Barcoding for Designers, Printers and Packagers

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1 Terminology

1.1 Global Trade Item Number (GTIN)

The Global Trade Item Number (GTIN) is one of the GS1 Keys uniquely identifying trade items (products and services) sold, delivered, warehoused, and billed throughout retail and commercial distribution channels. It provides an accurate, efficient, and economical means of controlling the flow of products and information through the use of an all-numeric identification system.

A GTIN is used for the unique identification of trade items worldwide within the GS1 System. The GTIN can be used to identify products at any packaging level (e.g., consumer unit, inner pack, case, pallet). A GTIN has a 14-digit data structure, though specific data carriers (barcodes) are only able to encode certain configurations: GTIN-12 (UPC-A), GTIN-13 (EAN-13), and GTIN-8 (EAN-8). As such, the GTIN is defined as a 14-digit number to accommodate all the different structures.

The term trade item refers to any product or service for which there is a need to retrieve pre-defined information; this product or service may be priced, ordered, or invoiced at any point in the supply chain. This includes individual items as well as all their different packaging configurations.

There are four data structures for the GTIN; each provides unique numbers when right justified in a 14-digit database field.

The GTIN may be encoded in any GS1 approved symbology, the appropriate data structure and symbology combination is determined by many factors:

- Product type
- Printing method
- Packaging material
- Designated environment (retailer point of sale, general distribution, etc.)

Additional detailed information regarding GTIN is available at www.gs1ca.org.

1.2 Introduction to Global Location Numbers (GLNs)

Organizations have globally exchanged business information internally and externally with their trading partners. It has become evident that precise information is necessary to clearly identify, in one standard fashion, company locations. The GLN was developed to address the need for a unique numeric identifier that is structured and read one way throughout the world. GTINs identify products; GLNs identify locations.
The GLN is part of the GS1 identification keys. It is a 13-digit numeric code that helps a company identify its corporate structure to its trading partners. GLNs can be used to identify any physical location or party that has meaning within a business scenario. The general rule is that a separate GLN is required to identify each different location (e.g., each store of a retail group must have a separate GLN to enable efficient delivery to the individual store).

The exact method used to allocate the GLN is at the discretion of the issuing organization. In line with best practice, GS1 recommends that the GLN be assigned at source, usually by the party owning the location.

When a new GLN is issued, it is recommended that:

- The GLN be associated with the master data for the identified location
- This master data is communicated to trading partners in a timely manner, and
- GLNs be allocated sequentially without classifying elements.

Once assigned at the source, usually by the party owning the location, the GLN becomes a global reference that can be used by all legal entities (e.g., ABC Canada Ltd.).

### 1.3 Variable Length Company Prefix (VLCP)

A Variable Length Company Prefix (VLCP) is currently being used as organizations with different capacity requirements are identified. The following table illustrates how the number of digits in the Company Prefix affects the maximum number of products or locations a company can assign GTINs or GLNs to, respectively.

<table>
<thead>
<tr>
<th>Company Prefix Length (# of Digits)</th>
<th>Maximum # of Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>100,000</td>
</tr>
<tr>
<td>7</td>
<td>10,000</td>
</tr>
<tr>
<td>8</td>
<td>1000</td>
</tr>
<tr>
<td>9</td>
<td>100</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>
2 About This Guide

Barcoding for Designers, Printers and Packagers introduces the standards used for barcode symbols on product packaging.

It discusses the requirements and possible problems associated with:
- Colours, contrast, reflectance, and obscuring patterns
- Size and placement of the barcode symbol on different packaging types
- Materials used in the packaging, and
- Different printing methods.

In designing and printing product packaging, everyone involved in the process must know something about the other person’s job. For example, a designer must be familiar with different printing methods; a printer must know about the designer’s requirements for contrast, size, and placement. Where you find a general description of a subject that you know in great detail, remember that this is intended for your partners in the process. We’re not trying to teach you what you already know!

This guide deals mainly with the GTIN (U.P.C.) symbol and packaging for consumer items. While it also includes a summary of the requirements for shipping containers, refer to the document Barcoding Basics for Shipping Containers for more information. For details about this and other documents mentioned in this guide, visit www.gs1ca.org under Standards.

2.1 Everyone’s Goal . . . Quality Barcodes

Quality barcodes are those that scan accurately during the first pass over the barcode reader.

Why is this so important?

For a retailer, it means that accurate information (about price, item, style, etc.) is passed to the point of sale (POS) register and re-ordering systems. It also means higher productivity at POS, as the cashier does not have to pass the item over the scanner more than once.

For a shipper, it means that goods reach their destination on time.

For a manufacturer, it means increased sales and repeat orders.

But for you—

- the designer,
- the printer,
- the packager,

—why are quality barcodes important to you?

Your work is what actually puts the “quality” into the barcodes. For you, it means that manufacturers and retailers will have confidence in your work and will repeat their requests for your services.
3 What are the Elements of a Quality Barcode?

A quality barcode for a consumer item begins with an accurate number supplied by the manufacturer. GS1 Canada is responsible for maintaining and distributing all Company Prefixes licensed to Canadian companies. To verify your Company Prefix number, contact GS1 Canada at 1.800.567.7084 or visit www.gs1ca.org.

From there, the printer, the designer, and the packager each play a role in supplying the remaining elements:

- Adequate space for a full-height U.P.C. (version A) symbol
- Colours that provide the right amount of contrast and reflectance for scanning the barcode symbol
- Appropriate bar-width reduction in the film master or printing plate for the printing method being used
- Packaging materials that do not adversely affect the contrast
- Appropriate placement on the package so the cashier can find the barcode
- Verification of the symbol throughout the printing run

The responsibility for producing a quality barcode is shared among the manufacturer, designer, printer, and packager. There is one other important element — communication. No one person is responsible for quality; everyone plays a part.
4 Barcoding Basics

Before you begin, it’s important to understand some frequently used terminology.

EAN (European Article Number)/ UPC (Universal Product Code) Symbols are designed for scanning by retail omni-directional scanners (the system for identifying consumer items at POS). These symbols are comprised of both the machine and human readable components.

The illustration shows a typical U.P.C. (version A) used on consumer items in Canada and the USA. It’s known variously as the “regular”, “version A”, or “12-digit” U.P.C. (version A)

Other types of GTINs you might see are the “zero-suppressed” or “version E” symbol (a narrower version of the regular UPC-A) and the EAN-13 or EAN-8 symbols (used outside of Canada and the USA). These and other types of barcode symbols used on shipping containers are illustrated in Appendix A – U.P.C. (version A) and Other Types of barcodes.
5  Contrast and Obscuring Patterns

The ability of a barcode scanner to accurately read a barcode symbol depends on the contrast between the dark and light areas of the symbol. While colour is a major factor of contrast, other elements, such as the material on which the symbol is printed, can also affect it.

