CEA Standard

Product and Packaging Bar Code Standard

CEA-621-A

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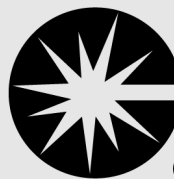
⊛ CEA
Consumer Electronics Association

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(From Project Number 2035, formulated under the cognizance of the CEA R9 Automatic Data Capture Committee .)

CONTENTS

FOREWORD

This standard was developed under the auspices of the Consumer Electronics Association (CEA) R9 Automatic Data Capture Committee.

CEA-6212-A supersedes EIA-621.

> NOTE—In 2003, CEA redesignated EIA/CEA standards and bulletins, and those EIA standards under CEA auspices, as CEA standards or bulletins, respectively. Please see http://global.ihs.com for the most recent designation.

This document is intended to provide a specification for marking products and sales packaging for the consumer electronics manufacturing industry when their products are sold through the retail channel of distribution. The symbologies, data encodation scheme and bar code formats specified were as a result of influence from EAN.UCC standards used by the retail industry.   This document was developed under the direction of the CEA R9 Automatic Data Capture Committee.

The reader should be aware of the existence of EIA-802 "Product Marking Standard", EIA 624-A "Product Package Bar Code Label", and EIA-556-B –"Outer Shipping Container Label Standard." These Standards are primarily intended for use by trading partners in manufacturing, distribution, industrial and other non-retail commercial applications.

1 Scope

The purpose of this standard is to assist manufacturers of consumer electronics in properly applying bar code symbols to products that will move through the retail channel of distribution to the ultimate consumer. EAN/UPC bar code symbols are being accepted worldwide for point-of-sale data capture by retailers. These bar codes uniquely identify the manufacturer and the product at the Stock Keeping Unit (SKU) level. Products marked per this Standard shall also comply with the product marking requirements in Section 7 of EIA-802 "Product Marking Standard".

There is further need to identify some consumer electronics products uniquely by means of a serial number. Use of a serial number for a given product is at the discretion of the manufacturer. Bar code marking of a product's serial number can assist manufacturers and retailers in areas such as:

- Manufacturer distribution inventory control
- Packing slips and invoices generated with SKU and serial number for inventory flooring, transport pilferage reporting, etc.
- Dealer receiving inventory control
- Warranty control and reporting
- Automated warranty establishment
- Service contracts
- Serial number control of rental equipment
- Retail invoices generated with SKU and serial number for warranty or insurance claims
- Warranty claim forms generated with SKU and serial number
- Verifying revision level of equipment for servicing purposes

This standard applies to the use of the EAN/UPC bar code symbol on consumer electronics products, and the sales packaging used for containing and displaying the product on the retailer's shelf/counter.

If the product has a serial number, this standard applies to the use of a bar code symbol to encode the item serial number on consumer electronics products and on the sales packaging used for containing and displaying the product on the retailer's shelf/counter.

If the product has an interior service number or secondary serial number, this standard applies to the use of a bar code symbol to encode an interior service number (secondary serial number) that is different from the item serial number seen on the outside of the product and the sales packaging used for containing and displaying the product on the retailer's shelf/counter.

This standard applies to the use of a bar code symbol to encode an electronic serial number used for a cellular mobile telephone (CMT).

2 References

2.1 Normative References

The following standards contain provisions that, through reference in this text, constitute normative provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Section 2.1.

2.1.1 Normative Reference List

"General EAN.UCC Specifications"

"U.P.C. Bulletin #2" -- June 1989

"U.P.C. Symbol Specification Manual" -- January 1986 (Reprinted October 1987)

"U.P.C. Marking Guidelines For General Merchandise And Apparel" -- January 1989

ANSI/MH10.8.2 – "Data Application Identifier Standard"

ISO/IEC 15416 - Information technology -- Automatic identification and data capture techniques -- Bar code print quality test specification -- Linear symbols

ISO/IEC 15424 - Information technology -- Automatic identification and data capture techniques -- Data Carrier Identifiers (including Symbology Identifiers)

ISO/IEC 15417 - Information Technology - Automatic identification and data capture techniques - Bar code symbology specification - Code 128

ISO/IEC 15418 – EAN.UCC Application Identifiers and FACT Data Identifiers and Maintenance

ISO/IEC 16388 Information Technology - Automatic identification and data capture techniques - Bar code symbology specification - Code 39

Military Specification, MIL-L-61002, Labels, Pressure-Sensitive Adhesive, for Bar Codes and Other Markings, 15 June 1990 [MIL-L-61002, Labels, Pressure Sensitive Adhesive, for Bar Codes and Other Marking - Amended 10/01/1992]

2.1.2 Normative Reference Acquisition
ANSI/EIA/CEA Standards:
- Global Engineering Documents, World Headquarters, 15 Inverness Way East, Englewood, CO USA 80112-5776; Phone 800-854-7179; Fax 303-397-2740; Internet http://global.ihs.com; Email global@ihs.com

ISO/IEC Standards:
- Global Engineering Documents, World Headquarters, 15 Inverness Way East, Englewood, CO USA 80112-5776; Phone 800-854-7179; Fax 303-397-2740; Internet http://global.ihs.com; Email global@ihs.com

- IEC Central Office, 3, rue de Varembe, PO Box 131, CH-1211 Geneva 20, Switzerland; Phone +41 22 919 02 11; Fax +41 22 919 03 00; Internet http://www.iec.ch; Email pubinfor@iec.ch

- International Organization for Standardization (ISO), 1, rue de Varembé, Case Postale 56 CH-1211 Geneva 20, Switzerland; Phone +41 22.749.01.11; Internet www.ISO.org

Military Specification
- Standardization Documents Order Desk, Internet www.dodait.com

UCC/UPC Standards
- Uniform Code Council, Inc., 7887 Washington Village Drive, Suite 300, Dayton, OH 45459; Phone +1 937.435.3870, Internet http://www.uc-council.org/

- EAN - International (EAN), 145 rue Royale, B-1000 Belgium; Phone +32 2.227.10.20; Internet http://www.ean-int.org/index800.html

3 Definitions

<u>alphanumeric</u> - The character set that contains letters, numbers and may contain other characters such as punctuation marks or control characters.

<u>ANSI</u> - The American National Standards Institute. A non-governmental organization responsible for the development of voluntary industry standards.

<u>Application Identifier (AI)</u> - A prefix used by EAN.UCC to define bar code data fields. Each AI uniquely identifies the meaning and format of the data field following it.

<u>bar</u> - The darker element of a printed bar code symbol.

<u>bar code</u> - An array of parallel rectangular bars and spaces that together represent data elements in a particular bar code symbology.

<u>bar code character</u> - A single group of bars and spaces that represent an individual number, letter, punctuation mark or other symbol.

<u>bar code density</u> - The number of data characters that can be represented in a linear unit of measure. Bar code density is often expressed in characters per inch (CPI). CPI is a function of the "X" dimension, element width ratio and intercharacter gap.

<u>bar code label</u> - A label that carries a bar code symbol and is suitable to be affixed to an article.

<u>bar code reader or scanner</u> - A device used for machine reading of a bar code. Readers may employ handheld wands, fixed optical beams, moving laser beams or handheld moving beams. (See "scanner.")

<u>bar code symbol</u> – The bar code symbol is an array of rectangular bars and spaces that are arranged in a pre-determined pattern following specific rules to represent elements of data that are referred to as characters. A bar code symbol typically contains a leading quiet zone, start character, data characters (s), including a check character (if any), stop character, and a trailing quiet zone.

<u>bar height</u> - The bar dimension perpendicular to the bar width.

<u>bar width</u> - The perpendicular distance across a bar measured from a point on one edge to a point on the opposite edge. Each point will be defined as having a reflectance that is 50 percent of the difference between the background and bar reflectances.

<u>character</u> - In a bar code symbol, a character is the smallest group of elements that represent one or more numbers, letters, punctuation marks, or other information.

<u>check character</u> - A character included within a bar code message whose value is used for the purpose of performing a mathematical check to ensure the accuracy of that message.

<u>check digit</u> - See "check character."

<u>clear area</u> - See "quiet zone."

<u>Code 39</u> – For the purposes of this Standard, Code 39 (also known as "Code 3 of 9") means the symbology as specified by ISO/IEC 16388.

<u>Code 128</u> - For the purposes of this Standard, Code 128 means the symbology as specified by ISO/IEC 15417

CMT - Cellular mobile telephone.

CPI - Characters per inch (see "bar code density").

EAN-International– EAN International, based in Brussels, Belgium, is an organization of EAN Member Organizations that manages the EAN.UCC System.

