UCC/EAN-128

APPLICATION IDENTIFIER STANDARD

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In this publication, the letters "U.P.C." are used solely as an abbreviation for the "Universal Product Code" which is a product identification system. They do not refer to the UPC®, which is a federally registered certification mark of the International Association of Plumbing and Mechanical Officials ("IAPMO") to certify compliance with the Uniform Plumbing Code as authorized by IAPMO.

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Current UCC/EAN Application Identifiers- June 30, 1994

AI	Content	Format
00	Serial Shipping Container Code	n2+n18
01	Shipping Container Code	n2+n14
10	Batch or Lot Number	n2+an..20
11 (*)	Production Date (YYMMDD)	n2+n6
13 (*)	Packaging Date (YYMMDD)	n2+n6
15 (*)	Sell By Date (Quality) (YYMMDD)	n2+n6
17 (*)	Expiration Date (Safety) (YYMMDD)	n2+n6
20	Product Variant	n2+n2
21	Serial Number	n2+an..20
22	HIBCC - Quantity, Date, Batch and Link	n2+an..29
23 (**)	Lot Number (Transitional Use)	n3+n..19
240	Additional Product Identification assigned by the Manufacturer	n3+an..30
250	Secondary Serial Number	n3+an..30
30	Quantity	n2+n..8
310 (***)	Net Weight, Kilograms	n4+n6
311 (***)	Length or 1st Dimension, Meters	n4+n6
312 (***)	Width, Diameter or 2nd Dimension, Meters	n4+n6
313 (***)	Depth, Thickness, Height or 3rd Dimension, Meters	n4+n6
314 (***)	Area, Square Meters	n4+n6
315 (***)	Volume, Liters	n4+n6
316 (***)	Volume, Cubic Meters	n4+n6
320 (***)	Net Weight, Pounds	n4+n6
321 (***)	Length or 1st Dimension, Inches	n4+n6
322 (***)	Length or 1st Dimension, Feet	n4+n6
323 (***)	Length or 1st Dimension, Yards	n4+n6
324 (***)	Width, Diameter, or 2nd Dimension, Inches	n4+n6
325 (***)	Width, Diameter, or 2nd Dimension, Feet	n4+n6
326 (***)	Width, Diameter, or 2nd Dimension, Yards	n4+n6
327 (***)	Depth, Thickness, Height or 3rd Dimension, Inches	n4+n6
328 (***)	Depth, Thickness, Height or 3rd Dimension, Feet	n4+n6
329 (***)	Depth, Thickness, Height or 3rd Dimension, Yards	n4+n6
330 (***)	Gross Weight, Kilograms	n4+n6
331 (***)	Length or 1st Dimension, Meters, Logistics	n4+n6
332 (***)	Width, Diameter or 2nd Dimension, Meters, Logistics	n4+n6
333 (***)	Depth, Thickness, Height or 3rd Dimension, Meters, Logistics	n4+n6
334 (***)	Area, Square Meters, Logistics	n4+n6
335 (***)	Gross Volume, Liters	n4+n6
336 (***)	Gross Volume, Cubic Meters	n4+n6
340 (***)	Gross Weight, Pounds	n4+n6
341 (***)	Length or 1st Dimension, Inches, Logistics	n4+n6
342 (***)	Length or 1st Dimension, Feet, Logistics	n4+n6
343 (***)	Length or 1st Dimension, Yards, Logistics	n4+n6
344 (***)	Width, Diameter or 2nd Dimension, Inches, Logistics	n4+n6
345 (***)	Width, Diameter or 2nd Dimension, Feet, Logistics	n4+n6
346 (***)	Width, Diameter or 2nd Dimension, Yards, Logistics	n4+n6
347 (***)	Depth, Thickness, Height or 3rd Dimension, Inches, Logistics	n4+n6
348 (***)	Depth, Thickness, Height or 3rd Dimension, Feet, Logistics	n4+n6
349 (***)	Depth, Thickness, Height or 3rd Dimension, Yards, Logistics	n4+n6
350 (***)	Area, Square Inches	n4+n6
351 (***)	Area, Square Feet	n4+n6
352 (***)	Area, Square Yards	n4+n6
353 (***)	Area, Square Inches, Logistics	n4+n6

354 (***)	Area, Square Feet, Logistics	n4+n6
355 (***)	Area, Square Yards, Logistics	n4+n6
356 (***)	Net Weight, Troy Ounce	n4+n6
360 (***)	Volume, Quarts	n4+n6
361 (***)	Volume, Gallons	n4+n6
362 (***)	Gross Volume, Quarts	n4+n6
363 (***)	Gross Volume, Gallons	n4+n6
364 (***)	Volume, Cubic Inches	n4+n6
365 (***)	Volume, Cubic Feet	n4+n6
366 (***)	Volume, Cubic Yards	n4+n6
367 (***)	Gross Volume, Cubic Inches	n4+n6
368 (***)	Gross Volume, Cubic Feet	n4+n6
369 (***)	Gross Volume, Cubic Yards	n4+n6
400	Customer's Purchase Order Number	n3+an..30
410	Ship To (Deliver To) Location Code Using EAN-13	n3+n13
411	Bill To (Invoice To) Location Code Using EAN-13	n3+n13
412	Purchase From (Location Code of Party from Whom Goods are Purchased)	n3+n13
414	EAN Location Code for Physical Identification	n3+n13
420	Ship To (Deliver To) Postal Code Within a Single Postal Authority	n3+an..9
421	Ship To (Deliver To) Postal Code With 3-Digit ISO Country Code Prefix	n3+n3+an..9
8001	Roll products - Width, Length, Core Diameter, Direction and Splices	n4+n14
8002	Electronic Serial Number for Cellular Mobile Telephones	n4+an..20
8003	UPC/EAN Number and Serial Number of Returnable Asset	n4+n14+an..16
8100	Coupon Extended Code - Number System Character and Offer	n4+n1+n5
8101	Coupon Extended Code - Number System Character, Offer, and End of Offer	n4+n1+n5+n4
8102	Coupon Extended Code - Number System Character preceded by zero	n4+n1+n1
90	Mutually Agreed, Between Trading Partners	n2+an..30
91	Intra-Company (Internal)	n2+an..30
92	Intra-Company (Internal)	n2+an..30
93	Intra-Company (Internal)	n2+an..30
94	Intra-Company (Internal)	n2+an..30
95	Internal-Carriers	n2+an..30
96	Internal-Carriers	n2+an..30
97	Intra-Company (Internal)	n2+an..30
98	Intra-Company (Internal)	n2+an..30
99	Internal	n2+an..30

(*) : To indicate only year and month, DD must be filled with "00"
(**) : Plus one digit for length indication
(***) : Plus one digit for decimal point indication

Data Value Representation:

a	alphabetic characters
n	numeric characters
an	alpha-numeric characters
a3	3 alphabetic characters, fixed length
n3	3 numeric characters, fixed length
an3	3 alpha-numeric characters, fixed length
a..3	up to 3 alphabetic characters
n..3	up to 3 numeric characters
an..3	up to 3 alpha-numeric characters

EXECUTIVE SUMMARY

The UCC/EAN Code 128 Application Identifier Standard is a versatile tool that can be used to facilitate efficient movement of goods and information. The standard has applicability to intra and inter-enterprise transfers of goods and information, across multiple industries, on a global scale.

The standard has been designed for maximum flexibility, to cost effectively handle the rich diversity of distribution situations found in global commerce. Concurrently, every effort has been made to enhance manageability of the system by organizing the various types of data into functional uses and by consolidating the similar forms of data into globally standard elements of data. As a result, the standard is much like a universal language. A few "words" have been established with standardized "spelling" and "definitions". The "words" may be used as needed to construct "communications" appropriate to the type of goods and distribution environment. The "communications" can be understood by anyone, anywhere.

The UCC/EAN Code 128 Application Identifier Standard has also been designed to complement, rather than replace, other UCC/EAN standards. Most UCC/EAN standards are designed primarily for identification of products. Industry expressed the need to standardize more than product identification. The UCC/EAN Code 128 Application Identifier Standard supplies this tool. In addition to primary identification of product, the standard adds versatility for inter-enterprise exchanges of perishability dating, lot/batch identification, specific container identification, units of use measure, location codes, and several other information attributes. The standard does supply an alternative method of presenting some of the UCC/EAN codes currently used with other symbologies. However, this feature has been incorporated in the standard simply to expand the choices available for cost effective construction of communications.

The UCC/EAN Code 128 Application Identifier Standard represents much more than a bar code. It is an integrated communications tool with capability to link information and goods. It complements UCC/EAN product identification processes. It connects physical goods to EDI information. It can be used to facilitate re-engineering of information driven business processes.

Implementation and use of the UCC/EAN Code 128 Application Identifier Standard holds the promise of long-term stability in application software supporting inter-enterprise transfers of goods and information. The standard embodies an "open architecture" approach. The standard has been carefully designed for modular expansion with minimal disruption. Groundwork has been completed with the standard to facilitate capture of benefits from future technological improvement without major changes to implemented application software.

In summary, the UCC/EAN Code 128 Application Identifier Standard is a versatile and important tool that can be used to improve the flow of goods and information. It is a comprehensive and systematic business communications process. It fills a gap left by other UCC/EAN standards. To the limited extent it overlaps other UCC/EAN standards, it also supplies continuity and flexibility. It has been designed with the future in mind, yet nicely accommodates the present.

PREFACE

GLOBAL UPC/EAN NUMBERING SYSTEM CONSIDERATIONS

The Uniform Code Council and the International Article Numbering (EAN) system enables any specified product or shipping container to be given a standard number which identifies it unambiguously anywhere in the world. UCC/EAN is an open standard, not specific to a company or an industry sector. It is managed by UCC (Uniform Code Council, Inc.) in the United States, by PCCC (Product Code Council of Canada) in Canada and by EAN (EAN International, International Article Numbering Association) outside the United States and Canada.

The concept that all trading partners in a distribution channel should use a standard identification procedure for unique products is now widely accepted. The use of standard identification in both paper and electronic communications is also widely accepted. Standard identification allows for improvements in efficiency and accuracy in manufacturer, distributor, and end customer operations.

The UCC/EAN numbering system is based on two principles:

- The codes must identify, not classify, an item. This provides the flexibility that enables the standards to be used in any kind of business. It enables the efficient distribution of a product to end customers in multiple industries.

- The UCC or the appropriate EAN coding authority assign codes to identify the supplier. Codes are assigned to specific items by their suppliers, usually the manufacturer. Combining the UCC/EAN assigned supplier identification and the supplier assigned item codes ensures that no two codes assigned anywhere in the world can ever be the same. Manufacturers are responsible for assigning codes to their products and for notifying customers of these codes.

UCC/EAN numbering was developed to work with computers to improve product distribution efficiency and accuracy. There are two interlinked ways in which the standard product numbers are used:

- On the physical items themselves, standard product numbers are represented in the form of a bar code; either the U.P.C. or EAN symbol on consumer items or the Interleaved 2 of 5 (ITF) shipping container symbol on shipping containers;

- In communications, standard product numbers describe the item either on paper, in electronic data interchange, or by computer-driven display.

Structured versus Non-Structured Identification
The U.P.C. and EAN numbers have no inherent meaning. They are fixed length and include a check character. The computer system is used to look up the item description and other product information when the U.P.C. item number is keyed in manually or scanned from a bar code.

The "structure" of the U.P.C. exists solely as an aid in managing number assignment and ensuring uniqueness. The entire U.P.C. or EAN number should always be used for identification without attempting to give meaning to any individual part of the number.

UPC-A and EAN-13 Structure
UPC-A codes are 12 digits in length. Their structure is shown in Figure 1. Starting from the left and moving to the right, the UPC-A number includes a 6-digit manufacturer number assigned by the Uniform Code Council (UCC). The first of these 6 digits is referred to as the number system character. This 6-digit field is followed by a 5-digit item number assigned by the owner/controller of the product label. The 12th digit, at the far right, is a check character.

EAN-13 codes are 13 digits in length. Code structure is determined by the country numbering authority which issues the manufacturer identification. The EAN-13 structure is shown in Figure 1.

EAN uniqueness from U.P.C. is obtained through use of the number system characters. The 13th character of the EAN code is the high order (leftmost) number system character. The value of this digit ranges from 1 through 9. The value of "0" in this position indicates a U.P.C. number. When EAN and U.P.C. numbers are both used in the same system or, for example, the shipping container code is used, as shown in Figure 1, the zero has to be added as a second (left most) U.P.C. number system character.

To gain the 13th character, EAN allows a mix of even

and odd parity in the left half of what would otherwise be a standard U.P.C. symbol (all left-half characters encoded with odd parity). This means that a 13-digit EAN symbol is exactly the same length as the 12-digit U.P.C. symbol. Since there is absolutely no difference between an EAN-13 symbol printed with a first character of zero and a U.P.C. symbol of the same value minus the zero, scanners are generally programmed to follow the specification: if the left half of the symbol has all odd parity, the scanner will identify it as a U.P.C. symbol and transmit 12 digits. If the left half of the symbol has mixed odd and even parity, the scanner automatically calculates the value (1 through 9) and adds the extra lead digit required for EAN-13.

This feature is an important consideration when, for example, it is necessary to compare the printed code on a product to a code displayed or printed from a computer. The UPC-A code is always printed showing 12 digits, and the EAN-13 is printed showing 13 digits.

UPC-E and EAN-8 Structure

Two additional types of U.P.C. and EAN codes are the EAN-8, an 8-digit code, and the UPC-E (8 digits). The UPC-E is a suppressed version of the 12-digit UPC-A with number system character zero. It is always maintained in its 12-digit form within a computer system to prevent duplication with EAN-8 codes, which are 8-digit product codes. EAN-8 codes do not expand to EAN-13 codes.