Contrast is measured by a certified verifier or another certified device that compares the amount of light reflected from the light and dark areas of a barcode symbol. Tests for contrast and reflectance are part of the verification procedure for printed barcodes. For more information, see the section Verification and the Quality Standard later in this guide.

5.1  Recommended Colours (and Colours to Avoid)

Black bars on a white background provide a good contrast.

When using other colours for the barcode symbol, keep the following in mind:

- Dark green or dark blue are good alternatives
- Avoid using shades of red, orange, and yellow for the dark bars, as the laser in the barcode scanner does not read the colour red; and
- Magenta and yellow are acceptable colours for the “light” spaces.

Other Elements Affecting Contrast

Other elements of packaging that affect the contrast between the dark bars and light spaces (and the ability of the scanner to read the barcode) are:

- Show-through
- Transparent overwrap
- Specular reflecting materials, and
- Half-tone screening.
5.1.1 **Show-Through**
In some packages, the product or background material may show through the light areas of the barcode symbol, making the light area (the spaces) appear dark to the scanner. This will affect the contrast. It will be very difficult to distinguish between the bar and space.

When printing barcode symbols on transparent or translucent materials, it is recommended to use a high intensity white or double white and/or white inner substrate to mask product and/or package in a lamination.

Do not rely on the material or product underneath to act as contrast for the light spaces or dark bars of the symbol.

5.1.2 **Transparent Overwrap**
A transparent wrapper over the printed symbol tends to reduce contrast slightly. When such a wrapper is used, measure the finished product, including the overwrap, for contrast.

5.2 **Specular Reflecting Materials**
Specular reflecting materials are very shiny materials such as foil or aluminum. Because these materials are highly reflective, they can have a serious effect on the print contrast.

If a specular reflecting material is a substrate for a symbol, avoid using the substrate itself to provide either the light or dark areas of the symbol. The symbol should be produced by overprinting the substrate with two inks to provide both the light spaces and dark bars.

If you cannot avoid using specular reflecting materials (e.g., on a two-piece can) and the symbol surface is rigid, then the following tips are recommended:
- The spaces should be printed in a light opaque colour
- The bars should be provided by the specular reflecting substrate itself or printed with a transparent ink that does not significantly change the reflectance
- The symbol should be printed at 1.00 magnification or larger, and
- The numbers below the bars should be highly visible and, if possible, printed in a dark colour.

5.2.1 **Half-Tone Screening**
Avoid half-tone screening or multiple colour impressions to provide the background for the symbol, as it may cause the scanner to read the half-tone screen as defects.

If the package graphics contain half-tone dots, the symbol itself must have a clear background to meet the contrast requirements.
It is also a good procedure to provide a white opaque background around the symbol area when a colour that would affect the scanning is used around the symbol.

5.2.2 Obscuring Patterns

In certain circumstances, it may be necessary to hide a U.P.C. (version A) symbol (e.g., on individual items in a multipack container that has its own symbol).

A solid layer of ink over the U.P.C. (version A) is not always effective in hiding the symbol from a very sensitive barcode scanner. Using an obscuring pattern is recommended instead.

It is recommended that obscuring patterns be comprised of lines or markings crossing the bars of the code at an oblique angle* with a thickness equal to or greater than two (2) times the X-dimension (smallest element of the code structure) to ensure the code is disabled.

*If lines parallel to the direction of the bars are used, it is recommended that they be a minimum of seven (7) times the X dimension wide, spaced seven (7) times the X dimension width apart, and repeated to cover the entire code.

**Note:** Lines perpendicular to the bars will not obscure the code.

The colour of the obscuring pattern should be equal to or darker than the symbol it obscures.

Example of Obscuring Pattern:
6 Size of the Barcode Symbol

6.1 Regular U.P.C. (version A) (or UPC-A) and EAN-13

The illustration below shows the measurements of a “nominal” or standard size U.P.C. (version A) and EAN-13.

![UPC-A/EAN-13 Barcode Symbol Dimensions](image)

<table>
<thead>
<tr>
<th>Magnification (X-Dimension)</th>
<th>A Bar to bar</th>
<th>B Incl. quiet zones</th>
<th>C Minimum bar height</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% (0.26mm)</td>
<td>25.08</td>
<td>29.83</td>
<td>18.29</td>
</tr>
<tr>
<td>90% (0.30mm)</td>
<td>28.22</td>
<td>33.56</td>
<td>20.57</td>
</tr>
<tr>
<td>100% (0.33mm)</td>
<td>31.35</td>
<td>37.29</td>
<td>22.86</td>
</tr>
<tr>
<td>120% (0.40mm)</td>
<td>37.62</td>
<td>44.75</td>
<td>27.43</td>
</tr>
<tr>
<td>160% (0.53mm)</td>
<td>50.16</td>
<td>59.66</td>
<td>36.58</td>
</tr>
<tr>
<td>200% (0.66mm)</td>
<td>62.7</td>
<td>74.58</td>
<td>45.72</td>
</tr>
</tbody>
</table>

A nominal UPC-A/EAN-13 is said to be at 100% magnification. This is also expressed as 1.0.

Depending on the requirements of the packaging, you can reduce the UPC-A/EAN-13 to 80% of the nominal size (a magnification of 0.8) or enlarge it to 200% of the nominal size (a magnification of 2.0).

A larger UPC-A/EAN-13 is often used on large packages simply to make the symbol easier to locate and scan. In other cases, a larger UPC-A/EAN-13 is required to overcome printing problems associated with certain substrates, such as corrugated cardboard and flexible plastic.

6.2 Zero-Suppressed U.P.C. (version E) (or UPC-E) and EAN-8

The zero-suppressed UPC-E/EAN-8 symbol is based on an 8-digit number derived from the regular 12-digit code. Examples of how the number is derived are given in Appendix A – U.P.C. (version A) and Other Types of barcodes.
The following illustration shows the measurements of a nominal size zero-suppressed UPC-E/EAN-8.

