THE GLOBAL LANGUAGE
OF BUSINESS

GS1 QR Code

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Table of Contents

1. Introduction 4
2. Background 4
3. Technology 4
4. Barcode Differences 5
5. More about GS1 QR Code 6
6. Two-Dimensional Symbols Usage 7
7. FAQs 8
Appendix A: How to encode GS1 System information into the GS1 QR Code? 11
Appendix B: GS1 Barcode Type and Usage 12

1. Introduction

A QR (Quick Response) code is the trademark for a two-dimensional barcode first designed for the automotive industry. The QR Code is a square barcode, which is made up of black modules (square dots/pixels), arranged in a square pattern on a white background. It is text-based data, which has been encoded to be read by specific hardware (image based scanners) or software (applications or “apps”) contained in smart phones.

2. Background

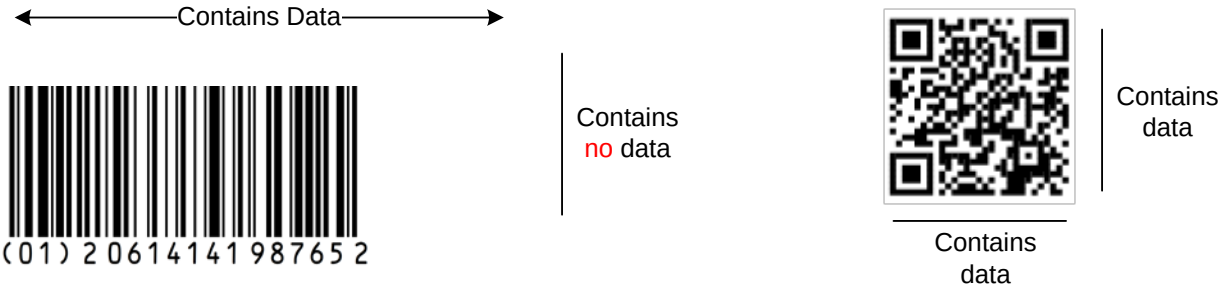
Invented by the Toyota subsidiary Denso Wave to track vehicles during the manufacturing process, the QR Code has become one of the most popular types of two-dimensional barcodes.

Recently, the symbol has become popular outside the automotive industry due, in part, to its large storage capacity compared to standard linear (1D) barcodes. Advances in technology have greatly enhanced the ability to read QR Codes via mobile devices at a reduced cost resulting in the explosion in the adoption of the QR Code.

3. Technology

Two-dimensional barcodes encode data in multiple dimensions. Data is encoded in the width and height of the square modules. The GS1 DataMatrix and GS1 QR Code symbols are two-dimensional barcodes within the GS1 System.

In the past, linear barcodes (1D) were scanned utilizing a laser-based technology. Nowadays, two-dimensional imaging scanners are the newest type of barcode reader. As with any new technology, imaging scanners were once perceived to be cost prohibitive. With the development and implementation of mobile applications on Smart Phones, cost has been removed as a barrier to adoption.



Since its introduction, the QR Code has gained wide acceptance in such diverse industries as manufacturing, warehousing and logistics, retailing, transportation, and most recently mobile applications.

4. Barcode Differences

		QR Code	GS1 QR Code	GS1 DataMatrix	U.P.C.
					
Type of Barcode		Matrix	Matrix	Matrix	Linear Barcode
Data Capacity	Numeric	7,089	7,089	3,116	12
	Alpha-numeric	4,296	4,296	2,335	0
	Binary	2,953	2,953	1,556	0
	Kanji	1,817	Not Applicable	Not Applicable	Not Applicable
Main Features		Large capacity, small size, high-speed scanning	Large capacity, small size, high-speed scanning	Large capacity, small size, high-speed scanning	Limited capacity, traditional laser scanning
Main Applications		Extended attribute data	Marketing plus GS1 Extended attribute data (Ref. Appendix A)	Healthcare Government Industrial	Point-of-sale applications
Barcode Introduced		1994	2012	2006	1977

5. More about GS1 QR Code

In January 2012, a version of the QR Code became a ratified standard for use within the GS1 System. The primary use is for sharing extended packaging information.