Shipping Container Code (SCC)

The SCC is a 14-digit code used to identify fixed content multipacks, shipping containers, pallets, and unit loads. The terminology "SCC" is somewhat inaccurate, because the SCC is also used to identify intermediate packages which are not actually intended to be shipping containers. Because "shipping containers" may be scanned in a dirtier environment, may have bar codes printed on rougher materials (like corrugated), and are often read from a distance (such as from a forklift), they are typically labelled using a bar code symbology called Interleaved 2 of 5 (ITF) - a symbology which is tolerant of these conditions. The SCC structure is shown in Figure 1.

The 14th (leftmost) character of the SCC is the packaging indicator (PI). The remainder of the code uses the same manufacturer and item structure used in the U.P.C. and EAN item codes. The PI does not identify the quantity, just as the U.P.C. number itself does not define the product. Instead these are nonsignificant numbers used to access a computer database. The computer database defines the product including the quantity. For one product the quantity associated with a PI = 3 might be 12, while for another product with a PI = 3, the quantity might be 10. Thus the quantity depends on both the PI and the base U.P.C. number.

PI = 0 is always used either to indicate that the U.P.C. item number identifying this container is different from the item number on the units inside the container or when the shipping container is the same as the consumer unit (quantity). When a 12-digit U.P.C. or 13 digit EAN code is read into a 14-digit numeric field within a database, the resulting value will be identical to an ITF-14 with a PI=0. The quantity of one option is used to ensure the number on the shipping container is identical to the number on the physical product. The same database field will be accessed regardless of whether the U.P.C., EAN or ITF-14 symbols are read.

Software and System Planning

In the development of computer systems and applications, 14-digit identification fields should be used to maximize the utility of the system using UCC/EAN identification. Doing so will avoid problems with imported products, support packaging configuration changes, and permit full utilization of electronic data interchange. It is very important that the full 14-digit shipping container code, not just the item portion of the code, be carried in the computer file. This will avoid major quantity errors when ordering systems are developed to use packaging levels higher than the consumer unit.

The following are some additional important points to consider when developing a system using UCC/EAN numbering:

- The number system characters do not indicate the country of origin of the product. The number system characters indicate the numbering authority which issued the code.

- EAN specifications refer to the number system characters as the EAN prefix. In some instances, the prefix may be three characters long. The EAN code remains 13 characters. Further, each EAN numbering authority decides on the manufacturer/item structure it will use to manage its code allocation. Therefore, meaning cannot

be assigned to parts of the code at a system level.

- Product identification is unique to the product. There is no need to change U.P.C. or obtain an EAN manufacturer identification due to manufacturing location or the country in which the product is to be marketed.

Note: **The UCC strongly recommends that U.S. systems accept EAN-13 codes**. EAN codes are not universally accepted in U.S. retail systems due to the fact that manufacturer U.P.C. based systems were in use for several years prior to the emergence of EAN and have not yet been converted.

- The full format 12-digit structure should be maintained for all 8-digit UPC-E codes. Converting back to the zero suppress form should occur only when displaying or printing the code to retain continuity with the code printed on the product.

- An SCC package identifier code of "0" should never be used when the item number of the products in a multipack is the same as that of the container. In this case, the package indicator is the only digit which differentiates the quantities in the consumer package from that of the shipping container.

GENERAL DESCRIPTION OF UCC/EAN CODE 128 APPLICATION IDENTIFIERS

The UCC-EAN Code 128 standard extends the existing UCC and EAN item and shipping container bar code standards to include additional information about products and shipments. The 12 digit U.P.C. code will still be used to identify retail products and the 14-digit ITF shipping container code will still be used for primary identification of standard shipping containers (although some exceptions will be presented in this manual).

The Application Identifiers (AIs) are prefixes used to define bar code data fields. Each prefix uniquely identifies the meaning and format of the data field following it.

A bar code system is made up of two basic parts. First is the human readable code (or characters) encoded in the symbol, and second is the symbology (unique bar/space pattern). Chapter 1 describes the Application Identifier (AI) code structure and accompanying dictionary of currently defined AIs. The UCC/EAN-128 structure is discussed in Chapter 2, and system guidelines are contained in Chapter 3.

The first AI was allocated to the UCC Serial Shipping Container Standard, a transaction level standard. It identifies the contents of shipping containers having a mixed assortment of products by linking the container to an electronic data interchange (EDI) transaction set identifying the container's content in detail.

In addition to the Serial Shipping Container Standard, AIs are defined for applications, e.g. production and expiration dates; batch or lot, and serial numbers; variable quantity, weight and dimensions; purchase order number and other information required by industries. However, every effort has been made to minimize the number of AIs by combining specific industry requirements into a global solution using a single AI.

The selection of AIs is based on industry requests presented to the UCC and the EAN. In addition, 56 companies and trade organizations were interviewed to determine their industries' data requirements. AIs have been defined to fulfill the bar coding requirements of raw material and finished goods manufacturers, freight carriers, wholesalers and retailers. Existing industry standard field definitions and codes were adopted wherever possible.

As new requirements arise, the structure allows new AIs to be defined. Applications which are developed using existing AIs will not need to be modified as the AI dictionary is expanded, unless some of the new AIs are added to the application. A company with AI scanning systems has the choice of modifying the systems to use new AI data fields when they are defined or leaving the systems unmodified. If the systems are not changed, the new fields will be safely ignored by the existing software. Contact the UCC if your industry has a need for a new AI.

The coding structure and symbology used for this standard is space efficient and allows multiple AIs with their data to be combined into a single bar code (a technique called concatenation). This will allow a company labelling a container to source mark, in a single bar code, information relating to the container which may be scanned during the distribution cycle.

Whenever the bar code is scanned, only that information required at that operation or for that industry will be extracted.

A company shipping products to many different industries may be able to produce a single bar code label which will satisfy customer requirements. The definitions of the data fields use international standard codes and units which will enable the same bar code labels to be used internationally.

The AIs and their data fields are encoded in UCC/EAN-128 a subset of USS Code 128 symbology. UCC/EAN-128 contains a reserved non-data character, Function 1, as the first symbol character after the start character. This subset is reserved for the use of UCC and EAN for this standard.

This combination of a standard data content and unique symbol architecture supplies compatibility of coding among different companies, while enabling companies which have no need for specific data fields to program their equipment to ignore them.

Detailed technical specifications for the symbology are found in the "AIM-USA Uniform Symbology Specification, Code 128" available from AIM, 634 Alpha Road, Pittsburgh, PA 15238, telephone (412) 963-8588.

Examples of the use of the Application Identifier Standard for specific industries are given in Appendix A and in these publications:

- UCC Universal Product Code: Industrial and Commercial Guidelines
- Application Specification for the UCC/EAN-128 Serial Shipping Container Code

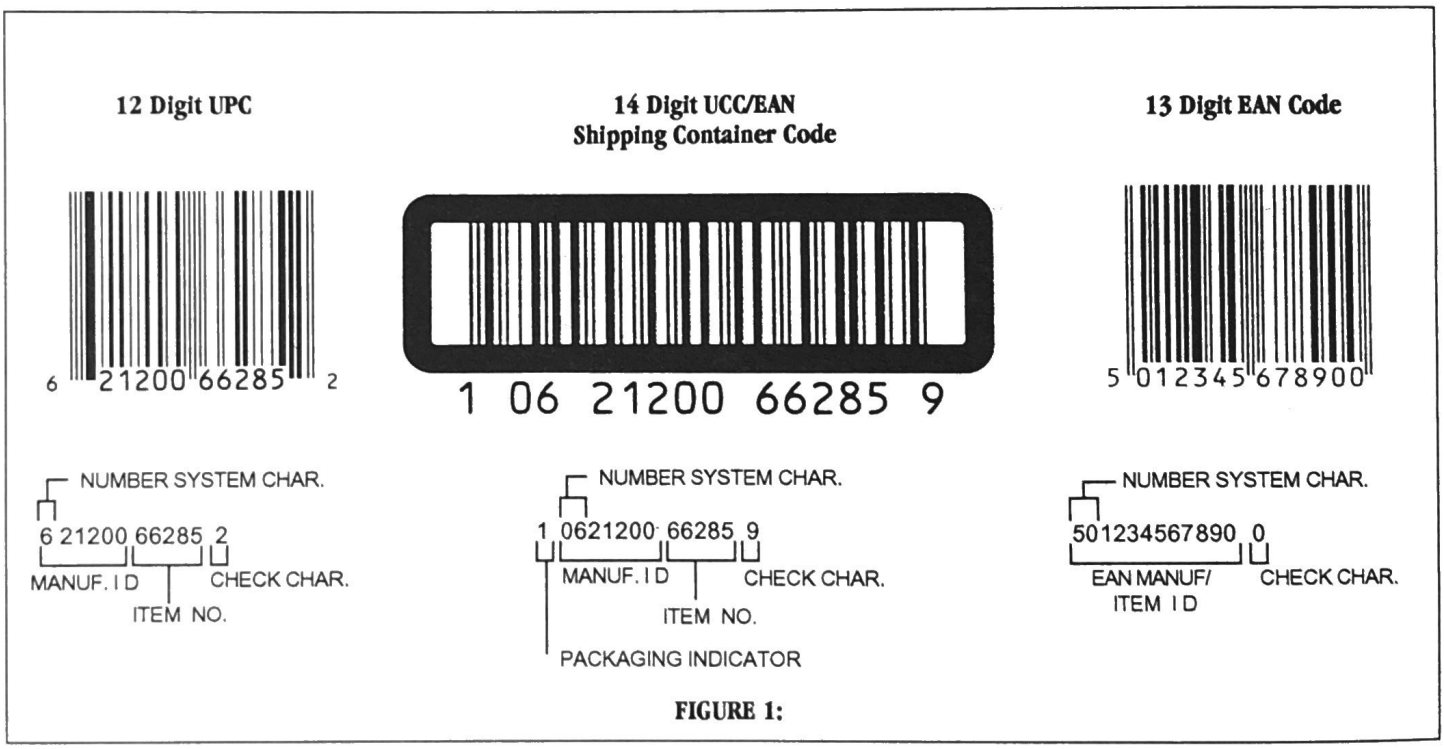

FIGURE 1:

CHAPTER 1

DEFINITION OF APPLICATION IDENTIFIERS

1.1 INTRODUCTION

The Application Identifiers (AIs) are prefixes used to define data fields. Each prefix uniquely identifies the meaning and the format of the data field following it.

AIs and their data are used to encode specified product identification, transactions and applications.

Each AI consists of two to four digits followed by the data field which it identifies. In order to conserve space the most widely used AIs are only two characters long. AIs for less widely used fields consist of three or four characters. Some closely related fields consist of the same first two characters to define the group, followed by an additional third, or third and fourth character to identify the specific application.

UCC Primary Identification, UCC Transaction Identification, and the data content for commonly used UCC Applications (Dates and Measurements) are all numeric. This significantly reduces bar code size. Alpha characters can be encoded as the data content of other applications where business practices commonly use alpha/numeric fields.

1.2 DATA CONTENT

The data field following an AI may be alphabetic and/or numeric characters and may be up to thirty characters in length. The first two characters determine the length of the AI. For example, AIs beginning with 41 are always three digits long: 410-419.

The data fields are either fixed or variable length. A fixed length field must always be its assigned data length. Leading zeros may be required to fill the required field length. A maximum data field length is specified for each variable length field. This maximum is specified to aid application design.

The maximum data field lengths shown in the definition do not include any auxiliary characters (such as Code A or Shift) which are used when the data is encoded in the UCC/EAN-128 bar code.

The AI is not part of the data field. When the data is used in other applications such as EDI, the AI must be dropped.

The data to be encoded, the structure to be used and the restrictions on characters encoded are described for each AI in Section 1.4 below.

1.3 CHECK DIGITS

There is no general specification regarding the use of check digits for the AI data fields (as opposed to the symbol check character). Where Application Identifiers require use of a check digit on the data, this is specified in the individual data format description. Individual users may also choose to use check digits, for their own purposes, in any portion of the data content that is chosen at their own discretion (for example in their own batch numbers).

1.4 DICTIONARY OF APPLICATION IDENTIFIERS

Table 1.1 summarizes the list of Application Identifiers currently available.

Other AI definitions may be assigned by UCC to reflect the needs of user industries. Contact the UCC.

The following convention applies for the data format:

Data Field Representation -

a	alphabetic characters
n	numeric characters
an	alphanumeric characters
a3	3 alphabetic characters, fixed length
n3	3 numeric characters, fixed length
an3	3 alphanumeric characters, fixed length
a..3	up to 3 alphabetic characters
n..3	up to 3 numeric characters
an..3	up to 3 alphanumeric characters

AIs are grouped by generic purpose in the dictionary which follows. Sections include primary identification, transactions and applications.

1.4.1 PRIMARY IDENTIFICATION

Shipping Containers

Application Identifier: 01

Definition: Shipping Container Code

Data format: n14

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1. **Fixed Content Multi-Pack (Standard Pack) Shipping Containers**: Standard pack shipping containers can be identified by using AI 01. The 14 digit data field defined by AI 01 is exactly the same product identification code as defined in the UCC manual "U.P.C. Shipping Container Code and Symbol Specification Manual." The AI 01 does not replace this UCC/EAN Standard for product identification of standard pack containers. Printing the bar code using Code 128 is provided as an alternative solution for specific applications where concatenation with other UCC/EAN codes is required. This can be the case when the product identification code is printed on a label with additional AI data related to the container (i.e., batch or lot number, dates, weight, etc.) This solution is available for internal use in a company or with trading partners who have agreed with it. The Interleaved 2 of 5 (ITF) bar code is widely used and preferred by many industries. It will continue to be the preferred method of presenting the product identification code when preprinting is possible.

