC identification number, encoded in machine readable form using the appropriate EAN•UCC endorsed data carrier, allows the management of CSAs to be integrated into the system for managing all other articles identified using the EAN•UCC System. To the extent that the physical article, that is actually produced, is identified with an EAN/UCC-13 identification number, these guidelines are fully compatible with the EAN•UCC specifications for Trade Items. In the order confirmation the supplier would indicate the EAN/UCC-13 identification number assigned to the product. It is not necessary to pre-assign numbers to all possible articles, only to those which are actually produced.

6.3.3.1 Data Carrier

The bar coding requirements for Customer Specific Articles are identical as for Trade. The data carrier used to represent the EAN•UCC identification number of the physical article shall be one of the following:

The EAN/UPC bar code symbology

* The ITF-14 bar code symbology

* The UCC/EAN-128 bar code symbology

The data carrier used to represent attribute information on Trade Items is:

* The UCC/EAN-128 bar code symbology

The choice of data carrier is left at the discretion of the organisation responsible for issuing the EAN•UCC identification number. However, any trade item which is intended to be scanned at a retail point-of-sale should be marked using the EAN/UPC bar code symbology.

Chapter 3:

Definitions of the Element Strings

TABLE OF CONTENTS

1. INTRODUCTION

This chapter describes every element string used in the EAN•UCC Standards. It enables users of the system to understand the unique function of each element string within the EAN•UCC system. It defines the meaning and structure of the element strings so that they can be correctly processed in users' applications programmes.

Automatic processing of element strings in business applications requires information about the type of transaction to which the transferred data refers. This is explained in Chapter 7.

In this chapter:

I. Element strings are either described completely and reference is made to information in other sections where applicable.

II. Necessary associations between element strings are given in Chapter 4.

III. Element strings are grouped according to their symbology identifier (see Chapter 5).

2. EAN/UPC SYMBOLOGY; UPC-A, UPC-E AND EAN-13 SYMBOL FORMATS

This Section describes the full strings beginning with symbology identifier]E0.

2.1 Identification of a Trade Item - Fixed Measure

Definition: EAN/UCC-13 identification number (GTIN) of a fixed measure trade item.

This element string is based on the ***UCC-12 or EAN/UCC-13 standard numbering structure*** (see Chapter 1, Section 3).

	Format of the element string												
	EAN•UCC company prefix →						← Item reference						Check digit
(EAN/UCC-13)	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}
(UCC-12)	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}

Figure 3 - 1

The ***EAN•UCC company prefix*** is assigned to the system user (see Chapter 1). It makes the number unique worldwide but does not identify the origin of the item. Company prefixes with ***EAN•UCC prefixes* 000 to 019, 030 to 039, 060 to 099, 100 to 139, 300 to 969, 977 to 979*** in the first three digits are used in this element string.

The ***item reference*** is assigned by the system user, who must observe the rules in Chapter 2, Section 1.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, carried out automatically by the bar code reader, ensures that the number is correctly composed.

Data carrier: EAN/UPC symbology; UCC-12 in UPC-A or UPC-E symbol format, EAN/UCC-13 in EAN-13 symbol format. For the numbers available in UPC-E see Chapter 3, Appendix 2.

System considerations: The system recognises this element string by the symbology identifier]E0 and the EAN•UCC prefixes starting with 000 to 019, 030 to 039, 060 to 099, 100 to 139, 300 to 969, 977 to 979.

The data transmitted from the bar code reader means that a ***quantity of one*** with the EAN/UCC-13 identification number of a fixed measure trade item has been captured.

	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
The format of this number for	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}
processing in a 14-digit field	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}

* Some EAN•UCC prefixes require that element strings are constructed according to particular rules which can be found in Chapter 3, Section 2.4 and Chapter 2, Section 1.2.1.3.

2.2 Identification of a Trade Item for Restricted Distribution - Fixed Measure

Definition: EAN/UCC-13 identification number of a fixed measure trade item for restricted distribution. Although this element string is mainly used for the identification of trade items, it may be used for any purpose as long as it is kept within a restricted environment (see Chapter 2. Section 6.4.4).

This element string is ***for use within a Numbering Organisation's geographic region.*** The Numbering Organisation may assign prefixes to be used for the same application throughout the region or may assign them to be used for companies' internal purposes within the region. The numbers are never unique if they leave the region and, if assigned to company internal use, are not unique if they leave the company or region.

Format of the element string												
EAN•UCC prefix		Item reference										Check digit
2	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}

Figure 3 - 2

The ***EAN•UCC prefix*** must be in the series ***20 to 29***. A particular prefix may be assigned either for use on fixed measure trade items for restricted distribution, variable measure trade items (see Chapter 3, Section 2.4) or for special applications (see Chapter 2, Section 6.4.4).

The ***item reference*** is assigned by the company that uses the element string. Positions N_3 to N_{12} may contain any digit.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, carried out automatically by the bar code reader, ensures that the number is correctly composed.

Data carrier: EAN/UPC symbology; EAN-13 symbol format.

System considerations: The system recognises this element string by the symbology identifier]E0 and the EAN•UCC prefix assigned by the relevant Numbering Organisation.

The data transmitted from the bar code reader means that a ***quantity of one*** with the EAN/UCC-13 identification number of a fixed measure trade item has been captured.

The format of this number for	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
processing in a 14-digit field	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}

2.3 Identification of a Trade Item Within a Company - Fixed Measure

Definition: UCC-12 identification number of a fixed measure trade item for restricted distribution. Although this element string is mainly used for the identification of trade items, it may be used for any purpose as long as it is kept within a restricted environment (see Chapter 2, Section 6.4.4).

This element string is ***for internal use in a company***. Any company may use this element string and, consequently, it does not provide unique identification of the trade item if it leaves the company's premises.

Format of the element string		
EAN•UCC prefix	Item reference	Check digit
0 4	N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}	N_{13}
0 0	0 I_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}	N_{13}

Figure 3 - 3

The ***EAN•UCC prefix 04*** is a system identifier showing that the identification number is under the sole control of the assigning company and that it is for internal trade item distribution. The same applies to ***EAN•UCC prefix 00*** when I_4 has any value from 1 to 7.

The ***item reference*** is assigned by the company that uses the element string. Positions N_3 to N_{12} may contain any digit.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, carried out automatically by the bar code reader, ensures that the number is correctly composed.

Data carrier: EAN/UPC symbology; UPC-A, UPC-E or EAN-13 symbol format. For the numbers available in UPC-E see Chapter 3, Appendix 2.

System considerations: The system recognises this element string by the symbology identifier]E0 and the EAN•UCC prefix 04 or the EAN•UCC prefix 00 and the following two positions being 01 to 07.

The data transmitted from the bar code reader means that a ***quantity of one*** with the EAN/UCC-13 identification number of a fixed measure trade item has been captured.

	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
The formats of these numbers for	0	0	4	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}
processing in a 14-digit field	0	0	0	0	I_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}

2.4 Short Identification Number with Price or Measure of a Trade Item for Restricted Distribution

Definition: Short identification number and price of a variable measure trade item for restricted distribution, to be scanned at a retail checkout.

The first line in the figure below shows the structure currently specified by UCC for North America. The same structure is used by many EAN Numbering Organisations. The next two lines do not show pre-determined structures. However, examples of recommended structures are given in Figure 3 - 5. Numbering Organisations choose appropriate structures for use within their geographic area.

Formats of the element string				
EAN•UCC prefix	Item reference	Price check digit	Item price	Check digit
0 2	N_3 N_4 N_5 N_6 N_7	N_8	N_9 N_{10} N_{11} N_{12}	N_{13}
0 2	N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}			N_{13}
2 N_2	N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}			N_{13}

Figure 3 - 4

The ***EAN•UCC prefix*** must be ***02 or 20 to 29***. Each prefix 20 to 29 may be assigned either for use on restricted distribution trade items with price or measure, fixed measure trade items (see Chapter 2, Section 1).

The ***item reference*** is usually assigned by the company that scans the element string at its retail checkouts. However, some countries may specify their own standard numbering systems for variable measure products administered by their Numbering Organisation or by a trade association.

The ***price check digit*** is the result of a special calculation and its verification ensures correct reading of the price. For details see Chapter 3, Appendix 1. Security of reading this element string without a price check digit would depend entirely on the overall check digit (see Chapter 3, Appendix 1).

The ***item price*** is the price of the trade item in the relevant currency with an implied decimal point defined by the trading partners or Numbering Organisation. A different format is required for each position of implied decimal point. Multiple formats require some unambiguous means to differentiate them and separate EAN•UCC prefixes may be assigned to do this.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, carried out automatically by the bar code reader, ensures that the data corresponds with the verification rules.

Examples of alternative data structures		
Item reference	Price check digit	Item price
Item reference		Item price
Item reference	Measure check digit	Item measure
Item reference		Item measure

Figure 3 - 5

The ***measure check digit*** is calculated from the digits in the item measure field in the same way that the price check digit is calculated from the item price digit (see Chapter 3, Appendix 1).

The ***item measure*** is a measurement of the trade unit with a defined unit of measure and implied decimal point position. The unit of measure and decimal point position are defined within the relevant geographic area for each EAN•UCC prefix and/or format code. The item measure may only be weight if local weights and measures regulations permit.

Data carrier: EAN/UPC symbology; UPC-A or EAN-13 symbol format.

Systems considerations: The system recognises this element string by the symbology identifier]E0, the EAN•UCC prefix 02 or 20 to 29 and the structure defined by the Numbering Organisation that it is operating within. Note that some of the prefixes 20 to 29 may have been assigned by the Numbering Organisations to the element string described in Chapter 3, Section 2.2.

The data transmitted from the bar code reader means that data about a variable measure retail unit has been captured. The bar code reader normally carries out the ***price*** check digit calculation. Failing this the calculation must take place in the application software.

The format of these numbers for processing in a 14-digit field

T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
0	0	2	N_3	N_4	N_5	N_6	N_7	0	0	0	0	0	C *
0	0	2	Item reference → ← Zeros										C *
0	2	N_2	Item reference → ← Zeros										C *

* The check digit is to be recalculated.

2.5 EAN•UCC Coupon Identification for Restricted Distribution

Definition: EAN•UCC identification of coupons for restricted geographic distribution.

A "Coupon" is a voucher with a cash value that is deducted at the point of sale. It is sometimes associated with a specific trade item. Coupon identification is organised on a national level and, therefore, is not unambiguous worldwide. The specification of the coupon data structure in the element string is the responsibility of each Numbering Organisation.

Format of the element string		
EAN•UCC prefix	Coupon data	Check digit
9 9	N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}	N_{13}

Figure 3 - 6

The ***EAN•UCC prefix 99*** denotes the element string " EAN•UCC coupon identification".

The structure of the field ***coupon data*** is determined according to the needs of a particular country. Mandatory components are the coupon issuer number and the coupon reference number. Further useful data is the redemption value in real or coded format and codes for the decimal point or tax rates.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, carried out automatically by the bar code reader, ensures that the data corresponds with the verification rules.

Data carrier: EAN/UPC symbology; EAN-13 symbol format.

System considerations: The system recognises this element string by the symbology identifier]E0 and the EAN•UCC prefix.

The data transmitted from the bar code reader means that the data of a coupon has been captured. Processing of coupons at a retailer's checkout usually consists of validity checks and deduction of its value.

2.6 UCC Coupon Identification for Restricted Geographic Distribution

UCC coupon identification consists of the actual coupon identification data and supplementary information represented in a coupon extended code. The UCC Coupon Code Manual provides detailed information on data contents and applied codes.

Note: The UCC coupon identification is a solution for the USA and Canada and cannot be used beyond their boundaries.

Definition: UCC identification of coupons for restricted geographic distribution.

Format of the element string				
UCC prefix	Company number	Family code	Value code	Check digit
5	N_2 N_3 N_4 N_5 N_6	N_7 N_8 N_9	N_{10} N_{11}	N_{12}

Figure 3 - 7

The ***UCC prefix 5*** denotes the element string "UCC coupon identification".

The ***company number*** is that of the company issuing the coupon for redemption if a product symbol marked with the same company number in the item identification number has been purchased.

The ***family code*** is used to validate the coupon.

The ***value code*** is the redemption value of the coupon in coded format.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, carried out automatically by the bar code reader, ensures that the data corresponds with the verification rules.

Data carrier: EAN/UPC symbology; UPC-A symbol format.

System considerations: The system recognises this element string by the symbology identifier]E0 and the UCC prefix 5.

Note: The company number N_2 to N_6 uses the implied UCC prefix 0 (zero). If the coupon is applicable to item identification numbers beginning with a UCC prefix other than zero, the presence of one of the element strings AI 8100 to 8102 (coupon extended code) is required.

2.7 *EAN•UCC* Common Currency Coupon Identification for Restricted Distribution

Definition: EAN•UCC identification of coupons used in a common currency area for restricted geographic distribution.

A "Coupon" is a voucher with cash value that is deducted at the point of sale. It is sometimes associated with a specific trade item. Coupon identification is normally organised on a national level using the prefix EAN•UCC prefix 99. However, for a common currency area coupon identification is organised between participating countries. The determination of the coupon data structure in the element string is the responsibility of all the Numbering Organisations in the common currency area.

Format of the element string												
EAN•UCC prefix			Coupon data									Check digit
9	8	1	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}
9	8	2	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}

Figure 3 - 8

The ***EAN•UCC prefixes 981 and 982*** denote the element string " EAN•UCC common currency coupon identification".

The structure of the field ***coupon data*** is determined according to the needs of a particular set of countries. Mandatory components are the coupon issuer number and the coupon reference number. Further useful data is the redemption value in real or coded format and codes for the decimal point or tax rates.

The ***check digit*** is explained in Appendix 1. Its verification, carried out automatically by the bar code reader, ensures that the data corresponds with the verification rules.

Data carrier: EAN/UPC symbology; EAN-13 symbol format.

System considerations: The system recognises this element string by the symbology identifier]E0 and the EAN•UCC prefix.

The data transmitted from the bar code reader means that the data of a common currency coupon has been captured. Processing of coupons at a retailer's checkout usually consists of validity checks and deduction of its value.

Today the only application of the EAN•UCC prefixes 981 and 982 are for the 'euro'. The euro is a new currency that will begin to replace the national currencies of some countries on 1 January 1999. A migration period of several years, with notes and coins only being introduced in 2002, is planned. Within the euro-area, coupon issuer numbers are administered by:

EAN BELGIUM•LUXEMBOURG
Rue Royale 29, B-1000 Brussels
Tel: + 32.2.229.18.80, Fax: + 32.2.217.43.47,
Email: icodif@eanbelgilux.be

2.8 EAN•UCC Identification of Refund Receipts - Restricted Distribution

Definition: EAN•UCC identification of refund receipts for restricted geographic distribution or restricted to a company.

Refund receipts are vouchers produced by equipment handling empty containers (bottles and crates), automatically. These receipts have a cash value that is refunded when the receipt is scanned at point of sale.

Format of the element string										
EAN•UCC prefix	Identification →						← Value			Check digit
9 8 0	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}

Figure 3 - 9

The ***EAN•UCC prefix 980*** denotes the element string " EAN•UCC identification of refund receipts".

The field ***identification and value*** contains an identification number and the value of the voucher. It may be structured by a particular system user to meet his needs or by a Numbering Organisation as a standard for its sphere of jurisdiction. The identification number may be of any structure and it shall provide a certain protection against invalid redemption.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, carried out automatically by the bar code reader, ensures that the data corresponds with the verification rules.

Data carrier: EAN/UPC symbology; EAN-13 symbol format.

System considerations: The system recognises this element string by the symbology identifier]E0 and the EAN•UCC prefix 980.

The data transmitted from the bar code reader means that the data of a refund receipt has been captured.

3. EAN/UPC SYMBOLOGY; EAN-8 SYMBOL FORMAT

This section describes the full strings beginning with symbology identifier]E4 (EAN-8).

3.1 Identification of a Trade Item - Fixed Measure

Definition: EAN/UCC-8 identification number (GTIN) of a fixed measure trade item.

This element string is based on the ***EAN/UCC-8 standard numbering structure*** (see Chapter 1, Section 2).

Format of the element string							
EAN/UCC-8 prefix →			← Item reference				Check digit
N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8

Figure 3 - 10

The ***EAN/UCC-8 prefix*** is the system identifier that denotes the Numbering Organisation that assigns the EAN/UCC-8 item number. It does not identify the origin of the item. ***EAN•UCC prefixes 100 to 139 and 300 to 969*** in positions N_1 to N_3 are currently used in this element string. Others may be added in the future.

The ***item reference*** is assigned by the Numbering Organisation. EAN/UCC-8 identification numbers may be requested one by one. Numbering Organisations provide procedures for obtaining EAN/UCC-8 identification numbers.

The ***check digit*** is explained in Appendix 1. Its verification, carried out automatically by the bar code reader, ensures that the number is correctly composed.

Data carrier: EAN/UPC symbology; EAN-8 symbol format.

System considerations: The system recognises this element string by the symbology identifier]E4 and by N_1 not being 0 or 2.

The data transmitted from the bar code reader means that a ***quantity of one*** with the EAN/UCC-8 identification number of a fixed measure trade item has been captured.

	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
The format of this number for processing in a 14-digit field	0	0	0	0	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8

3.2 Identification of a Trade Item within a Company - Fixed Measure

Definition: EAN/UCC-8 identification of a fixed measure trade item within a company. Although this element string is mainly used for the identification of trade items, it may be used for any purpose as long as it is kept within a restricted environment (see Chapter 2, Section 6.4.4).

This element string is ***for internal use in a company***. The numbers are assigned by individual companies as they wish, and so do not provide unique identification if they leave the company premises.

Format of the element string							
EAN/UCC-8 prefix	Item reference						Check digit
N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8

Figure 3 - 11

The ***EAN/UCC-8 prefixes 0 or 2*** are system identifiers that show that the item identification number is under the sole control of the assigning company and that it is for internal item distribution.

The ***item reference*** is assigned by the company that uses the element string. The positions N_2 to N_7 may contain any digit.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, carried out automatically by the bar code reader, ensures that the number is correctly composed.

Data carrier: EAN/UPC symbology; EAN-8 symbol format.

System considerations: The system recognises this element string by the symbology identifier]E4 and by N_1 being 0 or 2.

The data transmitted from the bar code reader means that a ***quantity of one*** with the EAN/UCC-8 identification number of a fixed measure trade item has been captured.

	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
The format of this number for processing in a 14-digit field	0	0	0	0	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8

4. EAN/UPC SYMBOLOGY; 2-DIGIT AND 5-DIGIT ADD-ON

This section describes the full strings beginning with symbology identifier]E1 (2-digit add-on) and]E2 (5-digit add-on).

These element strings may be transmitted with the data normally following the symbology identifier]E0 in which case the symbology identifier]E1 (2-digit add-on) or]E2 (5-digit add-on) is required. A single full string with the symbology identifier]E3 is followed by the data from the main symbol and the add-on (see Chapter 5).

4.1 Serial Number for Serial Publications

Definition: Serial number for serial publications.

A serial publication is identified by a trade item number as described in Chapter 2, Section 1.2.1.5.6. Item identification number and serial number together identify a particular issue of a particular serial publication.

Format of the element string
Serial number for serial publications
N_1 N_2

Figure 3 - 12

The ***serial number for serial publications*** always refers to the corresponding item identification number and has the following meaning:

Appearance	**Applied serial numbers**
Daily	Number of the week (01 - 53)
Weekly	Number of the week (01 - 53)
Bi-weekly	Number of the 1st week of the covered period (01 - 53)
Monthly	Number of the month (01 - 12)
Bi-monthly	Number of the 1st month of the covered period (01 - 12)
Quarterly	Number of the 1st month of the covered period (01 - 12)
Seasonal	N_1 = last digit of the year N_2 = 1 summer, 2 autumn, 3 winter, 4 spring
Bi-annual	N_1 = last digit of the year N_2 = number of the 1st season of the covered period
Annual	N_1 = last digit of the year N_2 = digit 5
Special intervals	Consecutively numbered from 01 - 99

Figure 3 - 13

Data carrier: EAN/UPC symbology; EAN/UPC-2 add-on symbol format.

System considerations: The system recognises this element string by the symbology identifier]E1. The EAN/UPC-2 add-on bar code symbol must be applied together with a UPC-A, UPC-E or EAN-13 bar code symbol. It is never scanned alone and the data from both bar code symbols is available together for processing.

4.2 Supplementary Information for Books, and Paperbacks

Definition: Supplementary information for books and paperbacks.

Books and paperbacks are identified by a GTIN as described in Chapter 2, Section 1.2.1.5.2. This element string provides more information about a particular publication of the printed item, but is not required for the identification of the title itself.

Format of the element string
Supplementary information
N_1 N_2 N_3 N_4 N_5

Figure 3 - 14

The ***supplementary information*** consists of numeric data of any structure and meaning. It is the publisher's responsibility to define the coding scheme.

Data carrier: EAN/UPC symbology; EAN/UPC-5 add-on symbol format.

System considerations: The system recognises this element string by the symbology identifier]E2. The EAN/UPC-5 add-on bar code symbol must be applied together with a UPC-A, UPC-E or EAN-13 bar code symbol. It is never scanned alone and the data from both bar code symbols is available together for processing.

5. ITF-14 SYMBOL

This section describes the full strings beginning with symbology identifier]I1.

The]I1 symbology identifier not only indicates that an ITF-14 symbol has been scanned but that the bar code reader has verified the check digit. If the bar code reader has not been set to verify the check digit the symbology identifier will be]I0. In this case check digit verification must be carried out in the application program.

5.1 EAN/UCC-13 Identification of Trade Item - Fixed Measure

Definition: EAN/UCC-13 identification number (GTIN) of a fixed measure trade item.

This element string is based on the ***UCC-12 or EAN/UCC-13 standard numbering structure*** (see Chapter 1, Section 3).

	Format of the element string													
	EAN•UCC Trade item identification number													Check digit
(EAN/UCC-13)	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}
(UCC-12)	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}

Figure 3 - 15

The ***EAN•UCC Trade item identification number*** is applied as described in Chapter 3, Section 2.1. It is preceded by a zero to establish an even number of digits (14) to meet the requirements of the data carrier.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, usually carried out automatically by the bar code reader, ensures that the number is correctly composed. The symbology identifier shows whether or not the check digit has been validated. If it has not, the check digit calculation must be programmed in the application software.

Data carrier: ITF-14 bar code symbol.

System considerations: The system recognises this element string by the symbology identifier]I1 and the number (14) of the decoded digits.

The data transmitted from the bar code reader means that a ***quantity of one*** with the EAN/UCC-13 or UCC-12 identification number of a fixed measure trade item has been captured.

This element string might not be supported at retail checkouts.

The format of this number for	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
processing in a 14-digit field	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}

5.2 EAN/UCC-14 Identification of a Trade Item - Fixed Measure

Definition: EAN/UCC-14 identification number (GTIN) of a fixed measure trade item.

This element string is based on the ***EAN/UCC-14 standard numbering structure*** (see Chapter 1, Section 2). It may be used only for the identification of trade items that contain two or more trade items ***with the same EAN•UCC identification number***.

	Format of the element string													
	EAN•UCC trade item identification number													
	Indicator	EAN•UCC identification of the contained trade items (without check digit)												Check digit
(EAN/UCC-8)	N_1	0	0	0	0	0	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}
(UCC-12)	N_1	0	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}
(EAN/UCC-13)	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}

Figure 3 - 16

The ***indicator*** is a digit of value ***1 to 8***. It is assigned as required by the company that constructs the identification number. It can provide up to 8 separate EAN/UCC-14 identification numbers to identify groupings of trade items.

The ***identification number of the trade items contained*** must always be the EAN/UCC-13, UCC-12 or EAN/UCC-8 identification number of the relevant level of packaging contained, usually the lowest level. ***Trade item identification numbers for restricted distribution must not be used in this element string.***

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, usually carried out automatically by the bar code reader, ensures that the number is correctly composed. The symbology identifier shows whether or not the check digit has been validated. If it has not, the check digit calculation must be programmed in the application software.

Data carrier: ITF-14 bar code symbol.

System considerations: The system recognises this element string by the symbology identifier]I1 and the number of digits decoded (14).

The data transmitted from the bar code reader means that a ***quantity of one*** with the EAN/UCC-14 identification number of a fixed measure trade item has been captured. It is important that the EAN/UCC-14 identification number is always processed in its entirety.

This element string might not be supported at retail checkouts.

The format of this number for	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
processing in a 14-digit field	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}

5.3 EAN/UCC-14 Identification of a Trade Item - Variable Measure

Definition: EAN•UCC identification number (GTIN) of a variable measure trade item.

The identification of a variable measure trade item is usually represented in element strings using application identifiers as described in Chapter 3, Sections 6.3 and 6.20 or 6.21.

The element string described in this section is an alternative that may be adequate in circumstances where an ITF-14 symbol must be used to represent the identification number of the trade item.

	Format of the element string													
	Identification number of the trade item													
	Indicator	EAN•UCC Company prefix →							← Item reference					Check digit
(UCC-12)	9	0	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}
(EAN/UCC-13)	9	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}

Figure 3 - 17

The ***digit 9*** in the ***indicator*** field indicates that the item identification number denotes a variable measure trade item.

The ***EAN•UCC company prefix*** and the ***item reference*** are applied as described in Chapter 3, Section 2.1. When the trade item contained is identified by an EAN/UCC-8 identification number and this product is sold in bulk, these two fields may be replaced by the EAN/UCC-8 identification number padded with 5 leading zeros without the check-digit.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, usually carried out automatically by the bar code reader, ensures that the number is correctly composed. The symbology identifier shows whether or not the check digit has been validated. If it has not, the check digit calculation must be programmed in the application software.

Data carrier: ITF-14 bar code symbol.

System considerations: The system recognises this element string by the symbology identifier]I1, the number of digits decoded (14) and the value 9 in the indicator field.

The data transmitted from the bar code reader means that the EAN/UCC-14 identification number of a variable measure trade item has been captured. To complete the item identification, the corresponding variable information (see Chapter 3, Sections 6.20 and 6.21) must be present at the same time.

This element string might not be supported at retail checkouts.

The format of this number for	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
processing in a 14-digit field	9	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}

6. UCC/EAN-128 SYMBOLOGY

This section describes the full strings beginning with symbology identifier]C1

The sub-sections for the element strings are in order of application identifier. When the ***full string*** is made up from concatenated element strings, each ***element string*** must be processed separately in association with the symbology identifier]C1 from the full string.

6.1 Identification of a Logistic Unit (AI 00)

Definition: Identification number (SSCC) of a logistic unit.

	Format of the element string			
		Serial shipping container code		
	Application identifier	Extension digit	EAN•UCC Company prefix → ← Item reference	Check digit
(EAN)	0 0	N_1	N_2 N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12} N_{13} N_{14} N_{15} N_{16} N_{17}	N_{18}
(UCC)	0 0	N_1	0 N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12} N_{13} N_{14} N_{15} N_{16} N_{17}	N_{18}

Figure 3 - 18

The ***application identifier 00*** indicates that the data field contains the serial shipping container code (SSCC).

The ***extension digit*** is used to increase the capacity of the SSCC. It is assigned by the company that constructs the SSCC.

The ***EAN•UCC company prefix*** is assigned to the system user (see Chapter 1, Section 2). It makes the number unique worldwide but does not identify the origin of the unit.

The ***item reference*** is a serial number which the company that has been assigned the company prefix chooses how to structure.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the identification number of a logistic unit has been captured.

6.2 Identification of a Trade Item - Fixed Measure (AI 01)

Definition: Identification number (GTIN) of a fixed measure trade item.

This element string is based on the ***UCC-12 or EAN/UCC-8 or EAN/UCC-13 or EAN/UCC-14 standard numbering structure*** (see Chapter 1, Section 3).

	Format of the element string														
	Application identifier	EAN•UCC trade item identification number													Check digit
(EAN/UCC-8)	0 1	0	0	0	0	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8
(UCC-12)	0 1	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}
(EAN/UCC-13)	0 1	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}
(EAN/UCC-14)	0 1	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}

Figure 3 - 19

The ***application identifier 01*** indicates that the data field contains the identification number of a trade item (GTIN).

The ***EAN•UCC trade item identification number*** contains the EAN/UCC-8, UCC-12 and EAN/UCC-13 identification numbers, which are the same as those described in Chapter 3, Sections 2.1 and 3.1 and the EAN/UCC-14 identification numbers, which are the same as those in Chapter 3, Section 5.1.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that a ***quantity of one*** with the identification number of a fixed measure trade item has been captured

The formats of these numbers for processing in a 14-digit field

T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
0	0	0	0	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8
0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}
0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}
N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}

6.3 Identification of a Trade Item - Variable Measure (AI 01)

Definition: Identification number (GTIN) of a variable measure trade item.

This element string is a special application of the ***EAN/UCC-14 standard numbering structure.***

	Format of the element string														
	Application identifier	Identification number of the trade item													
		Indicator	EAN•UCC Company prefix →								← Item reference				Check digit
(UCC-12)	0 1	9	0	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}
(EAN/UCC-13)	0 1	9	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}

Figure 3 - 20

The ***application identifier 01*** indicates that the data field contains a trade item identification number (GTIN).

The ***digit 9*** in field ***indicator*** indicates that the item identified is a variable measure trade item.

The ***EAN•UCC company prefix*** and the ***item reference*** are as described in Chapter 3, Section 2.1. When the trade item contained is identified by an EAN/UCC-8 identification number and this product is sold in bulk, these two fields may be replaced by the EAN/UCC-8 identification number padded with 5 leading zeros without the check-digit.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1, the application identifier and the digit 9 in the indicator field.

The data transmitted from the bar code reader means that the EAN/UCC-14 identification number of a variable measure trade item has been captured. To complete the item identification the variable information (see Chapter 3, Sections 6.20 and 6.21) must be present at the same time.

The format of this number for	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
processing in a 14-digit field	9	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}

6.4 Identification of Trade Items Contained in a Logistic Unit - Fixed Measure (AI 02)

Definition: Identification number (GTIN) of the fixed measure trade items contained in a logistic unit.

Note: This element string may be used only on a unit which is not itself a trade item and if all trade items that are contained at the same level have the same GTIN.

Format of the element string														
Application identifier	GTIN of the contained trade items													Check digit
0 2	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}

Figure 3 - 21

The ***application identifier 02*** indicates that the data field shows the identification number of the trade items contained.

The ***GTIN of the trade items contained*** represents the identification number of the highest level of trade item contained in the logistic unit.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the identification number of fixed measure trade items contained in a logistic unit has been captured. It must be processed together with element string AI 37 that must appear on the same unit (see Chapter 3, Section 6.24).

6.5 Identification of Trade Items Contained in a Logistic Unit - Variable Measure (AI 02)

Definition: Identification number (GTIN) of the variable measure trade items contained in a logistic unit.

Note: This element string may be used only on a unit which is not itself a trade item and if all trade items that are contained at the same level have the same GTIN. If the trade items are variable measure retail items then this GTIN will be the implied item number that does not appear on the items contained.

Format of the element string														
Application identifier	GTIN of the contained trade item													Check digit
0 2	9	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}

Figure 3 - 22

The ***application identifier 02*** indicates that the data field shows the identification number of the contained trade items.

The ***GTIN of the trade items contained*** represents the identification number of the highest level of items contained in the logistic unit.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the EAN/UCC-14 identification number of a variable measure trade item contained in a logistic unit has been captured. It must be processed with element string AI 37 and a valid trade measure that must appear on the same unit (see Chapter 3, Sections 6.20, 6.21 and 6.24).

6.6 Batch or Lot Number (AI 10)

Definition: Batch or lot number of a trade item.

Format of the element string	
Application identifier	Batch or lot number
1 0	X_1 ——— variable length ———→ X_{20}

Figure 3 - 23

The ***application identifier 10*** indicates that the data field contains a batch or lot number.

The ***batch or lot number*** gives whatever information the manufacturer (the party with responsibility for traceability of the trade item) considers relevant to the trade item to which the element string is applied. The data may refer to the trade item itself or to items contained. The number may be a production lot number, a shift number, a machine number, a time, an internal production code, etc. The data is alphanumeric and may include all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted by the bar code reader means that the element string " batch or lot number" has been captured. As it is an attribute of a particular item it should not be processed on its own, but together with the identification number of the trade item to which it relates.

Note: The batch or lot number is not part of the unambiguous identification of a trade item.

6.7 Production Date (AI 11)

Definition: Production date of a trade item.

Format of the element string			
Application identifier	Production date		
	Year	Month	Day
1 1	N_1 N_2	N_3 N_4	N_5 N_6

Figure 3 - 24

The ***application identifier 11*** indicates that the data fields contain a production date.

The ***production date*** is the production or assembly date determined by the manufacturer. The date may refer to the trade item itself or to items contained.

The structure is:

Year The tens and units of the year (e.g. 1997 = 97), which is mandatory.

Month The number of the month (e.g. January = 01), which is mandatory.

Day The number of the day of the relevant month (e.g. 2nd day = 02). If it is not necessary to specify the day, the field must be filled in with two zeros.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "production date" has been captured. As it is an attribute of a trade item it should not be processed on its own, but together with the identification number of the trade item to which it relates.

Note: This element string can only specify dates in the range from 49 years in the past to 50 years in the future. Determination of the correct century is explained in Chapter 3, Appendix 5.

6.8 Due Date (AI 12)

Definition: Due date for the payment of the amount indicated on a payment slip.

Format of the element string			
Application identifier	Due date		
	Year	Month	Day
1 2	N_1 N_2	N_3 N_4	N_5 N_6

Figure 3 - 25

The ***application identifier 12*** indicates that the data fields contain the date by which the invoice should be paid.

The structure is:

Year The tens and units of the year (e.g. 1998 = 98), which is mandatory

Month The number of the month (e.g. January = 01), which is mandatory

Day The number of the day of the relevant month (e.g. 2nd day = 02). If it is not necessary to specify the day, the field must be filled with two zeros.

Data Carrier: UCC/EAN-128 symbology.

Systems Considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the “due date” has been captured. Since this data element represents an attribute of a Payment Slip Reference Number and a EAN•UCC Global Location Number of the Invoicing Party it should not be processed on its own.

Note: This element string can only specify dates in the range from 49 years in the past to 50 years in the future. Determination of the correct century is explained in Chapter 3, Appendix 5.

6.9 Packaging Date (AI 13)

Definition: Packaging date of a trade item.

Format of the element string			
Application identifier	Packaging date		
	Year	Month	Day
1 3	N_1 N_2	N_3 N_4	N_5 N_6

Figure 3 - 26

The ***application identifier 13*** indicates that the data fields contain a packaging date.

The ***packaging date*** is the date when the goods were packed as determined by the packager. The date may refer to the trade item itself or to items contained.

The structure is:

Year The tens and units of the year (e.g. 1997 = 97), which is mandatory.

Month The number of the month (e.g. January = 01), which is mandatory.

Day The number of the day of the relevant month (e.g. 2nd day = 02). If it is not necessary to specify the day, the field must be filled in with two zeros.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "packaging date" has been captured. As it is an attribute of a trade item it should not be processed on its own, but together with the identification number of the trade item to which it relates.

Note: This element string can only specify dates in the range from 49 years in the past to 50 years in the future. Determination of the correct century is explained in Chapter 3, Appendix 5.

6.10 Minimum Durability Date (Quality) (AI 15)

Definition: Minimum durability date of a trade item.

Format of the element string			
Application identifier	Minimum durability date		
	Year	Month	Day
1 5	N_1 N_2	N_3 N_4	N_5 N_6

Figure 3 - 27

The ***application identifier 15*** indicates that the data fields contain a minimum durability date.

The ***minimum durability date*** indicates the ideal consumption or best effective use date of a product. It is a statement about ***quality***. It is often referred to as a "sell by date" or a "best before date".

The structure is:

Year The tens and units of the year (e.g. 1997 = 97), which is mandatory.

Month The number of the month (e.g. January = 01), which is mandatory.

Day The number of the day of the relevant month (e.g. 2nd day = 02). If it is not necessary to specify the day, the field must be filled in with two zeros.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "minimum durability date" has been captured. As it is an attribute of a trade item it should not be processed on its own, but together with the identification number of the trade item to which it relates.

Note: This element string can only specify dates in the range from 49 years in the past to 50 years in the future. Determination of the correct century is explained in Chapter 3, Appendix 5.

6.11 Maximum Durability Date (Safety) (AI 17)

Definition: Maximum durability date of a trade item.

Format of the element string			
Application identifier	Maximum durability date		
	Year	Month	Day
1 7	N_1 N_2	N_3 N_4	N_5 N_6

Figure 3 - 28

The ***application identifier 17*** indicates that the data fields contain a maximum durability date.

The ***maximum durability date*** is the date that determines the limit of consumption or use of a product. It is a statement about ***safety***. It is often referred to as "use by date" or "expiry date".

The structure is:

Year The tens and units of the year (e.g. 1997 = 97), which is mandatory.

Month The number of the month (e.g. January = 01), which is mandatory.

Day The number of the day of the relevant month (e.g. 2nd day = 02). If it is not necessary to specify the day, the field must be filled in with two zeros.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "maximum durability date" has been captured. Since the element string represents an attribute of a trade item it should not be processed on its own, but together with the identification number of the trade item to which it relates.

Note: This element string can only specify dates in the range from 49 years in the past to 50 years in the future. Determination of the correct century is explained in Chapter 3, Appendix 5.

6.12 Product Variant (AI 20)

Definition: Product variant of a trade item, for use within a company.

This element string is used to distinguish a variant from the standard item if the variation is not sufficiently significant to require a separate EAN•UCC identification number and if the difference is relevant only to the manufacturer.

The product variant is only for use by the ***manufacturer***, and not for the identification of an item in dealings with business partners, for which the EAN•UCC identification number is the only applicable standard. Although the element string will not have meaning outside the company, the element string may remain on the item throughout distribution.

Format of the element string	
Application identifier	Variant number
2 0	N_1 N_2

Figure 3 - 29

The ***application identifier 20*** indicates that the data field contains a variant number.

The ***variant number*** is assigned by the user of the element string. It forms a subsidiary numbering facility that can be used in addition to the item identification number and allows the creation of 100 variants of a particular item.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "product variant" has been captured. The product variant must always be decoded and processed together with the GTIN from the same item. Outside of the applying company it is decoded and ignored.

6.13 Serial Number (AI 21)

Definition: Serial number of a trade item.

Format of the element string	
Application identifier	Serial number
2 1	X_1 ——— variable length ———→ X_{20}

Figure 3 - 30

The ***application identifier 21*** indicates that the data field contains a serial number.

The ***serial number*** is assigned to an entity for its lifetime. Combined with a trade item identification number (GTIN) the serial number uniquely identifies each individual item. The serial number field is alphanumeric and may include all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3. The manufacturer determines the serial number.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "serial number" has been captured. The element string represents an attribute of a trade item and, therefore, it should not be processed on its own, but together with the identification number of the trade item to which it relates.

6.14 Secondary Data for Specific Health Industry Products (AI 22)

Definition: Secondary data (quantity, expiration date, and lot number) for specific health industry products.

Format of the element string	
Application identifier	Secondary data fields
2 2	X_1 ——— variable length ———→ X_{29}

Figure 3 - 31

The ***application identifier 22*** indicates that the data field contains the secondary data for specific health industry products.

The ***secondary data fields*** are described in Chapter 7, Section 8.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

Note: This element string was developed to accommodate an existing, non EAN/UCC, standard used with specific healthcare products. It not recommended for new applications or other industries. The use of the element strings "maximum durability date" and "lot number" are recommended instead.

6.15 Lot Number (transitional use) (AI 23n)

Definition: Lot number of a trade item.

This element string has been released for use in some applications where there was a need to concatenate several variable length element strings into one bar code symbol and where the FNC1 as separator character was not available. Currently it is used by the American meat industry instead of the element string with AI 10 (see Chapter 3, Section 6.6). It is considered a temporary system component that will be discontinued at some time in the future.

Format of the element string	
Application identifier	Lot number
2 3 n	N_1 ——— variable length ———→ N_{19}

Figure 3 - 32

The ***application identifier 23n*** indicates that the data field contains a lot number. The digit ***n*** indicates the length of the data field according to the following formula:

Number of digits in the lot number = 2n + 1

Example: Representation of the lot number 1234567 = 233 1234567.

It is used to determine the length of the element string when applied in concatenated form.

The ***lot number*** field has a variable length and always contains an odd number of digits. If the lot number originally had an even number of digits a leading zero should be added to the lot number.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "lot number" has been captured. Since the element string represents an attribute of a particular item it should not be processed on its own, but together with the identification number of the trade item to which it relates.

6.16 Additional Product Identification Assigned by the Manufacturer (AI 240)

Definition: Additional identification number of a trade item, assigned by the manufacturer.

The purpose of this element string is to enable identification data other than the EAN•UCC item identification number to be represented in an EAN•UCC data carrier. It is a ***cross-reference*** to previously used catalogue numbers. The additional item identification is considered as an attribute of the EAN•UCC item identification number (GTIN) e.g. to facilitate migration to the EAN•UCC system during a transitional period. However, it must not be used to replace the EAN•UCC item identification number.

Format of the element string	
Application identifier	Additional item identification
2 4 0	X_1 ——— variable length ———→ X_{30}

Figure 3 - 33

The ***application identifier 240*** indicates that the data field contains additional item identification.

The ***additional item identification*** field is alphanumeric and may include all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3. Its content and structure are at the discretion of the company applying the element string.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "additional item identification" has been captured.

6.17 Customer Part Number (AI 241)

Definition: Customer part number.

The purpose of this element string is to enable identification data other than the EAN•UCC item identification number to be represented in an EAN•UCC data carrier. It is only to be used between trading partners that are currently using the customer part number for ordering and have agreed to a timetable to convert to the EAN•UCC item identification number for their business purposes. The use of the EAN•UCC identification number and the AI 241 on the items is for transitional use while the conversion is taking place. The customer part number must not be used to replace the EAN•UCC item identification number (GTIN).

Format of the element string	
Application identifier	Customer part number
2 4 1	X_1 ——— variable length ———→ X_{30}

Figure 3 - 34

The ***application identifier 241*** indicates that the data field contains the customer part number.

The ***customer part number*** field is alphanumeric and may include all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "customer part number" has been captured.

6.18 Secondary Serial Number (AI 250)

Definition: Secondary serial number of a component of a trade item.

While the serial number using AI 21 (see Chapter 3, Section 6.13) contains the serial number of the trade item, the element string "secondary serial number" is destined for the representation of the serial number of one of the components of that item. It is left to the company applying the element string to determine to which component it refers for a given trade item. The recognition of the meaning of the secondary serial number is accomplished via the item identification number and via information independently provided by the issuer as to what component the secondary serial number refers in each instance.

If this element string is being used a trade item must be symbol marked with the following element strings:

AI 01 representing the identification number (GTIN) of the trade item
AI 21 representing the serial number of the trade item
AI 250 representing the serial number of a component of the trade item.

It should be noted that only ***one*** element string with AI 250 may be associated with a particular item identification number.

Format of the element string	
Application identifier	Secondary serial number
2 5 0	X_1 ——— variable length ———→ X_{30}

Figure 3 - 35

The ***application identifier 250*** indicates that the data field contains a secondary serial number.

The ***secondary serial number*** field is alphanumeric and may include all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3. The number and to what component it relates is determined by the issuer.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "secondary serial number" has been captured.

6.19 Reference to Source Entity (AI 251)

Definition: Reference to Source Entity

Reference to Source Entity is an attribute of a trade item, used to refer back to the original item the trade item was derived from. The issuer of the trade item must indicate through other means the source entity to which the data refers.

For example, the original item could be an animal from which a carcass of beef is derived. This element string would enable reference to the original animal, so that should it be found to be contaminated, all derived products could be isolated. In addition it could also be used for regulatory compliance when recycling parts from various white goods, such as refrigerators, where it is necessary to refer to the original appliance.

Format of the element string	
Application identifier	Reference to Source Entity
2 5 1	X_1 ——— variable length ———→ X_{30}

Figure 3 - 36

The ***application identifier digits 251*** indicate that the data field consists of a reference to the original item.

The ***reference to the source entity*** field is alphanumeric and may include all characters contained in Table 1 of the International Standards IOS/IEC 646, shown in Chapter 3, Appendix 3.

Data Carrier: UCC/EAN-128 Symbology

System considerations: The system recognises this element string by symbology identifier]C1 and the application identifier.

The data transmitted by the bar code reader means that the element string “reference to source entity” has been captured. Since this element string represents an attribute of an GTIN it should not be processed on its own.

6.20 Variable Count (AI 30)

Definition: Count of items contained in a variable measure trade item.

This element string is used to complete the identification of a variable measure trade item. It contains the number of items contained in such a unit and, therefore, should never be applied in isolation.

Format of the element string	
Application identifier	Count of items
3 0	N_1 —— variable length ——→ N_8

Figure 3 - 37

The ***application identifier 30*** indicates that the data field contains the number of items contained in a variable measure trade item.

The field ***count of items*** represents the quantity contained in the respective trade item. It is of variable length and may have up to 8 digits.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the quantity (count of items) which can be considered part of the identification of a variable measure trade item has been captured. It must be processed with the identification number of the trade item to which it relates.

Note: This element string must ***not*** be used to indicate the contained quantity of a ***fixed*** measure trade item. However, if this element string appears on a fixed measure trade item (in error) it should not invalidate the item identification but should be treated as redundant data.

6.21 Trade Measures (AI 31nn, 32nn, 35nn, 36nn)

Definition: Trade measures of variable measure trade items.

This element string is used to complete the identification of a variable measure trade item. It contains information on weight, size, volume, dimensions, etc. of such unit and, therefore, should never be applied alone. Several element strings are possible if the variables required are dimensions or weights expressed in kg and pounds.

Format of the element string	
Application identifier	Applicable value
A_1 A_2 A_3 A_4	N_1 N_2 N_3 N_4 N_5 N_6

Figure 3 - 38

The ***application identifier digits A_1 to A_3*** (see Figure 3 - 39) indicate that the data field contains the quantity or dimension of a variable measure trade item. It also denotes the unit of measure.

The ***application identifier digit A_4*** indicates the implied decimal point position, where the digit 0 means that there is no decimal point and the digit 1 means that the decimal point is between N_5 and N_6, etc.

The ***application identifiers*** used with this element string are the following:

A_1	A_2	A_3	Definition of Trade Measures	Unit of Measure
3	1	0	Net weight	Kilograms
3	1	1	Length or first dimension	Metres
3	1	2	Width, diameter or second dimension	Metres
3	1	3	Depth, thickness, height or third dimension	Metres
3	1	4	Area	Square Metres
3	1	5	Net volume	Litres
3	1	6	Net volume	Cubic Metres
3	2	0	Net weight	Pounds
3	2	1	Length or first dimension	Inches
3	2	2	Length or first dimension	Feet
3	2	3	Length or first dimension	Yards
3	2	4	Width, diameter or second dimension	Inches
3	2	5	Width, diameter or second dimension	Feet
3	2	6	Width, diameter or second dimension	Yards
3	2	7	Depth, thickness, height or third dimension	Inches
3	2	8	Depth, thickness, height or third dimension	Feet
3	2	9	Depth, thickness, height or third dimension	Yards
3	5	0	Area	Square Inches
3	5	1	Area	Square Feet
3	5	2	Area	Square Yards
3	5	6	Net weight	Troy Ounces
3	5	7	Net weight	Ounces
3	6	0	Net volume	Quarts
3	6	1	Net volume	Gallons (U.S.)
3	6	4	Net volume	Cubic Inches
3	6	5	Net volume	Cubic Feet
3	6	6	Net volume	Cubic Yards

Figure 3 - 39

The field ***applicable value*** contains the variable measure that applies to the respective trade item.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the quantity, which can be considered part of the identification of a variable measure trade item, has been captured. It must be processed with the identification number of the trade item to which it relates.

Note: Other values of AI 3nnn specify gross measures and logistic measures.

6.22 Logistic Measures (AI 33nn, 34nn, 35nn, 36nn)

Definition: Logistic measures.

Note: The EAN•UCC system provides standards for logistic weights and measures in metric and other units of measure. In principle a particular logistic measure should be applied in only one unit of measure on a given logistic unit. However, application of the same attribute in several units of measure does not impede the correct processing of the transmitted data.

Format of the element string	
Application identifier	Applicable value
A_1 A_2 A_3 A_4	N_1 N_2 N_3 N_4 N_5 N_6

Figure 3 - 40

The ***application identifier digits A_1 to A_3*** (see Figure 3 - 41) indicate that the data field contains the logistic quantity or dimension of a logistic unit or a variable measure trade item. It also denotes the unit of measure.

The ***application identifier digit A_4*** indicates the implied decimal point position, where the digit 0 means that there is no decimal point and the digit 1 means that the decimal point is between N_5 and N_6, etc.

The ***application identifiers*** used with this element string are the following:

A_1	A_2	A_3	Definition of Logistic Measures	Unit of Measure
3	3	0	Logistic weight	Kilograms
3	3	1	Length or first dimension	Metres
3	3	2	Width, diameter or second dimension	Metres
3	3	3	Depth, thickness, height or third dimension	Metres
3	3	4	Area	Square Metres
3	3	5	Logistic volume	Litres
3	3	6	Logistic volume	Cubic Metres
3	4	0	Logistic weight	Pounds
3	4	1	Length or first dimension	Inches
3	4	2	Length or first dimension	Feet
3	4	3	Length or first dimension	Yards
3	4	4	Width, diameter or second dimension	Inches
3	4	5	Width, diameter or second dimension	Feet
3	4	6	Width, diameter or second dimension	Yards
3	4	7	Depth, thickness, height or third dimension	Inches
3	4	8	Depth, thickness, height or third dimension	Feet
3	4	9	Depth, thickness, height or third dimension	Yards
3	5	3	Area	Square Inches
3	5	4	Area	Square Feet
3	5	5	Area	Square Yards
3	6	2	Logistic volume	Quarts
3	6	3	Logistic volume	Gallons (U.S.)
3	6	7	Logistic volume	Cubic Inches
3	6	8	Logistic volume	Cubic Feet
3	6	9	Logistic volume	Cubic Yards

Figure 3 - 40

The field ***applicable value*** represents the measures of the respective unit.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that a logistic measure has been captured. It must be processed with the identification number (SSCC or GTIN) appearing on the same unit.

6.23 Kilograms per Square Metre (AI 337n)

Definition: Kilograms per square metre of a trade item.

This element string is used to indicate the exact weight per square metre of a particular trade item.

Format of the element string	
Application identifier	Kilograms per square metre
3 3 7 n	N_1 N_2 N_3 N_4 N_5 N_6

Figure 3 - 41

The ***application identifier digits 337*** indicate that the data field contains the kilograms per square metre.

The ***application identifier digit shown as n*** indicates the implied decimal point position, whereof the digit 0 means that there is no decimal point and the digit 1 means that the decimal point is between N_5 and N_6, etc.

The field ***kilograms per square metre*** contains the weight per area of the respective trade item. The unit of measure is kilograms.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "kilograms per square metre" has been captured. Since the element string represents an attribute of a trade item it should not be processed on its own, but together with the identification number of the trade item to which it relates.

6.24 Count of Trade Items Contained in a Logistic Unit (AI 37)

Definition: Count of trade items contained in a logistic unit.

This element string is a mandatory completion of the identification described in Chapter 3, Sections 6.4 and 6.5.

Format of the element string	
Application identifier	Count of trade items
3 7	N_1 ——— variable length ——→ N_8

Figure 3 - 42

The ***application identifier 37*** indicates that the data field contains the number of trade items contained in a logistic unit.

The field ***count of trade items*** contains the number of trade items contained in the respective logistic unit. This information refers to the identification number of the contained trade items.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the number of trade items contained in a logistic unit has been captured. It must be processed with the identification number represented in AI 02 (see Chapter 3, Section 6.4 and 6.5) appearing on the same logistic unit.

6.25 Amount Payable - Single Monetary Area (AI 390n)

Definition: Amount Payable of a payment slip expressed in the local currency.

NOTE: To aid unambiguous processing it is recommended to use AI 391n, described in Chapter 3, Section 6.25, which indicates the currency in which the amount is expressed.

Format of the element string	
Application identifier	Applicable amount payable
3 9 0 **n**	N_1 ——— variable length ⟶ N_{15}

Figure 3 - 43

The ***application identifier digits 390*** indicate that the data field contains the amount payable of a payment slip.

The ***application identifier digit shown as n*** indicates the implied decimal point position, where the digit 0 means that there is no decimal point and the digit 1 means that the decimal point is before the last position of the amount payable. See examples in Figure 3 - 45.

The ***applicable amount payable*** contains the sum to be paid with the respective payment slip.

Data carrier: UCC/EAN-128 symbology.

Systems Considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data string transmitted from the bar code reader means that the “amount payable of a payment slip” has been captured. Since this element string represents an attribute of a Payment Slip Reference Number and a EAN•UCC Global Location Number of the Invoicing Party it should not be processed on its own.

Example of decimal point indication:

Application identifier	Encoded value	Actual value
3 9 0 **2**	1 2 3 4 5 6 7	1 2 3 4 5 . 6 7
3 9 0 **1**	1 2 3 4 5 6 7	1 2 3 4 5 6 . 7 0
3 9 0 **0**	1 2 3 4 5	1 2 3 4 5 . 0 0

Figure 3 - 44

6.26 Amount Payable - with ISO Currency Code (AI 391n)

Definition: Amount Payable of a payment slip expressed in the indicated currency.

Format of the element string		
Application identifier	ISO currency code	Applicable amount payable
3 9 1 **n**	N_1 N_2 N_3	N_4 —— variable length ⟶ N_{18}

Figure 3 - 45

The ***application identifier digits 391*** indicate that the data fields consist of an ISO currency code and an applicable amount payable.

The ***application identifier digit shown as n*** indicates the implied decimal point position in the field "applicable amount payable", where the digit 0 means that there is no decimal point and the digit 1 means that the decimal point is before the last position of the amount payable. See examples in Figure 3 - 46.

The field ***ISO country code*** contains the three-digit currency number of the numerical international standard ISO 4217 (data readily available on the Internet) indicates the currency in which the amount payable is expressed.

The ***applicable amount payable*** contains the sum to be paid with the respective payment slip.

Data carrier: UCC/EAN-128 symbology.

Systems Considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data string transmitted from the bar code reader means that the “amount payable” has been captured. Since this element string represents an attribute of a Payment Slip Reference Number and a EAN•UCC Global Location Number of the Invoicing Party it should not be processed on its own.

Example of decimal point indication:

Application identifier	ISO currency code	Encoded value	Actual value
3 9 1 **2**	7 1 0 [1])	1 2 3 0	1 2 . 3 0
3 9 1 **1**	7 1 0 [1])	1 2 3 0	1 2 3 . 0 0
3 9 1 **0**	0 4 0 [2])	1 2 3	1 2 3 . 0 0

Figure 3 - 46

[1]) **South African Rand**
[2]) **Austrian Shillings**

6.27 Amount Payable – Single Monetary Area (AI 392n)

Definition: Amount Payable – Single Monetary Area

The amount payable – single monetary area refers to an item identified by a variable measure GTIN expressed in local currency. This AI is an attribute of the variable measure GTIN and is always used in conjunction with it.

Format of the element string	
Application identifier	Applicable amount payable
3 9 2 **n**	N_1 ——— variable length ⟶ N_{15}

Figure 3 - 47

The ***application identifier digits*** indicate that the data field contains the amount payable for a variable measure item.

The ***application identifier digits shown as n*** indicate the implied decimal point position, where the digit 0 means that there is no decimal point and the digit 1 means that the decimal point is before the last position of the amount payable.

The ***applicable amount payable*** contains the sum to be paid for the variable measure item.

Data Carrier: UCC/EAN-128 Symbology

*(**Note:** RSS and/or Composite symbols may be specified in the future)*

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted by the bar code means that the element string “amount payable of a variable measure consumer GTIN” has been captured. Since this element string represents an attribute of a GTIN is should not be processed on its own.

Example of decimal point indication:

Application identifier	Encoded value	Actual value
3 9 2 **2**	1 2 3 4 5 6 7	1 2 3 4 5 . 6 7
3 9 2**1**	1 2 3 4 5 6 7	1 2 3 4 5 6 . 7 0
3 9 2**0**	1 2 3 4 5	1 2 3 4 5 . 0 0

Figure 3 - 48

6.28 Amount Payable – with ISO Currency Code (AI 393n)

Definition: Amount Payable –with ISO Currency Code

The amount payable – with ISO currency code refers to an item identified with a variable measure GTIN expressed in the indicated currency. This AI is an attribute of the variable measure GTIN and is always expressed in conjunction with it.

Format of the element string		
Application identifier	ISO currency code	Applicable amount payable
3 9 3 **n**	N_1 N_2 N_3	N_4 ——— variable length ⟶ N_{18}

Figure 3 - 50

The ***application identifier digits 393*** indicate that the data field consists of an ISO currency code and an applicable amount payable.

The ***application identifier digits shown as n*** indicate the implied decimal point in the field "applicable amount payable", where the digit 0 means that there is no decimal point and the digit 1 means that the decimal point is before the last position of the amount payable.

The field ***ISO Currency Code*** contains the three-digit currency number of the numerical International Standards ISO/IEC 4217 (data readily available on the Internet) indicate the currency in which the amount payable is expressed.

The ***applicable amount payable*** contains the sum to be paid for the variable measure item.

Data Carrier: UCC/EAN-128 Symbology

*(**Note:** RSS and/or Composite symbols may be specified in the future)*

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted by the bar code reader means that the element string "amount payable of a variable measure consumer GTIN" has been captured. Since this element string represents an attribute of a GTIN it should not be processed on its own.

Example of decimal point indication:

Application identifier	ISO currency code	Encoded value	Actual value
3 9 3 **2**	7 1 0 [1])	1 2 3 0	1 2 . 3 0
3 9 3 **1**	7 1 0 [1])	1 2 3 0	1 2 3 . 0 0
3 9 3 **0**	0 4 0 [2])	1 2 3	1 2 3 . 0 0

Figure 3 - 51

[1]) **South African Rand**
[2]) **Austrian Shillings**

6.29 Customer's Purchase Order Number (AI 400)

Definition: Customer's purchase order number restricted for use between two trading partners.

Format of the element string	
Application identifier	Customer's purchase order number
4 0 0	X_1 ⟵ variable length ⟶ X_{30}

Figure 3 - 52

The ***application identifier 400*** indicates that the data field contains the customer's purchase order number.

The field ***customer's purchase order number*** is alphanumeric and may include all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3. It contains the number of the purchase order assigned by the company that issued the order. The composition and content of the order number is left to the discretion of the customer. For example, the purchase order number may include release and line numbers.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted by the bar code reader means that the element string "customer's purchase order number" has been captured. It may be processed as a stand-alone information where applicable or with the identification data of the same unit.

Warning: This element string must be removed from the unit before the unit leaves the premises of the customer.

6.30 Consignment Number (AI 401)

Definition: Consignment number.

The consignment number identifies a logical grouping of goods (one or more physical entities) that has been consigned to a freight forwarder and is intended to be transported as a whole. The consignment number must be allocated by a freight forwarder; or carriers acting as a freight forwarder; or a consignor, but only if the prior agreement of the freight forwarder is given. Typically the AI 401 encodes a House Way Bill (HWB) number.

Freight Forwarder (as per Multi Industry Scenario for Transport – MIST): party arranging the carriage of goods including connected services and /or associated formalities on behalf of a shipper or consignee.

Carrier (as per MIST): party undertaking transport goods from one point to another.

Consignor (as per MIST): In transport, this is the party such as mentioned in the transport document, by which the goods are sent with a carrier.

Format of the element string					
Application identifier	Consignment number				
	EAN•UCC company prefix →		Consignment information →		
4 0 1	N_1 ...	N_i	X_{i+1} ...	variable length	$X_{j\ (j<=30)}$

Figure 3 - 53

The ***application identifier 401*** indicates that the data field contains a consignment number.

The ***consignment number*** is composed of the EAN•UCC company prefix of the carrier and the actual consignment information. The structure of the consignment information following the company prefix is left to the discretion of the user of the element string. It may contain all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted by the bar code reader means that the element string "consignment number" has been captured. It may be processed as a stand-alone information where applicable or with other identification data appearing on the same unit.

Note: If a new consignment is created, previous consignment element strings must be removed from the physical units.

6.31 Shipment Identification Number (AI 402)

Definition: Shipment identification number.

The shipment identification number is a number assigned by a consignor. It provides a globally unique number that identifies a logical grouping of physical units for the purpose of a transport shipment. It may be used by all parties in the transport chain as a communication reference, in say EDI messages, as a shipment reference and/or a consignors loading list (called a bill of lading in some countries)..

Format of the element string		
Application identifier	Shipment identification number	
	EAN•UCC Company prefix → ← Shipper reference	Check digit
4 0 2	N_1 N_2 N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12} N_{13} N_{14} N_{15} N_{16}	N_{17}

Figure 3 - 54

The ***application identifier 402*** indicates that the data field contains a shipment identification number.

The ***EAN•UCC company prefix*** is the company prefix of the shipper (see Chapter 1, Section 2)

The ***shipper reference*** is assigned by the shipper.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted by the bar code reader means that the element string "shipment identification number" has been captured. It may be processed as a stand-alone information where applicable or with other identification data appearing on the same unit.

Note: It is recommended to allocate numbers sequentially.

6.32 Routing Code (AI 403)

Definition: Routing Code.

The routing code is assigned by the parcel carrier and is an attribute to the Serial Shipping Container Code (SSCC). It is intended to provide a migration path to the adoption of a, yet to be defined, international, multi-modal solution. The Routing Code must not be used to encode information for which other element strings have been created (such as a "Ship to" Postal Code).

Format of the element string	
Application identifier	Routing code
4 0 3	X_1 ——— variable length ———→ X_{30}

Figure 3 - 55

The ***application identifier 403*** indicates that the data field contains a routing code

The ***routing code*** field is alphanumeric and may include all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3. Its content and structure are at the discretion of the parcel carrier issuing the code. If Parcel Carriers wish to enter co-operative agreements with other Parcel Carriers, then a mutually agreed indicator is required to indicate the structure of the Routing Code.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "routing code" has been captured. It must be processed with the Serial Shipping Container Code appearing on the same unit.

6.33 "Ship to - Deliver to" EAN•UCC Global Location Number (AI 410)

Definition: EAN•UCC Global Location Number (GLN) of the recipient of a logistic unit.

This element string is based on the ***EAN/UCC-13 standard numbering structure*** (see Chapter 1, Section 3).

Format of the element string													
Application identifier	EAN•UCC company prefix →						← Location reference						Check digit
4 1 0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}

Figure 3 - 56

The ***application identifier 410*** indicates that the data field contains the EAN•UCC Global Location Number of the consignee.

The ***EAN•UCC company prefix*** is the company prefix of the addressee (see Chapter 1, Section 2). It is a component of the EAN/UCC-13 numbering structure to make the number unique worldwide.

The ***location reference*** is assigned by the addressee's company.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the location number of the consignee of a physical item has been captured. It may be processed independently or together with related identifications.

6.34 "Bill to - Invoice to" EAN•UCC Global Location Number (AI 411)

Definition: EAN•UCC Global Location Number (GLN) of the addressee of an invoice.

This element string is based on the ***EAN/UCC-13 standard numbering structure*** (see Chapter 1, Section 3).

Format of the element string													
Application identifier	EAN•UCC company prefix →						← Location reference						Check digit
4 1 1	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}

Figure 3 - 57

The ***application identifier 411*** indicates that the data field contains the EAN•UCC Global Location Number of the addressee of an invoice.

The ***EAN•UCC company prefix*** is the company prefix of the addressee (see Chapter 1, Section 2). It is a component of the EAN/UCC-13 numbering structure to make the number unique worldwide.

The ***location reference*** is assigned by the addressee's company.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the location number of the addressee of an invoice has been captured.

6.35 "Purchased from" EAN•UCC Global Location Number (AI 412)

Definition: EAN•UCC Global Location Number (GLN) of the supplier of the respective trade item.

This element string is based on the ***EAN/UCC-13 standard numbering structure*** (see Chapter 1, Section 3).

Format of the element string													
Application identifier	EAN•UCC company prefix →						← Location reference						Check digit
4 1 2	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}

Figure 3 - 58

The ***application identifier 412*** indicates that the data field contains the EAN•UCC Global Location Number of the company the respective trade item had been purchased from.

The ***EAN•UCC company prefix*** is the company prefix of the supplier (see Chapter 1, Section 2). It is a component of the EAN/UCC-13 numbering structure to make the number unique worldwide.

The ***location reference*** is assigned by the company supplying the trade item.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the location number of the company that supplied the trade item has been captured. It may be processed independently or together with related identifications.

6.36 "Ship for - Deliver for - Forward to" EAN•UCC Global Location Number (AI 413)

Definition: EAN•UCC Global Location Number (GLN) which is used by the consignee for determining the internal or subsequent final destination of a physical unit.

This element string is based on the ***EAN/UCC-13 standard numbering structure*** (see Chapter 1, Section 3).

Format of the element string													
Application identifier	EAN•UCC company prefix →						← Location reference						Check digit
4 1 3	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}

Figure 3 - 59

The ***application identifier 413*** indicates that the data field contains the EAN•UCC Global Location Number of the internal or subsequent final destination.

The ***EAN•UCC company prefix*** is the company prefix of the final recipient (see Chapter 1, Section 2). It is a component of the EAN/UCC-13 numbering structure to make the number unique worldwide.

The ***location reference*** is assigned by the final recipient's company.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the location number of the final recipient of a physical item has been captured. It may be processed independently or together with related identifications.

Note: This element string is for the internal use of the consignee and is not to be used by the carrier.

6.37 Identification of a Physical Location, EAN•UCC Global Location Number (AI 414)

Definition: EAN•UCC Global Location Number (GLN) applied on a physical location for its identification.

This element string is based on the ***EAN/UCC-13 standard numbering*** structure (see Chapter 1, Section 3).

Format of the element string													
Application identifier	EAN•UCC company prefix →						← Location reference						Check digit
4 1 4	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}

Figure 3 - 60

The ***application identifier 414*** indicates that the data field contains the EAN•UCC Global Location Number of a physical location.

The ***EAN•UCC company prefix*** is the prefix of the holder of the location (see Chapter 1, Section 2). It is a component of the EAN/UCC-13 numbering structure to make the number unique worldwide.

The ***location reference*** is assigned by the owner or user of the physical location.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the location number of a physical location has been captured from the location itself. It may be processed according to the particular application requirements.

6.38 EAN•UCC Global Location Number of the Invoicing Party (AI 415)

Definition: EAN•UCC Global Location Number (GLN) of the invoicing party to be used on a payment slip.

This element string is based on the ***EAN/UCC-13 standard numbering structure*** (see Chapter 1, Section 3).

Note: This element string is a mandatory information for use on a payment slip. Together with the Payment Slip Reference Number it identifies a payment slip uniquely.

Format of the element string													
Application identifier	EAN•UCC company prefix →						← Location reference						Check digit
4 1 5	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}

Figure 3 – 60

The ***application identifier 415*** indicates that the data field contains the EAN•UCC Global Location Number of the invoicing party.

The ***EAN•UCC company prefix*** is the company prefix of the invoicing party (see Chapter 1, Section 2). It is a component of the EAN/UCC-13 numbering structure to make the number unique worldwide.

The ***location reference*** is assigned by the invoicing party.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data Carrier: UCC/EAN-128 symbology.

Systems Considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string EAN•UCC Global Location Number of the Invoicing Party has been captured. It must be processed together with the Payment Slip Reference Number on the same payment slip.

6.39 "Ship to - Deliver to" Postal Code Within a Single Postal Authority (AI 420)

Definition: National postal code of the addressee with restricted geographic distribution.

Format of the element string	
Application identifier	Postal code
4 2 0	X_1 — variable length → X_{20}

Figure 3 - 61

The ***application identifier 420*** indicates that the data field contains the postal code of the addressee, national format.

The field ***postal code*** contains the postal code of the addressee as defined by the appropriate Postal Authority. It is entered left justified and must not contain any filling characters.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the national version of a postal code of the addressee of the consignment has been captured. It is normally processed independently.

6.40 "Ship to - Deliver to" Postal Code With 3 Digit ISO Country Code (AI 421)

Definition: ISO country number and national postal code of the addressee.

Format of the element string		
Application identifier	ISO country code	Postal code
4 2 1	N_1 N_2 N_3	X_4 — variable length ⟶ X_{12}

Figure 3 - 62

The ***application identifier 421*** indicates that the data fields contain the postal code of the addressee, international format.

The field ***ISO country code*** contains the three-digit country number of the numerical international standard ISO 3166 (data readily available on the Internet) that relates to the following national postal code.

The field ***national postal code*** contains the postal code of the addressee as defined by the appropriate Postal Authority. It is entered left justified and must not contain any filling characters.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the international version of a postal code of the addressee of the consignment has been captured. It is normally processed independently.

6.41 Country of Origin of a Trade Item (AI 422)

Definition: ISO country code stating the country of origin of a trade item.

Format of the element string	
Application identifier	ISO country code
4 2 2	N_1 N_2 N_3

Figure 3 - 63

The ***application identifier 422*** indicates that the data field contains the ISO country code of the country of origin of the trade item.

The field ***ISO country code*** contains the three-digit country number of the numerical international standard ISO 3166 (data readily available on the Internet) that is the country of origin.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the ISO country code denoting the country of origin of the respective trade item has been captured.

Note: The country of origin is normally the country in which the trade item has been produced or manufactured. However, due to a wide range of definitions for Country of Origin laid down for different purposes, it is the manufacturer's responsibility that the correct country of origin is assigned.

6.42 Roll Products - Width, Length, Core Diameter, Direction, Splices (AI 8001)

Owing to the methods of production some roll products cannot be numbered according to standard criteria which have been determined in advance. They are therefore classified as variable items in the

EAN•UCC system. For those products where the standard trade measures are not sufficient the following is offered to achieve the desired result.