**UPC-E/EAN-8 Barcode Symbol Dimensions**

![Barcode Symbol Dimensions](image)

<table>
<thead>
<tr>
<th>Magnification (X-Dimension)</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% (0.26mm)</td>
<td>13.46</td>
<td>17.69</td>
<td>18.29</td>
</tr>
<tr>
<td>90% (0.30mm)</td>
<td>15.15</td>
<td>19.9</td>
<td>20.57</td>
</tr>
<tr>
<td>100% (0.33mm)</td>
<td>16.83</td>
<td>22.11</td>
<td>22.86</td>
</tr>
<tr>
<td>120% (0.40mm)</td>
<td>20.2</td>
<td>26.53</td>
<td>27.43</td>
</tr>
<tr>
<td>160% (0.53mm)</td>
<td>26.93</td>
<td>35.38</td>
<td>36.58</td>
</tr>
<tr>
<td>200% (0.66mm)</td>
<td>33.66</td>
<td>44.22</td>
<td>45.72</td>
</tr>
</tbody>
</table>

Because only 7 digits are encoded (the ‘0’ system character is assumed), the zero suppressed UPC-E/EAN-8 is considerably narrower than the standard UPC-E/EAN-8. At nominal size, it is .871” wide compared with 1.469”. All other requirements for size and magnification remain the same as the standard 12-digit UPC-E/EAN-8.

Note: If you use a zero-suppressed U.P.C. (version E), remember that the POS scanner decodes the symbol to the full 12-digit code. You cannot use the same code with the 12-digit, version A symbol for a different item.

### 6.3 Numbers

Standards for the size of numbers, position of the number system character and the check digit are given in the GS1 General Specifications.

### 6.4 Recommendations for Small Packages

Small packages are ones that do not have sufficient paneling (real estate) on the package large enough to accommodate a full-height U.P.C. (version A) symbol. When a consumer item is too small to accommodate a U.P.C. (version A) symbol, several alternatives are possible:
• If applicable, use a “zero-suppressed” U.P.C. (version E) to reduce the width (company prefix permitting)
• Reduce the size of the human readable numbers to reduce the height, and
• For special consideration, contact GS1 Canada or any qualified validation service to apply for a small packaging exemption.

6.4.1 Truncation
The GS1 General Specification states ‘ZERO TOLERANCE’ for truncation or shortening the height of the symbol. However, it is recognized that, in some cases, the package size and/or shape make it impossible to include a "full height” U.P.C. (version A). In these circumstances, the symbol may be truncated, but only as much as necessary to fit the package.

Keep in mind that truncation of a symbol can seriously impair a scanner’s ability to read it correctly.

In order to avoid trading partner penalties, NEVER truncate barcodes on packages large enough to accommodate a full-size symbol.

6.5 Quiet Zones
The quiet zones are the margins to the left and right of the symbol. They must remain free of all printing or graphics to allow the scanner to locate the symbol and read it correctly. The quiet zones are an integral part of the symbol and are included in the overall dimensions of the U.P.C. (version A).

Because the U.P.C. (version A) can be scanned from either direction - left to right or right to left - the quiet zones are required on both sides. The quiet zone should not contain any wording, other graphics, closures, perforations, die lines, glue slaps, scores, or cut-outs. Additionally, the U.P.C. (version A) symbol should be far enough away from the edge of the package to maintain an adequate quiet zone.
7 Location – General Guidelines

The location guidelines were developed to satisfy two needs:

• To place the symbology in the best position for successful scanning; and
• To provide consistency so the cashier can easily find the symbology.

The following section outlines some general guidelines for placing the U.P.C. on consumer items. The illustrations show U.P.Cs incorporated into the existing package graphics. In some cases, however, it may be necessary to use U.P.Cs printed on pressure-sensitive labels for unlabeled or unpackaged products such as pots, pans, and glassware. In such cases, the guidelines for placing the label are the same. For more details refer to GS1 Symbol Placement Guidelines.

7.1 Basic Guideline – Bottom Marking

For items that can be passed over a scanner at POS, the basic rule is to place the GTIN symbol in the centre of the package’s “natural bottom”. To determine the natural bottom, consider both the design of the container and the orientation of the package graphics.

Where bottom marking is not possible, either because of the shape of the package or the costs involved, other locations for the symbol are possible.

The following sections illustrate the most common situations. For more information about specific types of packaging, please see the GS1 General Specifications.

7.2 Boxes, Bags and Pouches

The bottom marking rule applies to most boxes and certain types of bags and pouches.

The symbol must be located where a date stamp (either stamped in ink or embossed) or a price mark (ink-stamped or sticker) is not likely to be placed over the symbol.

The symbol can be printed with the bars running vertically or horizontally. Printing the bars of the symbol parallel to the press direction provides a better-quality symbol.

7.3 Boxes

Here are several examples of “bottom marking” for rectangular boxes.
If the dimensions of the bottom panel are both greater than 6”, the symbol should be centered in the lower portion of the panel.

7.4 Bags and Pouches

Bags or pouches that have a natural bottom should be marked on the bottom.

On bags such as those used for flour or sugar, the symbol should be placed on the natural bottom if space permits. If not, it should be placed on the back panel, near the lower edge and centered horizontally.

7.5 Glass and Plastic Bottles, Plastic Tubs and Cans

The standard of bottom marking is not feasible for many glass and plastic bottles, plastic tubs, and cans. Many of these containers have a depression or convex surface which interferes with the scanning of the symbol. In other cases, the high cost of placing an additional label on the bottom makes it impractical.

In this case, the U.P.C. symbol may be printed on the back or side of these containers, as part of their current package graphics.

The symbol must be located as low as possible on the package with sufficient space between the symbol and any overlaps or seams in the packaging.

The following illustrates some typical situations with glass and plastic bottles and plastic tubs.

7.6 Wraparound Labels with One Display Panel

On wraparound labels with one main display panel, place the symbol in the lower 25% of the back of the label. On paper or plastic labels, place the symbol adjacent to the seam.
7.7 Wraparound Labels with Two Display Panels
On wraparound labels with two main display panels, place the symbol close to the bottom in the space between the two display panels.

7.8 Containers with a Single Spot Label
On containers with a single spot label, place the symbol in the lower left area of the label.

7.9 Containers with Two Spot Labels
On containers with two spot labels (front and back), place the symbol on the lower part of the back label, preferably in the centre.

7.10 Containers with Built-in Handles
On containers with a built-in handle, place the symbol on the lower part of the back label, opposite the handle.

7.11 Symbology Printed on Lids
The symbol may be placed on the lid of a container when printing on the lid of a container or on a label is not feasible, provided that the depth of the lid does not exceed 13mm (½”).

For foil tubs having graphics only on a paperboard lid, the lid is the recommended location for the symbol. For all other containers, the lid is the “last resort” location.
7.12 Metal Decorated Cans

Many bottles and plastics tubs have a depression in the bottom which interferes with the scanning of the symbol. In this case, the U.P.C. symbol may be printed on the side of the can, as part of the packaging graphics.

In general, the symbol must be located as low as possible on the package with sufficient space between the symbol and any seams or indentation.