The data structure is:
P MMMMMMM IIIII C
1 <----- 7 -----> <--5--> 1

Where:
P = Packaging Indicator
M..M = UCC/EAN prefix/manufacturer number (for UCC numbers, a leading 0 is inserted before the number system character)
I..I = Item Number
C = Check Digit (note that the check digit calculation is the same as defined in the "U.P.C. Shipping Container Code and Symbol Specification" manual, and that the check digit is calculated from the preceding 13 digits and does not include the AI 01.)

The structure is fully explained in the "U.P.C. Shipping Container Code and Symbol Specification" manual.

2. **Variable Measure Shipping Containers**: The structure of the code for identifying variable quantity/measure shipping containers follows the same 14-digit primary data structure defined above for standard pack shipping containers. However, the first digit on the left (the packaging indicator) always has the value 9.

In case of variable measure shipping containers, the AI 01 will be followed by another AI (30, 31 or 32 series) providing quantity or measurement information to the item.

The same restrictions as the ones expressed for standard pack shipping containers apply for using AI 01 on variable measure shipping containers.

1.4.2 TRANSACTION IDENTIFICATION

Serial Shipping Container Code

Application Identifier: 00

Definition: Serial Shipping Container Code

Data Format: n18

Application identifier 00 is assigned to the serial coding of shipping containers.

This standard is designed to identify uniquely individual shipping containers.

It enables merchandise that is packed differently from one shipping container to another, for example where products are picked and packed to meet individual orders, to be identified. This can support operations such as packing, distribution and receiving of non-standardized packages.

The data structure is:

P MMMMMMM SSSSSSSSS C
1 <------7------> <------9-------> 1

where:

P = Packaging Type*
M..M = UCC/EAN prefix/manufacturer number (for UCC numbers, a leading 0 is inserted before the number system character)
S..S = Serial number assigned by the manufacturer
C = Data Check digit

* Packaging Type Definitions (for serial shipping container code only .. not to be used as U.P.C. shipping container code packaging indicator):

0 = case or carton
1 = pallet (larger than case)
2 = container (larger than pallet)
3 = undefined
4 = internal (intra-company) use
5 through 9 = reserved for future use

The sixteen digits following the packaging type are composed as follows:

- A seven digit field containing the manufacturer's ID number assigned by the relevant UCC/EAN numbering authority. UCC prefix/manufacturer numbers are filled by adding a leading zero to make this a seven-digit field.

- The nine digits following the UCC/EAN prefix/manufacturer number are the serial number, used to identify uniquely each serialized shipping container packed by a supplier for a minimum of one year.

The method used to allocate serial numbers is left to the discretion of the company coding the package. However, the serial number must remain unique for a period of at least twelve months for each packaging type/manufacturer number.

* The digit following the serial number is a check digit calculated from the preceding nineteen digits. The structure and check digit calculation are fully explained in the UCC manual: "Application Specification for the UCC/EAN-128 Serial Shipping Container Code".

1.4.3 APPLICATION IDENTIFICATION

1.4.3.1 **Product Variant**

Application Identifier: 20

Definition: Product Variant

Data format: n2

AI 20 denotes a variant of the standard product. This method of differentiating variants from standard products must only be used when the variation is not sufficiently significant to require a change in the item number encoded in the main symbol. (See U.P.C. Guidelines Manual.)

The two digits following the AI 20 are used to differentiate product variants. Therefore, AI 20 provides for 100 different product variants. The digit values chosen are left to the discretion of the company applying the code, except that once assigned, they should remain unchanged for a 12 month period. Do not assign a new meaning to the product variant for a minimum of 12 months after its initial definition has been discontinued.

This AI and code is designed to minimize the number of different item numbers used to identify shipping containers while enabling companies to differentiate automatically product variants, such as some types of promotions which do not require the allocation of a specific identification number.

1.4.3.2 **Traceability Numbers**

Batch or Lot Number

Application Identifier: 10

Definition: Batch or Lot Number

Data Format: an..20

AI 10 denotes a batch or a lot number.

Production line numbers, shift numbers, time of production and so on, used singly or in combination to form what is, in effect, a batch or lot number, may

be encoded in this standard. The only requirement is that the data uniquely identify the product to the extent needed by the manufacturer for product service notification, recall, or other purposes.

Batch or lot numbers in this format may be formed using alphabetic characters and/or numeric characters and may have any length up to a maximum of twenty characters (exclusive of the Application Identifier).

Lot Number (Transitional Use)

Application Identifier: 230 through 239

Definition: Lot Number (transitional use)

Data Format: n..19

The Application Identifiers 230 through 239 have been assigned to identify a lot number. The third digit of the AI indicates the actual number of digits composing the lot number, using the formula length = (2xn) + 1, where n is the third digit. (Or, to say it differently, the third digit of the AI indicates the number of digit-pairs reserved for the lot number using the formula:

$$D \text{ (3rd digit)} = \frac{L-1}{2}$$

where L is the length of the lot number.

The length of the lot number is always an odd number. If an even lot number is to be coded, it must be filled with a leading zero.

For example, (233)1357964 identifies the 7-digit lot number 1357964.

For example, lot number 12345678 will be encoded as (234)012345678.

Note that parenthesis are used to separate the AI and the data field for easier reading. The parenthesis are not included in the symbol itself.

This AI has been released for transitional use in some applications where there was a need to concatenate several variable length data fields into one symbol, but where the facility to use the FNC1 character as a separator was not yet available.

Serial Number

Application Identifier: 21

Definition: Serial Number

Data Format: an..20

AI 21 has been assigned to identify a serial number. A serial number is a unique code assigned to an entity for its lifetime. Combined with primary product identification, the serial number identifies uniquely each individual item.

The Serial Shipping Container Code (AI 00) is structured in such a way that it identifies a shipping container uniquely, regardless of the item numbers inside. The serial number (AI 21) is unique only for a given item.

As with the batch or lot number (AI 10), any structure can be used by a company to generate the serial number. The only requirement is that AI 21 and the serial number be associated with a primary identification number to uniquely identify the product labelled.

1.4.3.3 **Dates**

AIs 11, 13, 15 and 17 identify different types of dates. When used on a shipping container, the dates refer to the items contained in the shipping container.

In the UCC/EAN Application Identifier Standard, the dates have a fixed length of six digits, in the format year, month, day (YYMMDD).

Years are shown as the last two digits of the appropriate calendar year.

Two digits are used to show the month from January with the value 01 through December with the value 12.

The day of the month is always shown as two digits. In applications where the day of the month is not relevant, the day field must be filled with "00", which means: "Day not specified".

Examples:

1st of July 1992 will be coded as "920701"
August 1992 will be coded as "920800"

For short life products where the year is not shown in human readable characters, the digits of the relevant year must, nonetheless, be shown in the bar code symbol.

Production Date

Application Identifier: 11

Definition: Production Date

Data Format: n6 (YYMMDD)

The production date is the date on which goods have been produced by the manufacturer.

Packaging Date

Application Identifier: 13

Definition: Packaging Date

Data Format: n6 (YYMMDD)

The packaging date is the date on which goods have been packed. Different packaging dates can be associated with different packing levels of the same product.

Sell By Date

Application Identifier: 15

Definition: Sell By Date

Data Format: n6 (YYMMDD)

Sell by date is advice given to the consumer regarding the best date by which to purchase the item. It indicates the ideal consumption or best effective use of a product. It is also referred to as a "best before" date. It is a statement about quality.

Expiration Date

Application Identifier: 17

Definition: Use By/Expiration Date

Data Format: n6 (YYMMDD)

The Use By/Expiration Date states the date by which a product must be used or consumed. It is a statement about public safety.

1.4.3.4 **Quantity**

Application Identifier: 30

Definition: Quantity Each

Data Format: n..8

The quantity information is generally associated with the identification of a shipping container. The shipping container can have a fixed content or a variable content.

1. **Fixed Content Multipack (Standard Pack) Shipping Containers**: In the case of a standard pack shipping container, the quantity refers to the number of smallest "eaches" contained in the shipping container. The quantity duplicates the information which is available in the computer file for this item.

Example: A pallet identified by the ITF-14 number **7 00 12345 67890 4** contains 12 cartons identified by the number **5 00 12345 67890 0**. Each carton contains 24 units of the item **0 12345 67890 5**. The markings would read as follows:

On the pallet - **(01) 70012345678904 (30) 12**
On the carton - **(01) 50012345678900 (30) 24**

Note that parenthesis are used to separate the AI and the data field for easier reading. The parentheses are not included in the data encoded in the UCC/EAN-128 symbol.

2. **Variable Measure Shipping Container**: Variable measure containers identified by the packaging

indicator "9" as the leftmost digit (refer to AI 01) are unable to use the packaging indicator convention detailed for fixed weight containers. However, "count" can be supplied as a simple number that refers to the number of "eaches" contained inside the labeled container. Quantity may also be included in addition to measurements such as weight in kilograms or in pounds, dimension, volume or area if desired.

In the case of variable measure shipping containers, the quantity and/or measurement information is part of the item identification. The package indicator "9" indicates to the application program that the item content is variable and that the actual quantity and/or measurement is provided in an accompanying AI. For example: a shipping container has a variable content. One specific shipping container contains a quantity of 435 items identified by U.P.C.
0 12345 67890 5. The marking on the container would read:
(01)90012345678908(30)435.

1.4.3.5 **Measurements**

The Application Identifiers described in this section represent different types of measurement.

A different unit of measurement is associated with each AI. Each AI is composed of 4 digits. The 4th digit represents the decimal point indicator also called the inverse exponent. The data itself always has a format of a numeric fixed length field of 6 digits.

The decimal point indicator shows the implicit decimal position that must be applied to the coded value. For example:

(3202)001234 = 12.34 pounds net weight.
(3201)001234 = 123.4 pounds net weight.

For metric measurements, the value expressed in the reference unit of measure is obtained by dividing the encoded value by 10 times the exponent indicated. For example:

The AIs 3100 through 3109 identify a net weight in kilograms:

(3100)000035 = 35 kg = 35 / 10^0 kilograms

(3103)000035 = 0.035 kg = 35 / 10^3 kilograms = 35 grams

AIs 3100 through 3209 (Section 1.4.3.5.1) identify measurements which define the purchased product within the shipping container. Such measurements are normally used to determine the selling price.

AIs 3300-3409 (Section 1.4.3.5.2) identify measurements required for logistical purposes. They are particularly relevant to the distribution process and relate to the container marked.

1.4.3.5.1 **Purchased Product Measurements**

Net Weight (KG)

Application Identifier: 3100 through 3109

Definition: Net Weight, Kilograms

Data Format: n6

AIs 3100 through 3109 identify the net weight of goods including any packing normally going with them for which the end user will be required to pay.

Net Weight (Pounds)

Application Identifier: 3200 through 3209

Definition: Net Weight, Pounds

Data Format: n6

AI 3200 through 3209 identify the net weight of goods including any packing the end user will be required to pay for.

Length or 1st Dimension (Meters)

Application Identifier: 3110 through 3119

Definition: Length or 1st Dimension, Meters

Data Format: n6

Width, Diameter or 2nd Dimension (Meters)

Application Identifier: 3120 through 3129

Definition: Width, Diameter or 2nd Dimension, Meters

Data Format: n6

Depth, Thickness, Height or 3rd Dimension (Meters)

Application Identifier: 3130 through 3139

Definition: Depth, Thickness or 3rd Dimension, Meters

Data Format: n6

Area (Square Meters)

Application Identifier: 3140 through 3149

Definition: Area, Square Meters

Data Format: n6

Volume (Liters)

Application Identifier: 3150 through 3159

Definition: Volume, Liters

Data Format: n6

Volume (Cubic Meters)

Application Identifier: 3160 through 3169

Definition: Volume, Cubic Meters

Data Format: n6

The volume is the measurement normally arrived at by multiplying the length, width and height of a package.

1.4.3.5.2 Logistics Measurements

AIs 3300 through 3409 identify different measurements required for logistical purposes. They are particularly relevant to the distribution process and relate to the container marked.

Gross Weight (KG)

Application Identifier: 3300 through 3309

Definition: Gross Weight, Kilograms

Data Format: n6

Gross Weight (Pounds)

Application Identifier: 3400 through 3409

Definition: Gross Weight, Pounds

Data Format: n6

AIs 3300 through 3309 and 3400 through 3409 identify the gross weight. This is the weight of the goods including the packaging.

Length or 1st Dimension, Logistics

Application Identifier: 3310 through 3319

Definition: Length or 1st Dimension, Meters

Data Format: n6

AIs 3310 through 3319 identify the length or first dimension in meters.

Width, Diameter or 2nd Dimension, Logistics

Application Identifier: 3320 through 3329
Definition: Width, Diameter or 2nd Dimension, Meters
Data Format: n6

AIs 3320 through 3329 identify the width, diameter or the second dimension of a product in meters.

Depth, Thickness, Height or 3rd Dimension, Logistics

Application Identifier: 3330 through 3339
Definition: Depth, Thickness, Height or 3rd Dimension, Meters
Data Format: n6

AIs 3330 through 3339 identify the depth, thickness, height or third dimension in meters.

Area, Square Meters, Logistics

Application Identifier: 3340 through 3349
Definition: Area, square meters
Data Format: n6

AIs 3340 through 3349 identify the area in square meters, normally arrived at by multiplying the length by the width.

Gross Volume, Liters

Application Identifier: 3350 through 3359
Definition: Gross Volume, Liters
Data Format: n6

AIs 3350 through 3359 identify the gross volume in liters.

Gross Volume, Cubic Meters

Application Identifier: 3360 through 3369
Definition: Gross Volume, Cubic Meters
Data Format: n6

AIs 3360 through 3369 identify the gross volume in cubic meters, or the measurement normally arrived at by multiplying the maximum length, width and height of a product.

1.4.3.6 **References**

Customer's Purchase Order Number

Application Identifier: 400
Definition: Customer's Purchase Order Number
Data Format: an..30

AI 400 identifies the customer's purchase order number or the number assigned by the buyer to an order. **For those following ANSI X12 (e.g. VICS/UCS Standards), the maximum length is limited to an..22.**

Location Codes

The AI described in this section identify location codes and their related function in trading transactions.

