



The Global Language of Business

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

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## About GS1

GS1® is a neutral, not-for-profit, global organization that develops and maintains the most widely-used supply chain standards system in the world. GS1 Standards improve the efficiency, safety, and visibility of supply chains across multiple sectors. With local Member Organizations in over 110 countries, GS1 engages with communities of trading partners, industry organizations, governments, and technology providers to understand and respond to their business needs through the adoption and implementation of global standards. GS1 is driven by over a million user companies, which execute more than six billion transactions daily in 150 countries using GS1 Standards.

## About GS1 US

GS1 US®, a member of GS1 global, is a not-for-profit information standards organization that facilitates industry collaboration to help improve supply chain visibility and efficiency through the use of GS1 Standards, the most widely-used supply chain standards system in the world. Nearly 300,000 businesses in 25 industries rely on GS1 US for trading-partner collaboration that optimizes their supply chains, drives cost performance and revenue growth while also enabling regulatory compliance. They achieve these benefits through solutions based on GS1 global unique numbering and identification systems, barcodes, Electronic Product Code-based RFID, data synchronization, and electronic information exchange. GS1 US also manages the United Nations Standard Products and Services Code® (UNSPSC®).

## 1 What is a Global Trade Item Number?

One of the main building blocks of the GS1 System, the Global Trade Item Number® (GTIN®) is the globally unique GS1 Identification Key used to identify trade items. GTINs are assigned by the brand owner of the product, and are used to identify products as they move through the global supply chain.



**What Is a Trade Item?** Any product or service that may be priced, ordered, or invoiced at any point in the supply chain. Trade items include individual items as well as all other packaging configurations offered for sale (e.g., two-pack; case; pallet; etc.). Each packaging level is identified by a unique GTIN. For example, Brand X would use a different GTIN to uniquely identify their individual tissue unit, four pack tissue unit, and their case of tissues along with any other product configurations that will move through the supply chain.

## 2 Where are GTINs used?

GTINs are used anywhere that a product or service needs to be identified -- including the Internet, business transactions, IT systems, and the physical product itself. GS1 Standards define how to format and structure the GTIN in a wide variety of applications so that the same GTIN can be used to identify the product for any of those needs:

- **Physical products:** GTINs can be encoded into barcodes and Radio Frequency Identification (RFID) tags and affixed to products to facilitate accurate identification as products move through the supply chain.
- **E-commerce:** GTINs can be used in e-commerce business transactions (e.g., Purchase Order, Advance Ship Notice, Invoice, etc.) to support Order-to-Cash business processes. GTINs are an integral data element of most Electronic Data Interchange (EDI) transactions in order to reduce errors and support machine-to-machine processing.
- **Internet applications:** GTINs can be presented as a Uniform Resource Identifier (URI) in order to support Internet-based applications and data sharing. The GS1 Electronic Product Code (EPC®) standards include two URI data formats for GTIN. These EPC URNs provide a standardized data format for GTIN that is consistent with the standardized data format of the Internet in order to support Internet-based data sharing as well as "virtual" products (i.e., downloadable books and music) and "virtual" points of sale where there is no barcode reader and no EPC scanner.
  - **LGTIN EPC** (a Uniform Resource Name (URN) for GTIN plus batch/lot number)
  - **SGTIN EPC** (a Uniform Resource Name (URN) for GTIN plus serial number)
- **Databases & IT systems:** GTIN provides a single product identifier that can be used in all systems (e.g., purchasing, inventory management, logistics, analytics, reporting, etc.). This maintains the connection between systems so they can be used collectively to enhance the quality and amount of data available to support operational processes as well as business intelligence and analytics.

## 3 GTIN Structure

GTINs can be 8, 12, 13, or 14 digits in length in order to accommodate different application and product constraints. These GTIN structures are known as GTIN-8, GTIN-12, GTIN-13, and GTIN-14 respectively.