EAN.UCC Application Identifier - See "Application Identifier."

electronic serial number (ESN) - When used for the cellular mobile telephone, the ESN is an 8-digit, hexadecimal number, (or the equivalent 11-digit decimal number) controlled by and assigned to various manufacturers by the Federal Communications Commission (FCC) in the United States. Each cellular mobile telephone (CMT) contains a unique ESN that is used, along with the telephone number, to process and bill calls made on that cellular telephone. In the event a CMT is stolen, the ESN can be used by the service provider to disable service for that telephone.

element – In a bar code symbol, a single bar or space.

Function code one character (FNC1) – A special non-data character of Code 128 that has been reserved for use by the EAN.UCC System. When function code one follows the start character of the EAN/UPC bar code, it provides a control mechanism that supplies security to EAN.UCC bar codes in a mixed bar code environment.

horizontal bar code - A bar code symbol presented in such a manner that its overall length dimension is parallel to the horizon. The bars are presented in an array that looks like a picket fence.

interior service number – For the purposes of this Standard, a secondary serial number assigned by the manufacturer and derived from the item serial number. It has a maximum of 21 alphanumeric characters, and is typically placed under the cover of a product so that it is not easily observed without removing the cover. It is used primarily to validate and warranty claims.

item serial number – For the purposes of this Standard, a number assigned by the manufacturer to uniquely identify a product. It has a maximum of 20 alphanumeric characters.

misread - A condition which occurs when the data output of a bar code reader or scanner does not agree with the data encoded in the bar code symbol.

module - The narrowest nominal bar or space in the bar code symbol. Wider bars and spaces are often specified as multiples of one module. Also known as "X dimension."

modulo check digit or character - See "check character."

nominal - The exact (or ideal) intended value for a specified parameter. Tolerances are specified as positive and negative deviations from this value.

numeric - A character set that includes only numbers.

orientation - The alignment of a bar code symbol. Two possible orientations are horizontal with vertical bars and spaces (picket fence) and vertical with horizontal bars and spaces (ladder).

picket fence code - See "horizontal bar code."

print quality - The measure of compliance of a bar code symbol to the requirements of dimensional tolerance, edge roughness, spots, voids, reflectance, quiet zone and encodation.

quiet zone - A clear space or area that contains no markings that would interfere with the scanning of the bar code. It precedes the start character of a bar code symbol and follows the stop character. Sometimes called the "clear area."

scanner – An optical and electronic device that scans bar code symbols and outputs the bar code information in the form of electrical signals suitable for input to a computer system.

serial number – Numbers and/or alpha characters assigned to uniquely identify an item. Serial numbers defined in this Standard include the item serial number, the interior serial number, and the cellular mobile telephone electronic serial number.

slot scanner - A bar code scanner usually positioned below a shelf or counter, over which product is hand moved for point-of-sale checkout. The shelf or counter has a slot cut out, usually containing a glass window, through which the scanner can read bar code symbols passing over it. Slot scanning is typically seen in grocery store and mass merchant checkout lanes.

space - The lighter element of a bar code usually formed by the background between bars.

Standard - A set of rules, specifications, instructions and directions to use a bar code or other automatic identification system to your profit. Usually issued by an organization, e.g. HIBCC, EAN.UCC, EIA, and CEA.

start and stop characters - Distinct characters or patterns used at the beginning and end of each barcode symbol that provides initial timing references and direction-of-read information to the decoding logic.

symbol - See "bar code symbol".

symbol length - The distance between the outside edges of the quiet zones.

symbology - The term used to specify different bar code types (e.g., Code 128 and U.P.C. are different bar code symbologies).

symbology check character - A mandatory check character traditionally appended at the end of a bar code symbol's data   message for the purpose of adding security to the scanned symbol. Some bar code symbologies have a mandatory check character as part of their basic structure. Examples would be Code 128's Modulus 103 and U.P.C.-A's Modulus 10 check characters. Other symbologies may not require any check character as part of their structure, but may have a check character suggested for optional use or required by an industry standard.

UCC - This is an abbreviation for the Uniform Code Council. This organization administers, in the U. S., the U.P.C. and other retail and industrial standards.

UCC/EAN-128 - For the purposes of this Standard, UCC/EAN-128 means the symbology as specified by the EAN.UCC System.

U.P.C. – This is the abbreviation for Universal Product Code. It is a standard bar code symbol applied to retail items/packages in North America.

verifier - A device that makes measurements of the bars, spaces, quiet zones and optical characteristics of a symbol to determine if the symbol meets the requirements of a specification of standard.

vertical bar code - A code pattern presented in such orientation that the axis of the symbol from start to stop is perpendicular to the horizon. The individual bars are in an array appearing as rungs of a ladder.

"X" Dimension - This describes the intended width of the narrow elements dictated by the application, or symbology specifications, or both. (See "module.")

4 Format

Exhibit 1 illustrates a typical format for displaying the U.P.C. Version A (UPC-A) point-of-sale (POS) bar code symbol and a typical item serial number bar code symbol. The item serial number bar code symbol should be above the   point-of-sale bar code symbol. The serial number bar code human readable information should be printed above the actual bar code.

All bar code symbols shall be printed as horizontal bar code symbols with the bars being vertical and the human readable characters being horizontal. A minimum of 3.2 millimeters (.125 inch) space shall separate the bottom of the serial number bar code symbol from the top of the point-of-sale bar code symbol. This format is consistent with "Vendor Information - Zone 2" as referenced in UCC "U.P.C. Marking Guidelines for General Merchandise and Apparel" -- January 1989.

Item numbers and serial numbers and other data coded in a bar code or 2-D symbol may be encoded using either Application Identifiers per section 3 of the General EAN.UCC Specifications or Data Identifiers per the ANSI MH10.8.2 specification (ISO/IEC 15418).

4.1 Point-Of-Sale

To assist the retailer in easily capturing the identity of the manufacturer and the Stock Keeping Unit (SKU), the EAN/UCC point-of-sale bar code shall be printed on or applied to the sales packaging that contains the product and, if space permits, should be printed on or applied to the product.

The decision of which point-of-sale bar code should be used (i.e., UPC-A, UPC-E or EAN-13, EAN-8) should be mutually agreed upon by trading partners. Generally, retailers in the USA and Canada prefer U.P.C. formats, whereas retailers in Europe and the Far East prefer EAN formats.

Since UPC-A is a subset of EAN-13, any scanner that can decode EAN-13 can also decode UPC-A. Most, it not all UPC-A scanners can decode EAN-13; however, most scanners manufactured in the last five years can easily decode both symbols. A scanner that can decode an EAN-13 symbol can also decode an EAN-8 symbol. Likewise, a scanner that can decode a UPC-A symbol can decode a UPC-E symbol. By January 1, 2005, all scanners used in the retail industry shall be capable of accepting both UPC-A and EAN-13 symbols and transmitting 13 digits to the systems.

Exhibit 2 illustrates a typical UPC-A symbol at three different levels of magnification and explains the human readable numbers. This standard recommends using the 100% magnification size as a minimum. Exhibit 4 explains the Mod 10 check character calculation (algorithm).

Exhibit 3 illustrates a typical EAN-13 symbol at 200% magnification and explains the human readable numbers. This standard recommends using the 100% magnification size as a minimum. Exhibit 4 explains the Mod 10 check character calculation (algorithm).

Further information regarding proper format of the EAN/UPC symbols can be obtained from the General EAN.UCC Specifications.

4.1.1 Manufacturer Assigned Item Number Uniqueness

Regardless of whether the U.P.C. or EAN point-of-sale symbol is used, the number assigned by the manufacturer to the product and packaging (that becomes part of the U.P.C. or EAN symbol) shall be unique within the manufacturer's product line and not be reused for at least 4 years after the product's manufacture is discontinued.

4.2 Serial Number (s)

Various serial numbers may be used or needed depending on the product requirements. For purposes of this standard, serial number bar code height should be 12.7 mm (.5 in) but shall be a minimum of 15% of the distance from the leading edge of the bar code's first bar to the trailing edge of the bar code's last bar. The serial number should be printed in human readable form above the bar code, and the height of the human readable characters shall be a minimum of 3.2 mm (.125 in). It is strongly recommended that these human readable characters be printed with a height of 4.8 mm (.1875 in).

Serial number bar code symbols shall have a title printed in human readable form in line with and to the left of the human readable representation of the serial number. Ordinarily the title will occupy two printed lines that are left justified, and the height of human readable title characters shall be a minimum of 6. mm (.0625 in).