AI 410, 411 and 412 identify a location using the EAN-13 location code. An alternative format for the location code is the 9-digit Dun & Bradstreet number (DUNS) commonly used in North America to identify unique business establishments. If this format is used, the DUNS number must be filled with 4 trailing zeros.

The AI 420 and 421 identify postal codes. Postal codes are usually allocated by a national postal authority. Generally, they do not identify a specific location, but are used as a supplementary information in applications requiring sorting or routing of transport packages.

Ship To - Deliver To

Application Identifier: 410

Definition: Ship to (deliver to) location code (DUNS or EAN location code)

Data Format: n13

AI 410 indicates the location code identifying the party to which goods should be delivered.

Bill To - Invoice To

Application Identifier: 411

Definition: Bill to (invoice to) location code (DUNS or EAN location code)

Data Format: n13

AI 411 indicates the location code identifying the party to whom an invoice is issued.

Purchase From

Application Identifier: 412

Definition: Purchase from - Location code of the party from whom goods are purchased (DUNS or EAN location code)

Data Format: n13

AI 412 indicates the location code identifying the party which manufactures or otherwise has possession of goods, and consigns or makes them available in trade.

Ship To - Deliver To - Single Postal Authority

Application Identifier: 420

Definition: Ship to (deliver to) postal code

Data Format: an..9

AI 420 indicates the postal code of the party to which goods should be delivered. It is assumed that the "ship from" and "ship to" parties are located under the same postal authority.

Ship To - Deliver To - Multiple Postal Authorities

Application Identifier: 421

Definition: Ship to (deliver to) postal code with 3-digit ISO country code prefix

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Data Format: n3 + an..9

AI 421 indicates the ISO country code and the postal code of the party to which goods should be delivered. It is assumed that the "ship from" and "ship to" parties are located under different postal authorities.

The country code to be used is the 3 digit numeric code established in the International Standards ISO 3166 (1988 or current version).

1.4.3.7 **Specific Applications**

HIBCC (Health Industry Business Communications Council)

Application Identifier: 22

Definition: HIBCC - quantity, date, batch

Data Format: an..29

AI 22 indicates a specific HIBCC Alternate Secondary Data Structure. This data structure includes an optional quantity field, an optional data field, a lot/batch or serial number and a link character.

The specification of the data structure is described in the "Health Industry Bar Code Supplier Labeling Standard" which can be obtained from the Health Industry Business Communications Council, 5110 North 40th Street, Suite 250, Phoenix, AZ 85018.

Roll Products

Application Identifier: 8001

Definition: Roll products - width, length, core diameter, direction and splices

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Data Format: n14

Roll products, such as rolls of paper, are treated as variable measure items in the UCC/EAN-128 Standard. The primary identification is encoded in AI01. The data structure is the following:

* slit width in millimeters	4 digits
* actual length in meters	5 digits
* internal core diameter in millimeters	3 digits
* winding direction (0, 1 or 9)	1 digit
* number of splices	1 digit

The slit width is the width of the roll. The actual length is the total length of the product on the roll. The diameter is the internal core diameter of the roll itself. The winding direction indicates whether the face of the product is out or in. It takes the value 0 for face out, 1 for face in, and 9 when the winding direction is unknown or not applicable. The last digit indicates the actual number of splices if less than or equal to 8. Value 9 indicates that the number of splices is unknown.

Electronic Serial Number

Application Identifier: 8002

Definition: Electronic serial number for cellular mobile telephones

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Data format: an..20

AI 8002 is assigned to the cellular mobile telephone (CMT) electronic serial number (ESN). This number is usually assigned by a national or pluri-national authority. The ESN is unique for each CMT. The number allows retrieving information about the owner of the CMT.

Internal Use and/or Mutually Agreed

Application Identifier: 90

Definition: Mutually Agreed, Between Trading Partners

Data Format: an..30

AI 90 is assigned for applications mutually agreed between trading partners.

The preferred use of AI 90 in the U.S. is to indicate that FACT-1 Data Identifier follows. A FACT Data Identifier is used in a closed application where no corresponding UCC/EAN Application Identifier has been defined for general use.

The data may have any length up to thirty characters and may be formed from alphabetic and/or numeric characters.

Internal Applications

Application Identifier: 91 through 98

Definition: Intra-Company Internal

Data Format: an..30

Companies may devise their own internal code structures and encode them using these AIs at their own discretion. Suggested assignments are shown in Table 1.1.

Carriers are using AI 95 and AI 96 to identify their unique progressive (PRO) number and Standard Carrier Alpha Code (SCAC).

The data may have any length up to thirty characters and may be formed from alphabetic and/or numeric characters.

Note of caution: As an additional security against ambiguity, it is strongly recommended to destroy the internal supplementary symbols when their use is complete.

Free Text

Application Identifier: 99

Definition: Free Text

Data Format: an..30

AI 99 has been allocated to the coding of free text in barcoded form. In computer applications, such text will normally require the party decoding the data to process them manually. It is therefore recommended to limit the use of this AI to information which cannot be encoded in a standard format.

TABLE 1.1 Current UCC/EAN Application Identifiers

AI	Content	Format
00	Serial Shipping Container Code	n2+n18
01	Shipping Container Code	n2+n14
10	Batch or Lot Number	n2+an..20
11 (*)	Production Date (YYMMDD)	n2+n6
13 (*)	Packaging Date (YYMMDD)	n2+n6
15 (*)	Sell By Date (Quality) (YYMMDD)	n2+n6
17 (*)	Expiration Date (Safety) (YYMMDD)	n2+n6
20	Product Variant	n2+n2
21	Serial Number	n2+an..20
22	HIBCC - Quantity, Date, Batch and Link	n2+an..29
23 (**)	Lot Number (Transitional Use)	n3+n..19
30	Quantity	n2+n..8
310 (***)	Net Weight, Kilograms	n4+n6
311 (***)	Length or 1st Dimension, Meters	n4+n6
312 (***)	Width, Diameter or 2nd Dimension, Meters	n4+n6
313 (***)	Depth, Thickness, Height or 3rd Dimension, Meters	n4+n6
314 (***)	Area, Square Meters	n4+n6
315 (***)	Volume, Liters	n4+n6
316 (***)	Volume, Cubic Meters	n4+n6
320 (***)	Net Weight, Pounds	n4+n6
330 (***)	Gross Weight-Kilograms	n4+n6
331 (***)	Length or 1st Dimension, Logistics	n4+n6
332 (***)	Width, Diameter or 2nd Dimension, Logistics	n4+n6
333 (***)	Depth, Thickness, Height or 3rd Dimension, Meters, Logistics	n4+n6
334 (***)	Area, Square Meters, Logistics	n4+n6
335 (***)	Gross Volume, Liters, Logistics	n4+n6
336 (***)	Gross Volume, Cubic Meters, Logistics	n4+n6
340 (***)	Gross Weight, Pounds	n4+n6
400	Customer's Purchase Order Number	n3+an..30
410	Ship To (Deliver To) Location Code Using EAN-13 or DUNS (Dun & Bradstreet) Number with Leading Zeros	n3+n13
411	Bill To (Invoice To) Location Code Using EAN-13 or DUNS (Dun & Bradstreet) Number with Leading Zeros	n3+n13
412	Purchase From (Location Code of Party from Whom Goods are Purchased)	n3+n13
420	Ship To (Deliver To) Postal Code Within a Single Postal Authority	n3+an..9
421	Ship To (Deliver To) Postal Code With 3-Digit ISO Country Code Prefix	n3+n3+an..9
8001	Roll products - Width, Length, Core Diameter, Direction and Splices	n4+n14
8002	Electronic Serial Number for Cellular Mobile Telephones	n4+an..20
90	Mutually Agreed, Between Trading Partners	n2+an..30
91	Internal-Raw Material, Packaging, Components	n2+an..30
92	Internal-Raw Material, Packaging, Components	n2+an..30
93	Internal-Product Manufacturers	n2+an..30
94	Internal-Product Manufacturers	n2+an..30
95	Internal-Carriers	n2+an..30
96	Internal-Carriers	n2+an..30
97	Internal-Wholesalers	n2+an..30
98	Internal-Retailers	n2+an..30
99	Mutually Defined Text	n2+an..30

(*) : To indicate only year and month, DD must be filled with "00"
(**) : Plus one digit for length indication
(***) : Plus one digit for decimal point indication

Data Value Representation:

a	alphabetic characters	n	numeric characters
an	alpha-numeric characters	a3	3 alphabetic characters, fixed length
n3	3 numeric characters, fixed length	an3	3 alph-numeric characters, fixed length
a..3	up to 3 alphabetic characters	n..3	up to 3 numeric characters
		an..3	up to 3 alpha-numeric characters

CHAPTER 2

STRUCTURING AND PRINTING COMMUNICATIONS USING APPLICATION IDENTIFIERS

2.1 Introduction

The UCC/EAN 128 Application Identifier Standard data are capable of being represented in the form of a bar code symbol. The bar code symbol to be used for this purpose is known as UCC/EAN Code 128.

This chapter is divided into two basic parts:
1. Structuring the communication which discusses placement of the Application Identifiers relative to each other, number of symbols, fixed and variable length AIs, and mixing of ITF and UCC/EAN-128 symbols;
2. Printing the communication which discusses conventions of Code 128 that are employed, symbol tolerances, sizes, substrates, printing processes, and placement advice.

2.2 Structuring the Communication

2.2.1 Application Identifier Order

There are two rules for presentation order in a UCC/EAN-128 communication. (1) the primary identification must be presented first; (2) when the primary ID indicates the contents are variable, a measurement Application Identifier should immediately follow, either in the same UCC/EAN-128 symbol or directly above. Apart from these simple rules, any order is permitted in the communication. The purpose of the "order rule" is to enhance capture and use of the information when more than one Application Identifier is used to convey the communication. It helps very much if the communication begins with the primary identification..."who" and "what" the rest of the information is about (see Appendix A for more information).

2.2.2 Number of Symbols

The fewer symbols used, the more efficient the total symbol size and the more secure data capture will be. It is possible all the information may be supplied in a single symbol. This is the most desirable format. This is also not always possible. Not all the information may be available at time of first printing. More information may be needed than a single symbol can contain. A general rule then, is to minimize the number of individual symbols for a given set of circumstances.

2.2.3 "Fixed" vs "Variable Length" Application Identifiers

AIs come in two general forms: fixed length and variable length. Wherever feasible, the AI has been given a fixed length. Examples include: Measurement data which is always presented in 6 numeric positions and Date data which is also always presented in 6 numeric positions. Variable length fields are specified to allow efficient use of space when the application covers a broad spectrum of potential users and needs. For example, Serial Number supplies the flexibility to use any combination of up to 20 alphanumeric characters. The user is permitted to use as few, or as many characters needed to support unique numbering.

There are three things to consider when selecting a format for "variable length" fields. First, numeric data has a space advantage over alpha data by a factor of two to one. This is because within Code set C of Code 128, two numeric characters can be represented by a single Code 128 codeword (bar code character). Second, numeric data should be used in multiples of two digits for optimum encoding efficiency. Third, it is necessary to "tell" the computer that will use the information exactly where the "end" of the Application Identifier data is. When there is only one "variable length" field, placing this application at the end of the communication will automatically tell the user computer how long the data stream is by virtue of the "stop" character for the symbol. Other situations, such as more than one "Variable Length" field or a "variable length" field not at the end, require a method of telling the user computer where the end of the data is. The device selected for this task is the "Function 1" character (FNC1). Detail on the use of this character is supplied in Section 3.7.

2.2.4 Mixing Interleaved 2 of 5 (ITF) and UCC/EAN-128 Symbols

As stated in Section 1.4.1 the ITF symbol (for primary identification) detailed in the UCC publication, "U.P.C.

Shipping Container Code And Symbol Specification Manual" is not eliminated. It is possible and often desirable to present both the ITF symbol and a UCC/EAN-128 symbol on the same container. (In this case, the UCC/EAN-128 symbol will not start with an "01" application.) There are two things to consider when implementing this option. First, the UCC/EAN-128 symbol bar width should not be less than 75% of the ITF symbol bar width. This will impact the size of the UCC/EAN-128 symbol in both physical length and maximum number of characters that can be encoded in one symbol (see Section 2.3.2 for detail). Second, user environments will, of necessity, require scanning devices that are "autodiscriminating" or capable of reading and processing both ITF and UCC/EAN Code 128 symbologies.

2.2.5 **Putting it All Together**

Upon selection of the (new) applications desired for the communication, an efficient method of structuring the communication is to follow this process:

1. If not already present, decide whether the primary identification number will be represented as an ITF, or UCC/EAN-128 bar code. This determination is made based on a number of factors. For example: the current industry norm of usage, the industry direction, and the cost/benefit of change including systems, labeling, and direct printing alternatives.

2. If the primary identification indicates the contents are variable in nature, select an appropriate measurement application next, if not already present.

3. Review the remaining applications desired, but not already present, and determine how many, if any, are "variable length".

   . If none, skip to step 4.

   . If one, put this at the end of the communication.

   . If more than one, put one of them at the end and plan to use a "Function 1" separating character immediately after each of the other "variable length" fields. Another option is to use multiple symbols placing one "variable length" AI at the end of each symbol.

4. It is now appropriate to add the Code 128 special characters and to determine both the size and number of symbols required to present the information in bar code format (see Section 2.3).

2.3 **PRINTING THE COMMUNICATION**

This section describes the UCC/EAN-128 bar code symbol. This is the only symbol that can be used to represent UCC/EAN-128 Application Identifier Standard data.

2.3.1 **UCC/EAN-128 SYMBOLOGY**

The UCC/EAN-128 bar code symbol has been carefully designed through joint cooperation between the International Article Numbering Association (EAN), the Uniform Code Council, Inc. (UCC), and Automatic Identification Manufacturers (AIM) governing bodies. Use of UCC/EAN-128 symbols provides a high degree of security and distinguishes UCC/EAN Application Identifier Standard data from other standard item codes and from extraneous non-standard symbols.

