



The Global Language of Business

Unlocking the Benefits of 2D Barcodes in Apparel and General Merchandise

Getting Brands and Retailers Ready for Sunrise 2027

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Document Summary

Document Item	Value
Document Title	Unlocking the Benefits of 2D Barcodes in Apparel and General Merchandise
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Document Description	The purpose of this document is to demonstrate the benefits of 2D barcodes in the apparel and general merchandise industry through definitions and use cases. This document was produced by the GS1 US 2D in Apparel and General Merchandise/ Sunrise 2027 Workgroup which consists of retailers, brands and solution providers in the apparel and general merchandise industry.



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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 (EPC®)-based RFID, data synchronization, and electronic information exchange. GS1 US also manages the United Nations Standard Products and Services Code® (UNSPSC®).

1 Introduction

Driven in part by technology developments, consumer expectations have rapidly expanded and evolved over the past decades. Both consumer and retailer demand for product information, traceability, authentication, and the seamless facilitation of checkout and returns go well beyond the original price look-up function of the current UPC barcodes. While the apparel and general merchandise industry already uses 2D barcodes for consumer engagement, there is still the need to take this to the next level: point-of-sale (POS). It was with this idea, that in May 2020 the GS1 US Board of Governors approved a 2027 Sunrise date for enabling 2D barcodes capabilities at retail POS.

1.1 What is Sunrise 2027?

Sunrise 2027 is an industry-set milestone to enable the ability to read and process 2D barcodes at retail point-of-sale. Unlike current linear or 1D barcodes that only encode a Global Trade Item Number® (GTIN®), 2D barcodes can include additional GS1 Application Identifiers (AIs), such as a serial number or a batch lot. With GS1 Digital Link, this information can be encoded in a web resolvable format in a 2D barcode to enable consumer engagement. 1D barcodes are not going away. Retailer systems will be able to process both 1D barcodes, like UPC-A and EAN-13, and 2D barcodes. There will be a time where both 1D and 2D barcodes are printed on hangtags and packaging.

1.2 Purpose

The purpose of this document is to demonstrate the benefits of 2D barcodes in the apparel and general merchandise industry through definitions and use cases. This document was produced by the GS1 US 2D in Apparel and General Merchandise/ Sunrise 2027 Workgroup which consists of retailers, brands and solution providers in the apparel and general merchandise industry.

2 Types of 2D Barcodes

2.1 What is the difference between a 1D and 2D barcode?

A 1D barcode can typically only hold a GTIN where a 2D barcode can carry a GTIN plus other data.

Figure 2-1 1D and 2D Barcodes



Figure 2-2 Examples of 2D Barcodes for POS

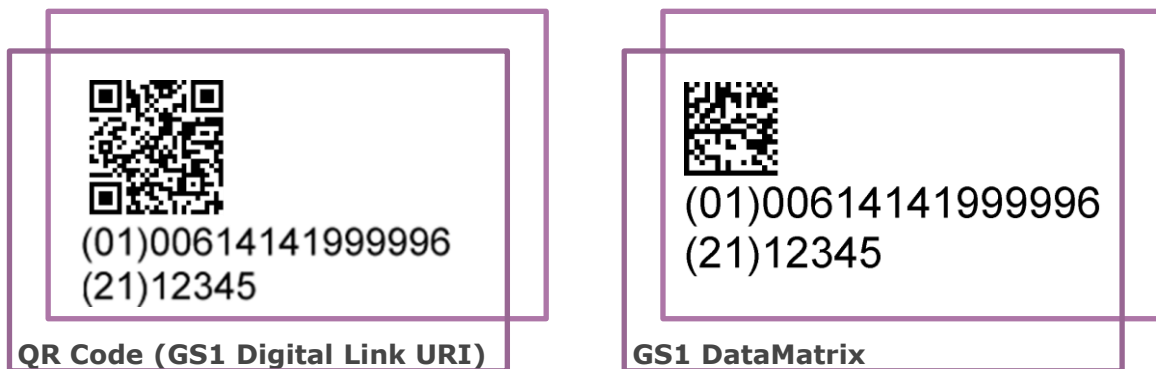
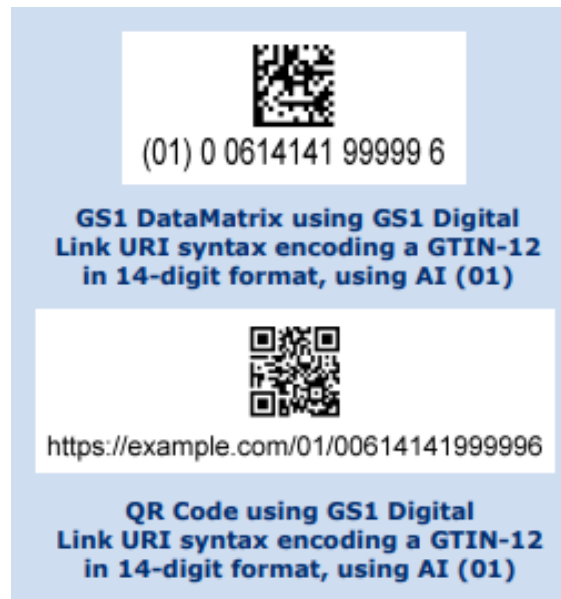