In such cases the identification of a roll product consists of the identification number (GTIN) and the variables. The basic product (e.g. a certain type of paper) is numbered with the EAN/UCC-14 numbering structure (see Chapter 3, Section 6.3) and the variables contain information about the special features of the particular item that has been produced.

Definition: Trade measures and other values of a roll product trade item.

Format of the element string					
Application identifier	Variable values of a roll product (see description below)				
8 0 0 1	N_1 N_2 N_3 N_4	N_5 N_6 N_7 N_8 N_9	N_{10} N_{11} N_{12}	N_{13}	N_{14}

Figure 3 - 64

The ***application identifier 8001*** indicates that the data fields contain the variable values of a roll product.

The ***variable values of a roll product N_1 to N_{14}*** consist of the following data:

N_1 to N_4 Slit width in millimetres (width of the roll)

N_5 to N_9 Actual length in metres

N_{10} to N_{12} Internal core diameter in millimetres

N_{13} Winding direction (face out 0, face in 1, undefined 9)

N_{14} Number of splices (0 to 8 = actual number, 9 = number unknown)

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the variables being part of the identification of a roll product trade item has been captured. It may be processed together with the simultaneously required identification number (see Chapter 3, Section 6.3) of that trade item.

6.43 Cellular Mobile Telephone Identifier (AI 8002)

Definition: Electronic serial identifier for cellular mobile telephones (CMTI) with restricted geographical distribution.

Format of the element string	
Application identifier	Serial number
8 0 0 2	X_1 ——— variable ——→ X_{20}

Figure 3 - 65

The ***application identifier 8002*** indicates that the data field contains the serial number of a cellular mobile telephone.

The field ***serial number*** is alphanumeric and may contain all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3. A national or pluri-national authority usually assigns the number. It identifies each mobile telephone uniquely ***within the given authority*** for special control purposes. It is not considered as an attribute of the identification of the telephone as a trade item.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "electronic serial identifier of CMT" has been captured. It may be processed according to the particular application requirements.

6.44 Global Returnable Asset Identifier (AI 8003)

Definition: EAN•UCC identification number of a returnable asset (GRAI) as a physical item with no reference to the contents.

The asset identification number is based on the ***EAN/UCC-13 or UCC-12 standard numbering structure*** (see Chapter 1, Section 3*)*.

	Format of the element string			
	Application identifier	Asset identification number		Serial number (optional)
		EAN•UCC Company prefix type → ← Asset	Check digit	
(UCC-12)	8 0 0 3	0 0 N_1 N_2 N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11}	N_{12}	X_1 — variable → X_{16}
(EAN/UCC-13)	8 0 0 3	0 N_1 N_2 N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12}	N_{13}	X_1 — variable → X_{16}

Figure 3 - 66

The ***application identifier 8003*** indicates that the data fields contain the Global Returnable Asset Identifier.

The ***EAN•UCC company prefix*** is the one allocated to the owner of the asset (see Chapter 1, Section 2). It is a component of the EAN•UCC numbering structure to make the number unique worldwide. The zero in the leftmost position is added to generate 14 digits in the field "asset identification number".

The ***asset type*** is a number assigned by the owner of the asset to identify uniquely each type of asset.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

The optional ***serial number*** is assigned by the owner of the asset. It identifies an individual asset within a given asset type number. The field is alphanumeric and it may contain all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1, by the application identifier and by the length of the transmitted data.

The data transmitted from the bar code reader means that the Global Returnable Asset Identification has been captured. It may be processed according to the particular application requirements.

6.45 Global Individual Asset Identifier (AI 8004)

Definition: EAN•UCC identification number of an individual asset (GIAI).

This element string may be used for the unique identification of assets to provide a means to store relevant data.

Note: This element string must never be used to identify the entity as a trade item or logistic unit. If an asset is transferred between parties the GIAI cannot be used for ordering the asset. However, the asset identification may be exchanged between parties for the purpose of traceability.

Format of the element string					
Application identifier	Individual asset number				
	EAN•UCC company prefix →		Individual asset reference →		
8 0 0 4	N_1 ...	N_i	X_{i+1} ...	variable length	$X_{j\ (j<=30)}$

Figure 3 - 67

The ***application identifier 8004*** indicates that the data field contains a Global Individual Asset Identifier.

The ***individual asset number*** uses the EAN•UCC company prefix of the company assigning the asset reference. The structure and numbering of the ***individual asset reference*** is determined by the holder of the company prefix. It may contain all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string Global Individual Asset Identifier has been captured. It may be processed according to the particular application requirements.

6.46 Price per Unit of Measure (AI 8005)

Definition: Price per unit of measure of a variable measure trade item with restricted use between trading partners.

This element string is used to indicate the price per unit of measure of price marked goods on a ***variable measure*** trade item to discriminate price variants of the same item. It is considered as an attribute of the respective trade item and not as part of its identification.

Format of the element string	
Application identifier	Price per unit of measure
8 0 0 5	N_1 N_2 N_3 N_4 N_5 N_6

Figure 3 - 68

The ***application identifier 8005*** indicates that the data field contains the price per unit of measure.

Content and structure of the field ***price per unit of measure*** are left to the discretion of the trading partners.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string "price per unit of measure" has been captured. This element string must always be decoded and processed together with the trade item identification number from the same item.

6.47 Identification of the Components of a Trade Item (AI 8006)

Definition: EAN•UCC identification of a fixed measure trade item (GCTIN) packed in separate parcels.

Format of the element string			
Application identifier	GTIN	Relative number of the component within the assembly	Total number of components in the assembly
8 0 0 6	N_1 N_2 N_3 ..... N_{11} N_{13} N_{14}	N_{15} N_{16}	N_{17} N_{18}

Figure 3 - 69

The ***application identifier 8006*** indicates that the data fields contain the identification of the trade item and the enumeration of its components.

The ***GTIN*** is the item number under which the whole item is traded. For the structures of the GTIN see Chapter 1, Section 3.

The field ***relative number*** shows the consecutive number of the particular component within the assembly. A component of a given trade item must always be identical for the respective trade item.

The field ***total number*** shows the total number of components of the trade item.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the identification of a component of a trade item has been captured. It may be processed according to the particular application requirements.

6.48 International Bank Account Number (AI 8007)

Definition: International Bank Account Number (IBAN) as defined in ISO 13616 for use on a payment slip.

Format of the element string	
Application identifier	International Bank Account Number
8 0 0 7	X_1 ——— variable ——→ X_{30}

Figure 3 - 70

The ***application identifier 8007*** indicates that the data field contains the international bank account identifier.

The ***international bank account number***, defined as ISO 13616, indicates to which account the amount of the respective payment slip is to be transferred. The invoicing party determines the applicable bank account number. The data field is alphanumeric and it may contain all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3.

Data carrier: UCC/EAN-128 symbology.

Systems considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data string transmitted by the bar code reader means that the International Bank Account Identifier has been captured. It must be processed together with the Payment Slip Reference Number and the EAN•UCC Global Location Number of the Invoicing Party captured from the same payment slip.

6.49 Global Service Relation Number (AI 8018)

Definition: EAN•UCC identification number of a service relation (GSRN) to be assigned by the service provider.

This element string may be used to identify the recipient of services in the context of a service relationship. It provides a means for the service provider to store data relevant to service(s) provided to the recipient.

Format of the element string			
Application identifier	Global Service Relation Number		
	EAN•UCC company prefix →	← Service reference	Check digit
8 0 1 8	N_1 N_2 N_3 N_4 N_5 N_6 N_7 N_8 N_9 N_{10} N_{11} N_{12} N_{13} N_{14} N_{15} N_{16} N_{17}		N_{18}

Figure 3 - 71

The ***application identifier 8018*** indicates that the data field contains a Global Service Relation Number.

The ***EAN•UCC company prefix*** is the one allocated to the service provider (see Chapter 1, Section 2). It is a component of the EAN•UCC numbering structure to make the number unique worldwide.

The ***service reference*** is assigned by the service provider. The structure and content of the service reference number is at the discretion of the particular service provider.

The ***check digit*** is explained in Chapter 3, Appendix 1. Its verification, which must be carried out in the application software, ensures that the number is correctly composed.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string Global Service Relation Number has been captured. It may be processed according to the particular application requirements.

6.50 Payment Slip Reference Number (AI 8020)

Definition: Payment slip reference number.

Format of the element string	
Application identifier	Payment slip reference number
8 0 2 0	X_1 ——— variable ——→ X_{25}

Figure 3 - 72

The ***application identifier 8020*** indicates that the data field contains a Payment Slip Reference Number.

The ***payment slip reference number***, assigned by the invoicing party, is an information to identify a payment slip within a given EAN•UCC Global Location Number of the Invoicing Party. Together with the Global Location Number of the Invoicing party it identifies a payment slip uniquely. The data field is alphanumeric and it may contain all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3.

Data carrier: UCC/EAN-128 symbology.

Systems Considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data string transmitted from the reading device means that a Payment Slip Reference Number has been captured. It must be processed together with the EAN•UCC Global Location Number of the Invoicing Party captured from the same payment slip.

6.51 UCC Coupon Extended Code (AI 8100 - 8102)

Definition: UCC coupon extended code, supplement to the UCC coupon identification with distribution restricted to North America.

Formats of the element strings				
Application identifier	Filler digit	UCC prefix	Offer code	Expiration date (month + year)
8 1 0 0		N_1	N_2 N_3 N_4 N_5 N_6	
8 1 0 1		N_1	N_2 N_3 N_4 N_5 N_6	N_7 N_8 N_9 N_{10}
8 1 0 2	0	N_2		

Figure 3 - 73

The ***application identifiers 8100 to 8102*** indicate that the data fields contain data supplementary to a UCC coupon identification.

The ***filler digit 0*** is used in AI 8102 to generate an even number of digits in the element string.

The ***UCC prefix*** is the digit which, proceeded by a zero and followed by a manufacturer number, completes the EAN•UCC company prefix.

The ***offer code*** is assigned by the issuer and serves for the identification of a particular promotion.

The ***expiration date*** indicates the end of the redemption period of the coupon.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the respective application identifier.

6.52 Information Mutually Agreed Between Trading Partners (Including FACT Data Identifiers) (AI 90)

Definition: Information of any kind mutually agreed between trading partners with distribution restricted to the trading partners.

Format of the element string	
Application identifier	Data field
9 0	X_1 ——— variable length ——→ X_{30}

Figure 3 - 74

The ***application identifier 90*** indicates that the data field contains any information, mutually agreed between trading partners.

The ***data field*** shows the information agreed between the two trading partners. The field is alphanumeric and may contain all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3. It might be used to incorporate data preceded by FACT Data Identifiers.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string AI 90 has been captured. As the data field may contain any information, processing is subject to prior agreement between trading partners.

Warning: The bar code containing this element string should be removed from any item that leaves the jurisdiction of the trading partners.

6.53 Company Internal Information (AI 91 - 99)

Definition: Company internal information.

Format of the element string	
Application identifier	Data field
A_1 A_2	X_1 ——— variable length ———→ X_{30}

Figure 3 - 75

The ***application identifier digits A_1 A_2*** assigned to this element string are ***91 to 99.***

The ***data field*** may contain any company internal information. The field is alphanumeric and may show all characters contained in Table 1 of the International Standard ISO/IEC 646, shown in Chapter 3, Appendix 3.

Data carrier: UCC/EAN-128 symbology.

System considerations: The system recognises this element string by the symbology identifier]C1 and the application identifier.

The data transmitted from the bar code reader means that the element string containing "company internal information" had been captured. Processing is to be organised by the using company.

Warning: This element string should be removed from any item that leaves the jurisdiction of the company.

APPENDIX 1 - CHECK DIGIT CALCULATIONS

Standard Check Digit Calculations of EAN•UCC Numbering Structures

	Digit positions																	
EAN/ UCC-8											N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8
UCC-12							N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}
EAN/ UCC-13						N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}
EAN/ UCC-14					N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}
18 digits	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}	N_{15}	N_{16}	N_{17}	N_{18}
	Multiply value of each position by																	
	x3	x1	x3	x1	x3	x1	x3	x1	x3	x1	x3	x1	x3	x1	x3	x1	x3	
	Accumulated results = ***Sum***																	
	Subtract ***sum*** from nearest multiple of ten = ***Check digit*** →																	

Figure 3 - 76

Example of a check digit calculation for the 18 digit field																			
Positions	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}	N_{15}	N_{16}	N_{17}	N_{18}	
Number ***without*** check digit	3	7	6	1	0	4	2	5	0	0	2	1	2	3	4	5	6		
Step 1: Multiply	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
by	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3		
Step 2: Add up	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=		
results to ***sum***	9	7	18	1	0	4	6	5	0	0	6	1	6	3	12	5	18		= 101
Step 3: Subtract ***sum*** from nearest multiple of ten (110) = Check digit (9)																			
Number ***with*** check digit	3	7	6	1	0	4	2	5	0	0	2	1	2	3	4	5	6	**9**	

Figure 3 - 77

Check Digit Calculation for Price/Weight Fields

To increase the security of reading a price or weight from a bar code symbol, the check digit for these fields is not only calculated according to the methods described in the previous section, but also according to the procedure described in this section.

The basic principle of the check digit calculation is that each digit position in a price/weight field is assigned a weighting factor. Weighting factors are 2-, 3, 5+ and 5-. Each weighting factor effects the particular calculation for the position concerned. The result of such a calculation is called a "weighted product".

The tables below show the weighted products of the various weighting factors.

Table for the weighting factor 2-

Calculation rule: The digit is multiplied by 2. If the result has two digits, the tens digit is subtracted from the units digit. The units digit resulting is the "weighted product".

Digits	0	1	2	3	4	5	6	7	8	9
Weighted product	0	2	4	6	8	9	1	3	5	7

Table for the weighting factor 3

Calculation rule: The digit is multiplied by 3. The units digit of the result is the "weighted product".

Digits	0	1	2	3	4	5	6	7	8	9
Weighted product	0	3	6	9	2	5	8	1	4	7

Table for weighting factor 5+

Calculation rule: The digit is multiplied by 5. The units digit and the tens digit of the result are added together. The result of this sum is the "weighted product".

Digits	0	1	2	3	4	5	6	7	8	9
Weighted product	0	5	1	6	2	7	3	8	4	9

Table for weighting factor 5-										
Calculation rule: The digit is multiplied by 5. The tens digit of the result is subtracted from the result. The units digit of the result of this subtraction is the "weighted product".										
Digits	0	1	2	3	4	5	6	7	8	9
Weighted product	0	5	9	4	8	3	7	2	6	1

Check digit calculation for the 4-digit price field

Assigned weighting factors				
Digit position	1	2	3	4
Weighting factor	2-	2-	3	5-

Calculation step 1: Determine the "weighted product" for each number in the digit positions 1 to 4 according to the assigned weighting factors.

Calculation step 2: Add the products of step 1.

Calculation step 3: Multiply the result of step 2 by the factor 3. The units digit of the result is the check digit

Example of a check digit calculation					
Position of price field	1	2	3	4	
Assigned weighting factor	2-	2-	3	5-	
Amount	2	8	7	5	
Step 1: Weighted product according to table	4	5	1	3	
Step 2: Sum	+	+	+	+	= 1 3
Step 3: Multiply by 3					= 3 ***9***

Unit position is the check digit

Check digit calculation for the 5-digit price field

Assigned weighting factors					
Digit positions	1	2	3	4	5
Weighting factor	5+	2-	5-	5+	2-

Calculation step 1: Determine the "weighted product" for each number in the digit positions 1 to 5 according to the assigned weighting factors.

Calculation step 2: Add the products of step 1.

Calculation step 3: Subtract the result from the nearest equal or higher multiple of 10.

Calculation step 4: Take the result and search for the same number in the row "weighted product" of the table "weighting factor 5-" (on previous page). The check digit is the number in the row "digit" of the same column.

Example of a check digit calculation						
Price field positions	1	2	3	4	5	
Assigned weighting factor	5+	2-	5-	5+	2-	
Amount	1	4	6	8	5	
Step 1: Weighted product according to table	5	8	7	4	9	
Step 2: Sum	+	+	+	+	+	= 33
Step 3: Result of subtraction (40 - 33)						= 7
Step 4: Weighted product 7 in the table weighting factor 5- shows ***number 6*** to be the check digit.						

APPENDIX 2 - UCC-12 IDENTIFICATION NUMBERS IN A UPC-E SYMBOL

UCC-12 item identification numbers beginning with the ***UCC prefix 0*** may be represented in a small bar code symbol named UPC-E. The UCC-12 item number is condensed into a bar code symbol consisting of 6 symbol character positions. For application processing, the item number must be transformed into its full length by the bar code reader software or by the application software. ***There is no UPC-E 6-digit trade item number.***

UPC-E option for the identification of trade items (GTIN)

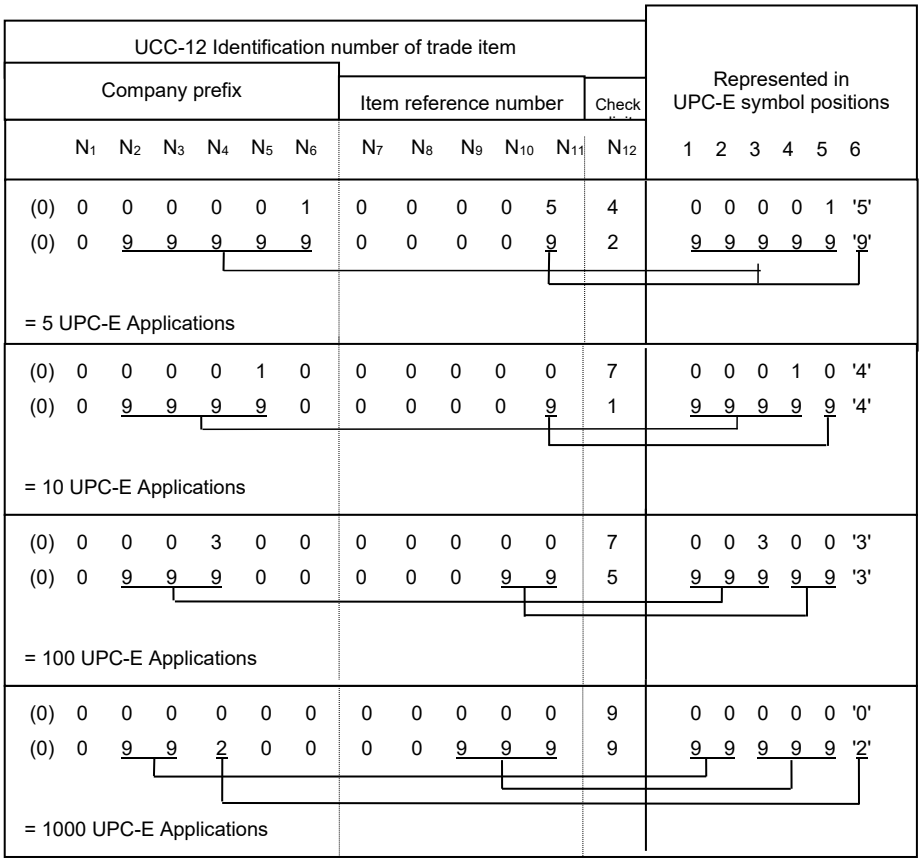

Figure 3 - 78

Company prefixes showing 000000 and 001000 to 007999 in positions N_1 to N_6 are not available in this UPC-E option (see Figure 3 - 75).

UPC-E option for the identification of trade items for company internal distribution

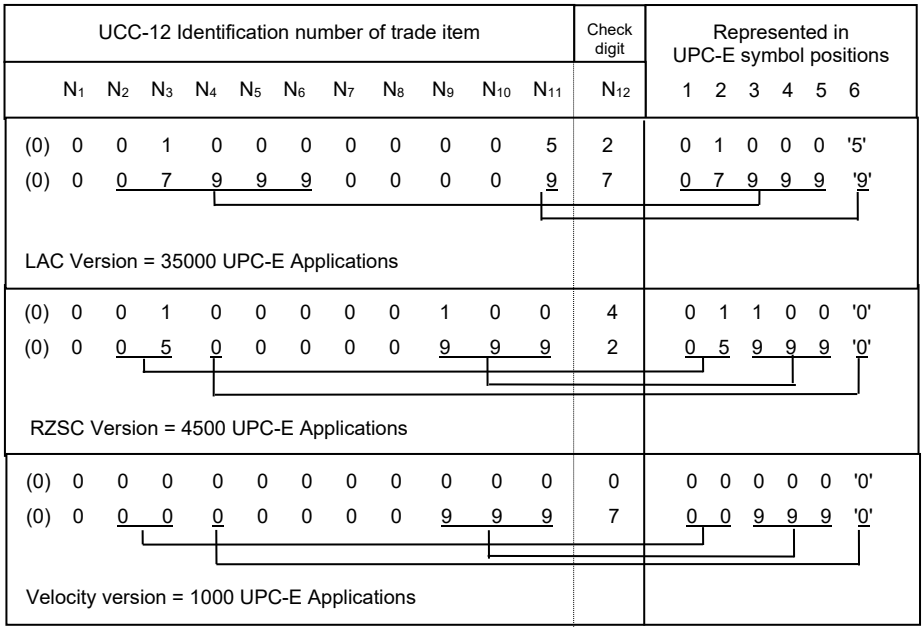

Figure 3 - 79The above figure shows the construction principle of UPC-E for trade item numbering for ***restricted distribution*** (company internal). These UCC-12 identification numbers are not unambiguous when leaving the applying company.

Remarks concerning Figure 3 - 75 and Figure 3 - 76

Each number position must only contain the digits shown in the upper and lower lines of each section and those in-between. On decoding, the extension to full length is determined by the value of the number in single quotes in the column ***Represented in UPC-E symbol positions***.

The ***check digit***, calculated as described in Chapter 3, Appendix 1, applies to the entire length of the UCC-12 identification number. In the UPC-E bar code symbol it is implicitly represented by the parity combination of the six symbol characters which are actually encoded.

Verification of correct UPC-12 identification numbering encoded in a UPC-E symbol

It is possible to create "false" UPC-E symbols if the encodation rules are not properly observed. Whether the digits represented in a UPC-E bar code symbol can be expanded correctly to a UCC-12 number may be verified by means of the following tests.

Test 1: Verify digits encoded in Positions 1 to 6 of the UPC-E bar code symbol as follows:

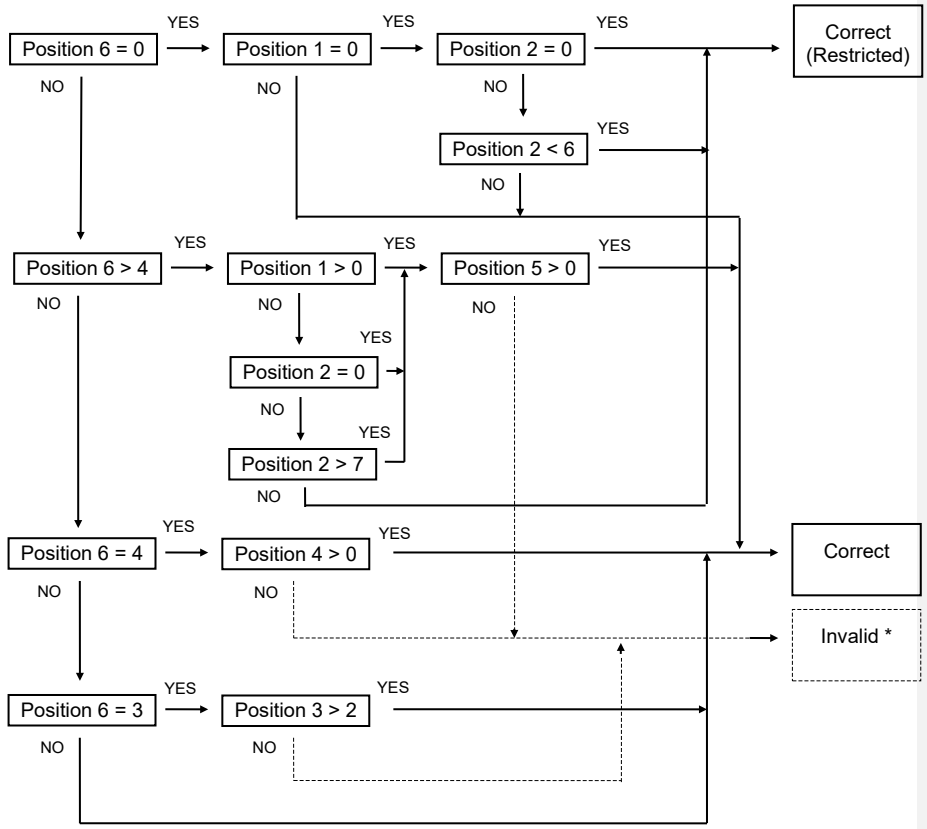

Figure 3 - 80

* **Important Note:** These UPC-E numbers were valid in some previous specifications. Provision for accepting them must be made during decoding only.

Test 2: Expand the digits encoded in the UPC-E bar code symbol to full length of the UCC-12 identification number, calculate the check digit and compare it with the check digit decoded from the UPC-E bar code symbol. Not matching signifies an "invalid" symbol.

APPENDIX 3 - TABLE 1 OF THE INTERNATIONAL STANDARD ISO/IEC 646

Unique graphic character allocations

Graphic Symbol	Name	Coded representation	Graphic Symbol	Name	Coded representation
!	Exclamation mark	2/1	M	Capital letter M	4/13
"	Quotation mark	2/2	N	Capital letter N	4/14
%	Percent sign	2/5	O	Capital letter O	4/15
&	Ampersand	2/6	P	Capital letter P	5/0
'	Apostrophe	2/7	Q	Capital letter Q	5/1
(	Left parenthesis	2/8	R	Capital letter R	5/2
)	Right parenthesis	2/9	S	Capital letter S	5/3
*	Asterisk	2/10	T	Capital letter T	5/4
+	Plus sign	2/11	U	Capital letter U	5/5
,	Comma	2/12	V	Capital letter V	5/6
-	Hyphen-Minus	2/13	W	Capital letter W	5/7
.	Full stop	2/14	X	Capital letter X	5/8
/	Solidus	2/15	Y	Capital letter Y	5/9
0	Digit zero	3/0	Z	Capital letter Z	5/10
1	Digit one	3/1	_	Low line	5/15
2	Digit two	3/2	a	Small letter a	6/1
3	Digit three	3/3	b	Small letter b	6/2
4	Digit four	3/4	c	Small letter c	6/3
5	Digit five	3/5	d	Small letter d	6/4
6	Digit six	3/6	e	Small letter e	6/5
7	Digit seven	3/7	f	Small letter f	6/6
8	Digit eight	3/8	g	Small letter g	6/7
9	Digit nine	3/9	h	Small letter h	6/8
:	Colon	3/10	i	Small letter i	6/9
;	Semicolon	3/11	j	Small letter j	6/10
<	Less-Than sign	3/12	k	Small letter k	6/11
=	Equals sign	3/13	l	Small letter l	6/12
>	Greater-Than sign	3/14	m	Small letter m	6/13
?	Question mark	3/15	n	Small letter n	6/14
A	Capital letter A	4/1	o	Small letter o	6/15
B	Capital letter B	4/2	p	Small letter p	7/0
C	Capital letter C	4/3	q	Small letter q	7/1
D	Capital letter D	4/4	r	Small letter r	7/2
E	Capital letter E	4/5	s	Small letter s	7/3
F	Capital letter F	4/6	t	Small letter t	7/4
G	Capital letter G	4/7	u	Small letter u	7/5
H	Capital letter H	4/8	v	Small letter v	7/6
I	Capital letter I	4/9	w	Small letter w	7/7
J	Capital letter J	4/10	x	Small letter x	7/8
K	Capital letter K	4/11	y	Small letter y	7/9
L	Capital letter L	4/12	z	Small letter z	7/10

Figure 3 - 81

APPENDIX 4 - EAN•UCC DATA TITLES

All Application Identifiers

AI	Full Title	Format	Data Title
00	Serial Shipping Container Code	n2+n18	SSCC
01	Global Trade Item Number	n2+n14	GTIN
02	GTIN of trade items contained in a logistic unit	n2+n14	CONTENT
10	Batch or Lot Number	n2+an..20	BATCH/LOT
11[1]	Production Date (YYMMDD)	n2+n6	PROD DATE
12[1]	Due Date (YYMMDD)	n2+n6	DUE DATE
13[1]	Packaging Date (YYMMDD)	n2+n6	PACK DATE
15[1]	Minimum Durability Date (YYMMDD)	n2+n6	BEST BEFORE or SELL BY
17[1]	Maximum Durability Date (YYMMDD)	n2+n6	USE BY or EXPIRY
20	Product Variant	n2+n2	VARIANT
21	Serial Number	n2+an..20	SERIAL
22	Secondary Data For Specific Health Industry Products	n2+an..29	QTY/DATE/BATCH
23[2]	Lot Number (Transitional Use)	n3+n..19	BATCH/LOT
240	Additional Product Identification Assigned by The Manufacturer	n3+an..30	ADDITIONAL ID
241	Customer Part Number	n3+an..30	CUST. PART No.
250[4]	Secondary Serial Number	n3+an..30	SECONDARY SERIAL
251[4]	Reference to Source Entity	n3+an..30	REF TO SOURCE
30	Variable Count	n2+n..8	VAR. COUNT
31-36[3]	Trade And Logistic Measurements	n4+n6	**See next pages**
337[3]	Kilograms per square metre	n4+n6	KG PER m²
37	Count of Trade Items Contained in a Logistic Unit	n2+n..8	COUNT
390[3]	Amount Payable – single monetary area	n4+n..15	AMOUNT
391[3]	Amount Payable – with ISO currency code	n4+n3+n..15	AMOUNT
392n	Amount Payable – single monetary unit	n4+n..15	AMOUNT
393n	Amount Payable – with ISO currency code	n4+n3+n..15	AMOUNT
400	Customer's Purchase Order Number	n3+an..30	ORDER NUMBER

Commented [MC1]:

1 When only year and month are required, DD must be filled with "00"
2 Plus one digit for length indication
3 These AIs comprise four digits. The first three digits identify the purpose of the AI and the fourth digit indicates the position of the decimal point.
4 The actual data title may be specified by the issuer of the data

401	Consignment Number	n3+an..30	CONSIGNMENT
402	Shipment Identification Number	n3+n17	SHIPMENT NO.
403	Routing Code	n3+an..30	ROUTE
410	"Ship To - Deliver To" EAN•UCC Global Location Number	n3+n13	SHIP TO LOC
411	"Bill To - Invoice To" EAN•UCC Global Location Number	n3+n13	BILL TO
412	"Purchased From" EAN•UCC Global Location Number	n3+n13	PURCHASE FROM
413	"Ship For - Deliver For - Forward To" EAN•UCC Global Location Number	n3+n13	SHIP FOR LOC
414	Identification of a Physical Location, EAN•UCC Global Location Number	n3+n13	LOC No
415	EAN•UCC Global Location Number of the Invoicing Party	n3+n13	PAY TO
420	"Ship To - Deliver To" Postal Code Within a Single Postal Authority	n3+an..20	SHIP TO POST
421	"Ship To - Deliver To" Postal Code With 3 Digit ISO Country Code	n3+n3+an..9	SHIP TO POST
422	Country of Origin of a Trade Item	n3+n3	ORIGIN
8001	Roll Products - Width, Length, Core Diameter, Direction And Splices	n4+n14	DIMENSIONS
8002	Electronic Serial Identifier For Cellular Mobile Telephones	n4+an..20	CMT No
8003	Global Returnable Asset Identifier	n4+n14+an..16	GRAI
8004	Global Individual Asset Identifier	n4+an..30	GIAI
8005	Price Per Unit of Measure	n4+n6	PRICE PER UNIT
8006	Identification of the Component of a Trade Item	n4+n14+n2+n2	GCTIN
8007	International Bank Account Number	n4+an..30	IBAN
8018	Global Service Relation Number	n4+n18	GSRN
8020	Payment Slip Reference Number	n4+an..25	REF No
8100	Coupon Extended Code - NSC + Offer Code	n4+n1+n5	-
8101	Coupon Extended Code - NSC + Offer Code + End Of Offer Code	n4+n1+n5+n4	-
8102	Coupon Extended Code - NSC	n4+n1+n1	-
90[4]	Information Mutually Agreed Between Trading Partners (Including FACT DIs)	n2+an..30	INTERNAL
91-99[4]	Company Internal Information	n2+an..30	INTERNAL

Figure 3 - 82

Metric trade measures

AI	Full title **Data Format n6**	Unit of Measure	Data title
310 (n)	Net weight	Kilograms	NET WEIGHT (kg)
311 (n)	Length or 1st dimension, trade	Metres	LENGTH (m)
312 (n)	Width, diameter or 2nd dimension, trade	Metres	WIDTH (m)
313 (n)	Depth, thickness, height or 3rd dimension, trade	Metres	HEIGHT (m)
314 (n)	Area, trade	Square Metres	AREA (m^2)
315 (n)	Net volume	Litres	NET VOLUME (l)
316 (n)	Net volume	Cubic Metres	NET VOLUME (m^3)

Figure 3 - 83

(n) Indicates the decimal point position outlined in Chapter 7, Section 5.

Non-metric trade measures

AI	Full title **Data Format n6**	Unit of Measure	Data title
320 (n)	Net weight	Pounds	NET WEIGHT (lb)
321 (n)	Length or 1st dimension, trade	Inches	LENGTH (i)
322 (n)	Length or 1st dimension, trade	Feet	LENGTH (f)
323 (n)	Length or 1st dimension, trade	Yards	LENGTH (y)
324 (n)	Width, diameter or 2nd dimension, trade	Inches	WIDTH (i)
325 (n)	Width, diameter or 2nd dimension, trade	Feet	WIDTH (f)
326 (n)	Width, diameter or 2nd dimension, trade	Yards	WIDTH (y)
327 (n)	Depth, thickness, height or 3rd dimension, trade	Inches	HEIGHT (i)
328 (n)	Depth, thickness, height or 3rd dimension, trade	Feet	HEIGHT (f)
329 (n)	Depth, thickness, height or 3rd dimension, trade	Yards	HEIGHT (y)
350 (n)	Area, trade	Square Inches	AREA (i^2)
351 (n)	Area, trade	Square Feet	AREA (f^2)
352 (n)	Area, trade	Square Yards	AREA (y^2)
356 (n)	Net weight	Troy Ounces	NET WEIGHT (t)
357 (n)	Net volume	Ounces (U.S.)	NET VOLUME (oz)
360 (n)	Net volume	Quarts	NET VOLUME (lb)
361 (n)	Net volume	Gallons (U.S.)	NET VOLUME (g)
364 (n)	Net volume	Cubic Inches	NET VOLUME (i^3)
365 (n)	Net volume	Cubic Feet	NET VOLUME (f^3)
366 (n)	Net volume	Cubic Yards	NET VOLUME (y^3)

Figure 3 - 84

(n) Indicates the decimal point position outlined in Chapter 7, Section 5.

Metric logistic measures

AI	Full title **Data Format n6**	Unit of Measure	Data title
330 (n)	Gross weight	Kilograms	GROSS WEIGHT (kg)
331 (n)	Length or 1st dimension, logistics	Metres	LENGTH (m), log
332 (n)	Width, diameter or 2nd dimension, logistics	Metres	WIDTH (m), log
333 (n)	Depth, thickness, height or 3rd dimension, logistics	Metres	HEIGHT (m), log
334 (n)	Area, logistics	Square Metres	AREA (m^2), log
335 (n)	Gross volume	Litres	VOLUME (l), log
336 (n)	Gross volume	Cubic Metres	VOLUME (m^3), log

Figure 3 - 85

(n) Indicates the decimal point position outlined in Chapter 7, Section 5.

Non-metric logistic measures

AI	Full title Data Format n6	Unit of Measure	Data title
340 (n)	Gross weight	Pounds	GROSS WEIGHT (lb)
341 (n)	Length or 1st dimension, logistics	Inches	LENGTH (i), log
342 (n)	Length or 1st dimension, logistics	Feet	LENGTH (f), log
343 (n)	Length or 1st dimension, logistics	Yards	LENGTH (y), log
344 (n)	Width, diameter or 2nd dimension, logistics	Inches	WIDTH (i), log
345 (n)	Width, diameter or 2nd dimension, logistics	Feet	WIDTH (f), log
346 (n)	Width, diameter or 2nd dimension, logistics	Yards	WIDTH (y), log
347 (n)	Depth, thickness, height or 3rd dimension, logistics	Inches	HEIGHT (i), log
348 (n)	Depth, thickness, height or 3rd dimension, logistics	Feet	HEIGHT (f), log
349 (n)	Depth, thickness, height or 3rd dimension, logistics	Yards	HEIGHT (y), log
353 (n)	Area, logistics	Square Inches	AREA (i^2), log
354 (n)	Area, logistics	Square Feet	AREA (f^2), log
355 (n)	Area, logistics	Square Yards	AREA (y^2), log
362 (n)	Gross volume	Quarts	VOLUME (q), log
363 (n)	Gross volume	Gallons (U.S.)	VOLUME (g), log
367 (n)	Gross volume	Cubic Inches	VOLUME (i^3), log
368 (n)	Gross volume	Cubic Feet	VOLUME (f^3), log
369 (n)	Gross volume	Cubic Yards	VOLUME (y^3), log

Figure 3 - 86

(n) Indicates the decimal point position outlined in Chapter 7, Section 5.

APPENDIX 5 – DETERMINATION OF CENTURY IN DATES

Element strings are available for the following types of dates:

- Production date (AI 11)
- Due date (AI 12)
- Packaging date (AI 13)
- Minimum durability date (Quality) (AI 15)
- Maximum Durability date (Safety) (AI 17)

It is left to the discretion of the user to interpret a particular date type in the sense of his business practices. Such interpretation may change according to the product range for which a date is being applied

Since the data field "year" consists of two positions, the century is established by the following procedure.

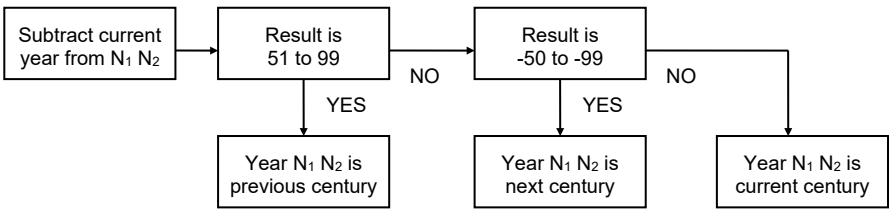

Figure 3 - 87

Note The element string can only specify a date in the range from 49 years in the past to 50 years in the future of the current year.

Chapter 4:

Association of Element Strings to Form Valid Messages

Table of contents

1. ASSOCIATION OF ELEMENT STRINGS TO FORM VALID MESSAGES

1.1 Introduction

The main purpose of automatic data capture (ADC) is to replace manual entry of visually captured information. This implies that an ADC message has to provide all information required for a transaction, without human intervention. EAN•UCC system data may be used to record entities in computer files, to sort goods on conveyor belts, to check completeness of a consignment, to verify dates, to record physical stock taking, etc.

Element strings may be applied directly on physical goods or printed in catalogues or documents. The scanning source and the type of transaction determine generally the required information in a given business application. Since all ADC data is being used in EDP applications, strict validation of data to be processed is an absolute prerequisite.

For correct processing of scanned data certain business applications may require the association of element strings representing a particular combination of identification data. The EAN•UCC system enables system users to choose the needed level of data accuracy through the use of adequate element strings.

The logical set-up of the data standard of the EAN•UCC system enables system users to validate scanned data messages see Chapter 7(System Processing in EDP Applications). Validation is effected on two levels.

The first level is validation of the data for conforming with the system rules, i.e. to provide a message which contains all information to be processed logically without human intervention. The second level is validation of the data for conforming with the requirements of a particular business application.

The two tables in this Chapter show the rules for the first verification level, i.e. to conform with the system logic. The first table defines the pairs of element strings which cannot appear on the same physical entity. The second table defines the element strings which mandate the appearance of another element string on the same physical entity. All other combinations of element strings are possible at the first level of verification, although they may not make sense at the second, the application level.

1.2 Basic considerations

The element strings that require specialised software and/or scanner set up are not covered by these rules. These are the element strings with EAN•UCC prefixes 0001 to 0007, 02, 04, 05, 20 to 29, 980, 99; EAN/UCC-8 prefixes 0 and 2; EAN-2 and EAN-5 add-ons; and AI's 8100 to 8102.

Duplicate element strings appearing on the same physical entity must have the same value.

In the following tables the term GTIN is used. The element strings that encode GTINs are defined in Chapter 3, Sections 2.1, 3.1, 5.1, 5.2, 5.3, 6.2, 6.3 and 6.47. GTINs may be encoded in an EAN/UPC bar code symbol, an ITF-14 bar code symbol or an UCC/EAN-128 bar code symbol using AI 01 or AI 8006.

1.3 Table of invalid pairs of element strings

The following table defines the pairs of element strings that cannot appear on the same physical entity.

Pair of element strings				Comment
AI	**Designation**	**AI**	**Designation**	
GTIN	Identification of a trade item	GTIN	Identification of a trade item	Duplicate GTINs with different values.
GTIN	Identification of a trade item	02	Identification of the content of a logistic unit	AI 02 must not be used for the identification of trade items contained in a trade item.
10	Batch/Lot number	23n	Lot number (transitional use)	Duplicate lot numbers with different values.
22	Secondary Data for the Health Industry	30	Count	Duplicate counts with different values.
22	"	10	Batch/Lot number	Duplicate lot numbers with different values.
22	"	17	Maximum durability date	Duplicate expiration date with different values.
22	"	21	Serial number	Duplicate serial numbers with different values.
22	"	23n	Lot number (transitional use)	Duplicate lot numbers with different values.
420	Ship to postal code, single postal authority	421	Ship to postal code with ISO country code	Only one "Ship to" postal code may be applied on an item.
390n	Amount payable – single monetary area	391n	Amount payable – with ISO currency code	Only one Amount Payable element string may be applied on a payment slip.
8006	Component identification	GTIN	Identification of a trade item	Other GTINs cannot be used with AI 8006. The trade item is identified by a GTIN contained in the AI 8006.

Figure 4 - 1

Field Code Changed

1.4 Table of mandatory association of element strings

The following table defines the element strings that mandate the appearance of another element string on the same physical entity.

If element string		**Then** mandatory associated element string	**Comment**
AI	**Designation**		
GTIN with $N_1 = 9$	Identification of a variable measure trade item	30, 3nnn[1] or 3nnn[2] or 8001	Mandatory association with variable measure information.
02	Identification of the content of a logistic unit	00	Mandatory association with an SSCC.
02	Identification of the content of a logistic unit	37	Mandatory count of the contained trade items.
10	Batch/Lot number	GTIN or 02	Mandatory association with a GTIN or with the identification of the content of a logistic unit.
11, 13, 15, 17	Dates	GTIN or 02	Mandatory association with a GTIN or with the identification of the content of a logistic unit.
12	Due date	8020 and 415	Mandatory association with the Payment Slip Reference Number and EAN•UCC GLN of the Invoicing Party
20	Product variant	GTIN or 02	Mandatory association with a GTIN or with the identification of the content of a logistic unit.
21	Serial number	GTIN	Mandatory association with a GTIN of a single trade item (a serial number cannot apply to a grouping of trade items).
22	Secondary data health industry	GTIN	Mandatory association with a GTIN.
23n	Lot number	GTIN or 02	Mandatory association with a GTIN or with the identification of the content of a logistic unit.
240	Additional product identification	GTIN or 02	Mandatory association with a GTIN or with the identification of the content of a logistic unit.
241	Customer part number	GTIN or 02	Mandatory association with a GTIN or with the identification of the content of a logistic unit.
250	Secondary serial number	GTIN	Mandatory association with a GTIN (a secondary serial number cannot apply to a grouping of trade items).

If element string		**Then** mandatory associated element string	**Comment**
AI	**Designation**		
251	Reference to Source Entity	GTIN	Mandatory association with GTIN of the trade item.
30	Variable count	GTIN or 02	Mandatory association with a variable measure GTIN (e.g. an EAN/UCC-14 identification number starting 9). or the identification of variable measure content of a logistic unit.
3nnn[1]	Trade measures which cannot be summed	GTIN	Mandatory association with a variable measure GTIN (e.g. an EAN/UCC-14 identification number starting 9).
3nnn[2]	Trade measures which can be summed	GTIN or 02	Mandatory association with a variable measure GTIN (e.g. an EAN/UCC-14 identification number starting 9) r the identification of variable measure content of a logistic unit.
3nnn[3]	Logistic measures	00 or GTIN	Mandatory association with an SSCC or a variable measure GTIN (e.g. an EAN/UCC-14 identification number starting 9).
337n	Kilograms per square metre	GTIN	Mandatory association with a GTIN.
37	Count of units contained	02	Mandatory association with the identification of the contents of a logistic unit.
390n	Amount payable – single monetary area	8020 and 415	Mandatory association with the Payment Slip Reference Number and the EAN•UCC GLN of the Invoicing Party.
391n	Amount payable – with ISO currency code	8020 and 415	Mandatory association with the Payment Slip Reference Number and the EAN•UCC GLN of the Invoicing Party.
392n	Amount Payable – single monetary unit	GTIN	Mandatory association with variable measure GTIN (e.g. an EAN/UCC-14 identification number starting with 9)
393n	Amount Payable – with ISO currency code	GTIN	Mandatory association with variable measure GTIN (e.g. an EAN/UCC-14 identification number starting with 9)
403	Routing Code	00	Mandatory association with an SSCC.
415	EAN•UCC GLN of the Invoicing Party	8020	Mandatory association with Payment Slip Reference Number.
422	Country of origin	GTIN	Mandatory association with a GTIN.

If element string		**Then mandatory associated element string**	**Comment**
AI	**Designation**		
8001	Variables of roll products	GTIN	Mandatory association with a variable measure GTIN (e.g. an EAN/UCC-14 identification number starting 9).
8005	Price per unit of measure	GTIN or 02 either with $N_1 = 9$	Mandatory association with a variable measure GTIN or the identification of variable measure content of a logistic unit.
8007	International Bank Account Number	8020 and 415	Mandatory association with the Payment Slip Reference Number and the EAN•UCC GLN of the Invoicing Party.
8020	Payment Slip Reference Number	415	Mandatory association with the EAN•UCC GLN of the Invoicing Party.

Figure 4 - 2

Field Code Changed

[1] AI's 3nnn where the first three digits are 312, 313, 324, 325, 326, 327, 328 and 329.

[2] AI's 3nnn where the first three digits are 310, 311, 314, 315, 316, 320, 321, 322, 323, 350, 351, 352, 356, 357, 360, 361, 364, 365 and 366.

[3] AI's 3nnn where the first three digits are 330, 331, 332, 333, 334, 335, 336, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 353, 354, 355, 362, 363, 367, 368 and 369.

Chapter 5:

Data Carriers

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1. DATA CARRIERS

1.1 Introduction

A **data carrier** is the means of representing data in machine readable format.

This chapter describes the **data carriers** which are endorsed by the EAN International and the Uniform Code Council in Chapter 5, Sections 1, 2, and 3 and covers bar code production and quality assessment in Chapter 5, Section 4.

It is important to recognise that EAN•UCC specifies the data carrier used to represent any given element string. Chapter 2 of this manual, dealing with Applications, includes specific rules indicating which data carrier should be used to represent which element strings in particular applications.

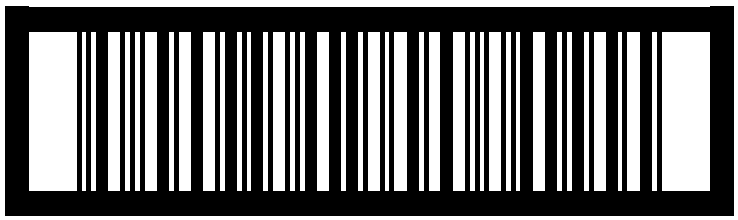
The EAN•UCC system uses the following data carriers:

The ***EAN/UPC symbology*** (which forms the basis for the symbols: UPC-A, UPC-E, EAN-13, EAN-8 and the 2 and 5 digit add-ons) is a bar code that can be read omnidirectionally. It must be used for all items that are scanned at the point of sale in retail outlets and may be used on other trade items.

EAN-13

UPC-A

The use of the ***ITF-14 (Interleaved Two of Five) symbology*** is restricted to the bar coding of identification numbers on trade items not expected to pass through retail checkouts. This symbology is better suited for direct printing onto corrugated fibreboard.



18931234567894

The **UCC/EAN-128 bar code** symbology is a subset of the 'Code 128' bar code symbology. Its use is exclusively licensed to EAN International and UCC. This extremely flexible symbology is used for the encoding of element strings using ***EAN•UCC Application Identifiers.***

(01) 10614141543219

1.2 International standards

A number of national and regional standardisation bodies have developed technical standards in the area of bar coding. At the time of writing, the International Standards Organisation (ISO) has not published standard bar code symbology specifications. However, a subcommittee of ISO/IEC JTC1 (International Standards Organisation/International Electronics Committee Joint Technical Committee 1) was established in 1996. It is expected that this committee will publish ISO standard bar code symbology specifications at some point in the future.

EAN International, the Uniform Code Council (UCC) and the EAN Numbering Organisations have been, and remain, actively involved in the development of these standards. The objective is that EAN standards remain fully compatible with relevant published national, regional and international symbology standards. The source documents for Chapter 5, Sections 1, 2, and 3 of this specification are the following ISO/IEC drafts:

Section 5.1	EAN/UPC Symbology Specification
Section 5.2	Automatic identification and data capture techniques - Bar code symbology specifications - Interleaved 2 of 5
Section 5.3	Automatic identification and data capture - Bar code symbology specification - Code 128.

Throughout Chapter 5, Sections 1, 2, and 3 information significant to the UCC and EAN Numbering Organisations (not normative at an ISO level) are highlighted in grey.

1.3 Symbology identifiers

The symbology identifier is not encoded in the bar code symbol, but is generated by the decoder after decoding and transmitted as a preamble to the data message.

All scanning equipment has the ability to recognise the symbology that has been scanned. Some scanners have the optional feature of being able to transmit a **symbology identifier**. The symbology identifier is a three-character data string comprising a flag character, code character, and a modifier character.

] is the **Flag Character** (which has an **ASCII** value of 93) - This denotes that the two characters following are symbol identifier characters;

c is the **Code Character** - This denotes the type of symbology;

m is the **Modifier Character** - This indicates the mode in which the symbology is used. For example, in the ITF-14 symbol the "m" character indicates the presence of a check digit.

Note: If used, the symbology identifier is transmitted as a prefix to the data message.

The symbology identifiers used in the EAN•UCC system are as follows:

Symbology identifier	Symbology format	Content
] E 0	EAN-13, UPC-A or UPC-E	13 digits
] E 1	2 digit EAN/UPC add-on	2 digits
] E 2	5 digit EAN/UPC add-on	5 digits
] E 3	EAN-13, UPC-A or UPC-E with add-on	15 or 18 digits
] E 4	EAN-8	8 digits
] I 1	ITF-14	14 digits
] C 1	UCC/EAN-128	variable alpha-numeric

Table 1

NOTE: EAN/UPC symbols with add-ons may be considered either as two separate symbols, each of which is transmitted separately with its own symbology identifier, or as a single data packet. The system designer shall select one of these methods.

Chapter 5, Section 1:

EAN/UPC Symbology Specifications

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1. STRUCTURE AND DIMENSIONS

1.1 Symbology characteristics

The characteristics of EAN/UPC are:

Encodable character set: numeric (0 to 9), i.e., ASCII characters 48 - 57 inclusive, in accordance with ISO 646;

Symbology type: continuous;

Symbol character density: 7 modules per symbol character;

Elements per symbol character: 4, comprising 2 bars (dark bars) and 2 spaces (light bars), each of 1, 2, 3, or 4 modules in width (auxiliary patterns have differing numbers of elements);

Character self-checking: yes; (see Chapter 8, Glossary of Terms for definition)

Data string length encodable: fixed (8, 12, or 13 characters including check digit depending on specific symbol type);

Omni-directionally decodable: yes;

Symbol check digit: one, mandatory (described in Chapter 3, Appendix 1);

Non-data overhead not including the check digit or quiet zones (light margins):

- 11 modules for EAN-13, EAN-8, and UPC-A symbols

  (Left Guard/Center Pattern/right Guard)

- 9 modules for UPC-E symbols

  (Left Guard/Right Guard)

1.2 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 Chapter 5, Section 1, Sub-Section 1.4.1 to 1.4.4, and the optional add-on symbols are described in Chapter 5, Section 1, Sub-Section 1.4.5.

1.3 Symbol encodation

1.3.1 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 bar), B denotes a bar (dark bar), and the element widths are in modules.

Chapter 5, Section 1, Appendix 2 illustrates Table 1 graphically. The sum of the bar (dark 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 space 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 Chapter 5, Section 1, Sub-Sections 1.4.1, 1.4.4, 1.4.5) 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 encodation.

1.3.2 Auxiliary pattern encodation

Auxiliary patterns shall be composed as shown below 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.							

Chapter 5, Section 1, Appendix 3 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.

1.4 Symbol formats

1.4.1 EAN-13 symbols

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

- a left quiet zone (light margin);
- 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 (light margin).

The rightmost symbol character shall encode the check digit calculated in accordance with Chapter 3, Appendix 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 below 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

1.4.2 EAN-8 symbols

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

- a left quiet zone (light margin);
- a normal guard pattern;
- 4 symbol characters from number set A;
- a centre pattern;
- 4 symbol characters from number set C;
- a normal guard pattern;
- a right quiet zone (light margin).

The rightmost symbol character shall encode the check digit calculated in accordance with Chapter 3, Appendix 1. Figure 2, shown below, is an example of an EAN-8 bar code

symbol.

Figure 2: EAN-8 bar code symbol

1.4.3 UPC-A symbols

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

- a left quiet zone (light margin);
- a normal guard pattern;
- 6 symbol characters from number set A;
- a centre pattern;
- 6 symbol characters from number set C;
- a normal guard pattern;
- a right quiet zone (light margin).

The rightmost symbol character shall encode the check digit calculated in accordance with Chapter 3 Appendix 1. UPC-A symbols may be decoded as a 13-digit number by adding an implied leading zero to the UCC-12 number. Figure 3, shown below, is an example of a UPC-A bar code symbol.

Figure 3: UPC-A bar code symbol

1.4.4 UPC-E symbols

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

- a left quiet zone (light margin);
- a normal guard pattern;
- 6 symbol characters from number sets A and B;
- a special guard pattern;
- a right quiet zone (light margin).

The UPC-E symbol may only be used to encode UCC-12 data strings which commence with a zero and contain a sequence of four or five zeroes in defined positions, as shown in Table 5. These zeros are removed from the data during encoding by the process of zero suppression described in Chapter 5, Section 1, Sub-Section 1.4.4.1. Figure 4, shown below, is an example of a UPC-E bar code symbol.

Figure 4: UPC-E bar code symbol (encoding "001234000057" by zero suppression)

1.4.4.1 Encodation of a UPC-E symbol

The following algorithm describes the encodation of a data string suitable for zero suppression:

1) Let *D1*, *D2*, *D3*...*D12* denote the UCC-12 data characters (including check digit). *D1* shall always be 0. *D12* shall be the symbol check digit calculated according to the algorithm in Chapter 3, Appendix 1. Let *X1*, *X2*...*X6* denote the six symbol characters in the final UPC-E symbol.

2) Convert *D2* through *D11* into a symbol character string by removing zeroes according to the following rules:

   a) if *D11* equals 5, 6, 7, 8, or 9
   and *D7* to *D10* inclusive are all 0
   and *D6* is not 0
   then *D7* to *D10* are not encoded.

Symbol character:	*X1*	*X2*	*X3*	*X4*	*X5*	*X6*
Data character:	*D2*	*D3*	*D4*	*D5*	*D6*	*D11*

   b) if *D6* to *D10* inclusive are all 0
   and *D5* is not 0
   then *D6* to *D10* are not encoded and *X6* = 4.

Symbol character:	*X1*	*X2*	*X3*	*X4*	*X5*	*X6*
Data character:	*D2*	*D3*	*D4*	*D5*	*D11*	4

   c) if *D4* is 0, 1, or 2
   and *D5* to *D8* inclusive are all 0
   then *D5* to *D8* are not encoded.

Symbol character:	*X1*	*X2*	*X3*	*X4*	*X5*	*X6*
Data character:	*D2*	*D3*	*D9*	*D10*	*D11*	*D4*

   d) if *D4* is 3, 4, 5, 6, 7, 8, or 9
   and *D5* to *D9* inclusive are all 0
   then *D5* to *D9* are not encoded and *X6* = 3.

Symbol character:	*X1*	*X2*	*X3*	*X4*	*X5*	*X6*
Data character:	*D2*	*D3*	*D4*	*D10*	*D11*	3

3) Determine the number sets for the implicit encodation of *D12* from Table 4.

4) Encode symbol characters *X1* to *X6* using number sets A and B as determined in Step 3.

Table 4: Number sets for UPC-E symbol

Value of check digit *D12*	**Number sets used for coding UPC-E symbol**					
	Symbol character position					
	1	2	3	4	5	6
0	B	B	B	A	A	A
1	B	B	A	B	A	A
2	B	B	A	A	B	A
3	B	B	A	A	A	B
4	B	A	B	B	A	A
5	B	A	A	B	B	A
6	B	A	A	A	B	B
7	B	A	B	A	B	A
8	B	A	B	A	A	B
9	B	A	A	B	A	B

EXAMPLE 1:	Original Data	Zero-Suppressed	Rule
	0 1 2 3 4 5 0 0 0 0 5 8	1 2 3 4 5 5	2a
		B A B A A B	

EXAMPLE 2:	Original Data	Zero-Suppressed	Rule
	0 4 5 6 7 0 0 0 0 0 8 0	4 5 6 7 8 4	2b
		B B B A A A	

EXAMPLE 3:	Original Data	Zero-Suppressed	Rule
	0 3 4 0 0 0 0 0 5 6 7 3	3 4 5 6 7 0	2c
		B B A A A B	

EXAMPLE 4:	Original Data	Zero-Suppressed	Rule
	0 9 8 4 0 0 0 0 0 7 5 1	9 8 4 7 5 3	2d
		B B A B A A	

NOTE: The number sets used to implicitly encode the check digit are shown in the zero-suppressed column.

1.4.4.2 Decoding a UPC-E symbol

Derivation of the 12-digit data string from the characters encoded in the UPC-E symbol can be performed according to Table 5.

Table 5: Decoding of UPC-E symbol

Encoded UPC-E digits									Decoded number											
	P1	P2	P3	P4	P5	P6			*D1*	*D2*	*D3*	*D4*	*D5*	*D6*	*D7*	*D8*	*D9*	*D10*	*D11*	*D12*
(0)	*X1*	*X2*	*X3*	*X4*	*X5*	0	(C)		(0)	*X1*	*X2*	0	0	0	0	0	*X3*	*X4*	*X5*	(C)
(0)	*X1*	*X2*	*X3*	*X4*	*X5*	1	(C)		(0)	*X1*	*X2*	1	0	0	0	0	*X3*	*X4*	*X5*	(C)
(0)	*X1*	*X2*	*X3*	*X4*	*X5*	2	(C)		(0)	*X1*	*X2*	2	0	0	0	0	*X3*	*X4*	*X5*	(C)
(0)	*X1*	*X2*	*X3*	*X4*	*X5*	3	(C)		(0)	*X1*	*X2*	*X3*	0	0	0	0	0	*X4*	*X5*	(C)
(0)	*X1*	*X2*	*X3*	*X4*	*X5*	4	(C)		(0)	*X1*	*X2*	*X3*	*X4*	0	0	0	0	0	*X5*	(C)
(0)	*X1*	*X2*	*X3*	*X4*	*X5*	5	(C)		(0)	*X1*	*X2*	*X3*	*X4*	*X5*	0	0	0	0	5	(C)
(0)	*X1*	*X2*	*X3*	*X4*	*X5*	6	(C)		(0)	*X1*	*X2*	*X3*	*X4*	*X5*	0	0	0	0	6	(C)
(0)	*X1*	*X2*	*X3*	*X4*	*X5*	7	(C)		(0)	*X1*	*X2*	*X3*	*X4*	*X5*	0	0	0	0	7	(C)
(0)	*X1*	*X2*	*X3*	*X4*	*X5*	8	(C)		(0)	*X1*	*X2*	*X3*	*X4*	*X5*	0	0	0	0	8	(C)
(0)	*X1*	*X2*	*X3*	*X4*	*X5*	9	(C)		(0)	*X1*	*X2*	*X3*	*X4*	*X5*	0	0	0	0	9	(C)

Notes:

- The symbol characters at positions P1, P2 … P5 of the UPC-E symbol are represented by *X1, X2 … X5.*
- Re-inserted zeroes are indicated by underlining.
- The leading digit for UPC-E symbols, which is not encoded, is indicated by “(0)”.
- The check digit implicitly encoded in UPC-E is indicated by “(C)”.

1.4.5 Add-on symbols

The add-on symbols were designed for use with EAN/UPC symbols on periodicals and paperback books. Because they provide reduced security, their use shall be limited to applications where rules in the application specification governing data format and content provide appropriate safeguards.

1.4.5.1 Two digit add-on symbol

The 2-digit add-on may be used in specific applications, in combination with an EAN-13, UPC-A, or UPC-E symbol. The add-on is positioned following the right quiet zone (light margin) of the main symbol, and consists of the following:

- add-on guard pattern;
- first digit of the add-on number from number sets A or B;
- add-on delineator;
- second digit of the add-on number from number sets A or B;
- a right quiet zone (light margin).

The add-on has no right guard pattern. It does not have an explicit check digit. Checking is done through the mix of the number sets (A or B) used for the two digits. The choice of number sets is linked to the value of the add-on number as shown below by Table 6:

Table 6: Number sets for 2-digit add-on

Value of the add-on number	Left-hand digit	Right-hand digit
Multiple of 4 (00,04,08,..96)	A	A
Multiple of 4+1 (01,05,..97)	A	B
Multiple of 4+2 (02,06,..98)	B	A
Multiple of 4+3 (03,07,..99)	B	B

Figure 5, shown below, is an example of an EAN-13 bar code symbol with 2-digit add-on.

Figure 5: EAN-13 bar code symbol with 2-digit add-on

1.4.5.2 Five digit add-on symbol

The 5-digit add-on may be used in specific applications in combination with an EAN-13, UPC-A, or UPC-E symbol. The add-on is positioned following the right quiet zone (light margin) of the main symbol, and consists of the following:

- add-on guard pattern;
- first digit of the add-on number from number sets A or B;
- add-on delineator;
- second digit of the add-on number from number sets A or B;
- add-on delineator;
- third digit of the add-on number from number sets A or B;
- add-on delineator;
- fourth digit of the add-on number from number sets A or B;
- add-on delineator;
- fifth digit of the add-on number from number sets A or B;
- a right quiet zone (light margin).

The add-on has no right guard pattern. It does not have an explicit check digit. Checking is done through the mix of the number sets (A or B) used for the five digits. A value V is determined by the following rules:

1) Sum the digits in positions 1, 3, and 5.
2) Multiply the result of step 1 by 3.
3) Sum the remaining digits (positions 2 and 4).
4) Multiply the result of step 3 by 9.
5) Sum the results of steps 2 and 4.
6) The value of V is the unit's position (lowest-order digit) of the result of step 5.

EXAMPLE: To calculate the value of V for the add-on number 86104:

Step 1: 8 + 1 + 4 = 13

Step 2: 13 x 3 = 39

Step 3: 6 + 0 = 6

Step 4: 6 x 9 = 54

Step 5: 39 + 54 = 93

Step 6: V = 3

The number sets can then be determined by using Table 7.

Table 7: Number sets for 5-digit add-on

Value of V	Number sets used for symbol characters				
	1	2	3	4	5
0	B	B	A	A	A
1	B	A	B	A	A
2	B	A	A	B	A
3	B	A	A	A	B
4	A	B	B	A	A
5	A	A	B	B	A
6	A	A	A	B	B
7	A	B	A	B	A
8	A	B	A	A	B
9	A	A	B	A	B

For the example, since V = 3, the sequence of number sets used to encode the value 86104 is B A A A B.

Figure 6 shows an example of an EAN-13 bar code symbol with 5-digit add-on.

Figure 6: EAN-13 bar code symbol with 5-digit add-on

1.5 Dimensions and tolerances

1.5.1 Nominal dimensions of characters

EAN/UPC symbols can be printed at various densities to accommodate a variety of printing and scanning processes. The significant dimensional parameter is *X*, the ideal width of a single module element. The *X* dimension must be constant throughout a given symbol.

The dimensions of an EAN/UPC symbol may be referenced to a defined set of dimensions referred to as the nominal size symbol. Refer to Chapter 5, Section 1, Appendix 7 for dimensioned drawings of nominal size symbols.

The *X* dimension at nominal size is 0.33 mm (0.013 inches).

The width of each bar (dark bar) and space (light bar) is determined by multiplying the *X* dimension by the module width of each bar (dark bar) and space (light bar) (1, 2, 3, or 4). There is an exception for the digit values 1, 2, 7, and 8. For these characters, the bars (dark bars) and spaces (light bars) are reduced or enlarged by 1/13 of a module to provide a uniform distribution of bar width tolerances and thus improve scanning reliability.

The reduction or enlargement in millimetres at nominal size of the bars (dark bars) and spaces (light bars) for the characters 1, 2, 7, and 8 in the Number Sets A, B, and C is given by the following table:

Table 8: Reduction / enlargement for characters 1, 2, 7, and 8

Character Value	Number Set A		Number Sets B and C	
	Bar (Dark Bar) mm	Space (Light Bar) mm	Bar (Dark Bar) mm	Space (Light Bar) mm
1	- 0.025	+0.025	+0.025	- 0.025
2	- 0.025	+0.025	+0.025	- 0.025
7	+0.025	- 0.025	- 0.025	+0.025
8	+0.025	- 0.025	- 0.025	+0.025

Note that existing equipment for the generation of symbols which uses a value of 0.030 mm for the reduction/enlargement factor at nominal size may continue to do so for the foreseeable future.

1.5.2 Symbol height

For EAN-13, UPC-A and UPC-E symbols, the height of the bars (dark bars) in the nominal size symbol is 22.85 mm (0.9 inch).

For EAN-8 symbols, the height of the bars (dark bars) in the nominal size symbol is 18.23 mm (0.718 inch).

For 2-digit and 5-digit add-ons, the height of the bars (dark bars) in the nominal size symbol is 21.9 mm (0.86 inch).

In EAN-13, EAN-8, UPC-A, and UPC-E symbols the bars (dark bars) forming the left, centre, and right guard patterns shall be extended downwards by 5x, i.e., 1.65 mm (0.065 in). This shall also apply to the bars (dark bars) of the first and last symbol characters of the UPC-A symbol.

Symbol height is not modular.

1.5.3 Quiet zone (Light margin)

The minimum quiet zone (light margin) width required by the main symbol types of the symbology is 7x. Various minimum quiet zone (light margin) dimensions are, however, specified for the various symbol types, due to the size and location of the human-readable characters. These dimensions are outlined below and expanded in Table 9.

Minimum width of quiet zones (light margins):

- EAN-13 symbols: left, 11x; right, 7x;
- UPC-A symbols: 9x;
- UPC-E symbols: left, 9x; right, 7x**;**
- EAN-8 symbols: 7x;
- Add-on symbols (all): right 5x.

Table 9: Quiet Zone (Light Margin) Width by Version

Symbol version	Left quiet zone (light margin)		Right quiet zone (light margin)	
	Modules	mm[1]	Modules	mm
EAN-13	11	3.63	7	2.31
EAN-8	7	2.31	7	2.31
UPC-A	9	2.97	9	2.97
UPC-E	9	2.97	7	2.31
Add-ons (EAN)	7-10	2.31-3.30	5	1.65
Add-ons (UPC)	9-12	2.97-3.96	5	1.65

Note: A useful device to help maintain the quiet zone (light margin) in some production processes is to include a “less than” (<) and/or “greater than” (>) character in the human-readable field aligned with the edge of the quiet zone (light margin). If this device is used, the character(s) shall be positioned in accordance with the appropriate drawings in Chapter 5, Section 1, Appendix 6.

1.5.4 Magnification factor

Symbols may be reduced or enlarged from the nominal size by applying a constant magnification factor in the range 0.8 to 2.0 to all dimensions.

The magnification factor of the add-on symbol shall be the same as the magnification factor of the associated main symbol.

[1] This is an example using an x dimension of 0.33 mm.

1.5.5 Symbol width

The symbol width in modules, including the minimum quiet zones (light margins), shall be as indicated below in Table 10.

Table 10: Symbol width in modules

Symbol type	Width
EAN-13	113
UPC-A	113
EAN-8	81
UPC-E	67
2-digit add-on	25
5-digit add-on	52
EAN-13 or UPC-A + 2-digit add-on	138
UPC-E + 2 digit add-on	92
EAN-13 or UPC-A + 5-digit add-on	165
UPC-E + 5- digit add-on	119

1.5.6 Positioning of the add-on symbol

The add-on shall not encroach on the right quiet zone (light margin) of the main symbol. The maximum separation shall be 12x.

The bottom edge of the bars (dark bars) in the add-on symbol shall be horizontally aligned with the bottom edge of the guard bars of the main symbol.

2. REFERENCE DECODE ALGORITHM

Decode algorithms are used by scanning equipment to convert the bar and space patterns of the bar code into data characters. As a matter of policy, EAN International and UCC make no attempt to specify or standardise equipment beyond stating that it should be capable of reading symbols produced in accordance with the specifications laid out in this manual.

Bar code reading systems are designed to read imperfect symbols to the extent that practical algorithms permit. This section describes the reference decode algorithm used to determine decode and decodability in symbol verification in accordance with ISO 15416.