To assist both the retailer and the manufacturer in easily capturing the various serial numbers assigned to consumer electronics products, the serial number(s) shall be printed on or applied to the sales packaging that contains the product and, if space permits, should be printed on or applied to the product itself.

4.2.1 Item Serial Number

For serialized products, the manufacturer shall assign a unique serial number to the product and the sales package containing the product. This serial number shall be represented in the form of a bar code symbol. A human readable representation of the serial number should be printed above the symbol.

Manufacturers are encouraged to use only numerals in their serial numbers. Since many point-of-sale terminals (cash registers) cannot handle key entry of alpha characters, problems of key entry of serial numbers containing alpha characters might arise should the bar code symbol not be scannable. Also, serial numbers with only numerals will produce shorter bar code lengths than serial numbers that include alpha characters. Manufacturers are discouraged from encoding "intelligence" into the serial number. Experience shows that future business decisions often are adversely affected when other than a non-intelligent, "license plate" number is used for this type of coding application.

4.2.1.1 Item Serial Number Length

The item serial number shall not exceed twenty (20) characters (exclusive of the EAN.UCC application identifier; see Section 5) and may contain any combination of alpha and numeric characters in any pattern desired. Although this standard specifies a maximum of 20 characters, it is not necessary that serial numbers use all 20 character positions. Each manufacturer shall determine its serial number length, not to exceed 20 characters. Exhibit 5 illustrates UCC/EAN-128 encoding using a 16-character item serial number. Note that the Application Identifier 8004 allows for thirty (30) character serial numbers. Serial numbers over 20 characters in lengths may not work in all trading partners' systems.

4.2.1.2 Item Serial Number Uniqueness

The serial number assigned by the manufacturer and affixed to the product and sales packaging shall not be duplicated within one model in the manufacturer's product line. Worldwide uniqueness is achieved by capturing both the point-of-sale bar code data and the item serial number bar code data.

4.2.1.3 Item Serial Number Bar Code Symbol Title

The title should be "Item Serial Number." The suggested printing format per the EAN.UCC General Specification is shown in Exhibit 1. The title should be printed above the bar code.

If a Data Identifier is used for the item serial number, the title should be "(S) Item Serial Number". (See 5.2.2.1)

4.2.2 Interior Service Number

This Standard recognizes the need for an interior service number or secondary serial number to assist in the verification and authentication of processing warranty claims for some electronics products. The interior

service number should be different from the item serial number shown on the outside of the equipment/product. The interior service number should not be visible unless the cover of the equipment/product is removed. The use of an interior service number is at the discretion of the manufacturer.

4.2.2.1 Interior Service Number Derivation
The interior service number or secondary serial numbers derived from the item serial number, and should be encrypted by any manufacturer in a manner that is unique to that manufacturer and of that manufacturer's choosing. This standard recommends the use of a "check character algorithm" to create an interior service number from an item serial number. In other words, the item serial number will be contained within the interior service number. However, the interior service number will be one character longer with a calculated additional character in the right-most position.

If alpha characters are used in an item serial number, a Mod 36 "check character" calculation would be required (See Appendix A). If alpha characters are not used in the manufacturer's serial number, a Mod 10 "check character" calculation could be used, similar to that used with the UPC-A symbol. Different position weighting schemes could be used to further "complicate"/encrypt the calculation, regardless of whether the Mod 36 or Mod 10 calculation is used. See Exhibit 8 for an example of a Mod 10 algorithm used to derive an interior service number. See Appendix A for Mod 36 calculations.

Each manufacturer may choose its own scheme for interior service numbering and calculating the rightmost "check character."   Likewise, each manufacturer may choose a scheme that does not use the "check character" calculation. If a secondary serial number is used for the purpose of providing an interior service number, it shall be preceded with the appropriate application or data identifier.

NOTE: The Interior Service Number check character is not the symbology check character that is used to verify correct reading of the bar code symbol. The Interior Service Number check character is part of the data that is encoded and displayed in the human readable interpretation.

4.2.2.2 Interior Service Number Bar Code Symbol Title
The title should be "Interior Service Number." The suggested printing format per the EAN.UCC General Specification is shown on Exhibit 8. The title should be printed above the bar code.

If a Data Identifier is used for the interior service number, the title should be "(30S) Interior Service Number". (See 5.2.2.2)

4.2.3 Cellular Mobile Telephone (CMT) Electronic Serial Number
The standard recognizes the need for an electronic serial number for manufacturers of the cellular mobile telephone (CMT). The CMT has two (2) serial numbers; namely an item serial number (MSN) assigned by the manufacturer, and an electronic serial number (ESN) that is controlled by the Federal Communications Commission (FCC) in the USA.

4.2.3.1 CMT Electronic Serial Number Derivation
In the USA, the FCC assigns the first three characters of the ESN to the CMT manufacturer. The manufacturer then assigns the last five characters of the ESN. These eight characters are hexadecimal, meaning that each character can have one of sixteen values (0-9 and A-F). Some manufacturers convert this 8 character hexadecimal number into an 11-digit decimal number. This standard supports ESN length of up to 20 alphanumeric characters.

4.2.3.2 CMT Electronic Serial Number Bar Code Symbol Title
The title should be "CMT Electronic Serial Number." The suggested UCC/EAN-128 printing format is shown on Exhibit 9. The title should be printed above the bar code.

If a Data Identifier is used for the electronic serial number, the title should be "(22S) CMT Electronic Serial Number". (See 5.2.2.3)

5 Symbology
The many benefits of bar code technology can only be realized if the symbols are properly printed, thereby promoting a very high first read rate. It is most important that the manufacturer label the product and packaging with very high quality bar codes, regardless of the symbology that is used. The ISO/IEC 15416 shall be used to determine bar code symbol print quality.
- minimum print quality grade = 1.5 (C);
- measurement aperture = 0.1524 mm (0.006 in);
- inspection wavelength = 660 nanometers +/- 10 nanometers

The above symbol quality and measurement parameters assure good scanning ability over a broad range of scanning environments.

It is very important that a "quiet zone" (clear area) precede the first bar and follow the last bar of all bar codes. The minimum quiet zone width dimension shall be 10 times the "X" dimension (module width) or 2.54 mm (0.1 in), whichever is greater

Since this standard addresses applications where more than one symbology will be read and where it is advantageous to be able to distinguish between scanned and key-entered data, bar code readers should be configured to attach symbology identifiers to data messages. When this option is available, symbology identifiers, as specified by the ISO/IEC 15424 specification should be used. Likewise, when bar code readers that can automatically read more than one symbology are used in an application, they should be configured to read only those symbologies required by the application.

For items that may be scanned at the point-of-sale, this Standard recommends encoding serial numbers in the UCC/EAN-128 symbology.

5.1 Point-Of-Sale
All dimensions, tolerances and magnification factors of the printed EAN/UPC symbol shall be in accordance with the General EAN.UCC Specifications.

5.2 Serial Number
The recommended symbology to be used for encoding the serial numbers referred to in this standard shall be UCC/EAN-128. The UCC/EAN-128 is a special implementation of Code 128 assigned to and used in the EAN.UCC System.

5.2.1 Symbol Structure
All tolerances, symbol structure, and optical characteristics of the printed UCC/EAN-128 or Code 128 symbol shall be in accordance with ISO/IEC 15417. When Code 39 is used, the ISO/IEC 16388 specification requirements shall be met.

The UCC/EAN-128 or Code 128 symbology "X" dimension (module width) of the serial number bar code shall not be less than .254 mm (0.01 in) nor greater than .432 mm (0.017 in). See Exhibit 7 for examples.

5.2.2 Application and Data Identifier Usage
Use of the UCC/EAN-128 symbology requires that an Application Identifier (AI) be used following the function one character (FNC1) of a bar code symbol. The data to be encoded, the structure to be used and the restrictions on characters encoded are described for each AI in section 3 of the General EAN.UCC Specifications.

The Application Identifier (AI) is a prefix used to define a data field. 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, three, or four digits followed by the data field that 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.

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

If Code 39 or Code 128 is used for serial number(s), the proper FACT data identifier, as published in ANSI/MH10.8.2 – Data Application Identifier Standard, shall be used. The FACT data identifier, though different from the EAN.UCC application identifier, serves the same function of providing a prefix used to define a data field.

5.2.2.1 Item Serial Number Identifiers
When using the UCC/EAN-128 symbology, the item serial number shall be preceded by the numerals 21 in keeping with section 3 of the General EAN.UCC Specifications. When this serial number and Application Identifier (AI) are represented in human readable form, the AI shall be shown in the human readable interpretation of the bar code symbol, separated from the rest of the data by parentheses. However, the parentheses shall not be considered part of the data; therefore, the parentheses shall not be encoded in the bar code nor key entered, should keying of the bar code data be necessary.

