



An Introduction to the Global Trade Item Number® (GTIN®)

BarCodes and eCom™

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Executive Summary

The Global Trade Item Number (GTIN) is the foundation of the GS1 System (formerly the EAN.UCC System) for uniquely identifying trade items, which includes both products and services that are sold, delivered, and invoiced at any point in the supply chain.

GTINs provide unique identification worldwide. The GTIN is encountered most frequently at point of sale and on cases and pallets of products in a distribution/warehouse environment. GTINs can be encoded into various types of GS1 bar codes and Electronic Product Codes™ (EPC) which are programmed into Radio Frequency Identification (RFID) tags.

The GTIN is a required component of the Global Data Synchronization Network™ (GDSN™) and various types of e-commerce transactions. They are most commonly used on purchase orders, and delivery and payment documents. Companies can be confident that a GTIN, when used correctly, will uniquely identify their products as they move through the global supply chain to the ultimate end user. This global identification system of GS1 ensures that the GTIN placed in a bar code or EPC is the same information contained in the corresponding electronic documents processed between trading partners.

GS1 US™ has developed the *Data Driver*® to help companies with the assignment and management of GTINs. *Data Driver* is a key benefit of GS1 US **Partner Connections** and is presently used by companies of all sizes and in various industries to manage more than a hundred thousand GTINs. Companies new to GTINs or those who are in the process of migrating to GTINs are urged to use *Data Driver*, which ensures the accuracy of GTIN assignments as well as, quality of bar code specifications. Find out more about *Data Driver* and GS1 US **Partner Connections** at www.gs1us.org/dd or contact GS1 US for more information at info@gs1us.org.

Key Benefits of the GTIN

- Facilitates the global flow of trade items (products and services) and associated information used in electronic commerce
- Uniquely identifies trade items at all levels of packaging (item, case, and pallet)
- Allows accurate machine reading of trade items when placed in bar codes and EPCs which are programmed into RFID tags
- Delivers trade item data in a consistent format and structure
- Simplifies supply chain management
- Employs the globally accepted GS1 System whose language is standardized, understood and used by multiple industries

Why is the GTIN Useful?

Uniqueness: The GTIN identifies an item uniquely. The rules for assigning GTINs ensure that every variation of an item (product or service) is allocated a single reference number that is globally unique.

Non-significance: The GTIN numbering structure does not contain any meaningful information in itself. A GTIN is a simple pointer to database information that can be directly used in any company and in any country.

Multi-sector: GTINs are unique across all business sectors. This means that a healthcare product, a grocery product, or an apparel product are all identified in a compatible manner.

International: GTINs are unique worldwide. A GTIN can be assigned anywhere in the world and can be used anywhere in the world.

Security: Security of GTINs are provided through a combination of database look-up and the fixed length, numeric format that includes a standard Check Digit.

Data Integrity: The Check Digit ensures the integrity of data passing through the system.

Source Numbering: The GTIN is assigned by the brand owner of the product. Once assigned, all trading partners and internal users can use the GTIN. The same GTIN can be used to identify a series of identical items.

Automatic Data Capture: One of the key benefits of the GTIN is that it can be encoded in many automatic data capture technologies (such as a bar code or EPC used in RFID tags). Machine reading allows the information flow to be linked to the physical flow of trade items through the supply chain.

Definitions

The GTIN is the unique GS1 System Identification Number used for trade items (products and services). The term *trade item* refers to any product or service upon 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 of their different packaging configurations.

GTINs are 8 digits, 12 digits, 13 digits, or 14 digits in length.

It is recommended that a GTIN be represented in software applications as 14 digits by right justifying and zero filling left, as appropriate.