For each symbol character, let *S* equal the total measured width of the character. The value *S* is used to determine reference threshold (*RT*) values. Individual edge to similar edge measurements (*e*) are then compared to the Reference Threshold (*RT*) to determine *E* values. Character values are determined from *E* values.

Value *e1* is defined as the measurement from the leading edge of a bar (dark bar) to the leading edge of the adjacent bar (dark bar). Value *e2* is defined as the measurement from the trailing edge of a bar (dark bar) to the trailing edge of the adjacent bar (dark bar). For number sets A and B the right edge of each of the two bars (dark bars) is considered to be leading, while for number set C the left edge of each bar (dark bar) is considered to be leading. These relationships are illustrated below in Figure 7.

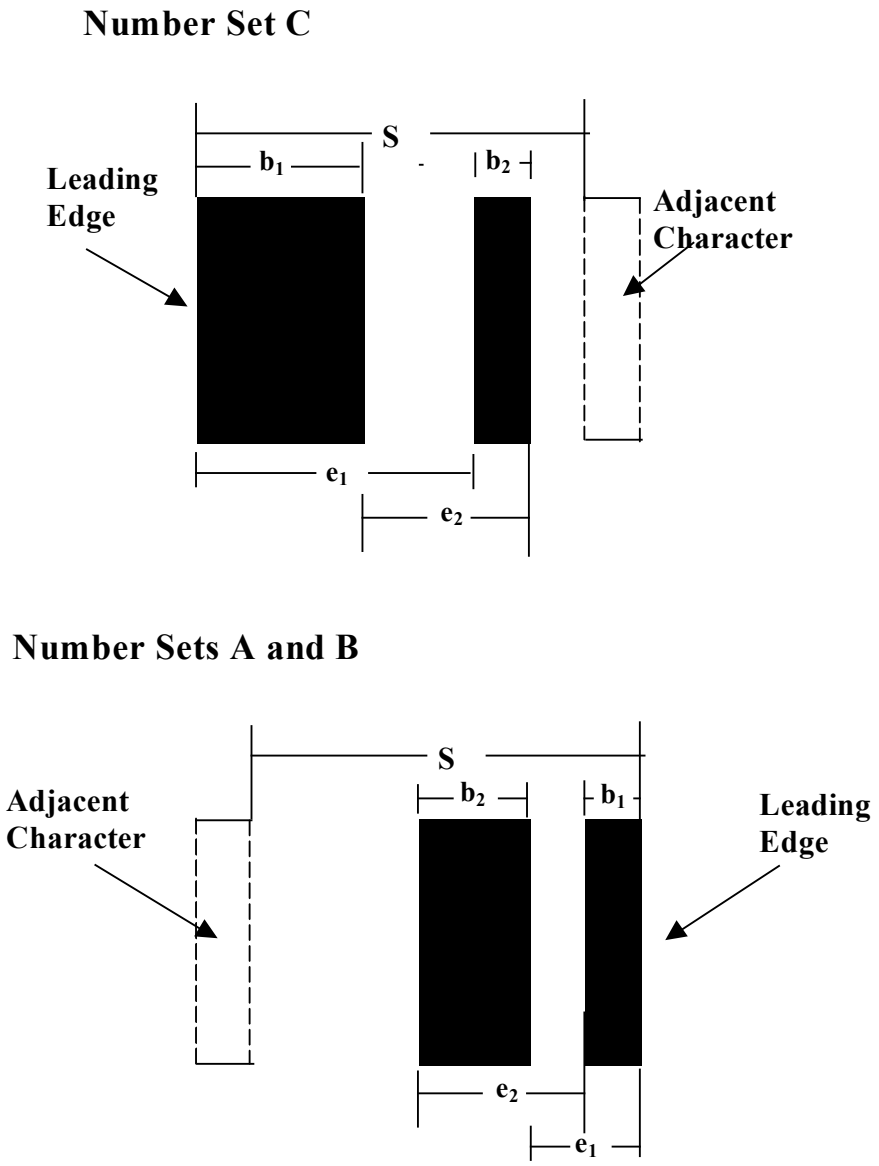


Figure 7: Symbol character decode measurements

Reference thresholds *RT1*, *RT2*, *RT3*, *RT4,* and *RT5* are given by:

RT1 = (1.5/7)*S*;

RT2 = (2.5/7)*S*;

RT3 = (3.5/7)*S*;

RT4 = (4.5/7)*S*;

RT5 = (5.5/7)*S*.

Within each character, the measurements *e1* and *e2* are compared with the reference thresholds. The corresponding integer values *E1* and *E2* are considered to be equal to 2, 3, 4, or 5 as follows:

If *RT1* <= e_i < *RT2*, E_i = 2;

If *RT2* <= e_i < *RT3*, E_i = 3;

If *RT3* <= e_i < *RT4*, E_i = 4;

If *RT4* <= e_i < *RT5*, E_i = 5.

Otherwise the character is in error.

In Table 11, use the values of *E1* and *E2* as the primary determinant for the symbol character value.

Table 11: EAN/UPC decoding table

Character	Number set	Primary determinant		Secondary determinant
		E1	E2	$7(b_1 + b_2)/S$
0	A	2	3	
1	A	3	4	<= 4
2	A	4	3	<= 4
3	A	2	5	
4	A	5	4	
5	A	4	5	
6	A	5	2	
7	A	3	4	>4
8	A	4	3	>4
9	A	3	2	
0	B and C	5	3	
1	B and C	4	4	>3
2	B and C	3	3	>3
3	B and C	5	5	
4	B and C	2	4	
5	B and C	3	5	
6	B and C	2	2	
7	B and C	4	4	<= 3
8	B and C	3	3	<= 3
9	B and C	4	2	

NOTE: b_1 and b_2 are the widths of the two bar (dark bar) elements

The character is uniquely determined for all combinations of *E1* and *E2* except for the following four cases:

E1 = 3 and *E2* = 4 (Characters 1 and 7 in number set A);

E1 = 4 and *E2* = 3 (Characters 2 and 8 in number set A);

E1 = 4 and *E2* = 4 (Characters 1 and 7 in number sets B and C);

E1 = 3 and *E2* = 3 (Characters 2 and 8 in number sets B and C).

These cases require that the combined width of the two bars (dark bars) be tested as follows:

For *E1* = 3 and *E2* = 4:

Character is "1" if: 7 x ($b_1 + b_2$) / *S* <= 4;

Character is "7" if: 7 x ($b_1 + b_2$) / *S* > 4.

For *E1* = 4 and *E2* = 3:

Character is "2" if: 7 x ($b_1 + b_2$) / *S* <=4;

Character is "8" if: 7 x ($b_1 + b_2$) / *S* > 4.

For *E1* = 4 and *E2* = 4:

Character is "1" if: 7 x ($b_1 + b_2$) / *S* > 3;

Character is "7" if: 7 x ($b_1 + b_2$) / *S* <= 3.

For *E1* = 3 and *E2* = 3:

Character is "2" if: 7 x ($b_1 + b_2$) / *S* > 3;

Character is "8" if: 7 x ($b_1 + b_2$) / *S* <= 3.

The requirements on ($b_1 + b_2$) are shown in Table 11.

The same procedures shall be used to decode the symbol characters in any add-on symbol.

Use Figure 8, to determine the appropriate S measurement for calculating the reference threshold values *RT1* and *RT2* applicable to the auxiliary patterns of the main symbol. For each symbol or half symbol the measurements of the appropriate auxiliary pattern e_i values are then compared to the reference thresholds to establish the integer *Ei* values. The determined values of *E1, E2, E3,* and *E4* shall match those of valid auxiliary patterns as shown in Table 12. Otherwise the symbol is in error.

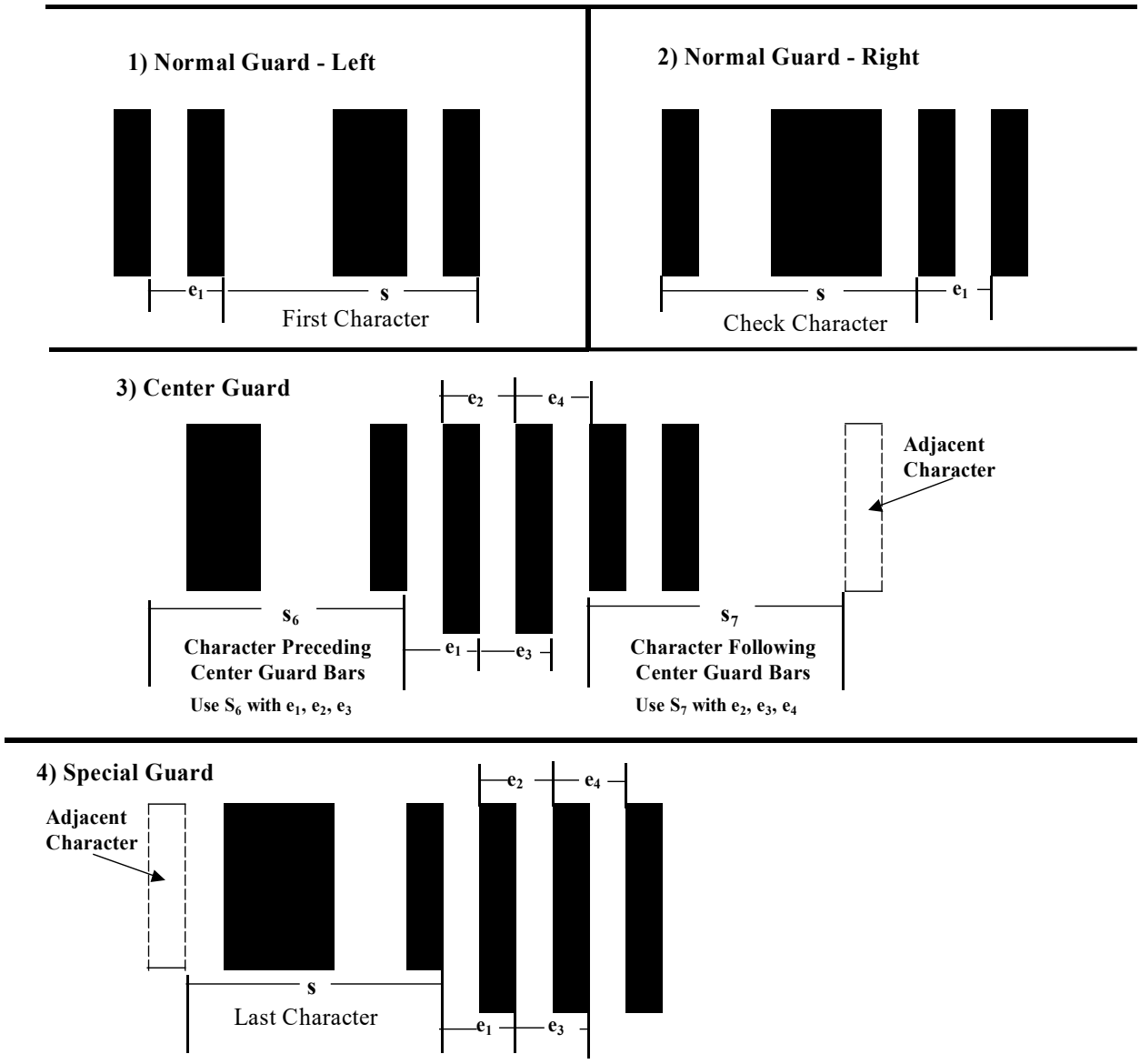


Figure 8: Auxiliary Pattern Measurements

Table 12: Main symbol auxiliary pattern E values

Auxiliary guard patterns	***E1***	***E2***	***E3***	***E4***
Normal guard pattern	2			
Centre (left half)	2	2	2	
Centre (right half)		2	2	2
Special guard pattern	2	2	2	2

3. HUMAN-READABLE INTERPRETATION

The human-readable digits shall be printed underneath the main symbol and above the add-on. A clearly legible font shall be used for the human-readable digits, and OCR-B as defined in ISO 1073-2 is recommended. This font is referenced only as a convenient standard typeface, and it is not intended that these characters be machine read or verified. Reasonable alternative type fonts and character sizes are acceptable provided the interpretation is clearly legible.

All the encoded digits for EAN-13, UPC-A, EAN-8, and the add-on symbols shall be shown in human-readable form. For UPC-E symbols, the six digits directly encoded together with the leading zero and the implicitly encoded check digit shall be shown in human-readable form. Figures 1, 2, 3, 4, 5, and 6 illustrate each type of symbol including the human-readable digits.

The height of the digits in the nominal size symbol is 2.75 mm. The minimum space between the top of the digits and the bottom of the bars (dark bars) shall be 0.5X. Normally the minimum is one module, which is close enough to keep the human-readable associated with the symbol.

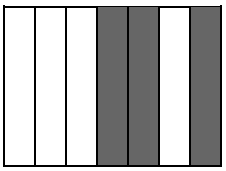
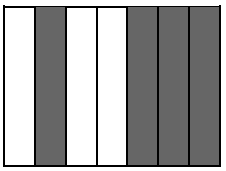
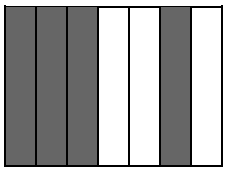
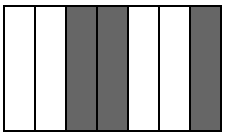
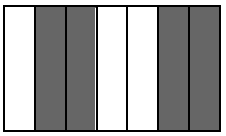
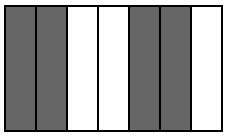
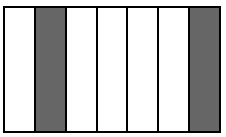
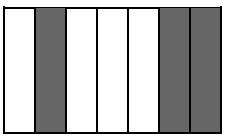
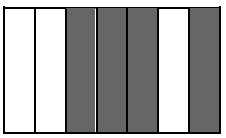
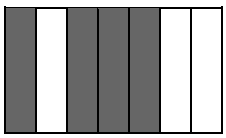
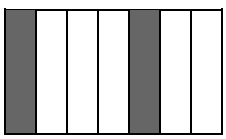
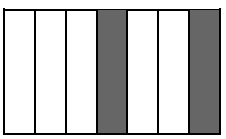
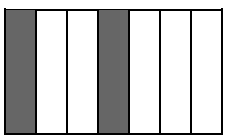
In the EAN-13 symbol, the leftmost digit, which is encoded by variable parity, is printed to the left of the start guard pattern in line with the other digits.

For UPC-A and UPC-E symbols, the size of the first and last digits should be reduced to a maximum width equivalent to 4 modules. The height is reduced proportionally. The right-hand side of the first digit is positioned 5 module widths to the left of the leftmost guard bar. The left-hand side of the last digit is positioned 5 module widths to the right of the rightmost guard bar for UPC-A symbols and 3 module widths for UPC-E symbols. The bottom edge of the first and last digit shall be aligned with the remaining full size digits.

The human-readable interpretation of the add-on symbol shall be above it. The digits shall be the same height as those of the main symbol. The upper edges of the digits are aligned with the upper edges of the bars (dark bars) of the main symbol. The minimum space between the bottom of the digits and the top of the bars (dark bars) shall be 0.5X.

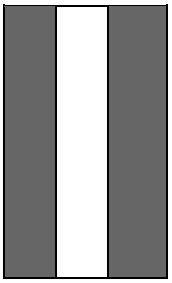
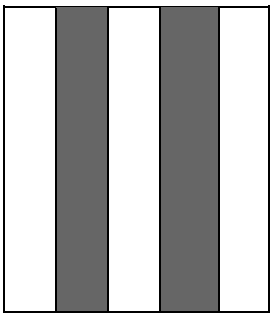
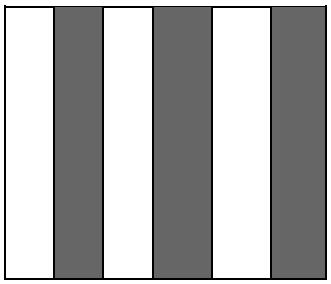
Some industries use specific variations to the recommended human-readable interpretation such as inserted hyphens to segment the number field. One example of this is shown in Appendix 7.

APPENDIX 1: CHARACTER VALUES IN THE EAN/UPC SYMBOLOGY

Value of Character	**Number set A (odd)**	**Number set B (even)**	**Number set C (even)**
0			
1			
2			
3			
4			
5			
6			
7			
8			

9			

APPENDIX 2: AUXILIARY CHARACTERS IN THE EAN/UPC SYMBOLOGY

Auxiliary Character	
Normal Guard Pattern **(right and left)**	
Centre Pattern	
UPC-E **Right Guard Pattern**	

APPENDIX 3: LOGICAL STRUCTURE OF AN EAN-13 & UPC-A SYMBOL EXCLUDING QUIET ZONES (LIGHT MARGINS)

Logical Structure of an EAN-13 or UPC-A symbol				
Left guard pattern	Characters 12 through 7 (left half)	Centre pattern	Characters 6 through 1 (right half)	Right guard pattern
3 modules	42 modules (6x7)	5 modules	42 modules (6x7)	3 modules
Total number of modules = 95				

Character Position												
Value of the 13th character	Number set used for representing characters 12 through 7						Number set used for representing characters 6 through 1					
	12	11	10	9	8	7	6	5	4	3	2	1
0	A	A	A	A	A	A	ALWAYS USE NUMBER SET C					
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						

APPENDIX 4: LOGICAL STRUCTURE OF AN EAN-8 SYMBOL EXCLUDING QUIET ZONES (LIGHT MARGINS)

Logical Structure of an EAN-8 symbol				
Left guard pattern	Characters 8 through 5 (left half)	Centre pattern	Characters 4 through 1 (right half)	Right guard pattern
3 modules	28 modules (4x7)	5 modules	28 modules (4x7)	3 modules
Total number of modules = 67				

Character Position							
Number set used for representing characters 8 through 5				Number set used for representing characters 4 through 1			
8	7	6	5	4	3	2	1
ALWAYS USE NUMBER SET A				ALWAYS USE NUMBER SET C			

APPENDIX 5: LOGICAL STRUCTURE OF A UPC-E SYMBOL EXCLUDING QUIET ZONES (LIGHT MARGINS)

Logical Structure of an UPC-E symbol		
Normal guard pattern	Six symbol characters (note the use of variable parity)	Special UPC-E guard pattern
3 modules	42 modules (6x7)	6 modules
Total number of modules = 51		

Value of prefix digit	Value of check digit	Number Sets used for coding UPC-E symbol					
		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

APPENDIX 6: SYMBOL FORMATS AT NOMINAL DIMENSIONS (NOT TO SCALE)

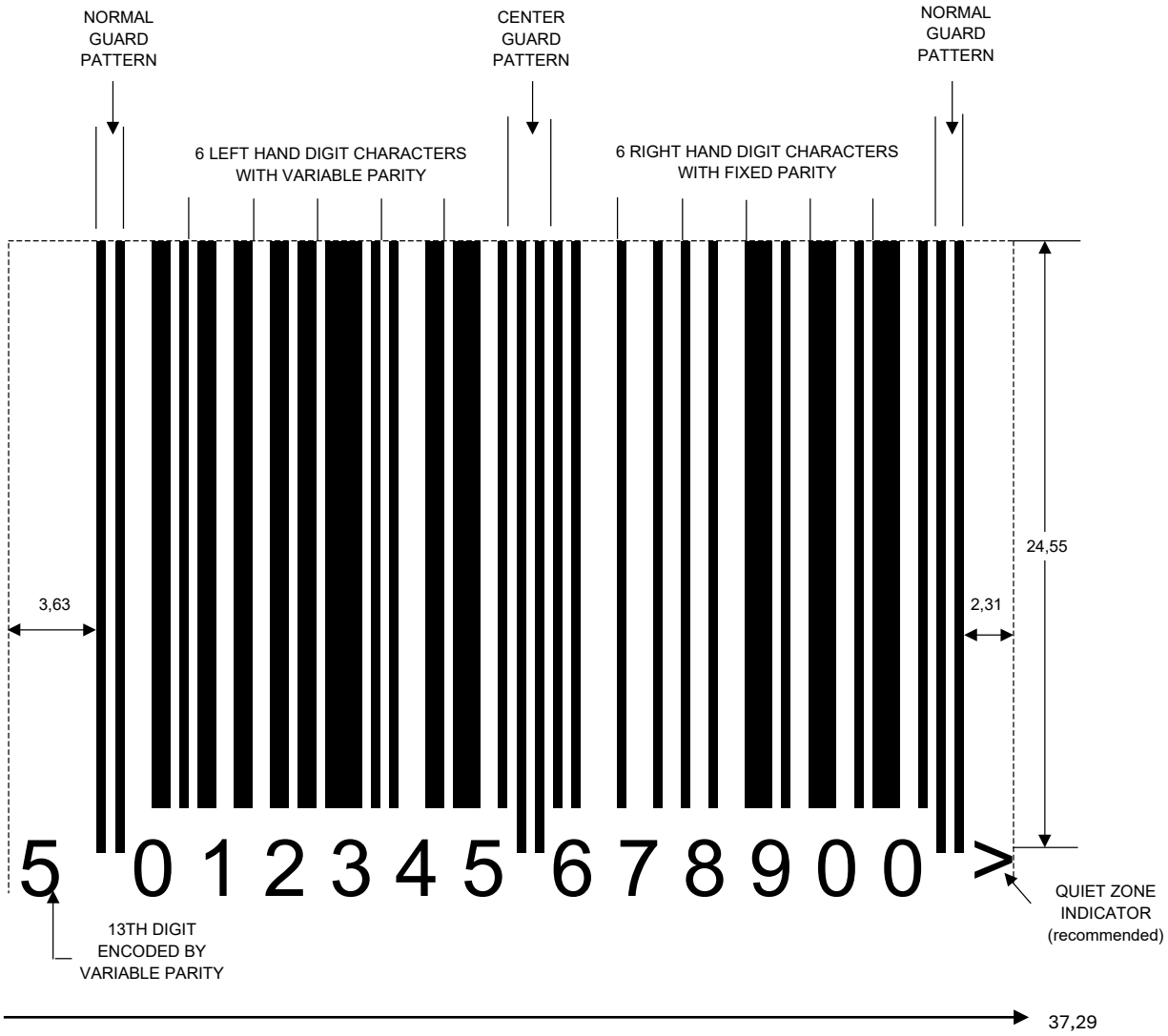


Figure 1: EAN-13 Symbol

Figure 2: UPC-A Symbol[1]

[1] The space between the bottom of the bars (dark bars) and the top of the human-readable is 0.31 mm. This is shown in the UPC-A symbol and the UPC-A Example Variation symbol, but is valid for all symbols within Appendix 7. 0.33 mm is historically accurate and acceptable for EAN-13 symbols.

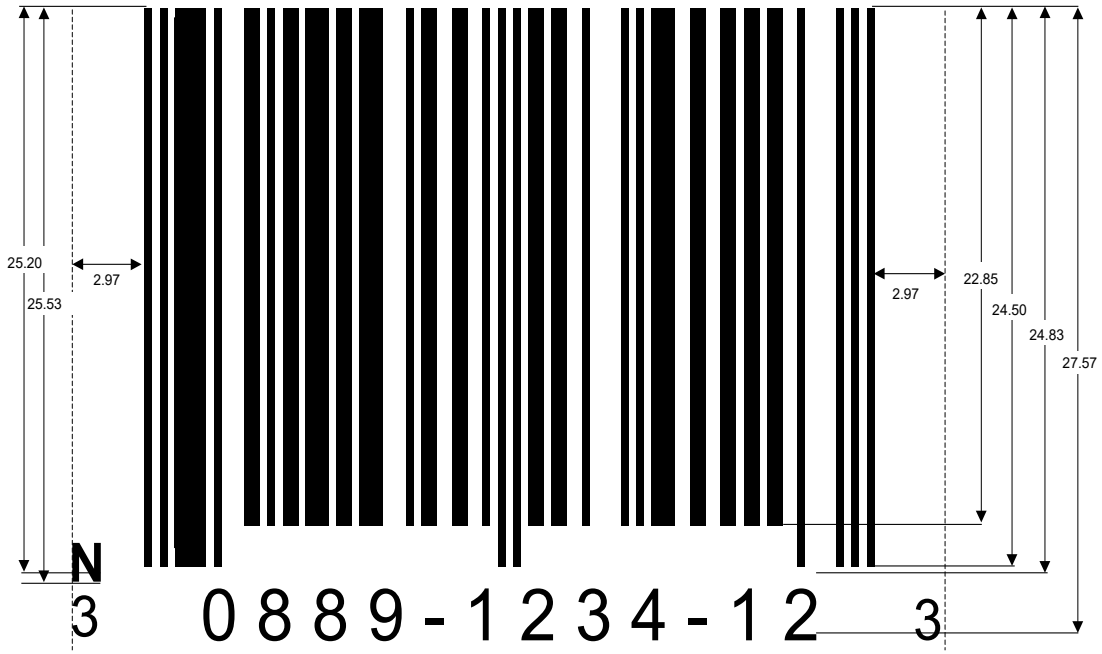


Figure 3: UPC-A Example Variation[2]

[2] The space between the bottom of the bars (dark bars) and the top of the human-readable is 0.31 mm. This is shown in the UPC-A symbol and the UPC-A Example Variation symbol, but is valid for all symbols within Appendix 7. 0.33 mm is historically accurate and acceptable for EAN-13 symbols. Used with EAN•UCC prefix 03 – USA National application, denoting national drug number.

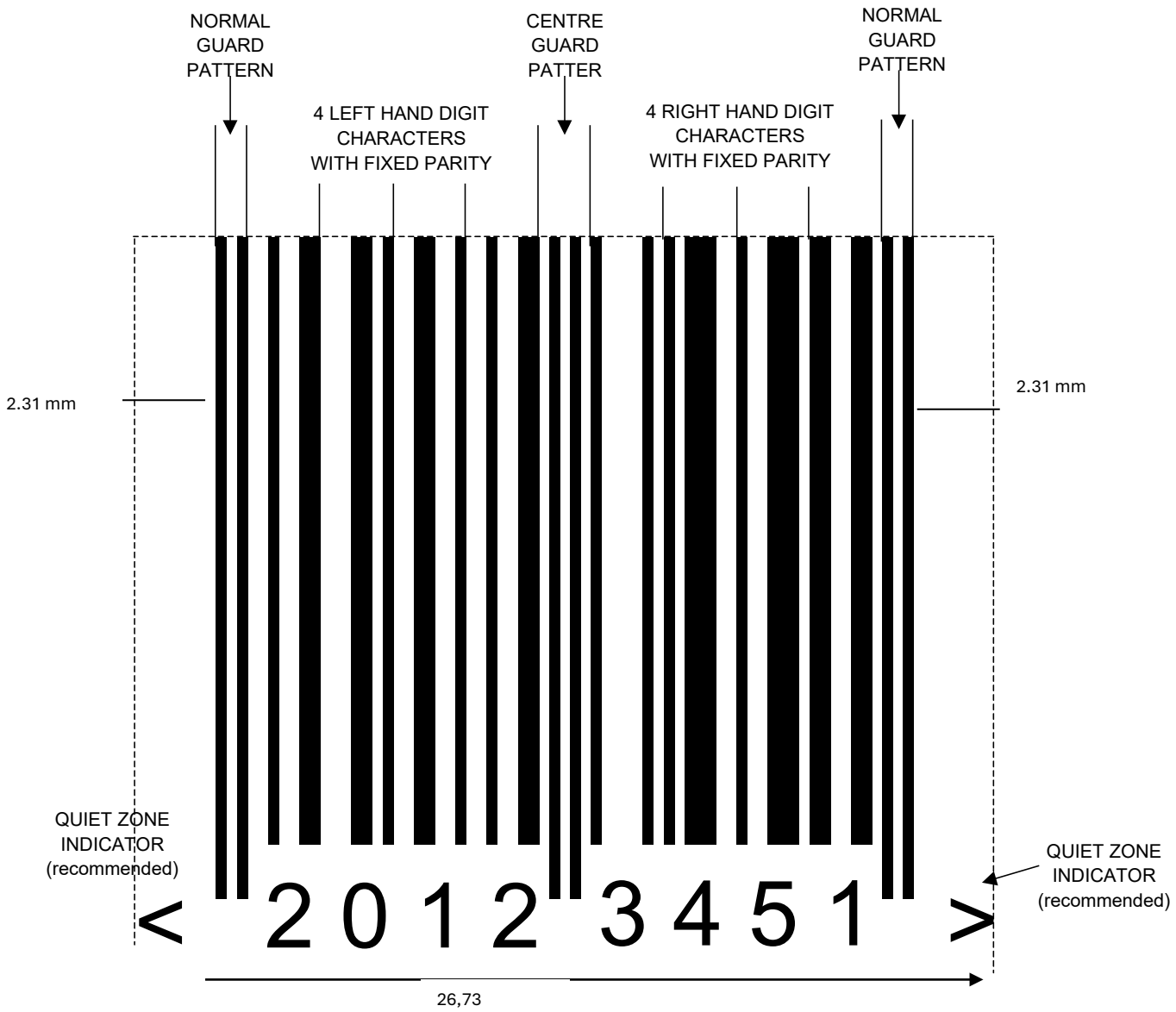


Figure 4: EAN-8 Symbol

Figure 5: UPC-E Symbol

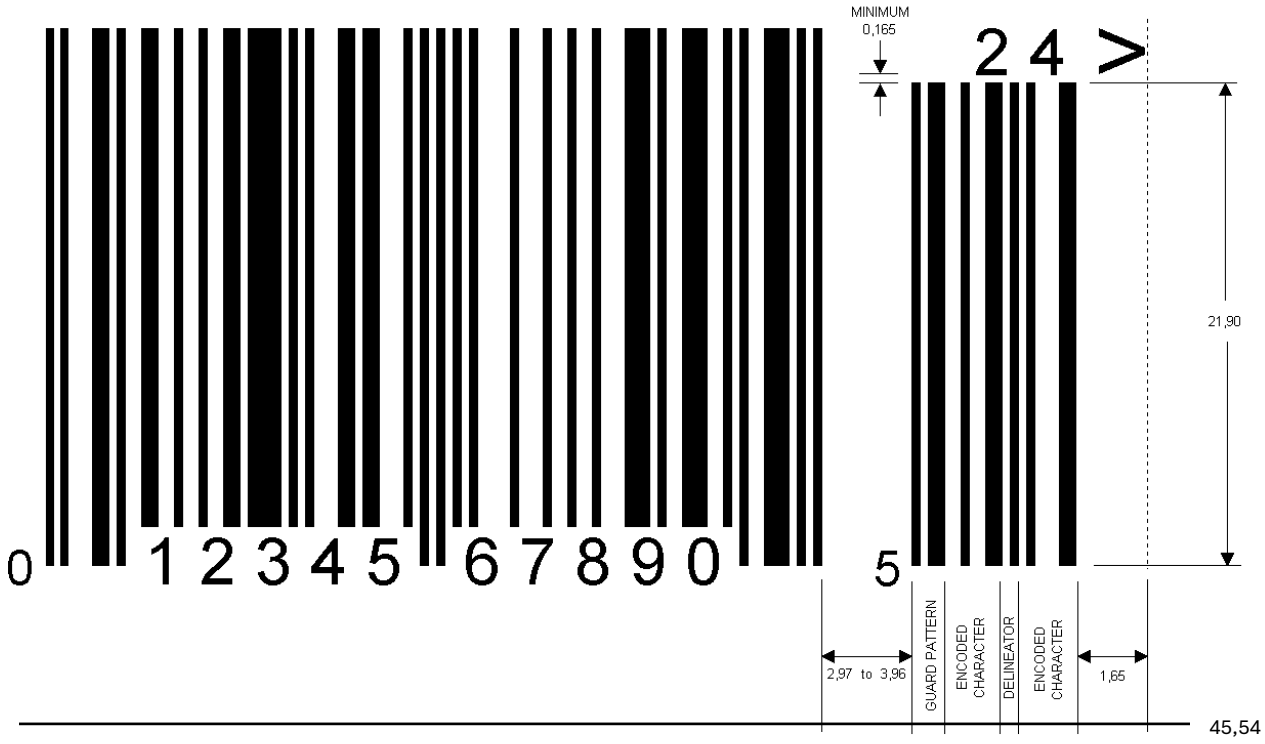


Figure 6: UPC-A with 2-digit add-on

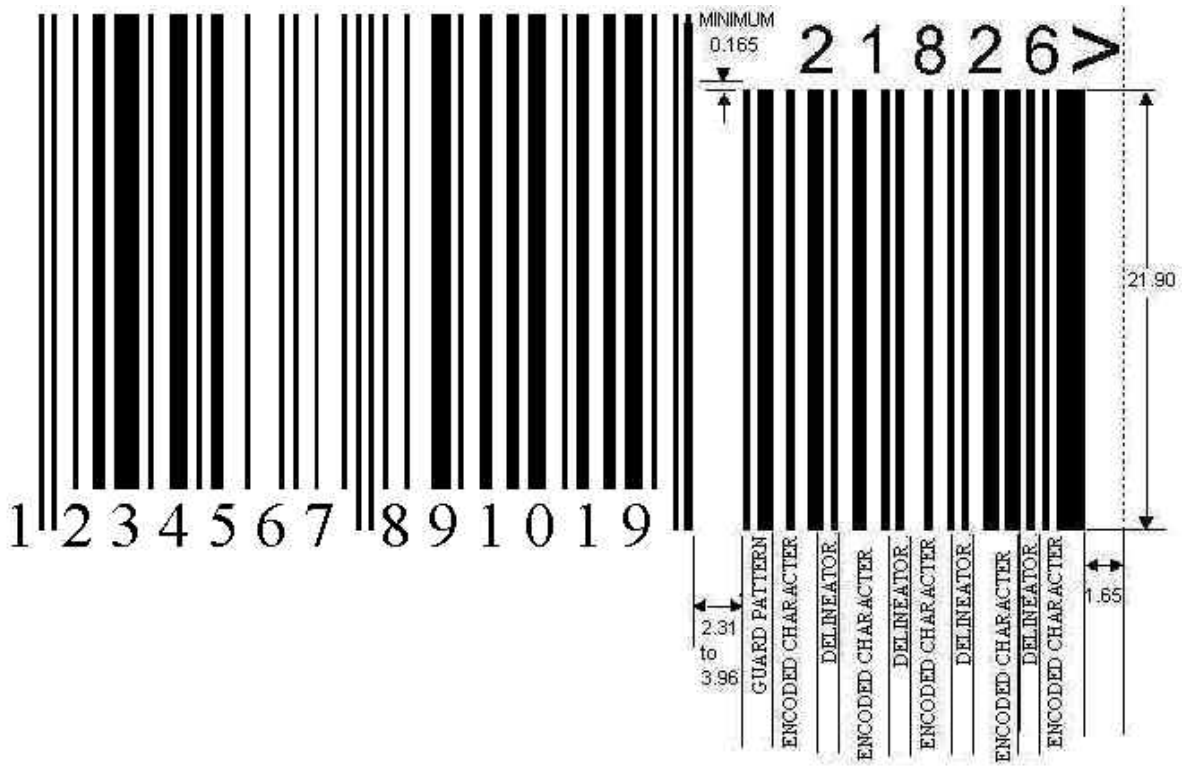


Figure 7: EAN-13 with 5-digit add-on

54,45

APPENDIX 7: DIMENSIONS OF MODULES AND SYMBOLS AT DIFFERENT LEVELS OF MAGNIFICATION FACTOR

Magnification factor	Module width (ideal) [mm]	**EAN-13/UPC-A** dimensions [mm]		**EAN-8** dimensions [mm]	
		Width	Height	Width	Height
0.80	0.264	29.83	20.73	21.38	17.05
0.85	0.281	31.70	22.02	22.72	18.11
0.90	0.297	33.56	23.32	24.06	19.18
0.95	0.313	35.43	24.61	25.39	20.24
1.00	0.330	37.29	25.91	26.73	21.31
1.05	0.346	39.15	27.21	28.07	22.38
1.10	0.363	41.02	28.50	29.40	23.44
1.15	0.379	42.88	29.80	30.74	24.51
1.20	0.396	44.75	31.09	32.08	25.57
1.25	0.412	46.61	32.39	33.41	26.64
1.30	0.429	48.48	33.68	34.75	27.70
1.35	0.445	50.34	34.98	36.09	28.77
1.40	0.462	52.21	36.27	37.42	29.83
1.45	0.478	54.07	37.57	38.76	30.90
1.50	0.495	55.94	38.87	40.10	31.97
1.55	0.511	57.80	40.16	41.43	33.03
1.60	0.528	59.66	41.46	42.77	34.10
1.65	0.544	61.53	42.75	44.10	35.16
1.70	0.561	63.39	44.05	45.44	36.23
1.75	0.577	65.26	45.34	46.78	37.29
1.80	0.594	67.12	46.64	48.11	38.36
1.85	0.610	68.99	47.93	49.45	39.42
1.90	0.627	70.85	49.23	50.79	40.49

1.95	0.643	72.72	50.52	52.12	41.55
2.00	0.660	74.58	51.82	53.46	42.62
Note: Refer to Chapter 5, Section 5.4, for the minimum, nominal, and maximum *X* dimensions and symbol heights for EAN/UPC symbols.					

Chapter 5, Section 2:

ITF-14 Symbology Specifications

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1. STRUCTURE AND DIMENSIONS

1.1 Symbology characteristics

In the EAN•UCC system the characteristics of ITF-14 are:

1) Encodable character set: numeric 0 to 9 (ASCII characters 48 - 57 inclusive, in accordance with ISO 646);

2) Code type: continuous;

3) Elements per symbol character: 5 (2 wide and 3 narrow) encoded as either five bars (dark bars) or five spaces (light bars);

4) Character self-checking: yes; (see Chapter 8, Glossary of Terms for definition)

5) Data string length encodable: variable (even number of characters)
Note: ITF-14 is fixed length at 14 digits;

6) Bidirectionally decodable: yes;

7) Symbol/data check character: one, required (see Chapter 5, Section 3, Appendix 1);

8) Symbol character density for ITF-14 is 16 to 18 modules per symbol character pair, depending on wide/narrow ratio. The value is 16 based on the target ratio of 2.5 to 1;

9) Non-data overhead is 8 to 9 modules, depending on wide/narrow ratio. The value is 8.5 based on the target ratio of 2.5 to 1.

1.2 Symbol structure

Interleaved 2 of 5 symbols comprises:

1) leading quiet zone (light margin);

2) start pattern;

3) seven pairs of symbol characters representing data;

4) stop pattern;

5) trailing quiet zone (light margin).

1.3 Character encodation

1.3.1 Data character encodation

Table 1 defines the Interleaved 2 of 5 character encodation. In the column “Binary representation", the character 1 is used to represent a wide element and 0 a narrow element.

Table 1: Binary representation of character encodation

Data character	Binary representation				
0	0	0	1	1	0
1	1	0	0	0	1
2	0	1	0	0	1
3	1	1	0	0	0
4	0	0	1	0	1
5	1	0	1	0	0
6	0	1	1	0	0
7	0	0	0	1	1
8	1	0	0	1	0
9	0	1	0	1	0

Table 1 uses a modified binary coded decimal encoding scheme. The four left-most bit positions for each character are assigned weights of 1, 2, 4, and 7, from left to right; the fifth position is used for an even parity bit. The sum of the positional weights of the '1' bits is equivalent to the data character value, except in the case of the data character 0, where the weights 4 and 7 are applied. The parity bit ensures that there are always two '1' bits per character.

The following algorithm defines the rules to convert numeric data into the symbol characters of an Interleaved 2 of 5 symbol (Numeric data = GTIN and therefore already contains the check digit):

0367123456789

Step in Algorithm	Example
1) Calculate check character for 0367123456789	
2) With ITF-14 the data string, including check digit, will always be a 14 digit number. The leftmost four digits of this GTIN are 0367.	367 0367
3) Subdivide the numeric string into digit pairs. The leftmost four digits of the GTIN are 0367;	0367 03 and 67
4) Encode the digit pairs as follows:	
a) Encode the leading digit of each pair into bar patterns as shown in Table 1;	0 and 6 3 and 7
b) Encode the second digit of each pair into space patterns as shown in Table 1;	
5) Form each symbol character pair by taking the bar (dark bar) and space (light bar) elements alternately from the patterns derived from Steps 4a and 4b, commencing with the first bar (dark bar) of the pattern for the first digit, followed by the first space (light bar) of the pattern for the second digit.	

Figure 1 illustrates the sequence of bar (dark bar) and space (light bar) elements corresponding to the data character pairs "03 67".

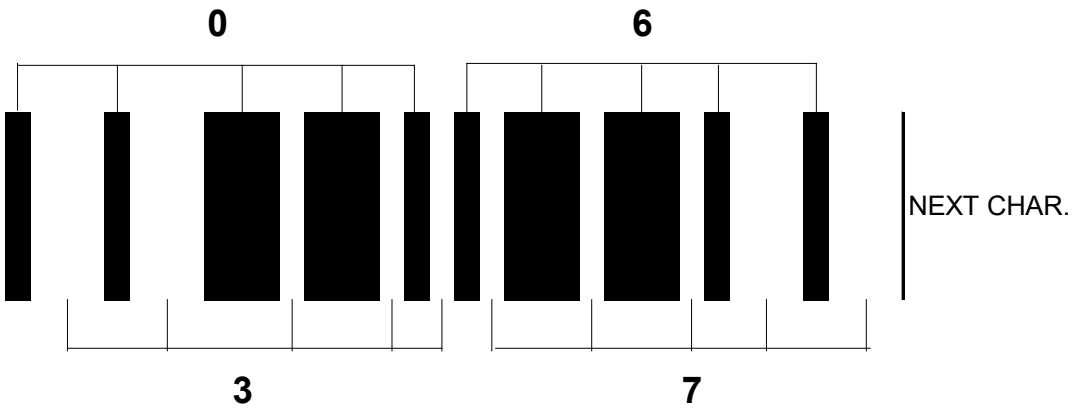


Figure 1: Interleaved 2 of 5 character pairs, encoding "03 67"

1.3.2 Start and stop patterns

The start pattern shall consist of four narrow elements in the sequence bar (dark bar) - space (light bar) - bar (dark bar) - space (light bar). The stop pattern shall consist of a wide bar (dark bar) - narrow space (light bar) - narrow bar (dark bar) sequence.

The start pattern shall be positioned at the normal left end of the data symbol characters adjacent to the first bar (dark bar) of the most significant digit. The stop pattern shall be positioned at the normal right end of the data symbol characters adjacent to the final space (light bar) of the least significant digit.

There is no assigned human readable interpretation of the start and stop patterns, and they shall not be transmitted by the decoder.

Figure 2 illustrates the start and stop patterns and their relationship to the symbol data characters.

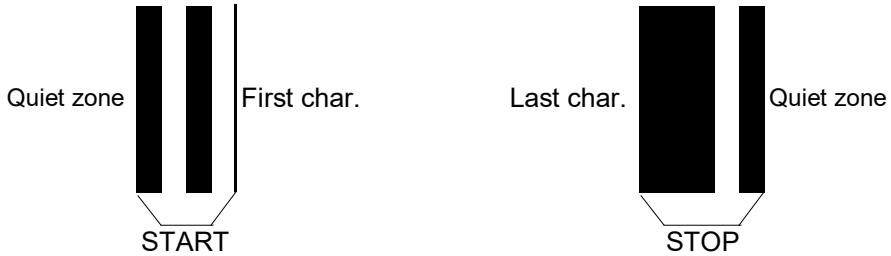


Figure 2: Start and stop patterns

Figure 3 illustrates a complete bar code symbol for the number 1234 showing the necessary quiet zones (light margins).

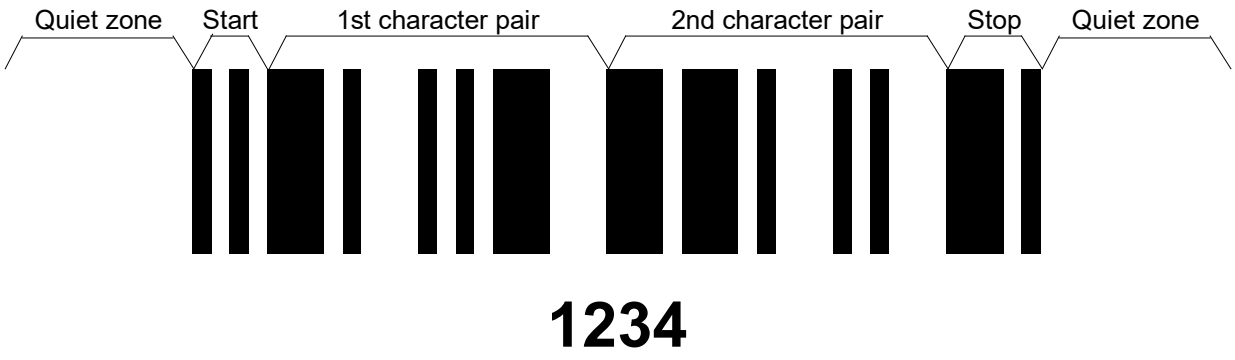


Figure 3: Interleaved 2 of 5 symbol inclusive of quiet zones (light margins)

1.3.3 Symbol/Data check character

The symbol/data check character is required in ITF-14. Chapter 3, Appendix 1 defines the check character position and calculation.

1.4 Dimensions and Tolerances

Interleaved 2 of 5 symbols shall use the following target dimensions:

width of narrow element (*X*): the *X* dimension of Interleaved 2 of 5 symbols may be defined by the application specification in accordance with the needs of the application in question. Refer to Chapter 5, Section 4, Sub-Section 1.2 for specification by application area.

In the ITF-14 target size the theoretical widths of the bars (light or dark) are:

Narrow bar = 1.016 mm (0.04 inch)

Wide bar = 2.540 mm (0.10 inch). The target width of the wide bars (dark bars) is 2.5 times the width of the narrow bars (dark bars).

The target width of an ITF-14 symbol ten element character pair is 16.256 mm (0.64 inch), and the corresponding widths of auxiliary characters are:

Start Guard = 4.064 mm (0.16 inch)

Stop Guard = 4.572 mm (0.18 inch)

The quiet zones (light margins) to the right and left of the symbol are compulsory. The minimum width of the quiet zone (light margin) is 10X. Both quiet zones (light margins) in an ITF-14 symbol have target widths of 10.2 mm (0.40 inch).

A minimum clear area of 1 mm (0.04 inch) between the bottom line of the bearer bar and the top of the human readable characters is to be observed.

For ITF-14 symbols, the height of the bars (dark bars) in the target size symbol is 31.8 mm (1.25 inch).

Note: All dimensions given are ideal and theoretical values corresponding to the target size of symbols as used in the general distribution operating environment. These dimensions are not intended to be used directly in the preparation of symbols.

The width, *W* (in millimetres) of an Interleaved 2 of 5 symbol, including quiet zones (light margins), can be calculated from the following expression:

$$W=(P(4N+6)+N+6)X+2Q$$

where:

P is the number of character pairs;

N is the wide/narrow ratio;

X is the width of a narrow element in millimetres;

Q is the width of the quiet zone (light margin) in millimetres.

An ITF-14 symbol has 7 character pairs, a target wide/narrow ratio of 2.5:1, a target *X* width of 1.016 mm (1.04 inch), and quiet zone (light margin) widths of 10.2 mm (0.40 inch). This corresponds to a total symbol width of 142.748 mm (5.8 inch).

1.5 Reference decode algorithm

Bar code reading systems are designed to read imperfect symbols to the extent that practical algorithms permit. This section describes the reference decode algorithm used in the computation of the decodability value described in ISO/IEC 15416.

Decodability shall be determined as follows:

1. Within each ITF-14 symbol character (representing two digits) sort the bars (b_i) and spaces (s_i) such that:

   $b_1<b_2<b_3<b_4<b_5$

   $s_1<s_2<s_3<s_4<s_5$

2. The determined X dimension denoted Z is given by:

   $Z = b_1 + b_2 + b_3 + s_1 + s_2 + s_3 / 6$

3. Separation value V_1 is:

   $V_1 = (d/Z) – 0.5$
   where d = the smaller of $(b_4 – b_3)$ or $(s_4 – s_3)$

4. Uniformity value V_2 is:

   $V_2 = 1 – u/Z$
   where u = the largest of:

   $b_5 – b_4$

   $b_3 – b_1$

   $s_5 – s_4$

   $s_3 – s_1$

5. Narrowest element value V_3 is:

   $V_3 = [(n/Z) – 0.25] / 0.75$
   where n = the smaller of s_1 or b_1

6. For each symbol character, determine the decodability value V is the smallest of V_1, V_2, or V_3.

7. The scan profile decodability value is the smallest value of V measured in a scan reflectance profile. The reference decode algorithm fails when V exhibits a negative value.

8. The decodability grade for each profile is determined from the decodability value according to Table 3 of ANSI X3.182.

1.6 Interleaved 2 of 5 (ITF-14) Symbol version

1.6.1 Bearer bar

The purpose of the bearer bar is 1) to equalise the pressure exerted by the printing plate over the entire surface of the symbol, and 2) to enhance the reading reliability by assisting in the reduction of the probability of misreads or short scans which may occur when a skewed scanning beam enters or exits the symbol through the top or bottom edge.

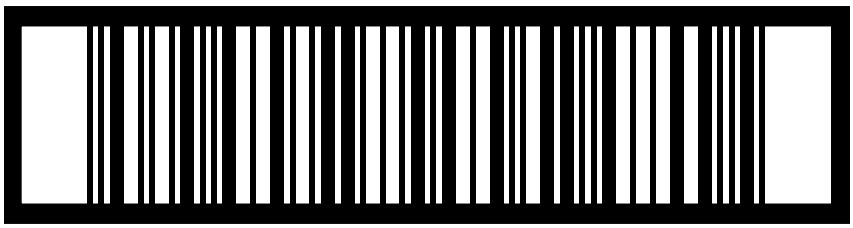
The bearer bar is mandatory unless it is not technically feasible to apply it (in which case reading reliability will be reduced).

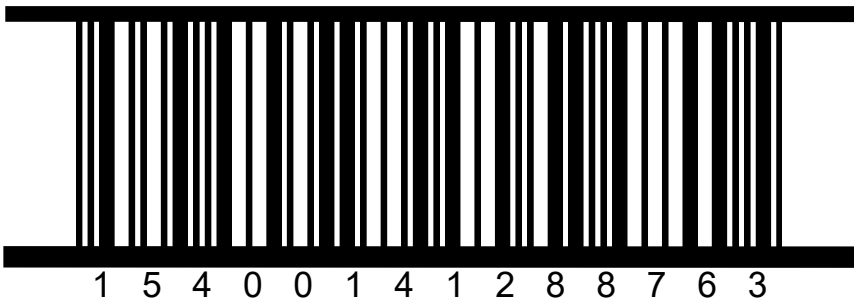
For printing methods requiring printing plates, the nominal bearer bar has a constant thickness of 4.8 mm (0.19 inch) and must completely surround the symbol, including its quiet zones (light margins), and butt directly against the top and bottom of the bars (dark bars) of the symbol.

For printing methods that do not require printing plates, the bearer bar should be a minimum of twice the width of a narrow bar (dark bar) and need only appear at the top and bottom of the symbol, butting directly against the top and bottom of the symbol bars (dark bars). The bearer bar may extend above and below the quiet zones(light margins). However, it is not mandatory to print the vertical sections of the bearer bar.

To determine the optimum magnification factor and bar width reduction for a given print environment, please refer to Chapter 5, Section 4, Appendix 5, page 47.

Examples:




1 5 4 0 0 1 4 1 2 8 8 7 6 3

1.7 Human-readable interpretation

A clearly legible, human-readable interpretation (proportional to the size of the symbol) of the data characters, including symbol check character should normally be printed with the symbol encoding them. Start/stop patterns have no human-readable interpretation. Character size and font are not specified, and the interpretation may be printed anywhere in the area surrounding the symbol, as long as quiet zones (light margins) are not encroached upon.

APPENDIX 1 (INFORMATIVE) ADDITIONAL FEATURES

1.1 Protection against short scans

In Interleaved 2 of 5 symbols, the bar (dark bar) patterns of the start and stop patterns may be found at the respective end and beginning of certain encoded symbol characters within the code. There is therefore no guarantee that a partial scan of the symbol will not produce a valid read for an embedded symbol having fewer characters.

In the EAN•UCC system short scans are very unlikely to happen, as the symbol must always contain 14 digits. However, a symbol containing more than 14 digits may cause a short scan of 14 digits. In this instance the data/symbol check character offers a certain security to detect this error.

These are the measures which should be taken to minimise the risk of partial read.

1.1.1 Fixed length symbols

In any application standard the number of characters encoded in an Interleaved 2 of 5 symbol should be fixed for that application, and reading or data processing equipment should be programmed to only accept messages of that defined length.

1.1.2 Bearer bars

For information regarding bearer bars, refer to Chapter 5, Section 2, Sub-Section 1.6.1.

APPENDIX 2 (INFORMATIVE) GUIDELINES FOR THE USE OF INTERLEAVED 2 OF 5

2.1 Autodiscrimination compatibility

Interleaved 2 of 5 symbols may be read by suitably programmed bar code readers that are designed to autodiscriminate them from other symbologies. The code is, in particular, fully distinguishable from, and thus compatible with, many symbologies including the ISO Standard Symbologies.

When Interleaved 2 of 5 is used in an auto-discrimination environment with Code 39 symbols, the following guidelines shall be followed:

a) The nominal intercharacter gaps in the Code 39 symbols shall be no wider than the narrow elements;

b) The reading system shall be constrained and the decoder programmed to ensure that the number of characters (including start and stop characters) in all Code 39 symbols is greater than one-half of the number of data characters in the Interleaved 2 of 5 symbols;

c) Interleaved 2 of 5 symbols shall have a minimum length of six characters in environments where they are autodiscriminated with Code 39.

The use of the recommendations in Chapter 5, Section 2, Appendix 1 will provide additional protection in an autodiscrimination environment.

The decoder's valid set of symbologies should be limited to those needed by a given application to maximize reading security.

2.2 System considerations

It is important that the various components (printers, labels, readers) making up a bar code installation operate together as a system. A failure in any component, or a mismatch between them, can compromise the performance of the overall system.

When both readers and printers are specified by a single user or by cooperative agreement (closed system), certain specified values such as *X* dimensions, intercharacter gap width, and spectral band may deviate from standard values. However, the characteristics of the printer, symbol, and reader should be matched to achieve desired performance.

APPENDIX 3 (INFORMATIVE) SYMBOLOGY IDENTIFIER

The symbology identifier allocated to Interleaved 2 of 5 in ISO/IEC 15424, which may be added as a preamble to the decoded data by a suitably programmed bar code reader, is

]I*m*

where:

] is ASCII character 93;

I (upper case I) is the code character for the Interleaved 2 of 5 symbology;

m is a modifier character

Note: The symbology identifier]I1 is the only symbology identifer used by UCC and EAN International with ITF-14. This information shall not be encoded in the bar code symbol, but should be generated by the decoder after decoding and transmitted as a preamble to the data message. The value of *m* in the symbology identifier is equal to 1 which indicates the Modulo 10 check character is validated and transmitted by the scanner.

APPENDIX 4 (INFORMATIVE) TEST SPECIFICATIONS

To verify whether a symbol meets the specifications in this EAN•UCC standard it shall be tested using the test specification defined in ISO/IEC 15416, which lays down conditions under which measurements should be made; it defines methods of determining an overall quality grade based on the attributes of the bar code symbol and determining its conformity with this Standard. For ITF-14 symbols the reference decode algorithm shall be the algorithm specified in Chapter 5, Section 2, Appendix 3. For those symbols with *x* dimension greater than 0.635 mm (0.025 inch) the minimum grade shall be:

0.5 / 20 / 670

Where 0.5 is the overall symbol quality grade

20 is the measuring aperture reference number (in this example, 0.5 mm diameter)

670 is the peak response wavelength in nanometers.

For those symbols with *x* dimension less than 0.635 mm (0.025 in) the minimum grade shall be:

1.5 / 10 / 670

Where 1.5 is the overall symbol quality grade

10 is the measuring aperture reference number (in this example 0.25 mm diameter)

670 is the peak response wavelength in nanometers.

In addition, the verifier shall determine the average wide-to-narrow ratio N for each profile. The value N should be computed character by character, then averaged over all characters in the symbol. The range indicated below is passing:

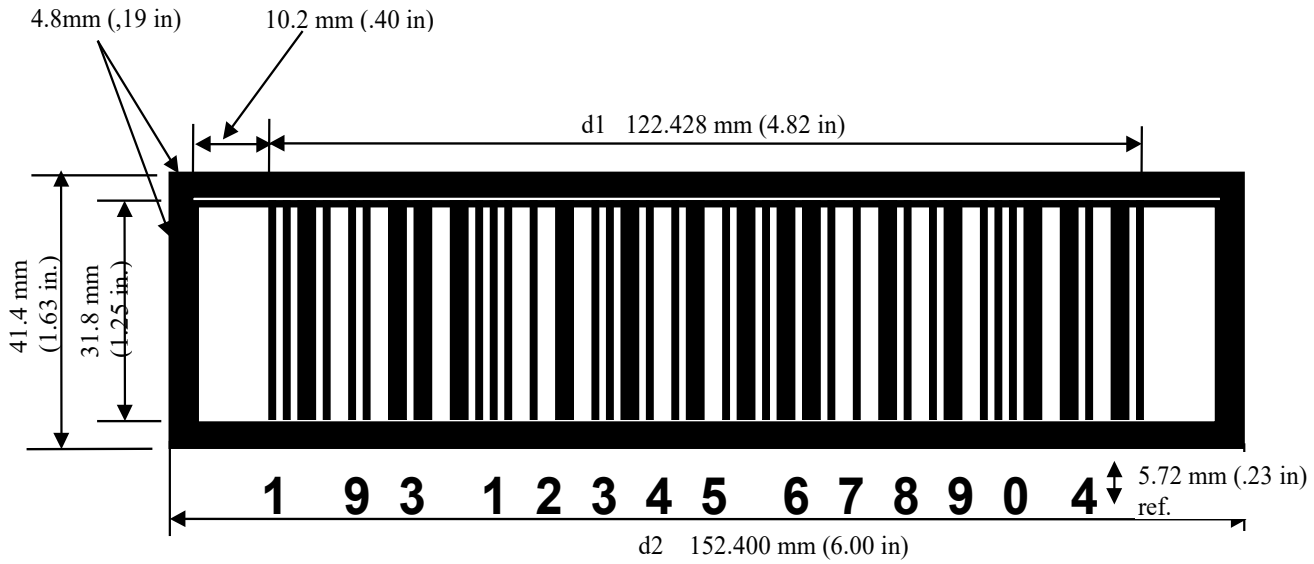
$2.25 < N < 3.00$

N is calculated for each symbol character (pair of data digits) according to the following rule:

$$N_i = 1.5*[(b_4 + b_5 + s_4 + s_5)/(b_1 + b_2 + b_3 + s_1 + s_2 + s_3)]$$

The value N for the profile would then be obtained by averaging the N_i for all characters in the symbol.

FIGURE 4.1: ITF-14 SYMBOL: MAIN DIMENSIONS AT 100% MAGNIFICATION FACTOR



This diagram is not intended to be used as a basis for measurement

Chapter 5, Section 3:

UCC/EAN-128 Symbology Specifications

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1. SYMBOLOGY CHARACTERISTICS

The UCC/EAN-128 bar code symbol has been carefully designed through joint co-operation among EAN International, the Uniform Code Council, Inc. (UCC) and Automatic Identification Manufacturers, Inc. (AIM). Use of UCC/EAN-128 symbols provides a high degree of security and distinguishes EAN•UCC element strings from extraneous non-standard bar code symbols.

The UCC/EAN-128 bar code symbology is a sub-set of the more general Code 128. By agreement among AIM, Inc., EAN International and the Uniform Code Council (UCC), the use of Function 1 (FNC1) in Code 128 symbols in the first symbol character position following the Start character has been reserved exclusively for the EAN•UCC system.

Code 128 is fully described in ISO/IEC WD 15417: *"Automatic identification and data capture – Bar code symbology specification – Code 128."* This chapter defines:

- Sections 1.1 – 6: UCC/EAN-128 symbology subset (using ISO/IEC WD 15417 for reference)
- Section 7: EAN•UCC Application defined parameters
- Section 8 EAN•UCC rules for encoding/decoding element strings in UCC/EAN-128 bar code symbols

1.1 UCC/EAN-128 Symbology characteristics

The characteristics of UCC/EAN-128 are:

a) Encodable Character Set:

1) The Code 128 ASCII characters in accordance with ISO 646. Refer to Chapter 3, Appendix 3, and Table 1 for more details.

2) Characters with ASCII values 128 - 255 may also be encoded.

Note: Characters with ASCII values 128 - 255 accessed by Function Character 4 (FNC4) are reserved for future use.

3) 4 non-data function characters

4) 4 code set selection characters (including single character code set shift)

5) 3 Start characters

6) 1 Stop character

b) Code type: Continuous

c) Elements per symbol character: 6, comprising 3 bars (dark bars) and 3 spaces (light bars), each of 1, 2, 3, or 4 modules in width. Stop character: 7 elements comprising 4 bars (dark bars) and 3 spaces (light bars)

d) Character self-checking: Yes (see Chapter 8, Glossary of Terms for definition)

e) Symbol length: Variable

f) Bi-directionally decodable: Yes

g) Symbol check character: One, mandatory (see Chapter 5, Section 3, Appendix 1.1).

h) Data character density: 11 modules per symbol character (5.5 modules per numeric character, 13 modules per stop character)

i) Non-data Overhead:

1) Note: The symbol has a special double character start pattern, consisting of the appropriate start character and immediately followed by function character 1 (FNC1). The FNC1 adds to the symbol non-data overhead: total symbol overhead is 46 modules.

2) Note: FNC1 is used within the data section in order to provide separation between element strings not contained in the predefined table.

j) UCC/EAN-128 symbol size characteristics

1) The maximum physical length is 165 mm (6.5 in) and the maximum number of data characters are specified.

2) The maximum number of data characters in a single symbol is 48.

3) For a given length of data, the symbol size is variable between limits in *X* dimension, to accommodate the ranges in quality achievable by the various printing processes.

2. UCC/EAN-128 SYMBOL STRUCTURE

The UCC/EAN-128 symbol is made up as follows, reading from left to right:

* Leading quiet zone (light margin)
* A start character (A, B or C) — the double character start pattern
* The FNC 1 character — the double character start pattern
* Data (including the Application Identifier represented in character set A, B or C)
* A symbol check character
* The stop character
* Trailing quiet zone (light margin)

The data characters represented in the symbol are shown in human readable characters underneath or above the symbol.

The general format of the symbol is shown in Figure 1.

Figure 1: General format of UCC/EAN-128 symbol

3. UCC/EAN-128 CHARACTER ASSIGNMENTS

Table 1 defines all the Code 128 character assignments. In the column ”Element Widths” the numeric values represent the widths of the elements in modules or multiples of the x dimension.

UCC/EAN-128 character assignments are identical.

3.1 Symbol character structure

The sum of the bar modules in any symbol character is always even (even parity) and that of the space modules is therefore always odd. This parity feature enables character self-checking to be carried out.

Figure 2 below illustrates Start character A.

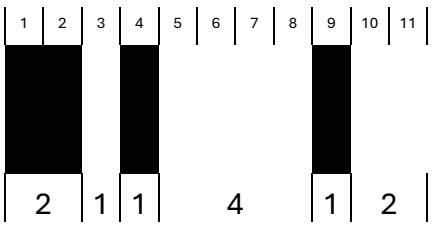


Figure 2: UCC/EAN-128 Start character A

Figure 3 below illustrates the encodation of the symbol character value 35, which represents data character "C" in Code Sets A or B or the two digits "35" in Code Set C.

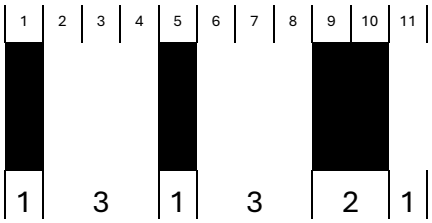


Figure 3: Symbol character value 35

Figure 4 below illustrates the Stop character.

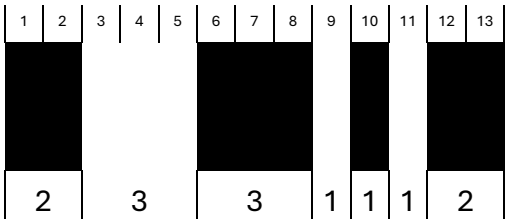


Figure 4: UCC/EAN-128 Stop character

3.2 Data character encodation

Code-128 has three character sets shown in Table 1 as A, B, and C.

UCC/EAN-128 specifies the identical character set, as defined by the International ISO/IEC 646 Standard. Refer to Chapter 3, Appendix 3, Table 1 of the *General EAN•UCC Specifications* , to ensure international compatibility.

The symbol character bar (dark bar) and space (light bar) patterns shown represent the data characters listed under the columns for Code Set A, B, or C. The choice of code sets depends on the Start character or the use of Code A, Code B, or Code C characters or the Shift character. If the symbol begins with Start character A, then Code Set A is defined initially. Code Set B and Code Set C are similarly defined by beginning the symbol with Start character B or C respectively. The code set can be redefined within the symbol by the use of Code A, Code B, and Code C characters or the Shift character (see Chapter 5, Section 3, Sub-Section 3.4.1 for the use of these special characters).

The same data may be represented by different Code 128 symbols through the use of different combinations of Start, Code Set, and Shift characters. The individual

applications do not specify Code Sets A, B or C. Chapter 5, Section 3, Appendix 3 contains rules to minimise the length of the symbol for any given data.

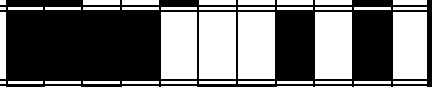
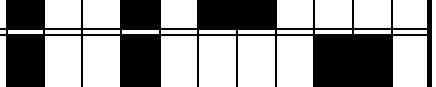
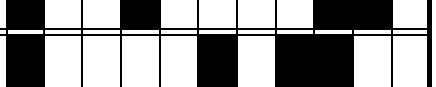
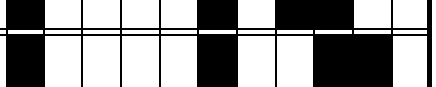
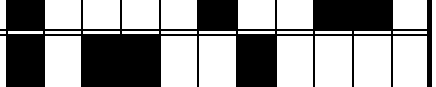
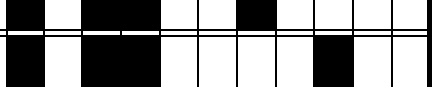
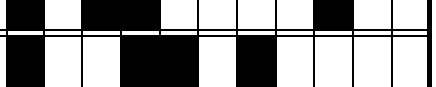
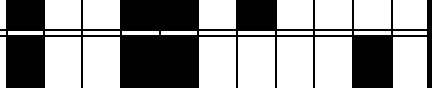
Each symbol character is assigned a numeric value listed in Table 1. This value is used in calculating the symbol check character value. It may also be used to provide a conversion to and from ASCII values (see Chapter 5, Section 3, Appendix 2).