Each GTIN is a numerical string comprised of distinct segments. GTIN segments include:

- **Indicator Digit:** The Indicator Digit identifies packaging level in order to define packaging hierarchy of a product with the same Item Reference. The field consists of a numeric value from 1 to 9 and is only used in GTIN-14.
  - **GS1 Company Prefix:** A globally unique number issued to a company by a GS1 Member Organization to serve as the foundation for generating GS1 identifiers (e.g., GTINs). GS1 Company Prefixes are assigned in varying lengths depending on the company's needs.
    - For GTIN-12, a U.P.C. Company Prefix is used
  - **Item Reference:** A number assigned by the user to identify a trade item. The Item Reference varies in length as a function of the GS1 Company Prefix length.
  - **Check Digit:** A one-digit number calculated from the preceding digits of the GTIN used to assure data integrity. GS1 US provides a [check digit calculator](#) to automatically calculate Check Digits for you.
- ✓ **Note:** The application and use of each segment can vary depending in the GTIN structure being used (e.g., GTIN-8, GTIN-12, GTIN-13, or GTIN-14). The specific rules are defined within the [standards](#).

The components and examples of each type of GTIN are provided below.

### 3.1 GTIN-8

The GTIN-8 is the only GTIN that can be used in EAN-8 barcodes. Components include:

- Seven digits containing a GS1-8 Prefix and the Item Reference
- One digit representing the Check Digit

**Figure 3-1** GTIN-8 Example – EAN-8 barcode symbol



### 3.2 GTIN-12

The GTIN-12 is the only GTIN that can be used in UPC-A barcodes. Components include:

- Eleven digits containing your GS1 US-Issued U.P.C. Company Prefix and the Item Reference, which is assigned by your company
- One digit representing the Check Digit

**Figure 3-2** GTIN-12 Example - UPC-A barcode symbol



### 3.3 GTIN-13

The GTIN-13 is the only GTIN that can be used in EAN-13 barcodes. Components include:

- Twelve digits containing your GS1 US-Issued GS1 Company Prefix and the Item Reference, which is assigned by your company
- One digit representing the Check Digit

**Figure 3-3** GTIN-13 Example - EAN-13 barcode symbol



### 3.4 GTIN-14

The GTIN-14 is used in ITF-14, GS1-128 (formerly UCC/EAN-128), GS1 DataBar®, and DataMatrix symbols as well as EPCs. Components include:

- One digit representing the Indicator Digit to indicate packaging level
- Twelve digits containing your GS1 US-Issued GS1 Company Prefix and the Item Reference which is assigned by your company
- One digit representing the Check Digit

**Figure 3-4** GTIN-14 example 1 - GS1-128 barcode symbol



**Note:** When a GS1-128, GS1 DataBar®, or GS1 DataMatrix is used to encode a GTIN, the Application Identifier of (01) must precede the GTIN. The GS1-128 barcode symbol allows for placement of multiple pieces of data (including the GTIN) in a single barcode. In this example, AI (3202), net weight in pounds is also included.

**Figure 3-5** GTIN-14 Example 2 - ITF-14 barcode symbol



**Note:** ITF-14 is the GS1 System's only use of Interleaved 2 of 5, a particular type of barcode symbol. It is only used to encode the GTIN so Application Identifier (01) is not needed like in the GS1-128. Any of the GTIN data structures may be used, as long as they are formatted as 14 digits as seen in the example below.

## 4 Which GTIN is right for your product?

A GTIN may be encoded in EAN/UPC, ITF-14, GS1-128, GS1 DataBar, and GS1 DataMatrix symbols as well as EPCs. The appropriate GTIN and barcode or EPC combination is determined by many factors, such as the type of product, point of sale versus distribution, and printing material used for the product packaging.

The following table provides examples of unique product identification at various levels. It also demonstrates how various GS1 barcodes can be used for GTINs.

**Table 4-1** Unique Product Identification at Various Levels

Description	Item	Level	Barcode Type	Encoded GTIN	GTIN in Database
Product A	1 Unit	Consumer	UPC-A	614141000012	00614141000012
Product A	96 Unit Case	Consumer	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

## 5 Key Features of the GTIN

- **Global:** GTINs are a global standard that can be assigned by a company anywhere in the world and can be used anywhere in the world.
- **Multi-sector:** GTINs can be used by all business sectors, enabling any product (e.g., healthcare product, a grocery product, a retail product, etc.) to all be identified using the same standardized identifier.
- **Unique:** the standardized structure and rules for assigning GTINs help assure that every GTIN is globally unique.
- **Packaging Hierarchy:** inclusion of the Indicator Digit in the GTIN-14 structure enables GTINs to be used to uniquely identify trade items at all packaging levels.
- **Data Integrity:** inclusion of the Check Digit supports uniqueness and integrity in the GTIN structure.