If Code 39 or Code 128 is used for the item serial number, the item serial number shall be preceded by the letter S in keeping with ANSI/MH10.8.2 – Data Application Identifier Standard. Unlike the EAN.UCC application identifier, the FACT data identifier is not shown as part of the human readable bar code interpretation. Rather, the FACT data identifier is enclosed in parenthesis and printed in the bar code title. (See 4.2.1.3)

5.2.2.2 Interior Service Number Identifiers
Since the interior service number or secondary serial number bar code application is different from the item serial number application, a different EAN.UCC Application Identifier (AI) from the AI 21 is needed. The EAN.UCC AI assigned for a secondary serial number or interior service number is AI 250. Since the item serial number can contain up to 20 alphanumeric characters, this interior service number must be able to contain up to 21 alphanumeric characters. For this bar code application to be successful, the data system must be able to capture, contain and print the "check character" calculated and placed in the right most position, hence the need for a 21-character field length.

When using the UCC/EAN-128 symbology, the interior service number shall be preceded by the numerals 250 in keeping with section 3 of the General EAN.UCC Specifications. When this secondary serial number and Application Identifier (AI) are represented in human readable form, the AI shall be shown in the human readable interpretation of the bar code symbol, separated from the rest of the data by parentheses. However, the parentheses shall not be considered part of the data; therefore, the parentheses shall not be encoded in the bar code nor key entered, should keying of the bar code data be necessary. (See Exhibit 9, Figure 2.)

If Code 39 or Code 128 is used for the interior service number, the interior service number or secondary serial number shall be preceded by the numerals 30S in keeping with ANSI/MH10.8.2 – Data Application Identifier Standard. The FACT data identifier is not shown as part of the human readable bar code interpretation; rather it is enclosed in parenthesis and printed in the bar code title. (See 4.2.2.2)

5.2.2.3 CMT Electronic Serial Number Identifiers
The EAN.UCC Application Identifier 8002 has been assigned to the Electronic Serial Number (ESN). Therefore, when encoding the ESN in UCC/EAN-128 symbology, the numbers 8002 shall precede the eight or eleven character ESN. When representing this encoded data in human readable form, the AI 8002 shall be enclosed in parentheses and precede the ESN. However, the parentheses shall not be considered part of the data; therefore, the parentheses shall not be encoded in the bar code nor key entered, should keying of the bar code data be necessary. See Exhibit 9.

If Code 39 or Code 128 is used for CMT electronic serial number, the CMT electronic serial number shall be preceded by 22S in keeping with ANSI/MH10.8.2 – Data Application Identifier Standard. The FACT data identifier is not shown as part of the human readable bar code interpretation; rather it is enclosed in parenthesis and printed in the bar code title. (See 4.2.3.2)

6 LABEL FORMAT
Label height and width shall be determined by the printer/applier of the label, based on the serial number bar code symbol length, the human readable text size, the magnification of the U.P.C. or EAN symbol and the top, bottom and side label margins. The recommended minimum label height for an item serial number and a 100% magnification U.P.C.-A symbol is 60.86 mm (2.396 in).   See Exhibit 9, Figure 1.

The quiet zone requirement, plus the longest bar code on the label will dictate the minimum label width. It is suggested that an additional 6.35 mm (0.25 in) be added to each quiet zone as label side margins.

See Appendix B for bar code symbol length and label width calculations.

7 LABEL PLACEMENT AND ORIENTATION
Label placement on sales packages should conform to the General EAN.UCC Specifications location guidelines including, if appropriate, the use of tear-off labels for large items that are carried to point-of-sale terminals.   In addition, labels should be placed no closer than 31.75 mm (1.25 in) from any package edge. When the sales package doubles as a shipping container, label survivability and accessibility should be considered when placing labels on that package.

NOTE: Suppliers may apply two (2) identical serial number bar code symbols on adjacent sides of a package containing only one product to ensure scanner access when the package is stacked on a pallet or in a warehouse rack system. However, in this case, the EAN/UPC symbol should appear only once on the package if the package is small enough to be subject to "slot scanning" at the point-of-sale terminal.

7.1 Item Serial Number
The item serial number bar code symbol shall be combined with the point-of-sale bar code symbol, as shown in Exhibit 9, Figure 1, to form a label, and placed on the product and sales packaging in a manner that facilitates scanning primarily at point- of-sale. The size and shape of each product will influence the physical space available; however, the ease of point-of-sale scanning should dictate placement and orientation.

7.2 Interior Service Number
The interior service number or secondary serial number bar code symbol should be printed, along with the point-of-sale bar code symbol, as shown in Exhibit 9, Figure 2, to form a label. This label should be placed inside the product so that it is not visible without removing the case or cover. Each manufacturer must decide on its own where the most appropriate placement and orientation should be for each product that utilizes the interior service number.

7.3 CMT Electronic Serial Number
The CMT electronic serial number bar code symbol shall be combined with the item serial bar code symbol and the point-of-sale bar code symbol, as shown on Exhibit 9, to form a label. Due to the number of bar

code symbols involved and the limited space available on some CMT components, it may not be possible to stack the bar codes one over the other. Figure 2 on Exhibit 9 shows a modified vertical/horizontal bar code orientation, which may be necessary to help with label placement and orientation.

When using the modified vertical/horizontal bar code orientation shown in Figure 2 on Exhibit 9, care must be taken to separate the EAN/UPC symbol's quiet zone from the serial number bar code symbols' quiet zones. The EAN/UPC symbol should be centered vertically between the two serial number bar codes, and the two serial number bar codes should be vertically separated by 12.7 mm (.5 in).

8 LABEL QUALITY

8.1 Label Durability
Environmental effects can lead to the degrading of the bar code symbol, substrate, adhesive or laminate. These changes may affect one or more quality parameters of the label whether they are optical or physical. The net effect of such changes can be to render the label unusable. It is important to consider these effects when producing and applying bar code labels.

Labels and bar codes shall meet the requirements in and be tested per specified per Annex A of CEA 802. Section 5 of this document shall be used in cases where references in Annex A are made to other clauses in CEA 802.

8.2 Label Recyclability
When possible, the label material, printing ink and adhesive should be specified to be recyclable materials. In particular, care should be taken that all label materials be compatible with the substrate packaging material for purposes of recyclability.

EXHIBIT 1
"U.P.C. Version A (UPC-A) Plus Item Serial Number

Item Serial
Number → (21) 1234ABCD5678EFGH9012

12.7 mm (0.5 in.)

3.2 mm (0.125 in.)
should separate the
two bar codes

0 12345 67891 2

EXHIBIT 2

UPC-A BAR CODE

80 PERCENT

0 12345 67891 2

100 PERCENT

0 12345 67891 2

200 PERCENT

0 1 2 3 4 5 6 7 8 9 1 2

Mod 10 Check Character

Number assigned by the manufacturer or labeler to a specific Stock Keeping Unit (SKU)

Number purchase from and assigned by the Uniform Code Council as a manufacturer's or labeler's identification number, together with the number system character

Number system character assigned by the Uniform Code Council. It becomes part of the manufacturer's or labeler's identification number

EXHIBIT 3

EAN-13 BAR CODE

EAN-13 (200%)

5 | 0 1 2 3 4 5 6 7 8 9 0 | 0

Modulo 10 Check Character

This ten digit number is allocated by various National Number Banks. Frequently, the leftmost five digits indicate the manufacturer and the rightmost five digits indicate the Stock Keeping Unit (SKU)

These two digits are "Flags" allocated by the EAN. Each National Authority or Number Bank is allocated one or more flag digits.

EXHIBIT 4

U.P.C.-A And EAN-13 Modulo 10
Check Character Calculation

Position	13	12	11	10	9	8	7	6	5	4	3	2	1
Full Size Version EAN-13	X	X	X	X	X	X	X	X	X	X	X	X	C
12-digit U.P.C. (13th position = "0")	0	X	X	X	X	X	X	X	X	X	X	X	C

IMPORTANT:		Digit positions are numbered from **right** to **left** in this algorithm (the check-digit is in the first position.
Step 1:		Starting from position 2 of the number (the number to the left of the position reserved for the check digit), add up the values of the digits in even-numbered positions.
Step 2:		Multiply the sum obtained in Step 1 by 3.
Step 3:		Starting from position 3 (from right), add up the values of the digits in odd-numbered positions.
Step 4:		Add the product of Step 2 to the sum of Step 3
Step 5:		Divide the sum of Step 4 by 10. Subtract the remainder of that answer from 10. The result is the check-digit. If there is no remainder, the check-digit is zero (0).