Table 1: Code 128 character encodation

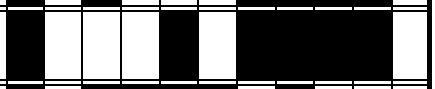
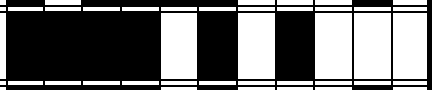
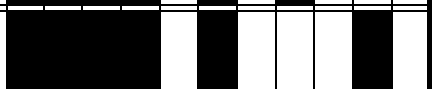
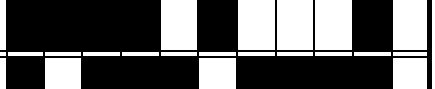
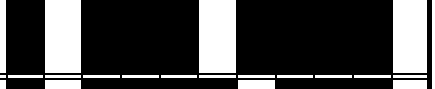
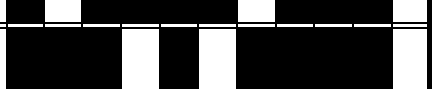
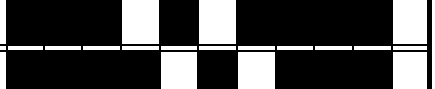
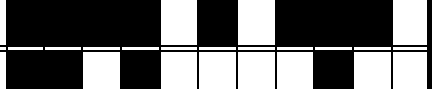
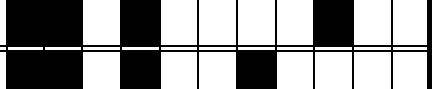
SYMBOL CHAR. VALUE	CODE SET A	ASCII VALUE for Set A	CODE SET B	ASCII VALUE for Set B	CODE SET C	ELEMENT WIDTHS (modules)						ELEMENT PATTERN										
						B	S	B	S	B	S	1	2	3	4	5	6	7	8	9	10	11
0	space	32	space	32	00	2	1	2	2	2	2	■	■		■	■			■	■		
1	!	33	!	33	01	2	2	2	1	2	2	■	■			■	■		■	■		
2	"	34	"	34	02	2	2	2	2	2	1	■	■			■	■			■	■	
3	#	35	#	35	03	1	2	1	2	2	3	■			■			■	■			
4	$	36	$	36	04	1	2	1	3	2	2	■			■				■	■		
5	%	37	%	37	05	1	3	1	2	2	2	■				■			■	■		
6	&	38	&	38	06	1	2	2	2	1	3	■			■	■			■			
7	apo-strophe	39	apo-strophe	39	07	1	2	2	3	1	2	■			■	■				■		
8	(	40	(	40	08	1	3	2	2	1	2	■				■	■			■		
9	)	41	)	41	09	2	2	1	2	1	3	■	■			■			■			
10	*	42	*	42	10	2	2	1	3	1	2	■	■			■				■		
11	+	43	+	43	11	2	3	1	2	1	2	■	■				■			■		
12	comma	44	comma	44	12	1	1	2	2	3	2	■		■	■			■	■	■		
13	-	45	-	45	13	1	2	2	1	3	2	■			■	■		■	■	■		
14	full stop	46	full stop	46	14	1	2	2	2	3	1	■			■	■			■	■	■	
15	/	47	/	47	15	1	1	3	2	2	2	■		■	■	■			■	■		
16	0	48	0	48	16	1	2	3	1	2	2	■			■	■	■		■	■		

17	1	49	1	49	17	1	2	3	2	2	1	
18	2	50	2	50	18	2	2	3	2	1	1	
19	3	51	3	51	19	2	2	1	1	3	2	
20	4	52	4	52	20	2	2	1	2	3	1	
21	5	53	5	53	21	2	1	3	2	1	2	
22	6	54	6	54	22	2	2	3	1	1	2	
23	7	55	7	55	23	3	1	2	1	3	1	
24	8	56	8	56	24	3	1	1	2	2	2	
25	9	57	9	57	25	3	2	1	1	2	2	
26	colon	58	colon	58	26	3	2	1	2	2	1	
27	semi-colon	59	semi-colon	59	27	3	1	2	2	1	2	
28	<	60	<	60	28	3	2	2	1	1	2	
29	=	61	=	61	29	3	2	2	2	1	1	
30	>	62	>	62	30	2	1	2	1	2	3	
31	?	63	?	63	31	2	1	2	3	2	1	
32	@	64	@	64	32	2	3	2	1	2	1	
33	A	65	A	65	33	1	1	1	3	2	3	
34	B	66	B	66	34	1	3	1	1	2	3	
35	C	67	C	67	35	1	3	1	3	2	1	

SYMBOL CHAR. VALUE	CODE SET A	ASCII VALUE for Set A	CODE SET B	ASCII VALUE for Set B	CODE SET C	ELEMENT WIDTHS (modules)						ELEMENT PATTERN										
						B	S	B	S	B	S	1	2	3	4	5	6	7	8	9	10	11
36	D	68	D	68	36	1	1	2	3	1	3	■		■	■				■			
37	E	69	E	69	37	1	3	2	1	1	3	■				■	■		■			
38	F	70	F	70	38	1	3	2	3	1	1	■				■	■				■	
39	G	71	G	71	39	2	1	1	3	1	3	■	■		■				■			
40	H	72	H	72	40	2	3	1	1	1	3	■	■				■		■			
41	I	73	I	73	41	2	3	1	3	1	1	■	■				■				■	
43	J	74	J	74	42	1	1	2	1	3	3	■		■	■		■	■	■			
43	K	75	K	75	43	1	1	2	3	3	1	■		■	■				■	■	■	
44	L	76	L	76	44	1	3	2	1	3	1	■				■	■		■	■	■	
45	M	77	M	77	45	1	1	3	1	2	3	■		■	■	■		■	■			
46	N	78	N	78	46	1	1	3	3	2	1	■		■	■	■				■	■	
47	O	79	O	79	47	1	3	3	1	2	1	■				■	■	■		■	■	
48	P	80	P	80	48	3	1	3	1	2	1	■	■	■		■	■	■		■	■	
49	Q	81	Q	81	49	2	1	1	3	3	1	■	■		■				■	■	■	
50	R	82	R	82	50	2	3	1	1	3	1	■	■				■		■	■	■	
51	S	83	S	83	51	2	1	3	1	1	3	■	■		■	■	■		■			
52	T	84	T	84	52	2	1	3	3	1	1	■	■		■	■	■				■	
53	U	85	U	85	53	2	1	3	1	3	1	■	■		■	■	■		■	■	■	
54	V	86	V	86	54	3	1	1	1	2	3	■	■	■		■		■	■			
55	W	87	W	87	55	3	1	1	3	2	1	■	■	■		■				■	■	

56	X	88	X	88	56	3	3	1	1	2	1	
57	Y	89	Y	89	57	3	1	2	1	1	3	
58	Z	90	Z	90	58	3	1	2	3	1	1	
59	[	91	[	91	59	3	3	2	1	1	1	
60	\	92	\	92	60	3	1	4	1	1	1	
61	]	93	]	93	61	2	2	1	4	1	1	
62	^	94	^	94	62	4	3	1	1	1	1	
63	_	95	_	95	63	1	1	1	2	2	4	
64	NUL	00	grave accent	96	64	1	1	1	4	2	2	
65	SOH	01	a	97	65	1	2	1	1	2	4	
66	STX	02	b	98	66	1	2	1	4	2	1	
67	ETX	03	c	99	67	1	4	1	1	2	2	
68	EOT	04	d	100	68	1	4	1	2	2	1	
69	ENQ	05	e	101	69	1	1	2	2	1	4	
70	ACK	06	f	102	70	1	1	2	4	1	2	
71	BEL	07	g	103	71	1	2	2	1	1	4	
72	BS	08	h	104	72	1	2	2	4	1	1	

SYMBOL CHAR. VALUE	CODE SET A	ASCII VALUE for Set A	CODE SET B	ASCII VALUE for Set B	CODE SET C	ELEMENT WIDTHS (modules)						ELEMENT PATTERN										
						B	S	B	S	B	S	1	2	3	4	5	6	7	8	9	10	11
73	HT	09	i	105	73	1	4	2	1	1	2	■					■	■		■		
74	LF	10	j	106	74	1	4	2	2	1	1	■					■	■			■	
75	VT	11	k	107	75	2	4	1	2	1	1	■	■					■			■	
76	FF	12	l	108	76	2	2	1	1	1	4	■	■			■		■				
77	CR	13	m	109	77	4	1	3	1	1	1	■	■	■	■		■	■	■		■	
78	SO	14	n	110	78	2	4	1	1	1	2	■	■					■		■		
79	SI	15	o	111	79	1	3	4	1	1	1	■				■	■	■	■		■	
80	DLE	16	p	112	80	1	1	1	2	4	2	■		■			■	■	■	■		
81	DC1	17	q	113	81	1	2	1	1	4	2	■			■		■	■	■	■		
82	DC2	18	r	114	82	1	2	1	2	4	1	■			■			■	■	■	■	
83	DC3	19	s	115	83	1	1	4	2	1	2	■		■	■	■	■			■		
84	DC4	20	t	116	84	1	2	4	1	1	2	■			■	■	■	■		■		
85	NAK	21	u	117	85	1	2	4	2	1	1	■			■	■	■	■			■	
86	SYN	22	v	118	86	4	1	1	2	1	2	■	■	■	■		■			■		
87	ETB	23	w	119	87	4	2	1	1	1	2	■	■	■	■			■		■		
88	CAN	24	x	120	88	4	2	1	2	1	1	■	■	■	■			■			■	
89	EM	25	y	121	89	2	1	2	1	4	1	■	■		■	■		■	■	■	■	
90	SUB	26	z	122	90	2	1	4	1	2	1	■	■		■	■	■	■		■	■	
91	ESC	27	{	123	91	4	1	2	1	2	1	■	■	■	■		■	■		■	■	
92	FS	28	|	124	92	1	1	1	1	4	3	■		■		■	■	■	■			

93	GS	29	}	125	93	1	1	1	3	4	1	
94	RS	30	~	126	94	1	3	1	1	4	1	
95	US	31	DEL	127	95	1	1	4	1	1	3	
96	FNC3		FNC3		96	1	1	4	3	1	1	
97	FNC2		FNC2		97	4	1	1	1	1	3	
98	SHIFT		SHIFT		98	4	1	1	3	1	1	
99	CODE C		CODE C		99	1	1	3	1	4	1	
100	CODE B		FNC4		CODE B	1	1	4	1	3	1	
101	FNC4		CODE A		CODE A	3	1	1	1	4	1	
102	FNC1		FNC1		FNC1	4	1	1	1	3	1	
103	Start A					2	1	1	4	1	2	
104	Start B					2	1	1	2	1	4	
105	Start C					2	1	1	2	3	2	

SYMBOL CHAR. VALUE	CODE SET A	ASCII VALUE for Set A	CODE SET B	ASCII VALUE for Set B	CODE SET C	ELEMENT WIDTHS (modules)							ELEMENT PATTERN											
						B	S	B	S	B	S	B	1	2	3	4	5	6	7	8	9	10	11	12	13
	Stop					2	3	3	1	1	1	2	■					■	■		■			■	■

NOTE: The Stop character comprises 13 modules in four bars (dark bars) and three spaces (light bars). Every other character is 11 modules wide, starts with a bar (dark bar) and ends with a space (light bar) and comprises six elements, each of which varies from one to four modules in width. The numeric values in the B and S columns represent the number of modules in each bar (dark bar) or space (light bar) element respectively in the symbol characters.

3.3 Code Sets

3.3.1 Code Set A

Code Set A includes all of the standard upper case alphanumeric characters and punctuation characters together with the control characters (i.e., characters with ASCII values from 00 to 95) and seven special characters.

3.3.2 Code Set B

Code Set B includes all of the standard upper case alphanumeric characters and punctuation characters together with the lower case alphabetic characters (i.e., ASCII characters 32 to 127 inclusive) and seven special characters.

3.3.3 Code Set C

Code Set C includes the set of 100 digit pairs from 00 to 99 inclusive, as well as three special characters. This allows numeric data to be encoded as two data digits per symbol character.

3.4 Special characters

The last seven characters of Code Sets A and B (character values 96 - 102) and the last three characters of Code Set C (character values 100 - 102) are special non-data characters with no ASCII character equivalents, which have particular significance to the bar code reading device.

3.4.1 Code Set and shift characters

Code Set and shift characters shall be used to change from one code set to another within a symbol. The decoder shall not transmit them.

a) **Code Set characters** Code A, B, or C characters change the symbol code set from the code set defined previously to the new code set defined by the code character. This change applies to all characters following the Code Set character until either the end of the symbol, another Code Set character, or the Shift character is encountered.

b) **Shift character** The Shift character changes the code set from A to B or B to A for the single character following the shift character. Characters following the affected character shall revert to the Code Set A or B defined prior to the Shift character.

3.4.2 Function characters

Function Characters (FNC) define instructions to the bar code reading device to allow for special operations and applications.

a) FNC1 shall be subject to the special considerations defined in Chapter 5, Section 3, and Appendix 2.
FNC1 in the first position following the Start character is at all times a reserved use, which identifies the EAN•UCC system.

b) FNC2 (Message Append) instructs the bar code reader to temporarily store the data from the symbol containing the FNC2 character and transmit it as a prefix to the data of the next symbol. This may be used to concatenate several symbols before transmission. This character may occur anywhere in the symbol. Where the sequence of data is significant, provision should be made to ensure reading of the symbols in the correct sequence.

c) FNC3 (Initialise) instructs the bar code reader to interpret the data from the symbol containing the FNC3 character as instructions for initialisation or reprogramming of the bar code reader. The data from the symbol shall not be transmitted by the bar code reader. This character may occur anywhere in the symbol.

d) **FNC4 is not used in the EAN•UCC system**.
In code 128, FNC4 is used to represent an extended ASCII character set (byte values 128 to 255) as specified in ISO 8859-1 or otherwise in an application specification. If a single FNC4 character is used, the value 128 is added to the ASCII value of the following data character in the symbol. A Shift character may follow the FNC4 character if it is necessary to change Code Set for the following

data character. Subsequent data characters revert to the standard ASCII set. If two consecutive FNC4 characters are used, the value 128 is added to the ASCII value of following data characters until two further consecutive FNC4 characters are encountered or the end of the symbol is reached. If, during this sequence of extended ASCII encodation a single FNC4 character is encountered, it is used to revert to standard ASCII encodation for the next data character only. Shift and Code Set characters shall have their normal effect during such a sequence. The default reference character set for extended ASCII values 128 - 255 is the corresponding half of ISO 8859-1, Latin Alphabet 1, as shown in Appendix F, but application specifications may define or reference alternative sets corresponding to byte values 128 to 255.

3.5 Start and Stop characters

- Start characters A, B, and C define the corresponding code set to be used initially in the symbol.
- The Stop character is common to all code sets.
- The decoder shall not transmit start and Stop characters.

3.6 Symbol check character

The symbol check character shall be included as the last symbol character before the Stop character. Appendix 1.1 defines the algorithm for its calculation. The symbol check character shall not be represented in the human readable interpretation, nor shall it be transmitted by the decoder.

3.7 UCC/EAN-128 start pattern

The UCC/EAN-128 symbology has special double character start patterns consisting of:

Start (A or B or C) FNC 1

It is these special Start characters which differentiate UCC/EAN-128 symbols from the more generalised Code 128 symbols.

In other words, a Code 128 symbol, which begins with one of the UCC/EAN-128 double character start patterns, is always an EAN•UCC symbol; a Code 128 symbol which does not begin with such a start pattern is never an EAN•UCC symbol.

Function 1 (FNC 1) may be the symbol check character (in less than 1% of cases). It is also used as a separator character, when appropriate, if Application Identifiers (AIs) and their data fields are concatenated into a single bar code.

Start A begins the UCC/EAN-128 data encodation according to character set A.

Start B begins the UCC/EAN-128 data encodation according to character set B.

Start C begins the UCC/EAN-128 data encodation according to character set C. Start C should always be used when the data inclusive of the Application Identifier begins with four or more numeric characters.

4. DIMENSIONAL REQUIREMENTS

Code 128 symbols shall conform to the following dimensions:

4.1 Minimum width of a module (*X*)

This should be defined by the application specification, having due regard to the availability of equipment for the production and reading of symbols and complying with the general requirements of the application. Within the EAN•UCC application environment the minimum x dimension is 0.250 mm (0.00984 in). The maximum x dimension is 1.016 mm (0.040 in). An application will specify a target and range of the x dimension.

The x dimension shall be constant throughout a given symbol.

4.2 Quiet zone (Light margin)

Minimum width of the quiet zone (light margin) to the left and right of the Code 128 symbol: 10*x*

5. REFERENCE DECODE ALGORITHM

Bar code reading systems are designed to read imperfect symbols to the extent that practical algorithms permit. This section describes the reference decode algorithm used in the computation of the decodability value described in *ISO/IEC NP 15416*.

The algorithm contains the following steps to decode each bar coded character:

1). Calculate eight-width measurements p, e_1, e_2, e_3, e_4, b_1, b_2, and b_3 (Figure 5).

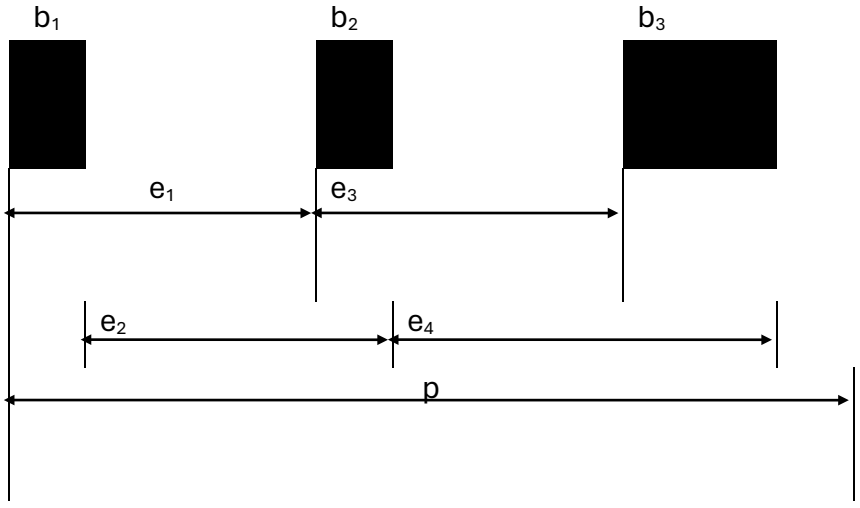


Figure 5: Decode measurements

2). Convert measurements e_1, e_2, e_3, and e_4 to normalised values e_1, e_2, e_3, and e_4 which will represent the integral module width (e_i) of these measurements. The following method is used for the i-th value.

If $1{,}5p/11 \leq e_i < 2{,}5p/11$, then $E_i = 2$.

If $2{,}5p/11 \leq e_i < 3{,}5p/11$, then $E_i = 3$.

If $3{,}5p/11 \leq e_i < 4{,}5p/11$, then $E_i = 4$.

If $4{,}5p/11 \leq e_i < 5{,}5p/11$, then $E_i = 5$.

If $5{,}5p/11 \leq e_i < 6{,}5p/11$, then $E_i = 6$.

If $6{,}5p/11 \leq e_i < 7{,}5p/11$, then $E_i = 7$.

Otherwise the character is in error.

3). Look up the character in decode table using the four values E_1, E_2, E_3, and E_4 as the key. (See Table 2)

4). Retrieve the character self-checking value V which is stored in the table with the character. The value V is equal to the sum of the modules for the bars (dark bars) as defined for that character.

5). Verify that:

$(V-1{,}75)p / 11 < (b1 + b2 + b3) < (V + 1{,}75)p / 11$

Otherwise the character is in error.

The calculation indirectly uses character parity to detect all decode errors caused by single non-systematic one-module edge errors.

Using these five steps, decode the first character. If it is a Start character, continue decoding the symbol in the normal forward direction. If it is not a Start character but decodes as a Stop character, attempt to decode all subsequent characters in the reverse direction.

After all characters have been decoded, make sure there was a valid Start character, a valid Stop character, and that the symbol check character is correct.

Translate the symbol characters into the appropriate data characters from Code Set A, B, or C according to the Start character, code characters, and shift characters used in the symbol.

In addition, perform such other secondary checks on quiet zones (light margins), beam acceleration, absolute timing, dimensions, etc., as are deemed prudent

and appropriate considering the specific reading device and intended application environment.

NOTE: In this algorithm the symbol is decoded using "edge to similar edge" measurements (e), plus an additional measurement of the sum of the three bar (dark bar) widths.

Table 2: Edge differences for decoding Code 128

Char. Value	E1	E2	E3	E4	V	Char. Value	E1	E2	E3	E4	V
00	3	3	4	4	6	54	4	2	2	3	6
01	4	4	3	3	6	55	4	2	4	5	6
02	4	4	4	4	6	56	6	4	2	3	6
03	3	3	3	4	4	57	4	3	3	2	6
04	3	3	4	5	4	58	4	3	5	4	6
05	4	4	3	4	4	59	6	5	3	2	6
06	3	4	4	3	4	60	4	5	5	2	8
07	3	4	5	4	4	61	4	3	5	5	4
08	4	5	4	3	4	62	7	4	2	2	6
09	4	3	3	3	4	63	2	2	3	4	4
10	4	3	4	4	4	64	2	2	5	6	4
11	5	4	3	3	4	65	3	3	2	3	4
12	2	3	4	5	6	66	3	3	5	6	4
13	3	4	3	4	6	67	5	5	2	3	4
14	3	4	4	5	6	68	5	5	3	4	4
15	2	4	5	4	6	69	2	3	4	3	4
16	3	5	4	3	6	70	2	3	6	5	4
17	3	5	5	4	6	71	3	4	3	2	4
18	4	5	5	3	6	72	3	4	6	5	4
19	4	3	2	4	6	73	5	6	3	2	4
20	4	3	3	5	6	74	5	6	4	3	4
21	3	4	5	3	6	75	6	5	3	3	4
22	4	5	4	2	6	76	4	3	2	2	4
23	4	3	3	4	8	77	5	4	4	2	8
24	4	2	3	4	6	78	6	5	2	2	4
25	5	3	2	3	6	79	4	7	5	2	6
26	5	3	3	4	6	80	2	2	3	6	6
27	4	3	4	3	6	81	3	3	2	5	6
28	5	4	3	2	6	82	3	3	3	6	6
29	5	4	4	3	6	83	2	5	6	3	6
30	3	3	3	3	6	84	3	6	5	2	6
31	3	3	5	5	6	85	3	6	6	3	6
32	5	5	3	3	6	86	5	2	3	3	6
33	2	2	4	5	4	87	6	3	2	2	6
34	4	4	2	3	4	88	6	3	3	3	6
35	4	4	4	5	4	89	3	3	3	5	8
36	2	3	5	4	4	90	3	5	5	3	8
37	4	5	3	2	4	91	5	3	3	3	8
38	4	5	5	4	4	92	2	2	2	5	6
39	3	2	4	4	4	93	2	2	4	7	6
40	5	4	2	2	4	94	4	4	2	5	6
41	5	4	4	4	4	95	2	5	5	2	6
42	2	3	3	4	6	96	2	5	7	4	6
43	2	3	5	6	6	97	5	2	2	2	6
44	4	5	3	4	6	98	5	2	4	4	6
45	2	4	4	3	6	99	2	4	4	5	8
46	2	4	6	5	6	100	2	5	5	4	8
47	4	6	4	3	6	101	4	2	2	5	8
48	4	4	4	3	8	102	5	2	2	4	8
49	3	2	4	6	6	103	3	2	5	5	4
50	5	4	2	4	6	104	3	2	3	3	4
51	3	4	4	2	6	105	3	2	3	5	6
52	3	4	6	4	6	$Stop_A$	5	6	4	2	6
53	3	4	4	4	8	$Stop_B$	3	2	2	4	6

NOTE: $Stop_A$ values are for decoding in a forward direction. $Stop_B$ values apply to the first six elements of the Stop character starting at the rightmost side when scanned in a reverse direction.

6. SYMBOL QUALITY

6.1 General

ISO/IEC NP 15416 defines a standardised methodology for measuring and grading bar code symbols. Code 128 symbols shall be evaluated according to that standard. The reference decode algorithm defined in Chapter 5, Section 3, Sub-Section 5 shall be used for the assessment of the "decode" and "decodability" parameters under ISO/IEC NP 15416.

For UCC/EAN-128 minimum quality level, refer to Chapter 5, Section 3, and Sub-Section 7.3

6.2 Decodability

Decodability is a measure of how closely the decode algorithm measurement values approach those in a theoretically perfect symbol.

For the calculation of the decodability value V, the following provisions apply, which are additional to those in ISO/IEC NP 15416 for edge to similar edge decodable symbologies:

Substitute V1 for V_C in the formula $V_C = K / (S / 2n)$.

Where: K = the smallest difference between a measurement and a reference threshold

N = 11 (number of modules in a symbol character)

S = total width of the character

Calculate V2:

$$V2 = \frac{1{,}75 - (ABS((W_b \times 11/S) - M))}{1{,}75}$$

Where: M = number of dark modules in the character.

S = total width of the character

W_b = sum of the bar (dark bar) widths in the character

ABS = mathematical term for taking the absolute of the calculation which follows it

V_C is the lesser of V1 and V2.

Note that the Stop character includes an additional terminating bar (dark bar). For the purpose of measuring decodability, the Stop character should be checked twice, first using the six leftmost elements and then the six rightmost elements from right to left. Both sets of six elements are equivalent in width to a standard character.

6.3 Quiet zones (Light margins)

The quiet zones (light margins) to the right and left of the UCC/EAN-128 symbol are compulsory. Both quiet zones (light margins) have a minimum width of 10*x*.

ISO/IEC NP 15416 allows for additional pass/fail criteria to be stipulated by a symbology specification. In the case of UCC/EAN-128, a minimum quiet zone (light margin) of 10Z is specified. Both left and right quiet zones (light margins) on each scan reflectance profile under ISO/IEC NP 15416 shall be measured and graded as follows: Quiet Zone ≥ 10Z: Grade 4 (A)

Quiet Zone < 10Z: Grade 0 (F)

Where: Z = The average measured width of the narrow bars (dark bars) and spaces (light bars) (1 module) in the symbol.

6.4 Transmitted data

Transmitted data from a decoded Code 128 symbol shall comprise the byte values of the data characters. It is prefixed by the symbology identifier defined in Appendix 3, if used. The Start and Stop characters, function characters, Code Set and Shift characters, and symbol check character shall not be included in the transmitted data.

For UCC/EAN-128 implementation, see Chapter 5, Section 3, and Sub-Section 7.4.

7. UCC/EAN-128 DEFINED APPLICATION PARAMETERS

7.1 Symbol height

For UCC/EAN-128 symbols, the height of the bars (dark bars) in the symbol is 32 mm (1.25 in) used in general distribution. The actual symbol height used is dependent on specific application requirements.

7.2 Symbol length

The dimensions of the UCC/EAN-128 symbol depend on the number of characters encoded:

1 start character	x 11 modules =	11
FNC 1	x 11 modules =	11
1 symbol check character	x 11 modules =	11

1 stop character	x 13 modules	=	13
N symbol characters	x 11 modules	=	11N
			(11N + 46) modules

Where N is the number of symbol characters, this includes any auxiliary characters (shift and code characters) embedded in the data.

A module is equal to the x dimension of the symbol.

Character set C allows two digits to be encoded in one symbol character. Thus, numeric data can be encoded with twice the density of other data when using character set C.

In addition quiet zones (light margins) to the right and left of the bar code are compulsory and both have widths of 10 modules.

Thus total symbol width, including quiet zones (light margins) is:

(11N + 66) modules = (11N + 66) x

7.3 Maximum symbol length

Two parameters have to be taken into consideration for defining the maximum length of an UCC/EAN-128 symbol: the physical length, which depends on the number of characters encoded and the module width (or x dimension) used, and the number of data characters encoded excluding the auxiliary characters.

The maximum length of any UCC/EAN-128 symbol must be within the following limits:

- The physical length including light margins cannot exceed 165 mm (6.5 in).
- The maximum number of encoded data characters is 48, including the Application Identifier(s) and FNC 1 when used as a separator character, but excluding the auxiliary characters and the symbol check character.

7.4 Human readable interpretation

The human readable translation of the data in the bar code must be shown above or below the bar code symbol. The symbol check character is not part of the data and is not shown in human readable format.

The precise location of the human readable characters and the font used to represent them are not specified for the UCC/EAN-128 symbol. However, the characters should be clearly legible (such as OCR-B) and must be obviously associated with the symbol. The quiet zones (light margins) must not be violated.

Application Identifiers should be clearly recognisable to facilitate key entry. This is achieved by putting the Application Identifier between parentheses in the human readable interpretation.

Note: The parentheses are not part of the data and are **NOT encoded** in the bar code symbol.

7.5 Symbol minimum quality

The parameters for the evaluation of symbols shall be defined by specifying a quality grade in accordance with ISO/IEC NP 15416 in the application standard. The grade shall include a grade level, measuring aperture, and the wavelength of light used for the measurement.

The minimum quality grade for UCC/EAN-128 symbols is:

1,5 / 10 / 670

where 1,5 is the overall symbol quality grade

10 is the measuring aperture reference number (in this example 0.010 inch or 0.25mm diameter)

670 is the peak response wavelength in nanometres.

7.6 Transmitted data (FNC1)

UCC/EAN-128 implementation described below is in accordance with ISO/IEC WD 15417 Appendix 2 for transmitted data:

- The FNC1 symbol character may validly occur as the symbol check character.
- FNC1 in the third or subsequent character position is transmitted as the ASCII character 29 (GS).
- Symbols using FNC1 in the first data position should have symbology identifiers enabled.
- When FNC1 is used in the first position it shall not be represented in the transmitted message, although its presence is indicated by the use of modifier value 1 in the symbology identifier.

8. RULES FOR ENCODING/DECODING ELEMENT STRINGS IN UCC/EAN-128

8.1 Basic structure of a UCC/EAN-128 bar code symbol

All bar code symbologies use particular symbol characters to mark the beginning and the end of the bar code symbol. UCC/EAN-128 may begin with the start character A, B, or C, which determines the interpretation of the subsequent symbol characters. UCC/EAN-128 symbology uses the "Function 1 Character " (FNC1) in the bar code position following the start character. This double start pattern is reserved for

EAN•UCC system applications worldwide. This makes it possible to distinguish bar coded EAN•UCC element strings from all other bar-coded data.

FNC1 cannot be expressed in printable characters.

8.2 The basic structure of each UCC/EAN-128 bar code symbol

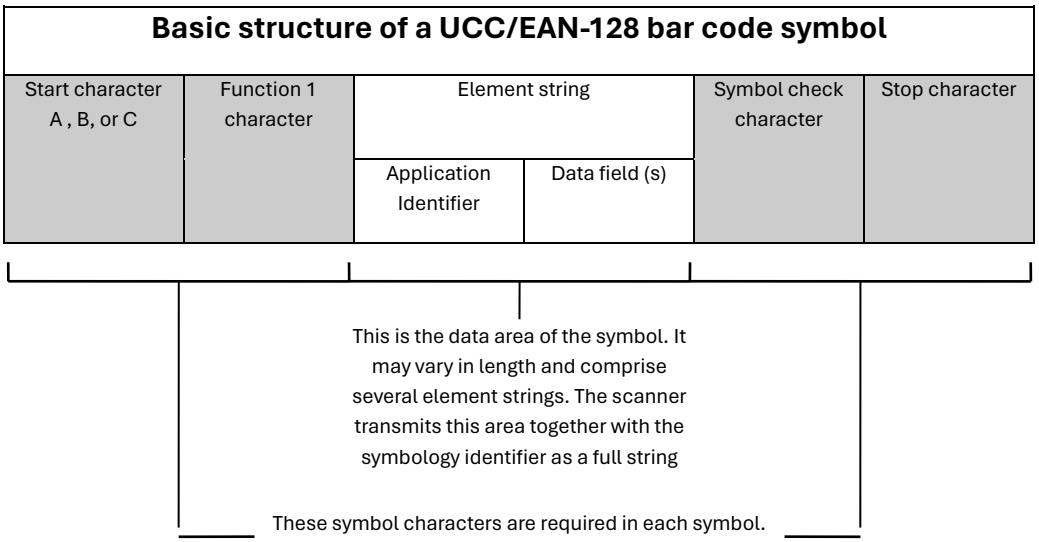


Figure 6: UCC/EAN-128 bar code symbol structure

Since UCC/EAN-128 bar code symbols are of variable length, it is important to ensure that

- not more than 48 ***data*** characters (see the data area of Figure 6) are encoded;
- the physical length does not exceed 165 mm (6.5 in) including quiet zones (light margins).

The maximum length allows several element strings to be encoded in one bar code symbol. This is termed concatenation. It is advantageous because it means that the symbol control characters are only needed once, so that the total amount of space needed is less than when separate bar code symbols are used for the encoding of each element string. It also aids in scanning accuracy enabling a single scan rather than multiple scans. The various element strings are then transmitted from the bar code reader as one full string.

The various element strings, which are transmitted from concatenated bar code symbols have to be analysed and processed. To simplify this procedure and reduce the size of the symbol, the lengths of some element strings are pre-defined (see Table 3). Those element strings that are not contained in Table 3 and which are not at the end of the symbol (encoded immediately before the symbol check character), must be immediately followed by the FNC1 to delimit the element string and separate it from the one following it.

8.2.1 Pre-defined length application identifiers

Table 3 contains all Application Identifiers which have a predefined length and therefore do not require a FNC1 delimiter.

Table of element strings with pre-defined length using application identifiers			
First two digits of the application identifier	Number of characters (Application identifier and data field)	First two digits of the application identifier	Number of characters (Application identifier and data field)
00	20	17	8
01	16	(18)	8
02	16	(19)	8
(03)	16	20	4
(04)	18	31	10
11	8	32	10
12	8	33	10
13	8	34	10
(14)	8	(35)	10
15	8	(36)	10
(16)	8	41	16

Table 3: Pre-defined length indicator table

This table is limited to the listed numbers and will remain unchanged. Those numbers in parenthesis are not yet assigned.

8.2.2 Application Identifier (23n)

The "First two digits of the Application Identifier" ***23n*** presents a special case. The first digit following the ***23n*** indicates the length of the element string. No separator character is required when AI 23n is used in a concatenated element string.

8.3 Concatenation

Using UCC/EAN-128 it is possible to concatenate (chain together) discrete elements strings. The "Pre-defined length indicator table" (above), which is permanent, specifies the total element string length (including the Application Identifier) associated with the first two digits of an Application Identifier. Application Identifiers that start with two digits which are *not* included in the pre-defined table are considered to have a variable length *even if the definition of the Application Identifiers specifies a fixed length data field*.

8.3.1 Concatenation of the pre-defined length element strings

Concatenating element strings constructed from Application Identifiers with a pre-defined length do not require the use of a data separator character. Each element string is immediately followed by either the next Application Identifier or the symbol check digit and stop character.

For example, concatenation of net weight (4 kg) with the associated EAN•UCC GTIN (95012345678903) does not require the use of a data separator character. From the pre-defined length indicator table:

01 pre-defined element string length of **16** digits

31 pre-defined element string length of **10** digits

EAN•UCC article number 95012345678903 Net weight 4.00 kg

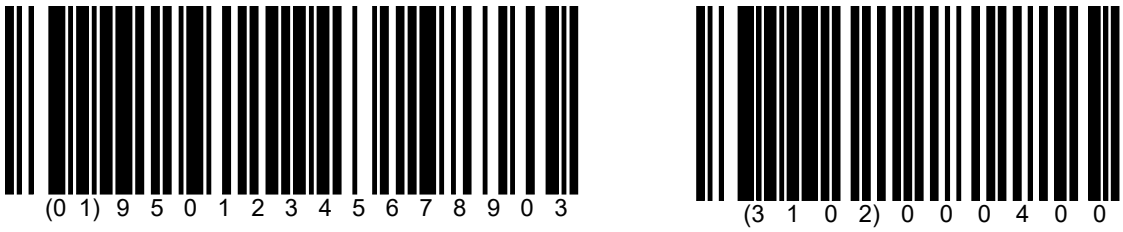


Figure 7

EAN•UCC article number 95012345678903 + Net weight 4.00 kg

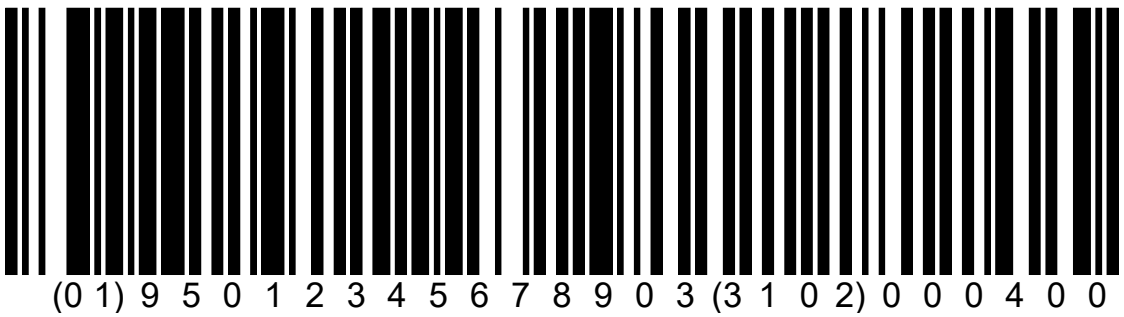
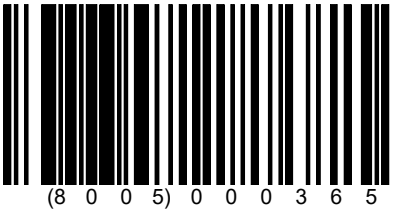


Figure 8

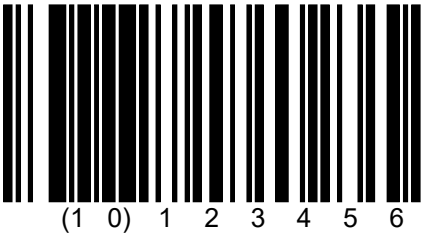
8.3.2 Variable length data strings

Concatenating element strings of variable length*, which includes all Application Identifiers which do not start with two characters contained in the pre-defined length indicator table* (above), involves the use of a data separator character. The data separator used is the function 1 (FNC1) character. It is placed immediately after the last symbol character of a variable length data string and is followed by the Application Identifier of the next element string. If the element string is the last to be encoded, it is followed by the symbol check and stop characters and ***not*** the function 1 separator character.

For example, concatenation of price per unit of measure (365 currency units) and batch number (123456) requires the use of a data separator character immediately after the price per unit of measure.



Price per unit of measure 365



Batch number 123456

Figure 9

Price per unit of measure 365 Batch number 123456

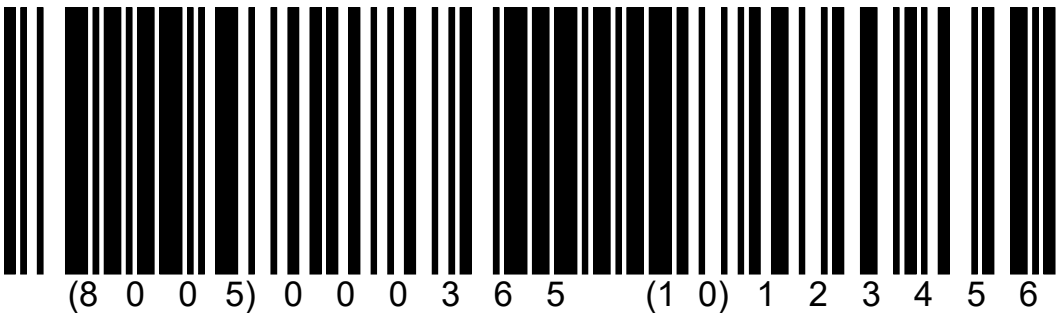


Figure 10

Note: The function 1 character is ***not*** shown in human readable form.

8.3.3 Pre-defined and variable length element strings

When concatenating a mixture of pre-defined and other element strings it is recommended to locate the pre-defined element strings before the variable length element strings. The separator character is not used to terminate pre-defined element strings, and hence fewer symbol characters are required in the concatenated bar code.

8.4 The separator character (FNC1)

The separator character appears in the decoded data string as <GS> (ASCII character 29, 7-bit character set ISO 646). All element strings not of pre-defined length must be followed by a FNC1 delimiter. However, no FNC1 is required at the end of the last element string represented in an UCC/EAN-128 bar code symbol. The processing routine shown on the next page allows for a FNC1 entered by error, e.g., after an element string contained in the pre-defined length table.

Refer to section Chapter 5, Section 3, and Sub-Section 7.6 for additional information on encoding/decoding FNC1.

8.5 Mixing ITF-14 and the UCC/EAN-128 with other symbologies

EAN/UCC-14 numbers may be carried by either UCC/EAN-128 or ITF-14 symbols. When additional data is required beyond the GTIN, UCC/EAN-128 symbols are used. The UCC/EAN-128 specification does not eliminate other EAN•UCC symbologies. In these cases the Global Trade Item Number (GTIN) is printed using ITF-14 symbol or other EAN•UCC system symbologies and additional data using an UCC/EAN-128 symbol.

8.6 Symbol placement

The preferred placement for the UCC/EAN-128 supplementary bar code is on the same horizontal plane as the bar code containing the GTIN, SSCC, or other EAN•UCC code and symbol that stand-alone. The supplementary symbol (s) should be as close as possible to the main symbol and must not interfere with the quiet zones (light margins).

- Orient the supplementary symbols in the same direction as the main symbol.
- The placement of the GTIN, SSCC, and other EAN•UCC data that stand-alone is given in Chapter 6 of the General EAN•UCC Specifications.
- Concatenated symbols must follow the placement recommendations for symbols representing GTIN, SSCC, or other EAN•UCC data that can stand-alone.

8.7 Processing UCC/EAN-128 symbols - basic required logic

In Chapter 7, on page 23 there is a model flow chart of the logic required to accurately parse UCC/EAN-128 the full data strings output from a scanner decoder.

APPENDIX 1 (NORMATIVE) ADDITIONAL FEATURES OF CODE 128

1.1 Symbol check character

The Code 128 symbol check character shall be calculated according to the following rules.

1) Retrieve the symbol character value from Table 1.
2) Each symbol character position is given a weighting. The Start character is weighted 1. Then, beginning on the left with the first symbol character following the Start character, the weights are 1,2,3,4, ..., n, for all following symbol characters up to, but not including, the symbol check character itself; n denotes the number of symbol characters representing data or special information in the symbol, exclusive of the Start/Stop characters and symbol check character.

   NOTE: Both the Start character and the first symbol character following the Start character are weighted by one.
3) Each symbol character value is multiplied by its weighting.
4) The products of the calculations in step 3 are summed.
5) The sum of the products is divided by 103.
6) The remainder derived from the calculation in step 5 is the symbol character value of the symbol check character.

For example, to calculate the symbol check character value for the data "AIM1234":

Characters	**Start B**	**A**	**I**	**M**	**Code C**	**12**	**34**
Character Values (Step 1)	104	33	41	45	99	12	34
Weights (Step 2)	1	1	2	3	4	5	6

Products (Step 3)	104	33	82	135	396	60	204
Sum of Products (Step 4)	1014						
Divide by 103 (Step 5)	1014 / 103 = 9						
Remainder = symbol check character value	**87**						

The symbol check character shall be positioned immediately following the final data or special character and before the Stop character.

NOTE: The symbol check character shall not be shown in the human-readable interpretation.

APPENDIX 2 (INFORMATIVE) RELATIONSHIP OF SYMBOL CHARACTER VALUE TO ASCII VALUE

In order to convert symbol character value (S) to ASCII decimal value or vice versa, the following relationships are applicable for Code Set A and Code Set B.

Code Set A

If $S \leq 63$,

ASCII value = S + 32

If $64 \leq S \leq 95$,

ASCII value = S - 64

Code Set B

If $S \leq 95$,

ASCII value = S + 32

The resulting values are shown in Table 1.

NOTE: As described in Chapter 5, Section 3, Sub-Section 3.4.2., the presence of the FNC4 character has the effect of adding 128 to the ASCII value of the following data character or characters derived from the rules given above.

APPENDIX 3 (INFORMATIVE) USE OF START, CODE SET, AND SHIFT CHARACTERS TO MINIMISE SYMBOL WIDTH

The same data may be represented by different UCC/EAN-128 (and other Code 128) symbols through the use of different combinations of Start, Code Set, and Shift characters.

The following rules to minimise the number of symbol characters needed to represent a given data string (and therefore the overall symbol width) should normally be implemented in printer control software.

1) Determine the Start character:
    a) If the data consists of 2 digits, use Start character C.
    b) If the data begins with 4 or more numeric data characters, use Start character C;
    c) If an ASCII control character (e.g., NUL) occurs in the data before any lower case character, use Start character A.
    d) Otherwise, use Start character B.
2) If Start character C is used and the data begins with an odd number of numeric data characters, insert a Code Set A or Code Set B character before the last digit, following rules 1c and 1d above to determine between Code Sets A and B.
3) If 4 or more numeric data characters occur together when in Code Sets A or B and:
    a) If there is an even number of numeric data characters, insert a Code Set C character before the first numeric digit to change to Code Set C;
    b) If there is an odd number of numeric data characters, insert a Code Set C character immediately after the first numeric digit to change to Code Set C.
4) When in Code Set B and an ASCII control character occurs in the data:
    a) If following that character, a lower case character occurs in the data before the occurrence of another control character, insert a Shift character before the control character;
    b) Otherwise, insert a Code Set A character before the control character to change to Code Set A.
5) When in Code Set A and a lower case character occurs in the data:

a) If following that character, a control character occurs in the data before the occurrence of another lower case character, insert a Shift character before the lower case character;

b) Otherwise, insert a Code Set B character before the lower case character to change to Code Set B.

6) When in Code Set C and a non-numeric character occurs in the data, insert a Code Set A or Code Set B character before that character, following rules 1c and 1d to determine between Code Sets A and B.

NOTE 1: In these rules the term “lower case” is used for convenience to mean precisely any Code Set B character with Code 128 character values 64 - 95 (ASCII values 96 - 127), i.e., all lower case alphabetic characters plus `{|}~DEL. The term “control character” means any Code Set A character with Code 128 character values 64 - 95 (ASCII values 00-31).

NOTE 2: If the Function 1 character occurs in the first position following the Start character, or in an odd-numbered position in a numeric field, it should be treated as two digits for the purpose of determining the appropriate code set.

APPENDIX 4 (INFORMATIVE) GUIDELINES FOR THE USE OF CODE 128

4.1 Autodiscrimination compatibility

Code 128 may be read by suitably programmed bar code decoders which have been designed to autodiscriminate it from other symbologies. The symbology is fully distinguishable from, and thus compatible with, the following linear symbologies:

Interleaved 2 of 5

Codabar

Code 39

Code 93

EAN/UPC

Telepen

RSS

Chapter 5, Section 4:

Bar Code Production and Quality Assessment

1. INTRODUCTION

Over the years, there have been a lot of changes in the EAN•UCC bar coding system. These changes can be roughly separated into the three following categories:

- The global expansion of the system into dozens of application areas beyond product identification and the addition of two new symbologies (beyond EAN/UPC) called ITF-14 and UCC/EAN-128
- The shift from the use of analog Bar Code Masters (Film Masters) to digital bar code files
- The adoption of a standard methodology for analysing and communicating about bar code symbol print quality (the ANSI X3.182 / CEN 1635 / ISO 15416 based verification methodology)

New Applications and Symbologies

Back in the days when the system basically accommodated product identification using only EAN/UPC symbols, it was relatively simple to explain our specifications to the world. Today that has all changed. There are many different symbol specification choices to make. In fact for every application, the following symbol specification questions must be answered before symbol design and production can begin:

1. What symbol(s) can be used?
2. How large or small can the symbol be?
3. What minimum quality level is specified for the symbol based on its intended scanning environment?
4. Where should the symbol be placed on the package or container?

To answer the first three questions, Chapter 5, Section 4, Sub-Section Section 2 of the *General* EAN•UCC *Specifications* provides a series of Symbol Specification Tables that are organised according to the applications defined in Chapter 2 of the *General* EAN•UCC *Specifications*. The last question can be answered by referring to Chapter 6 of the *General EAN•UCC Specifications*.

From Analog to Digital Design and Production

Bar Code Masters (Film Masters) are bar codes produced in an analog, negative, or positive film with specified attributes used in the prepress stage of bar code production. They can be used for film duplication, and then stored and reused as needed. They have been used by printing companies since the 1970s. Bar Code Masters are supplied to printing companies or tradeshops by companies that produce them within tight

EAN•UCC specified tolerances. The tolerances required for Bar Code Masters provide a measurable quality foundation in the symbol production process. For more information on Film Masters, refer to the following documents:

- ISO/IEC 15421- *Information Technology – Automatic Identification and Data Capture Techniques - Bar Code Master Test Specifications* (has Final Committee Draft status at the time of this printing)
- *U.P.C. Film Master Verification Manual* (available online @ uc-council.org)

Today, the printing industry is moving away from manual design, paste-up, stripping, contacting, and stepping of film. In a common scenario today, these production steps are accomplished using computers. This new capacity means the graphic arts community requires new options for creating symbols. Some purchase digital bar code files from a supplier while many others create their own bar code images using bar code design software resident on their computers. Any of these options are capable of creating appropriate symbols if a) the personnel involved are knowledgeable and b) the production systems and procedures are appropriate. Unlike the physical Film Master that provides a measurable quality foundation for digital bar code images depends on the expertise of graphic arts professionals and adequate conditions for their success.

The UCC and EAN International have produced two major documents dealing with this subject area, *Guidelines for Producing Quality Symbols* and *Guidelines for Providers of EAN/UPC Software Design Software*. The first document is aimed at anyone who is involved in symbol specification, design, production, or quality assessment. The second document is aimed at bar code symbol design software providers and includes several programmers' examples. Both documents are available from the UCC or EAN International.

Beyond this major shift in the way symbols are produced by printing companies, there has been another major shift in symbol production. This shift is based on the widespread use of direct thermal, thermal transfer, and desktop printers to produce bar codes. Chapter 5, Section 4, Appendixes 3 and 4of the *General EAN•UCC Specifications* provide guidance to anyone designing or producing bar code symbols on these printers.

Bar Code Symbol Print Quality Assessment

Verification of bar code symbols is a useful tool to add to quality control procedures in order to ensure bar codes will scan correctly throughout the supply chain. ANSI X3.182 and CEN 1635 methods have been integrated in a new ISO document (15416), which is now in the final stage of approval. For convenience, this document will refer to the combined ANSI/CEN approach as the ISO method. The ISO method is intended for use in combination with a verifier as a tool to analyse the quality of the printed symbol. Verification should be undertaken at all relevant stages of production, especially:

1. After initial printing.
2. In the final package configuration, after the application of sealing tape, straps or shrink-wrap material, which may interfere with the scannability of the item.

Verification is not intended to be used alone as a method for downstream rejection. For example, the UCC and EAN's advice today would be to use the ISO method only when a

problem with inconsistent scanning occurs. For problem EAN•UCC symbols, an ISO-based verifier can be of enormous assistance in diagnosing the problem, and provide a standard means of reporting between printing companies and their trading partners.

ISO-based Verification, as a method for use by the entire global supply chain, requires the *Calibrated Conformance Standard, Test Card for EAN/UPC Symbol Verifiers* (See Chapter 5, Section 4, Appendix 1) be used for checking verifier calibration and operator scanning methods to prevent divergence of trading partners. The EAN•UCC Global Symbology Committee (GSC) has developed a *Calibrated Conformance Standard* that is described in Chapter 5, Section 4, Appendix 1 of the *General EAN•UCC Specification*.

The UCC and EAN recognise the fact that a number of devices exist which automate the process of measuring individual bar widths and print contrast as specified in existing UCC and EAN documents. While we continue to view these devices as being useful to the printing community for process control, we do not recommend these devices be used for reporting between trading partners because no EAN•UCC *Calibrated Conformance Standard* exists to support this method. Furthermore, this technique of specifying widths provides less assurance of good scanning performance than can be achieved by following the newer ISO method. This method not only utilises a *Calibrated Conformance Standard*, but also assures that the printed symbol can be scanned by a wide variety of older and contemporary equipment.

1.1 What kind of bar codes do members of EAN and UCC use?

There are several bar code symbology types used by the EAN•UCC depending on the scanning or application environment. This section illustrates the possible symbol or symbol combinations used by members of EAN and UCC.

Figure 1: EAN-13 Bar Code

Figure 2: UPC-A Bar Code

Figure 3: EAN-8 Bar Code

Figure 4: UPC-E Bar Code

Figure 5: EAN-13 Bar Code with EAN/UPC-5 Add-on Symbol

Figure 6: UPC-A Bar Code with EAN/UPC-2 Add-on Symbol

Figure 7: ITF-14 Bar Code (EAN.UCC-14 Number)

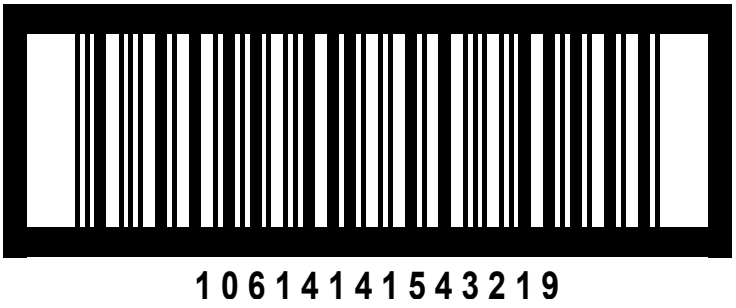


Figure 8: UCC/EAN-128 Bar Code (EAN.UCC-14 Number)

1.2 EAN•UCC symbol specification tables

This section provides EAN•UCC Symbol Specification Tables (SSTs) for the application areas defined in Chapter 2. Each SST provides the following bar code specification detail:

- The bar code symbol(s) specified by the EAN•UCC system for each application area (including country or regional exceptions).
- The minimum, target, and maximum X-dimension (narrow element width) for the symbol based on the scanning environment.
- The minimum, target, and maximum bar code symbol height based on the scanning environment.

Note: For EAN/UPC symbols this measurement includes the human readable text, but for ITF-14 and UCC/EAN-128 symbols the measurement pertains only to the bars.

- The left quiet zone (light margin) width, the right quiet zone (light margin) width, and for primary/secondary symbols, the minimum and maximum separation between the two symbols.

Note: These measurements are a factor of the X-dimension and are expressed as nx.

- The minimum ISO quality specification

Note: Expressed as g.g/aa/www, where g.g is the minimum GPA (grade point average of a 4.0 scale), aa is the effective measuring aperture in thousandths of an inch, and www is the wavelength of the light source in nanometres.

Before you can find the exact symbol specification you need, there are several specification variables that should be understood. The following section will explain these variables and help you find the correct specification for your bar code.

1.2.1 Role of the symbol's dimensional specifications

Over the years, it has been the operational requirements of EAN•UCC user's that have influenced dimensional specifications for EAN•UCC symbols and these dimensional specifications, have in turn, influenced the development of scanning system optics and printing processes. The three major dimensional specifications are the symbol's nominal (target) X-dimension, the symbol's allowable X-dimension range, and the symbol's minimum bar height. These dimensional characteristics are always specified based on the operating environment. The X-dimension target and range determine the scanner's operating range (field of view). The bar code's height along with its X-dimension target and range help determine the ergonomic aspects of product handling when using a scanner. These dimensional specifications are critical components to the efficient use of all scanners.

1.2.2 Omni-directional scanning and the term magnification

EAN/UPC symbols were originally designed for omni-directional scanners. Based on this type of scanner, the specifications include a fixed relationship between the symbol's nominal (target) width and height. The term "symbol magnification" has been used extensively to refer to this fixed relationship. For example, EAN-13 symbols have a fixed relationship between the symbol target width and height (100% magnification) based on the symbol height (including text) of 25.93 mm (1.02 in) and a target X-dimension of 0.33 mm (0.13 in). The term magnification has been used to refer to a range of magnification percentages below and/or above a target value that are specified based on the omni-directional scanning environment. The SSTs do not use magnification values and instead list the target, minimum, and maximum values for the symbol's X-dimension and height.

1.2.3 Printing considerations

The operational bands provide printers and labellers the flexibility needed to produce quality symbols over a wide range of processes. Once a scanning operational environment is determined and the allowable specification range is known, the printer should be consulted for guidance on:

- The minimum recommended symbol size based on printing press or print characterisation tests
- Colour/substrate considerations (e.g., separate print station for symbol or double ink layer)
- The optimum orientation of the symbol on the printed web

1.2.4 Packaging considerations

Once a scanning operational environment is determined and the allowable specification range is known, the Packaging Engineer should be consulted to:

- Ensure the symbol will not be obstructed by other graphics or package design parameters (e.g. folds, creases, corner wraps, flaps, laminates, embossed logos/patterns, text)
- Ensure that the symbol intended for scanning will be scanned (e.g., obscure all symbols on the individual units within larger trade items so that the individual units' symbols do not scan instead of the larger unit's symbol).

Chapter 6 contains complete information on symbol placement criteria to meet quality and ergonomic needs.

1.2.5 EAN•UCC Application Area Considerations

Before you can find the correct entry within the correct Symbol Specification Table (SST), you need to know the application where the bar code will be used. Table 1 provides a cross-reference for all of system applications defined in Chapter 2. In the column marked "See SST(s) #", you will find the SST appropriate for the application area. Because most application areas provide a reference to two SSTs based on the operative scanning environment, a decision must be made between the two. In Chapter 5, Section 4, Sub-Section 1.2.6, a decision tree (Figure 9) leads to the selection of the correct SST.

Table 1: Areas of EAN•UCC System Application

Application Areas	See Chap. 2 Section	See SST(s) #	Read Before Reviewing Symbol Specification Table
Fixed Measure Trade Item - Packages/Containers Scanned at POS	1 - 2.1.2	1 or 2	EAN-13, UPC-A, EAN-8 and UPC-E symbols only
Fixed Measure Trade Item – Books and Serials	1 - 2.1.5	1 or 2	EAN-13, UPC-A, EAN-8 and UPC-E symbols only
Fixed Measure Trade Item - Packages/Containers NOT Scanned at POS	1 - 2.1.1	3 or 4	
Fixed Measure Trade Items - Trade Item Packed in Several Physical Units NOT Scanned at POS	1 - 2.1.7	3 or 4	UCC/EAN-128 Symbol ONLY
Fixed Measure Trade Items - Restricted Distribution	1 - 2.3	1 or 2	
Variable Measure Retail Item - Restricted Circulation	1 - 2.4	1	EAN-13 and UPC-A Symbols Only
Variable Measure Trade Items - Packages/Containers NOT Scanned at POS	1 - 2.2	3 or 4	UCC/EAN-128 Symbol ONLY
POS Trade Item Attributes - Using Secondary EAN/UPC-2 or EAN/UPC-5 Add On Symbols	1 - 3.4.1 and 3.4.2	1	Use the X-dimension range specified for the Primary EAN/UPC Symbol
Trade Item Attributes - Using Secondary UCC/EAN-128 Symbols	1 - 3.1, 3.2, 3.3, 3.4.3, and	3 or 4	Use the X-dimension range specified for the Primary Symbol
Logistics - Mandatory SSCC	2 - 2	5	UCC/EAN-128 Symbol ONLY

Logistics - Logistic Unit Element Strings	2 - 2.1	5	UCC/EAN-128 Symbol ONLY
Assets - Global Returnable Asset Identifier	3 - 3.1.1	3 or 4	UCC/EAN-128 Symbol ONLY
Assets - Global Individual Asset Identifier	3 - 3.1.2	3 or 4	UCC/EAN-128 Symbol ONLY
Locations or Postal Codes	4	3 or 4	UCC/EAN-128 Symbol ONLY
Global Service Relation Numbers	5	3	UCC/EAN-128 Symbol ONLY
Coupons - Restricted Geographic Distribution Outside USA or Common Currency Area identification	6 - 1.3.1 and 1.3.2	1	EAN-13 Symbol ONLY
Coupons - Restricted Geographic Distribution Inside USA - * UPC-A PLUS UCC/EAN-128 Symbol	6 - 1.3.3	*3	*(See 4.18 & 4.19 - UCC's *Guidelines for Supply Chain Identification*)
Refund Receipts - Restricted Geographic Distribution	6 - 2	1	EAN-13 Symbols ONLY
Electronic Serial Identifier For Cellular Mobile telephones	6 - 3	3	UCC/EAN-128 Symbol ONLY
Company Internal Application Using EAN/UPC Symbol	6 - 4.4	1	EAN-13, UPC-A, and UPC-E Symbols ONLY
Internal Application Using UCC/EAN-128 Symbols	6 - 4.5	3 or 4	UCC/EAN-128 Symbol ONLY
Payment Slips	6 - 5	3	UCC/EAN-128 Symbol ONLY
Customer Specific Articles	6 - 6	3	

1.2.6 The four operative scanning environments for EAN•UCC symbols

1.2.6.1 EAN•UCC scanner functional bands

EAN•UCC symbol specifications are based on three scanner functional bands because scanner technology cannot universally support the entire operating range using a single scanner. The three scanner functional bands that have evolved to meet user needs are illustrated in Figure 9.

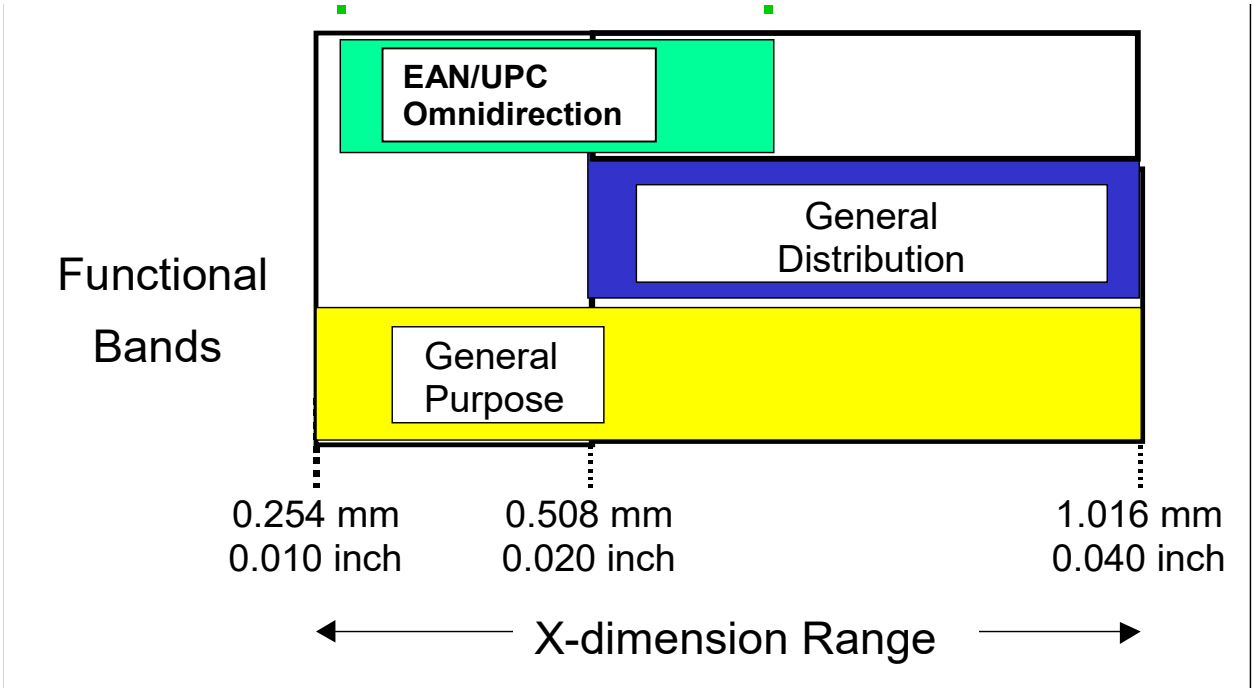


Figure 9: EAN•UCC Scanner Functional Bands

The scanner functional bands are:

- EAN/UPC omnidirectional band is developed primarily for retail operations to provide orientation free scanning. Scanners are designed to read EAN/UPC oversquare symbols an average of 101 mm (4 in) from their surface.
- Fixed scanner band is developed to facilitate automated scanning of trade items packaged for transport and logistics units using fixed mount scanners.
- The general purpose scanner band.

The three functional bands serve as the basis of four operative scanning environments covered in Chapter 5, Section 4, Sub-Section 1.2.6.2

1.2.6.2 Symbology operational bands

The final consideration for selecting the correct symbol specification is based on where the symbol will actually be scanned, or the symbol's operative scanning environment. This section provides a decision tree to assist you in determining the correct SST to use given the operative scanning environment (Figure 11). Before moving to the decision tree, the four operative scanning environments for EAN•UCC symbols are introduced:

1. **EAN/UPC Retail**

   Retail markets were the first users of the EAN/UPC symbology. Symbols on all trade items processed in retail must conform to the EAN/UPC symbology requirements. These are based on an omnidirectional scanning environment and associated ergonomic factors in retail environments:

2. **General Distribution**

   The general distribution operating environment includes trade items packaged for transport, logistics units, assets, and location tags. It includes their related attributes.

3. **Both EAN/UPC Retail and General Distribution**

   These are trade items in specific packaging suitable for transport purposes in General Distribution, but that are also scanned in the EAN/UPC retail environment.

4. **All Others**

   This category includes trade items used in industries on both the supply and demand sides of the supply chain (e.g. healthcare, paper, packaging, electrical, communications, and information technology), assets, and location tags.

Figure 10: Operative Scanning Environment

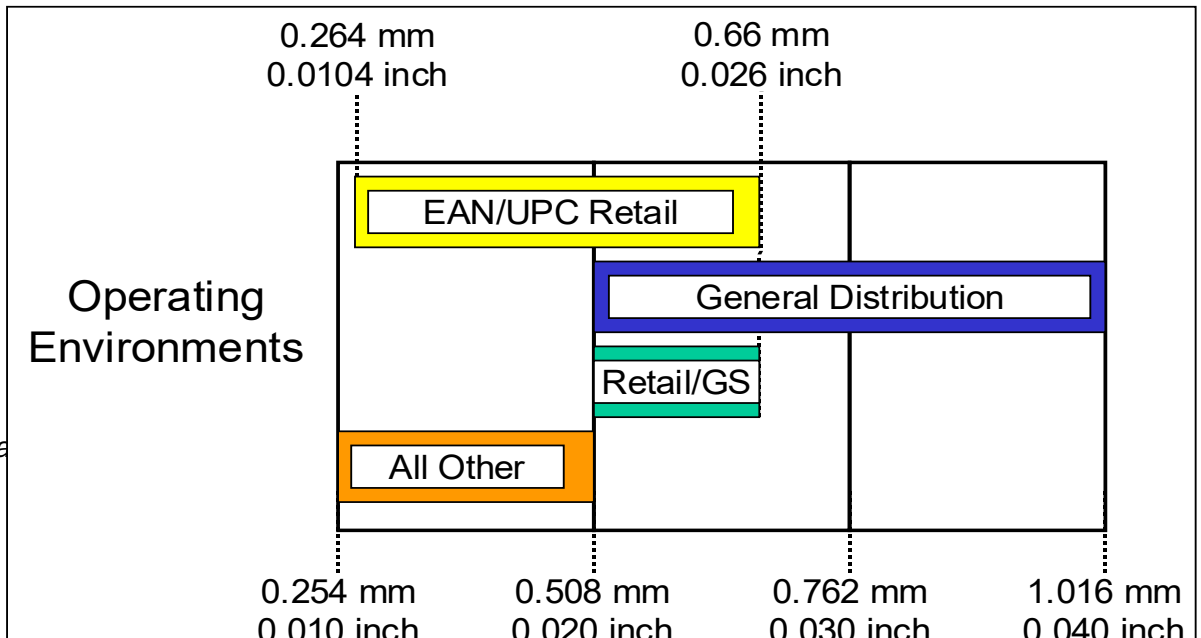
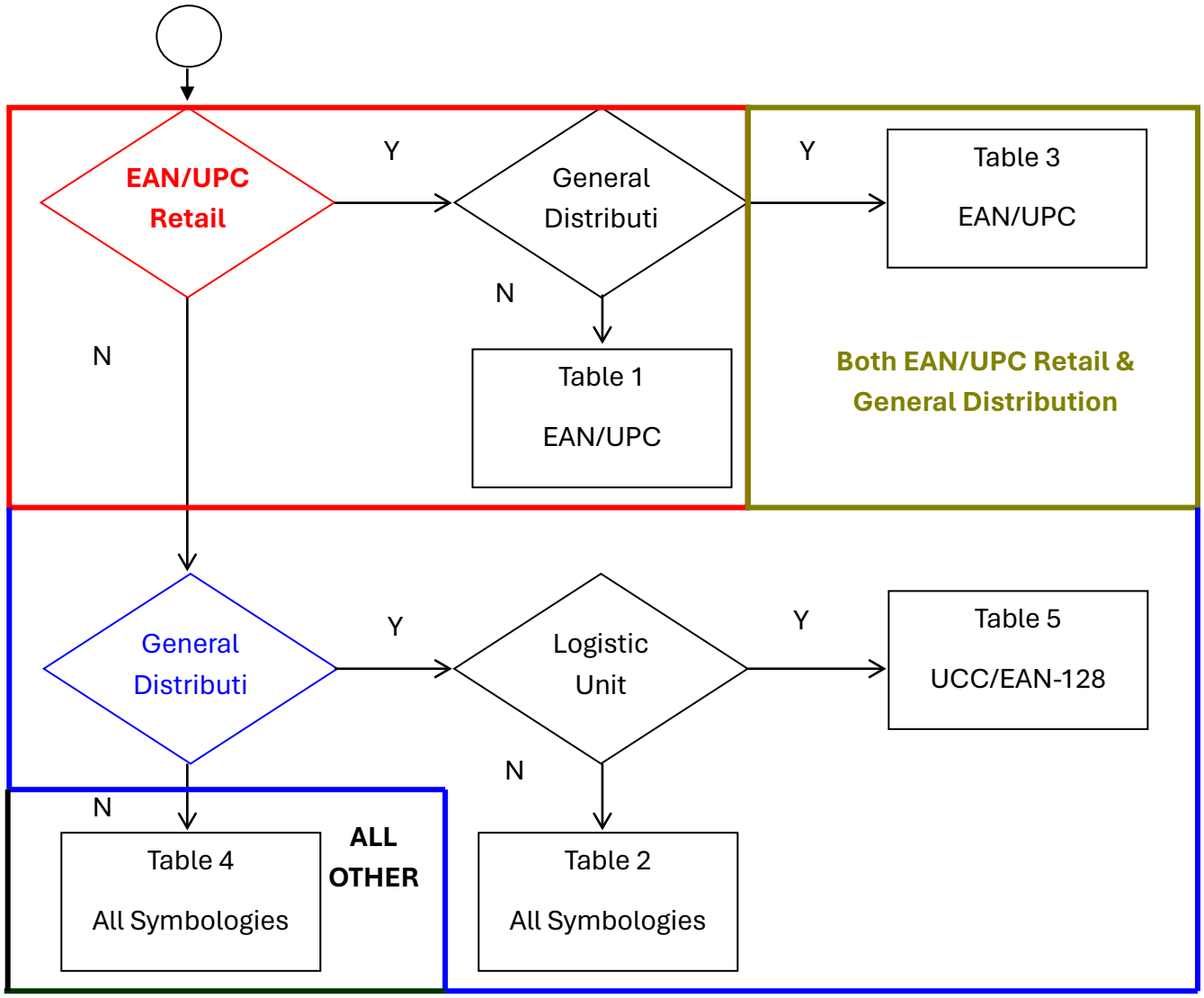


Figure 11: EAN•UCC Symbology Operational Environment Decision Tree



1.2.7 EAN•UCC symbol specification tables

In order to find the correct bar code specification, you must:

1. Find the appropriate EAN•UCC application area using Table 2 in Chapter 5, Section 4, Sub-Section 1.2.5
2. If the application area references two SSTs, use the decision tree in Chapter 5, Section 4, Sub-Section 1.2.6.2, Figure 1.1 to determine which one to use.

The EAN•UCC Symbol Specification Tables provide a basic "snapshot" of information required to begin producing a quality bar code symbol. Once the symbol type, size, minimum ISO print quality, and placement specifications (see Chapter 6 for information) are known, a discussion about producing bar codes can begin.