On metal decorated cans with one main display panel, place the symbol in the lower 25% of the container, opposite the solder seam.

On cans with two main display panels, place the symbol close to the bottom in the space between the two display panels.

On metal decorated cans that have one or more indentations in the wall surface, place the symbol to avoid the indentation.

If you cannot avoid the indentation, place the symbol so that the bars are at right angles to the indentation. When possible, the symbol will appear on the regular wall of the can.
7.13 Packages Without a Natural Bottom

Packages such as flexible bags and small pouches do not have a natural bottom. With this type of packaging, place the symbol on the back panel, as close as possible to the bottom and centre.

If the package bulges close to the lower edge, move the symbol closer to the centre of the bag. If there is a seam in the middle of the panel, place the symbol to the right of the seam.

7.14 Carded Products

Wherever possible on carded products, place the symbol on the back of the card.

If the back is not printed, place the symbol on the face of the card.

For carded products with a blister pack where the symbol is printed on the face of the card, the symbol must not be more than ½” (13 mm) from the scanning window when the package is lying flat. Keep the symbol clear of the plastic blister glue seams.

If the blister is greater than ½” deep, place the symbol far enough from the blister so that tilting the product will bring the entire symbol within ½” (13 mm) of the scanner window.

7.15 Products with Hang Tags

Products marked only with tags or pins that contain no other graphics, should show the U.P.C. on the tag or pin.
7.16 Large Items
Large items in boxes and bags are too awkward or too heavy to pass over a scanner at POS. The checkout person must enter the U.P.C. number through a keyboard or scan the symbol with a handheld-scanner.

7.16.1 Boxes
On boxes that contain one consumer unit (e.g., a television, appliance, or ready-to assemble furniture), place the consumer item symbol on the top of the box. The symbol may be printed on a label at a minimum of 100% of a nominal; or directly on the box at a minimum of 200% of nominal. In addition, the number portion of the symbol should be in figures 5/8” or larger.

If the box is both a consumer item and the shipping container, the U.P.C. or the shipping container code (SSC-14) may be used. In either case, the symbol should be printed on the lower part of the side and end panels. For more information about shipping container codes, see Shipping Containers later in the guide and Barcoding Basics for Shipping Container Codes.

7.17 Large and Heavy Bags
On large and heavy bags (e.g., bags containing bulk dog food), place the symbol on the front of the bag near the top but away from any seam or fold.
As an alternative, the symbol could be printed on a perforated extension of the top flap. The extension can be removed and scanned at POS.

When such an extension is planned, it must be designed so that abrasion during transport or stocking will not damage the barcode symbol.

### 7.18 Multipacks

The overriding rule for items sold in multipacks, whether they are bound by cardboard or clear overwrap, is that only one U.P.C. (or other approved symbology) can be visible on the multipack.

If a single item in the multipack is never sold individually or is too small to carry a symbol, the symbol should be placed only on the multipack wrapping.

If a single unit is sold separately, the individual items must have a different GTIN from the code on the multipack wrapping. However, the multipack container must completely obscure the U.P.C. on the individual items within.
7.19 Other Items

The GS1 General Specifications is the source for guidelines on placing GTINs for all types of packages.

In addition to the common types of packaging mentioned in this section, the manual gives specific guides for the following types of packaging:

- Random wrapping
- Beverages
- Magazines and paperback books
- Office products
- Shrink film and vacuum-formed packaging
- Banded products
- Milk and dairy products
- Tobacco products
- Cassettes and video tapes
- Unboxed plants and nursery products

For more details refer to [GS1 Symbol Placement Guidelines](#).
8 Printing the UPC

The following section describes the various elements that go into printing a quality U.P.C. symbol:

- the film master
- the verification to meet the quality standard, and
- the appropriate printing method.

8.1 Film Master

The film master is an extremely accurate photographic representation of a barcode used to make printing plates. This is one of the most important components in producing and printing a quality U.P.C., since errors at this stage could result in symbols that may be read incorrectly and/or rejected.

Reputable film master suppliers will create a film master meeting all global specifications.

8.2 EPS image files used when generating Barcodes

Encapsulated PostScript (EPS) is a file in vector format that has been designed to produce high-resolution graphics exclusively for print.

EPS files essentially contain a series of instructions for how a printer should reproduce an image at the maximum resolution. These files are the print industry standard format and can be imported or inserted with most graphic applications.

Although they are the best format for barcode images to be printed, EPS files cannot be used for web graphics.

If you are using EPS image files when generating your barcodes, be sure to work with a reputable film master supplier who has experience in working with EPS files.
8.3 SVG image files used when generating Barcodes

Scalable Vector Graphics (SVG) is a text-based graphics language that describes images with vector shapes, text, and embedded raster graphics. The word Scalable refers to the fact that the SVG can be scaled to different sizes without losing any quality.

SVG files provide resolution independent, high resolution dots per inch (HiDPI) graphics on the web, in print, and on mobile devices in a compact format. It is one of the most used formats for building a website and print graphics in order to achieve scalability. The format can only be used for two-dimensional graphics though.

SVG files can be viewed/opened in almost all modern browsers including Chrome, Internet Explorer, Firefox, and Safari.

If you are using SVG image files when generating your barcodes, be sure to work with a reputable film master supplier who has experience in working with SVG files.

8.4 Verification and the Quality Standard

Verification is the process of measuring a symbol to determine whether it meets the specifications in the GS1 General Specifications. Using a light pen or wand to read the symbol, the verifier analyzes and measures 9 attributes against International Standards Organization (ISO) standards:

- Minimum reflectance
- Symbol contrast
- Defects (voids and spots)
- Quiet zones
- Edge determination
- Minimum edge contrast
- Modulation
- Decode
- Decodability

Each attribute receives an ISO grade of 4 to 0. The lowest grade becomes the overall symbol grade.

The minimum acceptable grade for a symbol at POS scanning is ISO 1.5 (ANSI grade C), which means that a symbol can be expected to scan successfully with a well-maintained scanner in a normal environment. However, due to the variety of scanners that may be used (some are less sensitive than others), printers are urged to strive for the highest grade attainable.
8.4.1 **When is Verification Done and Who Does It?**

Verification is done in two stages.

First it is recommended to be submitted to a third-party validator at the pre-production stage to ensure "so-far-so-good" before you proceed to step two (testing attributes, such as magnification, quiet zones, colour choice, ISO, etc.).

Second, test on the final package as it will be represented to the POS scanner, including contents and any overwrap.

The Validation Report (also known as SVR Scan Verification Report, or U.P.C. Certificate of Conformity or the Shipping Container Verification Certificate), is part of your product listing requirement with your trading partner. This report reflects the results of the verification.