UCC/EAN-128 is a unique version of Code 128. Code 128 was chosen over other bar code symbologies because of its flexibility, high density, data security, and the existence of a previously reserved subset of Code 128 which could be assigned for this standard.

2.3.1.1 **Code 128 Characteristics**

Code 128 is a variable length bar code. Unlike the existing standard UCC/EAN symbologies, any number of data characters may be encoded and scanned. This is necessary for this standard because variable length data, such as batch or lot number, need to be encoded. The need to combine multiple AIs in a single bar code symbol also requires a variable length capability.

Two numeric digits can be bar coded using code 128 in the space of one alpha character. Additionally Code 128 provides for upper and lower case alpha, punctuation, special function and control characters if the application requires them. This is accomplished through three character sets A, B and C:

Character set A includes all of the standard upper case alphanumeric keyboard characters and special characters.

Character set B includes all of the standard upper

case and lower case characters and special characters.

Character set C enables numeric only data to be encoded with twice the density (two digits per bar coded character) of the other character sets. Character set C also contains special characters.

The start character determines which character set is being used. The character set can be changed within the symbol by use of the special characters: code A, code B, code C, or shift.

The Code 128 character set is shown in Appendix B.

Code 128 has both symbol character self-checking via a parity check and a strong Modulo 103 symbol check character.

The "AIM-USA Uniform Symbology Specification, Code 128" states that the use of the Function 1 character (FNC1) immediately following the start code is reserved exclusively for UCC/EAN use.

2.3.1.2 **The UCC/EAN-128 Subset of Code 128**

Today, many shipping containers already have bar codes applied to them by the manufacturer or distributor for in-house identification and routing. The data encoded in these bar codes can take any form and usually has meaning only within the company or facility where it was applied. Because this "random" data may be mistaken later for an industry standard code format, the UCC and EAN chose a symbology which can be uniquely identified from these other bar codes.

Code 128 is defined with the Function 1 character (FNC1) following the start character as uniquely identifying the symbol as UCC/EAN-128. This allows a scanning system to ignore other symbols which might be on the shipping container.

If the scanning system needs to decode other symbols, the AIM standard Symbology Identifier Prefix should be used. The scanner decoder will transmit an identification prefix message, called a symbology identifier, with every scanned bar code symbol. The three-character prefix "]C1" is assigned to identify UCC/EAN-128. Refer to "AIM USA Guidelines on Symbology Identifiers" for a complete listing of Symbology Identifiers.

The selection of UCC/EAN-128 provides the users of this standard very high security against errors. Not only is the symbology secure against decoding errors, but the system virtually eliminates the possibility of misinterpretation of data from other bar codes as UCC/EAN code format.

2.3.2 **Basic Bar Code Structure For All UCC/EAN-128 Symbols**

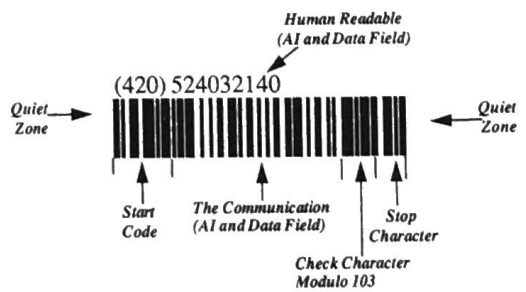
Section 2.2 explained how the communication...the information you wish to convey.... is organized. This section explains how that communication is placed in the bar code... the bar code structure.

All applications based upon the UCC/EAN-128 symbology share a similar bar code structure. Each UCC/EAN-128 bar code is composed of five (5) structural elements:

1. The Start Code
2. The Communication (AI and data)
3. The Symbol Check Character
4. The Stop Character
5. The Quiet Zones

This structure is shown in Figure 2.1.

Figure 2.1



2.3.2.1 **Start Code**

The UCC/EAN-128 symbology has a 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 generalized Code 128 symbols specified by AIM.

In other words, a Code 128 symbol which begins with one of the UCC/EAN-128 double character start patterns is always a UCC/EAN standard bar code; a Code 128 symbol which does not begin with such a start pattern is never a UCC/EAN bar code.

Start A, FNC 1 begins the UCC/EAN-128 data encodation according to character set A.

Start B, FNC 1 begins the UCC/EAN-128 data encodation according to character set B.

Start C, FNC 1 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.

Most printers will generate a start character A,B, or C automatically. The choice of start characters is made to minimize the length of the bar code. Most current printers require the application to specify the FNC1 in the position following the start character. It is not automatically supplied. Once done, the double character start code is complete.

Further advice on the choice of start patterns is given in the "AIM-USA Uniform Symbology Specification, Code 128".

2.3.2.2 **Communication (AI and data)**

This section contains either a single AI or multiple AIs and their associated data fields which are to be assembled using the guidelines established in Section 2.2. The code 128 character set which will be used to encode the data is shown in Appendix B.

In addition to being encoded in the bar code, these characters must also be shown in human readable form underneath or above the bar code as defined in Section 2.3.3.

2.3.2.3 **Check Character**

The bar code always incorporates a symbol check character which is not part of the data and is in addition to any check characters used in the data.

This Modulo 103 symbol check character is always included in the bar code immediately preceding the stop character. The symbol check character is calculated by the Modulo 103 algorithm from all the characters in the symbol except the stop character (but including the start character). Most printers automatically calculate the Modulo 103 check character. The Modulo 103 algorithm is described in the "AIM-USA Uniform Symbology Specification, Code 128"."

2.3.2.4 **Stop Character**

The stop character is always the last encoded character in the UCC/EAN-128 bar code. The same stop character is used to conclude all UCC/EAN-128 bar codes.

2.3.2.5 **Quiet Zones**

The quiet zones are areas free and clear of all printing preceding the start character and following the stop character.

The quiet zone or clear area preceding and following the bar code shall be at least 10 times the "X" dimension. The height of the quiet zone shall equal the height of the bar code.

2.3.3 **Human Readable Characters**

The human readable translation of the data in the bar code (Section 2.3.2.2) must be shown above or below the bar code symbol. The symbol check character, the start character, the FNC1 character, and the stop character are not part of the data and are 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 and must be obviously associated with the symbol.

While not part of the application data, AIs should be clearly recognizable to facilitate key entry. Separation of the AIs with the use of parentheses is the convention chosen to accomplish this.

The "Application Specification for the UCC/EAN-128 Serial Shipping Container Code", and the "UCC Universal Product Code: Industrial and Commercial Guidelines", give specific guidelines to be followed.

2.3.4 SYMBOLOGY CONSIDERATIONS

2.3.4.1 Concatenation

Multiple AIs and their data fields can be efficiently combined (concatenated) into a single bar code. When the first two characters of the AI correspond to a pre-defined length indicator (see section 3.5), no field separator is required. The next AI follows immediately after the last character in the data field of the previous AI. A variable length data field must be immediately followed by a field separator character, unless it is the last field in the bar code symbol. The Function 1 character is used as the field separator.

Example: Application Identifier A1 identifies a fixed length string of data called data1, A2 and A3 identify variable length fields respectively called data..2 and data..3. F1 is the Function 1 character.

* A1 and A2: | A1 | data1 | A2 | data..2 |

* A2 and A3: | A2 | data..2 | F1 | A3 | data..3 |

* A1,A2,A3: | A1 | data1 | A2 | data..2 | F1 | A3 | data..3 |

Note: When multiple AIs and their fields must be concatenated and when only one of them is of variable length, it is recommended to locate it at the end of the symbol. No separator character is then required.

2.3.4.2 Maximum Symbol Length

Two parameters have to be taken into consideration for defining the maximum length of an UCC/EAN-128 symbol:

(1) the physical length which depends on the number of characters encoded and the bar width (X dimension);

(2) the number of data characters encoded excluding the start, stop, and symbol check characters;

The maximum length of any UCC/EAN-128 symbol must be within the following limits:

* The physical length cannot exceed 6.5 inches.

* The maximum number of encoded data characters including the AIs and any FNC1 characters used for field separators, but excluding the start, stop and symbol check characters, is 48. Each numeric digit counts as one data character.

2.3.4.3 Symbol Length

For a given length of data, the symbol size is variable between limits in bar widths to accommodate the ranges in quality achievable by the various printing processes.

The X dimension, or narrow bar width, may range from 10 mils (.010 inch) to 48 mils (.048 inch) with a fixed X dimension remaining constant for a given symbol. Restrictions may be placed on the X dimension range by the scanning application or printing process.

Note: For metric equipment the EAN specified X dimension range from 0.25mm to 1.2mm should be used.

The size of the UCC/EAN-128 bar code symbol depends on three factors:

(1) the X dimension chosen; this will be between 10 mils and 48 mils, depending on the print quality and label size available;

(2) the number of characters encoded.

(3) the number of non-numeric characters in the data.

The formula for calculating the minimum symbol length (L) including quiet zones is:

$$L = (11N + 66)(X)$$

Where:

X = the narrow bar width;

N = the number of symbol characters including code A, code B, code C, shift, and FNC1 separator characters embedded in the data. In character set C, two numeric digits are encoded in one symbol character.

The start code, stop character, the symbol check character, and the quiet zones are accounted for in the constant value "66".

In character set C, two numeric digits are encoded in one data character.

Examples of the symbol length at various X dimensions are given in Appendices C and D.

The minimum X dimension to be used depends on the print quality.

For the serial shipping container code with application identifier 00, the minimum X dimension is 20 mils (.020 inch) and the maximum X dimension is 40 mils (.040 inch).

2.3.4.4 **Symbol Height**

The symbol height is determined by the application environment. The symbol height should be 15% of the symbol length or 0.50 inch, whichever is greater. At no time must the height be less than 0.20 inches. The guidelines based on the "Application Specification for the UCC/EAN-128 Serial Shipping Container Code" are shown in Appendix C.

2.3.5 UCC/EAN-128 SYMBOL GENERATION

Code 128 is easy to print because of its edge-to-edge decoding. This means that each character is decoded using a set of measurements from the leading or trailing edge of a bar, to the similar edge of the adjacent bar. This decoding method makes it very tolerant of uniform printing errors. For on-line printing systems, most of the dimensional error produced for bar codes is attributed to uniform printing errors. These errors include ink spread, dot-matrix printer dot overlap, laser printer printing too light or dark, and thermal print head heat maladjustment. An exception is the non-uniform edge error caused by surface ripples when printing directly on corrugated containers. ITF symbology provides a greater print tolerance for this error.

UCC/EAN-128 bar code symbols will sometimes be incorporated into a package design by the packaging supplier. In these circumstances the symbol can be produced using printing plates prepared from a film master.

Frequently, however, the code represented by the UCC/EAN-128 bar code symbol will be applied by the product manufacturer in a production/packaging plant or a warehouse. In these circumstances, the UCC/EAN-128 bar code symbol may be printed onto a label or directly onto the packaging using equipment which converts key-entered data directly into bar code format.

2.3.5.1 **Substrates**

The UCC-128 symbology is to be printed upon substrate that preserves the optical specifications as described in the "AIM-USA Uniform Symbology Specification, Code 128". Typically, white label stock as is commonly used for bar code generation is suitable providing it is not glossy (causing mirror-like [specular] reflections), nor prone to smearing, smudging, etc.

UCC/EAN-128 is attached to a wide variety of shipping containers ranging from small cartons to pallets. As such, label degradation effects due to handling and abrasion during shipping warrant consideration. The durability of the print process as well as that of the label stock should be addressed. Select that which is most durable or take protective measures such as the application of uniform optically pure overlays over the symbol.

2.3.5.2 **Printing Processes**

A wide variety of printing processes are possible providing they meet or exceed specification requirements and achieve the required degree of durability. Consult with your equipment suppliers before purchase to ensure that UCC/EAN-128 application compliance is achieved. The symbols must satisfy optical specifications for the spectral band centered at 633 nanometers (visible red). Refer to the "AIM-USA Uniform Symbology Specification, Code 128" for more information.

For all printing processes, it is strongly recommended that the symbols be tested to ensure that they meet specification requirements. This testing should be thoroughly accomplished and then later the symbols

should be intermittently tested, based upon your own requirements, to consistently ensure compliance with UCC/EAN-128 application specifications.

2.3.5.3 Symbol Location

The preferred location for the UCC/EAN-128 supplementary bar code is on the same horizontal plane as the bar code containing the primary item identification. The supplementary symbol(s) should be as close as possible to the main symbol and must not interfere with the quiet zones.

Supplementary symbols should be oriented in the same direction as the main symbol.

For the serial shipping container code and any UCC/EAN-128 code and symbol that is "stand-alone", i.e., not supplemental to any other symbol, the location is as follows:

. Location recommendations for the serial shipping container symbol are found in the "Application Specification for the UCC/EAN-128 Serial Shipping Container Code".

. Concatenated symbols (reference section 2.3.4.1) must follow the placement recommendations defined for the primary product identifier code.

CHAPTER 3

CAPTURE OF THE COMMUNICATION

3.1 Introduction

Previous chapters detail construction and printing of a communication. This chapter will concentrate on capture of the information with suggestions on computer systems design.

The UCC/EAN-128 Application Identifier system of inter-industry/global communication is an "open coding" system. Prefacing the communication with primary product identification has the value of leveraging existing global standards that supply uniqueness to identification of the product. Adoption of global standardization for Application Identifier numbering, definition and format permits full exploitation of the communication process in an efficient manner. Any company, in any industry, at any stage of product manufacturing/distribution can use the system to minimize redundancy of data expression and collection.