Chapter 5, Section 4, Sub-Sections 2 through 8 of this chapter will:

1. provide background on major bar code printing methods and materials
2. provide general printing and packaging background for major application groups
3. detail what should be specified before bar code printing begins
4. list what should be provided by EAN•UCC members (beyond the bar code specification) to printing companies when the decision to use an outside printing company is made

EAN•UCC Symbol Specification Table 1

* Primary Symbol(s) Specified	X-Dimension mm (inches)			** Minimum Symbol Height for Given X mm (inches)			Quiet Zone		Minimum Quality Specification
	Minimum	Target	Maximum	For Minimum X-dimension	For Target X-dimension	For Maximum X-dimension	Left	Right	
EAN-13	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	20.73 (0.82")	25.91 (1.02")	51.82 (2.04")	11*X*	7*X*	1.5/06/670
EAN-8	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	17.03 (0.67")	21.29 (0.84")	42.58 (1.68")	7*X*	7*X*	1.5/06/670
UPC-A	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	20.73 (0.82")	25.91 (1.02")	51.82 (2.04")	9*X*	9*X*	1.5/06/670
UPC-E	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	20.73 (0.82")	25.91 (1.02")	51.82 (2.04")	9*X*	7*X*	1.5/06/670

* Primary Symbol(s) Specified Plus Add-on 2 or 5	X-Dimension mm (inches)			** Minimum Symbol Height for Given X mm (inches)			Quiet Zone	Minimum Separation Between Symbols	Maximum Separation Between Symbols	Minimum Quality Specification
	Minimum	Target	Maximum	For Minimum X-dimension	For Target X-dimension	For Maximum X-dimension	Left			
EAN-13 + 2	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	20.73 (0.82")	25.91 (1.02")	51.82 (2.04")	11*X*	7*X*	12*X*	1.5/06/670
EAN-13 + 5	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	20.73 (0.82")	25.91 (1.02")	51.82 (2.04")	11*X*	7*X*	12*X*	1.5/06/670
UPC-A + 2	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	20.73 (0.82")	25.91 (1.02")	51.82 (2.04")	9*X*	9*X*	12*X*	1.5/06/670
UPC-A + 5	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	20.73 (0.82")	25.91 (1.02")	51.82 (2.04")	9*X*	9*X*	12*X*	1.5/06/670
UPC-E + 2	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	20.73 (0.82")	25.91 (1.02")	51.82 (2.04")	9*X*	7*X*	12*X*	1.5/06/670
UPC-E + 5	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	20.73 (0.82")	25.91 (1.02")	51.82 (2.04")	9*X*	7*X*	12*X*	1.5/06/670

* Special considerations exist for North American retail Point of Sale (POS) until a migration to International Standards is completed. Until January 1, 2005 only UPC-A or UPC-E symbols are acceptable in North America. After that date, EAN-8 and EAN-13 symbols will also be accepted using the size specifications in this table.

** The Symbol Height dimensions listed for EAN/UPC symbols include the human readable text. Because of the operative scanning environment for EAN/UPC symbols there is a direct relationship between the symbol's height and width. This means the minimum, target, and maximum symbol heights listed are tied to the minimum target and maximum X-dimension listed.

There is really no maximum for the height, but if the maximum X-dimension is used, the symbol height must be equal to or greater than those listed in the Maximum Symbol Height column.

EAN•UCC Symbol Specification Table 2

Symbol(s) Specified	* X-Dimension mm (inches)			** Minimum Symbol Height for Given X mm (inches)			Quiet Zones		*** Minimum Quality Specification
	Minimum	Target	Maximum	For Minimum X-dimension	For Target X-dimension	For Maximum X-dimension	Left	Right	
EAN-13	0.500 (0.0197")	0.66 (0.026")	0.66 (0.026")	38.87 (1.53")	51.82 (2.04")	51.82 (2.04")	11*X*	7*X*	1.5/06/670
EAN-8	0.500 (0.0197")	0.66 (0.026")	0.66 (0.026")	31.94 (1.26")	42.58 (1.68")	42.58 (1.68")	7*X*	7*X*	1.5/06/670
UPC-A	0.500 (0.0197")	0.66 (0.026")	0.66 (0.026")	38.87 (1.53")	51.82 (2.04")	51.82 (2.04")	9*X*	9*X*	1.5/06/670
UPC-E	0.500 (0.0197")	0.66 (0.026")	0.66 (0.026")	38.87 (1.53")	51.82 (2.04")	51.82 (2.04")	9*X*	7*X*	1.5/06/670
ITF-14	0.500 (0.0197")	0.500 (0.0197")	1.016 (0.040")	32.00 (1.25")	32.00 (1.25")	32.00 (1.25")	10*X*	10*X*	***
UCC/EAN-128	0.500 (0.0197")	0.500 (0.0197")	1.016 (0.040")	32.00 (1.25")	32.00 (1.25")	32.00 (1.25")	10*X*	10*X*	1.5/10/670

* UPC-E and EAN-8 symbols are designed for use on small packages. Whenever space permits, UPC-A, EAN-13, ITF-14, or UCC/EAN-128 symbols should be used in the general distribution scanning environment.

ITF-14 symbols with X-dimensions below 0.635 mm (0.025 in) should not be printed directly on corrugate with conventional (plate based) processes. Packages and/or containers marked with ITF-14 symbols with X-dimensions between 1.016 mm (0.040 in) and 1.219 mm (0.048 in) are acceptable based on historical specifications, but a migration to the 1.016 mm (0.040 in) maximum X-dimension should be made on new artwork. The ITF-14 symbol's bar width ratio target is 2.5:1 and the acceptable range is 2.25:1 to 3:1.

The minimum X-dimension for Variable Measure Products not scanned at the retail POS is 0.376 mm (0.0148 in).

** The minimum symbol height for general distribution scanning is always 31.75 mm (1.25 in).

The Symbol Height dimensions listed for EAN/UPC symbols include the human readable text. Because of the operative scanning environment for EAN/UPC symbols there is a direct relationship between the symbol's height and width. This means the minimum target and maximum symbol heights listed are tied to the minimum target and maximum X-dimension listed.

The Symbol Height dimensions for ITF-14 and UCC/EAN-128 relate to the bar heights only (do not include human-readable text or ITF-14 bearer bars). There is really no maximum for the height, but if the maximum X-dimension is used, the symbol height must be equal to or greater than those listed in the Maximum Symbol Height column.

*** For ITF-14 symbols with an X-dimension less than 0.635 mm (0.025 in), the minimum quality specification is 1.5/10/670. For ITF-14 symbols with an X-dimension greater than 0.635 mm (0.025 in), the minimum quality specification is 0.5/20/670.

EAN•UCC Symbol Specification Table 3

* Symbol(s) Specified	X-Dimension mm (inches)			** Minimum Symbol Height for Given X mm (inches)			Quiet Zones		Minimum Quality Specification
	Minimum	Target	Maximum	For Minimum X-dimension	For Target X-dimension	For Maximum X-dimension	Left	Right	
EAN-13	0.50 (0.0197")	0.66 (0.026")	0.66 (0.026")	38.87 (1.53")	51.82 (2.04")	51.82 (2.04")	11*X*	7*X*	1.5/06/670
EAN-8	0.50 (0.0197")	0.66 (0.026")	0.66 (0.026")	31.94 (1.26")	42.58 (1.68")	42.58 (1.68")	7*X*	7*X*	1.5/06/670
UPC-A	0.50 (0.0197")	0.66 (0.026")	0.66 (0.026")	38.87 (1.53")	51.82 (2.04")	51.82 (2.04")	9*X*	9*X*	1.5/06/670
UPC-E	0.50 (0.0197")	0.66 (0.026")	0.66 (0.026")	38.87 (1.53")	51.82 (2.04")	51.82 (2.04")	9*X*	7*X*	1.5/06/670

* Special considerations exist for North American retail Point of Sale (POS) until a migration to International Standards is completed. Until January 1, 2005 only UPC-A or UPC-E symbols are acceptable in North America. After that date, EAN-8 and EAN-13 symbols will also be accepted using the size specifications in this table.

UPC-E and EAN-8 symbols are designed for use on small packages. Whenever space permits, UPC-A, EAN-13, ITF-14, or UCC/EAN-128 symbols should be used in the general distribution scanning environment.

** The Symbol Height dimensions listed for EAN/UPC symbols include the human readable text. Because of the operative scanning environment for EAN/UPC symbols there is a direct relationship between the symbol's height and width. This means the minimum target and maximum symbol heights listed are tied to the minimum target and maximum X-dimension listed.

There is really no maximum for the height, but if the maximum X-dimension is used, the symbol height must be equal to or greater than those listed in the Maximum Symbol Height column.

EAN•UCC Symbol Specification Table 4

Symbol(s) Specified	* X-Dimension mm (inches)			** Minimum Symbol Height for Given X mm (inches)			Quiet Zones		*** Minimum Quality Specification
	Minimum	Target	Maximum	For Minimum X-dimension	For Target X-dimension	For Maximum X-dimension	Left	Right	
EAN-13	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	20.73 (0.82")	25.91 (1.02")	51.82 (2.04")	11*X*	7*X*	1.5/06/670
EAN-8	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	17.03 (0.67")	21.29 (0.84")	42.58 (1.68")	7*X*	7*X*	1.5/06/670
UPC-A	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	20.73 (0.82")	25.91 (1.02")	51.82 (2.04")	9*X*	9*X*	1.5/06/670
UPC-E	0.264 (0.0104")	0.33 (0.013")	0.66 (0.026")	20.73 (0.82")	25.91 (1.02")	51.82 (2.04")	9*X*	7*X*	1.5/06/670
ITF-14	0.250 (0.00984")	0.508 (0.020")	0.508 (0.020")	12.70 (0.50")	12.70 (0.50")	12.70 (0.50")	10*X*	10*X*	***
UCC/EAN-128	0.250 (0.00984")	0.508 (0.020")	0.508 (0.020")	12.70 (0.50")			10*X*	10*X*	1.5/10/670

* ITF-14 symbols with X-dimensions below 0.635 mm (0.025 in) should not be printed directly on corrugate with conventional (plate based) processes. Packages and/or containers marked with ITF-14 symbols with X-dimensions between 1.016 mm (0.040 in) and 1.219 mm (0.048 in) are acceptable based on historical specifications, but a migration to the 1.016 mm (0.040 in) maximum X-dimension should be made on new artwork. The ITF-14 symbol's bar width ratio target is 2.5:1 and the acceptable range is 2.25:1 to 3:1.

** The Symbol Height dimensions listed for EAN/UPC symbols include the human readable text, but the Symbol Height dimensions for ITF-14 and UCC/EAN-128 relate to the bar heights only (do not include human-readable text or ITF-14 bearer bars).

Because of the operative scanning environment for EAN/UPC symbols there is a direct relationship between the symbol's height and width. This means the minimum target and maximum symbol heights listed are tied to the minimum target and maximum X-dimension listed.

The minimum bar height for ITF-14 and UCC/EAN-128 symbols in this operative scanning environment is 12.7 mm (0.50 in), but if the package is physically too small to accommodate this rule, further truncation is permitted. In no case shall the bar height be less than 5.08 mm (0.20 in).

There is really no maximum for the symbol height, but if the maximum X-dimension is used, the symbol height must be equal to or greater than those listed in the Maximum Symbol Height column.

*** For ITF-14 symbols with an X-dimension less than 0.635 mm (0.025 in), the minimum quality specification is 1.5/10/670. For ITF-14 symbols with an X-dimension greater than 0.635 mm (0.025 in), the minimum quality specification is 0.5/20/670.

EAN•UCC Symbol Specification Table 5

Symbol(s) Specified	* X-Dimension mm (inches)			** Minimum Symbol Height for Given X mm (inches)			Quiet Zones		Minimum Quality Specification
	Minimum	Target	Maximum	For Minimum X-dimension	For Target X-dimension	For Maximum X-dimension	Left	Right	
UCC/EAN-128	0.50 (0.0197")	0.508 (0.020")	0.940 (0.037")	32.00 (1.25")	32.00 (1.25")	32.00 (1.25")	10*X*	10*X*	1.5/10/670

* If the item is too small to accommodate the minimum X-dimension and will not be scanned in a general distribution environment, the minimum X-dimension is 0.250 mm (0.00984 in).

** The minimum UCC/EAN-128 symbol height indicated is for bar height only and does not include the human readable text. If the item is too small to accommodate the minimum and will not be scanned in a general distribution environment, the minimum bar height is the greater of 15% of the symbol width including quiet zones (light margins) or 12.7 mm (0.50 in). If the package is physically too small to accommodate this rule, further truncation is permitted but in no case shall the bar height be less than 5.08 mm (0.20 in).

There is really no maximum for the height, but if the maximum X-dimension is used, the symbol height must be equal to or greater than those listed in the Maximum Symbol Height column.

The minimum X-dimension for symbols not intended to be scanned in general distribution is 0.376 mm (0.0148 in).

2. EAN•UCC BAR CODE PRINTING METHODS & MATERIALS

Most EAN•UCC bar codes are printed by:

- printing companies that use:
    - traditional printing methods (e.g., offset, flexographic, gravure, or screen) or
    - digital printing methods (e.g., digital offset, in-line ink-jet, or in-line ion deposition)
- digital bar code printing equipment (e.g., direct thermal, thermal transfer, continuous feed laser, or industrial ink jet)
- general purpose printing devices (e.g., sheet-fed laser or ink-jet)

EAN•UCC bar codes are usually printed directly on:

- blank labels used for imprinting
- labels with complex graphics
- apparel tags
- hang-tags for coils of steel or paper
- consumer packaging (e.g., bread bags, aspirin bottle cartons, magazines, and surgical devices)
- standardised, corrugated containers (e.g., standard cases with a fixed quantity or assortment of consumer packages)

3. PRINTING EAN•UCC BAR CODES BY APPLICATION GROUP

Bar code printing methods vary depending on the item being bar coded. For this reason the following section separates the discussion about bar code production into four groups. See the sub-section that best describes what you are bar coding.

3.1 Product packages

Bar coded product packages come in all sizes, shapes, and substrates. This is because EAN•UCC bar codes are used in the grocery, retail, foodservice, apparel, healthcare, construction, electronics, packaging furniture, textiles and most other sectors. This section provides only basic background information because package types are far too numerous to cover individually.

When EAN•UCC members are making decisions on how to print and package their products, a good place to start is to look at the way similar products are printed and packaged. This may help them and their printing company make decisions about what size bar code they need given the type, colour, shape, size, and substrate of the package. They may also want to talk to companies that provide bar code Film Masters (Bar Code Masters) or digital bar code files.

The next decision for EAN•UCC members is whether to print their own bar codes or have someone else print them for them. They should consider choosing traditional printing press methods if they:

- print a specific bar code in large quantities (fixed data content)
- print a bar code with other complex graphics (e.g., multi-colour or process printing)
- print directly on difficult packaging substrates (e.g., aluminium or translucent plastic)

They should consider choosing a digital printing method if they:

- print small batches of bar codes
- print bar codes that vary in data content frequently (variable data content)

No matter what printing method fits their requirement, EAN•UCC members can find someone else to produce their bar codes, but if their bar codes' data content varies frequently (e.g., requires a lot, batch, or date code) they may want to print their own. If they decide to print their own, EAN•UCC members should take the time to learn how to use the correct printer/software/label combination. To find out more about printing bar codes with digital printers, see Chapter 5, Section 4, Sub-Section 5 of this guideline.

3.2 Standardised, corrugated product handling containers

Standardised, corrugated containers are used for packaging, storing, handling, and shipping consumer packages. Because they are standard inventory units, they may be produced in large quantities.

If the container is not designed for scanning at the retail POS (e.g., a case of 36 paper towel rolls or a case of 144 bandage boxes), the container may often be used in its natural state: a brown corrugated box. There are generally three approaches to printing a bar code on a corrugated box.

1. printing directly on the box using a flexographic printing process
2. printing directly on the box using an industrial ink-jet printing device
3. printing on a label and then applying the label to the box

Several types of bar codes may be used on these containers based on the following conditions:

- if the bar code is printed directly on the box, the ITF-14 bar code is typically used because the specified bar code quality grade (ISO methodology) is relaxed to a minimum of 0.5/20/670
- If information is required that cannot be "carried" by the ITF-14 bar code (e.g., lot numbers, serial numbers, or dates), then a UCC/EAN-128 symbol is used
- If the container will be scanned at the retail POS, then an EAN/UPC bar code is required

It should be noted that printing EAN/UPC or UCC/EAN-128 symbols is difficult here because:

- Corrugate's brown colour does not provide a lot of contrast with the dark colour of printed bars
- Special care is required for printing UCC/EAN-128 and EAN/UPC symbols **because defects and unevenness in the surface have a more severe effect on them**.

Whenever EAN/UPC or UCC/EAN-128 symbols are printed, a minimum print quality of grade of 1.5 GPA (C) is specified. If either a UCC/EAN-128 or EAN/UPC symbol is required for your corrugate box and the minimum print quality requirements of 1.5 GPA cannot be met by printing directly on the corrugate, then printing and applying a label may be your best choice.

If the container will be scanned at the retail POS as well as in the distribution or shipping process, the EAN/UPC symbol must have a minimum narrow bar width of 0.495 mm or 0.0195" (19.5 mils) and the symbol placement guidelines for shipping containers should be followed.

3.3 Logistics units

The ID numbers in bar codes used to identify logistics units vary for each unit. This is because the bar codes must uniquely identify logistics units that vary by date, purchase order, customer, and/or content. This means the most practical method for printing bar codes used in logistics processes will be a digital method. In smaller EAN•UCC member companies, this may mean printing a transport label from a printer in the office. In larger companies, an industrial bar code printer (typically a thermal transfer printer) may be used to generate bar code transport labels on-demand for each shipment. In other large companies, transport labels may be printed in batches on a

continuous bar code printer (typically thermal transfer or laser) in a centralised location and then applied during order processing.

3.4 Coupons

Manufacturers' redeemable coupons are generally printed:

- on a traditional printing press for newspaper or product inserts or for postal distribution
- on a pressure sensitive label attached to a product for instant redemption
- as a part of the product packaging itself for redemption after the product is consumed

Retailers may also use traditional printing methods for in-store coupons or they may have electronic printers that produce coupons for the customer as a part of the POS process.

4. DEVELOPING A BAR CODE PRODUCTION PLAN

Whether EAN•UCC members print their own bar codes or have someone else print them for them, it is important to begin by developing a good plan (specification) for their bar codes. A good bar code plan will answer the questions that follow:

1. **What GTIN is in the bar code?**

   To create a correct GTIN, see Chapter 2 for the detailed rules for implementing the EAN•UCC system in the application area required. Then move to the appropriate sub-section of Section 3 to find the unambiguous definition of the data content for the bar code.

2. **What bar code type will be used?**

   To find what bar code(s) to use, see Chapter 5, Section 4, Sub-Section 1.2 to find a Symbol Specification Table for your application area based on the scanning environment. A general tutorial on this subject can also be found in Section 1.2 of *Guidelines for Producing Quality Symbols*.

3. **What size is the bar code graphic?**

   After the correct bar code symbol is specified together with the information to encode in it, the design stage begins. The size of the symbol within the design will depend on the symbol specified, where the symbol will be used, and how the symbol will be printed. The final major consideration for symbol size is the capability of the selected printing process. The minimum size and correct BWR (bar width reduction) for an EAN•UCC symbol varies by printing process and even press to press. Printing companies should establish a minimum symbol size and BWR to achieve acceptable and repeatable quality results. Print gain gauges (see Chapter 5, Section 4, Appendix 5) provide a means of press calibration.

To find the minimum, nominal and maximum X-dimension (narrow bar width) and bar height required for your bar code symbol, see Chapter 5, Section 4, Sub-Section 1.2 to find a Symbol Specification Table for your application area based on your scanning environment.

4. **What colour is the bar code symbol?**

   The optimum colour combination for an EAN•UCC bar code is black bars with a white background (spaces and quiet zones). If you want to use other colours, the following may help you choose satisfactory ones:

   a) EAN•UCC bar code symbols require dark colours for bars (e.g., black, dark blue, dark brown or dark green);

b) The bars should always consist of a single line colour and should never be printed by multiple imaging tools (plate, screen, or cylinder);

c) EAN•UCC bar code symbols require light backgrounds of adequate opacity for the quiet zones (light margins) and spaces (light bars) e.g. white or pale yellow. In addition to light backgrounds, “reddish” colours may also be used. This is also true of similar colours such as yellow, orange, pink, peach, light browns, and light purples. Given the fact that most bar code scanners use a red light source, you can quickly see why these colours may be suitable for backgrounds, but avoided for bars;

d) In many cases the symbol background is not printed. If the symbol background is printed beneath the bars, the background should be printed as solid line colours. If you use multiple layers of ink to increase the background opacity, each layer should be printed as a solid. If you use a fine screen to deliver more ink to the substrate, be sure there are no voids in the print caused by the screen not adequately filling in.

The EAN•UCC does not offer a list of acceptable colours for bars (dark bars) and spaces (light bars). This is because of the wide variety of inks and dyes with varied properties and the varied ink transfer process employed. The *Symbol Contrast Gauge for EAN•UCC Symbols* provides an easy and effective way to evaluate the Symbol Contrast of your design if package you are evaluating approximates the final, filled package.

In many cases a package designer is involved in the specification of the printing material characteristics such as matte, gloss, colour, or texture. A printer may submit sample materials for evaluation and/or approval. When these decisions are made, the bar code symbol quality should be considered. The following questions provide some examples:

- Will a fluorescent, metallic, translucent, or transparent material be overprinted to create the symbol background? If so, will the ink opacity be sufficient for symbol contrast?
- Will an overprint varnish or laminate be used? If so, will it interfere with symbol scanning?
- Will the material be pitted or textured to a degree that could create voids in the bars (dark bars) or spots in the background spaces (light bars)?

5. Where should the bar code symbol be placed on my product?

When discussing symbol placement we are referring to the symbol location on the design and the symbol orientation (rotation) relative to the printed web or sheet flow. When assigning the placement for the symbol, begin by consulting the specifications in Chapter 6, then consider the packaging and printing processes. You should consult the Packaging Engineer to make sure the symbol will not be obscured or damaged, (e.g., over a carton edge, beneath a carton fold, beneath a package flap, or covered by another packaging layer). After determining the proper placement, the printing company should be consulted before assigning the symbol rotation. This is because many printing processes require bar codes to be printed in a specific orientation to the feed direction of the web or sheet. For example:

- If possible, when using flexographic printing, the bars should run parallel to the press web direction. If the bars are required to run perpendicular to the press direction, try to avoid distorting the symbol for the plate roll circumference. This lack of distortion will alter the overall width of the symbol, but will provide dimensional integrity.
- When using either silk screen or rotogravure printing processes, the symbol should be aligned parallel to the cell structure on the screen or gravure plate cylinder to provide the smoothest bar edge possible.

To find specifications for symbol placement, see Chapter 6 of this specification.

6. How should the symbol text associated with the bar code be printed?

The best way to cover the questions about the human readable text for EAN•UCC bar code symbols, would be to answer some of your more frequently asked ones.

Does the human readable text need to be a certain size?
The OCR-B font was originally specified for use with EAN/UPC symbols. The human readable text for ITF-14 and UCC/EAN-128 symbols must be clearly legible and in a size proportional to the symbol size per Chapter 5, Sections 2 and 3.

Can I put spaces in between the text characters?
Yes, in fact EAN/UPC symbols specify spacing per the drawings referenced in the question above. Many companies specify spacing in between ITF-14 and UCC/EAN-128 human readable text. This makes the text easier to read, remember, and key enter. While including spaces is perfectly appropriate for the human readable text, the spaces must not be encoded into these symbols.

I see parentheses around the AIs (Application Identifiers) in the UCC/EAN-128 symbol. Are they supposed to be there and are they encoded in the bars (dark bars) and spaces (light bars) of the symbol?
All AIs must be enclosed in parentheses in the human readable text, but the parentheses must not be encoded in the symbol

How many digits do I print beneath the EAN/UPC symbol in the human readable text?
You must, absolutely and without exception, print 12 digits, no more, no less, below the UPC-A symbol. You must, absolutely and without exception, print 13 digits, no more, no less, below the EAN-13 symbol. You must, absolutely and without exception, print 8 digits, no more, no less, below UPC-E and EAN-8 symbols.

7. What quality level is required to insure the symbol will scan easily?

Today, bar code quality can be graded using an instrument called a verifier that uses the ISO grading method. To determine the minimum ISO Symbol Grade / verifier aperture / verifier wavelength to be specified, see Chapter 5, Section 4, Sub-Section 1.2 to find a Symbol Specification Table for your business application/scanning environment (e.g., 1.5/06/670).

ISO describes a method for looking at the quality of printed bar code symbols using an ISO based verifier as a tool.

- The verifier is programmed to look at certain characteristics of the symbol, the way a scanner would, provide scan grades, and after ten scans provide an ISO symbol grade. The UCC and EAN Numbering Organisations utilise

the ISO method, but specify the minimum grade necessary for every EAN•UCC symbol depending on which symbol is used, where it is used, or what identification code it is carrying. In addition to the minimum grade, the UCC and EAN Numbering Organisations also specify the verifier aperture width and wavelength. This would be similar to a University using a standardised test to determine whether applicants qualify for admission. Several Universities may utilise the same standardised test, but each sets the minimum score necessary for their applicants to be admitted.

- Verification, as a method for use by the entire global supply chain, requires a calibrated conformance standard for EAN/UPC symbol verifiers to be used for checking calibration and operator scanning methods to prevent divergence of trading partners. The EAN•UCC Global Symbology Committee (GSC) has developed a *Calibrated Conformance* Standard that is described in Chapter 5, Section 4, Appendix 1 of the General Specification. The idea behind the standard is to test, on a regular basis, if the verification equipment is operating within the ISO tolerance levels as published by the verifier manufacturer. This is especially important in heavy use applications, where various operators may be involved, or where a new user is learning to use the verifier properly. The operator, on a routine basis, should scan each of the symbols on the standard to determine if the verifier device provides the values listed on the test card.

The current ANSI X3.182 and CEN 1635 symbol print quality standards are to be replaced by ISO/IEC 15416 *Automatic Identification and Data Capture Techniques – Bar Code Print Quality Specifications – Linear Symbols*. ISO/IEC 15416 is in the final review process in ISO/IEC JTC1 SC31 at release of Version 1 of the *General EAN•UCC Specifications*.

Chapter 5, Section 4, Appendix 2 contains a history of the evolution of ISO/IEC 15416 and a quick reference table of the symbol quality parameters depending on their type, their application, or the identification code they are carrying. For more detailed information on this quality assessment methodology, see Section 1.7 of *EAN•UCC Guidelines for Producing Quality Symbols* or the UCC's Technical Bulletin #1: *Understanding UCC Specified Methods for Assessing EAN/UPC Symbol Quality*.

5. WHEN EAN•UCC MEMBERS CHOOSE TO PRINT THEIR OWN BAR CODES

If EAN•UCC members decide to print their own bar codes, they need a production plan (see Chapter 5, Section 4, Sub-Section 4), a software package for designing bar codes, a printing device to print them, and a device to check their printed quality. Many companies can help them with bar code design software, bar code printers, bar code quality control instruments, quality assessment services, and general bar code information.

If EAN•UCC members decide to use a direct thermal or thermal transfer bar code label printer, they should read Chapter 5, Section 4, Appendix 3. These printers and their associated software are typically designed with EAN•UCC bar codes built into the firmware. Direct thermal and thermal transfer printers are capable of generating high quality bar code symbols (typically ANSI/CEN grade A or B). The printers may stand-

alone or they may be integrated into an application such as a weighing and labelling system. In many cases the user has no control over the size or placement of the bar code. Quality printing is easily maintained by observing the following guidelines.

EAN•UCC members may also decide to use a printer in their office (e.g. a desktop, sheet-fed laser or ink-jet printer). Chapter 5, Section 4, Appendix 4 provides advice on using a general office printer. These printing devices are capable of printing high quality bar codes when operated by experienced EAN•UCC members equipped with a good bar code design software product. This category includes laser, desktop, ink jet, ion deposition, and mechanical matrix office printers. These devices are designed primarily for printing full size pages of text and graphics. However, they can be used to print retail tags by using pre-cut labels on page size backing paper. Some are also equipped with a continuous feed mechanism when producing symbols in large quantities.

6. WHEN MEMBERS USE A PRINTING COMPANY TO PRINT SYMBOLS

If EAN•UCC members decide to have a printing company print their bar codes, they should start by providing them with a bar code specification that answers the questions in Chapter 5, Section 4, Sub-Section 4. The printing company may also want them to provide either a bar code Film Master (Bar Code Master), digital bar code file, or FPO (for position only) symbol.

If a printing company asks an EAN•UCC member for a Film Master, they should see if the printing company is already working with a Film Master manufacturer who understands their special requirements. Beyond providing printing companies with Film Masters, these companies are traditionally an excellent resource for advice on bar code production.

Printing companies who print bar codes in a pressroom (and prepare artwork electronically) or print bar codes electronically, typically use digital bar code files. They may create the files themselves with internal bar code design software or rely on a Film Master manufacturer or customer to supply a digital bar code file.

The printing company may also ask EAN•UCC members to provide artwork that includes an FPO symbol. If so, the printing company will create the actual production ready symbol themselves or have it created by a third party.

EAN•UCC members should also ask the printing company about specific requirements when printing EAN•UCC bar codes, such as:

- What are the minimum size requirements for the bar code given the selected printing process?
- Should the bar code be oriented in a specific direction for the best quality result?
- Will an additional print station be required for the bar code?

EAN•UCC members should also consider how the printed bar code will appear in the final, filled package:

- make sure the bar code is not underneath a fold or flap after the product is packaged
- do not let the bar code wrap around the corner of a box or container after it is packaged
- make sure the bar code's placement on the package meets EAN•UCC recommendations in Section 6 of this specification

- make sure the product inside a plastic package will not show through the bar code printed on the plastic package to the degree that the bar code does not meet minimum quality grades

7. COMMON PROBLEMS TO AVOID

7.1 Poor print quality

The followings are the most common problems associated with print quality for traditional wet ink processes and digital printer applications.

Symbol Contrast

It is essential that the bars (dark bars) and spaces (light bars) of adequate opacity be printed in solid colours without any voids or missing sections.

- For traditional printing this may mean more ink and/or pressure being applied to the printing plate, or using a darker colour.

For label printing it may mean increasing the intensity of the thermal print head and/or replacing the label substrate and foil (ribbon) materials for a compatible match.

Print Defects

When using recycled substrate material, particularly fibreboard, the "bits" (defects) in the board can affect the quality of the print contrast and light margins. Proper care should also be used when printing on the flutes of fibreboard. Some plastic and/or paper substrates may also contain voids in their surface treatment or coating which can cause defects to appear in the print.

On-demand printers can also introduce printing defects. Some examples include:

- For thermal printers, faulty print heads or creases in the thermal transfer ribbons will produce bar code symbols that have missing bars or horizontal lines through the bars. Thermal print heads must be cleaned and maintained regularly, and replaced when necessary, to avoid printing incomplete bar code symbols.
- Thermal printer consumable supplies are an important quality consideration. For best results, the correct combination of label and ribbon materials should be chosen for the printer type and application environment. When a different brand or batch of labels or ribbon is loaded on the printer, initial set-up procedures for analysing print quality should be followed.
- For general-purpose printers or printing companies, bar code design software may introduce rounding errors if the symbol's target size is not scaled to match the resolution of the output device.

General-purpose printers require periodic maintenance. Laser printers, for example, not only consume toner, but also require periodic replacement of components such as drums, developers, fusers, and brushes. All of the consumable parts may be contained

in a single replacement cartridge, or they may be separately installed, depending on the make and model of printer. Because bar code labels contain a higher percentage of black printing than occurs in ordinary text, fewer pages can be printed between maintenance intervals.

Quiet Zones (Light Margins)
The left and right quiet zones (light margins) must not be infringed.

- Avoid printing the bar code too close to the edge of the label.
- Avoid printing additional text or lines too close to the bar code symbol.
- Quiet Zone (light margin) Indicators are a useful tool to "protect" quiet zones (light margins).

7.2 Common packaging problems to avoid

Obscured symbols
If any part of the symbol is obscured it may not scan. Ensure the bar code symbol is not obscured by sealing tape, straps, labels, pre-printed film, creases in shrink wrap, or embossed areas (e.g., recycle logo on plastic package).

Label Application

- Replace bar code labels that have been poorly applied (e.g., creased or peeled up on an edge)
- Take extra care when using wrap-around labels, ensuring the quiet zone (light margin) is not too close to the corner of a case

Show through
The exterior packaging materials of the package must obscure bar codes on individual items contained within it. This eliminates the possibility of scanning the individual item's bar code instead of the bar code on the larger unit.

Specular reflectance
In many cases, bar codes on the final, filled package (e.g., positioned under film wrap or at obscure angles under blister packs) will not scan.

- Account for the total package construction (e.g., colours and packaging materials) and the contents inside the package (e.g., soil or black candy behind a white translucent plastic) when assessing the final position of the bar code symbol during the design phase.

8. QUICK CHECK-LIST

Wrong bar code symbol

It is vital that identification numbers and supplementary data are encoded in the correct bar code symbol. To create a correct ID number, see Chapter 2 for the detailed rules for implementing the EAN•UCC system in the application area required. Then move to the appropriate sub-section of Section 3 to find the unambiguous definition of the data content for the bar code.

Bar height and truncation

If the bar code symbol height is too small, scanning performance will drop or scanning failure will occur. Check height requirements for the bar code symbol for your application based on the Symbol Specification Tables in Chapter 5, Section 4, Sub-Section 1.2 of this chapter.

Bars (dark bars) and spaces (light bars)

If the width of the bars (dark bars) and the spaces (light bars) are not printed in accordance with EAN•UCC standards, the bar code symbol will not scan successfully. If the width of the bars (dark bars) and spaces (light bars) are not adjusted for the addressable resolution of the output device, degradation in Decodability grades will occur. For more detailed information on designing symbols for addressable resolution, see Section 1.8 of *Guidelines for Producing Quality Symbols* or the UCC's *Guideline for Providers of EAN/UPC Symbol Design Software*.

EAN/UPC Magnification

Print EAN/UPC bar code symbols within the specified magnification range after correcting for the addressable resolution of the output device. Symbols should be printed at the nominal size wherever possible and specifications below the nominal size should only be made after consulting with the printing company for their recommendation.

Incorrect colour

A colour and substrate combination that provides adequate ISO Symbol Contrast for the symbol is important. For a general tutorial on the subject, see Section 1.4 of *Guidelines for Producing Quality Symbols*.

Data Input Inconsistencies

Three common inconsistencies will result in scanning errors and must be avoided.

- The human-readable text does not correspond to the data encoded in bar code symbols.
- The user has not been informed of a product identification number in sufficient time to include it or revise it in the product data file.
- Two bar code symbols used on the same product package encode different identification numbers.

9. BAR CODE PRODUCTION AND QUALITY ASSESSMENT RESOURCES

Bar Code Design and Production

- *Guidelines for Producing Quality Symbols* (available in print and on the UCC's CD-ROM Tool Kit called *The Art of Producing Bar Codes*)
- *Guidelines for Providers of EAN/UPC Symbol Design Software Providers* (available online @ uc-council.org, in print, and on the UCC's CD-ROM Tool Kit called *The Art of Producing Bar Codes*)
- ISO/IEC 15419 – *Information Technology – Automatic Identification and Data Capture Techniques – Bar Code Digital Imaging and Printing Conformance Specification* (Committee Draft or CD at the time of Version 1 of the *EAN•UCC General Specification*)
- *U.P.C. Film Master Verification Manual* (available online @ uc-council.org, in print, and on the UCC's CD-ROM Tool Kit called *The Art of Producing Bar Codes*)
- ISO/IEC 15421- *Information Technology – Automatic Identification and Data Capture Techniques - Bar Code Master Test Specifications* (Final Committee Draft or FCD at the time of Version 1 of the EAN•UCC *General Specification*)

Bar Code Quality Assessment

- *Guidelines for Producing Quality Symbols* (available in print and on the UCC's CD-ROM Tool Kit called *The Art of Producing Bar Codes*)
- ISO/IEC 15419 – *Information Technology – Automatic Identification and Data Capture Techniques – Bar Code Print Quality Test Specification – Linear Symbols* (Committee Draft or CD at the time of Version 1 of the EAN•UCC *General Specification*)
- ANSI/UCC5: *Quality Specification for the U.P.C. Printed Symbol* (available online @ uc-council.org, in print, and on the UCC's CD-ROM Tool Kit called *The Art of Producing Bar Codes*)
- Technical Bulletin #1: *Understanding UCC Specified Methods for Assessing EAN/UPC Symbol Quality* (available online @ uc-council.org, in print, and on the UCC's CD-ROM Tool Kit called *The Art of Producing Bar Codes*)
- *Calibrated Conformance Standard, Test Card for EAN/UPC Symbol Verifiers* (traceable standard for checking verifier calibration and training verifier operators – available from the UCC)

- Symbol Templates and Gauges (available from the UCC as a set)
    - *Layout Template for EAN Symbols* (EAN-13 and EAN-8)
    - *Layout Template for U.P.C. Symbols* (UPC-A and UPC-E)
    - EAN•UCC *Symbol Size Gauge* (EAN-13, EAN-8, UPC-A, UPC-E, ITF-14, and UCC/EAN-128)
    - *Symbol Contrast Gauge for EAN•UCC Symbols* (for use with opaque substrates)
- ANSI X3.182 *Bar Code Print Quality Guideline* (being replaced by ISO/IEC 15416)
- CEN 1635 *Test Specifications – Bar Code Symbols* (being replaced by ISO/IEC 15416)
- Flexographic Technical Association: Flexographic Image Reproduction Specifications and Tolerance, 2nd Edition
- Fibre Box Association: Guideline to Direct Contact Printing of Bar Code Symbols on Corrugated

APPENDIX 1: CALIBRATED CONFORMANCE STANDARD

The *Calibrated Conformance Standard, Test Card for EAN/UPC Symbol Verifiers* is a physical set of EAN/UPC symbols designed to test particular characteristics of ISO/IEC 15416 based verification equipment. The standards are manufactured on special materials and are made traceable to NIST (National Institute of Standards and Technology). This traceability is facilitated through a custom designed piece of hardware (nicknamed "the Judge") and has been engineered to measure the various attributes outlined in ANSI X3.182 *Bar Code Print Quality Guideline* published in 1990 and ANSI/UCC5 published in 1994. The Judge has also been made traceable to National Institute of Standards and Technology (NIST) located in Washington D.C., USA. ANSI X3.182 has now been integrated in ISO/IEC 15416.

The idea behind the standard is to test, on a regular basis, if the verification equipment is operating within the ISO tolerance levels as published by the verifier manufacturer. This is especially important in heavy use applications, where various operators may be involved or where a new user is learning to use the verifier properly. The operator, on a routine basis, should scan each of the symbols on the standard to determine if the verifier device provides the values listed on the test card. A small picture of the Test Card's layout (NOT TO SCALE) is shown in Figure A.1 of this Appendix.

EAN•UCC specifies a 6-mil aperture and 670nm +/_10 wavelength be used for EAN/UPC symbols and the exact scanning method should be determined by following all of the verifier manufacturer recommendations. This may require some practice to obtain the right touch, but it will inform the operator when the correct method has been used. If the verifier reports values that agree with the values listed on the Test Card (within the verifier manufacturer's stated accuracy and repeatability limits), then the operator can assume the verifier is calibrated. If, after repeated attempts, the device does not provide the value as printed on the standard, (within the verifier manufacturer's stated accuracy and repeatability limits), then the device or the operator's scanning technique must be considered suspect. In this event, the operator should refer to his or her operator's manual as to the proper remedies specified by the verifier manufacturer.

The Test Card, as any standard, is sensitive and should be handled with care. If the symbols show dirty areas, one can safely clean these by using a soft cotton pad and photographic grade film cleaner. If visual scratches develop on a symbol, that area of the symbol should not be used. If sufficient visual scratches develop where a clean line of scan is not available, then the Test Card is no longer certified and should not be used as a standard.

Figure A.1: Calibrated Conformance Standard, Test Card for EAN/UPC Symbol Verifiers (SAMPLE LAYOUT ONLY – NOT TO SCALE)


CALIBRATED CONFORMANCE STANDARD ©
TEST CARD
FOR EAN/UPC SYMBOL VERIFIERS
EAN-13 MASTER GRADE
UPC-A MASTER GRADE
FAIL
PASS
QUIET ZONE TEST
DECODABILITY:
CONTRAST:
MODULATION
DEFECTS (VOID)
DECODABILITY (BAR)
CALIBRATION #
WAVE LENGTH 670 nm
EFF. APER:
CONTRAST
PART NO. CCSV-1
REV G
SAMPLE

APPENDIX 2: QUALITY LEVELS TO INSURE THE SYMBOL WILL SCAN EASILY

Today, bar code quality can be graded using an instrument called a verifier that uses the ISO grading method. To determine the minimum ISO Symbol Grade / verifier aperture / verifier wavelength to be specified, see Chapter 5, Section 4, Sub-Section 1.2 to find a Symbol Specification Table for your business application/scanning environment (e.g., 1.5/06/670).

ISO/IEC 15416 describes a method for looking at the quality of printed bar code symbols using an ISO based verifier as a tool. The verifier is programmed to look at certain characteristics of the symbol the way a scanner would, provide scan grades, and after ten scans provide an ISO symbol grade.

The EAN•UCC utilises the ISO method, but specifies the minimum grade necessary for every EAN•UCC symbol depending on which symbol is used, where it is used, or what identification code it is carrying. In addition to the minimum grade, EAN•UCC also specifies the verifier aperture width and wavelength. This would be similar to a university using a standardised test to determine whether applicants qualify for admission. Several universities may utilise the same standardised test, but each sets the minimum score necessary for their applicants to be admitted.

The table below provides you with a quick reference list of the symbol quality parameters depending on their type, their application, or the identification code they are carrying.

Table B.1

Symbology	Application or ID Code	ANSI Symbol Grade	Aperture	Wavelength
EAN/UPC	EAN.UCC-8	1.5 (GPA) or a "C"	6 mils	670 nm +/-10
EAN/UPC	UCC-12	1.5 (GPA) or a "C"	6 mils	670 nm +/-10
EAN/UPC	EAN.UCC-13	1.5 (GPA) or a "C"	6 mils	670 nm +/-10
UCC/EAN-128	Extended Coupon Code	1.5 (GPA) or a "C"	6 mils	670 nm +/-10
UCC/EAN-128	EAN.UCC-14	1.5 (GPA) or a "C"	10 mils	670 nm +/-10
UCC/EAN-128	SSCC-18	1.5 (GPA) or a "C"	10 mils	670 nm +/-10
UCC/EAN-	Small Shipping	1.5 (GPA) or a "C"	10 mils	670 nm +/-10

128	Packages			
ITF (<25mil X)	EAN.UCC-14	1.5 (GPA) or a "C"	10 mils	670 nm +/-10
ITF (≥25mil X)	EAN.UCC-14	0.5 (GPA) or a "D"	20 mils	670 nm +/-10

For example, a EAN/UPC symbol will always be verified using a 6 mil (0.006 inch) aperture, a 670 nm (nanometer) +/-10 wavelength of light, and require a minimum symbol grade of 1.5 (grade point average on 4.0 scale) or a "C". On a bar code purchase order this would typically be expressed as 1.5/06/670.

APPENDIX 3: USING A THERMAL BAR CODE LABEL PRINTER

Direct thermal and thermal transfer printers are capable of generating high quality bar code symbols (typically ISO grade A or B). The printers may stand-alone or they may be integrated into an application such as a weighing and labelling system. In many cases the user has no control over the size or placement of the bar code. Quality printing is easily maintained by observing the following guidelines. This information is taken from Section 3.2 of *Guidelines for Producing Quality Symbols*.

Symbol Design Considerations for Direct Thermal and Thermal Transfer Printers:
Direct thermal and thermal transfer printers typically contain all of the low-level software required to generate bar code symbols. This means that various symbol formats are loaded into the firmware of the printer. The bar code design software simply sends commands to address the firmware in the printer to create the symbol. These commands typically relate to data characters, symbol size, symbol orientation and symbol placement. Before reviewing the unique design factors for this class of printers, you should review the suggestions made in Sections 1.8.1 –1.8.5 of *Guidelines for Producing Quality Symbols*.

The following special factors should be considered when designing the symbol for direct thermal and thermal transfer printers:

1. Generate symbols at a corrected magnification (*****see Note below) or an X-dimension which is supported by the resolution of the specified printer (refer to *Guidelines for Providers of EAN/UPC Symbol Design Software,* Section 1.3, for detailed technical information on "Corrected Magnification"). For example, the closest bar width to 13 mils a 203 DPI printer can achieve is 14.76 mils. This is because each bar width is constructed with three 203 DPI dots which individually measure 4.92 mils wide. Table C.1 (displayed at the end of this Appendix) lists achievable EAN/UPC symbol magnifications (after correction) addressed by several resolutions of direct thermal and thermal transfer printers.

   *Note: A process of altering the desired dimensions of an EAN•UCC symbol to create modules consisting of a consistent integer number of addressable imaging device dots.)

2. Use a bar code graphic file that was designed for the resolution or the printer specified.

General Considerations for Direct Thermal Printing:
Direct thermal printing should be avoided whenever the symbol may be exposed to direct sunlight, extreme temperatures, or has a shelf life exceeding one year. These

labels fade very quickly in direct sunlight, and the background darkens at elevated temperatures. Some fading also occurs as labels age at room temperature under normal indoor lighting. As labels fade or darken, the contrast decreases so that at some point the symbol can no longer be scanned.

An example of a good application for thermal labels is in-store marking of meat and other perishable food items. Such labels need last only days or weeks under protected indoor conditions.

General Considerations for Thermal Transfer Consumable Supplies:

Consumable supplies are an important quality consideration. For best results, the correct combination of label and ribbon materials should be chosen for the printer type and application environment. Whenever a different brand or part number of labels or ribbons is loaded on the printer, the initial set-up should be repeated.

Initial Direct Thermal and Thermal Transfer Printer Set-Up:

Direct thermal and thermal transfer printers require different settings for best results on different combinations of label and ribbon materials. Manufacturers' recommendations should be followed for making the necessary changes and adjustments.

After any change (e.g., printed format, ribbon type, label type, print speed, or printhead heat intensity), it is advisable to print a test symbol and verify it using an ISO based verifier. If you are printing a long run of identical symbols, it would be appropriate to verify one to determine the symbol quality. If you are printing EAN/UPC symbols that will vary in data content, a test EAN/UPC symbol containing the digits "4 12785 12783 2" is recommended for the verification process.

When you verify the test symbol, you should expect an ISO grade of A or B using the thermal transfer process. If these grades are not achieved, you are likely to have a problem with printer adjustments, cleanliness, or some other malfunction. With some direct thermal label materials, you may only be able to produce C grade symbols. While such symbols do conform to the quality specifications, you will have less margin for process variations and degradation from handling and ageing.

In addition to verification, you should examine the test symbol for adequate quiet zones (light margins), bar height, and the legibility of the human readable interpretation.

Maintaining Acceptable Quality:

The quality of printed symbols tends to degrade as deposits build up on the thermal print head. Regular cleaning of the print head and guide surfaces in accordance with manufacturer's recommendations is strongly advised.

Thermal print heads eventually wear out to the point where one or more dot elements fail to heat properly. When this occurs, the printed symbols may no longer be scannable. One solution to this problem is frequent verification to assure continuing quality. Some printers can be equipped with on-line verification devices that will indicate when a problem is detected. Although such on-line verifiers may not test all of the parameters for ISO, they can be very useful for monitoring the printing process. This is particularly true after supplies replacement or printer maintenance.

An alternative method for detecting dot burnout is to print a line across the width of the symbol. Any dot failure will be immediately visible to the operator as a small break in the line as shown in Figure C.1 below:

Figure C.1

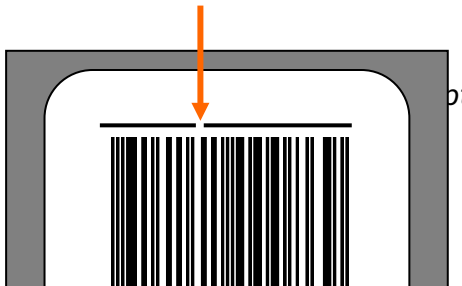


Table 3.1: Achievable Magnifications for Thermal Printed EAN/UPC Symbols after Correction

Reference DPI	Actual DPI	Dots Per Millimetre	Actual Dot Width (Centre Point to Centre Point)		Dots Per Module Width	MODULE WIDTH		*Corrected Magnification
			Inch	mm		Mils	mm	
200	203.2	8	0.0049	0.1250	2	9.84	0.250	**75.76%
200	203.2	8	0.0049	0.1250	3	14.7	0.375	113.64%
200	203.2	8	0.0049	0.1250	4	19.6	0.500	151.52%
200	203.2	8	0.0049	0.1250	5	24.6	0.625	189.39%
300	304.8	12	0.0032	0.0833	3	9.84	0.250	**75.76%
300	304.8	12	0.0032	0.0833	4	13.1	0.333	100.01%
300	304.8	12	0.0032	0.0833	5	16.4	0.416	126.26%
300	304.8	12	0.0032	0.0833	6	19.6	0.500	151.52%
300	304.8	12	0.0032	0.0833	7	22.9	0.583	176.77%
400	406.4	16	0.0024	0.0625	4	9.84	0.250	**75.76%
400	406.4	16	0.0024	0.0625	5	12.3	0.312	94.70%
400	406.4	16	0.0024	0.0625	6	14.7	0.375	113.64%
400	406.4	16	0.0024	0.0625	7	17.2	0.437	132.58%
400	406.4	16	0.0024	0.0625	8	19.6	0.500	151.52%
400	406.4	16	0.0024	0.0625	9	22.1	0.562	170.45%
400	406.4	16	0.0024	0.0625	10	24.6	0.625	189.39%
600	609.6	24	0.0016	0.0416	6	9.84	0.250	**75.76%
600	609.6	24	0.0016	0.0416	7	11.4	0.291	88.38%
600	609.6	24	0.0016	0.0416	8	13.1	0.333	101.01%
600	609.6	24	0.0016	0.0416	9	14.7	0.375	113.64%
600	609.6	24	0.0016	0.0416	10	16.4	0.416	126.26%
600	609.6	24	0.0016	0.0416	11	18.0	0.458	138.89%
600	609.6	24	0.0016	0.0416	12	19.6	0.500	151.52%
600	609.6	24	0.0016	0.0416	13	21.3	0.541	164.14%
600	609.6	24	0.0016	0.0416	14	22.9	0.583	176.77%
600	609.6	24	0.0016	0.0416	15	24.6	0.625	189.39%

* Note: The nominal EAN/UPC symbol can be based on a module width of either 0.013 inch or 0.33 mm. In North America, the long-standing U.P.C. specifications have set the nominal module size at 0.013 inch or 13 mils. EAN specifications and the pending ISO-IEC specification for EAN/UPC set the nominal module at 0.33 mm. The international, metric nominal is 0.0606 percent smaller than the original inch-based nominal. The

data in the right-most column labeled “Corrected Magnification” are based on a nominal module width of 0.33 mm.

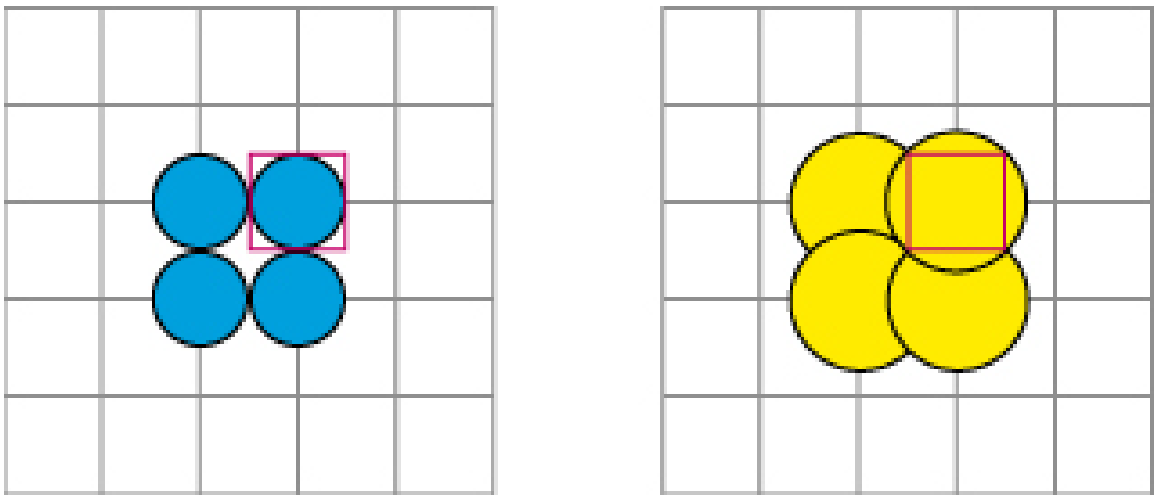
** Note: These values are less than the specified minimum for EAN/UPC symbol magnification.

APPENDIX 4: USING A GENERAL OFFICE PRINTER

General-purpose printing devices are capable of printing high quality bar codes when operated by experienced EAN•UCC members equipped with a good bar code design software product. This category includes laser, desktop, ink jet, ion deposition, and mechanical matrix office printers. These devices are designed primarily for printing full size pages of text and graphics. However, they can be used to print retail tags by using pre-cut labels on page size backing paper. Some are also equipped with a continuous feed mechanism for producing symbols in large quantities. The following information is taken from Section 3.3 of *Guidelines for Producing Quality Symbols*.

It is more difficult for the user to create high quality bar code symbols with general-purpose printers than it is with direct thermal transfer label printers. There are two reasons for this difficulty. First, the printed dot size for general-purpose printers is appreciably larger than the pixel dimension, as shown in Figure D.1 below. This will cause the bars (dark bars) to be printed wider and the spaces (light bars) narrower than nominal, unless the software driving the printer corrects for this distortion. Second, the software that constructs the bar code symbol may itself introduce dimensional errors.

Figure D.1 (Pixel-sized dot on the left and typical size general-purpose printer dot on the right)



<u>Symbol Design Considerations for General Purpose Printers</u>

There are a wide variety of software packages for creating symbols using general-purpose printers. Unfortunately, many of these packages are capable of producing symbols with totally unacceptable quality. Before reviewing the unique design factors for this class of printers, review the suggestions made in Sections 1.8.1 through 1.8.5 of *Guidelines for Producing Quality Symbols*. Then the following special factors should be considered when designing the symbol for general-purpose printers:

1. Generate symbols at a corrected magnification or an X-dimension which is supported by the resolution of the specified printer (refer to *Guidelines for Providers of EAN/UPC Symbol Design Software*, Section 1.3, for technical information on corrected magnification). For example, the closest bar width to 13 mils a 300 DPI printer can achieve is 13.12 mils. This is because each bar width is constructed using four 300 DPI dots which individually measure 3.28 mils wide. Table D.1 (displayed at the end of this Appendix) lists the achievable EAN/UPC symbol magnifications (after correction) addressed by several different resolutions of general-purpose printers. EAN/UPC symbol magnifications other than those listed in this table will be printed inaccurately and may or may not achieve passing verifier grades.
2. Specify one or more dots (pixels) of uniform bar width reduction to compensate for excessive bar width that is typical of general-purpose printers. For example, with a typical 300 dot-per-inch laser printer and four dots per module, best print quality is often achieved with one pixel (or dot) of bar width reduction.
3. When a bar code graphic file is transferred between two parties, the printer resolution attribute should be communicated. If the printer resolution changes, the bar code file should be recreated. The symbol should be treated as a fixed design element. It should not be resized, rotated, scaled, or stretched.
4. When the bar code graphic file is transferred between two parties, they should determine which symbol design attributes should be communicated. The following list should be considered as optional attributes which can be useful in assuring symbol quality:
    - printer resolution for bar width (strongly suggested)
    - “corrected magnification” factor
    - “corrected BWR” factor

These specifications should not be altered at any later stage within illustration or page layout software programs. These suggestions should provide you with quality symbols when the output conditions match the design attributes. The most predictable results are obtained using software packages that drive the printer directly by low level software. Often, when bar code images are passed from one software application to another, the bar code symbol may become distorted. These distorted symbols may or may not achieve passing verifier grades.

Initial General Purpose Printer Set-Up

Once you have the required software, hardware, and consumable materials in place, determine the symbol magnification and other parameters that you will be using to produce bar code labels or tags. Next, print two test EAN/UPC symbols in which all of the left and right hand digits are represented: for example, the following symbols:

0 12345 01234 1

6 78912 56789 0

Verify both test EAN/UPC symbols per the ISO method. It is desirable to achieve grade B or better in this initial set-up. If one or both of the test symbols are below grade B, you may be able to improve the quality by changing some of the software or printer variables. At the minimum, grade C symbols are acceptable, but they leave you with minimal margin for process variations and possible degradation from handling. In addition to verification, you should examine the test symbols for adequate quiet zones (light margins), bar height, and legibility of the human readable interpretation.

For small operations, the investment in a bar code verifier that conforms to the ISO method may not be justified. The alternative is to submit your test symbols to a qualified testing organisation.

Finally, whenever any changes are made in software parameters, the initial set-up procedures should be repeated.

Maintaining Acceptable Quality

All printers require periodic maintenance. Laser printers, for example, not only consume toner, but also require periodic replacement of components such as drums, developers, fusers, and brushes. All of the consumable parts may be contained in a single replacement cartridge, or they may be separately installed, depending on the make and model of printer. Because bar code labels contain a higher percentage of black printing than occurs in ordinary text, fewer pages can be printed between maintenance intervals.

Printed symbols should be checked visually for consistent appearance and verified whenever they appear doubtful. Symbol verification, whether conducted on-site or consulted, can be an effective tool for maintaining quality within a conscientiously applied program of quality assurance. Verification should be employed as a quality sampling technique, particularly after any supplies replacement or printer maintenance. For answers to frequently asked questions regarding EAN/UPC symbol verification, refer to *UCC Technical Bulletin #1: Understanding UCC Specified Methods for Assessing EAN/UPC Symbol Quality.*

Table 4.1: * General-Purpose Printer: Achievable Magnifications for EAN/UPC Symbols after Correction

* Comparing of a 300 DPI General-Purpose and a 12DPMM General-Purpose Printer

Reference DPI	Actual DPI	Dots Per Millimetre	Actual Dot Width (Centre Point to Centre Point)		Dots Per Module Width	MODULE WIDTH		*Corrected Magnification
			Inch	mm		Mils	mm	
300	304.8	12	0.0032	0.083	3	9.843	0.2500	**75.76%
300	304.8	12	0.0032	0.083	4	13.123	0.3333	100.01%
300	304.8	12	0.0032	0.083	5	16.404	0.4166	126.26%
300	304.8	12	0.0032	0.083	6	19.685	0.5000	151.52%
300	304.8	12	0.0032	0.083	7	22.966	0.5833	176.77%
300	300	11.812	0.0033	0.084	3	10.000	0.2538	76.96%
300	300	11.812	0.0033	0.084	4	13.333	0.3386	102.61%
300	300	11.812	0.0033	0.084	5	16.667	0.4232	128.27%
300	300	11.812	0.0033	0.084	6	20.000	0.5079	153.92%
300	300	11.812	0.0033	0.084	7	23.333	0.5926	179.58%

* Note: The nominal EAN/UPC symbol can be based on a module width of either 0.013 inch or 0.33 mm. In North America, the long-standing U.P.C. specifications have set the

nominal module size at 0.013 inch or 13 mils. EAN specifications and the pending ISO-IEC specification for EAN/UPC set the nominal module at 0.33 mm. The international, metric nominal is 0.0606 percent smaller than the original inch-based nominal. The data in the right-most column labelled "Corrected Magnification" are based on a nominal module width of 0.33 mm.

** Note: These values are less than the specified minimum for EAN/UPC symbol magnification.

APPENDIX 5: (INFORMATIVE) PRINT PROCESS CHARACTERISATION TECHNIQUES

5.1 Introduction

Electronic (digital) creation of package printing images is widely used in the printing industry today. It has a positive impact on quality, cost, and speed of manufacture. The EAN•UCC Global Symbology Committee has worked closely with the printing industry associations and their members to develop contemporary methods of press characterisation based on digital imaging for plate based printing processes. This work is on going, and is presented here along with traditional Film Master (analog) approaches to press characterisation.

5.2 General

Manufacturers monitor EAN/UPC symbol quality on the final packaged product to provide an indication of how well their product will perform in a particular scanning environment. It is important for printers to understand the limitations of their printing process and educate their customers on what they are capable of producing. Some printing companies relate warranties and disclaimers for print quality based on the symbol design conforming to their internal policies and EAN•UCC specifications. This communication allows the manufacturer to weigh product design goals in a balance between production process capabilities and the critical functionality of each EAN•UCC symbol to their customers.

Press characterisation (or fingerprinting) is a common practice among printing companies. It is a prerequisite for producing quality bar code symbols. There are many fingerprinting approaches taken by printing companies, but all of these methods should result in providing the printer with two key pieces of information:

- The minimum symbol size that can be reproduced consistently with accuracy.
- The proper BWC (bar width compensation) to be applied in the design stage.

Bar code symbol design is generally broken into two major approaches and characterisation approaches are generally broken into two corresponding approaches.

- For those utilizing digital bar code files or bar code design software, a characterisation method has evolved utilizing a Symbol Matrix. The Symbol Matrix is analysed using ISO-based verification results for Decodability. This method is described in Chapter 5, Section 4, Appendix 5.3.
- For those who use Film Masters, an approach exists that utilises an analog-based Film Master or Printability Gauge to provide the minimum size and nominal BWC. This method is discussed in Chapter 5, Section 4, Appendix 5.4.

5.3 Digital production methods of characterisation

5.3.1 Symbol matrix characterisation method

Flexographic Technical Association: Flexographic Image Reproduction Specifications and Tolerances, 2nd Edition, November 1999

Ms. Cindy Cole, Technical Director, FTA Flexographic Training Center
1302 Concourse Drive, Suite 303
Linthicum, MD 21090
Telephone: (410) 691-5314
Website: **http://www.fta-ffta.org**

The symbol matrix characterisation method specifies a procedure for selecting the optimum X-dimension and BWR (bar width reduction, also called cut back) for pre-press design of bar code symbols created using digital methods. It describes how to select the X-dimension/BWR that will provide the best results for the range of impression encountered on press, using ISO/IEC 15416 based verifiers. This is appropriate for use with any bar code symbol. The U.S. Flexographic Technical Association has developed this method with the assistance of members of the Global Symbology Committee for plate based printing methods. It may be used as a template for most digital production methods:

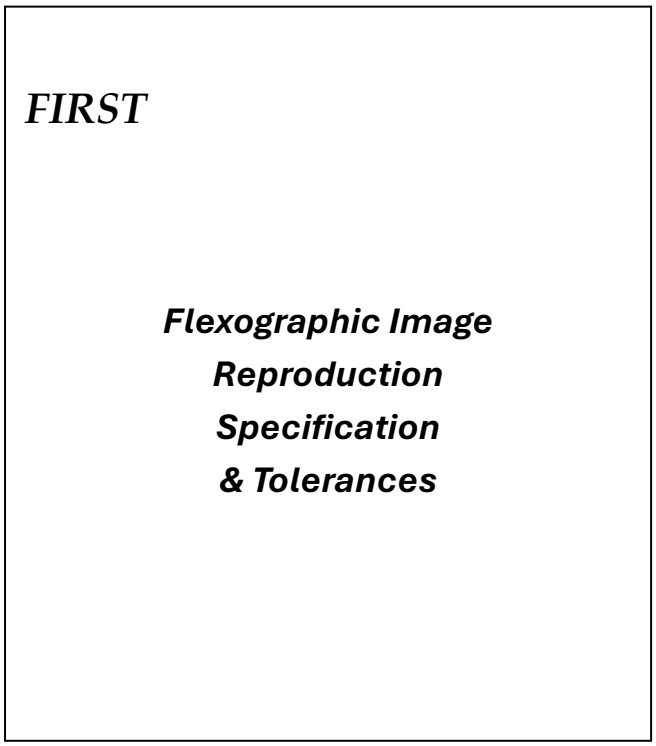


Figure 5.1

5.3.2 Direct contact printing of bar code symbols on corrugated

Fibre Box Association: Guideline for Direct Contact Printing of Bar Code Symbols on Corrugated, 1998

Ms. Mary Opfer,Technical Manager
Fibre Box Association
2850 Gulf Road, Suite 412
Rolling Meadows, IL 6008
Telephone: 847 364 9600
Website: **http://www.fba.org**

This guideline presents contemporary guidelines for printing ITF-14 directly on corrugated. It was developed in close coordination with the Global Symbology Committee.

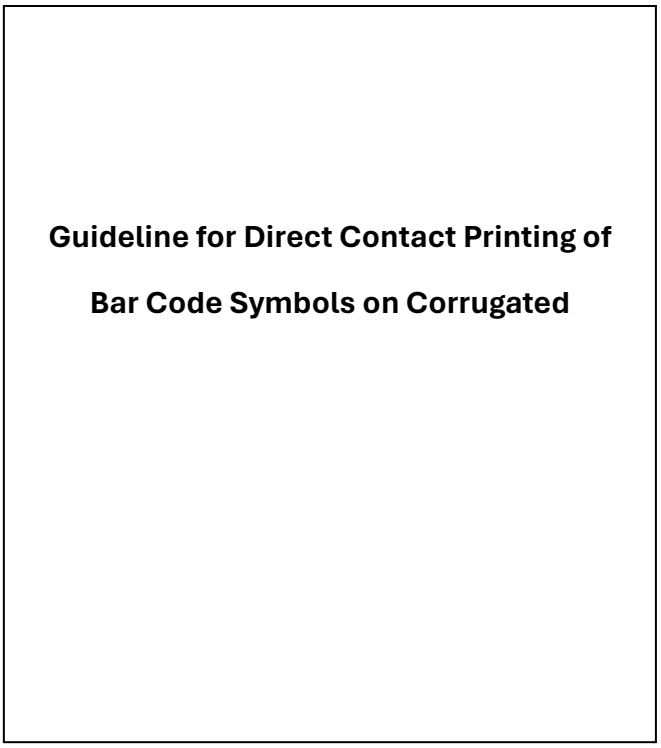


Figure 5.2

5.4 Characterisation approach for film master based processes

The production of a symbol in its finished state involves a number of separate processes, each of which contributes to the quality of the final result. The three main processes in the production of a symbol using a Film Master are:

- The production of a Film Master representing the symbol
- The fabrication of the printing plates that incorporate the Film Master
- The package printing from plates incorporating the Film Master

These processes will normally be undertaken by specialists, which may employ techniques at their own discretion in order to produce symbols of acceptable reliability for scanning. In order to refine the standards required, the following sections outline the considerations that apply to the production processes, and give methods whereby acceptable quality can be achieved.

5.4.1 Print gain and variation

If a Film Master containing symbol bars of nominal width is converted into a printing plate and printed on to a package, the bars as finally printed will usually be found to be wider than the original bars on the Film Master. This is due to many factors: plate making, print pressure, absorbent material, ink viscosity, and so on. This increase in width is known as the Print Gain. It is shown in the diagram below.

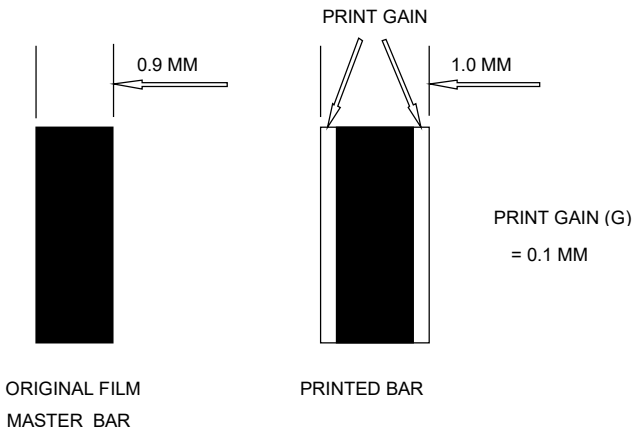


Figure 5.3: Print Gain

In the course of a print run, it is to be expected that the extent of print gain will differ between individual impressions. The print gain may be either positive or negative. This difference in the amount of print gain is known as Variation.

5.4.2 Assessment of printing conditions

In preparation for the printing of a symbol on a package, it is first necessary to assess the average print gain and extent of variation normally encountered in the day to day printing of the packaging.

The assessment should be made under the following conditions:

Assessments can be made using either a Film Master of an actual symbol (e.g. an ITF symbol representing a standard value 999 ... reserved for this use) or a special Film Master which serves as a gauge (See Chapter 5, Section 4, Appendixes 5.5 and 5.6). The film must be integrated into the printing plates using the standard procedure normally used in the particular operation.

Assessments should be carried out on actual production runs, using qualities of inks and substrate in normal use.

The assessment should include both:

- Bars printed parallel to the direction of printing
- Bars printed at right angles to the direction of printing

The assessment should include all the variations likely to be encountered in practice and all the factors affecting print quality so that the effects of extremes of printing conditions can be measured. A basic method of print quality assessment is to use proper sampling over a sufficient variety of production runs and measure directly the bars in printed symbols to find:

- the average of extremes of print gain
- the variation in print gain

Compensation for both these factors must be made when the Film Master is prepared. The extent of variation in print gain determines the X-dimension of the symbol. The extent of average print gain determines the bar width reduction (BWR). This is the amount by which the bars on the Film Master must be reduced, or increased in width, to correct for the print gain.

The space required on the package must be within the allowable range of sizes for the symbol based on the application area and scanning environment. Reliability is always enhanced by selecting an X-dimension larger than the minimum that the space on the package permits.

Note that the minimum X-dimension is always determined by the print quality. It is not possible to select an arbitrary symbol size to fit a predetermined space on the package. The bars on the Film Master are corrected to allow for print gain by reducing (or in rare

instances increasing) the width of each bar on the Film Master, symmetrically (on both left and right) by a total equal to the average print gain in each case. The BWR applied is the same for each bar, irrespective of the width of the bar.

The amount of BWR required is equal to the average print gain in all cases, and is not itself affected by the X-dimension of the symbol. Thus the BWR is applied after the X-dimension has been determined and not the reverse.