There are four GTINs that can be represented in a bar code and each provides unique numbers when right justified and used in a 14-digit database field:

- **GTIN- 8 (used in EAN-8 bar codes)**
 - Seven digits containing a GS1-8 Prefix and Item Reference
 - One digit representing the Check Digit

- **GTIN-12 (used in UPC-A and UPC-E bar codes)**
 - Eleven digits containing a U.P.C. Company Prefix and the Item Reference assigned by your company
 - One digit representing the Check Digit

- **GTIN-13 (used in EAN-13 bar codes)**
 - Twelve digits containing a GS1 Company Prefix and the Item Reference assigned by your company
 - One digit representing the Check Digit

- **GTIN-14 (used in ITF-14, GS1-128 (formerly UCC/EAN-128), Reduced Space Symbols, and Data Matrix bar codes, plus EPCs)**
 - One digit representing the Indicator digit to indicate packaging level
 - Twelve digits the GS1 Company Prefix and the Item Reference assigned by your company
 - One digit representing the Check Digit

GS1 Company Prefix – The globally unique number assigned to a company by GS1 US™ or another GS1 Member Organization. GS1 Company Prefixes are assigned to companies in varying lengths. Some GS1 US™ BarCodes and eCom™ members may have a membership certificate that shows only a U.P.C. Company Prefix (formerly a UCC Company Prefix). A U.P.C. Company Prefix is converted to a GS1 Company Prefix by adding a zero to the front of the U.P.C.

Company Prefix. The following table illustrates the conversion of a U.P.C. Company Prefix to a GS1 Company Prefix.

U.P.C. Company Prefix	Converted to GS1 Company Prefix
801234	0801234
8412340	08412340
81123400	081123400

Note: The GTIN-12 requires the use of the U.P.C. Company Prefix, not the GS1 Company Prefix.

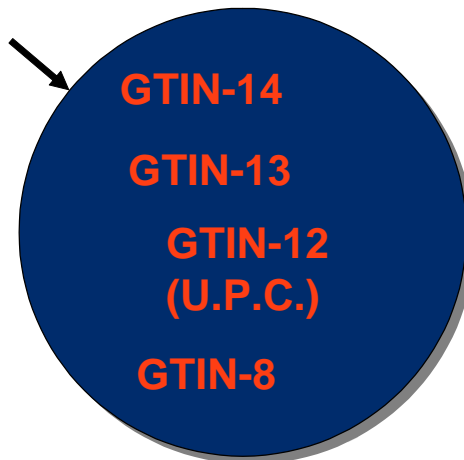
Item Reference – The number assigned by the holder of the GS1 Company Prefix to uniquely identify a trade item within the company. The Item Reference varies in length as a function of the Company Prefix length.

Check Digit – A calculated one-digit number used to ensure data integrity. To understand how this digit is calculated; refer to www.gs1us.org/checkdig.

Global Trade Item Number®

GTIN data structures

- Globally unique 8, 12, 13, and 14-digit numbers to identify trade items (products or services)



GTINs in a GTIN Compliant database

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
GTIN-12	0	0	X	X	X	X	X	X	X	X	X	X	X	C
GTIN-13	0	X	X	X	X	X	X	X	X	X	X	X	X	C
GTIN-8	0	0	0	0	0	0	X	X	X	X	X	X	X	C
GTIN-14	X	X	X	X	X	X	X	X	X	X	X	X	X	C

As previously stated, a GTIN may be encoded in EAN/UPC, ITF-14, GS1-128, Reduced Space Symbology, and Data Matrix bar codes, plus Electronic Product Codes. The appropriate GTIN and bar code or EPC combination is determined by many factors, such as the type of product, point of sale vs. distribution, and printing material used for the product packaging.

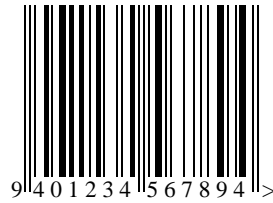
The following table provides examples of unique product identification at various levels and using various bar codes.

<i>Descrip.</i>	<i>Item</i>	<i>Level</i>	<i>Bar Code</i>	<i>Encoded GTIN</i>	<i>GTIN in database</i>
Product A	1 Unit	Consumer	UPC-A	614141000012	00614141000012
Product A	96 Units	Case	ITF-14	00614141000029	00614141000029
Product B	1 Unit	Consumer	UPC-A	614141000777	00614141000777
Product B	6 Pack	Consumer	UPC-A	614141000883	00614141000883
Product B	12 Pack	Consumer	UPC-A	614141000999	00614141000999
Product B	2x12 Pack	Case	GS1-128	10614141000996	10614141000996
Product B	4x12 Pack	Case	GS1-128	30614141000990	30614141000990
Product B	8x12 Pack	Case	ITF-14	50614141000994	50614141000994