## 6 How do GTINs support business intelligence?

GS1 Standards provide the format and structure for using GTINs across the various platforms where product identification and information is needed: databases and systems, physical product marking, e-commerce transactions, and Internet applications. This enables trading partners to use the same identifier to identify the product across all of those platforms – empowering data driven organizations with the data they need to optimize business intelligence and improve business processes.

### Example:

Manufacturer assigns the following GTIN-12 to a product: **314141999995**. The table below illustrates GS1 Standards used to enable that single GTIN to identify the product across the various platforms and applications used for supply chain management:



Platform / Application	GS1 Standard	Example
Databases & Systems	14-digit fixed-length text field, right-justified & zero-filled	00314141999995
Physical product marking *	UPC-A	
	GS1 DataMatrix	
Internet applications	LGTIN EPC	urn:epc:class:lgtn:031414.0199999.987654321GFEDCBA
E-commerce business transactions *	EDI 850 Purchase Order	ST*850*5221004 BEG*00*SA*15875915**20040301 PER*BD*BUYER NAME*TE*5558881111 FOB*PP*OR*323-726-6271 DTM*002*20040315 TD5****M N1*ST*John's Club - *UL*0641131030359 N3*800 South Park Drive N4*Westmont*NJ N1*VN*MEDICAL SUPPLIER*UL*00312300000017 PO1**20*CA*32.15*FX*UP*00314141999995*PI*8045502 PO4*2*5*LB PO1**40*CA*44.22*FX*UP*00314141999995*PI*8045550 PO4*2*5*LB CTT*2**867*LB*15*CF SE*16*5221004

\*Limited examples provided here for illustration. Additional data carriers and e-commerce transactions are available in the GS1 System.

## 7 How are GTINs assigned to products?

Manufacturers or brand owners are responsible for assigning GTINs to their products in a process known as *allocation*. The brand owner is the organization that owns the specifications of a trade item, regardless of where and by whom it is manufactured. The GS1 System provides clear, structured data standards and management rules that manufacturers follow when allocating GTINs to assure that their GTINs are globally unique and in a consistent format.

There are two basic steps for allocating a GTIN:

1. GS1 US issues a *GS1 Company Prefix* to the manufacturer. The *GS1 Company Prefix* provides the foundation for generating GS1 Identification Keys.

2. The manufacturer assigns/generates their own GTINs based on their GS1 *Company Prefix* and the GS1 Standards and GTIN Management Rules.

When a manufacturer allocates a GTIN, they also define a prescribed set of data about the product to which that GTIN relates. These *product description attributes* define core data that is consistent across all instances of the product (e.g., size, color, brand information, etc.). The GTIN and its associated attributes are then saved in a database and shared among supply chain partners to support supply chain operations and systems.



**Note:** GS1 US provides an online tool, known as Data Hub® | Product, to support users in allocating GTINs, defining the associated product attributes, and generating barcode images.

## 8 Business Benefits of Using GTINs

As a key component of the GS1 System, the GTIN is well established as the standard used worldwide for trade items. GTINs enable trading partners to efficiently and effectively manage information about products using a unique, global standard for product identification. This facilitates the communication of accurate product information among trading partners to support supply chain operations and optimize business intelligence. Simply put, using GTINs streamlines supply chain management and promotes accuracy, speed, and efficiency for your business.

- **Drives e-commerce:** Using the GTIN facilitates the global flow of trade items and associated information used in electronic commerce.
- **Enhances compatibility:** Since GTINs work within any business sector and across business sectors, companies can trade goods and services knowing that product identification will be compatible.
- **Facilitates accuracy:** Use of the GTIN improves scanning at checkout, warehouse, or hospital. It is also essential for accurate stock control and order replenishment.
- **GDSN:** Use of the GTIN for product identification enables users to leverage the GS1 Global Data Synchronization Network™ (GDSN®) to manage product information. The GDSN offers a continuous, automated approach to data management that helps assure that product information is identical among supply chain partners, increasing data accuracy and driving costs out of the supply chain.
- **Simplified supply chain management:** GTIN strengthens business communications among supply chain partners by accurately identifying specific products and the flow of associated information.
- **Improved information quality:** Using the GTIN as the link to product information improves information quality by ensuring that product information is identical among supply chain partners. This benefits both internal and external business processes.

## 9 Frequently Asked Questions about the GTIN

### What is a GTIN?

Global Trade Item Number, or GTIN, is the GS1 Identification Key used to identify trade items. The key comprises a GS1 Company Prefix, an item reference and check digit.