It is important to note that the bar code spaces (light bars) are wider than the X-dimension of the bars (dark bars) by the same BWR dimension used to narrow the bars (dark bars). The net result is that the overall symbol length meets the nominal dimension specified for the symbol.

5.4.3 Printability gauge method

Chapter 5, Section 4, Appendix 5.4.2 describes the basic assessment method of determining the allowances to be made in the printing process. In practice, a simpler alternative operating method can be employed, using a specially calibrated Printability Gauge.

Where the source of the bar code master image is known to conform to ISO/IEC 15421, it is possible to use the printability gauge method to determine the optimum magnification factor and bar width reduction for a given production environment.

There are two types of printability gauges, the type which is used for EAN/UPC symbols, generally known as the EAN/UPC Printability Gauge and the type which is used for ITF symbols which is generally known as the 'H' Gauge. Each consists of a very precise design in the form of a positive or negative master and contains a range of gauges so that the capability of a wide range of print processes can be assessed. Both types of gauge contain elements oriented at right angles to one another. This enables print quality to be assessed both in print direction and across print direction. Printability gauges are normally obtainable commercially from film master suppliers.

The printability gauge should be introduced to the process as if it were a bar code master. Each step of the process should be carried out as it would normally be carried out. Any special measures taken to improve the accuracy of any part of the process could result in a false characterisation of the process.

The printability gauge must be used as it is supplied. Any photographic enlargement or reduction of the gauge will defeat its purpose.

5.4.3.1 The EAN/UPC printability gauge

The EAN/UPC printability gauge is formed from a number of gauges which are identified by the letters of the alphabet from A to K (see Figure 5.4). Each of these elements is composed of two components which are at right angle to each other. Each component is a series of parallel lines which are spaced apart by an amount determined by the letter of the alphabet to identify that gauge. The spacing between the lines which form the gauges is reduced progressively as the gauge designation goes from A to K. The spacing is set empirically and it is not necessary to know the dimensional values when using this method. Gauges must however be produced to a tolerance of +/- 0.005 mm (0.0002 in) in their critical dimensions.

Printability gauges are used to characterize the processes of reproducing the bar code symbol, and from the results, to determine the amount of compensation required to offset the print gain or loss of the process and to determine the range of variability

which the symbol must be capable of accommodating. (See Chapter 5, Section 4, Appendix 5.4.4 for more information.) They are included in actual production runs of the packaging on which the bar codes will eventually be printed, in locations similar to those likely to be used for the symbols, and using the same processing and printing methods. If any significant change is made in the reproduction or printing processes a new printability trial should be conducted.

The EAN/UPC Printability Gauge is intended for use in reproduction and print processes where the print gain and variability does not exceed 0.2 mm (0.0078 in).

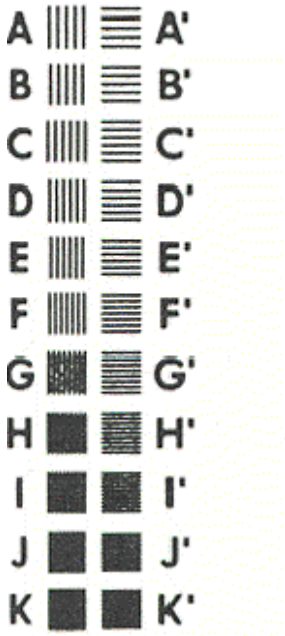


Figure 5.4

5.4.3.2 The H printability gauge

For print processes where the bar width gain is likely to be in the range 0.2 mm (0.0078 in) to 0.4 mm (0.016 in), the H gauge is the appropriate means of assessing the reproduction and printing processes. (See Figure E.5 below.) H gauges are defined by the numerical values from 1 to 7 where the number of the gauge specifies the spacing in 0.1 mm (0.004 in) increments, between the uprights of the H. An H1 gauge has a space (light bar) of 0.1 mm (0.004 in) between the uprights of the H, and an H7 gauge has a spacing of 0.7 mm (0.028 in) between the uprights of the H. Gauges must be manufactured so that the tolerance on the spacing between the uprights of the H is +/_ 0.02 mm (0.0008 in).

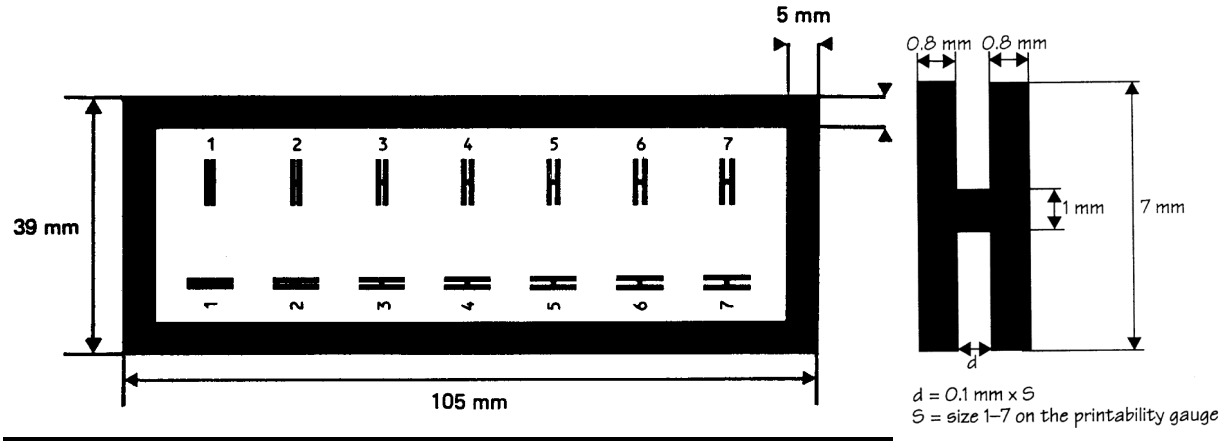


Figure E.5

Figure 5.6

5.4.4 Evaluation of printability gauge results

Samples of prints incorporating the gauge are taken at intervals during the print-run. The samples are examined under a magnifying glass to determine the finest gauge pattern where the lines first touch one another in each sample. Small, localised deviations are disregarded in judging where the lines are touching, the lines are considered to be touching when they are in contact along 50% or more of their length. Gauges which are printed in both print direction and across print direction should be assessed and rated for printability. The gauge at which the lines are touching by 50% or more is the printability rating of that sample. In some circumstances it is possible that say gauges A to D remain open and E to K are completely filled in, in this case the printability rating is D.

All of the samples from a print run are assessed and their printability ratings noted. It is normal that the printability rating shall vary at different points in a print run and that the rating will be different for gauges which are in print direction and those which are across print direction. The range of the printability rating should be noted for both the gauges that are in print direction and those which are across print direction.

For EAN/UPC Symbols, reference should be made to Chapter 5, Section 4, Appendix 5, Tables 5.1 and 5.2, to determine the minimum magnification factor of the symbol and the bar width reduction which should be applied to a bar code symbol, which is to be printed by that process and in that orientation. For printability trials that are conducted using the H gauge, reference should be made to Chapter 5, Section 4, Appendix 5, Table 5.3 for the minimum X-dimension and the bar width reduction to be applied.

5.4.5 Print quality checks

If allowances for process variability have been properly made in the preparation of the film master, it should not be necessary to check the overall quality or performance of every symbol as printed. It should be sufficient to carry out spot check sampling in the course of the print run to ensure that print quality does not deteriorate below the levels which were recorded during the test runs.

Print quality is particularly important when printing symbols of small size, where even a small deterioration in symbol quality could seriously reduce decodability. This is because the tolerance below nominal size reduces disproportionately to the reduction in magnification factor.

Important notes:

- The H-mark serves as a quality control guide. It's interpretation is reserved to the printer. Printers and distributors must therefore not use it as a rejection criterion of the printing work.
- The quality control H-marks are located within the box formed by the bearer bar aligned with the center of the bars of the symbol and outside the light margins, right and left (see Figure E.6).

5.4.5.1 Print quality checks for EAN/UPC symbols

The appropriate range of elements of the printability gauge can be incorporated in an inconspicuous part of the print. These should be consistent with the printability range which was determined in the printability trial for that machine and substrate. Spot checks will then reveal whether the printability gauge pattern is still being reproduced to the same standard achieved during printability trials. If the range of variability observed in the printability gauges exceeds that which was observed in the printability trial, it is essential that the process be examined to determine which of the variables in the process has gone out of control. Continuing production when the Printability gauges indicate that the process is not in control, may result in the production of symbols which do not comply with the minimum required quality standard for the application.

5.4.5.2 Print quality checks for ITF symbols

For the quality checking of ITF symbols during a print run, the H gauge can be incorporated into the area to left and right of the symbol (see Figure E.6). The H gauges should be placed within the bearer bar that surrounds the symbol so that the impression conditions are the same for the H gauge as they are for the symbol. Two sizes of gauge should be selected: one to indicate the condition where all of the print tolerance is used up due to bar width gain, and the other to indicate when significant bar width loss is present.

To determine which gauges are the correct ones to use, reference should be made to the printability trial for the machine and the substrate on which the print run will be made. The gauge which is placed on the right of the symbol should be the same number as that of the lowest number in the printability range. That on the left should be one higher than the highest number in the printability range.

Care must be taken to ensure that the H gauges are clear of the quiet zones (light margins) of the symbol. Provision is made in the symbology standard to provide an additional 3 mm wide zone to left and right of the symbol quiet zones (light margins), when H gauges are required to be incorporated.

5.4.5.3 Print quality checks for UCC/EAN-128 symbols

Where the print variation is small, UCC/EAN-128 symbols should be checked using the method described for the EAN/UPC Symbol. Where the print variation is large, EAN•UCC symbols should be checked using the method described for ITF symbols.

Table 5.1: Magnification and Bar Width Reduction for Flexography

Printability Rating Range	Magnification Factor	Line-Width Reduction (Thousandths of an Inch)	Bar Width Reduction (mm)
A - B	2.00	8 ± 2	0.20 (± 0.05)
A - C	1.90	8 ± 2	0.20 (± 0.05)
A - D	1.85	8 ± 2	0.20 (± 0.05)
A - E	1.80	8 ± 2	0.20 (± 0.05)
A - F	1.70	9 ± 1	0.23 (± 0.02)
A - G	1.60	8 ± 1	0.20 (± 0.02)
A - H	1.80	7 ± 1	0.18 (± 0.02)
A - I	2.00	6 ± 1	0.15 (± 0.02)
B - C	1.85	8 ± 2	0.20 (± 0.05)
B - D	1.80	8 ± 2	0.20 (± 0.05)
B - E	1.70	8 ± 2	0.20 (± 0.05)
B - F	1.60	8 ± 1	0.20 (± 0.02)
B - G	1.55	8 ± 1	0.20 (± 0.02)
B - H	1.60	7 ± 1	0.18 (± 0.02)
B - I	1.80	6 ± 1	0.15 (± 0.02)
C - D	1.70	8 ± 2	0.20 (± 0.05)
C - E	1.60	7 ± 2	0.18 (± 0.05)
C - F	1.55	7 ± 2	0.18 (± 0.05)
C - G	1.45	7 ± 2	0.18 (± 0.05)
C - H	1.45	7 ± 1	0.18 (± 0.02)
C - I	1.60	6 ± 1	0.15 (± 0.02)
D - E	1.55	7 ± 2	0.18 (± 0.05)
D - F	1.45	7 ± 2	0.18 (± 0.05)
D - G	1.40	7 ± 2	0.18 (± 0.05)
D - H	1.30	8 ± 1	0.20 (± 0.02)
D - I	1.45	6 ± 1	0.15 (± 0.02)
E - F	1.40	7 ± 2	0.18 (± 0.05)
E - G	1.30	7 ± 2	0.18 (± 0.05)
E - H	1.20	7 ± 1	0.18 (± 0.02)
E - I	1.30	6 ± 1	0.15 (± 0.02)
F - G	1.20	6 ± 2	0.15 (± 0.05)
F - H	1.15	6 ± 2	0.15 (± 0.05)
F - I	1.15	6 ± 1	0.15 (± 0.02)
G - H	1.10	6 ± 2	0.15 (± 0.05)
G - I	1.00	6 ± 2	0.15 (± 0.05)
H - I	0.90	6 ± 1	0.15 (± 0.02)

Table 5.2: Magnification and Bar width Reduction for Lithography, Gravure, and Letterpress

Printability Rating Range	Magnification Factor	Line-Width Reduction (Thousandths of an Inch)	Bar width Reduction (mm)
E - F	1.00	11 (+0-3)	0.28 (+0-0.08)
E - G	1.00	10 (+1-2)	0.25 (+0.02-0.05)
E - H	1.20	9 (+2-1)	0.23 (+0.05-0.02)
E - I	1.30	8 (± 2)	0.20 (± 0.05)
E - J	1.40	7 (± 1)	0.18 (± 0.02)
E - K	1.50	6.5 (+2-1)	0.16 (+0.05-0.02)
F - G	0.90	9 (+0.5-2)	0.23 (+0.01-0.05)
F - H	1.00	8 (± 2)	0.20 (± 0.05)
F - I	1.20	7 (+2-1)	0.18 (+0.05-0.02)
F - J	1.25	6 (± 1)	0.15 (± 0.02)
F - K	1.30	5.5 (± 1)	0.14 (± 0.02)
G - H	0.90	7 (+1-2)	0.18 (+0.02-0.05)
G - I	1.00	6 (± 2)	0.15 (± 0.05)
G - J	1.10	5 (+1-2)	0.13 (+0.02-0.05)
G - K	1.20	4.5 (+2-1)	0.11 (+0.05-0.02)
H - I	0.90	5 (+1-2)	0.13 (+0.02-0.05)
H - J	0.95	4 (± 1)	0.10 (± 0.02)
H - K	1.00	3.5 (± 1)	0.09 (± 0.02)
I - J	0.90	3 (± 1)	0.08 (± 0.02)
I - K	0.90	2.5 (± 1)	0.06 (± 0.02)
J - K	0.80	1.5 (± 1)	0.04 (± 0.02)

Table 5.3: ITF-14 Symbol Marking Determining the X-Dimension and Bar-Width Reduction on the Basis of the Printability Range

Print range	X-Dimension		Bar Width	
	mm	in	mm	in
0 - 0	0.813	0.032	0	0
0 - 1	0.914	0.278	0.10	0.039
1 - 1	0.914	0.278	0.10	0.039
0 - 2	0.914	0.278	0.10	0.039
1 - 2	0.914	0.278	0.10	0.039
2 - 2	0.914	0.278	0.10	0.039
0 - 3	1.016	0.040	0.20	0.078
1 - 3	1.016	0.040	0.20	0.078
2 - 3	1.016	0.040	0.20	0.078
3 - 3	1.016	0.040	0.20	0.078
0 - 4	1.016	0.040	0.20	0.078
1 - 4	1.016	0.040	0.20	0.078
2 - 4	1.016	0.040	0.20	0.078
3 - 4	1.016	0.040	0.20	0.078
4 - 4	1.016	0.040	0.20	0.078
0 - 5	1.118	0.044	0.30	0.118
1 - 5	1.118	0.044	0.30	0.118
2 - 5	1.118	0.044	0.30	0.118
3 - 5	1.118	0.044	0.30	0.118
4 - 5	1.118	0.044	0.30	0.118
5 - 5	1.118	0.044	0.30	0.118
0 - 6	1.220	0.048	0.40	0.158
1 - 6	1.220	0.048	0.40	0.158
2 - 6	1.220	0.048	0.40	0.158
3 - 6	1.220	0.048	0.40	0.158
4 - 6	1.220	0.048	0.40	0.158
5 - 6	1.220	0.048	0.40	0.158
6 - 6	1.220	0.048	0.40	0.158

0 - 7	1.220	0.048	0.40	0.158
1 - 7	1.220	0.048	0.40	0.158
2 - 7	1.220	0.048	0.40	0.158
3 - 7	1.220	0.048	0.40	0.158
4 - 7	1.220	0.048	0.40	0.158
5 - 7	1.220	0.048	0.40	0.158
6 - 7	1.220	0.048	0.40	0.158
7 - 7	1.220	0.048	0.40	0.158

Chapter 6:
Symbol Placement Guidelines for Trade Items

TABLE OF CONTENTS

1. INTRODUCTION

This chapter gives guidelines on the placement of bar code symbols on packages and containers. It gives the general principles that apply, including some rules that have to be observed, and then describes and illustrates recommendations for symbol placement on specific packaging and container types.

Consistency of symbol placement is important to the scanning process. With manual scanning, variation of symbol placement makes it difficult for the scanning operator to predict where the symbol is located, and this reduces efficiency. With automated scanning the symbol must be positioned so that it will pass through the field of vision of a fixed scanner as it travels past. Respecting the guidance in this chapter will give the consistency and predictability required.

The guidelines in this global specification replace previous local recommendations, but it is not intended that manufacturers should scrap packaging printed according to previous guidance. When packaging is redesigned these current recommendations should be observed. In the meantime breaking these guidelines should not be taken as a reason for rejection of a package or container.

If government regulatory guidelines are inconsistent with those in this manual, the government guidelines should always take precedence.
NOTE: Bar code symbols in this guideline that are used as examples are For Position Only (FPO) symbols and are not intended to denote correct symbol type, size, color, or quality.

2. GENERAL PLACEMENT PRINCIPLES

The following are general principles for bar code symbol placement that should be considered for any package type whether they are scanned at the retail point of sale or elsewhere in the supply chain. Trade items intended to be scanned at a retail point of sale system must be marked with an EAN-13, UPC-A, EAN-8* or UPC-E*[*] bar code symbol. The bar code symbols that are scanned elsewhere are EAN-13, UPC-A, ITF-14 or UCC/EAN-128.

2.1 Number of symbols

Bar code symbols representing different global trade item numbers (GTIN) must never be visible on any one item. Two or more symbols representing the **same** GTIN are recommended on trade items for scanning in warehousing, distribution and other logistics environments (see Chapter 6, Section 7.2). Two or more symbols representing the **same** GTIN are recommended on heavy or bulky items for the retail point of sale (see Chapter 6, Section 4.9) and are permissible on random wraps intended for the retail point of sale (see Chapter 6, Section 3.3.5)

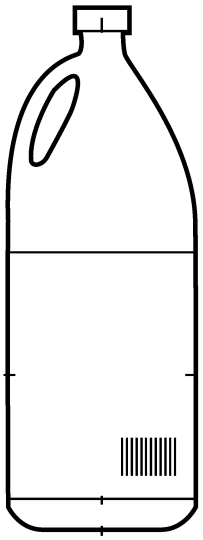
2.2 Scanning environment

Determine whether the item will be scanned in a retail point of sale or a logistics environment, before considering the package type. If the item is scanned at a retail point of sale only, the bar code symbol placement guidelines in Chapter 6, Section 4 and 5 apply. However, if the item is scanned in both retail point of sale and logistics environments or in a logistics environment only, the requirements in Chapter 6, Section 7 take precedence.

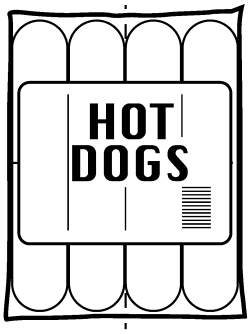
[*]EAN-8 and UPC-E symbols are intended for use on very small trade items sold in retail outlets.

2.3 Orientation

Bar code symbol orientation is determined primarily by the print process and any curvature of the item. If the printing process and curvature allow, the preferred orientation is “picket fence” rather than “ladder”; that is, the bars of the bar code symbol should be perpendicular to the surface on which the package stands in its normal display position. When the symbol is in the ”picket fence” orientation the human readable characters beneath should read from left to right. The text and orientation of the ladder barcode symbol can be read either from the top down, or from the bottom up, whichever is consistent with other text and graphics on the container. Empirical data demonstrated that it makes no difference one way or the other. Rules for positioning codes on curved surfaces is given in Chapter 6, Appendix 1.



“Picket Fence” orientation



“Ladder” orientation

2.3.1 Printing direction

Bar code orientation is often determined by the printing process. Some printing processes give much higher quality results if the bars of the symbol run in the direction of print, also known as the “web direction”. The printer should always be consulted.

2.3.2 Global trade items with curved surfaces

When a bar code symbol is printed onto a curved surface it is sometimes possible for the extremes of the symbol to disappear round the curve, so that both ends cannot be visible to the scanner at the same time. This is more likely the bigger the symbol and the tighter the curve of the packaging. There are certain combinations of *X* dimension and diameter of curved surface in which the bars **must** be printed around the curve (for example, in ladder orientation on a can, picket fence on a cylindrical packet of biscuits). The effect of this is to ensure that the curve results in an apparent loss of height of the bars rather than the more serious apparent loss of complete bars.

The mandatory rule is that the angle between the tangent to the center of the curved symbol and the tangent to the extremity of the curved symbol (outer edge of the guard bars for EAN/UPC bar code symbology) must be less than 30°. If this angle is more than 30° the symbol must be oriented such that the bars are perpendicular to the generating lines of surface of the item. See Chapter 6, Appendix 1.

2.3.3 Avoiding scanning obstacles

Anything that will obscure or damage a bar code symbol will reduce scanning performance and should be avoided, such as:

- ☹ Never position the bar code symbol on the item in an area with inadequate space. Do not let the other graphics encroach on the space for the bar code.
- ☹ Never place bar code symbols, including quiet zones (light margins) on perforations, die-cuts, seams, ridges, edges, tight curves, folds, flaps, overlaps, and rough textures.
- ☹ Never put staples through a bar code symbol or its quiet zones (light margins).
- ☹ Never fold a symbol around a corner.
- ☹ Never place a symbol under a package flap.

3. GENERAL PLACEMENT GUIDELINES FOR RETAIL POINT OF SALE

This section outlines the guidelines for bar code placement for trade items that are to be scanned at the retail point of sale systems. For detailed information on specific package types, see Chapter 6, Sections 4 and 5. Chapter 6, Section 7 outlines the guidelines for bar code placement for trade items that are to be scanned in the warehousing, distribution or other logistics environments.

3.1 Number of symbols

There should be only one symbol visible on a trade item intended for the retail point of sale. Exceptions include large or bulky items (see Chapter 6, Section 4.9) and random or unregistered wrapping (see Chapter 6, Section 3.3.5)

Bar code symbols representing different global trade item numbers (GTIN) must never be visible on any one item. At the retail point of sale this is particularly relevant to multi-packs such as over wrapped items, sleeved items and banded items where the individual inner units carry a different GTIN from that on the outer wrapper or container. The bar codes on the inner products must be *totally obscured* so that they cannot be read by mistake by the retail point of sale system. (See Chapter 6, Section 3.3.5 for overwrap special considerations.)

3.2 Identifying the back of the trade item

The front of the trade item is the primary “trading/advertising area” which typically displays the product name and the company’s logo. The back of the trade item is directly opposite the front and is the preferred placement of the bar code symbol for most trade items.

3.3 Symbol placement

Information in this section is provided to guide symbol placement in the development of packaging for new products and should be adopted if economically feasible when changing the graphics of existing products.

3.3.1 Preferred placement

Preferred bar code symbol placement is on the **lower right quadrant of the back**, respecting the proper quiet zone (light margin) areas around the bar code symbol and the edge rule. See the Edge Rule in Chapter 6, Section 3.3.3 below. Reference Chapter 6, Section 3.3.6 for special considerations.

3.3.2 Undesirable alternative

The undesirable alternative is on the **lower right quadrant of another side of the container.**

3.3.3 Edge rule

The bar code symbol must not be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container. Previous guidelines suggested a distance of 5 mm (0.2 in) as a minimum. Practical experience has shown this to be inadequate. For example, cashiers often grab bags and other trade items on the edge with their thumbs. Avoid placing the bar code symbol too close to the edge. Such placement too close to the edge reduces retail point of sale efficiency.

3.3.4 Avoid truncated symbols

Truncation of a bar code symbol is the reduction of the height of a bar code symbol relative to its width. The truncation of the bar code symbol is not recommended because it destroys the ability of a symbol to be scanned omnidirectionally at the retail point of sale. A truncated symbol can only be scanned when the trade item is oriented in particular directions across the scanning beam. This reduces checkout efficiency. The more the height of the symbol is reduced the more critical alignment of the symbol across the scanning beam becomes. Truncation should be avoided unless absolutely necessary and then the maximum height possible should be printed. See Chapter 6, Appendix 1 for the relationship of the diameter, magnification factor, and X-Dimension.

3.3.5 Bottom marking

Bottom marking of the trade item with the bar code symbol continues to be acceptable, except Large, Heavy or Bulky traded items. However, the back (side) marking is preferred. For more details see Chapter 6, Appendix 1.

3.3.6 Exceptions to the general placement guidelines

Some trade items require special considerations for bar code symbol placement.

- **Bags**
  Settling contents usually result in bag edges bulging to the extent that bar code symbols located on the lower right quadrant may not be flat enough to permit successful scanning. For this reason, bar code symbols on bags should be placed **in the center of the back about one third up from the bottom and as far away from the edge as possible respecting the edge rule**. (See Chapter 6, Section 4.1 of this guideline for more details on bags.)
- **Blister Packs or Unpackaged Items**
  Trade items that cause scanners to read beyond the flat plane are some “Blister Packs” and Unpackaged items (such as deep bowls). For these package types, the depth of the scanner’s reading between the scanner window and the bar code symbol on the container or item must be considered. The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container. (See Chapter 6, Section 4 for more details on Blister Packs and Unpackaged Items.
- **Large, Heavy, or Bulky Items**
  Any package/container **weighing more than 13 kg (28 lb.)** or **having two dimensions greater than 45 cm (18 in.)** (width/height, width/depth, or height/depth) is considered a “Large, Heavy, or Bulky Item”. Large, heavy, or bulky items tend to be hard to handle. Large bags require **two** symbols, one on top and one on the bottom of opposite quadrants of the bag. Large, heavy, or bulky bottles, boxes, cans, jars, jugs and tubs require only **one** label. (See Chapter 6, Section 4 of this guideline for more details on Large, Heavy, or Bulky Items.)
- **Thin Items or Containers**
  “Thin Items or Containers” are defined as any package/container with **a dimension less than 3 cm (1 in.)** (height, width, or depth). Examples of thin items or containers are packages of pizza, powdered drink mixes, and writing pads. Any placement of the symbol on the edge hinders effective scanning because the symbol is obscured from the cashier and is likely to be truncated. (Refer to Chapter 6, Section 4 of this guideline for more details on Thin Items or Containers.)

3.3.7 Special packaging considerations for bar code placement

Specific packaging methods require special considerations for bar code symbol placement.

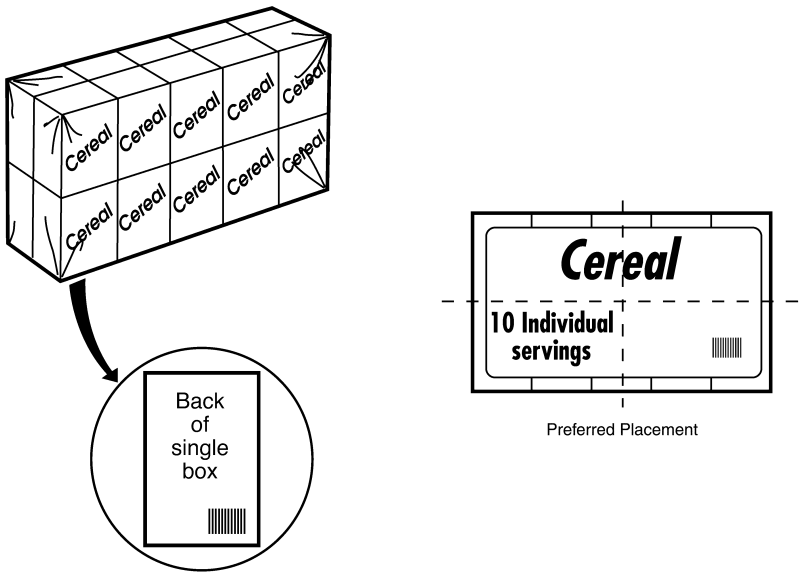
- **Over-Wrap**

  Trade items to be sold in multiples are mechanically gathered and covered with clear over-wrap material which may carry print. Typical over-wrapped items are small cereal boxes and chocolate bars. Package over-wrap can create two distinct problems:

  1. Obscuring the bar code symbols on individual units inside the multipack is necessary so they are not confused with the outer multipack bar code symbol that must be different.
  2. Over-wrapping with such materials as cellophane causes diffraction of the light beam of the scanner and can reduce contrast that causes scanning inefficiencies.

To determine proper bar code symbol placement for over-wrapped packaging, follow the guidelines specific to the applicable package type/shape. (Refer to Chapter 6, Section 4 of this guideline for details on symbol placement for specific package types.)

Example of Bar Code Symbol Placement on Over-Wrapped Item



- **Random (Unregistered) Wrap**

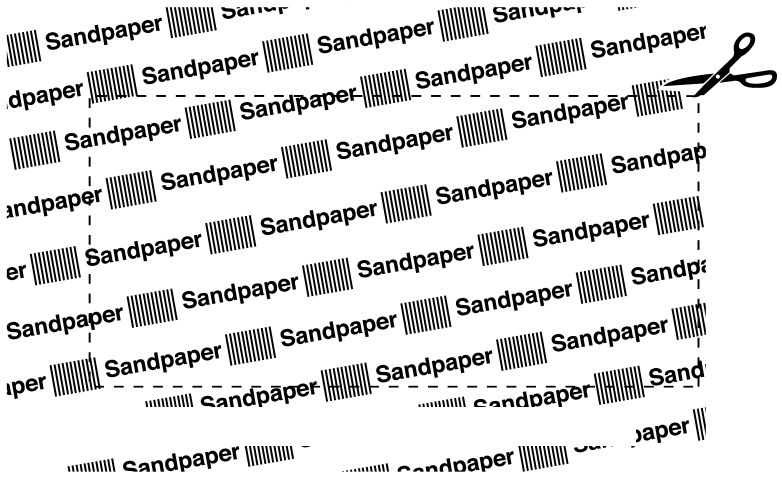
  Some wrappers, like those used on sandpaper or margarine, have a repeating design and are neither cut nor placed on the product such that a particular part of the design always appears in the same location. This is referred to as random or unregistered wrapping. As the wrapper is not registered, it is unlikely that the symbol will appear on one face of the package when the wrapper is placed on the product.

  Experience has shown that the presence of more than one bar code symbol on a package can have a detrimental effect on scanning productivity and, more importantly, can lead to a double read. For this reason, the use of registered packaging is preferred. If random wrap must be used, the minimum requirement is to print the symbol with sufficient frequency that a full symbol will appear on one package face.

  Double reads are more likely when the gaps between the symbols are larger. Repeating symbols should never be more than 150 mm (6 in) apart.

  Consideration should also be given to elongating the bars of the symbol to ensure a full symbol on one face, instead of repeating it.

Example of Bar Code Symbol Placement on Random-Wrapped Item

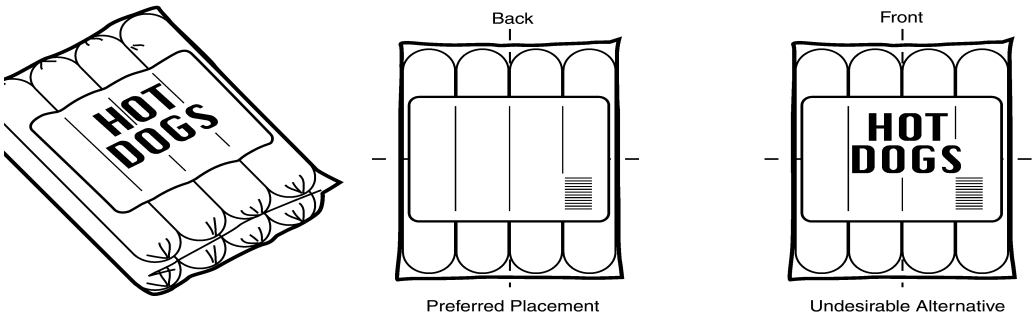


- **Shrink Film / Vacuum-Formed Packages**

  The bar code symbol on an item packaged in shrink film or that is vacuum-formed should be located on a flat surface and in an area free of creases, wrinkles, or other types of distortions. Refer to the example of bar code symbol placement on the hot dogs below. Since the curvature of the hot dogs was greater than the diameter shown within the Appendix 1 tables, the "Ladder" orientation was selected.

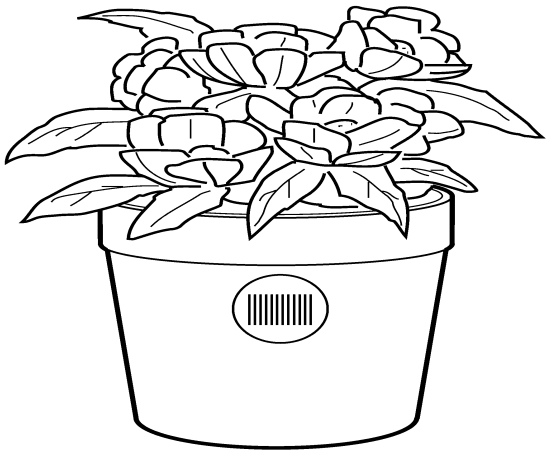
  To determine proper bar code symbol placement for shrink film/vacuum-formed packaging, follow the guidelines specific to the applicable package type/shape. (Refer to Chapter 6, Section 4 of this guideline for details on symbol placement for specific package types/shapes.)

Example of Bar Code Symbol Placement on Shrink Film/Vacuum-Formed Item



- **Spot Labels**
  Bar code symbols printed on spot labels that are applied to the trade item are acceptable alternatives to incorporating symbols into existing packaging graphics or for use on items without packages such as some pots, pans, and glassware. The most suitable type of spot labels are those that cannot be removed from the item without destroying the symbol.
  To determine proper bar code symbol placement on items bearing spot bar code symbol labels, follow the guidelines specific to the applicable package type/shape. (Refer to Chapter 6, Section 4 of this guideline for details on symbol placement for specific package types.)

Example of Bar Code Symbol Placement with a Spot Labels



3.3.8 Operational considerations of bar code placement

Speed, efficiency, and effectiveness in scanning operations is the ultimate goal of proper bar code symbol placement. To ensure scanning performance will not be compromised by your initial bar code symbol placement, take into account the following operational considerations before resolving the final bar code symbol placement:

- **Consistent Symbol Location**
  Compare your package/container to packaging for like products to ensure corresponding symbol placement. The ease in which bar code symbols are located by the cashier from product to product relies essentially on consistent symbol placement.
- **Hand Motion Effectiveness**
  Pass the bar code symbol across the scanner with your hand to test the initial symbol placement. This test is intended to confirm that the bar code symbol placement does not necessitate unnatural hand motions while you are scanning the symbol.

- **Quality Validation**
  Use a pen to draw a line through the bar code symbol. Continue the line of ink from left to right emulating a scanner beam across the bar code symbol. Such a test should indicate the path of the scanner beam thus enabling inspection for obstructions or item texture that could create potential scanning obstacles.

4. PLACEMENT GUIDELINES FOR SPECIFIC PACKAGE TYPES

Following are bar code placement guidelines for Specific Package Types. Chapter 6, Section 5 contains graphics for clothing and fashion accessories. Clothing and fashion accessory trade items are not included in Chapter 6, Section 4.
Major groupings of package types are identified in this section. The following Package Type Reference Table lists these categories in addition to providing information of their characteristics, as well as examples of each.

To use the table, select the package type that best fits the item or item's package/container. *(Example: A package of flower seeds in a 5.1 cm (2 in) by 7.6 cm (3 in). envelope. According to the table, this type of packaging is classified as a Thin Items or Containers, an example of which is a packaged powdered soft drink mix. The correct bar code symbol placement for this package type can be determined by looking at the corresponding specification in Chapter 6, Section 4.)*

More explicit information related to these various package types is provided in the following individual sections of Chapter 6, Section 4. These individual sections each contain the following information:

Package Characteristics	*(Particular characteristics that identify the specific package type.)*
Unique Considerations	*(Special issues to consider related to the specific package type.)*
Bar Code Symbol Placement	*(Standards for appropriate symbol placement.)*

1. Preferred Placement
2. Undesirable Alternative
3. Edge Rule

Examples	*(Graphic examples of correct symbol placement on actual items.)*

Package Type Reference Table

Chapter 6, Section	Package Type	Package Characteristics	Product Examples
4.1	Bags	Sealed cylindrical or rounded-corner wrapped units	Potato chips; flour; sugar; bird seed
4.2	Blister Packs	Flat card backing a formed clear plastic bubble placed over product	Toys; hardware parts
4.3	Bottles & Jars	Small or large-mouth vessels sealed with removable lids	Barbecue sauce; fruit jelly
4.4	Boxes	Folded, sealed heavy paper or corrugated cardboard cartons	Crackers; cereal; detergent
4.5	Cans & Cylinders	Cylindrical-shaped units sealed at each end	Soups; drinks; cheese; biscuits
4.6	Carded Items	Items mounted or sealed on flat cards	Hammer; parcels of candy; kitchen utensils
4.7	Egg Cartons	Irregular hexahedrons of plastic or molded pulp with hinged lids	Eggs
4.8	Jugs	Glass or plastic vessel with built-in handle(s) and removable lids	Household cleaners; cooking oil
4.9	Large, Heavy, Bulky Items	Items having physical size dimension of 45 cm (18 in.) in any two dimensions **and/or** weight in excess of 13 kg (28 lbs.)	Pet food; unassembled furniture; sledge hammer
4.10	Multipacks	Multiple items mechanically bound to create one package	Soft drink cans
4.11	Publishing Items	Printed paper media that is bound, stapled, or folded	Books; magazines; newspapers; tabloids
4.12	Thin Items or Containers	Items or containers with one dimension less than 3 cm (1 in.)	Box of pizza; CD jewel box; powdered soft drink mix package; writing pads
4.13	Trays	Flat, formed receptacles holding product covered with over-wrap	Prepared meats; pastries; snacks; pies or pie crusts
4.14	Tubes	Firmly packed cylinders sealed at both ends, or sealed at one end with a cap or valve on the other end	Toothpaste; sausage; caulk
4.15	Tubs	Deep vessels with removable lids	Margarine; butter; ice cream; whipped cream
4.16	Unpackaged	Trade items that have no packaging, are often of an unusual shape and are hard to label and scan	Frying pan, mixing bowl, cooking pot, wrapped cheese

4.1 Bags

Although this category is referred to as bags this package/container is often called sacks or pouches. This category includes paper or plastic containers that are:

- Fold-sealed on both ends (i.e., flour and sugar)
- Fold-sealed on one end and pinched sealed at the other end (i.e., potato chips)
- Pinch-sealed at both ends (i.e., cough drops)
- Fold-sealed on one end and gathered at the other end (i.e., bread)

NOTE: Some bags are sealed at both ends and carded for display, such as bags of sweets. These types of items are not considered a bag package type, but fall into the category of Carded Items. (See Chapter 6, Section 4.6 for more details on Carded Items.)

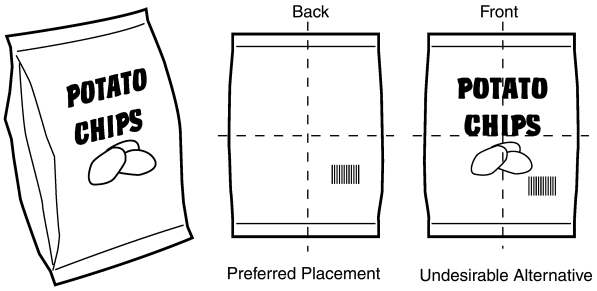
Package Characteristics
Sealed cylindrical or rounded-corner wrapped units.

Unique Considerations
Bags have a tendency to have contents that shift and bulge, consequently, the bar code symbol placement must be on an area of the bag that is most likely to be flat.

Bar Code Symbol Placement
Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. **Preferred Placement**
   On the **center of the back, about one third up from the bottom** and away from the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Undesirable Alternative**
   On the **center of the front, about one third up from the bottom** and away from the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Bags



4.2 Blister packs

Blister packs are pre-formed clear plastic bubbles, or blisters, containing product and backed or topped with cardboard stock.

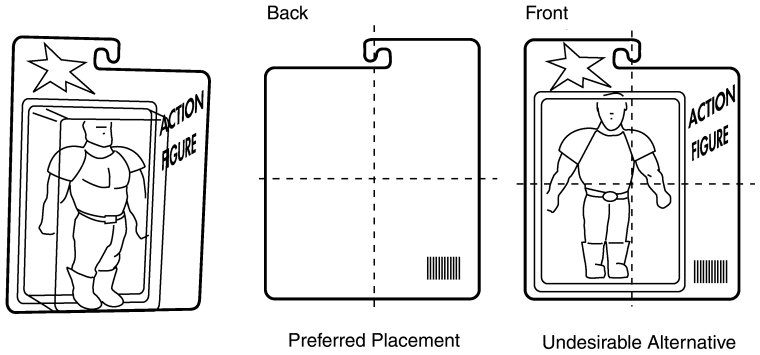
Package Characteristics
Flat card, backing a formed clear plastic bubble placed over product.

Unique Considerations
To ensure quality scanning the bar code symbol must clear the edges of the blister. Avoid placing the symbol under the blister pack or placing the symbol over any perforations on the back of the package.

Bar Code Symbol Placement
Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. **Preferred Placement**
   On the **lower right quadrant of the back**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Undesirable Alternative**
   On the **lower right quadrant of the front**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Blister Packs


ACTION FIGURE
Back
Front
ACTION FIGURE
Preferred Placement
Undesirable Alternative

4.3 Bottles and jars

Bottles and jars normally carry spot labels applied to confined areas of the package, not covering the entire surface or wrapping around the entire perimeter.

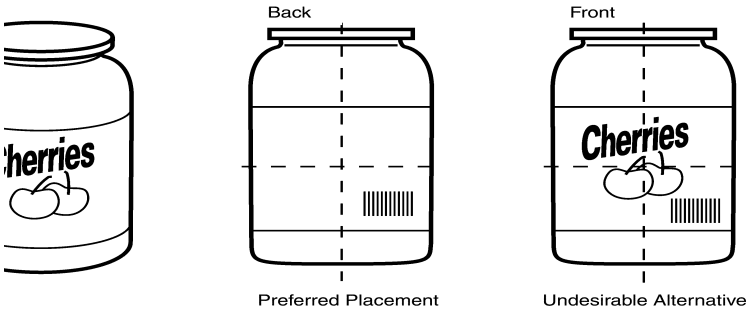
Package Characteristics
Small or large-mouth containers sealed with removable lids.

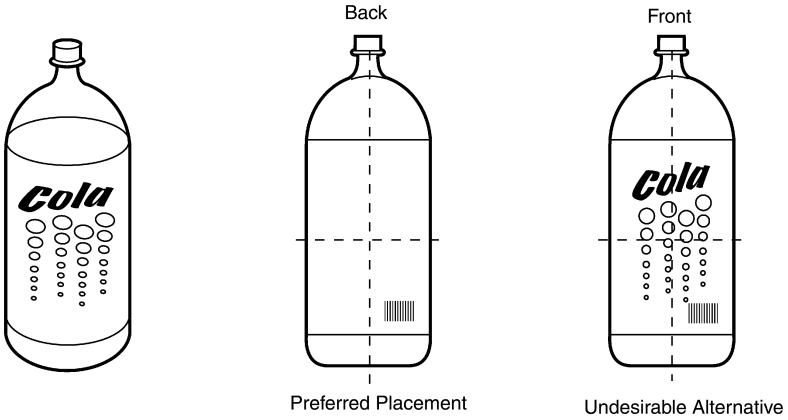
Unique Considerations
Application of the bar code symbol to the neck of a bottle is disallowed. Symbol placement on the neck of the bottle necessitates additional handling at the point-of-sale and space limitations on this area of the bottle usually result in symbol truncation.
See Chapter 6, Appendix 1 of this guideline for the rules on the relationship of diameter of the item and the bar code symbol magnification factor and X-Dimension.

Bar Code Symbol Placement
Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. **Preferred Placement**
   On the **lower right quadrant of the back**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Undesirable Alternative**
   On the **lower right quadrant of the front**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Bottles and Jars




Cola
Back
Front
Cola
Preferred Placement
Undesirable Alternative

4.4 Boxes

This package type includes cuboid or cylindrical cardboard or plastic cartons, as well as rectangular sleeves (used for such products as light bulbs). These packages might contain anything from crackers or cereal to detergent.

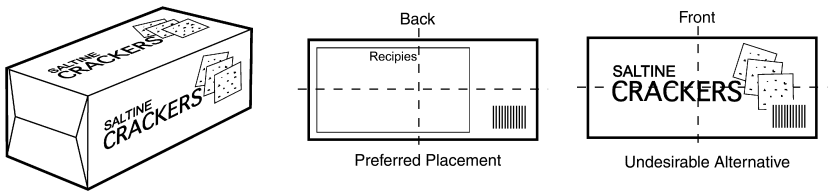
Package Characteristics
Folded, sealed heavy paper or corrugated cardboard cartons.

Unique Considerations
There are no unique considerations that apply to this package type.

Bar Code Symbol Placement
Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. **Preferred Placement**
   On the **lower right quadrant of the back**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Undesirable Alternative**
   On the **lower right quadrant of the front**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Boxes



4.5 Cans and cylinders

This category includes cylindrical shaped containers (usually made of plastic or metal) that are sealed at each end. Some containers have removable lids or openings. Common examples are canned fruit and vegetables, paints, and adhesives.

Package Characteristics

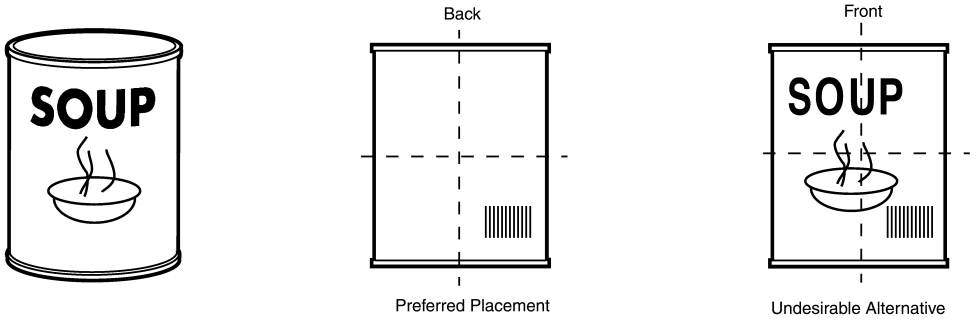
Cylindrical-shaped units sealed at each end.

Unique Considerations
Obstacles such as beading, seams, and/or ridges on the package/container should be avoided as they will reduce scanning performance.
See Chapter 6, Appendix 1 of this guideline for the rules on the relationship of diameter of the item and the bar code symbol magnification factor and X-Dimension.

Bar Code Symbol Placement
Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. **Preferred Placement**
   On the **lower right quadrant of the back**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Undesirable Alternative**
   On the **lower right quadrant of the front**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Cans and Cylinders



4.6 Carded items

Small, loose, or non-packaged items that are difficult to label are placed on cards that are marked with a bar code symbol. Examples include hammers, toys, and kitchen utensils.

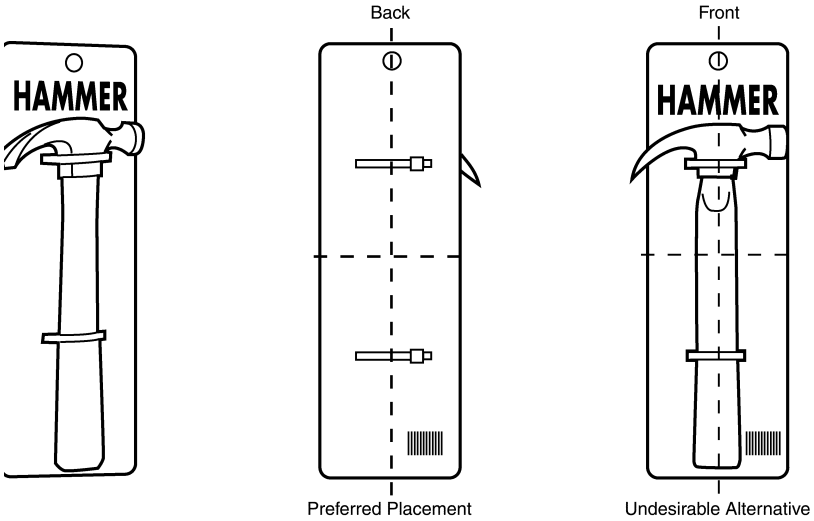
Package Characteristics
Items mounted or sealed on flat cards.

Unique Considerations
When placing bar code symbols on carded items, it is important to take into consideration the proximity of the bar code symbol to the product. Be sure to allow adequate space for the symbol, avoiding any obstructions that might be caused by placing the symbol too close to the product. In addition, do not place the symbol over any perforations or other obstructions on the package.

Bar Code Symbol Placement
Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. **Preferred Placement**
   On the **lower right quadrant of the back**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Undesirable Alternative**
   On the **lower right quadrant of the front**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Carded Items



4.7 Egg cartons

Molded pulp, foam, or plastic egg cartons come in sizes according to the count of the eggs contained.

Package Characteristics

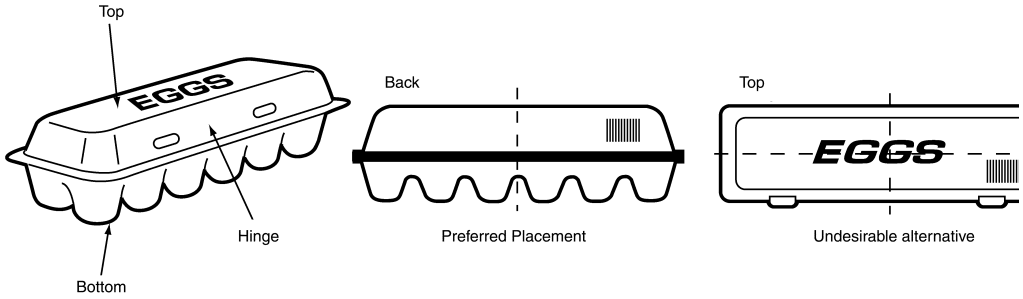
Irregular shaped hexahedrons of plastic or molded pulp with a hinged lid.

Unique Considerations
The recommended symbol placement is on the side of the lid portion of the egg carton that opens and closes to cover the eggs. The uneven surface of the molded bottom of an egg carton prevents bar code symbol placement in this area.

Bar Code Symbol Placement
To determine bar code symbol placement on an **egg carton**, the first step is to identify the **top** of the carton by locating the primary "trading/advertising area" which is marked with the product name and the company's logo. The **bottom** of the egg carton is the molded area, directly opposite the top, in which the eggs sit. The sides are divided horizontally by a hinged lid. The **front** of the carton is the long side containing the opening/closing mechanism. The **back** of the carton is directly opposite the front, on the long side with the hinge.

1. **Preferred Placement**
   Near the edge, on the **right half of the back, above the hinge on the lid**, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Undesirable Alternative**
   On the **lower right quadrant of the top, on the lid adjacent to the opening/closing mechanism**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Egg Cartons



4.8 Jugs

Jugs are glass or plastic containers with built-in handle(s) that aid in pouring of contents. Jugs normally carry spot labels applied to defined areas of the package, not covering the entire surface of the trade item or wrapping around the entire perimeter of the item.

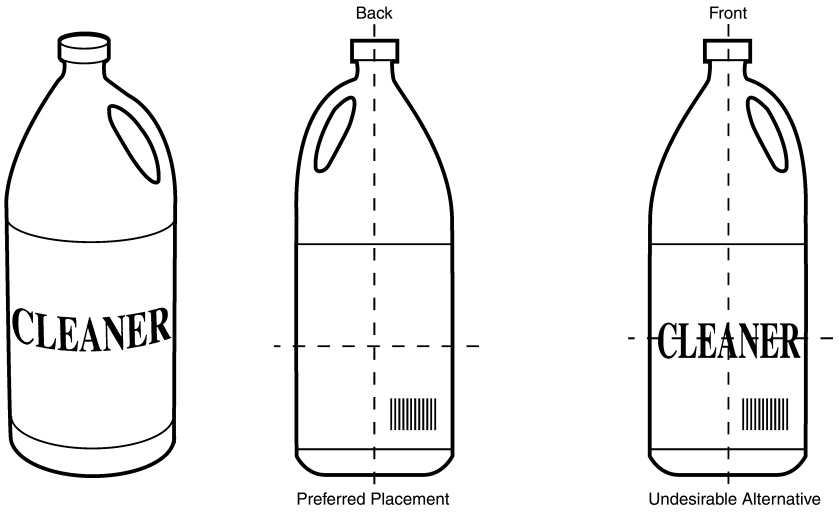
Package Characteristics
Glass or plastic vessels with built-in handle(s) and removable lids.

Unique Considerations
Application of the symbol to the neck of the jug is disallowed. Placement of the symbol on the neck of the jug necessitates additional handling at the point-of-sale and space limitations on the neck usually result in symbol truncation.
See Chapter 6, Appendix 1 of this guideline for the rules on the relationship of diameter of the item and the bar code symbol magnification factor and X-Dimension.

Bar Code Symbol Placement
Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. **Preferred Placement**
   On the **lower right quadrant of the back**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Undesirable Alternative**
   On the **lower right quadrant of the front**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Jugs



4.9 Large, heavy, or bulky items

Large, heavy, or bulky items of any kind are difficult to handle and scan and different symbol placement guidelines therefore apply.

Package Characteristics

Items considered "large, heavy, or bulky" either:

- Have a physical dimension of 45 cm (18 in.) in any two dimensions (width/height, width/depth, or height/depth), **and/or**
- Weigh in excess of 13 kg (28 lbs.)

Unique Considerations

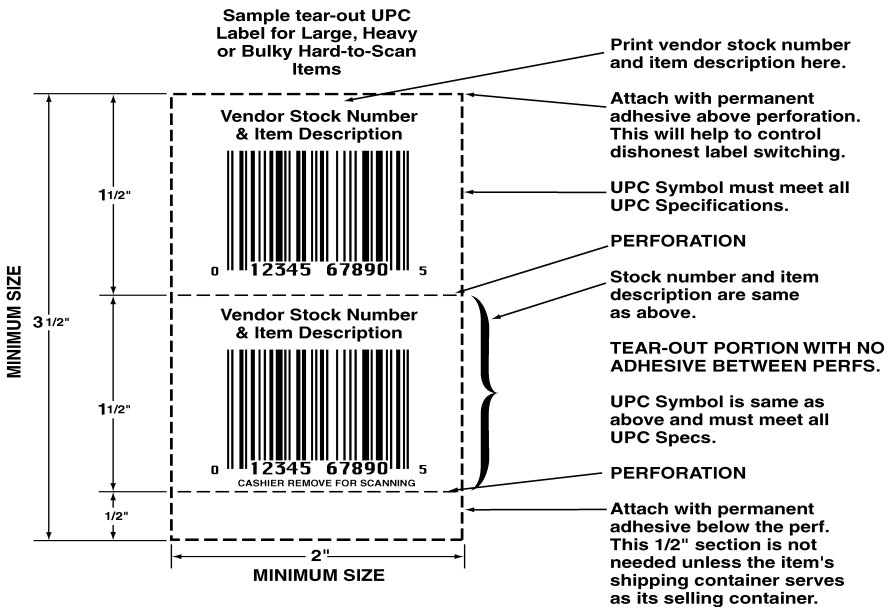
Number of symbols

- **Large or heavy bags: two** bar code symbols should be used, one on top of the front and one on bottom of the back in opposite quadrants.
- **Boxes, bottles, jars, cans, jugs, tubs, and unpackaged items: one** bar code symbol is used.

Special labels

A special double label with a tear-out bar code symbol may be applied to large, heavy, or bulky items that are too heavy or too awkward to pick up and pass over a fixed scanner. This label has one section that is permanently adhered to the item's box (or to a hang-tag or card if the item is not boxed). This section has a human-readable number and item description printed above a full-size magnification factor and X-Dimension bar code symbol. Beneath a perforation, a second section contains exactly the same human-readable information and an identical full-size bar code symbol. The two sections are virtually identical except that the section below the perforation has no adhesive on its back.

SAMPLE ILLUSTRATION OF THE DOUBLE LABEL WITH TEAR-OUT UPC



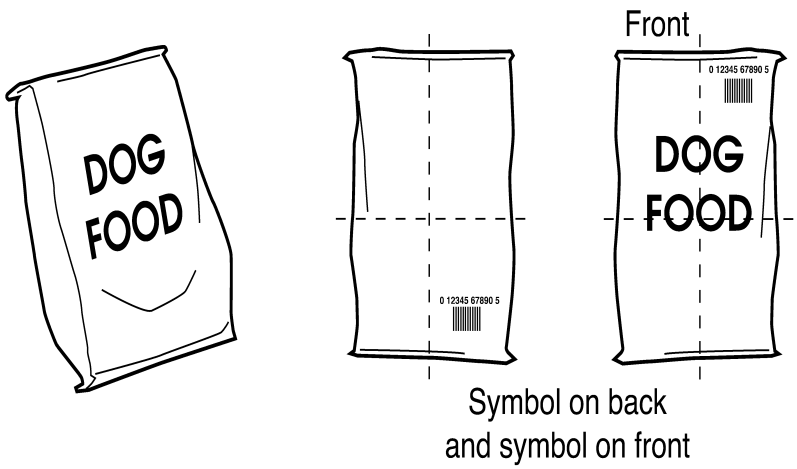
When the item is brought to the point-of-sale, the lower half of the label below the perforation is removed. The cashier then either scans the label, or if the symbol cannot be scanned, the cashier

key-enters the human-readable code beneath the symbol. The top label remains attached to the item or its box.
In the instances where the large, heavy, or bulky item is displayed and sold in its shipping container, a third section of label is recommended. Beneath the tear-out label, a second perforation and a 12 mm (0.50 in.) section with permanent adhesive should be added. This provides a more secure vehicle for the tear-out section and makes it less likely to tear off in transit.
Human-readable text
Human-readable bar code numbers or text on large, heavy, or bulky items should be a **minimum of 16 mm (5/8 in.) high**. This facilitates easier capture of the bar code number by the cashier without having to pick up the product and move it across the scanner.

Bar Code Symbol Placement
Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

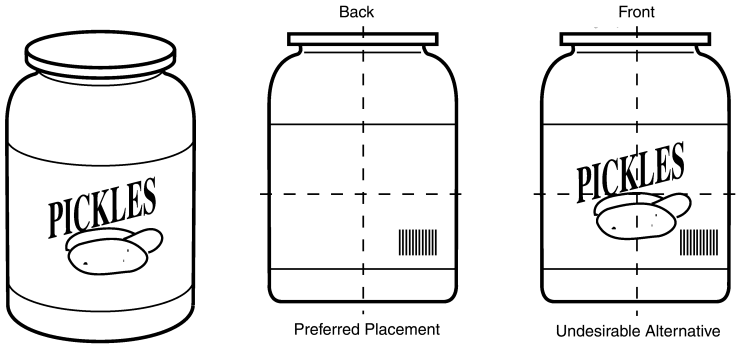
1. Preferred Placement
Bags
Two bar code symbols: one **on the front of the bag, at the top of the upper right quadrant,** near the edge, and the other **on the back of the bag, centered in the lower right quadrant**, near the edge (to accommodate settling of contents).

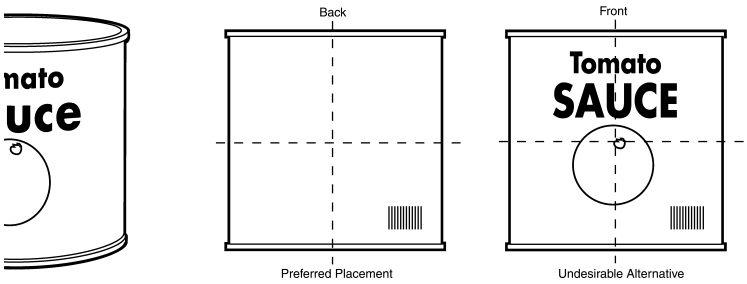
Example of Symbol Placement on "Large, Heavy, or Bulky" Bags



Bottles, jars, cans, jugs, tubs, and unpackaged items
Preferred bar code symbol placement for large, heavy, or bulky bottles, jars, boxes, cans, jugs, tubs, and unpackaged items are subject to the same symbol placement guidelines as their smaller corresponding size items. (Refer to the appropriate section in Chapter 6, Section 4 for symbol placement guidelines for specific package types.)

Example of Symbol Placement on "Large, Heavy, or Bulky" Jars, Cans, Jugs, Tubs





2. **Undesirable Alternative**
   On the **lower right quadrant of the front**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

4.10 Multipacks

Single items are sometimes packaged together as one unit or trade item. This is referred to as a multipack. Multipacks provide convenience to the consumer, and/or may represent a price reduction compared to purchasing items individually. Typical multipacks contain bottles, cans, jars, and tubs.

Package Characteristics

Multi-items bound together to create one package.

Unique Considerations

As a general rule, a bar code symbol should be placed on every consumer package traded through the supply chain. Consequently, items sold in multipacks as well as those sold individually must carry a unique symbol for each consumer package variation or aggregation. To avoid confusion at the point-of-sale, the multipack symbol should be the **only** visible symbol when both the multipack and individual items are symbol-marked. The binder of the multipack acts as a screen to obscure the symbols on the individual items.

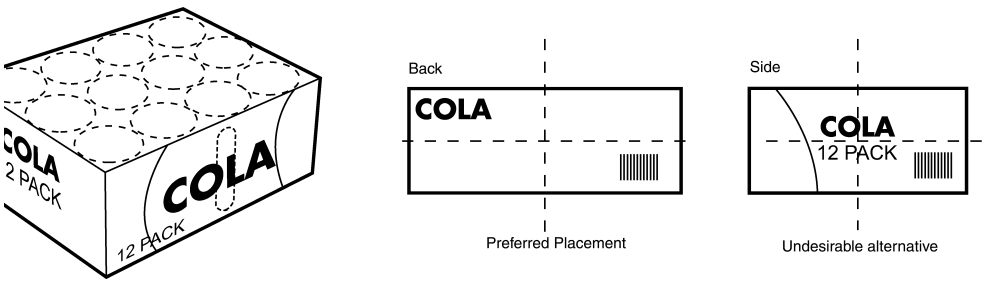
Special Note for Can Multipacks: Avoid placing the symbol on the top or bottom of the container as shown below, since the cans have a tendency to cause impressions in the cardboard and distort the symbol. These Can impressions in the symbol may reduce the quality of the scanning.

Bar Code Symbol Placement

Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. **Preferred Placement**
   On the **lower right quadrant of the back**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Undesirable Alternative**
   On the **lower right quadrant of the side**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Multipacks



4.11 Publishing items

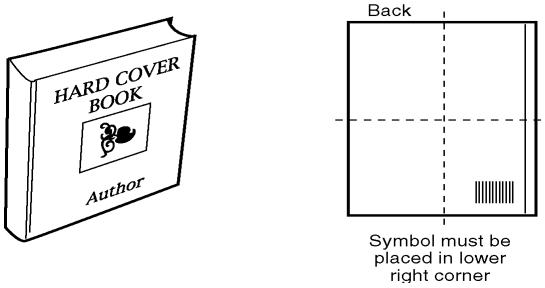
Publishing items represent printed materials sold individually for consumer use including books, magazines, newspapers, and tabloids. Bar code symbol placement on published items varies depending on type.

Package Characteristics
Printed paper media that is bound, stapled, or folded.
Unique Considerations
In addition to the regular bar code symbol, some publishing items have add-on symbols that carry supplementary information such as the issue number. Bar code symbol placement on published items varies depending on the media type. If an add-on symbol is used, it must be located to the right of the regular bar code symbol and parallel to it.
Bar Code Symbol Placement
Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. Preferred Placement

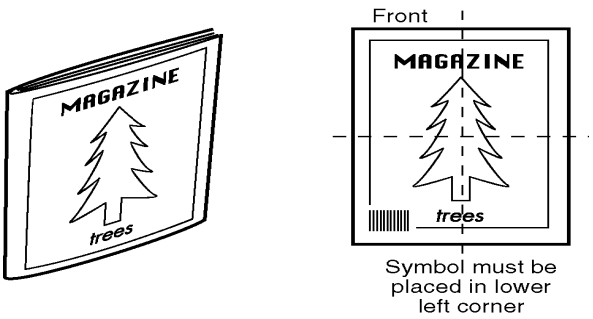
Books

On the **lower right quadrant of the back,** near the spine, respecting the proper quiet zone (light margin) areas around the bar code symbol.



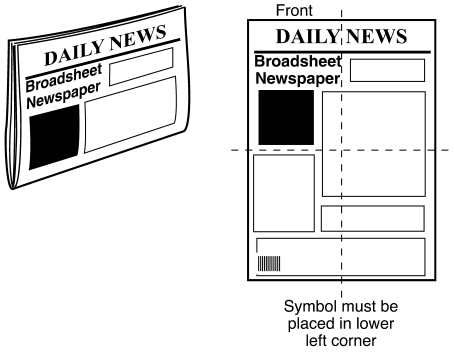
Magazines

On the **lower left quadrant of the front,** near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.

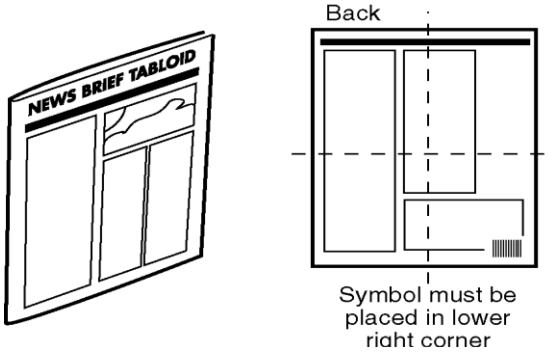


Newspapers

When displayed for sale as shown on the left in the example below, place the symbol on the **lower left quadrant of the front,** near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol. If an add-on symbol is used, it must be located to the right of the regular bar code symbol and parallel to it.



When displayed for sale as shown in the example below, place the symbol on the **lower right quadrant of the back,** near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol. If an add-on symbol is used, it must be located to the right of the regular bar code symbol and parallel to it.



2. Undesirable Alternative

The undesirable alternative is not feasible for this package type.

3. Edge Rule

The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

4.12 Thin items or containers

This package type is so named as items or containers in this category have one physical dimension (height, width, or depth) less than 3 cm (1 in.). Boxes of pizza, compact disk boxes, packages of powdered drink mix, and writing pads are examples.

Package Characteristics

Items or containers with one dimension less than 3 cm (1 in.).

Unique Considerations

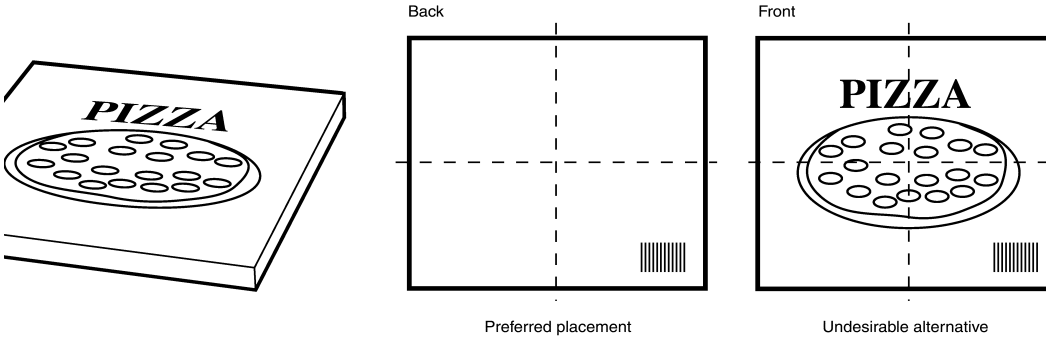
There are no unique considerations that apply to this package type.

Bar Code Symbol Placement

Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. **Preferred Placement**
   On the **lower right quadrant of the back**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Undesirable Alternative**
   On the **lower right quadrant of the front**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Thin Items or Containers



4.13 Trays

This package type includes thin square, rectangular, or circular trays holding items that are covered with over-wrap of clear shrink-film or that are vacuum-sealed. Examples include prepared meats, pastries, snacks, and pies or piecrusts.

Package Characteristics

Flat, formed receptacles holding product covered with over-wrap.

Unique Considerations

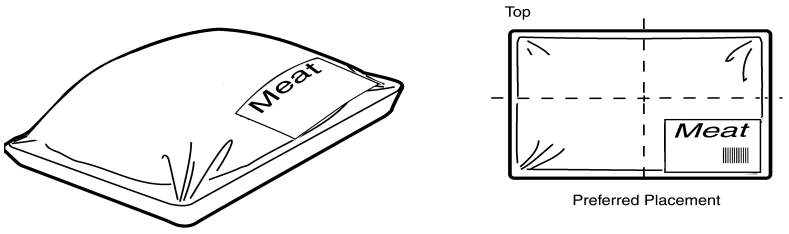
See Chapter 6, Appendix 1 of this guideline for the rules on the relationship of diameter of the item and the bar code symbol magnification factor and X-Dimension.

Bar Code Symbol Placement

Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. **Preferred Placement**
   On the **upper left quadrant of the front**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Trays



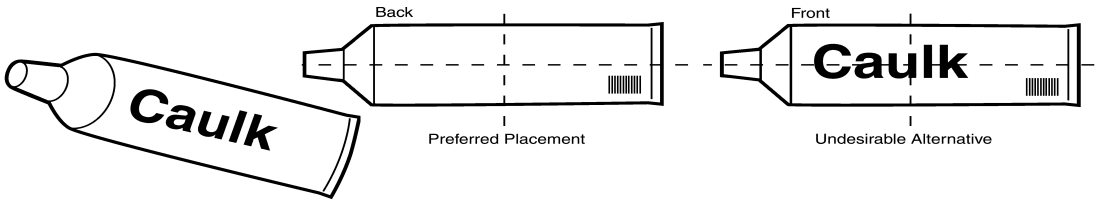
4.14 Tubes

Tubes are cylindrical shaped items or containers that are either sealed at both ends, such as sausage or refrigerated dough; or that are sealed at one end and have a cap or valve on the other end, such as tooth paste or caulk.