The following illustrates the use of a GTIN in UPC-A and EAN-13 bar codes:



**UPC-A symbol
GTIN-12 structure**



**EAN-13 symbol
GTIN-13 structure**

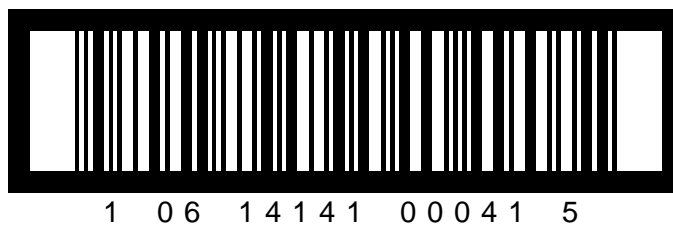
The following illustrates a GTIN in a GS1-128 bar code:



Note:

- When GS1-128 symbology is used to encode a GTIN, the Application Identifier of (01) is required and precedes the GTIN
- Ability to string together (concatenate) multiple fields (Here, the GTIN plus net weight in pounds)

The following illustrates a GTIN in an ITF-14 bar code:



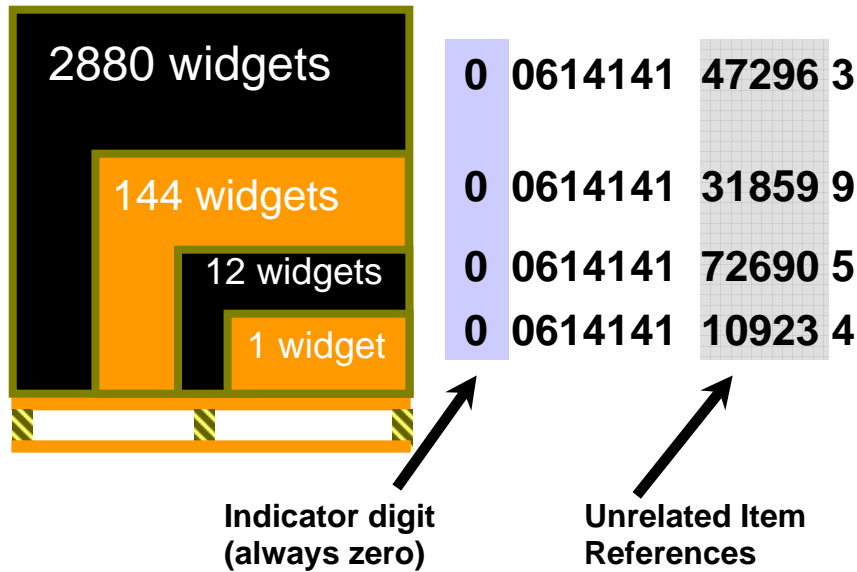
Note:

- ITF-14 = The GS1 system's only use of Interleaved 2 of 5. It is only used to encode the GTIN
- Any of the GTIN data structures may be used, as long as they are expressed as a 14-digits