Figure 2-3 Types of 2D Barcodes:



2.2 GS1 DataMatrix and Data Matrix

GS1 DataMatrix and Data Matrix are types of 2D barcodes. It has several advantages such as its compact design and the existence of various production methods that accommodate placing the symbology onto various substrates. GS1 DataMatrix is a subset of Data Matrix that is specifically designed for encoding GS1 element string syntax, while in the GS1 System, Data Matrix is used to encode GS1 Digital Link URI syntax only. Since the two versions of Data Matrix look very similar, using both on one package could lead to confusion; trading partners and consumers would not know which to scan. Best practice is to use only one of these symbologies on-pack.

2.3 QR Code

A QR Code is a 2D barcode that is often used for consumer engagement. QR Codes are recognized by the consumer and by most smartphone camera apps. Consumers have learned to scan the codes using their mobile devices to access brand-authorized content. Many existing implementations of QR Codes on-pack are now enabling proprietary experiences. When these barcodes are repurposed to use GS1 Digital Link URI syntax, they can be utilized to create a multi-use barcode that allows consumer engagement and price look-up without adding another data carrier or taking up additional space on packaging graphics. QR Codes can be used to encode GS1 Digital Link URI but shall not be used with element string syntax because systems will not be able to recognize the AIs. QR code is currently the industry preference over Data Matrix for consumer engagement use cases due to consumer recognition and its ability to be read without a special application across mobile devices.

2.4 What is GS1 Digital Link?

GS1 Digital Link is a data format that allows barcodes and other data carriers to act as web links - connecting a product's unique identity to online sources of real-time information that brands control.

The GS1 Digital Link standard extends the power and flexibility of GS1 identifiers by making them part of the web. This means that GS1 identifiers, such as the GTIN, are now a gateway to consumer information that strengthens brand loyalty, improved supply chain traceability information, business partner APIs, and more.

GS1 Digital Link is a standard including the syntax that defines how to encode GS1 Application Identifiers into a barcode URL format.

Learn more about GS1 Digital Link [here](#).

Figure 2-4 Digital Link Example



3 2D Barcode Use Cases

Because 2D barcodes can hold more data than just a GTIN, there are many use cases that can be unlocked by incorporating a GTIN plus other GS1 Application Identifiers (AIs). These include managing inventory at the serialized level, adding country of origin for traceability or having consumers directly scan the barcode with smartphone for extra consumer engagement.

Figure 3-1 Use Cases Made Possible by 2D



3.1 Common Apparel and General Merchandise Application Identifiers

Table 3-1 Common Apparel and General Merchandise Application Identifiers

AI	Data Content	Format*	Data Title
01	Global Trade Item Number (GTIN)	N2+N14	GTIN
10	Batch or Lot Number	N2+X..20	BATCH/LOT
21	Serial Number	N2+X..20	SERIAL
17	Expiration Date (YYMMDD)	N2+N6	USE BY OR EXPIRY
22	Consumer product variant	N2+X..20	CPV
422	Country of Origin	N3+N3	ORIGIN

3.2 Inventory Management Use Cases:

A GTIN plus a serial number or SGTIN can be used in the apparel and general merchandise industry in multiple ways, especially when used in conjunction with RAIN/RFID technology.

- **Capturing Serialized Sales Data:** The SGTIN being scanned at POS can unlock new and more robust sales data that a GTIN alone cannot.
- **Merchandising:** 2D barcodes can be used for store associate retail applications which could show seasonal planograms, merchandise to be marked down or even help find merchandise that needs to be removed from the shelf due to recalls.
- **Returns Management:** Serialization at point-of-sale will allow the retailer to identify each specific product that was sold and from where (i.e. store or e-Commerce). Returns can be simplified by no longer needed to affix additional barcode stickers to the receipt or packaging.
- **Mis-Mates:** Loss of inventory occurs when paired products such as footwear, swimwear, mens and ladies suits or sleepwear, are not returned as a set. A 2D barcode could potentially identify when the proper pair is not returned (i.e., the same size shoe).
- **Reverse Logistics:** Fulfilling merchandise from multiple channels is now a normal practice in apparel and general merchandise. 2D barcodes could help with the disposition of returned merchandise. Scanning the 2D barcode could help inform store associates what they need to do with the product, such as return it to the vendor, put it back on the selling floor or mark it out of stock.
- **Loss Prevention:** The use of RFID and a 2D barcode can help determine if merchandise has left the store without being sold at POS.
- **Reduced Shortage:** SGTIN could lead to the reduction of fraudulent un-receipted returns. If a retailer recognizes that a specific item has not been sold within their system, they could deny the return of that item.