Extended Packaging is an approach to give consumers access to additional information or services about trade items. For consumer goods, the recommendation is to use the GS1 QR Code ***or*** GS1 DataMatrix when brand owners want to encode a link to a website. When ***either*** barcode is scanned, the same information will be transmitted regardless of the symbology used.

The Application Identifier (8200) indicates that the following data field contains a brand owner authorized URL to be used in mandatory association with the Global Trade Item Number AI (01). For more information about Application Identifiers, please refer to Section 3.0 of the current version of the GS1 General Specifications.

It is important to note the GS1 QR Code *requires* the mandatory association of the GTIN and Extended Packaging URL. Additional information can be encoded as required.

The use of the Packaging Component Number (PCN) AI (243), when associated with a GTIN, uniquely identifies the relationship between a finished consumer trade item and one of its packaging components.

Both the GS1 QR Code and GS1 DataMatrix support the GS1 Identification Numbers and the use of GS1 Application Identifiers.

For more information, please contact customer support:

- Main Telephone Number: +1 937.435.3870
- Email Address: info@gs1us.org

6. Two-Dimensional Symbols Usage

Generic QR Code*	GS1 QR Code	GS1 DataMatrix
Magazines, signs, buses, business cards, buildings etc. to deliver marketing material via the internet to consumers	Magazines, signs, buses, business cards, buildings etc. to deliver marketing material via the internet to consumers *utilizing* the associated Global Trade Item Number (GTIN) and Application Identifier	Healthcare industry to print on very small healthcare items *with* GS1 System information (i.e., GTIN, Serial Number, and Batch/Lot) May be used in Regulated Healthcare environments
Industrial utilization for tracking parts and assets	Industrial sector for uniquely identifying the relationship between a finished consumer trade item and one of its packaging components.	Aerospace & Defense industry to mark assets (parts and components) *with* GS1 System information (i.e., GRAI, GIAI, SSCC)
Grocery/CPG sector for tracking of packaging materials to corresponding products	*Cannot* be used in Regulated Healthcare environments	Any direct part marking application within the GS1 System utilizes the GS1 DataMatrix
		Consumer level products to deliver internet content to consumers via mobile devices *utilizing* the associated Global Trade Item Number (GTIN) GS1 Data Matrix does not *require* the use of a URL.
		Industrial sector for tracking parts and components

* Generic QR Codes ***do not*** utilize GS1 Identification standards, i.e., Global Trade Item Number (GTIN).

7. FAQs

1. **Does GS1 US support the QR Code?**
   A - In January 2012, a version of the QR Code was adopted for use within the GS1 System for sharing extended packaging information on items.

2. **How do I know which Barcode is best suited for my application?**
   A - Refer to the Two-Dimensional Symbols Usage table within this document to determine which symbol to utilize.

3. **Do you offer QR Codes or the ability to generate QR Codes for businesses?**
   A - No, GS1 US does not currently create or provide the ability to generate QR or GS1 QR Codes for businesses. GS1 US licenses prefixes that are used to create unique identifiers, i.e., GTIN in order for you to create the GS1 QR Code.

4. **How can we get a GS1 QR Code?**
   A - You can create a GS1 QR Code by using your GS1 Company Prefix, as you do with other GS1 Identifiers. If you do not have a GS1 Company Prefix, please contact the GS1 US Customer Service Department (info@gs1us.org) to license a GS1 Company Prefix. This will allow you to create the GS1 QR Code with the encoded GTIN and Extended Packaging URL. See Appendix A on how to encode GS1 System information into the GS1 QR Code.

5. **Does the GS1 QR Code replace the U.P.C.?**
   A - No, the GS1 QR Code was adopted into the GS1 System to provide extended packaging information associated with the product GTIN. The QR Code cannot be scanned at retail point-of-sale and the U.P.C. is still utilized to capture the product information for point-of-sale scanning.

6. **Can I create a GS1 QR Code in DataDriver?**
   A -No, at this time DataDriver cannot create GS1 QR Codes. DataDriver has the ability to generate UPC-A, ITF-14, and GS1-128 barcodes.