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

No, this is only a change in terminology. GTIN is the unique identification number used to identify trade items. The U.P.C. barcode symbol (also known as a UPC-A) encodes a GTIN-12. The identifiers do not

change; companies that place a GTIN-12 (U.P.C.) on products now should continue to do so without any changes.

### **Is a unique GTIN required for every level of packaging?**

Yes. There should be a unique GTIN identifying the consumer unit, inner pack, multi-pack, case, or pallet where applicable if the item has a need to retrieve pre-defined information and that may be priced or ordered or invoiced at any point in any supply chain.

### **What is GTIN compliance?**

A company is considered GTIN compliant when it is able to process, store, and communicate information about its products with trading partners using all types of GTINs, whether 8, 12, 13, or 14 digits. This will support the GTIN on products at all levels of packaging (consumer, inner packs, multi-packs, cases, pallets, etc.). A company must be GTIN compliant in order to take advantage of:

- Data synchronization using the Global Data Synchronization Network (GDSN)
- GS1 Data Carriers
- Electronic Product Codes

### **If a change is made to a 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 modified in any way that is relevant to the trading process. The guiding principle here is that a new GTIN should be assigned to the updated trade item if:

- the consumer and/or trading partner expected to distinguish the changed or new product from previous/current products
- there is a regulatory/liability disclosure requirement to the consumer and/or trading partner
- there a substantial impact to the supply chain (e.g., how the product is shipped, stored, received)

For more information, refer to the [GTIN Management Standard and Guiding Principles](#).

### **When is a 9 used as the Indicator Digit in a GTIN-14?**

A 9 is used to indicate a variable measure product, which is an item that is always produced in the same pre-defined version (e.g., type, packaging, design) that may be sold at any point in the supply chain and that may vary in weight or size or may be traded without a pre-defined weight, size, or length.

### **What are the correct ASC X12 EDI qualifiers for GTIN?**

The correct qualifiers are as follows:

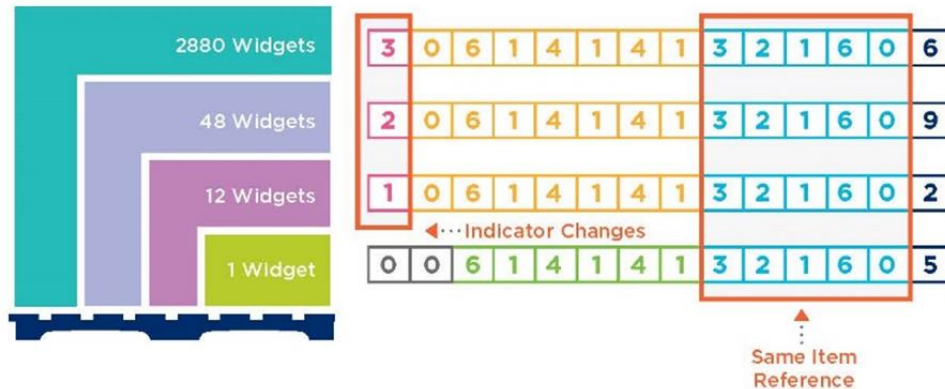
- UK for GTIN-14
- EN for GTIN-13
- UP for GTIN-12
- EO for GTIN-8

## 10 GTIN Advanced Topics

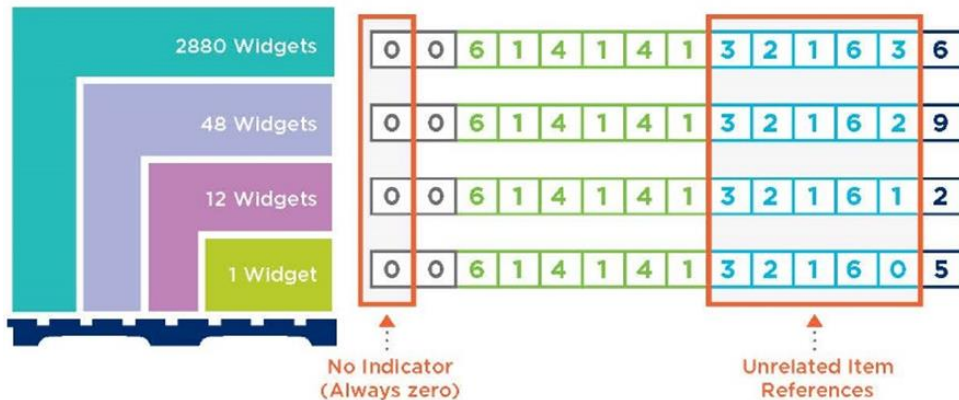
### 10.1 Assigning GTINs to Packaging Levels

The following diagrams illustrate 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.