Package Characteristics
Firmly packed cylinders sealed at both ends, or sealed at one end with a cap or valve on the other end.
Unique Considerations
See Chapter 6, Appendix 1 of this guideline for the rules on the relationship of diameter of the item and the bar code symbol magnification factor and X-Dimension.
Bar Code Symbol Placement
Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. **Preferred Placement**
   On the **lower right quadrant of the back**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Undesirable Alternative**
   On the **lower right quadrant of the front**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Tubes



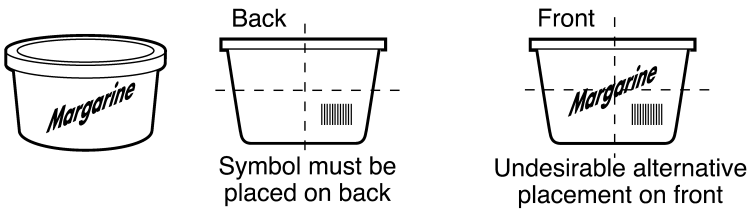
4.15 Tubs

Tubs are circular containers (usually made of paper, plastic or metal) that have removable lids. In most cases, they have spot labels that do not cover the entire surface of the container. Examples include margarine, butter, ice cream, and whipped topping.

Package Characteristics
Deep vessels with removable lids.
Unique Considerations
There are no unique considerations that apply to this package type.
Bar Code Symbol Placement
Identify the front of the package/container. (Refer to Chapter 6, Section 3.2, Identifying the Back of the Package, for instructions on how to identify the package front.)

1. **Preferred Placement**
   On the **lower right quadrant of the back**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
2. **Undesirable Alternative**
   On the **lower right quadrant of the front**, near the edge, respecting the proper quiet zone (light margin) areas around the bar code symbol.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

Example of Symbol Placement on Tubs



4.16 Unpackaged items

These are square, rectangular, circular, concave or convex shaped items including bowls, pots, pans, skillets, cups, vases, and other products (with or without contents), that lack an upright surface suitable for symbol placement.

Package Characteristics

These are items that are unpackaged and sold with spot labels or carded sleeves.

Unique Considerations

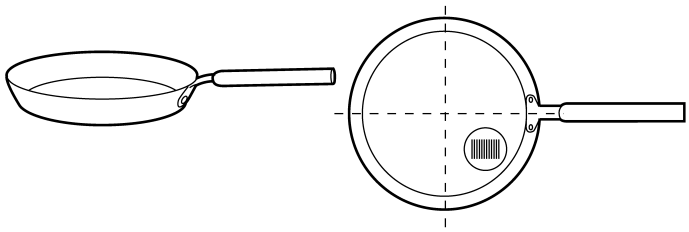
Consider the product's concave shape on the inside or irregular curvature on the outside while respecting the scanning distances defined in the edge rule below when selecting symbol placement.

Bar Code Symbol Placement

Bar code symbol placement on unpackaged items depends on the shape/ type of the item. The following examples illustrate symbol placement appropriate to specific item types:

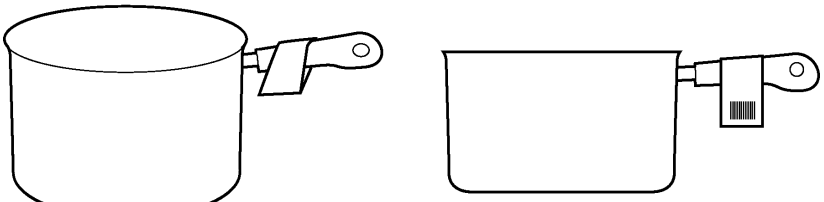
1. **Preferred Placement**
   Examples below indicate options that are acceptable placement locations for other shaped items.

Option 1



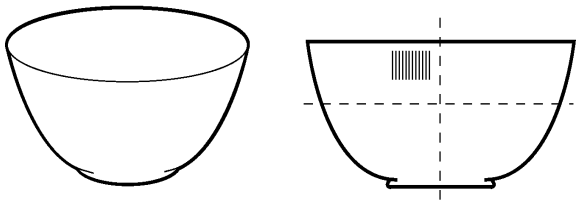
Symbol on bottom

Option 2



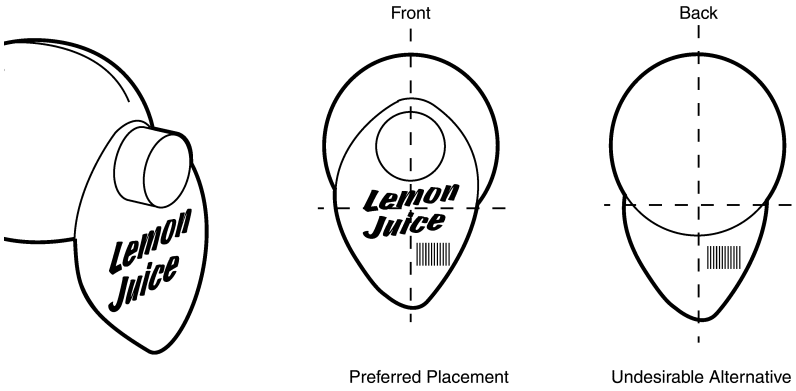
Symbol on sleeve

Option 3



Symbol on outside edge

Option 4

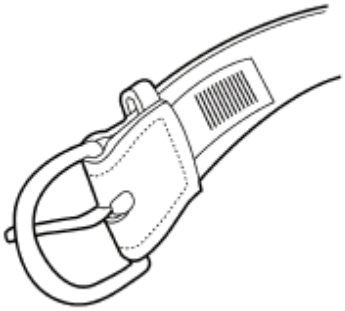


Preferred Placement Undesirable Alternative

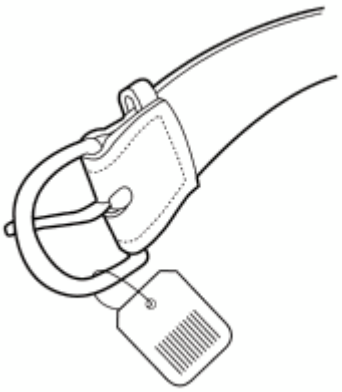
2. **Undesirable Alternative**
   The undesirable alternative is not applicable.
3. **Edge Rule**
   The bar code symbol cannot be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package/container.

5. SYMBOL PLACEMENT FOR CLOTHING AND FASHION ACCESSORIES

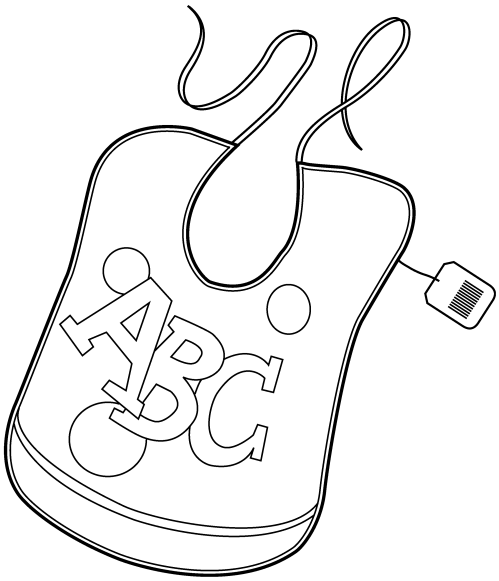
The following examples show recommended placement of symbols on clothing and fashion accessories.

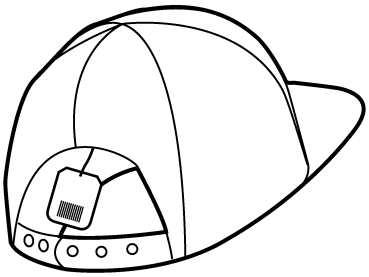


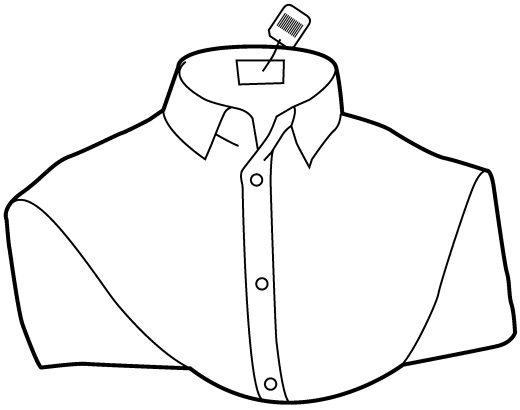
Option 1

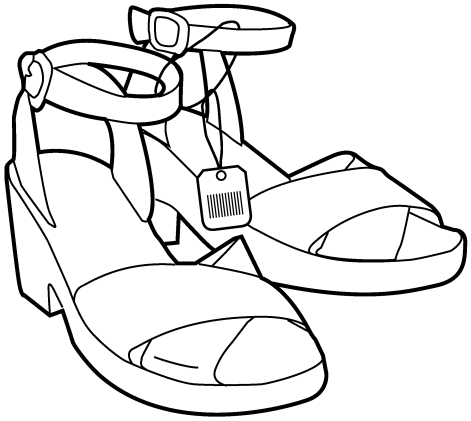


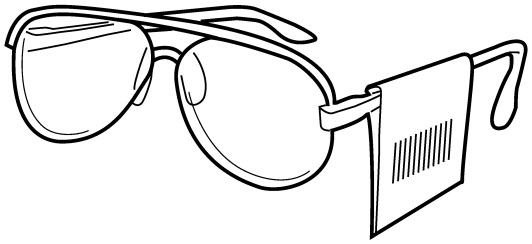
Option 2

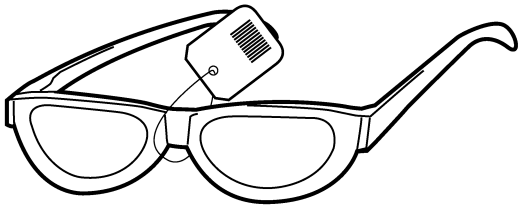


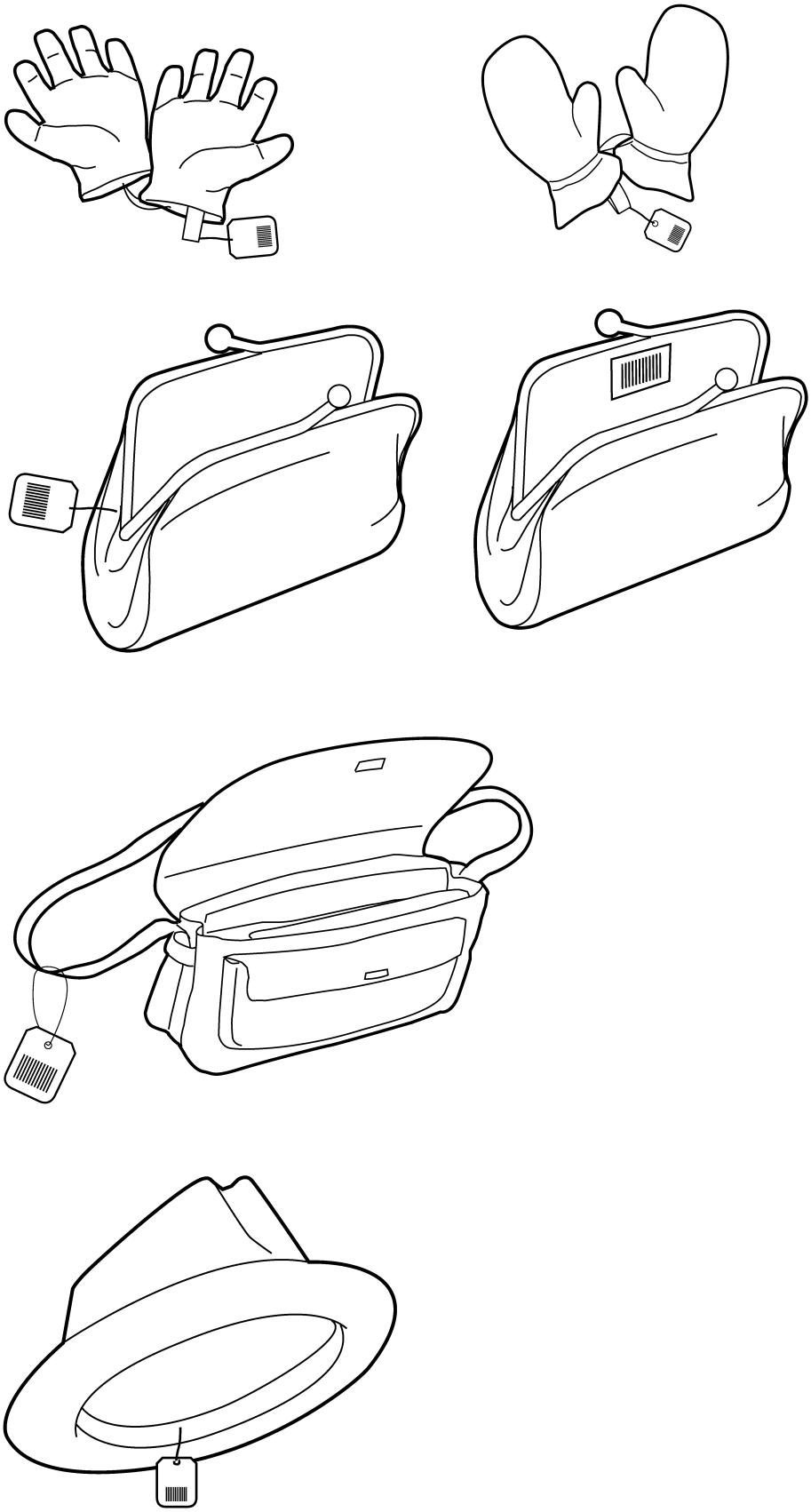


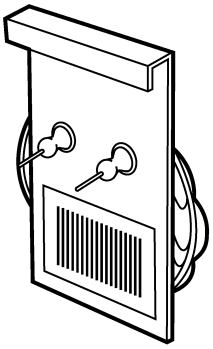


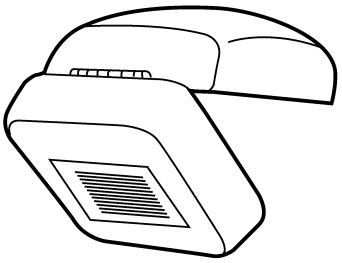


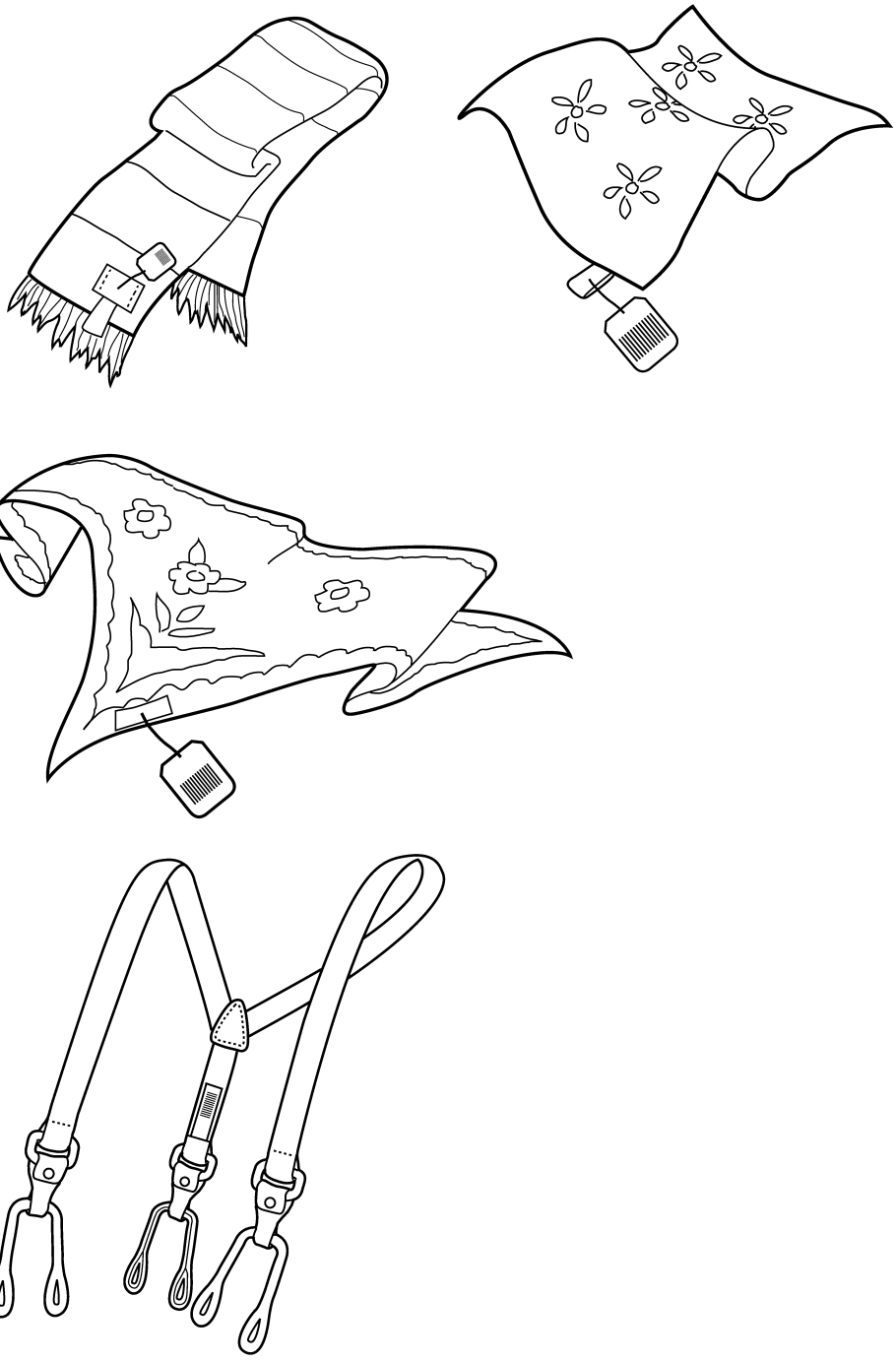


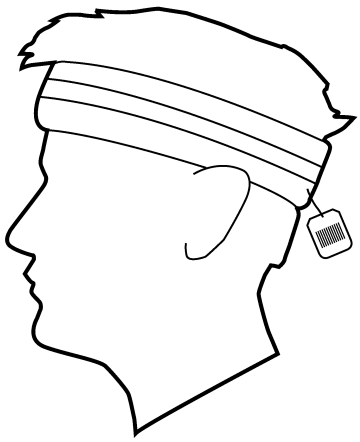


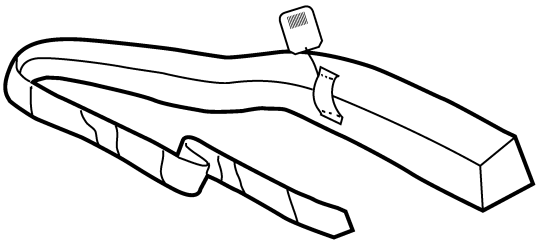


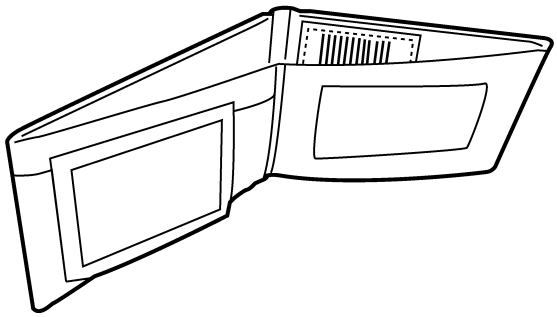


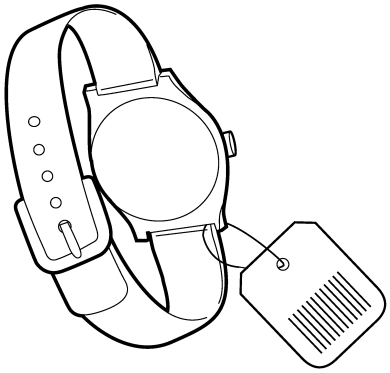


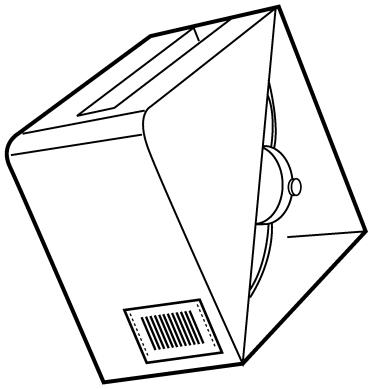


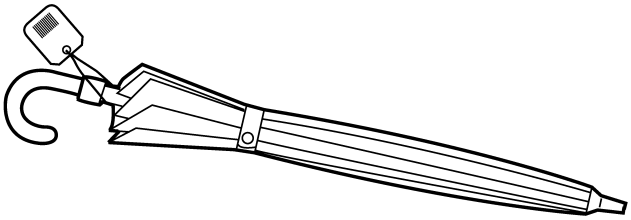


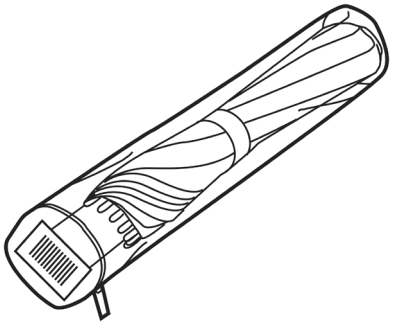


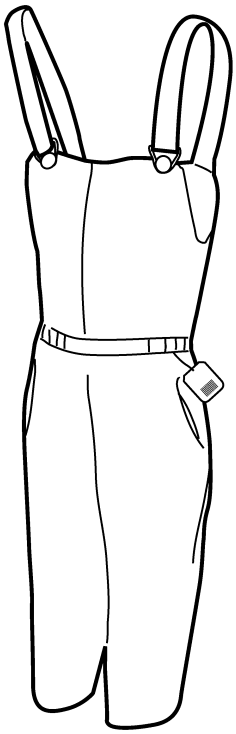


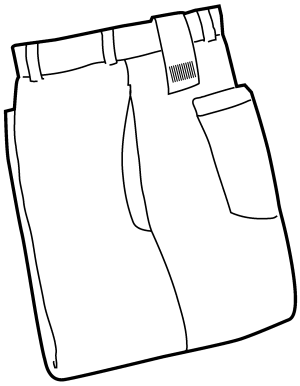




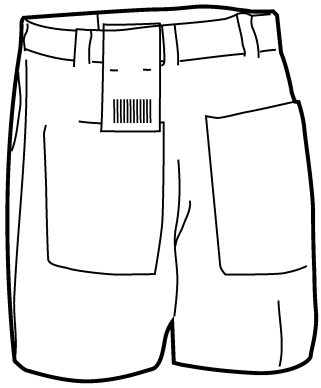




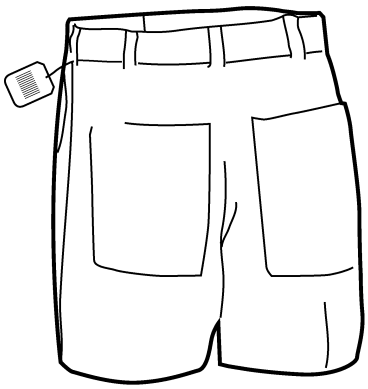




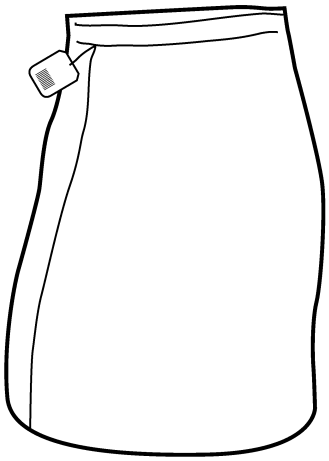
Option 1 Option 2



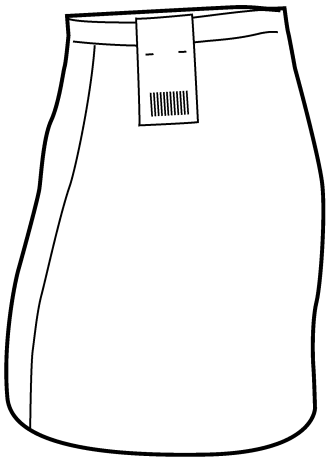
Option 1



Option 2



Option 1



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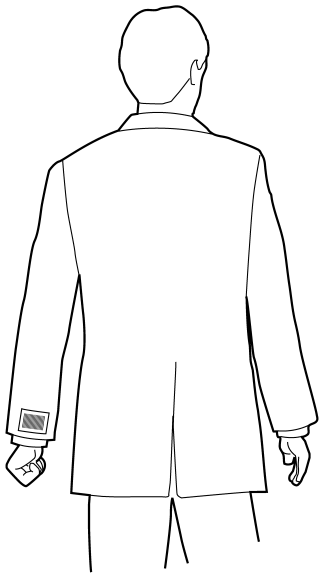
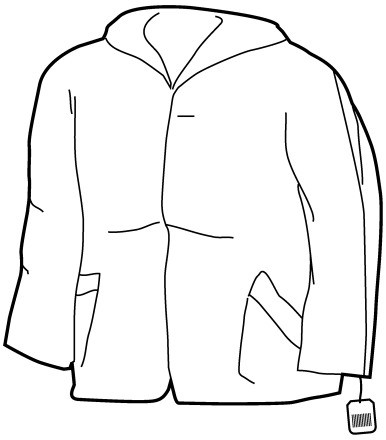
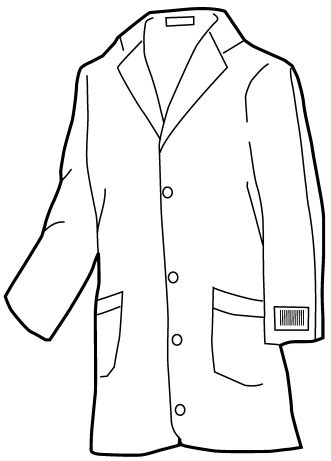
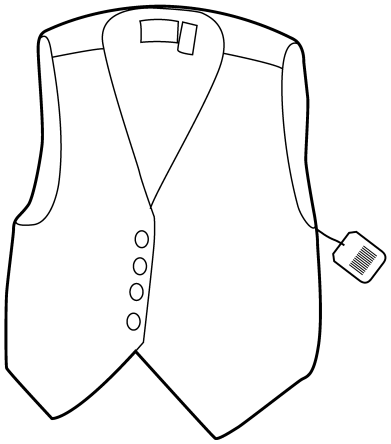


Option 1

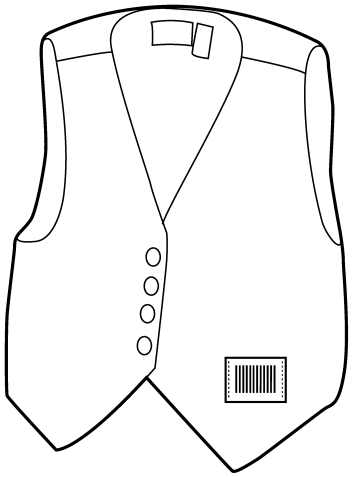
Option 2







Option 1



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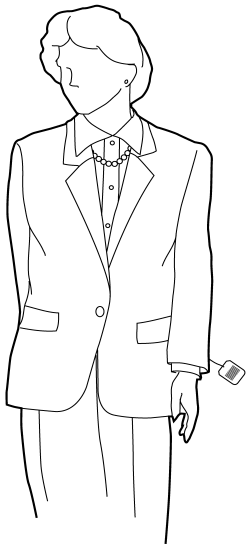
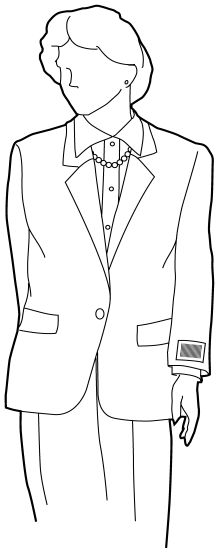
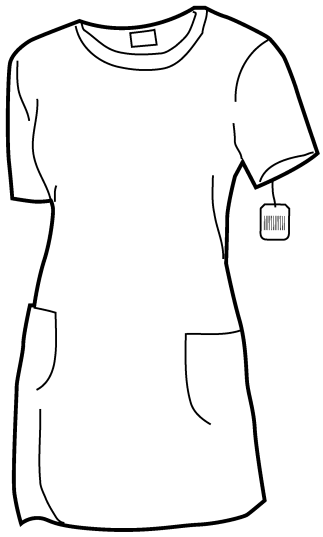


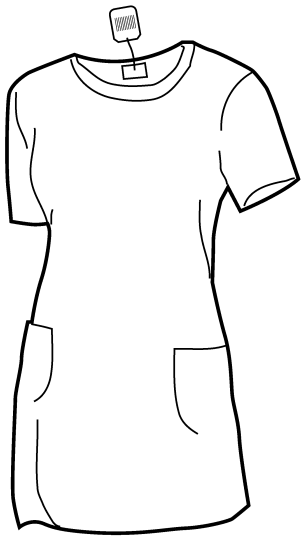
Option 1



Option2



Option 1



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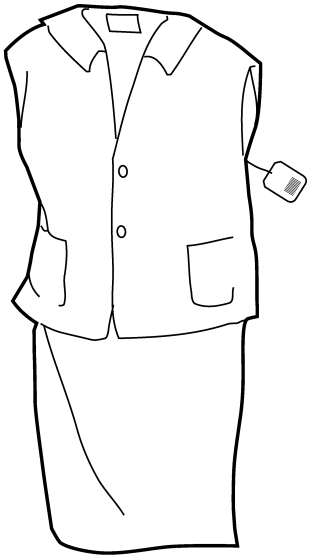
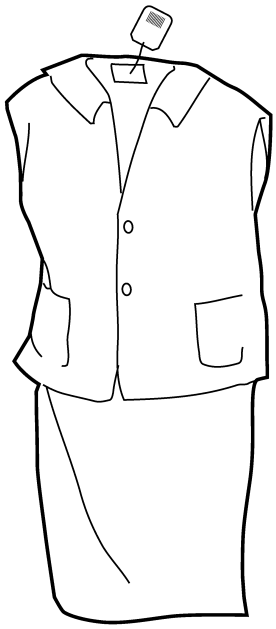
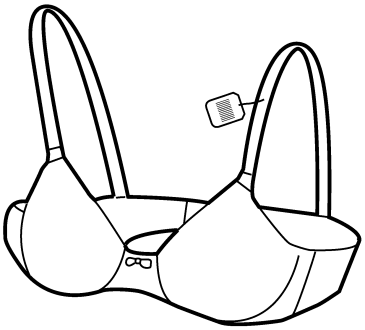


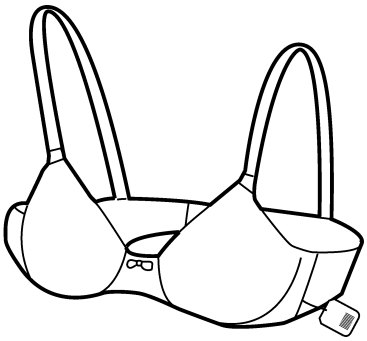
Option 1



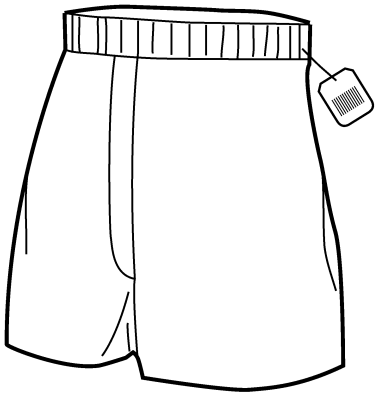
Option 2

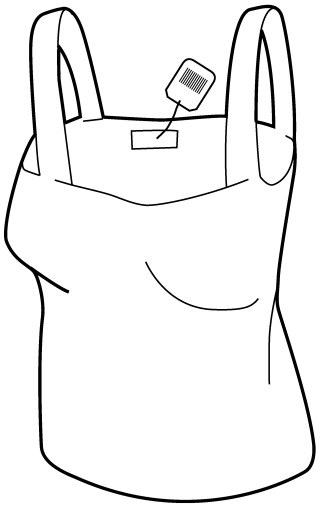


Option 1



Option 2





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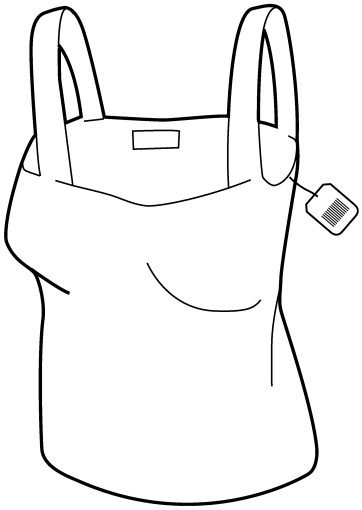

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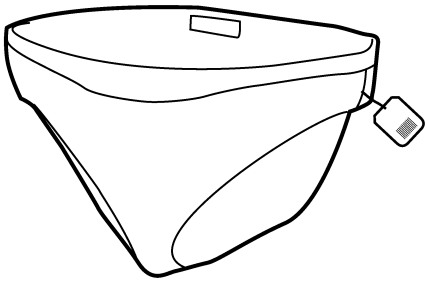

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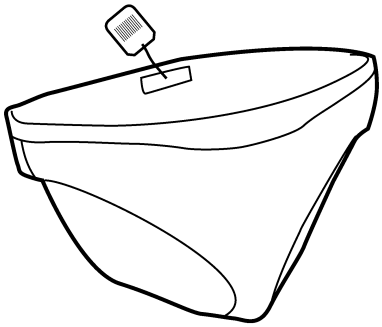

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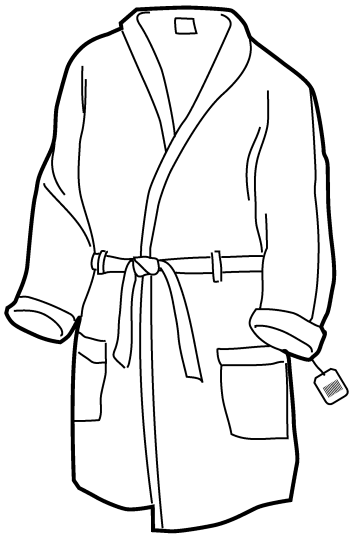
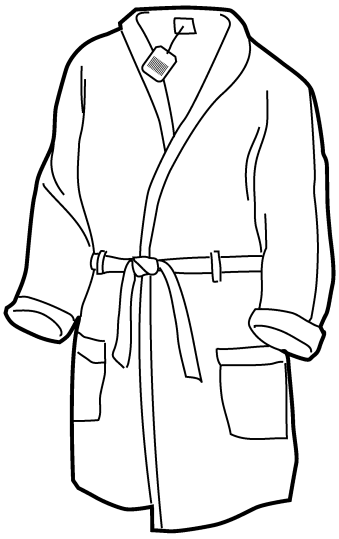
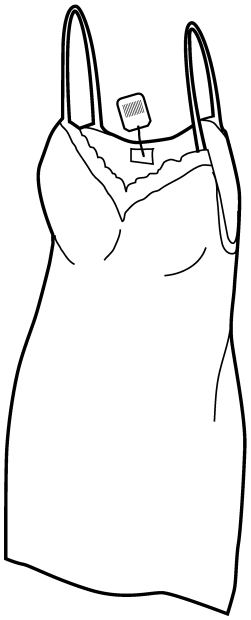


Option 1

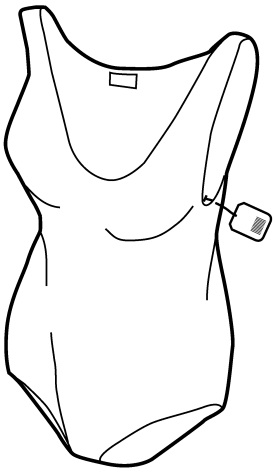


Option 2

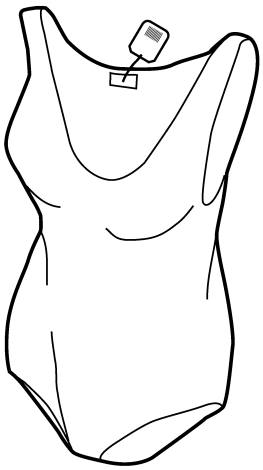
Option 1



Option 2



Option 1



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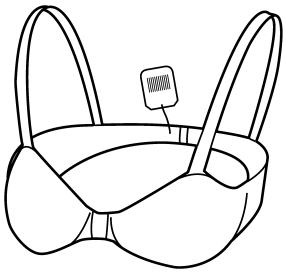
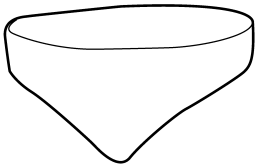
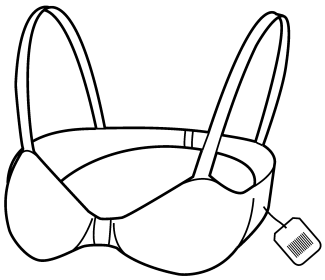
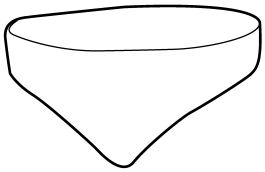




Option 1





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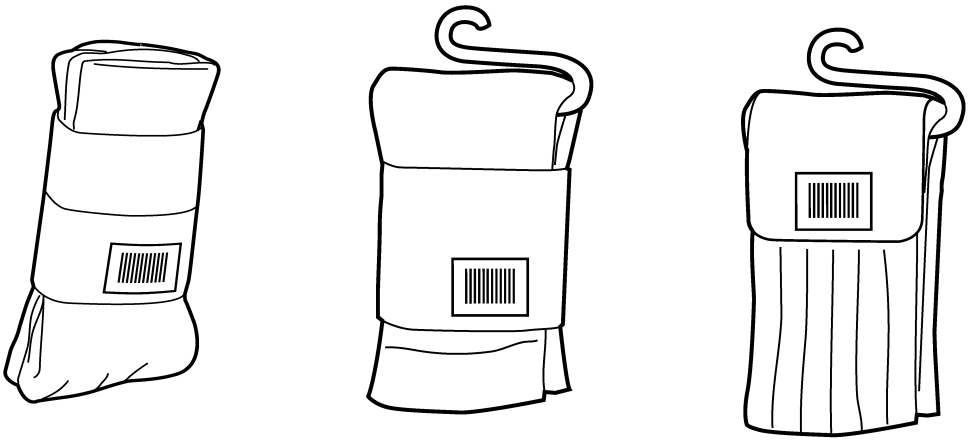
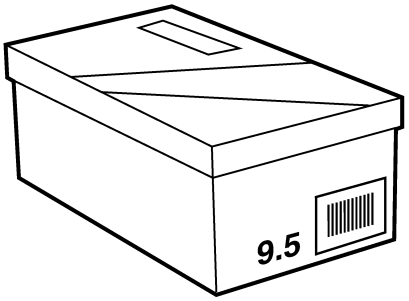
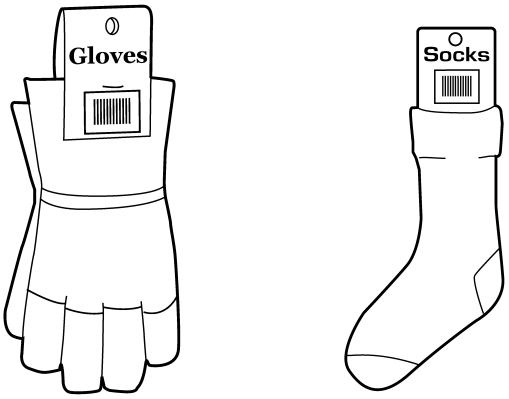
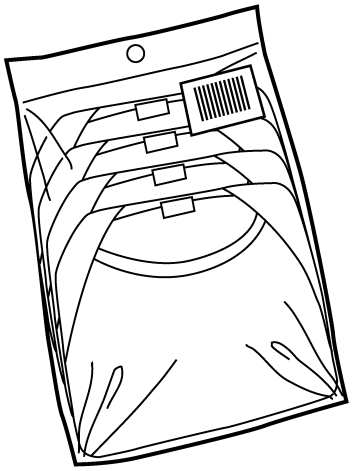
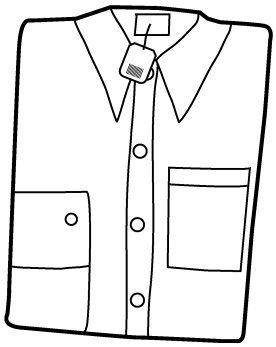
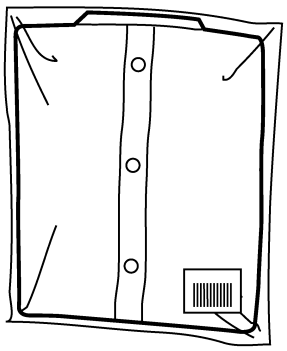


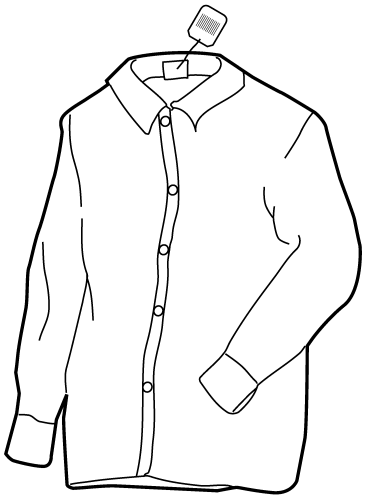

9.5


Gloves
Socks







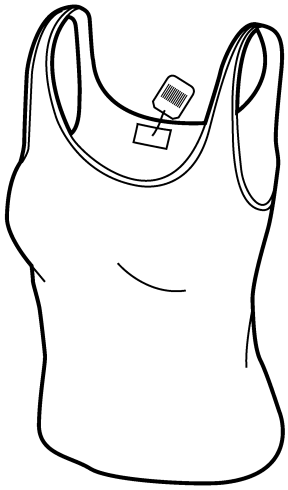


Option 1

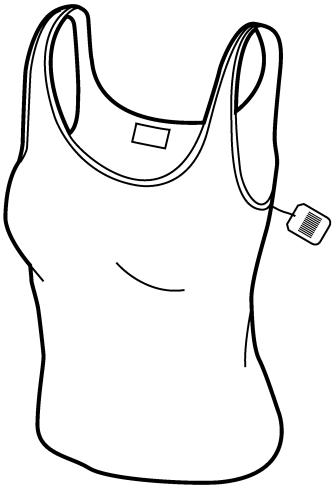
Option 2

Option 1

Option 2



Option 1



Option 2

6. GENERAL FORMAT GUIDELINES FOR CLOTHING AND FASHION ACCESSORIES LABELS

Clothing is displayed in a variety of ways such as loose (as in hanging garments), in boxes, or in bags. In many cases, a relatively small label must be used to carry all the pertinent information relevant to the product. A retail label is expected to carry not only product-specific information important to the retailer (i.e., die lot, batch) and consumer related information (i.e., style, size, color), but also the bar code symbol itself.

The correct general layout for a retail label is indicated below. Because there are many various clothing types on the retail market, detailed label formats are presented in Chapter 6, Section 6.2.

Layout of Label

The label should be divided into three portions:

1. Manufacturer/Retailer Information
   The upper portion of the format is the preferred location for human-readable product identification codes. These codes are important to both manufacturers and retailers, but not usually to the consumer.
2. Bar Code Symbol
   The center portion of the format is the best location for the bar code symbol. Symbols in this location are the least likely to present obstructions to hand-held scanners by forming a natural boundary between the manufacturer/retailer information (upper portion) and the consumer information (lower portion).
3. Consumer Information
   The lower portion of the format is the preferred location for information that is provided for the consumer such as prices, size and fabric content.

Label Placement on Clothing and Fashion Accessories

To determine the placement of the printed label on clothing and fashion accessories, see Chapter 6, Section 5 for drawings that specifically illustrate where to attach or place the label for each product.

6.1 Information zones concept

There are seven information zones which have been organized to carry the product information needed for the vendor, retailer, and consumer. Some of the information is optional based upon the type of label.

6.1.1 General label information zones

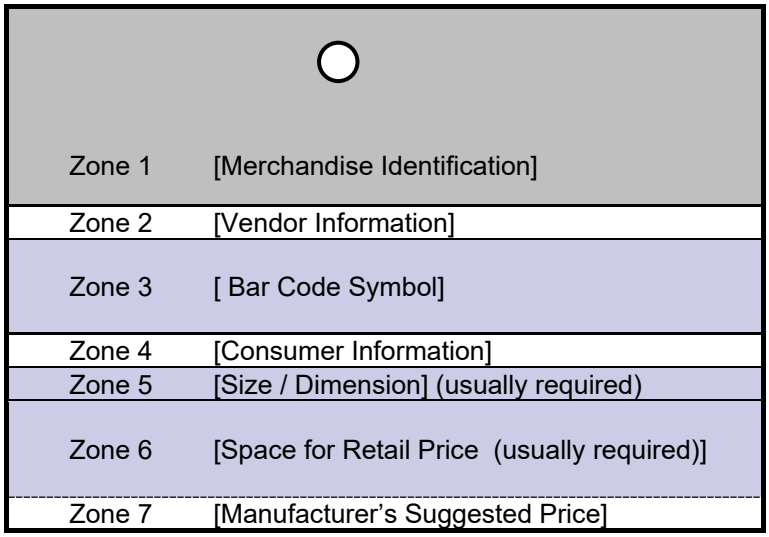
Zones	Information Type	Description	Status: Required / Optional
Zone 1	Merchandise Identification	Primary human readable merchandise identifier, usually the style number, although it may be pattern, model or garment type. The merchandise identifier should be located in the upper left-hand portion of Zone 1.	Always Required **(See Note 1)**
Zone 2	Vendor Information	Optional vendor production information such as Vendor SKU, cut number, dye lot, color, pattern, etc. (Helps to ensure correct EAN/UPC bar code symbol is attached to the product.)	Optional
Zone 3	Data Structure (EAN/UCC-13, UCC-12, EAN/UCC-8)	Bar Code Symbol	Always Required
Zone 4	Consumer Information	Optional product information for the consumer such as fiber content, fire retardancy, country of origin, etc.	Optional
Zone 5	Size/Dimension	Size/Dimension is a key requirement for the consumer. Size information can be emphasized in large bold print and should be located in the right-hand portion of Zone 5. Vendors may optionally include a style name as a selection aid for the consumer.	Usually Required *Unless defined by the product (e.g., towels)*
Zone 6	Retail Price	Allow space to print the price with minimum dimension characters of 25 mm (1 in.) x 32 mm (1 1/4 in.). For plastic packaged, boxed and banded products, this required space for price can be provided by several methods: 1. For EAN/UPC marking on adhesive label, the space for price can be included as part of the label. 2. For EAN/UPC marking designed into the packaging, the space for price can be included on the package artwork. 3. Providing package space adjacent to Zone 5 that is reserved for retail item pricing creates implied space for price. Implied space replaces the requirement for actual space on labels or package artwork. If implied space for price is used, no information of importance should be printed in the area that might be covered by adhesive item price labels.	Usually Required *Unless defined by the ticket format (e.g., sewn-in tickets)*
Zone 7	Manufacturer's Suggested Price	For use only if merchandise is pre-priced or suggested retail price is printed on the tag. If provided, the area must be perforated for optional removal.	Optional

Note 1: Size and color is optional in Zone 1 if vendor usage requires this information to define the product.

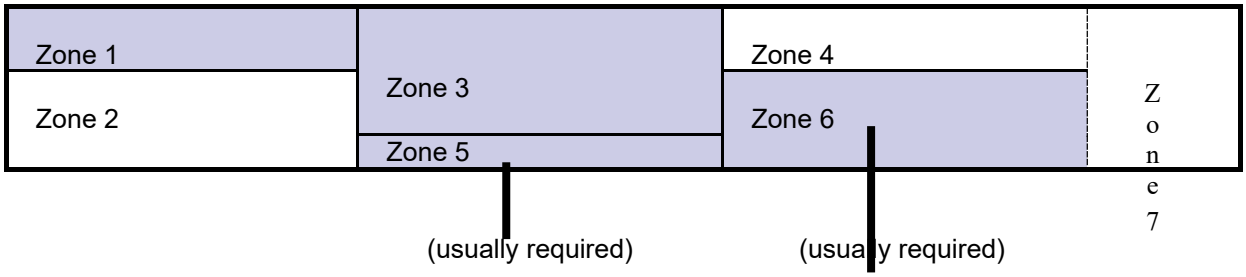
6.1.2 General label format

See the following diagrams for an example of how the zones appear in a typical vertical and horizontal label format.

Vertical Label Format



Horizontal Label Format



KEY

Required	Optional

6.2 Hang tag (Hanging label) format

Although hang tags (hanging labels) are primarily associated with hanging ready-to-wear apparel, a great many other products are identified with hang tags. Flat-folded apparel, jewelry, belts, handbags, lamps, and furniture are identified by some form of hang tag. Therefore, the voluntary hang tag format guidelines outlined in this section provide for flexibility in hang tag design while maintaining the overall concept of the information zones.

Hang tags serve a dual purpose. First, they provide brand identification to the consumer. Secondly, as the back of hang tags is frequently used for product information and product identification codes, the back of the hang tag should carry the EAN/UPC bar code symbol that identifies the product.

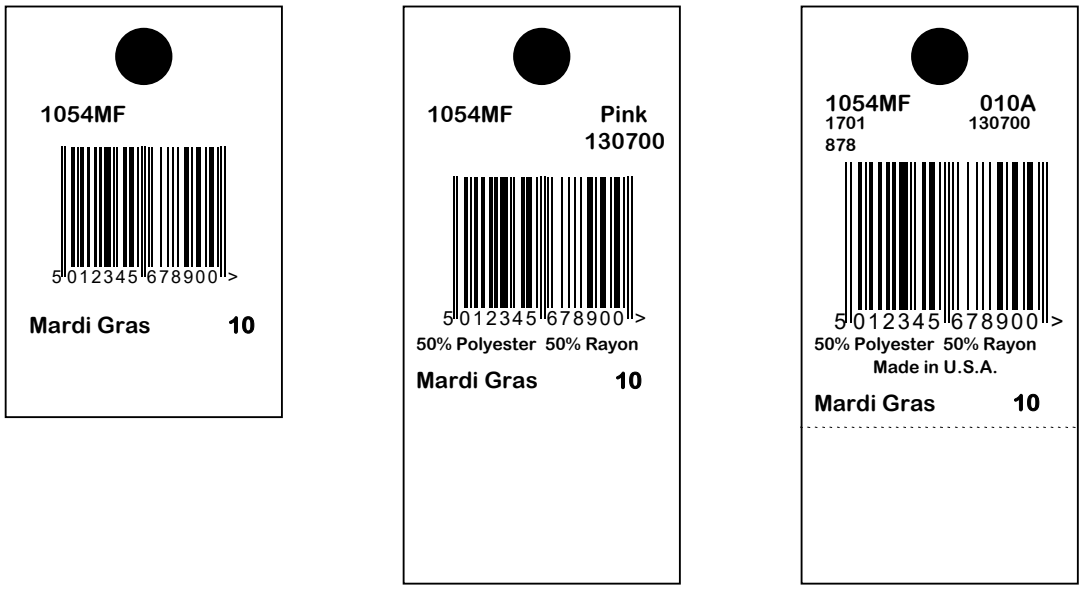
The typical hang tag layout features the vendor's logo on the front and product identification codes and the EAN/UPC bar code symbol on the back. Vendors may optionally include an additional logo on the back of the hang tags. However, a logo should not appear at the bottom because a retail price label may obscure it or it could be torn off if a manufacturer's suggested retail price is removed. Background printing of logos should be avoided as this may obscure required information or important consumer information. Logos must never obscure the EAN/UPC bar code symbol.

6.2.1 Hang tag label information zones

Zones	Information Type	Description	Status: Required / Optional
Zone 1	Merchandise Identification	Primary human readable merchandise identifier, usually the style number, although it may be pattern, model or garment type. The merchandise identifier should be located in the upper left-hand portion of Zone 1.	Always Required **(See Note 1)**
Zone 2	Vendor Information	Optional vendor production information such as Vendor SKU, cut number, dye lot, color, pattern, etc. (Helps to ensure correct EAN/UPC bar code symbol is attached to the product.)	Optional
Zone 3	Data Structure (EAN/UCC-13, UCC-12, EAN/UCC-8)	Bar Code Symbol	Always Required
Zone 4	Consumer Information	Optional product information for the consumer such as fiber content, fire retardancy, country of origin, etc.	Optional
Zone 5	Size/Dimension	Size/Dimension is a key requirement for the consumer. Size information can be emphasized in large bold print and should be located in the right-hand portion of Zone 5. Vendors may optionally include a style name as a selection aid for the consumer.	Usually Required *Unless defined by the product (e.g., towels)*
Zone 6	Retail Price	Allow space to print the price with minimum dimension characters of 25 mm (1 in.) x 32 mm (1 1/4 in.).	Usually Required *Unless defined by the ticket format (e.g., sewn-in tickets)*
Zone 7	Manufacturer's Suggested Price	For use only if merchandise is pre-priced or suggested retail price is printed on the tag. If provided, the area must be perforated for optional removal.	Optional

Note 1: Size and color is optional in Zone 1 if vendor usage requires this information to define the product.

6.2.2 Hanging tag label examples



6.3 Sewn-on (Joker) label format

Used almost exclusively for apparel merchandise, joker labels are similar in format to hang tags, but differ in one important respect. They are attached directly to the product, sewn on, instead of hanging from the product. Being sewn on, only one side of the label is available for the vendor's logo, the EAN/UPC bar code symbol, and merchandise identification information.
Inclusion of a vendor logo on the label is optional. If it is included, however, it should not appear at the bottom, because a retail price label may obscure it, or it could be torn off by the removal of a manufacturer's suggested retail price. Background printing of logos should be avoided as it may obscure required information or important consumer information. Logos must never obscure the EAN/UPC bar code symbol.

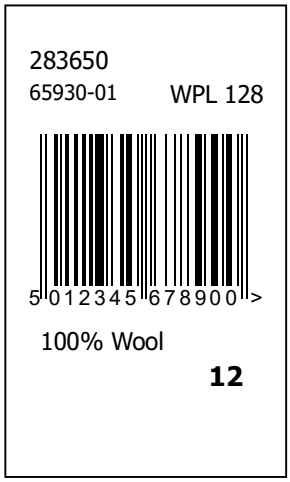
6.3.1 Sewn-on (Joker) label information zones

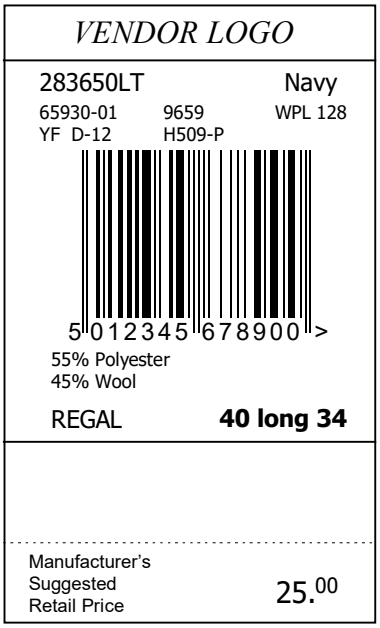
Zones	Information Type	Description	Status: Required / Optional
Zone 1	Merchandise Identification	Primary human readable merchandise identifier, usually the style number, although it may be pattern, model or garment type. The merchandise identifier should be located in the upper left-hand portion of Zone 1.	Always Required **(See Note 1)**
Zone 2	Vendor Information	Optional vendor production information such as Vendor SKU, cut number, dye lot, color, pattern, etc. (Helps to ensure correct EAN/UPC bar code symbol is attached to the product.)	Optional
Zone 3	Data Structure (EAN/UCC-13, UCC-12, EAN/UCC-8)	Bar Code Symbol	Always Required
Zone 4	Consumer Information	Optional product information for the consumer such as fiber content, fire retardancy, country of origin, etc.	Optional
Zone 5	Size/Dimension	Size/Dimension is a key requirement for the consumer. Size information can be emphasized in large bold print and should be located in the right-hand portion of Zone 5. Vendors may optionally include a plain language style name on the size line as a selection aid for the consumer.	Usually Required *Unless defined by the product (e.g., towels)*
Zone 6	Retail Price	Allow space to print the price with minimum dimension characters of 25 mm (1 in.) x 32 mm (1 1/4 in.).	Usually Required *Unless defined by the ticket format (e.g., sewn-in tickets)*
Zone 7	Manufacturer's Suggested Price	For use only if merchandise is pre-priced or suggested retail price is printed on the tag. If provided, the area must be perforated for optional removal.	Optional

Note 1: Size and color is optional in Zone 1 if vendor usage requires this information to define the product.

6.3.2 Sewn-on (Joker) label examples

Vertical Layout





Horizontal Layout

6.4 Sewn-in label formats

Sewn-in labels are often used for towel products. Sewn-in labels may be paper based, for removal by the consumer, or cloth based and more permanent.

Because a portion of the sewn-in label is normally covered over by a hem, the label should be designed with sufficient blank space on the end that will be attached to the product. Care must be taken to ensure that the product identification information on the label is not obscured by the hem, and that it does not interfere with the readability of the EAN/UPC symbol at the retail point-of-sale.

6.4.1 Sewn-in label information zones

Zones	Information Type	Description	Status: Required / Optional
Zone 1	Merchandise Identification	Primary human readable merchandise identifier, usually the style number, although it may be pattern, model or garment type. The merchandise identifier should be located in the upper left-hand portion of Zone 1.	Always Required **(See Note 1)**
Zone 2	Vendor Information	Optional vendor production information such as Vendor SKU, cut number, dye lot, color, pattern, etc. (Helps to ensure correct EAN/UPC bar code symbol is attached to the product.)	Optional
Zone 3	Data Structure (EAN/UCC-13, UCC-12, EAN/UCC-8)	Bar Code Symbol	Always Required
Zone 4	Consumer Information	Optional product information for the consumer such as fiber content, fire retardancy, country of origin, etc.	Optional
Zone 5	Size/Dimension	Size or dimension is optional for sewn-in labels. Size or dimension may assist the consumer with product selection or may help the vendor ensure that the correct label and EAN/UPC bar code symbol are attached to the product.	Usually Required *Unless defined by the product (e.g., towels) and is readily apparent to the consumer.*
Zone 6	Retail Price	Allow space to print the price with minimum dimension characters of 25 mm (1 in.) x 32 mm (1 1/4 in.).	Usually Required *Unless defined by the ticket format (e.g., sewn-in tickets)*
Zone 7	Manufacturer's Suggested Price	For use only if merchandise is pre-priced or suggested retail price is printed on the tag. If provided, the area must be perforated for optional removal.	Optional

Note 1: Size and color is optional in Zone 1 if vendor usage requires this information to define the product.

6.5 Plastic packaged products' label location guidelines

The plastic packaged category covers a wide assortment of merchandise which includes sheets, pillowcases, table linens, pantyhose, underwear, stationery supplies, pillows, bedspreads, and numerous types of flat-folded apparel which are plastic packaged.

There are two different methods of EAN/UPC marking of plastic packaged products:

1. Incorporate the EAN/UPC bar code symbol and other merchandise identification information into the artwork of the packaging.
2. Print the EAN/UPC bar code symbol and other merchandise identification information on an adhesive label that can be press-applied to the product.

Inclusion of a vendor logo on the label is optional. If it is included, however, it should not appear at the bottom, because a retail price label may obscure it, or it could be torn off by the removal of a manufacturer's suggested retail price. Background printing of logos should be avoided as it may obscure required information or important consumer information. Logos must never obscure the EAN/UPC bar code symbol.

6.5.1 Plastic packaged products' label information zones

Zones	Information Type	Description	Status: Required / Optional
Zone 1	Merchandise Identification	Primary human readable merchandise identifier, usually the style number, although it may be pattern, model or garment type. The merchandise identifier should be located in the upper left-hand portion of Zone 1.	Always Required **(See Note 1)**
Zone 2	Vendor Information	Optional vendor production information such as Vendor SKU, cut number, dye lot, color, pattern, etc. (Helps to ensure correct EAN/UPC bar code symbol is attached to the product.)	Optional
Zone 3	Data Structure (EAN/UCC-13, UCC-12, EAN/UCC-8)	Bar Code Symbol	Always Required
Zone 4	Consumer Information	Optional product information for the consumer such as fiber content, fire retardancy, country of origin, etc.	Optional **(See Note 2)**
Zone 5	Size/Dimension	Size/Dimension is a key requirement for the consumer. Size information can be emphasized in large bold print and should be located in the right-hand portion of Zone 5. Vendors may optionally include a style name as a selection aid for the consumer.	Usually Required **(See Note 3)**
Zone 6	Retail Price	Allow space to print the price with 25 mm (1 in.) x 32 mm (1 1/4 in.) minimum dimension characters. For plastic packaged products, this required space for price can be provided by several methods: 1. For EAN/UPC marking on adhesive label, the space for price can be included as part of the label. 2. For EAN/UPC marking designed into the packaging, the space for price can be included on the package artwork. 3. Providing package space adjacent to Zone 5 that is reserved for retail item pricing creates implied space for price. Implied space replaces the requirement for actual space on labels or package artwork. If implied space for price is used, no information of importance should be printed in the area that might be covered by adhesive item price labels.	Usually Required
Zone 7	Manufacturer's Suggested Price	For use only if merchandise is pre-priced or suggested retail price is printed on the tag. If provided, the area must be perforated for optional removal.	Optional

Note 1: Size and color is optional in Zone 1 if vendor usage requires this information to define the product.

Note 2: Some jurisdictions require that certain products include a permanently affixed statement of information of this type in Zone 4 that may not be satisfied by inclusion on the package.

Note 3: Size may be omitted from Zone 5, if the size information is readily available on the product packaging.

6.5.2 Plastic packaged products' label placement guidelines

Consistency of bar code placement is needed for the merchandise carrying the EAN/UPC bar code to scan successfully at the retail point-of-sale. The symbol placement guidelines for plastic packaged product have been designed with the flexibility to accommodate differences that may arise from industry to industry as follows:

1. The overall voluntary guideline for the placement of the EAN/UPC bar code symbol and other product identification information on plastic packaged products is the front top right-hand corner.
2. The symbol and other product identification information may be located on the front or back of plastic packaged products. However, all products within a particular merchandise category must use the same side of the package for EAN/UPC bar code marking.

CAUTION: Placement of the EAN/UPC symbol on the back of a product may result in the presentation of the product on the display counter in a backside up orientation by some retailers, in order that the EAN/UPC symbol and retail price appear together in full view by the customer.

3. The orientation of the EAN/UPC bar code symbol and other product identification information should be consistent with any graphics or descriptive data on the plastic package.
4. The symbol and other product identification information, whether built into the package artwork or an adhesive label, must not be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package. Previous guidelines suggested a distance of 5 mm (0.2 in) as a minimum. Practical experience has shown this to be inadequate. Also, cashiers often grab packages on the edge with their thumbs. Avoid placing the bar code symbol too close to the edge. Such placement too close to the edge reduces retail point of sale efficiency and may cause distortion of the symbol. (See Chapter 6, Section 3.3.3, Edge Rule.)
5. The EAN/UPC bar code symbol and other product identification information on the plastic packaged products should normally be located on the front top right-hand corner. However, for some very large, bulky, or unusually shaped products, this may be impractical or inappropriate. See Chapter 6, Section 4 for Large, Heavy and Bulky items.

Note: Chapter 6, Section 4 specifies the "lower right quadrant of the back" of the package or container as the recommended location of the EAN/UPC bar code symbol. This recommendation remains in effect for plastic packaged products that are sold in a grocery store environment.

6.5.3 Plastic packaged products' label example

6.6 Boxed products' label formats

Some boxed products may be sold in or out of the box. Some boxed products are actually sets that may also be sold as individual items. Some boxes carry significant amounts of design graphics while others are simply a cardboard box containing the product.

Box size can range from very small, as in jewelry or cosmetics, to very large as in home furnishings. For extremely large boxed products, consideration should be given to using a two-part tear-off EAN/UPC bar code label to facilitate scanning at the point-of-sale while leaving one label on the box.

There are two different methods of EAN/UPC bar code symbol marking on boxed products:

1. Incorporate the EAN/UPC symbol and other merchandise identification information into the artwork of the box.
2. Print the EAN/UPC symbol and other merchandise identification information on an adhesive label that can be applied to the box.

Inclusion of a vendor logo in the box marking format is optional. If it is included, it should not appear at the bottom because it may be obscured by a retail price label or it could be torn off if a manufacturer's suggested retail price is removed. Background printing of logos should be avoided as it may obscure required information or important consumer information.

6.6.1 Boxed products' label information zones

Zones	Information Type	Description	Status: Required / Optional
Zone 1	Merchandise Identification	Primary human readable merchandise identifier, usually the style number, although it may be pattern, model or garment type. The merchandise identifier should be located in the upper left-hand portion of Zone 1.	Always Required **(See Note 1)**
Zone 2	Vendor Information	Optional vendor production information such as Vendor SKU, cut number, dye lot, color, pattern, etc. (Helps to ensure correct EAN/UPC bar code symbol is attached to the product.)	Optional
Zone 3	Data Structure (EAN/UCC-13, UCC-12, EAN/UCC-8)	Bar Code Symbol	Always Required
Zone 4	Consumer Information	Optional product information for the consumer such as fiber content, fire retardancy, country of origin, etc.	Optional **(See Note 2)**
Zone 5	Size/Dimension	Size/Dimension is a key requirement for the consumer. Size information can be emphasized in large bold print and should be located in the right-hand portion of Zone 5. Vendors may optionally include a style name as a selection aid for the consumer.	Usually Required **(See Note 3)**
Zone 6	Retail Price	Allow space to print the price with minimum dimension characters of 25 mm (1 in.) x 32 mm (1 1/4 in.). For boxed products, this required space for price can be provided by several methods: 1. For EAN/UPC marking on adhesive label, the space for price can be included as part of the label. 2. For EAN/UPC marking designed into the packaging, the space for price can be included on the package artwork. 3. Providing package space adjacent to Zone 5 that is reserved for retail item pricing creates implied space for price. Implied space replaces the requirement for actual space on labels or package artwork. If implied space for price is used, no information of importance should be printed in the area that might be covered by adhesive item price labels.	Usually Required
Zone 7	Manufacturer's Suggested Price	For use only if merchandise is pre-priced or suggested retail price is printed on the tag. If provided, the area must be perforated for optional removal.	Optional

Note 1: Size and color is optional in Zone 1 if vendor usage requires this information to define the product.

Note 2: Some jurisdictions require that certain products include a permanently affixed statement of information of this type in Zone 4 that may not be satisfied by inclusion on the package.

Note 3: Size may be omitted from Zone 5, if the size information is readily available on the product packaging.

6.6.2 Box marking versus item marking

Certain boxed products may be sold out of the box as a free standing item or they may be sold in the box. This creates a dilemma for the manufacturer. Mark the item or mark the box?
One solution to this problem is the use of a special adhesive label known as a double stick label. It allows manufacturers to mark the box and leave the item marking decision to the retailer. The double stick label has two layers of backing material. The first layer is peeled off when the label is applied to the box. At the retailer's option, the adhesive label may be peeled off a second time and applied directly to the product.
Another solution is to mark both the box and item with the same EAN/UPC symbol.

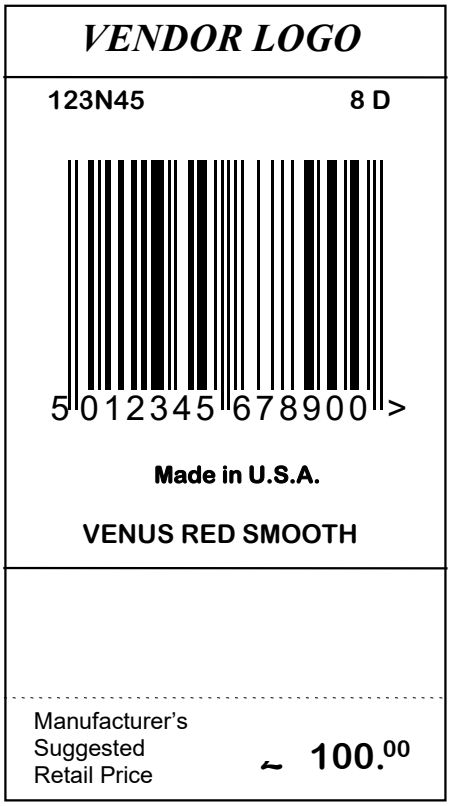
6.6.3 Boxed products' label placement guidelines

Consistency of marking location within an industry or product category is mandatory for the EAN/UPC bar code symbol labeled merchandise to function successfully at the retail point-of-sale. Since the category of boxed products includes a very diverse merchandise group, the location guidelines have been designed with considerable flexibility to accommodate differences that may arise from industry to industry as follows:

1. The overall voluntary guideline for the location of the EAN/UPC symbol and other product identification information for boxed products sold primarily in the department or specialty store environment is the normally the exposed surface of the box.
2. The orientation of the EAN/UPC symbol and other product identification information should be consistent with any graphics or descriptive data on the box.
3. The symbol and other product identification information, whether built into the package artwork or an adhesive label, must not be **closer than 8 mm (0.3 in.)** or **farther than 102 mm (4 in.)** from any edge of the package. Previous guidelines suggested a distance of 5 mm (0.2 in) as a minimum. Practical experience has shown this to be inadequate. Also, cashiers often grab packages on the edge with their thumbs. Avoid placing the bar code symbol too close to the edge. Such placement too close to the edge reduces retail point of sale efficiency and may cause distortion of the symbol. (See Chapter 6, Section 3.3.3, Edge Rule.)
4. The EAN/UPC bar code symbol and other product identification information on the plastic packaged products should normally be located on the front top right-hand corner. However, for some very large, bulky, or unusually shaped products, this may be impractical or inappropriate. See Chapter 6, Section 4 for Large, Heavy and Bulky items.