The following example will illustrate the calculation for an EAN-13 number (427622135746 C):

4 2 7 6 2 2 1 3 5 7 4 6 C

Step 1:		2 + 6 + 2 + 3 + 7 + 6 (from the right)	= 26
Step 2:		x 3	= 78
Step 3:		4 + 7 + 2 + 1 + 5 + 4 (from the right)	= 23
Step 4:		78 (Step 2) + 23 (Step 3)	= 101
Step 5:		101/10 = 10 with a Remainder of 1; 10 – 1	= 9 (Check Digit)

The full EAN-13 number with Check Digit is encoded "427622135746 <u>9</u>".
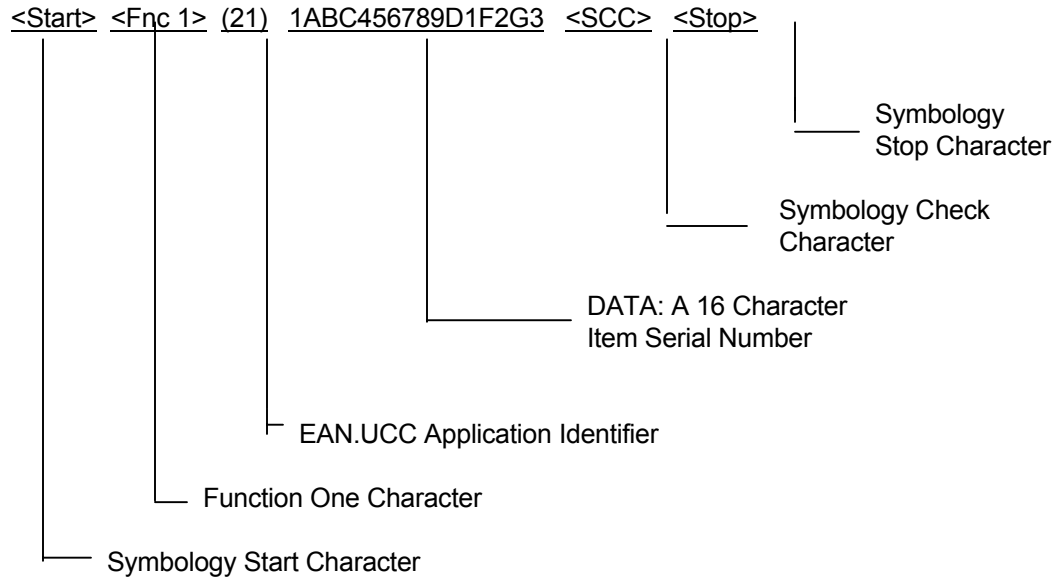
Exhibit 4 (Continued)

The following example will illustrate the calculation for a U.P.C. number (09875610001) having:
Manufacturer Identification Number – 098756 (1st Digit "0" is Number System Digit)
Item Code Number = 10001

0 0 9 8 7 5 6 1 0 0 0 1 C

Step 1:		0 + 8 + 5 + 1 + 0 + 1 (from the right)	= 15
Step 2:		x 3	= 45
Step 3:		0 + 9 + 7 + 6 + 0 + 0 (from the right)	= 22
Step 4:		45 (Step 2) + 22 (Step 3)	= 67
Step 5:		67/10 = 6 with a Remainder of 7; 10 – 7	= 3 (Check Digit)

The full U.P.C.-A Symbol with Check Character is encoded "09875610001 <u>3</u>".

EXHIBIT 5

**EXAMPLE: ENCODATION OF A TYPICAL MANUFACTURER'S SERIAL
NUMBER USING UCC/EAN-128 SYMBOLOGY**

<Start> <Fnc 1> (21) 1ABC456789D1F2G3 <SCC> <Stop>

Symbology
Stop Character

Symbology Check
Character

DATA: A 16 Character
Item Serial Number

EAN.UCC Application Identifier

Function One Character

Symbology Start Character

NOTE:

      Although a 16-character item serial number is shown in the above example, this standard provides for up to 20 alphanumeric characters to be used, if desired. There is no minimum number of characters required by this standard, and fewer characters will result in shorter length bar code symbols.

Of equal importance is the matter of data systems. If a retailer's computer data file is limited to 12 characters, a 13-digit EAN number will not be fully compatible even if the scanner can decode the EAN symbol. Therefore, it is recommended that data files be structured for a minimum of 13 characters in the future to conform with the Uniform Code Council's U.P.C. Bulletin #2 (June 1989). Additionally, in the development of computer systems and applications, 14 digit identification fields should actually be used (rather than 13 digit) so as to maximize the utility of the system using EAN.UCC System identification.   Doing so will avoid problems in the USA with imported products.   Likewise, using the 14-digit field will 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.

EXHIBIT 6

UCC/EAN-128 and Code 128 have three unique character subsets known as CODE A, B, and C. Subset CODE A allows for upper case alpha, numerics and special characters. Subset CODE B allows for upper and lower case alpha, numerics and fewer special characters. Subset CODE C allows for double density numerics.

It is possible to change from one code subset to another within a symbol. Therefore, the length of the UCC/EAN-128 and Code 128 symbol will be a function of how many numerics can be printed in double density, whether it is necessary or desirable to switch subsets within the symbol and the width of the module (i.e., the "X" dimension).

The shortest item serial number will be realized if no alpha characters are present and an even number of digits is used. Since subset CODE C encodes numbers in double density, if an odd number of digits is encountered, a zero is filled to the leftmost position to "pad" the actual number, thereby making it an even number of digit positions.

The following examples demonstrate that:

1. All numerics make shortest symbol lengths;
2. When alpha characters are mixed with numerics, an even number of numerics between alpha characters make shorter symbol lengths;
3. The smaller module (i.e., "X" dimension) makes a shorter symbol length

All examples shown are compared to the U.P.C.-A symbol printed at 100% magnification factor.

Item Serial
Number   (21) 123456

12.7 mm (0.5 in)

0   12345 67891   2
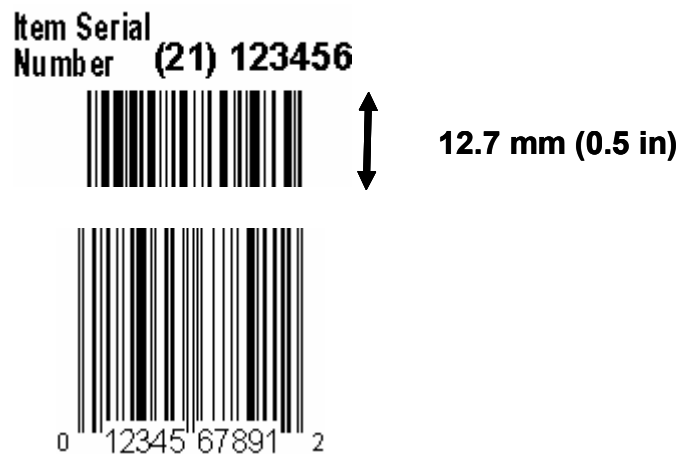
NOTE: A UCC/EAN-128 item serial number of six digits (no alpha characters) following the application identifier will have approximately the same length bar code as the U.P.C.-A bar code at 100% magnification factor when using a .305 mm (0.012 in) "X" dimension for the item serial number.

EXHIBIT 6 (Continued)

UCC/EAN-128 using a 0.25 mm (0.010 in) "X" Dimension

Item Serial Number (21) 1ABC456789D1F2G3

12.7 mm (0.5 in)

Item Serial Number (21) 123456AB9012CD56

12.7 mm (0.5 in)

Item Serial Number (21) 12345678901234AB

12.7 mm (0.5 in)

Item Serial Number (21) 1234567890123456

12.7 mm (0.5 in)

NOTE: The UPC-A bar code symbol at the top of this page is shown at 100% magnification.

EXHIBIT 6 (Continued)

UCC/EAN-128 using a 0.38 mm (0.015 in) "X" Dimension

Item Serial Number   (21) 1ABC456789D1F2G3
                                                            12.7 mm (0.5 in)

Item Serial Number   (21) 123456AB9012CD56
                                                            12.7 mm (0.5 in)

Item Serial Number   (21) 12345678901234AB
                                                            12.7 mm (0.5 in)

Item Serial Number   (21) 123456789012345 6
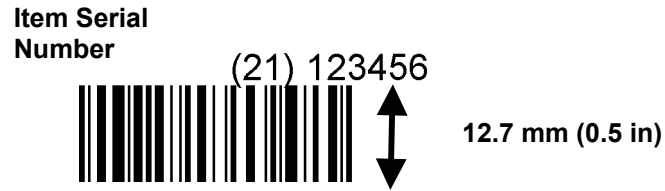   12.7 mm (0.5 in)

NOTE: The U.P.C.-A barcode symbol at the top of this page is shown at 100% magnification.