7. **Who can create a GS1 QR Code for me?**
   A - Solution providers within the barcoding industry may assist you in the development of the GS1 QR Code or the barcode software production industry can assist in the creation of the GS1 QR Code. To find a list of specific GS1 US Solution Partners, please go to https://www.gs1us.org/resources/solution-partners

8. **What information can be included in the GS1 QR Code?**
   A -The GS1 QR Code can encode all of the GS1 Application Identifiers, but it **MUST** encode the AI (01) for GTIN and AI (8200) for Extended Packaging URL before any other Application Identifier. In contrast, the GS1 DataMatrix barcode does not require the mandatory use of AI (8200).

9. **How do I link product and U.P.C. information?**
   A – The U.P.C., in the form of a GTIN, can be encoded, along with URLs, into GS1 QR Codes, which can appear in magazines, on signs, buses, and business cards, etc.

10. **How do you incorporate additional information beyond the GTIN and Extended Packaging in a GS1 QR Code?**
    A - In the same way as you incorporate additional information in other GS1 Data Carriers, with the use of multiple GS1 Application Identifiers (AIs).

11. **Why is GS1 DataMatrix the only 2D symbology used in the regulated healthcare industry and not GS1 QR Code?**
    A - The GS1 application standards for healthcare only allow a single symbology for use, which is the GS1 DataMatrix. The GS1 Data Matrix was approved as a standard in 2006 and has become widely adopted and implemented in Healthcare. There is demonstrated success in its use especially in direct part marking. There is no business driver to migrate to the GS1 QR Code at this time. It is important to note that some of the healthcare needs are being met, and will continue to be met, with 'traditional' linear bar codes, such as GS1-128 or GS1 DataBar. However, for applications where they are not, GS1 Healthcare adopted the use of GS1 DataMatrix as the data carrier (bar code symbol) solution.

12. **Do most common QR Code reader apps also read GS1 QR and GS1 Data Matrix?**
    A –Most (if not all) commercially available apps will read the QR Code. The GS1 QR Code became available in January 2012, and, as a result, is not currently read by mobile apps. We anticipate this will change as the GS1 QR becomes broadly implemented. To date, the GS1 DataMatrix has been primarily implemented in healthcare and has not been associated with digital. GS1 US hopes this will change as it is adopted for mobile use. Conversely, the GS1 Linear Barcodes, such as the UPC can be read by mobile applications and will be instrumental in accessing the GS1 Trusted Source of data.

13. **Can you encode a URL into the generic QR Code in addition to the GS1 QR Code?**
    A - Yes, both the generic QR and the GS1 QR Code have the capability to encode URLs. The GS1 QR Code utilizes an Application Identifier, AI (8200) to indentify the URL, where the generic QR Code does not.

14. **Why would a company use a GS1 QR Code rather than just a generic QR Code?**
    A - The benefit of using the GS1 QR Code is that it allows the use of GS1 System information, where the generic QR Code does not. Using the GS1 QR Code leverages your current investment in the GS1 System of Standards. While we tend to promote the use of the GS1 QR Code for marketing applications, it may be used throughout the supply chain between trading partners as the GS1 QR Code has the capability of containing extended attribute data such as batch/lot, expiry date, etc. The GS1 QR Code is standards based so trading partners are “speaking the same language”, ensuring uniqueness of the identification of the product through the use of the Global Trade Item Number (GTIN) and Packaging Component Number (PCN). The GS1 QR Code provides a standard symbology to access a GS1 Trusted Source of data.

Appendix A: How to encode GS1 System information into the GS1 QR Code?

1. Refer to your EAN/UPC barcode and reference the GTIN
2. GTIN: 614141999996
3. Create a 14-digit GTIN format of the EAN/UPC GTIN
4. GTIN: 00614141999996
5. Create an extended packaging URL: e.g. http://www.gs1us.org
6. Encode the QR Code with the Function Code One Character (FNC1)
7. Encode the GS1 AI (01) and Insert the created 14-digit GTIN
8. Encode the GS1 AI (8200) and Insert the created URL
9. Optional: Encode additional Application Identifiers (AIs) from the GS1 System based on the business need

Extended Packaging allows consumers to access additional information or services about trade items through their mobile device. It enables the ability to retrieve additional information about the trade item through mobile devices or in general linking a trade item with virtual information or services. Extended Packaging is supported by the Extended Packaging URL AI (8200). The AI (8200) indicates the identification of a Brand Owner authorized URL to be used in mandatory association with the GTIN AI (01).

