



The Global Language of Business

An Introduction to the Global Trade Item Number (GTIN)

Release 2.1, July 2021





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Change Log

Release	Date of Change	Changed By	Summary of Change
2.1	6/30/21	GS1 US	Inclusion of Digital Link
2.1	6/30/21	GS1 US	Mention of GS1 US GTINs
2.1	6/30/21	GS1 US	Improved barcode graphics/addition of GTIN structure graphics
2.1	6/30/21	GS1 US	Correction to GTIN Mistake image
2.1	6/30/21	GS1 US	Expansion on visibility elements
2.1	6/30/21	GS1 US	Updated terminology
2.1	6/30/21	GS1 US	Benefits/compliance updated to reflect Sunrise 2027 elements
2.1	6/30/21	GS1 US	Correction to invalid information/proofing and style alignment updates
2.1	6/30/21	GS1 US	Use of Education & Training color coding, where appropriate
2.1	6/30/21	GS1 US	Updated disclaimer and last-page footer
2.1	6/30/21	GS1 US	Replaced barcode on last page with GDTI formatting




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.


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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®).

-  **Important:** This document is voluntary, not mandatory. It should be noted that use of the words “must” and “require” throughout this document relate exclusively to technical recommendations for the proper application of the standards to support the integrity of your implementation.

1 What is a Global Trade Item Number?

The Global Trade Item Number® (GTIN®) is the globally unique GS1 Identification Key used to identify trade items and one of the main building blocks of the GS1 System. 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?** A trade item is 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, a brand would use a different GTIN to uniquely identify their individual unit, four-pack unit, and their case 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. This includes the internet, business transactions, IT systems, the physical product, and more. 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 both barcodes and Radio Frequency Identification (RFID) tags along with the serial number and affixed to products to facilitate accurate identification as products move through the supply chain.
- **Business transactions:** 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) using GS1 Digital Link to support internet-based applications, data sharing, and consumer engagement. GS1 Digital Link provides a standard URI syntax based on GS1 Application Identifiers against which simple rules can then be applied so that apps, websites, and point-of-sale (POS) scanners can translate both existing and new barcodes into web-enabled content, like promotions, shopping experiences, and other interesting product information while also enhancing business-to-business processes.
- **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.
- **Visibility needs:** The Electronic Product Code (EPC) provides representations of GTIN to support visibility use cases. For instance, GTIN and serial number (SGTIN) are combined to produce a globally unique identifier for an individual trade item, so trading partners can verify authenticity. Similarly, a GTIN and batch/lot number (LGTIN) can be combined to expedite recall notification and withdrawal. A SGTIN, expressed as an EPC, can be represented in RFID tags. It can also be shared in system-to-system with EPCIS.

3 GTIN structure

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

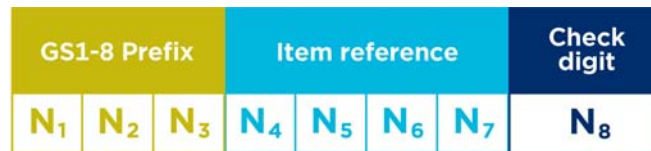
Each GTIN is a numerical string comprised of distinct components. GTIN components include:

- **Indicator Digit:** A number from 1-8 used in to identify packaging levels to define the packaging hierarchy of a product. Indicator digit 9 is used exclusively with variable measure products. Indicator digits are only used in GTIN-14.
 - **GS1 Company Prefix:** A globally unique number licensed to a company by a GS1 Member Organization to serve as the foundation for generating GS1 Identification Keys (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 in place of the GS1 Company Prefix
 - **Item Reference:** A number, containing no logic, assigned by the user to identify a trade item. The Item Reference varies in length based on GS1 Company Prefix length.
 - **Check digit:** The final digit calculated from the preceding digits of the GTIN. This digit is used to check that the data has been correctly composed. GS1 US provides a [check digit calculator](#) to automatically calculate check digits for you.
- ✓ **Note:** The application and use of each component 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 [GS1 General Specifications](#). For example, GTIN-8 only includes a GS1-8 Prefix, Item Reference, and Check Digit.