An underlying philosophy of the UCC/EAN-128 Application Identifier system is that it is more efficient to capture all information at the point of scan, and to determine what information is useful at this particular point of data capture, within the security of the computer system. This avoids the need for regulated data placement, and improves the flexibility and efficiency of communication. It also minimizes potential for human error in selection and capture of appropriate data that may not be logically linked. In other words, capturing all the data and discarding what isn't needed rather than trying to restrict capture of the information, is more efficient overall.

3.2 Point of Scan

The symbol is designed to be read bidirectionally by fixed or portable scanners.

Several types of devices are presently available for scanning bar codes. Many of these have capability to read and process more than one symbology. These are generally called "autodiscriminating" devices. Among the types of devices are:

1. wand or pen type devices;
2. hand-held or gun type devices;
3. fixed position or stationary type devices.

The best device for any single application is primarily a function of the type of data to be captured, the number of symbologies encountered in the situation, the environment present at scanning, and economics of the situation. A high degree of quality in both the printing and scanning devices is necessary for effective use of any information system, whether the information will be used internally or externally. As the quantity of information communicated increases, so does the need for quality. Systems that will be designed around capture of information are only as good as the information supplied to the system. Value is proportional to quality in this sense. It may be beneficial to evaluate originator/user considerations throughout the normal product cycle for a given type of good. For example, an end user of a product may find that originators need the option to manually place bar codes on an item and decide that it is more economical to increase the tolerance at scanning than to force a high degree of tolerance at application. This might lead to selection of a "raster" option for fixed or stationary type scanning devices as a "best solution" for the situation.

3.3 System Considerations for Using the AI Coding Structure

Wherever possible, the AIs and fixed field lengths have been chosen to result in an even number of numeric characters. This reduces the length of the symbol, as UCC/EAN-128 can pack a pair of digits into one symbol character.

Although UCC/EAN-128 can encode any length alphanumeric field, AI fields will take up less space if they are all numeric and have an even number of digits. For example, when batch numbers are assigned, even length numeric batch numbers should be selected to produce the shortest bar code symbol. Existing batch numbers with alphabetic characters which represent plant or production lines could be changed to represent the alphabetic character with one or two digits. A leading zero could be appended to an odd length batch number to make it even. Note that AIs with three digit identifiers, such as purchase order number, will require an odd number of data digits to produce an even length field.

Systems which use the UCC and EAN standard bar codes should program the bar code decoders to recognize UPC-A and UPC-E, EAN-13 and EAN-8,

14-digit ITF, and UCC/EAN-128. If the 6-digit shipping container supplement is required, 6-digit ITF should be enabled. If other bar codes are used in the system, those symbologies and specific data lengths should be enabled.

The symbology identifier prefix]C1 shall be used to identify the bar code symbol being read. UCC/EAN-128 symbols must be further processed to identify the encoded data fields through their respective AI.

3.4 AI Processing Software

Application Identifiers identify either a variable or a fixed length field.

When several AIs and their data field are concatenated into one symbol, each variable length field must be followed by the FNC 1 character, unless it is the last field encoded in the symbol. The scan decoder will transmit a group separator "GS" character (decimal ASCII 29) to represent the FNC1 as a field separator in the output data stream. The FNC1 character is transmitted to the application as a "GS" only when it is used as a field separator.

Fixed length fields can be combined without requiring a field separator. The next AI follows immediately after the last character in the data field of the previous AI. The length of the fixed length AI is determined by accessing a table of pre-defined length indicators as described in section 3.5.

3.5 Fixed Length Indicators

Provision has been made for fixed length fields which will be allocated in the future. A table of indicators identifying the predefined fixed length field (Table 3.1) has been defined. The table is permanent and will not change. The table contains both currently defined fixed length AIs and those which will be assigned in the future. This allows decoding software to be programmed independently of any future additional release of Application Identifiers.

This table must always be included in the processing software.

The table specifies the length of the data string including the AI and the data following the AI. The picture of the data fields is not pre-defined in the table. Data fields can be numeric, alphanumeric or alphabetic.

Table 3.1 Pre Defined Length Indicators

2-Digit Indicator	String Length
00	20
01	16
02	16
03	16
04	18
11	8
12	8
13	8
14	8
15	8
16	8
17	8
18	8
19	8
20	4
31	10
32	10
33	10
34	10
35	10
36	10
41	16

Application Identifier 23 presents a special case. The first digit following AI 23 indicates the length of the data string. No separator character is thus required after AI 23 and its data field.

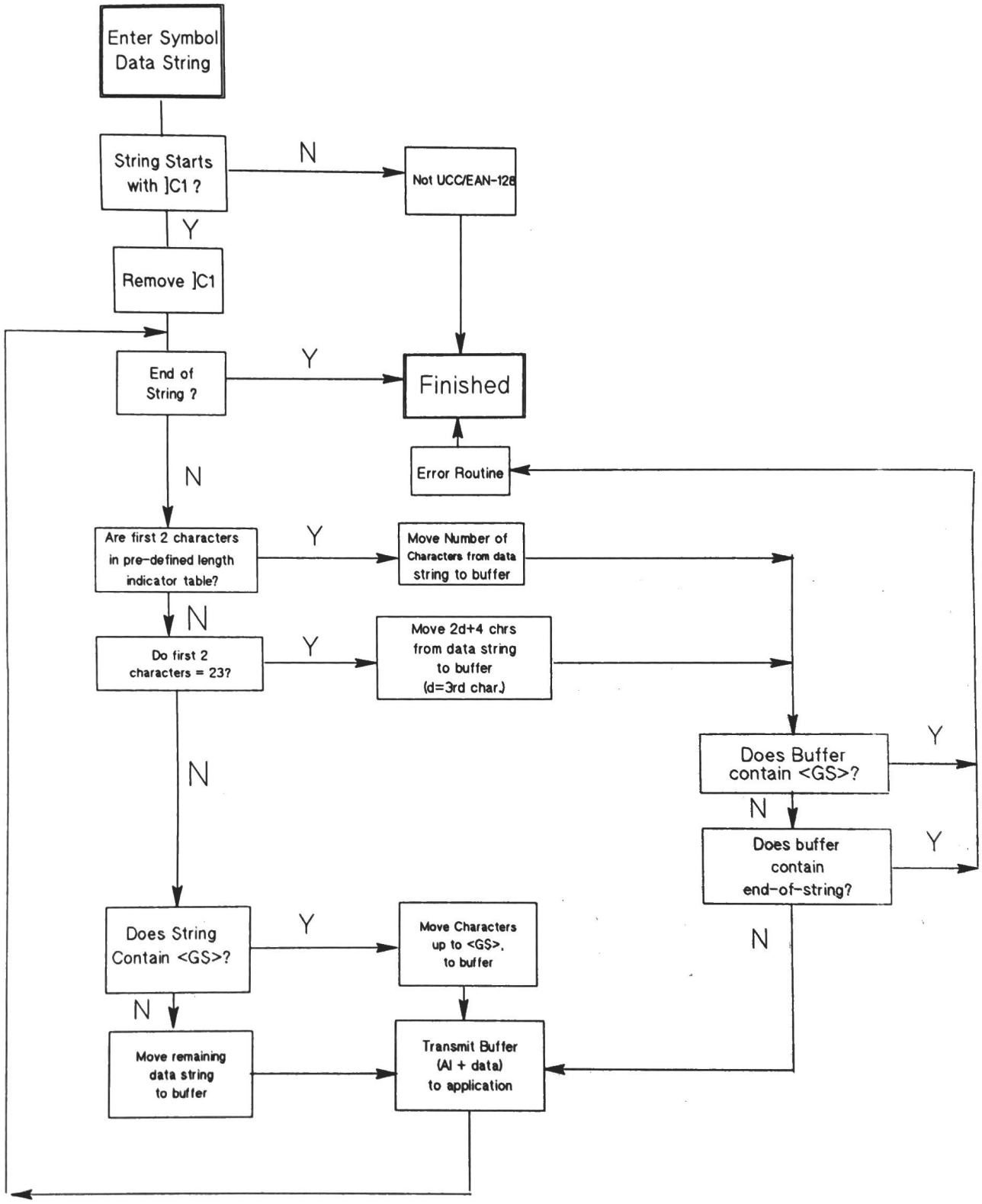
3.5.1 Future Application Identifiers

The "predefined length indicators table" is permanent and will not change. New Application Identifiers not in this table will always be treated as "variable length" fields. As such, they will require placement last, or use of a FNC1 separator character to determine the length of the field.

3.5.2 User Application AIs

In addition to the "predefined length indicators table" described above, users need to define a table of AIs required by their applications. This will allow users to decide individually whether or not to add a new AI to their system.

TABLE 3.2 DECODING SOFTWARE FLOWCHART -- BASIC REQUIRED LOGIC



This flowchart represents the basic required logic for processing one string of data coming from a UCC/EAN-128 symbol. It may not be the optimum software implementation. It assumes the scanner provides]C1 to identify UCC/EAN-128 and <GS> (ASCII 29) for any FNC 1 symbol characters following the FNC 1 in the first symbol character position after the start character.

3.6 Scanner/Decoder

The functions of the scanner/decoder include the following:

- Read the symbol, identify Code 128, decode the symbol;
- Verify symbol integrity by modulo 103 check character;
- Create symbology identification: Start C + FNC 1 =]C1;
- Translate FNC 1 separator characters into <GS>;
- Format the symbol data string;
- Transmit the symbol data string to the symbol input processing software of the computer.

3.7 Symbol Input Processing

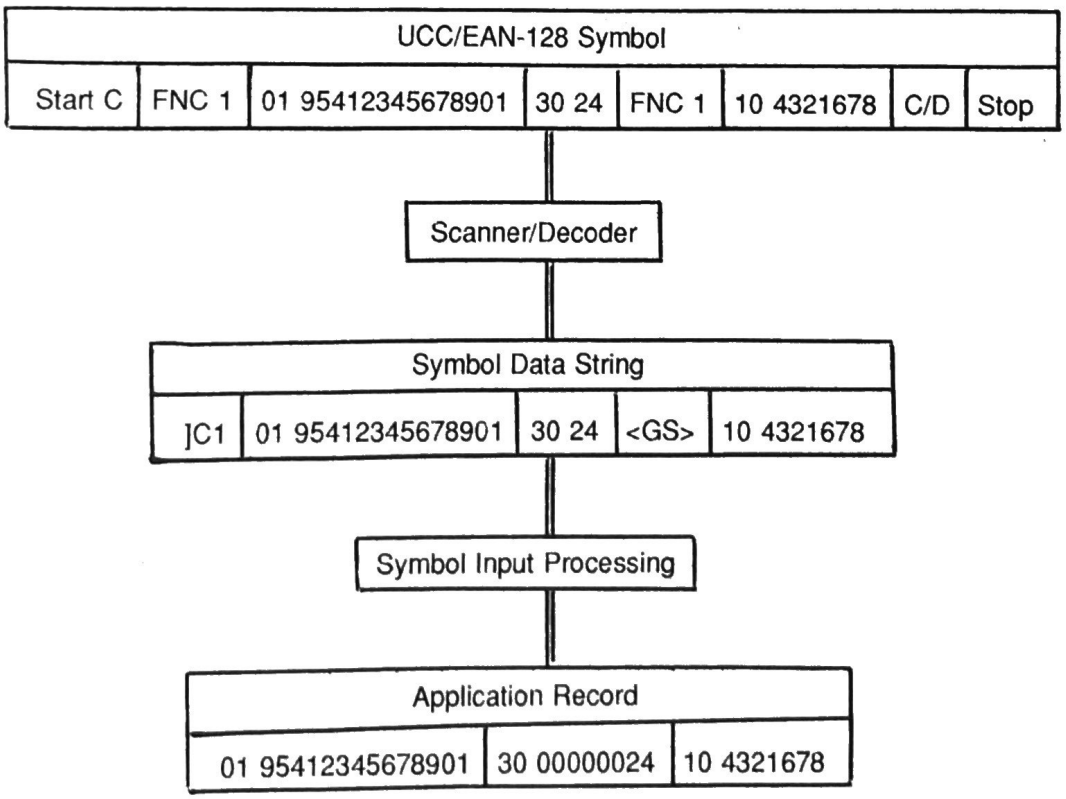
The functions of the symbol input processing software include the following:

- Verify that symbology is EAN-128 by checking the symbology identifier]C1;
- Separate AIs in symbol data string using predefined length indicator table (3.1) and "GS" separator;
- Pass each AI and its data field to the application processing software.

A decoding software flowchart is provided in Table 3.2

Figure 3.1 illustrates the data flow from a sample symbol containing a product ID, a quantity and a batch number through the scanner/decoder to a computer ready for application processing.

Figure 3.1 Data Flow



NOTE: Separators and spaces are shown for ease of reading.

APPENDIX A

The Use of AIs in the Pharmaceutical Industry

The application of bar codes in the pharmaceutical industry includes raw material and pharmaceutical manufacturers, wholesale drug distributors, retail pharmacies and hospitals.

The pharmaceutical industry uses bar codes to identify product number, lot number, quantity and expiration date for raw materials, production batch number during manufacturing, product number and purchase order during distribution, and product number in the retail pharmacy or hospital.

The raw material manufacturers use the batch record number (lot number) to track products through the manufacturing of the raw material. When the finished raw material product is placed in containers, the containers are labelled with the UPC/EAN product number, the lot number, the expiration date and the net weight of the product. This bar code is used for production accounting and in the finished goods warehouse for put-away verification or random location recording, inventory cycle counting, shipment lot number tracking and verification.

The pharmaceutical manufacturers use the incoming raw material bar codes to maintain the raw material warehouse inventory by product. The manufacturer's lot number is used to ensure that only those lots which have been released by quality control are issued to production. The expiration date is used to release lots to manufacturing in expiration sequence while verifying that no expired raw materials are used.

In pharmaceutical manufacturing, the raw material lot numbers and weights are recorded for the production batch record. Manufacturing in-process bar codes are used to track the batch record number and quantities throughout manufacturing. Product bar codes are applied to unit dose packages and pharmacy stockkeeping units (SKU's) during packaging.