The report should conform to one of the samples shown on the following pages.

This validation and certification service is available at GS1 Canada or any other qualified third-party validator.

Samples of the U.P.C. Certificate of Conformity and Shipping Container Validation Certificate are shown on the following pages:
8.4.2 Certificate of Conformity for a U.P.C.

<table>
<thead>
<tr>
<th>Date/Date:</th>
<th>Jul 29, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom du client/Client Name:</td>
<td>Company ABC123</td>
</tr>
<tr>
<td>Customer Number/Numéro du Client:</td>
<td>1234567890</td>
</tr>
<tr>
<td>Description du produit:</td>
<td>DESCRIPTION FRANÇAIS</td>
</tr>
<tr>
<td>Product description:</td>
<td>DESCRIPTION ENGLISH</td>
</tr>
<tr>
<td>Format/Size:</td>
<td>100 gr</td>
</tr>
<tr>
<td>GTIN:</td>
<td>012345678905</td>
</tr>
</tbody>
</table>

**Vérification visuelle/Visual Check**

<table>
<thead>
<tr>
<th>Symbologie/Symbology</th>
<th>UPC-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vérification numéro/Number Verification</td>
<td>PASS</td>
</tr>
<tr>
<td>Emplacement du symbole/Code Location</td>
<td>PASS</td>
</tr>
<tr>
<td>Caractère de contrôle/Check Character</td>
<td>PASS</td>
</tr>
<tr>
<td>Facteur de grossissement/Code Magnification</td>
<td>110% PASS</td>
</tr>
<tr>
<td>Troncature/Truncation</td>
<td>PASS</td>
</tr>
<tr>
<td>Espaces blanc/Quiet Zone</td>
<td>3/4 LT PASS, 3/4 RT PASS</td>
</tr>
</tbody>
</table>

**Test de vérification/Verification Test**

<table>
<thead>
<tr>
<th>Paramètre/Parameter</th>
<th>Mètre/Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Réflectance minimale/Minimum Reflectance</td>
<td>100 A</td>
</tr>
<tr>
<td>Contraste du symbole/Symbol Contrast</td>
<td>81 A</td>
</tr>
<tr>
<td>Contraste minimal du bord/Minimum Edge Contrast</td>
<td>48 A</td>
</tr>
<tr>
<td>Modulation/Modulation</td>
<td>60 B</td>
</tr>
<tr>
<td>Décodabilité/Decodability</td>
<td>74 A</td>
</tr>
<tr>
<td>Défauts/Defects</td>
<td>5 A</td>
</tr>
</tbody>
</table>

**Note Générale/Overall ANS1 Grade** | 2.0 B
8.4.3 Certificate of Validation for a Shipping Container

GS1 Canada
INTEGRA™ 9500 Verification Report

Overall: 0.0/10/660 (F)

Operator signature

Second signature

Edge determination failures reduced the overall grade by 56%

<table>
<thead>
<tr>
<th>ID</th>
<th>1D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbology</td>
<td>EAN/UCC-128</td>
</tr>
<tr>
<td>Decoded text</td>
<td>01006038301518015120724</td>
</tr>
<tr>
<td>Xdim</td>
<td>0.685mm</td>
</tr>
<tr>
<td>Edge determ (failures reduced overall grade)</td>
<td>56% ERROR</td>
</tr>
<tr>
<td>Min Reflec</td>
<td>PASS</td>
</tr>
<tr>
<td>Minimum EC</td>
<td>FAIL 12%</td>
</tr>
<tr>
<td>Decode</td>
<td>PASS 57</td>
</tr>
<tr>
<td>Quiet zone</td>
<td>PASS</td>
</tr>
<tr>
<td>Contrast</td>
<td>1.0 (D) 31%</td>
</tr>
<tr>
<td>Modulation</td>
<td>0.2 (D) 37%</td>
</tr>
<tr>
<td>Decodability</td>
<td>0.7 (D) 27%</td>
</tr>
<tr>
<td>Defects</td>
<td>0.9 (D) 28%</td>
</tr>
<tr>
<td>Blemish</td>
<td>0.0 (C) 67%</td>
</tr>
<tr>
<td>Rmin</td>
<td>1%</td>
</tr>
<tr>
<td>Rmax</td>
<td>32%</td>
</tr>
<tr>
<td>GT</td>
<td>16%</td>
</tr>
<tr>
<td>Bar height</td>
<td>20.389mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>ReportID</td>
</tr>
<tr>
<td>Operator</td>
</tr>
<tr>
<td>Application standard</td>
</tr>
<tr>
<td>Effective aperture</td>
</tr>
<tr>
<td>Wavelength</td>
</tr>
<tr>
<td>Date and time</td>
</tr>
<tr>
<td>Time zone</td>
</tr>
<tr>
<td>Sector size</td>
</tr>
<tr>
<td>Last calibration</td>
</tr>
<tr>
<td>Field of view</td>
</tr>
<tr>
<td>Serial numbers</td>
</tr>
<tr>
<td>Software product and version</td>
</tr>
<tr>
<td>INTEGRA™ 9500 manufactured by:</td>
</tr>
</tbody>
</table>
8.5 Choosing the Right Printing Method

There is a wide variety of printing methods that can produce high quality symbols. The method you choose is based on several factors:

- **Package design**
  How large is the package? What material is used for the packaging? How complex are the package graphics? How many colours are needed to print the package?

- **Volume**
  How many GTINs or labels are needed?

- **Cost**
  Is cost a factor? Which method is most cost-effective?

- **Flexibility**
  Do you need more than one type of print run completed? Do the packages require additional graphics?

- **Efficiency**
  How much time is available for preparation, operator intervention, and maintenance?

The table below outlines the major features of the printing methods commonly used for packaging and/or barcodes. However, because printing methods are constantly improving with advances in technology, you should discuss with your printer, which method will best suit your needs.

<table>
<thead>
<tr>
<th>Commonly Used for</th>
<th>Good For</th>
<th>Good For</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>Board</td>
<td>Corrugate</td>
<td>Plastic/Cellophane</td>
</tr>
<tr>
<td>Lithography</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexography</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Rotogravure</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silkscreen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermography</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laser</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inkjet</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8.6  The Different Printing Methods

This section describes the different printing methods that can be used to print symbols, and the possible problems associated with each method. Where a solution is not offered, a different printing method should be used to avoid the problem.

8.6.1  Lithography

In lithography, the printing plate is flat rather than raised as in letterpress or recessed as in gravure. The area to be printed is treated chemically so that it accepts ink and rejects water, while the non-printing area is treated to accept water and reject ink. Oil-based inks are used which require greater drying time.