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
- Check digit

Figure 3-1 GTIN-8 example – EAN-8 barcode



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 U.P.C. Company Prefix and the Item Reference
- Check digit

Figure 3-2 GTIN-12 example – UPC-A barcode



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 Company Prefix and the Item Reference.
 - A GS1 Company Prefix used to create a GTIN-13 will begin with a 1-9.
- Check digit

Figure 3-3 GTIN-13 example – EAN-13 barcode



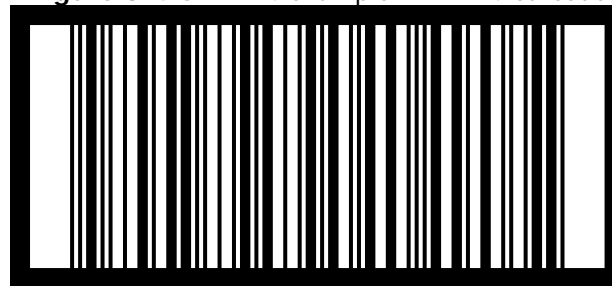
3.4 GTIN-14

The GTIN-14 cannot be used in EAN/UPC barcodes. Components include:



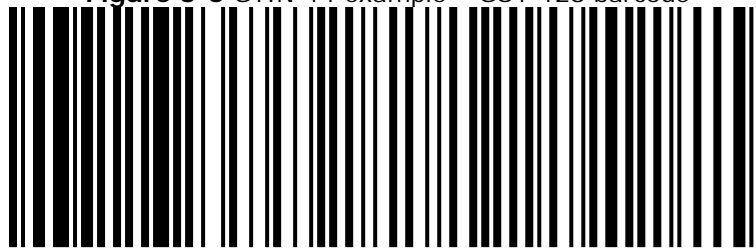
- The Indicator Digit to indicate packaging level (1-8) or that the product is variable measure (9).
- Twelve digits containing your GS1 Company Prefix and the Item Reference
- Check digit

Figure 3-4 GTIN-14 example – ITF-14 barcode



10614141000415

Figure 3-5 GTIN-14 example – GS1-128 barcode



(01)90614141000411(3202)071200



Note: Any of the GTIN data structures (GTIN-8, GTIN-12, GTIN-13, and GTIN-14) may be used in an ITF-14 or GS1-128, as long as they are formatted as 14 digits as seen in the Table 4-1.

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. The GTIN may also be encoded in EPC scheme for RFID tags or in QR Code and Data Matrix when using GS1 Digital Link URI. The appropriate GTIN and barcode, or if applicable, the GTIN and EPC/RFID tag combination is determined by many factors, such as the type of product, where it will be scanned, and the 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	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

5 Key features of the GTIN

- **Global:** GTINs are a global standard that can be assigned by any company anywhere and can be used all over the world.
- **Multi-sector:** GTINs can be used by all business sectors, enabling any product (e.g., a healthcare product, a grocery product, a retail product, etc.) to 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:** GTIN-14 can be used to identify trade item packaging levels based on a GTIN-8, GTIN-12, or GTIN-13. Use of GTIN-14 enables more products to be identified from a single GS1 Company Prefix.
- **Data integrity:** Inclusion of the check digit supports integrity in the GTIN structure.

6 How do GTINs support business intelligence?

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

Example:

A manufacturer assigns the following GTIN-12 to a product: **614141000005**. The table below illustrates the use of GS1 Standards to enable the GTIN to identify the product in the various platforms and applications across the supply chain and consumer applications.

Platform / Application	GS1 Standard	Example
Databases & Systems	14-digit fixed-length text field, right-justified & zero-filled	00614141000005
Physical product marking *	UPC-A	
	GS1 DataMatrix	
Internet applications	GS1 Digital Link URI in QR Code	 https://example.com/01/00614141000005
Visibility event data	GTIN + Batch/lot (LGTIN) EPC URI	urn:epc:class:lgtin:061414.0100000.987654321GFEDCBA
RFID tags & visibility event data	Serialized GTIN (SGTIN) EPC Scheme	urn:epc:id:sgtin:061414.0100000.ABCDE12345
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*00614141000005*PI*8045502 PO4*2*5*LB PO1**40*CA*44.22*FX*UP*00614141000005*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 data sharing standards are available in the GS1 System.


7 How are GTINs assigned to products?

Brand owners are responsible for assigning GTINs to their products. 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 three basic steps for assigning a GTIN:

1. License a GS1 Company Prefix or a single GS1 US GTIN. GS1 US licenses a GS1 Company Prefix that provides the foundation for generating GS1 Identification Keys. For businesses that only need to identify a small number of products, individual GTINs can be licensed outside of a GS1 Company Prefix.
 - a. For those who license a GS1 Company Prefix, the company assigns and generates their own GTINs based on their GS1 Company Prefix, GS1 Standards, and GTIN Management Rules.
2. When a company assigns a GTIN, they also define a prescribed set of data which describes the product. This product information defines core data that is consistent across all instances of the product (e.g., size, color, brand information, etc.).
3. The GTIN and associated product information is then saved in a database and shared among supply chain partners to support their operations and systems.