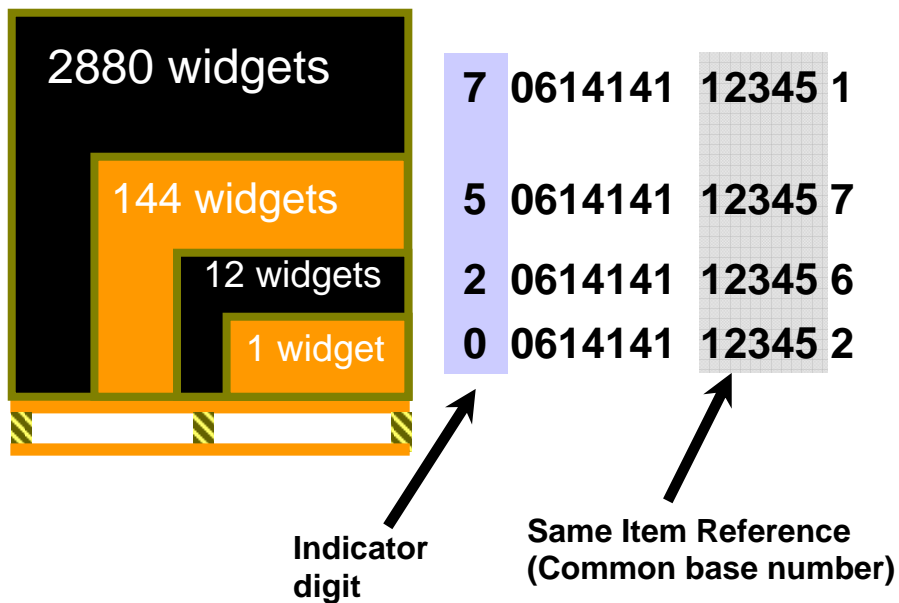
Assignment of GTINs to Packaging Levels

The following illustrates the assignment of GTINs at various item and package levels; note that uniqueness can be achieved through the use of different Indicator digits or different Item References at the higher levels of packaging.

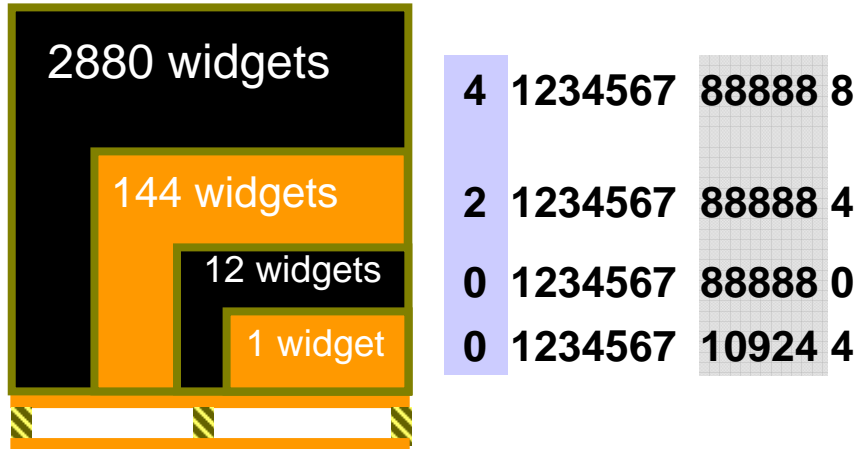
Item Reference for higher levels of packaging



Indicator digit for higher levels of packaging



Combination of Indicator digit and Item Reference for higher levels of packaging



Common GTIN Mistakes Explained

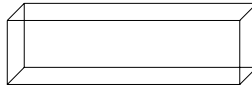
GTINs incorrectly assigned to products cause invoice errors and time to market delays. The following examples show the most common mistakes and explain how these mistakes can be avoided.

Mistake #1: Retail Unit and Case have the same GTIN

Retail Unit
Product A 18 oz.



Case
12 x Product A 18 oz.



Incorrect

GTIN-12 in UPC-A symbol:
6 14141 45324 5

GTIN-14 in ITF-14 symbol:
0 06 14141 45324 5

A unique GTIN is required for the retail unit and the case. In this example the GTIN of both is: 0 0614141 45324 5. The GTIN must differentiate between the two. The symbology does not differentiate. A valid GTIN for the case would be 1 06 14141 45324 2.

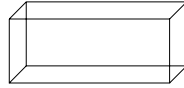
Mistake #2a: Indicator digit used without a hierarchy

Retail Unit
Product H 8 oz.



GTIN-12 in UPC-A symbol:
6 14141 00324 2

Case
12 x Product H 8 oz.



GTIN-14 in ITF-14 symbol:
1 06 14141 45000 5

Incorrect

The Indicator digit, in this example the first “1” in the GTIN-14, when 1 thru 8 indicates a packaging hierarchy. Thus, the GTIN-14 should be either:

1) 1 06 14141 00324 9 creating the packaging hierarchy of the retail unit or 2) 0 06 14141 45000 8 making the Indicator digit “0” to eliminate the packaging hierarchy.