Most lithography is offset, meaning the ink is first transferred to a rubber blanket wrapped around a rotating metal cylinder and from there the image is transferred to paper.

Potential problems with barcodes printed with the lithographic process can be identified and corrected by:

1. Fingerprinting the press
2. Applying appropriate bar-width reduction, and
3. Where slur is a problem, avoiding cross-press barcodes.

Possible Problems

• Ink spread
• Slur, and
• Optical gain (ISO modulation is often a problem with plastic substrates or laminates).

8.6.2  Flexography

Flexography is a type of letterpress in which the area to be printed is raised from the printing plate. In flexography, plates are made of rubber or photopolymer and fast-drying solvent or water-based inks are used. It is an inexpensive printing method that can be used on a wide variety of materials including paper, foil, laminate, and plastic film.

Potential problems with barcodes printed with the flexographic process can be identified and corrected by:

1. Fingerprinting the press; and
2. Monitoring ink spread with a printability gauge during the press run.
**Flexography: Possible Problems & Solutions**

<table>
<thead>
<tr>
<th>Possible Problems</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO “modulation” on plastic substrates</td>
<td>Use more opaque inks and or substrates.</td>
</tr>
<tr>
<td>Ink spread from plate breakdown or swelling or Halos from dirty plates and excessive gain</td>
<td>Clean the plates. Lessen squeeze.</td>
</tr>
<tr>
<td>Plate bounce resulting in ink squeeze. Most evident when barcode is not in the press direction.</td>
<td>Run bars in press direction.</td>
</tr>
<tr>
<td>Pin holing on non-reflective substrate</td>
<td>Print double hit of light coloured ink.</td>
</tr>
<tr>
<td>Plate distortion (mounting stretch)</td>
<td>Remake plate, measure for accuracy.</td>
</tr>
<tr>
<td>Slur</td>
<td>Run bars in press direction.</td>
</tr>
<tr>
<td>Excessive impression</td>
<td>Underlay all areas except the symbol. Use the most compressible mounting tape.</td>
</tr>
<tr>
<td>Excessive gain on bar width</td>
<td>Print with a finer anilox roll having a volume of 4 - 4.5 BCM. Change bar width reduction.</td>
</tr>
<tr>
<td>Plate thickness variations</td>
<td>Use photopolymer or underlay as required</td>
</tr>
<tr>
<td>Dirty print from air blowing on the plate or ink drying too fast</td>
<td>Adjust balance between colour dryers; adjust solvent blend.</td>
</tr>
<tr>
<td>Symbol off spec even though printed sample has a good impression.</td>
<td>Check the film master, engraving and/or plate against expected line width reduction using a minimum of a 40-power scope graduation in .001” division.</td>
</tr>
</tbody>
</table>

---

**8.6.3 Rotogravure**

With rotogravure, the area to be printed is etched or engraved into the surface of the printing cylinder. The paper is fed through the press on a rubber-covered cylinder which presses the paper into the recesses to pick up the ink. The ink is thin, and solvent based.

**8.6.4 Direct Thermal**

Small heating elements inside a print head are selectively heated and pressed against special heat-sensitive paper.

Direct thermal printers are usually very small—desktop or handheld. Frequent maintenance of the printer is required to ensure symbol quality.

<table>
<thead>
<tr>
<th>Possible Problems</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bars can fade and spaces can darken when exposed to light for a long time.</td>
<td>Avoid using on items with an extended shelf life or which might be exposed to direct sunlight in storage.</td>
</tr>
</tbody>
</table>
Thermal Transfer

Similar to direct thermal printing. This method uses an ink ribbon which prints the symbol on regular paper.

<table>
<thead>
<tr>
<th>Possible Problems</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbols may smear</td>
<td>Use a resin or wax/resin ribbon on true thermal paper to allow good bonding.</td>
</tr>
<tr>
<td></td>
<td>Coat with a clear, non-reflective substance.</td>
</tr>
</tbody>
</table>

8.6.5 Silkscreening

A stencil made from a film master is supported on a screen of synthetic fibre or metal. Ink is spread across the stencil and then squeezed through the cut-away section of the stencil and the screen by a rubber “squeegee”.

The process is relatively slow, but it can be used on a wide variety of surfaces including curved surfaces. It prints a thick film of ink which can provide good contrast, but it is not good for fine detail unless high mesh count screens are used.

<table>
<thead>
<tr>
<th>Possible Problems</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ink spread</td>
<td>Use a higher mesh count screen.</td>
</tr>
<tr>
<td>Stair casing at bar edges</td>
<td>Apply the appropriate bar-width reduction.</td>
</tr>
</tbody>
</table>

8.6.6 Laser

A laser printer can print computer-generated symbols directly to the printing surface. The black laser image provides high contrast for good scanning results.

The resolution of the imaging device bar width should be a multiple of the size of the dot output by the printer.

8.6.7 Inkjet

The printer sprays the printing surface with bursts of ink from an ink cartridge.

<table>
<thead>
<tr>
<th>Possible Problems</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ink spread</td>
<td>Best used on corrugate shipping containers with Interleaved 2 of 5 barcode symbols.</td>
</tr>
</tbody>
</table>
9 Shipping Containers

The following section is a brief overview of barcode symbols for shipping containers. For more information, see the documents Barcoding Basics for Shipping Containers and the GS1 General Specification.

9.1 The Different Types of Container Code

The type of shipping container code you use depends on whether the contents of the containers are “standard” or “variable”.

9.1.1 Standard Containers

The contents of a shipping container are considered to be standard when all the units in the shipping container are identical—they all have the same description, size, count, and weight.

A standard container uses a GTIN-14 shipping container code, e.g., 3 00 12345 67890 6.

Since all the consumer units in each container have the same GTIN, the GTIN14 is created using the first 11 digits of the GTIN-12 and is preceded by an indicator digit and filler zero (see the GS1 General Specification for more information related to hierarchy coding). The same GTIN-14 is used on all containers of the same size carrying the same item.

When GTIN-14 shipping container codes are encoded with a GS1-128 symbology, they are prefixed with the number 01 in parentheses, e.g. (01) 3 00 12345 67890 6. The (01) is called an application identifier.

This symbology may be used alone or when secondary information such as weight, is to be combined with the GTIN-14 in a single barcode symbol using Application Identifiers (AI).
9.1.2 Variable Containers

The contents of a shipping container are considered to be variable when the units in the shipping container vary in some respect—colour, size, weight, quantity, freshness.

A variable container uses an SSCC-18 serial shipping container code, e.g. (00) 0 0012345 987654321 8.

There is no correlation between the SSCC-18 and the GTIN-12 of the units inside. The serial shipping container code uses a unique number that identifies just one container. The serial shipping container code must not be repeated on another container for at least one year or while the original container is still in use.