Note: Chapter 6, Section 4 specifies the "lower right quadrant of the back" of the package or container as the recommended location of the EAN/UPC bar code symbol. This recommendation remains in effect for plastic packaged products that are sold in a grocery store environment.

6.6.4 Boxed products' label examples



6.7 Banded products' label formats

Banded packaging involves a fairly specialized group of products. This type of packaging is most commonly associated with hosiery (socks) or yarn products.
There are two different methods of EAN•UCC marking for banded products:

1. Incorporate the EAN/UPC symbol and other merchandise identification information into the artwork of the band.
2. Print the EAN/UPC symbol and other merchandise identification information on adhesive label that can be applied to the band.

The typical banded product label will feature the vendor's logo on the front while the back will contain product identification codes, consumer information and the EAN/UPC symbol. The vendor's logo can also be printed on the back of the band as part of the band marking format. However, care should be taken to ensure that there is no obstruction of the EAN/UPC symbol or other important product identification information. Background printing of logos should also be avoided.

6.7.1 Banded products' label information zones

Zones	Information Type	Description	Status: Required / Optional
Zone 1	Merchandise Identification	Primary human readable merchandise identifier, usually the style number, although it may be pattern, model or garment type. The merchandise identifier should be located in the upper left-hand portion of Zone 1.	Always Required **(See Note 1)**
Zone 2	Vendor Information	Optional vendor production information such as Vendor SKU, cut number, dye lot, color, pattern, etc. (Helps to ensure correct EAN/UPC bar code symbol is attached to the product.)	Optional
Zone 3	Data Structure (EAN/UCC-13, UCC-12, EAN/UCC-8)	Bar Code Symbol	Always Required
Zone 4	Consumer Information	Optional product information for the consumer such as fiber content, fire retardancy, country of origin, etc.	Optional **(See Note 2)**
Zone 5	Size/Dimension	Size/Dimension is a key requirement for the consumer. Size information can be emphasized in large bold print and should be located in the right-hand portion of Zone 5. Vendors may optionally include a style name as an aid to the consumer in selection.	Usually Required **(See Note 3)**
Zone 6	Retail Price	Allow space to print the price with minimum dimension characters of 25 mm (1 in.) x 32 mm (1 1/4 in.). For banded products, this required space for price can be provided by several methods: 1. For EAN/UPC marking on adhesive label, the space for price can be included as part of the label. 2. For EAN/UPC marking designed into the packaging, the space for price can be included on the package artwork. 3. Providing package space adjacent to Zone 5 that is reserved for retail item pricing creates implied space for price. Implied space replaces the requirement for actual space on labels or package artwork. If implied space for price is used, no information of importance should be printed in the area that might be covered by adhesive item price labels.	Usually Required
Zone 7	Manufacturer's Suggested Price	For use only if merchandise is pre-priced or suggested retail price is printed on the tag. If provided, the area must be perforated for optional removal.	Optional

Note 1: Size and color is optional in Zone 1 if vendor usage requires this information to define the product.

Note 2: Some jurisdictions require that certain products include a permanently affixed statement of information of this type in Zone 4 that may not be satisfied by inclusion on the package.

Note 3: Size may be omitted from Zone 5, if the size information is readily available on the product packaging.

7. GENERAL PLACEMENT GUIDELINES FOR SYMBOL PLACEMENT ON ITEMS USED IN DISTRIBUTION

Items packaged for transport includes any item handled as a single unit in the transportation and distribution process. This covers a wide variety of package types, such as pallets, cartons, cases, bins, totes, and slipsheets. These items can be trade items (orderable units) or logistic units (items bundled together for transport).

The symbols on these items can be scanned using diverse scanning techniques. During sortation processes at any point in the supply chain, fixed position scanners could be positioned on conveyor systems to identify and route items. Scanning might be done from forklifts during loading and unloading on transport vehicles. Hand held scanners might be used when items are selected for dispatch or when they are received. Symbol location is designed to accommodate all these possibilities.

7.1 Symbol location

The symbol should ideally be located on all four vertical sides of the item. However, if this is not possible or practical, two symbols fixed to adjacent sides is preferred. The minimum is one symbol per item.

7.1.1 Units less than 1 metre in height

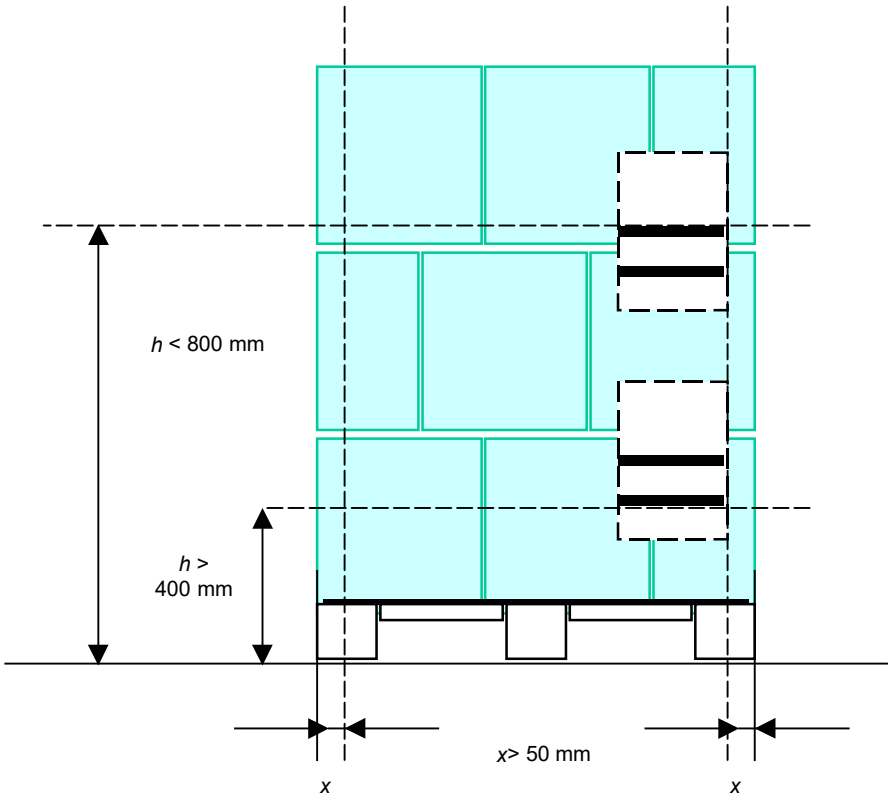
For cartons and other units less than 1 metre (39 in) in height pallets excluded, symbols should be placed so that the lowest edge of the bar code is 32 mm (1.25 in) from the base of the unit. Including quiet zones (light margins), the symbol should be at least 19 mm (0.75 in) from the vertical edge.

7.1.2 For pallets less than 1 metre in height

For pallets less than 1 metre (39 in) in height, symbols should be placed as high as possible but not more than 800 mm (32 in) from the base of the unit.

7.1.3 Units greater than 1 metre in height

For pallets and other units greater than 1 metre (39 in) in height excluding pallets, symbols should be placed so that all the bar code symbols are at a height between 400 mm (16 in) and 800 mm (32 in) from the base of the unit. Including quiet zones (light margins), the symbol should be no closer than 50 mm (2 in) from the vertical edge.



7.2 Shallow trays and cases

If the height of a case or tray is less than the height of the symbol at the magnification factor required, or if the construction of the unit is such that the full symbol height cannot be accommodated, the following options should be considered in order of preference:

1. Print the symbol at full height with the top of the bars located at the top of the side (i.e., as close as

possible to the recommended location).

2. When the height of the unit is less than the height of the symbol including human readable digits, the human readable digits should be placed to the left of the symbol, always respecting the compulsory quiet zones (light margins).

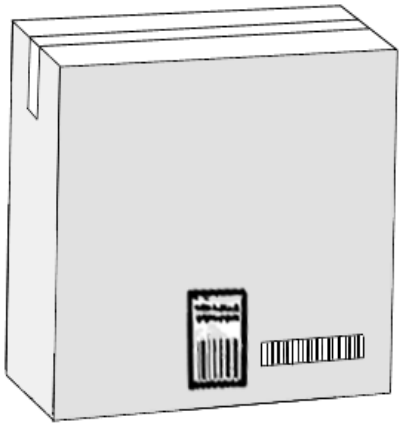
3. When the height of the unit is less than the bar height, the bars should run from top to bottom of the unit's side, again with the human readable digits placed to the side (i.e., truncate the symbol by the minimum amount).

4. If placing a bar code on the side of the package is not possible, due to insufficient package height, the bar code symbol may be placed on the top of the package. In this case, the symbol should be placed with the bars perpendicular to the shortest side, no closer than 32 mm (1.25 in) from any edge.

Sometimes two bar codes are used on variable measure units. If it is necessary to remove the human readable digits from beneath, the human readable digits of the main symbols should be placed to the left of the bars of the main symbol. The human readable digits of the add-on symbol should be placed to the right of the bars of the add-on symbol.

7.3 Supplementary symbols

If the unit is already marked with a symbol, any supplementary symbol shall be placed so as not to obscure the pre-existing bar code. The preferred location for the symbol in this case is to the side of the pre-existing bar code, so that a consistent horizontal location is maintained. Maintain quiet zones (light margins) for both symbols.



If there is the potential for both parts of the data content to be represented in UCC/EAN-128, they should be concatenated and one symbol produced. Bar codes containing data *essential* for complete product identification (trade measurements for example), should *always* be aligned with and to the right of the bar code containing the trade item number (the original symbol).

APPENDIX 1: GENERAL RULES

1.1 Curved surfaces

If a bar code symbol is printed on a curved surface, it is preferable for the bars to be perpendicular to the "generating lines" of the surface of the container.
This preference may be subject to considerations of space and to the direction of printing. Better printing quality is normally obtained when the bars are parallel to the direction of printing.
The text and orientation of the ladder barcode symbol can be read either from the top down, or from the bottom up, whichever is consistent with other text and graphics on the container. Empirical data demonstrated that it makes no difference one way or the other.
This preference for orientation on curved surfaces becomes a mandatory rule on curves with small radii. The rule is that the angle between the tangent to the center of the curved symbol and the tangent to the extremity of the curved symbol (outer edge of the guard bars for EAN/UPC bar code symbology) must be less than 30□. If this angle is more than 30□□ the symbol must be oriented such that the bars are perpendicular to the generating lines of surface of the item.
This is explained diagrammatically in Figure 1.1 below.

Figure 1.1: Bar code orientation on curved surfaces

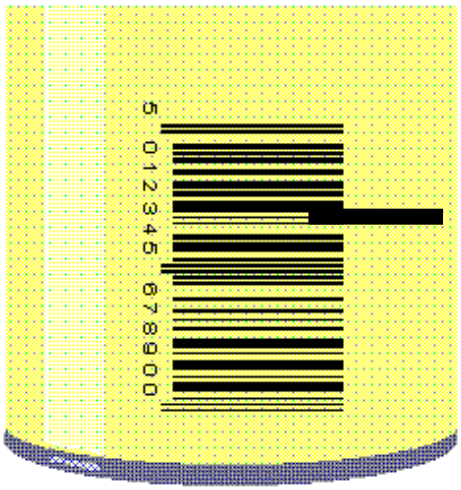
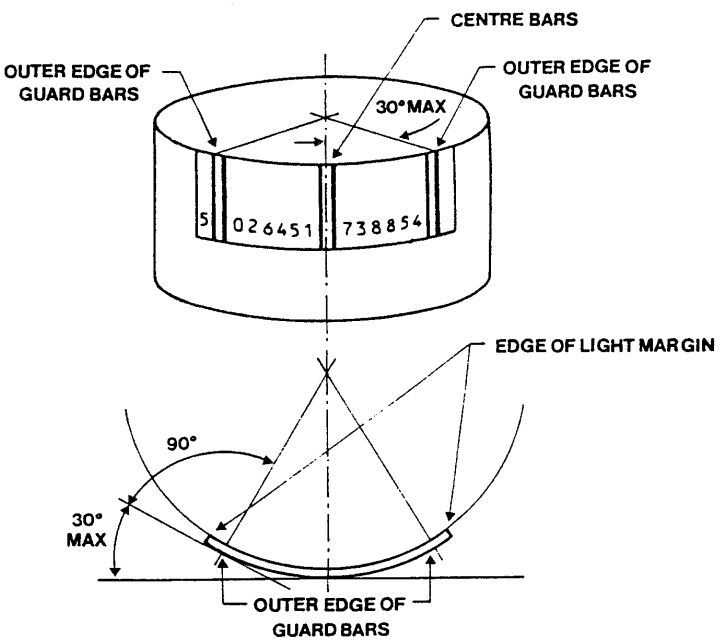


Figure A.2: Relationship between symbol and curvature



The following tables show the relationship between magnification factors acceptable for units of different diameters and the minimum diameters for different magnification factors.

Table 1: Relationship of Diameter and Magnification Factor and X Dimension

Diameter of Container (cm)	Diameter of Container (in)	Maximum Value of Magnification Factor and X Dimension					
		EAN-13 or UPC-A symbol			EAN-8 symbol		
		Magnification	X Dimension		Magnification	X Dimension	
			mm	Thousandths of an inch		mm	Thousandths of an inch
3 cm or below	1.18	*	*	*	*	*	*
3.5	1.38	*	*	*	0.83	.274	12.0
4.0	1.57	*	*	*	0.95	.314	12.4
4.5	1.77	*	*	*	1.07	.353	13.9
5.0	1.97	0.83	.274	10.8	1.18	.389	15.3
5.5	2.16	0.92	.304	12.0	1.30	.429	16.9
6.0	2.36	1.00	.330	13.0	1.42	.469	18.5
6.5	2.56	1.08	.356	14.0	1.54	.508	20.0
7.0	2.75	1.17	.386	15.2	1.66	.549	21.6
7.5	2.95	1.25	.413	16.3	1.78	.587	23.2
8.0	3.25	1.34	.446	17.4	1.90	.627	24.7
8.5	3.35	1.42	.469	18.5	2.00	.660	26.0
9.0	3.54	1.50	.495	19.5	2.00	.660	26.0
9.5	3.74	1.59	.525	20.7	2.00	.660	26.0
10.0	3.94	1.67	.551	21.7	2.00	.660	26.0
10.5	4.13	1.75	.578	22.8	2.00	.660	26.0
11.0	4.33	1.84	.607	23.9	2.00	.660	26.0
11.5	4.53	1.92	.634	25.0	2.00	.660	26.0
12 cm or above	4.72	2.00	.660	26.0	2.00	.660	26.0

Note 1: The magnification factor necessary for the 30° constraint to be respected is smaller than acceptable standards permit (less than 0.8). Hence the symbol will have to be pivoted through an angle of 90°.

Note 2: An asterisk (*) indicates that the package diameter is too small to permit the "picket fence" orientation and the symbol must be rotated 90° to a "ladder" orientation.

Table 2: Relationship of Magnification Factor and X Dimension and Diameter

Magnification Factor and X Dimension			Minimum Diameter of Container			
Magnification Factor	X Dimension (thousandths of an inch)	X Dimension (mm)	EAN-13 or UPC-A symbol (mm)	EAN-13 or UPC-A symbol (inch)	EAN-8 symbol (mm)	EAN-8 symbol (inch)
0.80	10.4	.264	4.8	1.89	3.4	1.34
0.90	11.7	.297	5.4	2.13	3.8	1.50
1.00	13.0	.330	6.0	2.36	4.3	1.69
1.10	14.3	.363	6.6	2.60	4.7	1.85
1.20	15.6	.396	7.3	2.87	5.1	2.01
1.30	16.7	.429	7.8	3.07	5.5	2.16
1.40	18.2	.462	8.4	3.31	5.9	2.32
1.50	19.5	.495	9.0	3.54	6.4	2.52
1.60	20.8	.528	9.6	3.78	6.8	2.68
1.70	22.1	.561	10.3	4.05	7.3	2.87
1.80	23.4	.594	10.8	4.25	7.6	2.99
1.90	24.7	.627	11.4	4.49	8.0	3.25
2.00	26.0	.660	12.0	4.72	8.5	3.35

Table 3: Relationship of Diameter and X Dimension

Diameter of Container (cm)	Diameter of Container (in)	Maximum Value of X Dimension					
		ITF-14		UCC/EAN-128		SSCC	
		mm	Thousandths of an inch	mm	Thousandths of an inch	mm	Thousandths of an inch
6.0	2.36	*	*	*	*	*	*
8.0	3.25	*	*	*	*	*	*
10.0	3.94	*	*	*	*	*	*
12.0	4.72	*	*	*	*	*	*
14.0	5.51	*	*	*	*	*	*
16.0	6.30	*	*	*	*	*	*
18.0	7.09	.254	10.0	*	*	*	*
20.0	7.87	.284	11.2	.257	10.1	*	*
22.0	8.66	.310	12.2	.284	11.2	*	*
24.0	9.45	.340	13.4	.310	12.2	*	*
26.0	10.24	.366	14.4	.337	13.3	*	*
28.0	11.02	.393	15.5	.360	14.2	*	*
30.0	11.81	.429	16.9	.386	15.2	*	*
32.0	12.60	.429	16.9	.429	16.9	*	*
34.0	13.38	.429	16.9	.429	16.9	*	*
≥ 36.0	14.17	.429	16.9	.429	16.9	*	*

Note: An asterisk (*) indicates that the package diameter is too small to permit the “picket fence” orientation and the symbol must be rotated 90° to a “ladder” orientation.

Chapter 7:
System Processing in EDP Applications

TABLE OF CONTENTS

1. INTRODUCTION

The purpose of entering data transmitted from a reading device into a system is to record a transaction. In the EAN•UCC system a transaction is an ***electronic message*** to be processed according to the meaning and content of the data fields contained in the message. This should be possible without requiring any human intervention to determine the data's meaning and content.

The standardised element strings of the EAN•UCC system are the basis for the identification of items of every kind. They identify a particular item in an unambiguous manner and supply relevant attribute information.

When these element strings are ***printed on items***, the scanned and transmitted data refers to that item and identifies its physical presence at a given location. When the message read from the scanned data carrier is coupled with an internally assigned designation of the type of item movement (e.g. warehouse entry, stock taking, and sales.), it is possible to record data related to each movement of items automatically. This provides security in two ways. In the first place it is not possible to produce a bar code reader message unless an item is physically present and, secondly, only the data in the data carrier on and therefore relevant to the item can be recorded. False notification of movements is thereby largely eliminated.

When element strings are used ***in administrative areas***, e.g. in order entry, they can be used in the same way as described above for automatic, error-free data capture. In view of the considerable length of EAN•UCC numbers, automatic reading has great significance, as the correctness of the reading and of the number itself is ensured by the built-in check digit.

2. SYNOPSIS OF MESSAGE PROCESSING

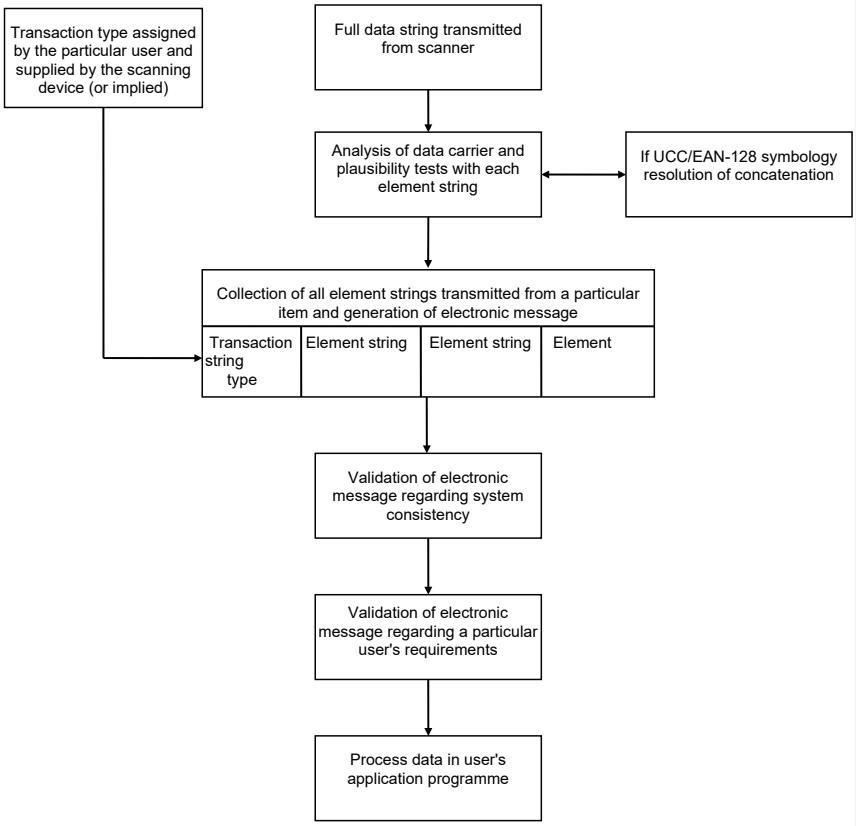


Figure 7 - 1

Details on the above operations are stated in the following pages.

2.1 Analysis of the Data Carrier and Plausibility Tests of Element Strings

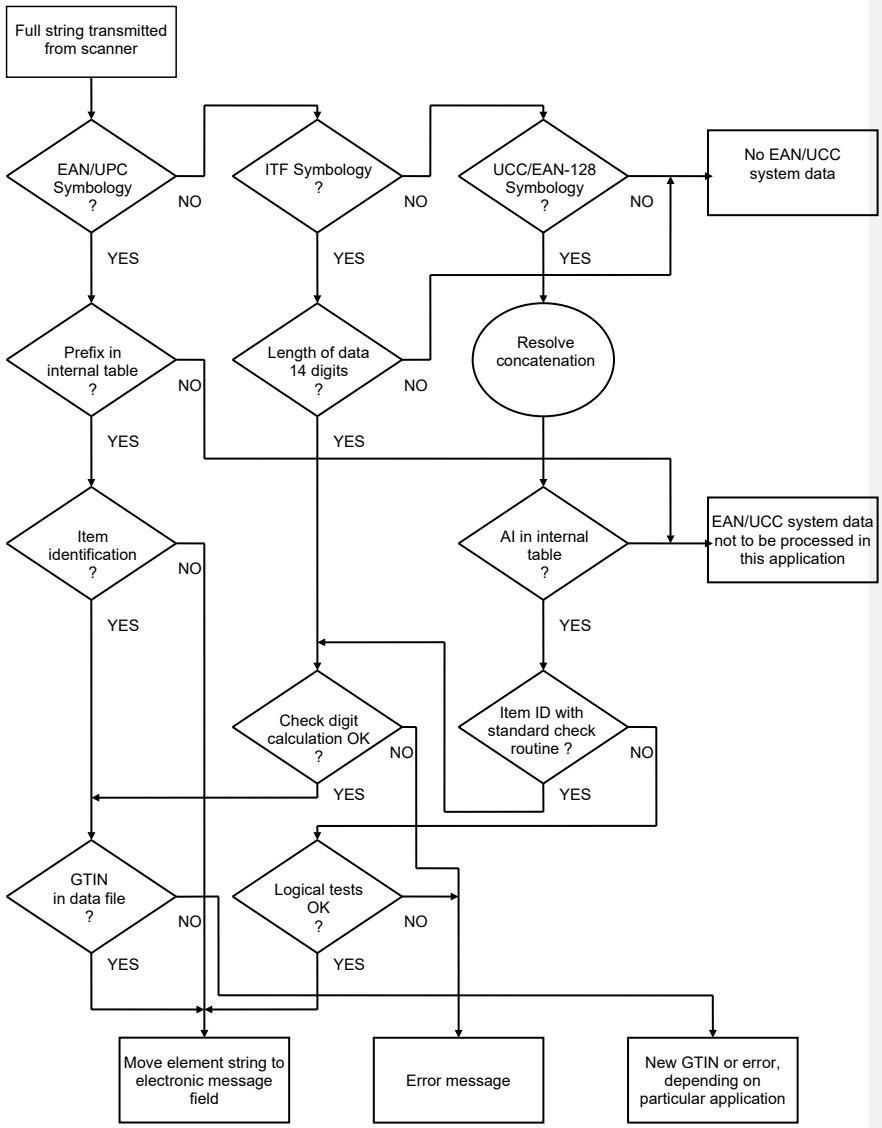


Figure 7 - 2

Details on this flow chart are shown on the next pages.

2.1.1 Symbology identification

Each transmitted full string consists of a symbology identifier and one or more element strings see Chapter 3 (Definitions of Element Strings). The identifiers of bar code symbologies are stated in Chapter 5 (Data Carriers).

2.1.2 Prefix in internal table

System users may generate an internal table showing the UCC and EAN prefixes of those element strings they wish to process. This table also serves to sort out the element strings representing item identification numbers for checking their presence in the data file. Details on the respective prefixes are stated in Chapter 3 (Definitions of Element Strings).

2.1.3 Item identification

EAN/UPC bar code symbols contain identification data for trade items and special data structures (e.g. for coupons). Whether an element string contains the identification of a trade item is determined by the EAN•UCC prefix. System users must determine the specific structure and meaning of the prefixes 20 to 29 as defined by their Numbering Organisation.

2.1.4 Application Identifier (AI) in internal table

The element strings using Application Identifiers cover a wide range of applications. In order to keep the amount of programming on a reasonable level it is possible to ignore processing of unwanted element strings. This is achieved by establishing an internal table with the Application Identifiers intended for processing.

2.1.5 Length of data 14 digits

ITF symbology provides bar code symbols of any even-numbered length. The EAN•UCC system uses only the length of 14 digits to represent trade item identification numbers.

2.1.6 Check digit calculation

In EAN/UPC symbology the check digit verifies reading and decoding of the bar code symbol as well as the contained data. Item identification numbers represented in EAN/UPC symbology do not require the verification of the check digit because this is performed automatically by the bar code reader.

Bar code readers processing ITF-14 symbols may be programmed to verify the check-digit as well. Whether this has been performed is indicated by the symbology identifier ***]I1*** (see Chapter 5- Data Carriers). Data transmitted from ITF-14 symbols with symbology identifier ***]I0*** must be verified.

UCC/EAN-128 bar code symbols have an integral ***symbol check character*** that verifies correct decoding of scanned data. If an element string encoded in UCC/EAN-128 includes a ***check digit***, the check digit will not be verified by the bar code reader. While the data security provided by the UCC/EAN-128 symbol check character guarantees proper decoding of the entire element string, correctness of contained identification number is to be programmed in the application software by verifying the check digit.

2.1.7 Logical tests

Logical tests check for reasonable data content, including the checking of data fields ranges (e.g. month < 13 and > 00), of the maximum length of a variable length element string, of alpha characters in numeric only fields, of correct EAN•UCC prefixes in given applications, etc.

2.1.8 Move element string to message field

Several element strings may be scanned in a particular transaction. In order to verify the correctness and completeness of the transmitted data, each element string is transferred to a

message record. It eases verification of the message if element strings not using Application Identifiers are assigned Application Identifiers internally. Trade item identification numbers transmitted from EAN/UPC bar code symbols may be denoted with AI 01. Other element strings may be assigned "ghost" Application Identifiers.

3. VALIDATION OF THE ELECTRONIC MESSAGE REGARDING SYSTEM CONSISTENCY

The EAN•UCC system enables system users to process scanned data without human intervention. This implies that the electronic message, generated from data scanned and transmitted from data carriers, needs to substitute all human activities in a particular transaction. In other words, the transmitted data must provide all information required for its correct processing.

The EAN•UCC system is designed to fulfil these requirements. Chapter 4 (Association of Element Strings) to form valid messages - describes the association of element strings to form valid messages.

Validation of system consistency refers to the verification of the correct composition of the electronic message in terms of a system processing the transaction messages. Whether the message is adequate in business application terms is dealt with by the application software.

Only messages containing a valid set of element strings defined in the EAN•UCC system can be unambiguously processed. The processing of invalid messages may lead to data file errors because the meaning and relationship of the element strings are not defined. This is illustrated in the following examples using Application Identifiers.

Examples of valid messages			
Element strings in message			Comment
AI 00	AI 33nn		Identification of a logistic unit + logistic weight.
AI 00	AI 01		Identification of an entity as a logistic unit and as a fixed measure trade item.
AI 00	AI 01 '9'	AI 31nn	Identification of an entity as a logistic unit and as a variable measure trade item.
AI 00	AI 02	AI 37	Identification of a logistic unit and of its contained fixed measure trade items.
AI 01	AI 10	AI 15	Identification of a trade item + lot number + minimum durability date.
AI 00	AI 401		Identification of a logistic unit as part of a consignment.
AI 01 '9'	AI 31nn	AI 33nn	Identification of a variable measure trade item + logistic weight.
AI 00	AI 01	AI 33nn	Identification of an entity as a logistic unit and as a fixed measure trade item. The logistic weight is associated with the identification number of the logistic unit.

Figure 7 - 3

Examples of invalid messages			
Element strings in message			Comment
AI 00	AI 01	AI 37	Identification of an entity as a logistic unit and as a fixed measure trade item. AI 37 (quantity of items contained) must be used with AI 02 only.
AI 01	AI 10	AI 33nn	Identification of a fixed measure trade item + lot number. AI 33nn is incorrect because logistic measures of a fixed measure trade item are fixed attributes stored in the data file.
AI 01'9'	AI 33nn		Identification of a variable measure trade item + logistic weight. The mandatory element string with a trade measure is missing.
AI 00	AI 11		Identification of a logistic unit. AI 11 is incorrect because a production date must be associated with the identification number of a trade item.
AI 00	AI 01	AI 02/37	Identification of an entity as a logistic unit and as a fixed measure trade item. AI 02/37 must not be associated with AI 01.
AI 01	AI 30		Identification of a fixed measure trade item. AI 30 must only be associated with the identification number of a variable measure trade item.
AI 02	AI 37		Identification of the fixed measure trade units contained in an unidentified logistic unit. AI 00 is missing.
AI 00	AI 02		Identification of a logistic unit and of the contained fixed measure trade items. AI 02 requires the mandatory presence of AI 37 to complete the identification of the content.

Figure 7 - 4

4. VALIDATION OF THE ELECTRONIC MESSAGE REGARDING USER REQUIREMENTS

Some industry groups and organisations use element strings for attributes and other information not directly identifying the item. Contrary to the validation of messages for system conformity, UCC and EAN International do not define the rules for the validation and application of these particular element strings. Validation of messages containing these element string in these environments, e.g. trade item identification with best before date and batch number, is left to the discretion of the particular system user community.

Validation of the correctness of a message may be performed differently for each trade item identification number. Respective instructions have to be stored in the data file. System users are advised to include the Application Identifiers and their specific application rules in the stored instructions.

It is important that the validation of the user requirements is performed after validation of system consistency. Missing elements in consistent messages may in given instances be by-passed or completed. Inconsistent messages cannot be processed properly at all.

5. CONVERSION OF WEIGHTS AND MEASURES IN USER APPLICATIONS

All weights and measures that are encoded in the element strings with the Application Identifiers 31nn to 36nn are structured according to the same mathematical rules. The determination of basic units of measurement and the freedom to choose the number of decimal positions will lead to variations in data representation. Suppliers will choose that value which best suits the respective trade item in terms of weight/size and the degree of accuracy required (e.g. grams) for the representation of weights and measures in the 6-position field "applicable value".

On the other hand it is possible that the recipient of such goods may want to store these details in a standardised form in his data file. This requirement is easily fulfilled through programming with the conversion formula shown below.

As described in the various chapters below defining the variable measure element strings in Chapter 3 (Definition of Element Strings), the Application Identifier in position A_4 denotes the position of the implied decimal point. It is also called an "inverse exponent". The formula is as follows:

Step 1: Define the inverse exponent in accordance with the basic unit of measure of the ***company's internal*** field structure. Example: Inverse exponent 0 signifies kg; inverse exponent 3 signifies grams.

Step 2: Subtract the ***company's internal*** inverse exponent from the value of the position A_4 of the Application Identifier out of the decoded element string. Call the result X.

Step 3: Divide the amount of the 6-digit field "applicable value" from the decoded data string by 10^X. The result is the value required in the company's data structure.

In the following examples, the company's system uses internal weight fields eight digits in length (format: nnnnnnn.n) with a unit of measure equal to grams. Thus the company uses the internal "inverse exponent" of 3.

Decoded data string					**Conversion**	**Internal weight field**							
Application identifier A_1 A_2 A_3 A_4				Weight		8-digit data field defined as grams with 1 decimal position							
3	1	0	0	005097 (= 5097 kg)	Step 2: X = 0 minus 3 = -3 Step 3: 005097 divided by 10^{-3} (.001) =	5	0	9	7	0	0	0	
3	1	0	2	005097 (= 50.97 kg)	Step 2: X = 2 minus 3 = -1 Step 3: 005097 divided by 10^{-1} (.1) =	0	0	5	0	9	7	0	
3	1	0	3	045250 (= 45.250 kg)	Step 2: X = 3 minus 3 = 0 Step 3: 045250 divided by 10^{0} (1) =	0	0	4	5	2	5	0	
3	1	0	4	012347 (= 1234.7 g)	Step 2: X = 4 minus 3 = 1 Step 3: 012347 divided by 10^{1} (10) =	0	0	0	1	2	3	4	7

Figure 7 - 5

Decimal point

In the following examples, the company's system uses internal weight fields eight digits in length (format: nnnnn.nnn) with a unit of measure equal to kilograms. Thus the company uses an internal "inverse exponent" of 0.

Decoded data string					**Conversion**	**Internal weight field**							
Application identifier A_1 A_2 A_3 A_4				Weight		8-digit data field defined as kilograms with 3 decimal position							
3	1	0	0	005097 (= 5097 kg)	Step 2: X = 0 minus 0 = 0 Step 3: 005097 divided by 10^0 (1) =	0	5	0	9	7			
3	1	0	2	005097 (= 50.97 kg)	Step 2: X = 2 minus 0 = 2 Step 3: 005097 divided by 10^2 (100) =	0	0	0	5	0	9	7	
3	1	0	3	045250 (= 45.250 kg)	Step 2: X = 3 minus 0 = 3 Step 3: 045250 divided by 10^3 (1000) =	0	0	0	4	5	2	5	
3	1	0	4	012347 (= 1234.7 g)	Step 2: X = 4 minus 0 = 4 Step 3: 012347 divided by 10^4 (10000) =	0	0	0	0	1	2	3	5

Figure 7 - 6

Decimal point

Position rounded

6. LINKAGE OF TRADE ITEM IDENTIFICATION NUMBERS IN A DATABASE

A trade item is defined as *any item (product or service) upon which there is a need to retrieve pre-defined information and that may be priced or ordered or invoiced at any point in any supply chain.* Trade items may be a single item, part, unit, product or service or a pre-defined multiple or grouping or combination of such items. A seperate GTIN identifies each of these items unambiguously, irrespective of the applied numbering structure. This also applies for identification numbers for restricted distribution in their closed environment.

Information about the hierarchical structure of trade items is an important issue in a business. This chapter shows with an example how the required links can be established by using a relational database.

~~1.1~~6.1 The principle

Formatted: Bullets and Numbering

Hierarchy: Basic product A; 10 x A = product B; 5 x B = product C.

Trade item data base			
GTIN (14 digits)	Item characteristics	Relation up	Relation down
A	(as applicable)	YES	NO
B		YES	YES
C		NO	YES

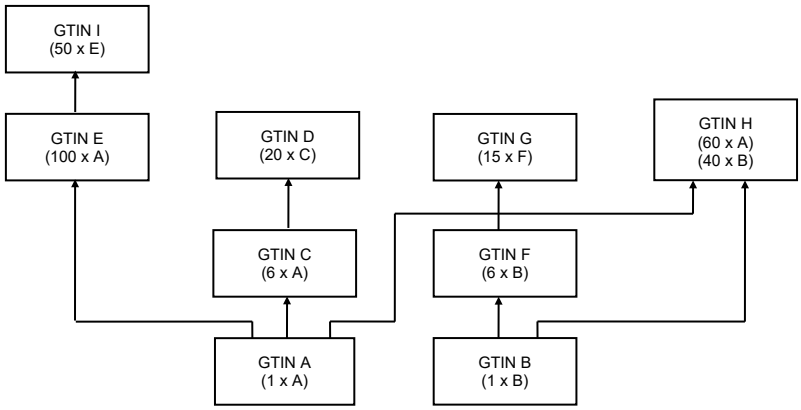
Upper relations	
GTIN in database	GTIN of relation
A	B
B	C

Lower relations	
GTIN in database	GTIN of relation
B	A
C	B

Figure 7 - 7

The example on the following pages shows the mechanism of linkage for the various types of trade items.

6.2 Extended example of a trade item hierarchy



Note: For reasons of simplicity GTINs are expressed in letters in this example, signifying that they may be of any standardised structure.

Trade item data base			
GTIN (14 digits).	Item characteristics	Relation up	Relation down
A	(as applicable)	YES	NO
B		YES	NO
C		YES	YES
D		NO	YES
E		YES	YES
F		YES	YES
G		NO	YES
H		NO	YES
I		NO	YES

Upper relations				Lower relations			
GTIN in database	GTIN of relation	Quantity of items contained	Relation is mixed trade item	GTIN in database	GTIN of relation	Quantity of items contained	Relation is mixed trade item
A	C	6 *	NO	C	A	6 **	NO
A	E	100	NO	D	C	20	NO
A	H	60	YES	E	A	100	NO
B	F	6	NO	F	B	6	NO
B	H	40	YES	G	F	15	NO
C	D	20	NO	H	A	60	NO
E	I	50	NO	H	B	40	NO
F	G	15	NO	I	E	50	NO

Figure 7 - 8

* Quantity of items numbered A contained in item numbered C.

** Quantity of items numbered A contained in item numbered C.

Note: The columns " GTIN in database" and " GTIN of relation" are sufficient to establish the links between the different items. The column "Quantity of items contained" provides additional information, which may be useful in particular business applications. The column "Relation is mixed trade item" provides the relations pointing to all trade items contained in a mixed trade item.

6.3 Linkage of GTINs in a Non-Relational Database by Trade Item Manufacturer

Many types of items are produced and distributed in fixed measure standard nested packaging configurations (e.g., consumer unit, carton, case, and pallet), with fixed quantity relationships. The various packaging configurations are often broken into lower levels at various points in the supply chain and therefore each level of the packaging may be a trade item. Computer systems must be capable of understanding the relationships of the units or trade items in the configuration and treating inventory of all levels of the configuration as one SKU (stock keeping unit).

Use of the first digit indicator (values 1-8) of the 14-digit EAN•UCC number to identify levels of a standard packaging configuration allows digits 2-13 to remain constant for all levels of the standard packaging configurations for an item. If this method of numbering item configurations is used, when necessary to support business processes, or when driven by system constraints, the non-relational database construct defined below may be appropriate.

The item database is constructed with a base item record (table) and segments (tables) for each level of the item packaging configuration. Properly designed, this type of system can support

pricing, ordering, and shipping of any level of the packaging configuration (trade item) with appropriate dimension and weight information. It enables maintaining inventories by packaging level and in total for the base item. And, it provides channel partners or customers the choice of ordering and invoicing unit. Meeting these requirements often makes this approach a good business solution for manufacturers, because it meets the most critical needs in the supply chain and is practical to implement, particularly in distributed and small systems where performance is critical.

The base item record contains the base EAN/UPC number (digits 2-13) as a key, with all information relating to the base unit and the item in total (including total inventory balance). Each of the packaging segments contains information unique to the respective packaging configuration (indicator, check digit, quantity relationship to next lower level of the configuration, dimensions, weight, prices, etc.). After accessing the item record using the EAN/UPC base number (digits 2-13), the packaging segments are accessed using the indicator (1st digit).

It is noted that this database construct demands that: 1) the trade item must be fixed in measure, 2) there must be a single GTIN for the base item of the related packaging configurations that is an EAN/UCC-8, UCC-12 or EAN/UCC-13, and 3) each related packaging configuration is limited to 8 levels of packaging for the base item using indicator values 1-8.

The EAN•UCC system demands that each GTIN be unique in a field length of 14 digits. While the above is a valid approach to manage uniqueness it is intended to support the uniqueness management process for the construction of GTINs and not for the receiving process. Companies that receive trade items with GTINs must be able to process the complete GTIN without regard to how it was constructed.

7. ELEMENT STRINGS REPRESENTED IN DATA CARRIERS

Scanned element strings are decoded as a full string by the reading device and are then transmitted for processing in the application software. The full string is composed of a data carrier identifier and one or more element strings. The meaning of an element string is also determined by the data carrier in which it is represented.

A synopsis by data carrier of the element strings described in this manual is shown below. The figure below further provides an overview of the sequential number range of trade items by data carrier.

~~4.17~~7.1 GTIN's represented in EAN•UCC System Data Carriers

	ITF-14 Symbol and UCC/EAN-128 AI 01													
	EAN-13 Symbol													
	UPC-A or UPC-E Symbol													
	EAN-8 Symbol													
2)	*	*	*	*	*	*	0 0	0 9	0 9	0 9	0 9	0 9	0 9	C C
1)	*	*	*	*	*	*	1 1	0 3	0 9	0 9	0 9	0 9	0 9	C C
2)	*	*	*	*	*	*	2 2	0 9	0 9	0 9	0 9	0 9	0 9	C C
1)	*	*	*	*	*	*	3 9	0 6	0 9	0 9	0 9	0 9	0 9	C C
1)	0 0	0 0	0 0	0 0	0 0	1 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
2)	*	*	0 0	0 0	1 7	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
1)	0 0	0 0	0 1	0 9	8 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
4)	*	0 0	2 2	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
1)	0 0	0 0	3 3	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
2)	*	0 0	4 4	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
5)	*	0 0	5 5	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
1)	0 0	0 0	6 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
1) 8)	0 0	1 1	0 3	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
2)	0 0	2 2	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
1) 8)	0 0	3 9	0 6	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
7)	*	9 9	7 7	7 8	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
5) 6)	*	9 9	8 8	0 2	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
5)	*	9 9	9 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
1)	1 8	0 0	0 0	0 0	0 0	0 0	1 1	0 3	0 9	0 9	0 9	0 9	0 9	C C
1)	1 8	0 0	0 0	0 0	0 0	0 0	3 9	0 6	0 9	0 9	0 9	0 9	0 9	C C
1) 3)	1 9	0 0	0 0	0 0	0 0	1 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
1) 3)	1 9	0 0	0 1	0 9	9 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
1) 3)	1 9	0 0	3 3	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
1) 3)	1 9	0 0	6 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
1) 3)	1 9	1 1	0 3	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C
1) 3)	1 9	3 9	0 6	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	0 9	C C

Figure 7 - 9

1) fixed measure 2) fixed measure restricted distribution 3) variable measure 4) variable measure restricted distribution
5) Coupons 6) Refund receipts 7) ISBN & ISSN 8) Location & returnable asset number

7.2 Handling of trade item identification numbers to conform with the system

Synopsis of the representation of the GTIN in the various bar code symbols

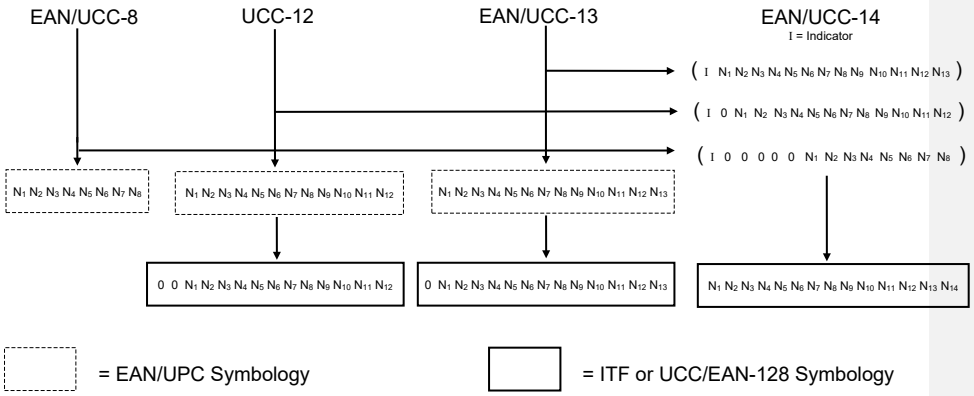


Figure 7 - 10

Incorporation of the GTIN to conform with the system

As shown above the EAN•UCC system uses trade item identification numbers of a varying number of digits. To avoid duplication in the reference field "trade item identification number" of a computer file it is necessary to observe some rules regarding their arrangement.

The longest identification number for fixed measure items consists of 14 digits, which necessitates the creation of a 14-digit field. The figure below shows how the identification numbers of trade items transmitted in the data strings have to be inserted.

Identification numbers	Positions in the field "GTIN" in a computer file													
	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}	T_{12}	T_{13}	T_{14}
EAN/UCC-8	0	0	0	0	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8
UCC-12	0	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}
EAN/UCC-13	0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}
EAN/UCC-14	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_{10}	N_{11}	N_{12}	N_{13}	N_{14}

Figure 7 - 11

7.3 Element Strings Represented in UCC/EAN-128 Symbology

The element strings encoded in the UCC/EAN-128 symbology are composed of an Application Identifier and one or several data fields. The Application Identifier denotes the contents and structure of the respective data fields. Full details are contained in Chapter 3 (Definition of Element Strings).

Element strings represented in UCC/EAN-128 symbology		
Application identifier	Data format	Significance
00	n18	Serial Shipping Container Code (SSCC)
01	n14	Global Trade Item Number (GTIN) - fixed measure
01	n14	Global Trade Item Number (GTIN) - variable measure
02	n14	GTIN of trade item contained in a logistic unit - fixed measure
02	n14	GTIN of trade item contained in a logistic unit - variable measure
10	an..20	Batch or lot number
11	n6	Production date
12	n6	Due date
13	n6	Packaging date
15	n6	Minimum durability date (Quality)
17	n6	Maximum durability date (Safety)
20	n2	Product variant
21	an..20	Serial number
22	an..29	Secondary data for specific health industry products
23	n1+n..19	Lot number (transitional use)
240	an..30	Additional product identification assigned by the manufacturer
241	an..30	Customer part number
250	an..30	Secondary serial number
251	an..30	Reference to Source Entity
30	n..8	Variable count
31nn 32nn 35nn 36nn	n6	Trade measures
33nn 34nn 35nn 36nn	n6	Logistic measures
337n	n6	Kilograms per square metre
37	n..8	Count of trade items contained in a logistic unit
390n	n..15	Amount payable – single monetary area
391n	n3+n..15	Amount payable – with ISO currency code
392n	n..15	Amount payable – single monetary area
393n	n+3+n..15	Amount payable – with ISO currency code

Element strings represented in UCC/EAN-128 symbology *(continued)*		
Application identifier	Data format	Significance
400	an..30	Customer's purchase order number
401	an..30	Consignment number
402	n17	Shipment Identification Number
403	an..30	Routing Code
410	n13	"Ship to - Deliver to" EAN•UCC Global Location Number (GLN)
411	n13	"Bill to -Invoice to" EAN•UCC Global Location Number (GLN)
412	n13	"Purchased from" EAN•UCC Global Location Number (GLN)
413	n13	"Ship for - Deliver for - Forward to" EAN•UCC Global Location Number (GLN)
414	n13	Identification of a physical location, EAN•UCC Global Location Number (GLN)
415	n13	EAN•UCC Global Location Number (GLN) of the Invoicing Party
420	an..20	"Ship to -Deliver to" postal code within a single postal authority
421	n3+an..9	"Ship to - Deliver to" postal code with 3 digit ISO country code
422	n3	Country of origin of a trade item
8001	n14	Roll products - width, length, core diameter, direction, splices
8002	an..20	Cellular Mobile Telephone Identifier (CMTI)
8003	n14+an..16	Global Returnable Asset Identifier (GRAI)
8004	an..30	Global Individual Asset Identifier (GRAI)
8005	n6	Price per unit of measure
8006	n14+n2+n2	Global Component of a Trade Item Number (GCTIN)
8007	an..30	International Bank Account Number (IBAN)
8018	n18	Global Service Relation Number (GSRN)
8020	an..25	Payment slip reference number
8100	n1+n5	UCC coupon extended code
8101	n1+n5+n4	UCC coupon extended code
8102	n1+n1	UCC coupon extended code
90	an..30	Information mutually agreed between trading partners (including FACT Data Identifiers)
91 - 99	an..30	Company internal information

Figure 7 - 12

n = numeric an = alpha-numeric .. = variable length Figures = number of characters

8. SECONDARY DATA FOR SPECIFIC HEALTH INDUSTRY PRODUCTS

The following tables show the correct data formats for this element string. If a column is left blank, then that information is not used. The following field descriptions are used:

MM	2 digit expiration date month indicator (fixed length of 2 numeric digits)
YY	2 digit expiration date year indicator (fixed length of 2 numeric digits)
DD	2 digit expiration date day indicator (fixed length of 2 numeric digits)
HH	2 digit expiration date hour indicator (fixed length of 2, G.M.T. format)
JJJ	3 digit expiration date Julian Day indicator (fixed length of 3 numeric digits
LOT	up to 13 digit alpha-numeric lot number
L	1 digit Link Character (GTIN check digit)
QQ	2 digit quantity (fixed length of 2 numeric digits)
QQQQQ	5 digit quantity (fixed length of 5 numeric digits)

The following example data is always used in the example below:

GTIN	10312345678903
Lot Number	3C001
Link Character	3
Expiration Date	September 28, 1995 at 10 PM
2 digit Quantity	24
5 digit Quantity	00100

The quantity represents the quantity of items contained within the trade item where the inside item is assigned the GTIN 00312345678906.

The following data formats give all the combinations of the sub-fields possible within the element string.

Row	Application Identifier	Quantity Format Digit	Quantity Format	Expiration Date Format Digit	Expiration Date Format	Lot Field	Link Digit	Example Data
1	22				MMYY	LOT	L	2209953C0013
2	22			2	MMDDYY	LOT	L	2220928953C0013
3	22			3	YYMMDD	LOT	L	2239509283C0013
4	22			4	YYMMDDHH	LOT	L	224950928223C0013
5	22			5	YYJJJ	LOT	L	225952713C0013
6	22			6	YYJJJHH	LOT	L	22695271223C0013
7	22			7		LOT	L	2273C0013
8	22	8	QQ		MMYY	LOT	L	2282409953C0013
9	22	8	QQ	2	MMDDYY	LOT	L	2282420928953C0013
10	22	8	QQ	3	YYMMDD	LOT	L	2282439509283C0013
11	22	8	QQ	4	YYMMDDHH	LOT	L	228244950928223C0013
12	22	8	QQ	5	YYJJJ	LOT	L	228245952713C0013
13	22	8	QQ	6	YYJJJHH	LOT	L	22824695271223C0013
14	22	8	QQ	7		LOT	L	2282473C0013
15	22	8	QQ			LOT	L	228243
16	22	9	QQQQQ		MMYY	LOT	L	2290010009953C0013
17	22	9	QQQQQ	2	MMDDYY	LOT	L	2290010020928953C0013
18	22	9	QQQQQ	3	YYMMDD	LOT	L	2290010039509283C0013
19	22	9	QQQQQ	4	YYMMDDHH	LOT	L	229001004950928223C0013
20	22	9	QQQQQ	5	YYJJJ	LOT	L	229001005952713C0013
21	22	9	QQQQQ	6	YYJJJHH	LOT	L	229001006952712223C0013
22	22	9	QQQQQ	7		LOT	L	2290010073C0013
23	22	9	QQQQQ			LOT	L	229001003

Figure 7 - 13

Example with the required AI 01 and AI 22, row 8 above:

The full string is **]C1 01 10312345678903 22 82409953C0013**

9. PROCESSING OF DATA FROM UCC/EAN-128 BAR CODE SYMBOLS

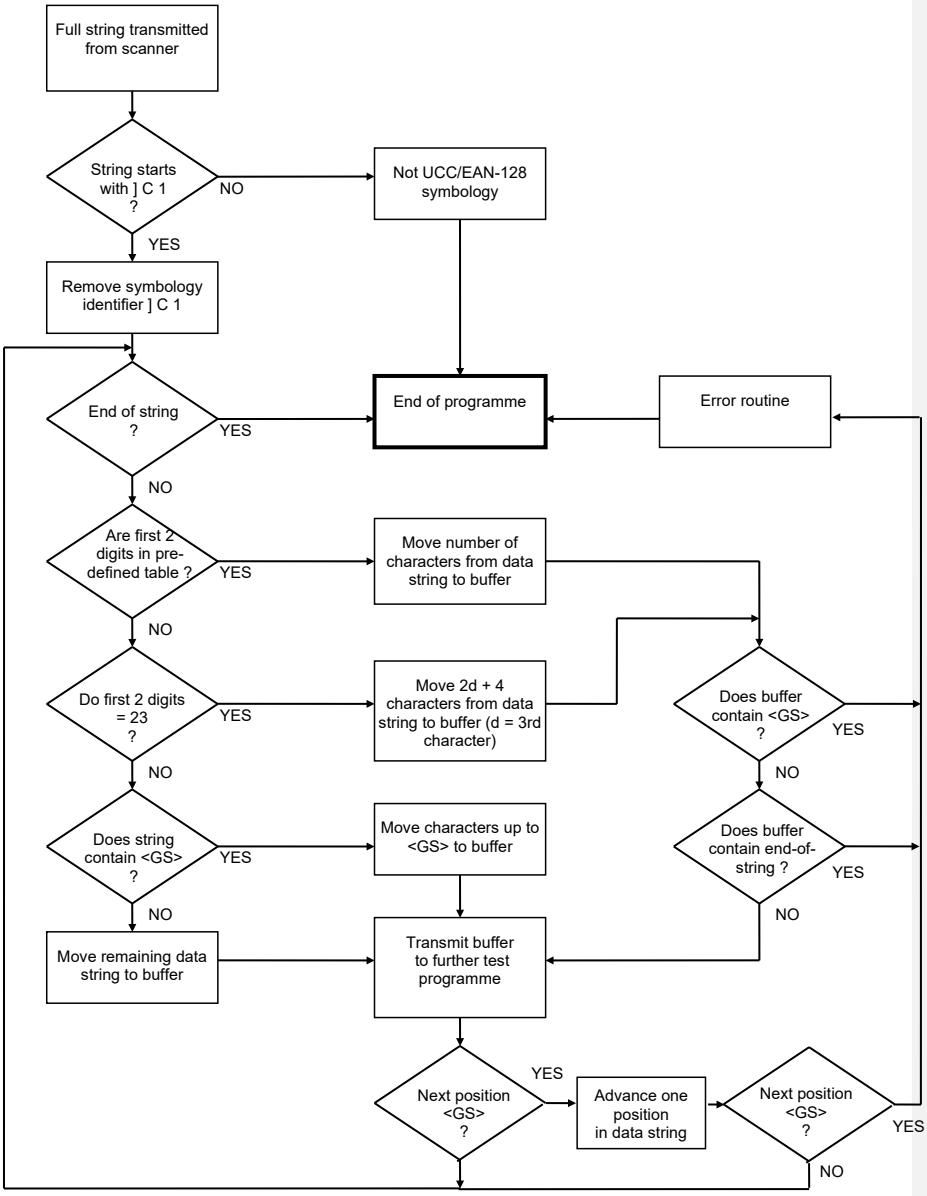


Figure 7 - 14

Details on this flow chart are shown on the next page.

9.1 General

UCC/EAN-128 bar code symbols may represent several element strings in concatenated form (see Chapter 5). For processing as shown in Figure 7 - 3 it is necessary to separate each element string, which is performed by the processing routine stated on the previous page.

9.2 Element strings with pre-defined length using Application Identifiers

Representation of more than one element string in a UCC/EAN-128 bar code symbol requires the use of a separator character ***between*** the different element strings to mark their end. In UCC/EAN-128 symbology this is the "Function 1 character" (FNC1). For details see Chapter 5.

However, in order to enable printing of shorter bar code symbols, some element strings have been pre-defined in length, so that the end may be determined and the FNC1 is not needed. These element strings, stored in a table, in Chapter 5, Section 3, page 25. This table is limited to the listed numbers and will remain unchanged. Those numbers in parenthesis are not yet assigned.

9.3 The separator character (FNC1)

The separator character appears in the decoded data string as <GS> (ASCII character 29, 7-bit character set ISO 646). All element strings of variable length and those of fixed length not stated in the above table must be followed by a FNC1 delimiter. However, no FNC1 is required at the end of the last element string represented in a bar code symbol.

The processing routine shown on the previous page takes care of a FNC1 entered by error, e.g. after an element string contained in the above table.

Chapter 8:
Glossary of Terms

Add-on symbol	EAN/UPC symbol used to encode information supplementary to that in the main EAN/UPC symbol.
AI	Abbreviation for *Application Identifier*.
Alphanumeric (an)	Describes a character set that contains alphabetic characters (letters), numeric digits (numbers), and other characters such as punctuation marks. Normally used to indicate the permissible characters in a UCC/EAN-128 bar code symbol.
ANSI	American National Standards Institute.
Aperture	A physical opening that is part of the optical path in a device such as a scanner, photometer, or camera. Most apertures are circular, but they may be rectangular or elliptical.
Application identifier	The field of two or more characters at the beginning of an *element string* encoded in a UCC/EAN-128 symbol, which defines uniquely its format and meaning.
ASC x12	Accredited Standards Committee X12. ASC X12 is responsible for developing American National Standards for EDI.
Attribute	A piece of information reflecting a characteristic related to an identification number.
Auto-discrimination	This term describes the capability of a reader to automatically recognise and decode multiple bar code symbologies.
Bearer bars	Bars surrounding a bar code to prevent misreads or to improve print quality of the bar code symbol.
Billing unit	An item which is priced and invoiced in trade between two parties at any point in the supply chain.
Brand owner	The party that is responsible for allocating EAN•UCC numbering and bar coding on a given trade item. The administrator of an EAN•UCC company prefix.
Character Self-Checking	A property of a symbology whereby a checking algorithm is applied to each character in the code; substitution errors can then only occur if two or more separate printing defects occur within one character. Codes, which are not self-checking, usually have a check character added to the encoded data.
Check digit	A digit calculated from the other digits of an *element string*, used to check that the data has been correctly composed. (*See Standard check digit calculation.)*

Company Number	A component of the EAN•UCC Company prefix. EAN and UCC assign company prefixes to entities that administer the allocation of EAN•UCC identification numbers. These entities may be commercial companies, not for profit organisations, governmental agencies, business units within organisations, etc. Criteria to qualify for the assignment of an EAN•UCC Company prefix are set by the EAN Numbering Organisations and the UCC.
Concatenation	The representation of several *element strings* in one bar code symbol.
Contrast	Amount of difference in reflectance between the dark bars and the light spaces of a machine-readable bar code symbol.
Conveyorized scanning	Unattended, fixed mount scanning environments, where items are scanned automatically as they pass by on a conveyor.
Coupon	A voucher which can be redeemed at the point of sale for a cash value or free item.
Data carrier	A means to represent data in a machine readable form, used to enable automatic reading of the *element strings*.
Data character	A letter, digit or other symbol represented in the *data field(s)* of an *element string*.
Data field	The smallest part of the data part of an *element string* which needs to be distinguished.
Data standard	The entirety of all EAN•UCC system data standardised in meaning and structure.
Data titles	A standard abbreviated description of a data field and used to denote the 'human readable' interpretation of encoded data.
Direct print	A process in which the printing apparatus prints the symbol by making physical contact with a substrate, for example, flexography.
EAN	See *EAN International*.
EAN International	The designation commonly used for the International Article Numbering Association EAN, Brussels.
EAN Numbering Organisation	A member of *EAN International* responsible for the EAN•UCC system in their country (or assigned area) and for correct use of the EAN•UCC system by their member companies.
EAN•UCC company prefix	Part of the international EAN•UCC numbering structures consisting of EAN•UCC *prefix* and a *company number* allocated by *UCC* or an *EAN Numbering Organisation*.
EAN•UCC prefix	An index number with two or more digits, co-administered by *EAN International* and *UCC* denoting the format and meaning of a particular *element string* encoded in an EAN/UPC bar code symbol.

EAN/UCC-13 identification number	The EAN•UCC identification number comprising 13-digits.
EAN/UCC-13 standard numbering structure	The 13-digit EAN•UCC standard numbering structure composed of an EAN•UCC *company prefix*, *item reference number* and *check digit*.
EAN/UCC-14 identification number	The EAN•UCC identification number comprising 14-digits.
EAN/UCC-14 standard numbering structure	The 14-digit EAN•UCC standard numbering structure composed of an *indicator* combined with the 12-digits of an *EAN/UCC-13* or *UCC-12 identification number* and a *check digit*.
EAN/UCC-8 identification number	The EAN•UCC identification number comprising 8-digits.
EAN/UCC-8 prefix	A 1, 2 or 3 digit index number co-administered by *EAN International* and *UCC* denoting the area of distribution of *trade items* identified by an EAN/UCC-8 identification number.
EAN/UCC-8 standard numbering structure	The 8-digit EAN standard numbering structure composed of *EAN/UCC-8 prefix*, *item reference number* and *check digit*.
EAN-13 bar code symbol	Bar code symbol of the EAN/UPC *symbology* comprising 13-digits.
EAN-8 bar code symbol	Bar code symbol of the EAN/UPC *symbology* comprising 8-digits.
EANCOM	The international *EDI* standard provided by *EAN International*, conforming to the UN/EDIFACT standard.
EDI	Electronic Data Interchange.
Electronic commerce	The conduct of business communications and management through electronic methods, such as electronic data interchange and automated data collection systems.
Electronic message	A composition of *element strings* from scanned data and transaction information assembled for data validation and unambiguous processing in a user application.
Element string	A piece of data defined in structure and meaning, comprising an identification part (prefix or *application identifier*) and a data part, represented in an EAN•UCC endorsed *data carrier*.
Even parity	A characteristic of the encodation of an EAN/UPC symbol character whereby the character contains an even number of dark modules.
Fixed length	Term used to describe a *data field* in an *element string* with an established number of characters.
Fixed measure trade item	An item always produced in the same pre-defined version (type, size, weight, contents, design, etc.) that may be sold at any point in the supply chain.
FNC 1	Abbreviation for *Function 1* character.

Full string	The data transmitted by the bar code reader from reading a *data carrier*, including *symbology identifier* and *element string(s)*.
Function 1 character (FNC1)	A *symbol control character* used to form the double start pattern of a UCC/EAN-128 bar code symbol. It is also used to separate certain concatenated *element strings*, dependent on their positioning in the bar code symbol.
GIAI	Shorthand term for the EAN•UCC Global Individual Asset Identifier.
GLN	Shorthand term for the EAN•UCC Global Location Number using the EAN/UCC-13 standard numbering structure.
GRAI	Shorthand term for the EAN•UCC Global Returnable Asset Identifier.
GSRN	Shorthand term for the EAN•UCC Global Service Relation Number.
GTIN	Shorthand term for the EAN•UCC Global Trade Item Number. A GTIN may use the *EAN/UCC-8, UCC-12, EAN/UCC-13* or *EAN/UCC-14 standard numbering structure.*
GTIN format	The format in which GTINs must be represented in a 14-digit reference field (key) in computer files to ensure uniqueness of the identification numbers.
Guard pattern	An auxiliary pattern of bars/spaces corresponding to start or stop patterns in bar code symbologies, and serving to separate the two halves of an EAN/UPC bar code symbol.
Human readable	Characters that can be read by persons, such as letters and numbers, as opposed to bar codes.
Indicator	A digit to complete a particular identification number or to add some sort of significance to a particular *element string*. The digits that may be used are 1 to 8 to denote packaging configuration and 9 to denote variable measure.
Individual asset	An entity which is part of the inventory of given company. (*See also Returnable asset.)*
Inverse exponent	The digit denoting the implied decimal point position in the *application identifier* of an *element string* representing variable measures.
ISO	International Standards Organisation
Item reference	The part of the *standard numbering structures* allocated by the user.
ITF	The "Interleaved two of five" *symbology*.
LAC	(Local Assigned Code) A particular use of the *UPC-E bar code symbol* for *restricted distribution*.
Light margin	A clear space, containing no machine readable marks, that precedes the start character of a bar code symbol and follows the stop character. Sometimes called the "clear area" or “quiet zone.”

Light margin indicator	A 'greater than' (>) or 'less than' (<) character, printed in the human readable field of a bar code symbol, with the tip aligned with the outer edge of the light margin.
Location number	The identification number to denote physical or functional or legal entities.
Logistic measures	Measures indicating the outside dimensions, total weight or volume inclusive of packing material of a *logistic unit*. Also known as gross-measures.
Logistic unit	An item of any composition established for transport and/or storage which needs to be managed through the supply chain.
Magnification	Different sizes of bar code symbols, stated as a percent or decimal equivalent of a nominal size.
Module	The narrowest nominal width unit of measure in a symbol. In certain symbologies, element widths may be specified as multiples of one module. Equivalent to "X" dimension.
Odd parity	A characteristic of the encodation of an EAN/UPC symbol character whereby the character contains an odd number of dark modules.
POS	Point-of-sale. Refers to the retail type checkout where EAN/UPC bar code symbols are normally scanned.
Print gain/loss	The increase/decrease in bar width due to effects of the reproduction and printing processes.
Printability gauge	A series of specially calibrated marks printed on to a substrate to assess or monitor the quality of printing.
Quiet zone	*See Light Margin*
Refund receipt	A voucher produced by equipment handling empty containers (bottles and crates).
Restricted distribution	Signifies that such system data may be applied on goods to be processed only in certain environments, defined by the appropriate EAN Numbering Organisation, such as a country, company, industry, etc.
Returnable asset	A reusable entity owned by a company, used for transport and storage of goods.
RZSC	(Retailer Zero Suppression Code) A particular use of the *UPC-E bar code symbol* for *restricted distribution*.
Scanner	An electronic device to read bar codes and convert them into electrical signals understandable by a computer device.
Separator character	*Function 1 character* used to separate certain concatenated *element strings*, dependent on their positioning in the UCC/EAN-128 bar code symbol.

Serial shipping container code (SSCC)	The unique identification of a *logistic unit* using an 18-digit standard numbering structure.
SSCC	Abbreviation for the *serial shipping container code*.
Standard check digit calculation	EAN•UCC algorithm for the calculation of a *check digit* to verify accuracy of data decoded from UPC/EAN symbols or correctness of EAN•UCC standard identification numbers decoded from other symbologies.
Standard numbering structures	The UCC and EAN numbering structures defined in the various lengths required for the different identification purposes which all share a hierarchical composition. Their composition blends the needs of international control with the needs of the users.
Substrate	The material on which a bar code symbol is printed.
Symbol character	A group of bars and spaces in a symbol which is decoded as a single unit. It may represent an individual digit, letter, punctuation mark, control indicator, or even multiple *data characters*.
Symbol check character	A *symbol character* included within a UCC/EAN-128 symbol, the value of which is used by the bar code reader for the purpose of performing a mathematical check to ensure the accuracy of the scanned data. It is not shown in human readable characters. It is not input to the bar code printer and is not transmitted by the bar code reader.
Symbol control character	A character that is used in a UCC/EAN-128 symbol as part of the organisation, control, or representation of data.
Symbology	A defined method of representing numeric or alphabetic characters in a bar code. (A type of bar code.)
Symbology element	A character or characters in a bar code symbol used to define the integrity and processing of the symbol itself, for example, start and stop patterns. These elements are symbology overhead and are not part of the data conveyed by the bar code.
Symbology identifier	A sequence of characters transmitted with the decoded data that identifies the *data carrier* from which the data has been decoded.
Trade item	Any item (product or service) upon which there is a need to retrieve pre-defined information and that may be priced or ordered or invoiced at any point in any supply chain.
Trade measures	Net measures of *variable measure trade items* as used for invoicing (billing) the *trade item*.
Transaction type	Information (not part of the EAN•UCC system) denoting the particular operation in connection with which the scanned data has been captured.
Truncation	Printing a symbol with less than the symbology specification's recommended minimum height for a symbol of that length, that can make the symbol difficult for an operator to successfully scan end to end.

UCC	*See Uniform Code Council.*
UCC company prefix	Part of the *UCC-12 standard numbering structure* consisting of *UCC prefix* and a *company number* allocated by *UCC*.
UCC prefix	A 1-digit index number administered by *UCC* denoting the format and meaning of a particular *element string* encoded in an UPC-A or UPC-E symbol.
UCC-12 identification number	The UCC identification number comprising 12-digits.
UCC-12 standard numbering structure	The 12-digit UCC standard numbering structure composed of a *UCC company prefix*, *item reference number* and *check digit*.
Uniform Code Council	The Numbering Organisation in the USA to administer and manage the EAN•UCC system standards in the USA and Canada.
Unrestricted distribution	Signifies that such system data may be applied on goods to be processed anywhere in the world without restraint as to country, company, industry, etc.
UPC-A bar code symbol	Bar code symbol of the EAN/UPC *symbology* comprising 12-digits. It differs from the EAN-13 symbol with regard to the human readable printing of the contained number.
UPC-E bar code symbol	Bar code symbol of the EAN/UPC *symbology* representing a *UCC-12 identification number* in 6 explicitly encoded digits.
UPC-E option	The possibility to encode selected *UCC-12 identification numbers* in a short bar code symbol. *(*See *UPC-E bar code symbol.)*
Validation of data	Verification of scanned data to determine whether it meets the application rules for system logic and consistency and/or a particular user's requirements, prior to processing in EDP applications.
Variable measure trade item	An item always produced in the same pre-defined version (type, design, packaging, etc.) that may be sold at any point in the supply chain, which either may vary in weight/size by its nature or which may be traded without a pre-defined weight/size/length.
Wide-to-narrow ratio	The ratio between the wide bar or space and the narrow bar or space. Significant when used in reference to the Interleaved 2-of-5 symbology.
X dimension	The dimension of the narrow bars and spaces in a bar code symbol.