Mistake #2b: Indicator digit used without a hierarchy

Incorrect

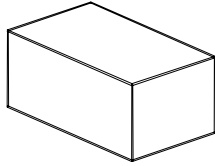


A product without a lower level of packaging, e.g. a 5 gallon pail of chocolate chip cookie dough

GTIN-14 in ITF-14 symbol:
1 06 14141 77777 5

Because there is no packaging hierarchy, the GTIN-14 must have an Indicator digit of “0” and a valid GTIN would be 0 06 14141 77777 8.

Mistake #3: A wrong GTIN for a mixed case



An orderable mixed case box contains:

12 x Product C: Retail Unit (6 14141 77777 8)

12 x Product D: Retail Unit (6 14141 88888 7)

GTIN-14 in ITF-14 symbol:

1 06 14141 77777 5

Incorrect

Because there is more than one product in the case the Indicator digit may not be 1 thru 8 to indicate a packaging hierarchy. Thus, the GTIN-14 must have an Indicator digit of "0" and a new Item Reference – a valid GTIN would be 0 06 14141 00444 7.

Mistake #4: The same trade item has two different GTINs

Case

12 x Product A 18 oz.

Retail unit marked with

GTIN-12 in UPC-A

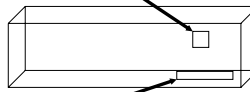
symbol:

6 14141 45324 5

Incorrect

GTIN-12 in UPC-A symbol:

6 14141 76890 5



GTIN-14 in ITF-14 symbol:

1 06 14141 45324 2

A single unique GTIN is required for a trade item – not two: 1 0614141 45324 2 and 0 0614141 76890 5. There should only be one symbol per standard. If unavoidable based on trading partner requirements, the next best action is to assign the GTIN in the ITF-14 the same GTIN-12 in the UPC-A symbol 0 0614141 76890 5

Examples of GTIN Use

In October, 2001 AT Kearney was engaged by the Grocery Marketing Association (GMA) and the Food Marketing Institute (FMI) to evaluate and provide recommendations for e-commerce collaboration. Recommendations of this study included the adoption of an industry-wide, standardized numbering

system, providing benefits and savings across the supply chain such as out of stocks, cost of reconciling invoice errors, receiving times, and speed to market. More significant, but more difficult to capture, were the benefits from supply chain visibility and collaboration, that can drive significant inventory reductions across the whole supply chain.”

In the book industry, the move to computerize book information led to the realization that a descriptive/alpha system was too cumbersome. In the grocery industry, the idea had been around, but the evolution of commercially viable scanning equipment signified an opportune moment. It is significant to note that both industries adopted an all-numeric schema.

Only in the grocery industry have significant attempts been made to quantify the benefits of using GTINs. Net benefits (after implementation costs) were initially estimated at approximately 1% of sales, but more recently revised to 2.8% of sales, or US\$8 billion. These benefits were primarily due to increased process efficiencies and productivity gains. The same studies also estimate that an additional US\$15 billion of benefits could potentially be realized through improved collaboration¹. In the case of the book industry, the benefits and savings of using a standard product identification numbering system were considered so obvious that a cost/benefit analysis was not even done to quantify anticipated results.

In conclusion, the agreement to adopt a standardized product identification numbering system provides the foundation to reap extensive benefits throughout the supply chain, not only for all the individual members but also in growing the whole industry.

Frequently Asked Questions

1. Is GTIN a new standard?

GTIN is a term, not a new standard. The term was introduced to ensure consistent terminology around the world. Since the U.P.C. symbol encodes a 12-digit GTIN, GS1 US has been promoting the GTIN since 1972. GTINs ensure that trade items are identified uniquely around the world, which enables more efficient global trading.

¹ *17 Billion Reasons to Say Thanks: The 25th Anniversary of the U.P.C. and Its Impact on the Grocery Industry*, PriceWaterhouseCoopers, December 14, 1999.

2. Does GTIN replace the U.P.C.?

No, GTIN is a term only. Remember the U.P.C. symbol encodes a 12-digit GTIN. The U.P.C. does not go away; companies that place a GTIN-12 (U.P.C.) on products now should continue to do so.

3. Is a unique GTIN required for every level of packaging?

Yes. There should be a unique GTIN identifying the consumer unit, an inner pack, multi-pack, case, or pallet where applicable.