3.3 Traceability Use Cases:

A GTIN plus other AIs can be used for traceability of the product through the supply chain.

- **Supply Chain Visibility:** 2D barcodes can include an AI for country of origin that can be used for visibility through the supply chain.
- **Sustainability Data:** Adding a batch/lot AI or SGTIN to a 2D barcode can help with sustainability information such as raw materials or product certifications like "organic cotton" or "recyclable materials" by showing when and where the product was produced.
- **Legislation:** With legislation on the horizon, such as the European "Digital Product Passport", 2D barcodes will be necessary to know the entire lifecycle of a product from the source to the consumer.
- **Product Contents:** A 2D barcode can be used to convey product attributes that may be necessary for customs such as an HTS codes, polyfill or hazardous materials.

3.4 Consumer Engagement Use Cases:

Many consumers already scan QR Codes with the smartphones. 2D barcodes allows brands and retailers to talk directly to their customers. GS1 Digital Link unlocks many ways to communicate with consumers. These are just a few examples of consumer engagement use cases:








- **Care Information:** 2D barcodes can direct consumers to care information or to content page for more information about the product.
- **Expiration:** Using the AI for expiration date can used to help consumers dispose of expired products such as cosmetics or candy.
- **Promotions:** GS1 Digital Link allows for updated messaging on products; consumers could scan a 2D barcode in store to receive special promotions.
- **Sustainability information:** 2D barcodes and GS1 Digital Link could be used to share eco-label information with consumers about each specific product.
- **Product Authenticity:** By capturing the 2D barcode with their smartphone, a consumer could be taken to a product authentication page thus confirming they are buying authentic merchandise.
- **Circularity:** 2D barcodes can help consumers dispose of products sustainably by giving proper instructions on how each product should be handled.

4 Other Considerations

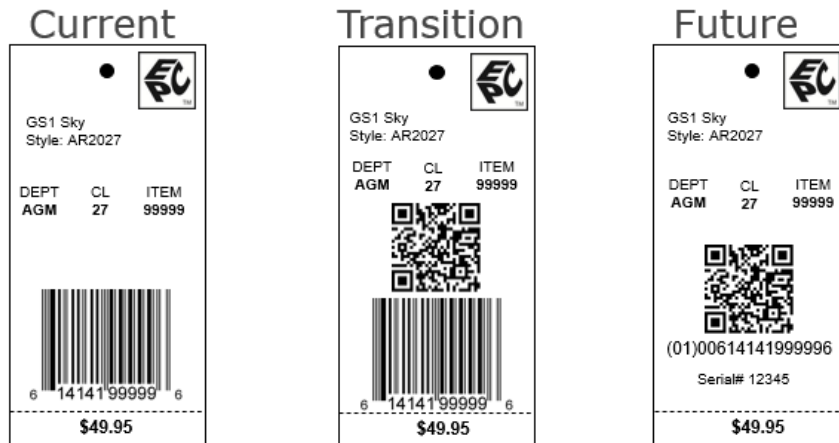
4.1 Things to Consider When Getting Ready for 2027:

- **Minimum and Maximum Sizes for Barcodes:** The more data that is encoded in a 2D barcode the bigger it will be.

Table 4-1 Minimum and Maximum Sizes for Barcodes

Barcode Type	Encoded Data	Minimum Size	Maximum Size
GS1 DataMatrix	GTIN	 (01)00614141999996	 (01)00614141999996
GS1 DataMatrix	GTIN Country of Origin Serial Number	 (01)00614141999996 (422)840 (21)052687	 (01)00614141999996 (422)840 (21)052687
QR Code with GS1 Digital Link	GTIN	 https://example.com/01/00614141999996	 https://example.com/01/00614141999996
QR Code with GS1 Digital Link	GTIN Country of Origin Serial Number	 https://example.com/01/00614141999996/21/052687?422=840	 https://example.com/01/00614141999996/21/052687?422=840

- **Enabling Dual Marking:** There will be a time where both 1D and 2D barcodes will be accepted and both may be required on hangtags and packaging. This needs to be taken into account for sizing purposes.



- **Hardware Requirements:** To get ready for Sunrise 2027, start working with your hardware vendor now to understand if you will need any updates. GS1 US has a barcode capabilities test kit that can be downloaded to test how your systems will respond.
- **Software Requirements:** Data systems may need to be updated to include the serial number and/or batch lot along with the GTIN/UPC to ensure that full potential of 2D barcode is unlocked.
- **Sewn-in Tags:** To ensure the identity and/or authentication of a product after a hangtag or packaging has been removed, a 2D barcode with the same data could be sewn or attached to the product.

5 Additional Resources

For more information about Sunrise 2027 [click here.](#)

Download the test kit [here.](#)



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IAPMO

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*If applicable

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