EXHIBIT 7

Calculating a typical Interior Service Number from an all numeric Item Serial Number using a Mod-10 check character algorithm:

**Item Serial
Number**

(21) 123456

12.7 mm (0.5 in)

IMPORTANT: Character positions are numbered from RIGHT to LEFT in this algorithm with the check character in the first (rightmost) position. (See Exhibit 4.)

The item serial number application identifier shall not be included in the check character calculation.

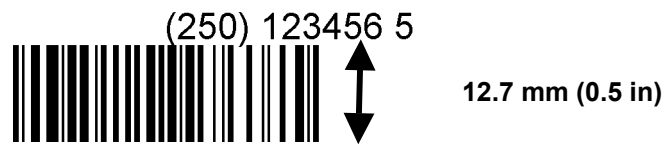EXAMPLE: Assume an item serial number of (21) 123456 as shown above.

(21) 123456

Position 1 reserved for check character

Step 1:		2 + 4 + 6 (from right)		= 12
Step 2:			x 3	= 36
Step 3:		1 + 3 + 5 (from right)		= 9
Step 4:		36 (Step 2) + 9 (Step 3)		= 45
Step 5:		45/10 = 4 with a Remainder of 5; 10 - 5		= 5 (check character)

The resulting interior service number would be:

**Interior Service
Number**

(250) 123456 5

12.7 mm (0.5 in)

NOTE: (250) is the Interior Service Number Application Identifier and "5" in the rightmost position is the calculated "check character" value.

EXHIBIT 8
Figure 1
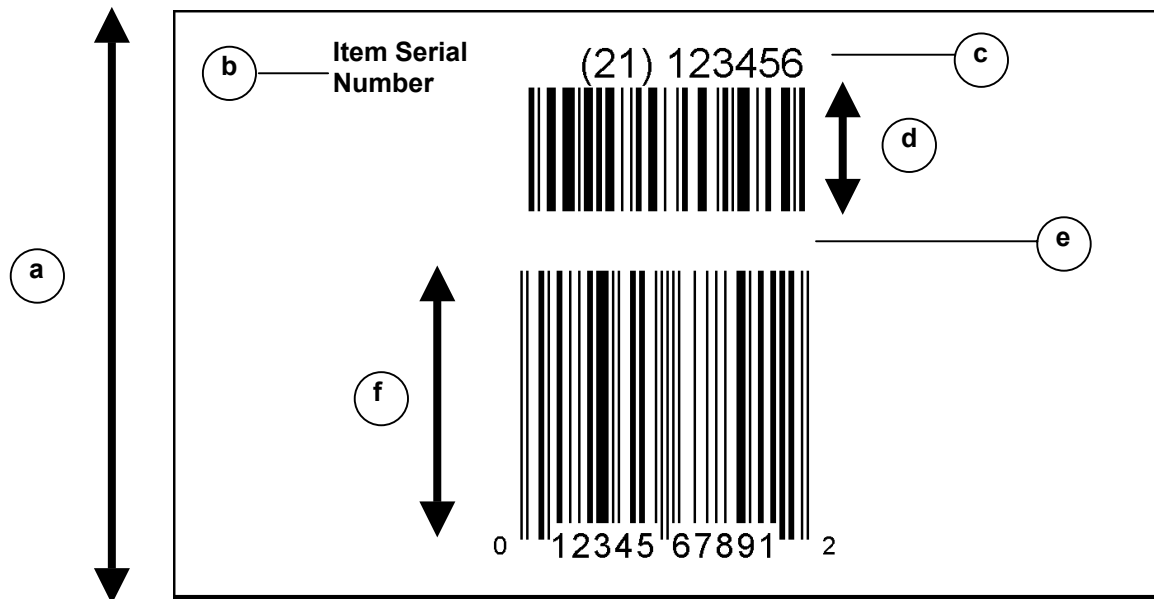**Item Serial Number Bar Code Label**
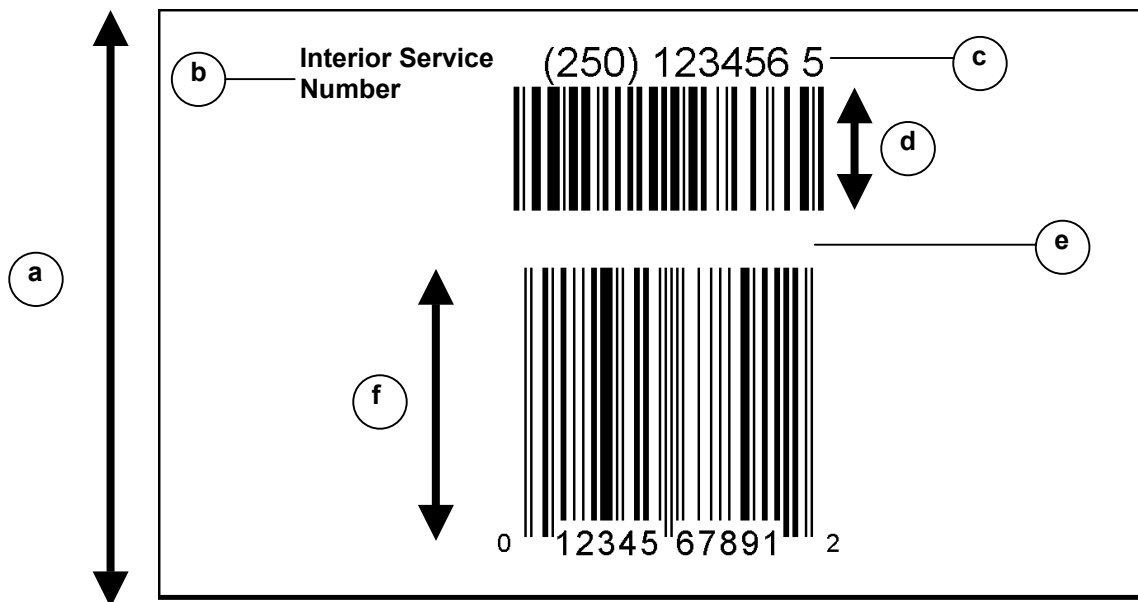

Figure 2
Interior Service Number Bar Code Label

EXHIBIT 8 (continued)

Label Specifications

(**a**) The overall height of the label should be a minimum of 60.9 mm (2.4 in).

(**b**) The two line human readable title information should be a minimum height of 6.4 mm (0.25 in).

(**c**) The human readable encodation height should be a minimum of 4.8 mm (0.19 in).

(**d**) The overall height of the UCC/EAN-128 bar code should be a minimum of 12.7 mm (0.5 in).

(**e**) The distance dividing the UCC/EAN-128 and the Point-of-sale bar code should be a minimum height of 3.2 mm (0.13 in).

(**f**) The overall height of the point-of-sale bar code should be a minimum of 25.9 mm (1.02 in).

NOTE: There should be a minimum of 6.4 mm (0.25 in) margin between the edge of the label and the information included in the label (including bar code quiet zones).
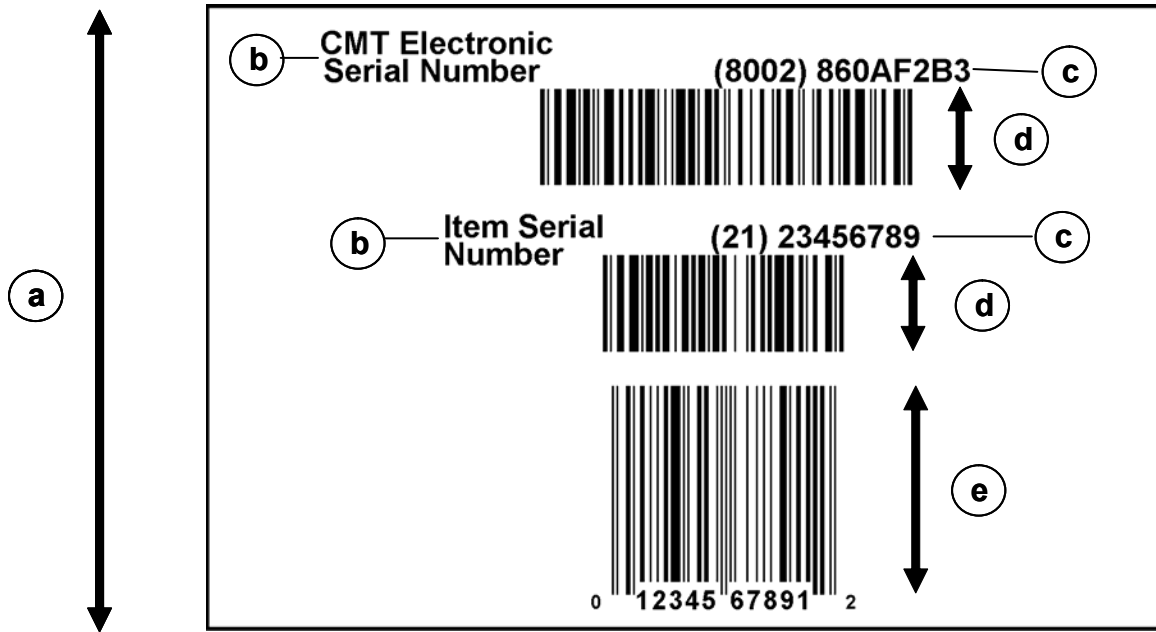
EXHIBIT 9