For more information about item and container codes, see Appendix A – U.P.C. (version A) and Other Types of barcodes

Decision Tree for Container Code Selection
9.2  The Different Types of Barcode Symbology

Symbology is the method used to create the barcode symbol. There are two symbologies used to create shipping container barcode symbols:

- Interleaved 2 of 5 (ITF)
- GS1-128

9.3  Interleaved 2 of 5

The Interleaved 2 of 5 symbology is used to create barcodes for 14-digit GTIN codes for standard containers.

Interleaved 2 of 5 symbols are characterized by bearer bars, the thick lines around the symbol and the simpler design of the bars and spaces.

This symbology was designed to be used on rough surfaces, such as corrugate. It may be used wherever a 14-digit GTIN symbol is required, and no additional information (such as weight) needs to be encoded.

9.4  GS1-128

14-digit GTIN codes are also printed using GS1-128 symbology when they are combined with other information, such as weight or a production date. In this case, the application identifier (01) identifies the 14-digit GTIN, and other application identifiers, such as (3102) and (11), which indicate the weight and date, respectively.

Due to the finer detail of the GS1-128 symbology, these shipping container code symbols should be printed on labels rather than directly on the shipping container.
The GS1-128 symbology is used to create barcodes for serial shipping container codes (SSCC-18) as well as standard 14-digit GTIN codes when additional information needs to be encoded.

When GS1-128 symbology is used, the number is always preceded by an application identifier (the number in parentheses), which indicates which type of number follows. For example, (00) indicates a serial shipping container code (SSCC-18).

### 9.5 Printing the Barcode Symbol on a Shipping Container

A variety of printing processes are available to produce shipping container codes, as long as the symbol can meet the quality specifications. It is strongly recommended that the symbols be tested to ensure that they meet the requirements. In addition, since the containers will be subjected to multiple handlings and abrasion during shipping, you should also consider the durability of the print process.

For more information, see the sections on *Verification and the Quality Standard and The Different Printing Methods* earlier in this guide.

### 9.6 U.P.C. (version A) (UPC-A)

When the shipping container is also a consumer unit, the case requires a GTIN-12 that is scannable at POS instead of a shipping container code.

Quality requirements for the EAN/UPC symbol are adapted from the ISO/IEC 15420.

- **Magnification**
  To be scannable within an automated distribution environment, the symbol should be as large as possible while respecting the maximum allowable size.

- **Quality**
  Symbols must meet the standards outlined in the Quality Specification for the U.P.C. Printed Symbol. The minimum acceptable grade is ISO 1.5 (ANSI Grade C).

- **Substrate**
  Printing on mottled white or full beached linerboard; or printing a white background for the symbol will produce a satisfactory quality grade. Printing the U.P.C. (version A) symbol directly on natural kraft linerboard is not recommended when it is expected to be scanned at POS.

- **Colour**
  Black, dark blue or dark green ink is recommended.
9.7    Interleaved 2 of 5 (ITF)

Interleaved 2 of 5 barcode symbols are suitable for printing directly on linerboard. When decoding ITF symbols, scanners are more tolerant of imperfections, allowing a lower acceptable quality grade.

Quality requirements for the ITF symbol are adapted from the ISO/IEC 16390.

- **Magnification**
  The magnification can range from 70 to 120% of nominal. Bigger is better. Larger symbols can be scanned with a greater depth of field, allowing more accurate reading of the symbol at a greater distance from the scanner.

- **Quality**
  The minimum acceptable symbol ISO grade is 0.5 if the symbol is greater than 70% of nominal.

- **Substrate**
  Interleaved 2 of 5 symbols can be printed successfully on natural kraft, mottled white or full bleached linerboard, or on white labels.

- **Colour**
  The use of black, dark blue or dark green ink is especially important as the greater contrast with these colours helps the scanner to overlook the reflectance variations in the kraft linerboard.

- **Other recommendations**
  Assure solid ink coverage for the bars because large voids in the bars will confuse the scanner.

For conventional printing plate processes, undercut the film master generously to prevent excessive ink spread. In general, scanners are more tolerant of narrower than nominal bars, than of narrower spaces.

9.8    GS1-128

Quality requirements for the GS1-128 symbol are adapted from the ISO/IEC 15417

- **Size**
  The GS1-128 symbols can vary in width, depending on the amount of information encoded in the symbol, the requirements for the size of the symbol are based on the X dimension—the nominal width of the narrowest bar or space.

- **Quality**
  The minimum acceptable grade is ISO 1.5 but a grade of 2.5 or better is recommended (ANSI Grade C or above).

- **Substrate**
  GS1-128 barcode symbols should be printed on white labels. The label surface should not be glossy, and not prone to smearing or smudging.

- **Colour**
  Black, dark blue or dark green ink is recommended.

9.9    Placing the Shipping Container Code

The following recommendations apply to both 14-digit GTIN and SSCC-18 barcode symbols, whether printed directly on the container, applied with a label, or printed using non-contact methods.
The recommendations were designed so that the symbol will remain legible if the edge of the package is damaged.

### 9.10 Containers 39” (1m) or Less in Height

These recommendations were designed to assist scanning in an automated environment. It is important that the symbol be placed in a similar location on all packages.

- If possible, the shipping container code should appear on two adjacent sides, or a minimum of one side.
- The bottom edge of the shipping container barcode should be 1.25” (± 0.125”) from the bottom of the container. Even if the barcode cannot be placed so precisely, the bars of the barcode must extend through the range from 1.38” to 1.90” from the natural bottom of the container.
- The outermost bar of the code (excluding bearer bar and quiet zone) should be at least 1.25” from the edge. The outer edge of the quiet zone should be no closer than 0.75” to the edge.
- The shipping container code should be parallel to the bottom of the container, with the bars of the code at right angles to the bottom of the container.

### 9.11 Containers Greater than 39” (1m) in Height

In general, these are containers for large items in which the item packaging is also the shipping container.

The placement of shipping container codes on large containers is designed for ease of scanning by hand.
• The bottom edge of the symbol should be within a range of 20”– 30” from the bottom of the container.
• The symbol should be right of centre, at least 2” from either edge.
Appendix A - U.P.C. (version A) and Other Types of Barcodes

This appendix describes and illustrates types of barcode symbols mentioned in this guide.

**UPC-A**
The Universal Product Code (U.P.C.) is used on virtually all consumer items sold in North America.

*Variable Length Company Prefixes (VLCP) are used in the examples below. Refer to VLCP for further information.*

```
8 1234567 890 1
```

**UPC Company Prefix** — A unique number that identifies each manufacturer or supplier in Canada and the USA. The Company Prefix is licensed to Canadian organizations by GS1 Canada or by GS1 US in the U.S.