4. What is GTIN Compliance?

A company that is able to process, store, and communicate information about their products with trading partners using all GTINs, whether 8, 12, 13, or 14 digits, is considered to be GTIN Compliant. Companies become GTIN Compliant by expanding the appropriate systems and applications to 14-digits.

This will support the GTIN on products at all levels of packaging (consumer, inner packs, multi-packs, cases, and pallets, etc. It is necessary to become GTIN Compliant to take advantage of the benefits of:

- Data synchronization using the Global Data Synchronization Network (GDSN)
- Reduced Space Symbology® (RSS®)
- EPCglobal Network™

5. Does my company need a new GS1 Company Prefix to create GTINs?

No. Continue to use the one you have.

6. If a change is made to the product does the GTIN need to change?

A separate unique GTIN is required whenever any of the pre-defined characteristics of a trade item are different in any way that is relevant to the trading process. The guiding principle is if the consumer is expected to distinguish a new trade item from an old trade item and purchase accordingly, a new GTIN should be assigned to the new trade item (product package and shelf edge label declarations should appear the same to the consumer). For complete information, refer to the *GTIN Allocation Rules* (available through the *GS1 US Product Catalog*) or refer to the *Bar Codes and Identification Numbers* section of the Solutions Center.

7. When is a “9” used as the Indicator digit in a GTIN?

It is used to indicate a variable measure product.

8. What are the correct ASC X12 EDI qualifiers for GTIN?

The correct qualifiers are:

- UK for GTIN-14
- EN for GTIN-13
- UP for GTIN-12
- EO for GTIN- 8

9. What can be identified using the GS1 Identification Numbers?

- **Trade items:** Products and services upon which there is a need to retrieve pre-defined information at any point in the supply chain (Global Trade Item Number[®]/**GTIN**[®]).
- **Logistic units:** Physical units established for transport and storage of products of any kind that need to be tracked and traced individually in a supply chain (Serial Shipping Container Code/**SSCC**).
- **Assets:** Fixed or returnable assets (Global Individual Asset Identifier/**GIAI**, Global Returnable Asset Identifier/**GRAI**).
- **Locations:** Physical, functional or legal entities requiring a permanent identification, such as a company, department, or warehouse (Global Location Number/**GLN**).
- **Service Relations:** Public or private service provider to track any entity's service requirements and needs over a continuing relationship (Global Service Relation Number/**GSRN**).

Note: All GS1 identifiers use the same GS1 Company Prefix assigned to the company or organization

Resources

Data Driver

Data Driver is a tool developed by GS1 US to assist companies with the assignment and management of GTINs. *Data Driver* is a key benefit of GS1 US **Partner Connections** and is presently used by companies of all sizes and in various industries to manage thousands of GTINs. Companies new to GTINs or those who are in the process of migrating to GTINs are urged to use *Data Driver*, which ensures the quality and accuracy of bar codes. Find out more about *Data Driver* and the GS1 US **Partner Connections** Program at www.gs1us.org/dd or contact GS1 US for more information at info@gs1us.org.

GTIN Allocation Rules

The *GTIN Allocation Rules* are available in the Solutions Center. They can also be obtained through the *GS1 US Product Catalog*. The correct assignment of GTINs is critical to your business processes. It is strongly recommended that you refer to a copy of this guide to ensure correct assignment of GTINs to your products.

Solutions Center

The Solutions Center is your one-stop source for GS1 System solutions to help you improve supply chain management and conduct business more productively. You will find the essential education and implementation resources you need to:

- Integrate and utilize the standards of the GS1 System in your business
- Guide you through the bar coding process
- Improve the efficiency of your electronic commerce activities
- Uniquely identify your company's products, assets, locations, and logistics units throughout the global supply chain

Specifically, *Bar Codes for Different Uses* will guide you through the implementation process, giving you specific solutions and guidelines to properly mark products and logistics units for use within the GS1 System. This easy-to-follow system will guide you through the essentials of the bar coding process to help you:

- Assess where you will use the bar code
- Determine the specific information to include in the bar code
- Prepare bar code specifications for those responsible for printing your bar codes

A preview of the Solutions Center can be seen at www.gs1us.org/solutionscenter.

GS1 US Glossary

www.gs1us.org/glossary

GS1 US Product Catalog

www.gs1us.org/productcatalog

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