Figure 1
CMT Vertical Label
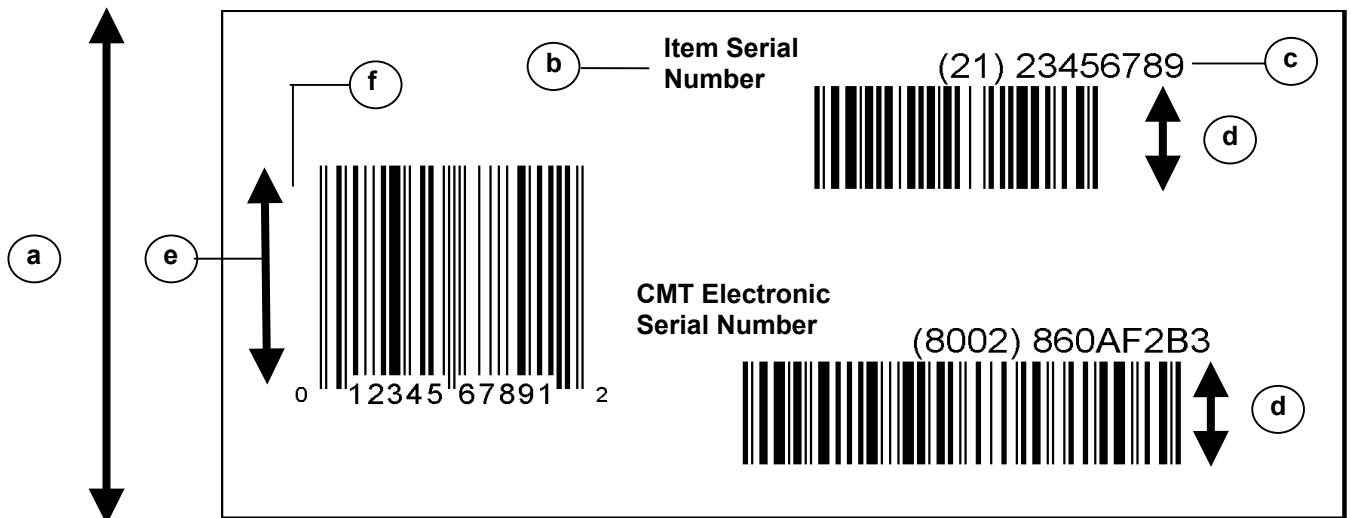

Figure 2
CMT Modified Vertical /Horizontal Label

EXHIBIT 9 (continued)

Label Specifications

(**a**) The overall height of the label should be a minimum of 82.6 mm (3.25 in) for Figure 1, and 63.5 mm (2.5 in) for Figure 2

(**d**) The overall height of the UCC/EAN-128 bar code should be a minimum of 12.7 mm (0.5 in).

(**b**) The two lines of human readable title information should be a minimum height of 6.4 mm (0.25 in).

(**e**) The overall height of the point-of-sale bar code should be a minimum of 25.9 mm (1.02 in).

(**c**) The human readable encodation height should be a minimum of 4.8 mm (0.19 in).

(**f**) The quiet zone before and after all bar codes should be a minimum of 6.4 mm (0.25 in).

NOTE: **There should be a minimum of 6.4 mm (0.25 in) margin between the edge of the label and the information included in the label (including bar code quiet zones).**

APPENDIX A

MOD 36 INTERIOR SERVICE NUMBER "CHECK CHARACTER" CALCULATION

A "check character" algorithm is suggested to calculate the interior service number or secondary serial number from the manufacturer's serial number. The Mod 36 check character (remainder method) should be used if alpha characters are contained in the item serial number. This "check character" is neither a replacement for nor the same as any symbology check character(s).

TABLE 1
CHARACTER VALUE TABLE

Value	Character	Value	Character
0	0	18	I
1	1	19	J
2	2	20	K
3	3	21	L
4	4	22	M
5	5	23	N
6	6	24	O
7	7	25	P
8	8	26	Q
9	9	27	R
10	A	28	S
11	B	29	T
12	C	30	U
13	D	31	V
14	E	32	W
15	F	33	X
16	G	34	Y
17	H	35	Z

TO CALCULATE THE MOD 36 CHECK CHARACTER (Remainder Method):

Data Content (For Check Character Calculation)

The interior service number or secondary serial number application identifier (AI) is 250. The interior service number application identifier shall not be included in the check character calculation.

The item serial number application identifier shall not be included in the check character calculation.

IMPORTANT: Character positions are numbered from RIGHT to LEFT in this algorithm (the check character is in the first position).

Step 1:		Starting from position 2 of the number (i.e., the character to the left of the position reserved for the check character), add up the values of the characters in even-numbered positions.
Step 2:		Multiply the sum obtained in Step 1 by 3
Step 3:		Starting from position 3 (from right) add up the values of the characters in odd-numbered positions.
Step 4:		Add the product of Step 2 to the sum of Step 3.
Step 5:		Divide the sum of Step 4 by 36. Look in the Character Value Table for the character with the remainder value. This corresponding character is the Mod 36 check character, and it becomes the right-most character in the interior service number.

EXAMPLE

Assume the item serial number of:

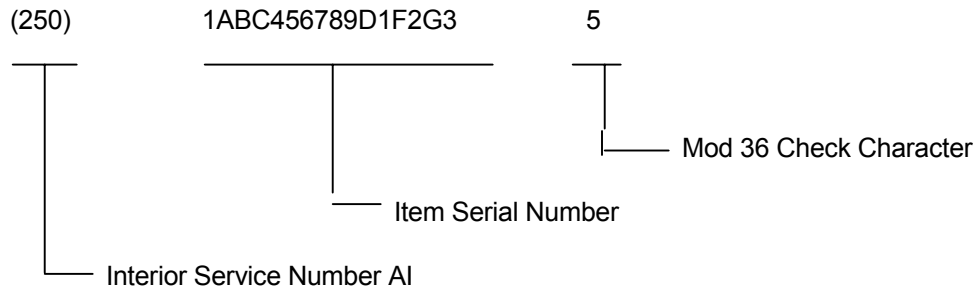(21) 1 A B C 4 5 6 7 8 9 D 1 F 2 G 3

Position 1 is reserved for check character

Step 1:		10 + 12 + 5 + 7 + 9 + 1 + 2 + 3 (from right)	= 49
Step 2:		x 3	= 147
Step 3:		1 + 11 + 4 + 6 + 8 + 13 + 15 + 16 (from right)	= 74
Step 4:		147 (Step 2) + 74 (Step 3)	= 221
Step 5:		221/36 = 6 with a Remainder of 5	

APPENDIX A (Continued)

Looking in the value Table, a remainder value of 5 corresponds to a character of 5; therefore, for this example, the check character is 5.

The final interior service number for this example is:

```
    (250)              1ABC456789D1F2G3              5
     ┬                  ─────────┬─────────          ┬
     │                           │                   │
     │                           │                   └──── Mod 36 Check Character
     │                           │
     │                           └──── Item Serial Number
     │
     └──── Interior Service Number AI
```

NOTE: If Step 5 results in a remainder of zero, the check character is zero. If the remainder is greater than nine, the check character is an alpha character.