**Item Number** — Assigned and controlled by the manufacturer. Each different consumer package must have a unique item number.

**Check Digit** — Calculated from the preceding numbers in the code. For instructions to calculate the check digit, visit www.gs1ca.org/apps/calculator/main.asp

Manual calculation is available at: www.gs1ca.org/page.asp?intPageID=320

**UPC-E**
The zero-suppressed GTIN is a narrower version of the standard 12-digit GTIN. It is used when the size or shape of the packaging does not allow a full-width GTIN. It is also called the “Version E” GTIN.

Note: Only GTINs with the number system character of 0 can be narrowed in this way. (Only Canadian or U.S. prefixes begin with a zero.)

```
012350315
```

The zero-suppressed GTIN comprises eight digits: an “implied” 0; six digits derived from the original 12-digit GTIN number; and a check digit calculated from the full 12-digit number.

The number is created differently, depending on the manufacturer number:
If the Company Prefix Ends in 000, 100 or 200
If the company prefix ends in 000, 100 or 200, there are 1,000 possible item numbers from 00000 to 00999.

The zero-suppressed GTIN is obtained from the first two digits of the manufacturer number, the last three digits of the item number, followed by the third digit of the manufacturer number.

0 12000 00890 0
0 128900 0

If the Company Prefix Ends in 300, 400, 500, 600, 700, 800 or 900
If the company prefix ends in 300, 400, 500, 600, 700, 800 or 900, there are 100 possible item numbers from 00000 to 00099.

The zero-suppressed GTIN is obtained from the first three digits of the manufacturer number, the last two digits of the item number, followed by “3.”

0 12300 00090 1
0 123903 1

If the Company Prefix Ends in 10, 20, 30, 40, 50, 60, 70, 80 or 90
If the Company Prefix ends in 10, 20, 30, 40, 50, 60, 70, 80 or 90, there are 10 possible item numbers from 00000 to 00009.

The zero-suppressed GTIN is obtained from the first four digits of the manufacturer number, the last digit of the item number, followed by “4.”

0 12340 00009 1
0 123494 1

If the Company Prefix Does Not End in Zero
If the Company Prefix does not end in zero, there are five possible item numbers, from 00005 to 00009.
The zero-suppressed GTIN is obtained from all five digits of the manufacturer number and the last digit of the item number.

**EAN-13**
The EAN-13 symbol is the equivalent of the GTIN used outside of North America. The U.P.C. and EAN symbols contain the same number of bars and spaces, and so are compatible. The EAN symbol contains 13 digits; the GTIN contains 12.

Note: The 13th digit is also encoded in the GTIN symbol but, because it is always 0 in the GTIN, it is not shown in the human readable numbers.

**EAN-8**
The EAN-8 symbol is the equivalent of the U.P.C. zero-suppressed or version E symbol. However, it contains only the EAN 2-digit prefix, a 5-digit item number and a check digit. The 5-digit item number must be uniquely assigned by the country coding authority.
GTIN-14
GTIN-14 is a 14-digit shipping container code used for standard containers (i.e., those containing identical consumer units).

The number for the GTIN-14 is created in the following way:

```
prefix (6-10 digit)

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

**Indicator Digit** Identifies the size or type of container. Manufacturers define their own packaging indicators using the digits 1 to 8.

**UPC Company Prefix** Unique number assigned by GS1 Canada and is preceded by one system character digit (zero fill) for EAN compatibility.

**Item Number** Item number from the consumer items in the shipping container.

**Check Digit** Calculated from the other numbers in the code.

*GTIN-14s are most often encoded using Interleaved 2 of 5 symbology and GS1-128s*

SSCC-18
SSCC-18 is an 18-digit serial shipping container code used for variable shipping containers. The number for the SSCC-18 is created in the following way:

<table>
<thead>
<tr>
<th>Application Identifier</th>
<th>Extension Digit</th>
<th>GS1 Company Prefix</th>
<th>Serial Reference</th>
<th>Check Digit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0</td>
<td>N₁, N₂, N₃, N₄, N₅, N₆, N₇, N₈, N₉, N₁₀, N₁₁, N₁₂, N₁₃, N₁₄, N₁₆, N₁₇, N₁₈</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Application Identifier** A prefix that defines what type of information is encoded in the symbol. For an SSCC-18, the application identifier is always (00).

**Extension Digit** Used to increase the capacity of the Serial Reference within the SSCC. It is assigned by the company that constructs the SSCC. The extension digit ranges from 0 to 9.

**GS1 Company Prefix** Unique number assigned by GS1 Canada. It includes one system character digit for EAN compatibility.
<table>
<thead>
<tr>
<th><strong>Serial Reference</strong></th>
<th>Unique number assigned by the manufacturer to identify the individual shipping container.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Check Digit</strong></td>
<td>Calculated from the other numbers in the code.</td>
</tr>
</tbody>
</table>

SSCC-18s are encoded using GS1-128 symbology.
Appendix B - International Standards

A number of national and regional standardization bodies have developed barcode technical standards. The International Organisation for Standardisation (ISO) has published standard barcode symbology specifications via a subcommittee of ISO/IEC JTC1 (International Organisation for Standardisation/International Electrotechnical Commission Joint Technical Committee 1).

GS1 is actively involved in developing these standards. The objective is for GS1 System standards to remain fully compatible with relevant published national, regional, and international symbology standards.

The pertinent documents include the latest published version of:

- ISO/IEC 15424: Information technology; automatic identification and data capture techniques; data carrier/symbology identifiers
- ISO/IEC 15420: Information technology; automatic identification and data capture techniques; barcode symbology specifications; EAN/UPC
- ISO/IEC 16390: Information technology; automatic identification and data capture techniques; barcode symbology specifications; ITF-14
- ISO/IEC 15417: Information technology; automatic identification and data capture techniques; barcode symbology specifications; GS1-128 Symbology specifications

Barcode Production and Quality Assessment

- ISO/IEC 15415: Information technology; automatic identification and data capture techniques; barcode print quality test specification; two-dimensional symbols
- ISO/IEC 15416: Information technology; automatic identification and data capture techniques; barcode print quality test specification; linear symbols
- ISO/IEC 15419: Information technology; automatic identification and data capture techniques; barcode digital imaging and printing performance testing
- ISO/IEC 15421: Information technology; automatic identification and data capture techniques; barcode master test specifications
- ISO/IEC 15426-1: Information technology; automatic identification and data capture techniques; barcode verifier conformance specification - Part 1: Linear symbols