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

8 Business benefits of using GTINs

As a key component of the GS1 System, the GTIN is established as the standard used worldwide for trade items. GTINs enable trading partners to manage information efficiently and effectively 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:** GTIN facilitates the global flow of trade items and associated information used in e-commerce.
- **Enhances compatibility:** GTIN builds confidence across all business sectors to trade goods and services with compatible product identification.
- **Facilitates accuracy:** Capturing the GTIN at warehouse shipping and receiving, hospital, POS, etc. is essential for accurate stock control and order replenishment.
- **GS1 Global Data Synchronization Network™ (GDSN®):** GTIN enables users to leverage the GDSN to manage product information. The GDSN offers a continuous, automated approach to data management that helps ensure that product information is identical among supply chain partners, increasing data accuracy and reducing costs.
- **Simplified supply chain management:** GTIN strengthens business communications among supply chain partners by accurately identifying specific products and the flow of associated information.
- **Improved data quality:** GTIN 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. See [section 3](#) for more information on GTIN structure.

Does GTIN replace the U.P.C.?

A GTIN does not replace a U.P.C. Companies that currently place a GTIN-12 (U.P.C.) on products should continue to do so. The GTIN is the unique number used to identify trade items, whereas the U.P.C. (known as a UPC-A) is a barcode that encodes a GTIN-12.

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. This allows trading partners order the specific product they need and to consistently retrieve correct information.

What is GTIN compliance?

For a company to be GTIN compliant, they must be able to process and store GTIN-8, GTIN-12, GTIN-13, and GTIN-14 across all systems in a 14-digit format. This includes point-of-sale, supply chain applications, ERP, and other systems that are interacting with GTINs. A company must be GTIN compliant to take full advantage of:

- Unique identification of trade items
- Reliable price-look-up functions
- Interoperability and quality of product identification and information throughout the value chain
- Data synchronization using the Global Data Synchronization Network (GDSN)
- GS1 data carriers
- Electronic Product Codes (EPC)
- GS1 Digital Link

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

A new 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 GTIN Management Standard's guiding principles state that a new GTIN should be assigned to the updated trade item if:

- The consumer and/or trading partner is 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 is a substantial impact to the supply chain (e.g., how the product is shipped, stored, or received)

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

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

An Indicator Digit of 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) but may vary in weight, count, or size or be traded without a pre-defined weight, size, or length. Examples of variable measure products include meat, textiles, cheeses, seafood, and construction supplies.

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

This section uses color-coded images to define the GTIN components being shown. The colors representing each component are:

- **Indicator Digit**
- **Fill Digit**
- **GS1 Company Prefix**
- **U.P.C. Company Prefix**
- **Item Reference**
- **Check Digit**

10.1 Assigning GTINs to packaging levels

The following diagrams illustrate the assignment of GTINs at various item and package levels. The use of different Indicator Digits or different Item References at the higher levels of packaging ensure groupings of products are identified distinctly from the products contained within each grouping.