APPENDIX B

UCC/EAN-128 BAR CODE SYMBOL LENGTH AND LABEL WIDTH CALCULATIONS

Each character in the UCC/EAN-128 bar code requires 11 modules except the stop character that requires 13 modules. (See Exhibit 5.) Each bar code requires the following "overhead" modules in addition to the data characters:

	Modules
Start Code	11
Function One Character	11
Two Digit Application Identifier	22
Symbology Check Character	11
Stop Character	13
	=====
	68

If the "X" dimension of each module equals .254 mm (0.010 in), the "overhead" characters will require 68 x .254 mm = 17.27 mm (0.68 in)

Two Quiet Zones	= 12.7 mm (0.50 in)
	====
"Overhead" + Quiet Zones	= 30.0 mm (1.18 in) required

Assume 12 alpha characters are in the serial number:

12 characters x 11 modules x .010 inch	= 33.5 mm (1.32 in)

Total "Overhead" + Quiet Zones	= 30.0 mm (1.18 in)
12 alpha data characters	= 33.5 mm (1.32 in)
	=====
Total length of symbol	63.5 mm (2.5 in)

If the serial number were all numeric, divide the number of alpha characters in half. In the above example:

Total "Overhead" + Quiet Zones	= 30.0 mm (1.18 in)
6 alpha (12 numeric) data characters	= 16.75 mm (0.66 in)
	=====
Total length of symbol	46.75 mm (1.84 in)

APPENDIX B (Continued)

NOTE: If the serial number is all numeric, a two digit AI would be encoded with only 11 modules, thereby "saving" 11 X .254 mm = 2.79 mm when using .254 mm (1.010 in) "X" dimension. In the above example, the 12 numeric serial bar code symbol would be 46.75 mm (1.84 in) – 2.79 mm (0.11 in) = 44 mm (1.73 in).

If a minimum of 6.35 mm (0.25 in) constitutes the label margin, 12.7 mm (0.5 in) must be added to the calculated symbol length in order to have a 6.35 mm (1.25 in) margin on each side of the label, outside of each quiet zone.

In the above case of 12 alpha characters at .254 mm (0.010 in) "X" dimension the label = 76.2 mm (3.0 in) wide.

The 12 all numeric serial number would require a minimum label width of 44 mm (1.73 in) +12.7 mm (0.5 in) = 56.7 mm (2.23 in) using an "X" dimension of .254 mm (0.010 in).   Using 11 modules for the two-digit AI saves space.

As can be seen from Figure 2, using four (4) alpha characters in the serial number can take as little as 53.8 mm (2.12 in) of label width at 2.54 mm (0.010 in) "X" dimension. This same width of label could accommodate eight (8) all numeric data characters.

Twenty (20) all alpha characters using .43 mm (0.017 in) "X" dimension would require a label 15. mm (5.9 in) wide.   Twenty (20) all numeric data characters, using .43 mm (0.017 in) "X" dimension would require a label 102.3 mm (4.026 in) wide, minus the 11 modules "saved" on a two digit AI or:

   11 X .43 mm (0.017 in) = 4.73 mm (.186 in);

therefore, the actual label width would be:

 102.3 mm (4.026 in) – 4.73 mm (.186 in) = 97.57 mm (3.84 in).

Combinations of alphanumeric serial numbers will fall between the above-calculated extremes, when using 4 to 20 characters in the serial number and "X" dimensions from .254 mm (0.010 in) to .43 mm (0.017 in).

The interior service number or secondary serial number bar code symbol length and label width will be at least 11 modules greater than the item serial number calculations in order to accommodate the "check character." Since the EAN.UCC assigned a three digit AI for the secondary serial number or interior service number, the length will increase even more.

The CMT electronic serial number will be calculated using a four digit AI (8002) and will usually have eight alphanumeric characters in the USA. Since Figure 1 and Figure 2 of Appendix B assume an AI of two (2) digits, these graphs will not apply to the CMT electronic serial number, nor the interior service number.

Symbol Length for UCC/EAN-128

All alpha characters, includes quiet zones

"X" dimension

0.254 mm (0.10 in)   0.43 mm (0.170 in)
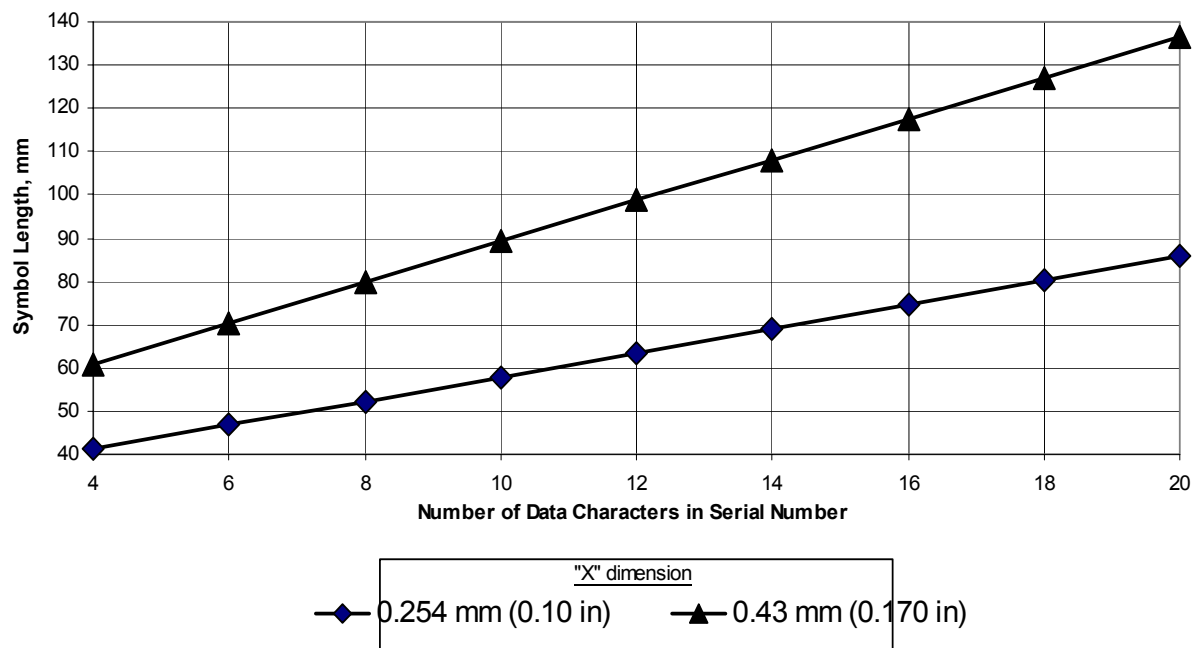
APPENDIX C

MASTERPACK GUIDELINE

The shipment of consumer electronic products often involves a master carton that may contain numerous like items, each of which has a unique item serial number. Although there are instances when the items inside the master carton have unique item serial numbers that are in no way similar, there are instances when the items inside the master carton have sequential item serial numbers.

In those instances when the unique item serial numbers are sequential, it is highly desirable to be able to print a minimum number of bar codes that will enable both the shipper and the receiver to identify the unique item serial numbers contained within the master carton.

The ANSI/MH10.8.2 document lists a DI of 32S to identify the ending serial number. Thus, by printing only two bar codes, a shipper can mark a master carton containing many sequentially serialized like products in a manner that adequately references all item serial numbers contained within the carton.

The EAN.UCC have agreed that the AI 90 can be used for mutually agreed upon data formats that can then take advantage of using UCC/EAN-128 symbology. Such a situation as using FACT DI's to identify beginning and ending sequential item serial numbers could be addressed as follows:

Beginning Sequential Item Serial Number

Start Character	Function One	AI 90	DI 31S	Item Serial Number	Symbology Check Character	Stop Character

Ending Sequential Item Serial Number

Start Character	Function One	AI 90	DI 32S	Item Serial Number	Symbology Check Character	Stop Character

The above suggested encodation guideline takes advantage of the UCC/EAN-128 symbology and the function one character (FNC1) security, while at the same time, taking advantage of the 31S and 32S ANSI/MH10.8.2 DI's that have very specific meaning for sequential serial numbers.

Those manufacturers/shippers who choose to use this guideline with their trading partners should make certain that the coding scheme is mutually agreed upon. Also, it is important that the portion of the serial number that increases sequentially be totally numeric and not contain alpha characters. There could be misunderstanding in knowing when an alpha letter "B" advances sequentially to an alpha letter "C".

CEA Document Improvement Proposal

If in the review or use of this document, a potential change is made evident for safety, health or technical reasons, please fill in the appropriate information below and email, mail or fax to:

Consumer Electronics Association
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2500 Wilson Blvd.
Arlington, VA 22201
FAX: 703 907-7693
standards@ce.org

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