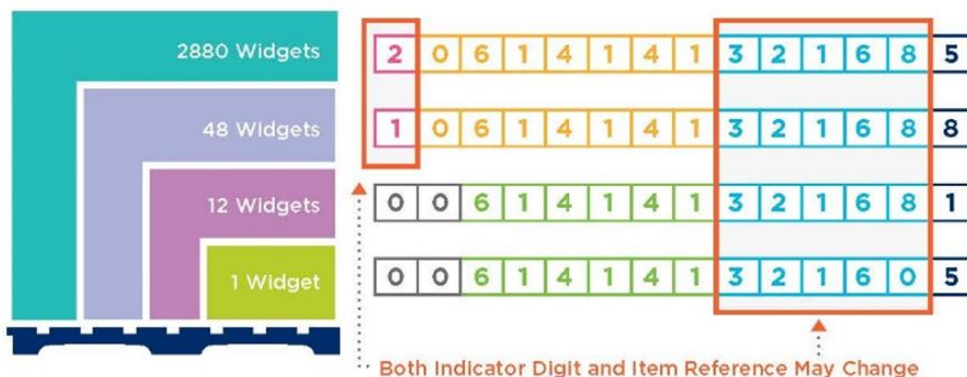
**Figure 10-1** Indicator Digit for Higher Levels of Packaging



**Figure 10-2** Item Reference for Higher Levels of Packaging



**Figure 10-3** Combination of Indicator and Item Reference for Higher Levels of Packaging



## 10.2 Avoiding Mistakes in Assigning a GTIN

When a GTIN is incorrectly assigned to products, the result is invoice errors and delays in products reaching the market. Following are several examples that demonstrate the most common mistakes made in assigning GTINs and how to avoid them.

### 10.2.1 Mistake #1: Assigning the Same GTIN to a Retail Unit and Case

#### INCORRECT



Yogurt (Retail Unit)  
GTIN-12 in UPC-A Symbol:

6	1	4	1	4	1	4	5	3	2	4	5
---	---	---	---	---	---	---	---	---	---	---	---



8 Yogurt Pack (Case)  
GTIN-12 (in a 14 digit format) in an ITF-14 Symbol:

0	0	6	1	4	1	4	1	4	5	3	2	4	5
---	---	---	---	---	---	---	---	---	---	---	---	---	---

#### CORRECT



Yogurt (Retail Unit)  
GTIN-12 in UPC-A Symbol:

6	1	4	1	4	1	4	5	3	2	4	5
---	---	---	---	---	---	---	---	---	---	---	---



8 Yogurt Pack (Case)  
GTIN-14 in an ITF-14 Symbol:

1	0	6	1	4	1	4	1	4	5	3	2	4	2
---	---	---	---	---	---	---	---	---	---	---	---	---	---

The retail unit and the case each require a unique GTIN. In this example, the assigned GTIN for both packaging levels is 0 0614141 45324 5. The GTIN must differentiate between the two packaging levels. The symbology does not differentiate. A valid GTIN for the case would be 1 06 14141 45324 2.

## 10.2.2 Mistake #2: Using an Indicator Digit without a Hierarchy

### INCORRECT



12 Donut Box (Retail Unit)  
GTIN-12 in UPC-A Symbol:

6	1	4	1	4	1	0	0	3	2	4	2
---	---	---	---	---	---	---	---	---	---	---	---



24 Donuts (Case)  
GTIN-14 in an ITF-14 Symbol:

1	0	6	1	4	1	4	1	4	5	0	0	0	5
---	---	---	---	---	---	---	---	---	---	---	---	---	---

### CORRECT



12 Donut Box (Retail Unit)  
GTIN-12 in UPC-A Symbol:

6	1	4	1	4	1	0	0	3	2	4	2
---	---	---	---	---	---	---	---	---	---	---	---



24 Donuts (Case)  
GTIN-14 in an ITF-14 Symbol or a new GTIN-12:

1	0	6	1	4	1	4	1	0	0	3	2	4	9
---	---	---	---	---	---	---	---	---	---	---	---	---	---