Bar code labels with product, quantity, lot number and expiration date are placed on intermediate packs and shipping containers. The lot number is used by the manufacturer to track production, lot quarantine and release, finished goods inventory and record the lot number of every shipment.

The wholesalers use the product identification bar codes on shipping containers and SKU's for receiving and inventory control. They have requested that the manufacturers place a bar code with their purchase order number on the manifest.

Hospitals use the product bar codes on shipping containers, inner packs and SKU's for inventory tracking. They use the product bar code in the hospital pharmacy for inventory control and cart replenishment. Unit dose product bar codes will soon be scanned at the bedside to verify patient medication.

Retail pharmacies use the product bar code to scan and electronically reorder. Items sold over the counter are scanned at the point-of-sale.

The Use of AIs in the Meat Industry

The application of bar codes in the meat industry includes meat packers with both production and finished goods warehousing, and retailers with distribution centers and retail markets. The industry uses bar codes on shipping containers to identify the product, weight, sell-by-date and shipping container sequence number.

Product bar codes with tare weight and packer identification are placed on shipping containers before they are packed. The packed containers are conveyed past an automatic bar code scanner and a weigh-in-motion scale. As each is scanned and weighed, an on-line label printer prints and applies a bar code label containing the product, net weight, sell-by date, batch number and container sequence number.

The product and packer bar codes scanned in packing are used for production accounting. The bar code labels applied in packing are used in the cooler for inventory tracking, product shipment by sell-by date and shipment verification and billing.

Retailers use the shipment container bar codes for receiving and managing product turn-over by sell-by date. Some retailers place bar code point-of-sale labels on each package with its in-store product code and price to be scanned at the point-of-sale.

The Use of AIs in the Apparel Industry

The application of bar codes in the apparel industry includes textile and apparel manufacturers,

distributors, and general merchandise retailers with both distribution and retail operations.

The apparel industry uses bar codes to identify product number and purchase order number for raw materials, work order or production lot number during manufacturing, and product number and serial shipping container number to identify shipping containers and product code for point-of-sale scanning.

Textile and apparel manufacturers use product code, production batch number, and quantity, weight or length bar codes to track raw materials and production. Intermediate packs can be identified with product bar codes. Finished goods are identified with product number and quantity or dimension bar codes. Shipments to distributors may include a purchase order bar code on the manifest. A ship to zip code or pro number may be placed on each shipping container for use by the carrier for automated package handling.

Distributors scan the product codes on the shipping containers and the purchase orders in receiving. The product numbers on the containers are used to track reserve stock inventory. product codes on intermediate packs can be used for replenishment and picking verification and tracking. Point-of-sale product bar codes are applied during picking or in staging prior to shipment.

Shipping containers are identified with the serial shipping container bar code before it is shipped to the retailer. Prior to shipment, an advance shipment notice is sent to the retailer using EDI. This transmission provides the retailer with the serial shipping container number and the container's detailed contents.

Retailers can order specific container packs from the manufacturer or distributor to fulfill specific store restocking requirements and avoid repacking. The retailer can scan the serial shipping container bar codes at a central distribution center and immediately identify those containers which can be cross-docked to be shipped directly to the store. Other containers that will go into inventory for repack can be immediately identified by content.

The retail store will use the serial shipping container symbol at the back door to identify the receipt. The items with product code labels can go directly to the floor to be scanned at the point-of-sale.

The Use of AIs in the Electrical Equipment Industry

The application of bar codes in the electrical equipment industry includes raw material and equipment manufacturers, electrical distributors, and large end users.

The electrical equipment industry uses bar codes to identify product number, lot number, and quantity/weight/length for raw materials, production batch number and serial number during manufacturing, product code and purchase order during distribution, and purchase order number and product code by end users.

The raw material manufacturers use the manufacturing lot number to track products through the manufacturing of the raw materials. After manufacturing, the materials are labelled with the product code, lot number and quantity/weight/length. The bar code labels are used for finished goods stock location tracking and cycle counting as well as shipment verification.

The electrical equipment manufacturers use bar codes containing the purchase order number and product codes in receiving raw materials. The product codes are used to track the raw material inventory.

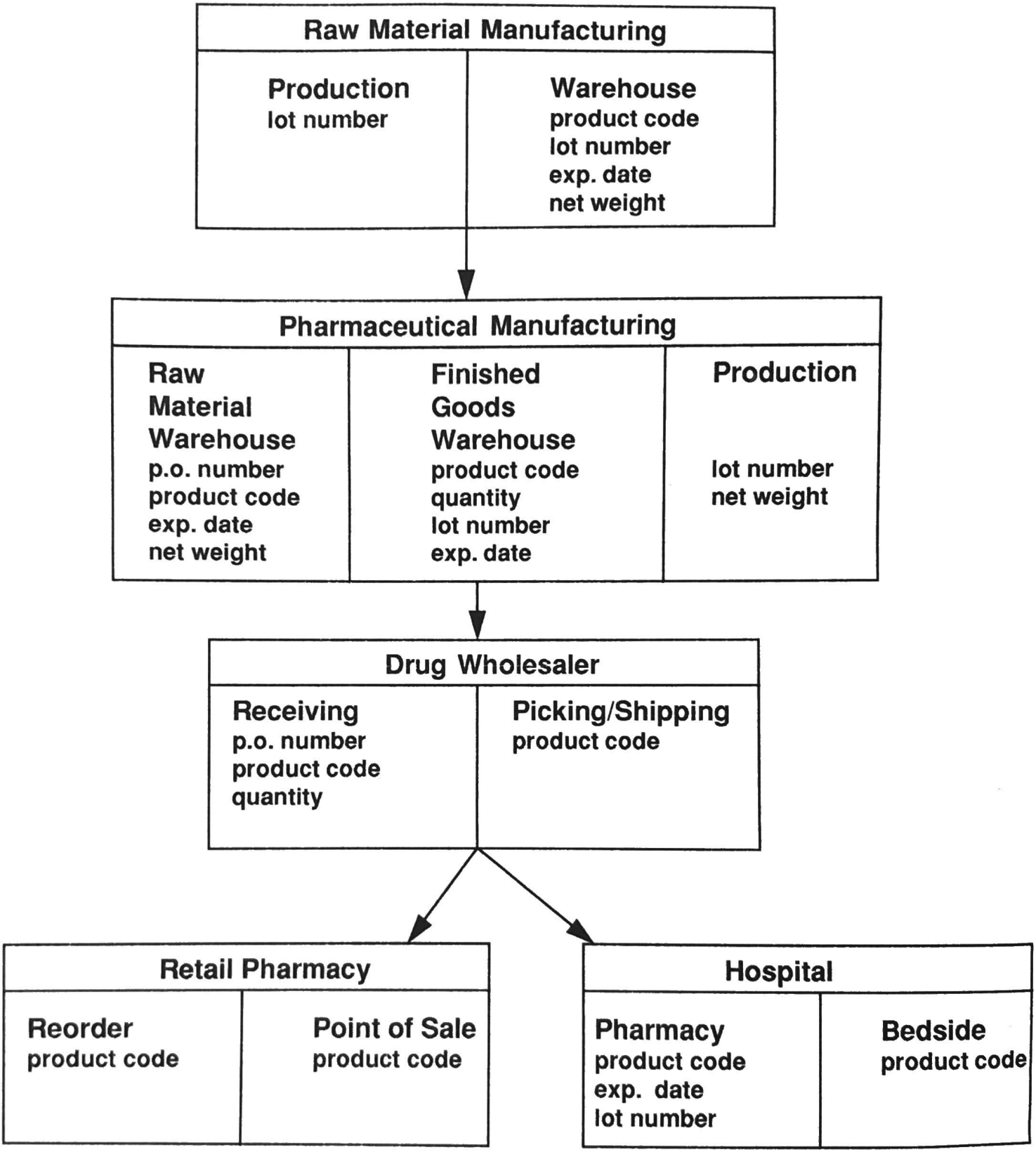
In the manufacturing of the electrical equipment, in-process bar codes are used to track the manufacturing lot number and quantities. Product bar codes and sometimes lot number or serial number bar codes are applied to the finished goods packages.

The product code bar codes are used to track the finished goods inventory and to verify order fulfillment. Some products may require tracking the lot or serial number.

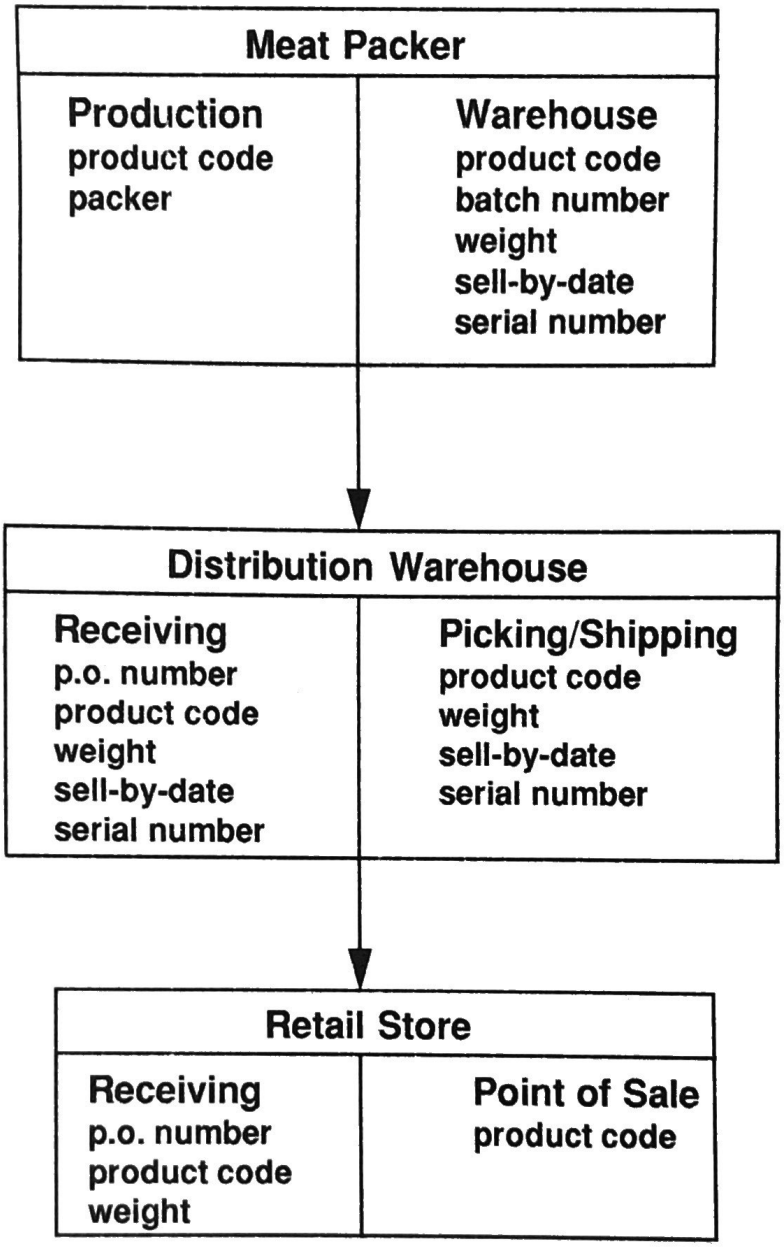
The electrical distributors use the purchase order number and product bar codes in receiving. They also use the product codes for inventory cycle counting.

Large end users will use the purchase order and product bar codes in receiving.

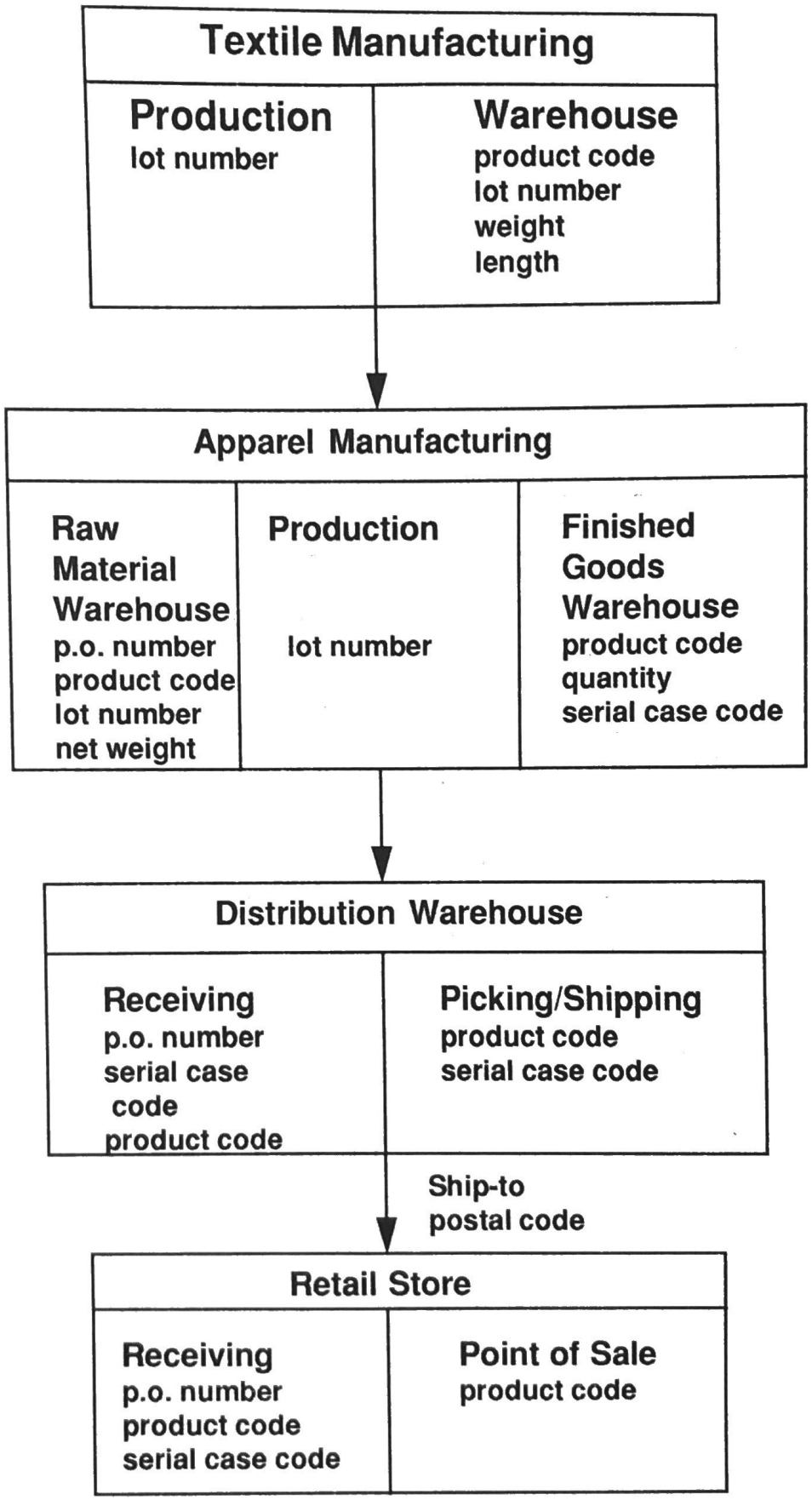
Bar Code use in the Pharmaceutical Industry