Figure 10-1 GTIN-14 for higher levels of packaging

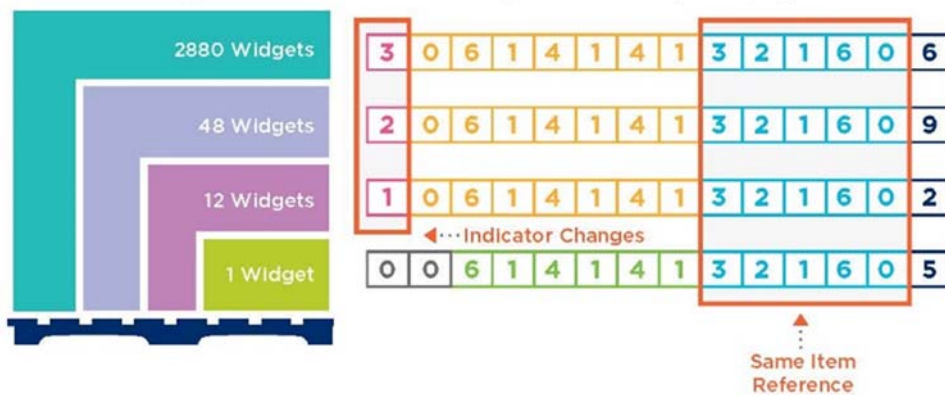
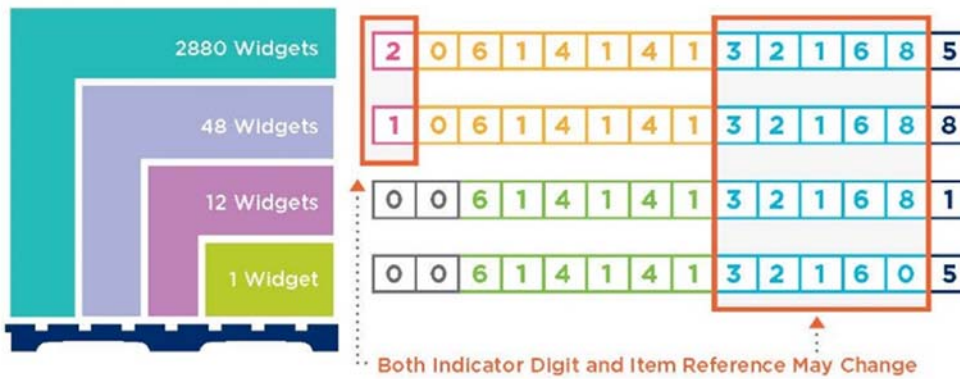


Figure 10-2 GTIN-12 for higher levels of packaging



Figure 10-3 Combination of GTIN-12 and GTIN-14 for higher levels of packaging



10.2 Avoiding mistakes in assigning a GTIN

When a GTIN is incorrectly assigned to a product, it results in invoice errors and delays in the product reaching the retailer. The following are several examples that demonstrate the most common mistakes made when 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 the retail unit and case is 00614141453245. The GTIN must differentiate between the two packaging configurations. The symbol does not differentiate. A valid GTIN for the case would be 10614141453242.

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 GTIN-14 without a hierarchy can cause confusion for your trading partners, who may believe this is a case for a different trade item. Using an Indicator Digit without a hierarchy is not permitted in the GS1 System. This error can be corrected in two different ways. In the first option, a GTIN-14 should be assigned for the case level using the Indicator Digit 1. The new GTIN should retain the same Item Reference as used in the GTIN-12, with a different check digit to form the GTIN-14 in the ITF-14, **10614141003249**). Alternately, in the second option, the case can be assigned with its own Item Reference as a part of a new GTIN-12 and include a new check digit (**00614141450008**).

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-14 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

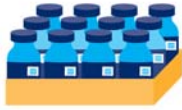
GTIN-12 in GS1-128 Symbol:

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

In the instance of a mixed case, a GTIN-14 cannot be used indicate the packaging hierarchy, as there is more than one type of product at the case level. Instead, a unique GTIN-12 should be issued for this mixed case containing a new Item Reference. A valid GTIN-12 would be **00614141004447**.

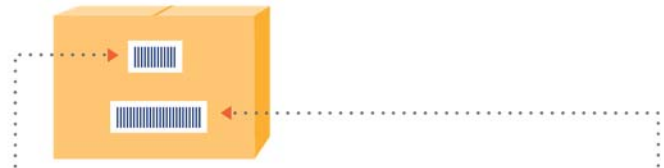
10.2.4 Mistake #4: Assigning the same trade item two different GTINs

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



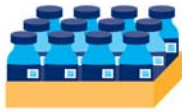
GTIN-12 in a UPC-A Symbol:

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 instance, two different GTINs have been assigned to the same package hierarchy. A GTIN-14, assigned to the higher-level of packaging, can be encoded into an ITF-14 symbol on the case while the lower-level item retains the GTIN-12 encoded into a UPC-A symbol. If different barcodes are needed based on trading partner requirements, a new GTIN-12, assigned to the higher-level of packaging, can be encoded into an ITF-14 as well as UPC-A barcode: 00614141453245.

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 more.
- [CHECK DIGIT CALCULATOR](#): Helps you ensure that the GTIN components have been entered correctly by automatically calculating the check digit.
- [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 ensure correct GTIN assignment to your products.
- [EPC INFORMATION SERVICES \(EPCIS\) STANDARD](#): Enables trading partners to share information about the physical movement and status of products as they travel throughout the supply chain.
- [RESOURCE LIBRARY](#): Documents, videos, and other information to support implementation of standards by all trading partners in the value chain.



- **[FREQUENTLY ASKED QUESTIONS](#)**: Frequently Asked Questions about GS1 Standards, implementation, and how to get started.

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IAPMO

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*If applicable

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