0	0	6	1	4	1	4	1	4	5	0	0	0	8
---	---	---	---	---	---	---	---	---	---	---	---	---	---

Using an Indicator Digit without a hierarchy can cause confusion for your trading partners, who may believe this is a case for a different GTIN-12. Using an Indicator Digit without a hierarchy is not allowed in the GS1 System. To correct the error, either the case should be marked using the Indicator Digit 1 with the same Item Reference as used in the GTIN-12 (recalculating the Check Digit to form the GTIN-14 in the ITF-14, 1 06 14141 00324 9) or the case should be set up as its own unique Item Reference as a GTIN-12 (0 06 14141 45000 8).

### 10.2.3 Mistake #3: Assigning an Incorrect GTIN for a Mixed Case

#### INCORRECT



Master Case contents: 32 items

24 Donuts (Retail Unit)

6 1 4 1 4 1 7 7 7 7 7 8

8 Yogurt Pack (Retail Unit)

6 1 4 1 4 1 8 8 8 8 8 7

GTIN-12 in GS1-128 Symbol:

Where one of the two item reference numbers are used

1 0 6 1 4 1 4 1 7 7 7 7 7 8

#### CORRECT



Master Case contents: 32 items

24 Donuts (Retail Unit)

6 1 4 1 4 1 7 7 7 7 7 8

8 Yogurt Pack (Retail Unit)

6 1 4 1 4 1 8 8 8 8 8 7

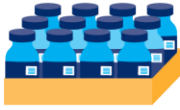
GTIN-12 in GS1-128 Symbol:

0 0 6 1 4 1 4 1 0 0 4 4 4 7

As there is more than one type of product in the case, the Indicator Digit may not be 1 thru 8 to indicate a packaging hierarchy. Thus, a GTIN-12 should be issued for this mixed case with a new Item Reference. A valid GTIN would be 0 06 14141 00444 7.

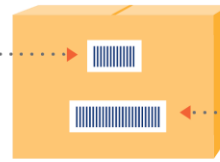
### 10.2.4 Mistake #4: Giving the Same Trade Item Two Different GTINs

#### INCORRECT



Case of 12 x Product A marked with GTIN-12 in UPC-A Symbol:

6 1 4 1 4 1 4 5 3 2 4 5



GTIN-12 in a UPC-A Symbol:

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

GTIN-14 in a ITF-14 Symbol:

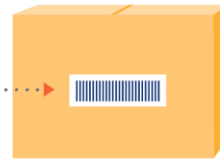
1 0 6 1 4 1 4 1 4 5 3 2 4 5

#### CORRECT



Case of 12 x Product A marked with GTIN-12 in UPC-A Symbol:

6 1 4 1 4 1 4 5 3 2 4 5



GTIN-14 in an ITF-14 Symbol:

1 0 6 1 4 1 4 1 4 5 3 2 4 2

Each trade item should be assigned a single unique GTIN. In this case, two different GTINs have been assigned. If different barcode types are needed based on trading partner requirements, the next best action is to encode the GTIN in the ITF-14 the same GTIN-12 that is used in the UPC-A symbol: 0 0614141 45324 5. Do not assign different GTINs different same product.

## 11 Tools and Resources

GS1 US offers a number of easily accessible online tools and resources that can help guide you through the GS1 Standards and processes:

- **[GS1 US GET STARTED GUIDE](#)**: Online guide to help you obtain a GS1 Company Prefix to create GTINs, barcodes, and U.P.C.s, and more.
- **[CHECK DIGIT CALCULATOR](#)**: Helps you assure that the GTIN components have been entered correctly
- **[GS1 US DATA HUB | PRODUCT](#)**: Online tool that helps companies quickly and accurately create, manage and share GS1-compliant barcodes, GTINs, and U.P.C.s.
- **[GTIN MANAGEMENT STANDARD](#)**: Helps to assure correct assignment of GTINs to your products.
- **[RESOURCE LIBRARY](#)**: Documents, videos, and other information to increase the value of standards for all trading partners in the value chain
- **[FREQUENTLY ASKED QUESTIONS](#)**: Frequently Asked Questions about GS1 Standards, implementation, and how to get started.



**For more information about GS1 US, GTINs and other GS1 Standards:**

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