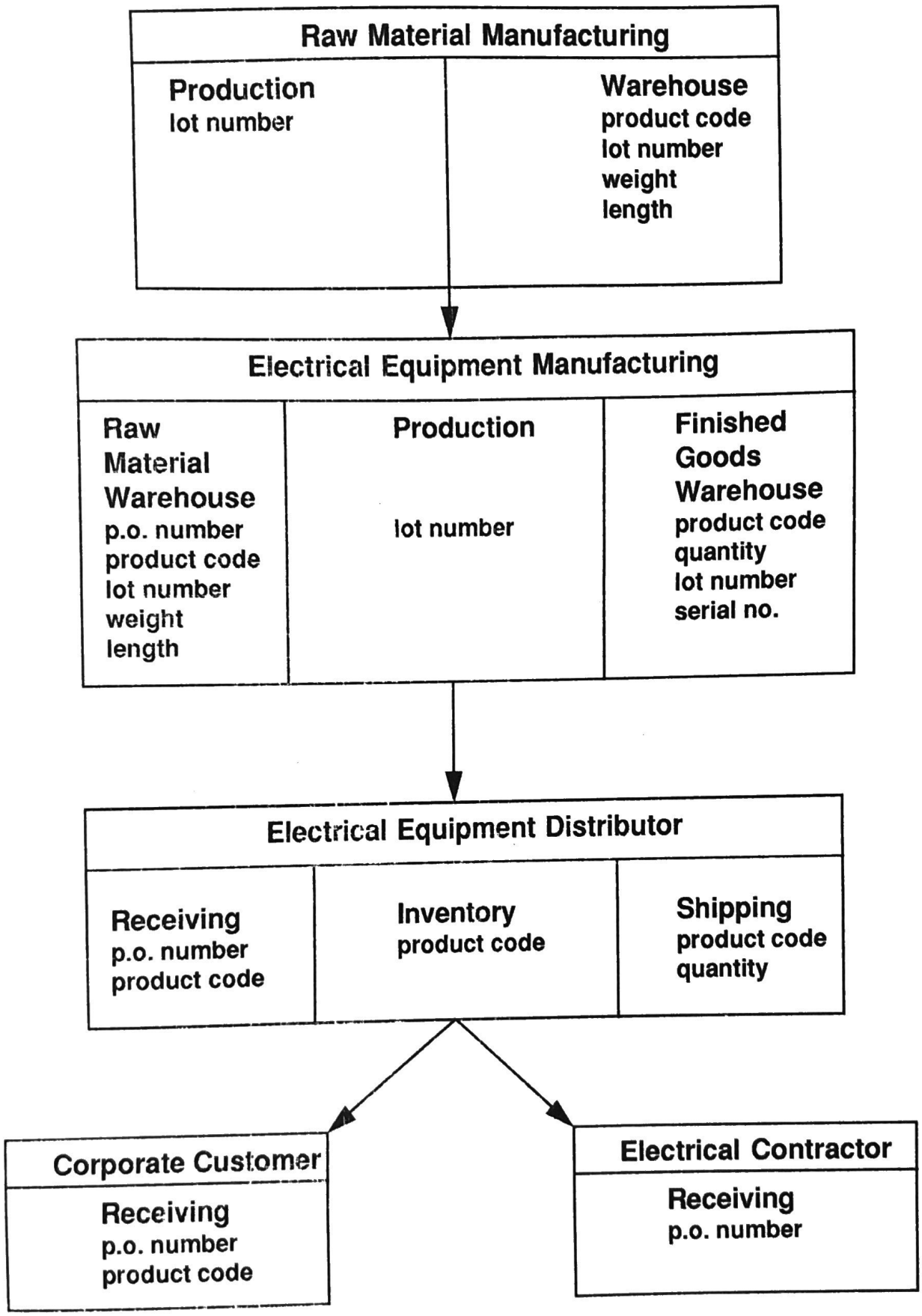
Bar Code Use in the Meat Industry



Bar Code Use in the Apparel Industry



Bar Code Use in Electrical Equipment Industry



APPENDIX B: CODE 128 CHARACTER SET

Value	Code Set A	Code Set B	Code Set C	BAR PATTERN B S B S B S
0	SP	SP	00	2 1 2 2 2 2
1	!	!	01	2 2 2 1 2 2
2	"	"	02	2 2 2 2 2 1
3	#	#	03	1 2 1 2 2 3
4	$	$	04	1 2 1 3 2 2
5	%	%	05	1 3 1 2 2 2
6	&	&	06	1 2 2 2 1 3
7	'	'	07	1 2 2 3 1 2
8	(	(	08	1 3 2 2 1 2
9	)	)	09	2 2 1 2 1 3
10	*	*	10	2 2 1 3 1 2
11	+	+	11	2 3 1 2 1 2
12	,	,	12	1 1 2 2 3 2
13	-	-	13	1 2 2 1 3 2
14	.	.	14	1 2 2 2 3 1
15	/	/	15	1 1 3 2 2 2
16	0	0	16	1 2 3 1 2 2
17	1	1	17	1 2 3 2 2 1
18	2	2	18	2 2 3 2 1 1
19	3	3	19	2 2 1 1 3 2
20	4	4	20	2 2 1 2 3 1
21	5	5	21	2 1 3 2 1 2
22	6	6	22	2 2 3 1 1 2
23	7	7	23	3 1 2 1 3 1
24	8	8	24	3 1 1 2 2 2
25	9	9	25	3 2 1 1 2 2
26	:	:	26	3 2 1 2 2 1
27	;	;	27	3 1 2 2 1 2
28	<	<	28	3 2 2 1 1 2
29	=	=	29	3 2 2 2 1 1
30	>	>	30	2 1 2 1 2 3
31	?	?	31	2 1 2 3 2 1
32	@	@	32	2 3 2 1 2 1
33	A	A	33	1 1 1 3 2 3
34	B	B	34	1 3 1 1 2 3
35	C	C	35	1 3 1 3 2 1
36	D	D	36	1 1 2 3 1 3
37	E	E	37	1 3 2 1 1 3
38	F	F	38	1 3 2 3 1 1
39	G	G	39	2 1 1 3 1 3
40	H	H	40	2 3 1 1 1 3
41	I	I	41	2 3 1 3 1 1
42	J	J	42	1 1 2 1 3 3
43	K	K	43	1 1 2 3 3 1
44	L	L	44	1 3 2 1 3 1
45	M	M	45	1 1 3 1 2 3
46	N	N	46	1 1 3 3 2 1
47	O	O	47	1 3 3 1 2 1
48	P	P	48	3 1 3 1 2 1
49	Q	Q	49	2 1 1 3 3 1
50	R	R	50	2 3 1 1 3 1
51	S	S	51	2 1 3 1 1 3
52	T	T	52	2 1 3 3 1 1
53	U	U	53	2 1 3 1 3 1
54	V	V	54	3 1 1 1 2 3
55	W	W	55	3 1 1 3 2 1
56	X	X	56	3 3 1 1 2 1
57	Y	Y	57	3 1 2 1 1 3
58	Z	Z	58	3 1 2 3 1 1
59	[	[	59	3 3 2 1 1 1
60	\	\	60	3 1 4 1 1 1
61	]	]	61	2 2 1 4 1 1
62	^	^	62	4 3 1 1 1 1
63	_	_	63	1 1 1 2 2 4
64	NUL	`	64	1 1 1 4 2 2
65	SOH	a	65	1 2 1 1 2 4
66	STX	b	66	1 2 1 4 2 1
67	ETX	c	67	1 4 1 1 2 2
68	EOT	d	68	1 4 1 2 2 1
69	ENQ	e	69	1 1 2 2 1 4
70	ACK	f	70	1 1 2 4 1 2
71	BEL	g	71	1 2 2 1 1 4
72	BS	h	72	1 2 2 4 1 1
73	HT	i	73	1 4 2 1 1 2
74	LF	j	74	1 4 2 2 1 1
75	VT	k	75	2 4 1 2 1 1
76	FF	l	76	2 2 1 1 1 4
77	CR	m	77	4 1 3 1 1 1
78	SO	n	78	2 4 1 1 1 2
79	SI	o	79	1 3 4 1 1 1
80	DLE	p	80	1 1 1 2 4 2
81	DC1	q	81	1 2 1 1 4 2
82	DC2	r	82	1 2 1 2 4 1
83	DC3	s	83	1 1 4 2 1 2
84	DC4	t	84	1 2 4 1 1 2
85	NAK	u	85	1 2 4 2 1 1
86	SYN	v	86	4 1 1 2 1 2
87	ETB	w	87	4 2 1 1 1 2
88	CAN	x	88	4 2 1 2 1 1
89	EM	y	89	2 1 2 1 4 1
90	SUB	z	90	2 1 4 1 2 1
91	ESC	{	91	4 1 2 1 2 1
92	FS	|	92	1 1 1 1 4 3
93	GS	}	93	1 1 1 3 4 1
94	RS	~	94	1 3 1 1 4 1
95	US	DEL	95	1 1 4 1 1 3
96	FNC 3	FNC 3	96	1 1 4 3 1 1
97	FNC 2	FNC 2	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	FNC 4	CODE B	1 1 4 1 3 1
101	FNC 4	CODE A	CODE A	3 1 1 1 4 1
102	FNC 1	FNC 1	FNC 1	4 1 1 1 3 1

VAL		B S B S B S
103	START (CODE A)	2 1 1 4 1 2
104	START (CODE B)	2 1 1 2 1 4
105	START (CODE C)	2 1 1 2 3 2

	B S B S B S B
STOP	2 3 3 1 1 1 2

Where : B = Bar and S = Space
For definitions of FNC2 - FNC3 - FNC4 : see USS-128 Specifications.

APPENDIX C: UCC/EAN-128 BAR CODE DIMENSIONS FOR NUMERIC DATA

Number of Digits(*) Including AIs	Dimensions (in inches) including Quite Zones						
	.010**	.016**	.020**	.024**	.032**	.040**	.048**
4	.88	1.41	1.76	2.11	2.82	3.52	4.22
6	.99	1.58	1.98	2.38	3.17	3.96	4.75
8	1.1	1.76	2.20	2.64	3.52	4.40	5.28
10	1.21	1.94	2.42	2.90	3.87	4.84	5.81
12	1.32	2.11	2.64	3.17	4.22	5.28	6.34
16	1.54	2.46	3.08	3.70	4.93	6.16	-
20	1.76	2.82	3.52	4.22	5.63	-	-
30	2.31	3.70	4.62	5.54	-	-	-
Symbol Ht. (inches)	0.5	0.5	1.0	1.0	1.00	1.25	1.50

* Remember that two digits are encoded per character in the all numeric mode (Subset C).

** X dimension or narrow bar

Note 1: Bar Code Length for other numbers of encoded digits can be calculated using the formula in Section 2.3.4.3

Note 2: X dimension from 20 to 40 mils (.020 to .040 inch) recommended for automated handling scan environments.

Note 3: X dimension minimum of 10 mils (.010 inch) recommended for hand-held scanners.

APPENDIX D: UCC/EAN-128 BAR CODE DIMENSIONS FOR ALPHABETIC DATA

Number of Digits Including Identifier	Dimensions (in inches) including Quite Zones						
	.010*	.016*	.020*	.024*	.032*	.040*	.048*
4	1.10	1.76	2.20	2.64	3.52	4.40	5.28
6	1.32	2.11	2.64	3.17	4.22	5.28	6.34
8	1.54	2.46	3.08	3.70	4.93	6.16	-
10	1.76	2.82	3.52	4.22	5.63	-	-
12	1.98	3.17	3.96	4.75	6.34	-	-
16	2.42	3.87	4.84	5.81	-	-	-
20	2.86	4.58	5.72	-	-	-	-
30	3.96	6.34	-	-	-	-	-
Symbol Ht. (inches)	0.5	0.5	1.05	1.25	1.25	1.25	1.50

* - X dimension or narrow bar

Note 1: One Code A or Code B character has been included in these calculations. If more Code A, Code B, Code C shift or FNC1 separator characters are used, the symbol width will be larger.

Note 2: Widths for other numbers of encoded characters can be calculated using the formula in Section 2.3.4.3

Note 3: X dimension from 20 to 40 mils (.020 to .040 inch) recommended for automated handling scan environments.

Note 4: X dimension minimum of 10 mils (.010 inch) recommended for hand-held scanners.