Appendix B: GS1 Barcodes and Usage

Barcode	Display	Exact Numeric Digits	Data Structure	Usage	Usage Examples
EAN - 8		8	GTIN-8	The EAN-8 is used on small packages where the EAN-13 barcode would be too large. It encodes the Global Trade Item Number (GTIN-8) and is also used by retailers to identify own-brand products sold only in their stores.	Used on retail Items such as cosmetics
UPC - A		12	GTIN-12	The UPC-A uniquely identifies a product for retail checkout. It encodes the Global Trade Item Number (GTIN-12) and is also used by retailers to identify own-brand products sold only in their stores.	Used on retail Items that cross point of sale applications
UPC - E		12	GTIN-12	The UPC-E allows the use of U.P.C. barcodes on smaller packages where the full 12-digit UPC-A may not fit. It utilizes a zero-suppression method to compress the GTIN-12 into a 6-digit format. It is also used by retailers to identify own-brand products sold only in their stores.	Used on retail Items such as cosmetics, packs of chewing gum, cigarettes.
EAN - 13		13	GTIN-13	The EAN-13 is used for marking products often sold at retail point of sale and general distribution. It encodes the Global Trade Item Numbers (GTIN-13). Used on retail product marking worldwide. Also used by retailers to identify own-brand products sold only in their stores.	Used on retail Items that cross point of sale applications such as periodicals, magazines, and books

Barcode	Display	Exact Numeric Digits	Data Structure	Usage	Usage Examples
ITF - 14		14	GTIN-12 GTIN-13 GTIN-14	ITF-14 symbols are generally used on higher packaging levels of a product, such as a case or carton. It lends itself well to be directly printed on corrugate material. It encodes the Global Trade Item Number (GTIN).	Used on standard product groupings such as a Case of dish washing detergent - 24 bottle count
GS1 DataBar Truncated		14	GTIN-12 GTIN-13 GTIN-14	GS1 DataBar Truncated is designed for very small item identification and are mainly used within the Healthcare industry. It cannot be scanned with Flatbed POS scanners.	Example application include: unit dose pharmaceuticals
GS1 DataBar Stacked Omnidirectional		14	GTIN-12 GTIN-13 GTIN-14	GS1 DataBar Stacked Omnidirectional is used to condense the GTIN information into a more compact and square barcode suitable for use on small packages and loose fresh produce. It has the capability for omni-directional scanning. Retail point-of-sale accepts GTIN-12 and GTIN-13 structures.	Loose Produce
GS1 DataBar Limited		14	GTIN-12 GTIN-13 GTIN-14	The GS1 DataBar Limited is designed for very small item identification and are mainly used within the Healthcare industry. It cannot be scanned with Flatbed POS scanners. It is "limited" to the use of zero '0' or one '1' in the first data position.	Very Small Healthcare Items such as ampoules scanned using a hand held device

Barcode	Display	Alpha/ Numeric	Data Structure	Usage	Usage Examples
GS1 - 128		Up to 48 characters	Concatenated strings using GS1 Application Identifiers	The GS1-128 uses a series of GS1 Application Identifiers (AIs) to include additional data such as Best Before Date, Batch/Lot Number, Quantity, Weight and many other attributes. It also encodes the SSCC (Serial Shipping Container Code).	Used for large bulk items such as pallets or logistic units
GS1 DataBar Expanded		Up to 74 numeric or 41 alphabetic characters	Concatenated strings using GS1 Application Identifiers	The GS1 DataBar Expanded is used for marking products that cross point of sale applications. It encodes any of the GS1 Identification Numbers plus supplementary AI Element Strings, such as Weight and Best Before Date, in a linear symbol that can be scanned omnidirectionally by suitably programmed slot scanners.	Encodes information such as expiration date on fresh foods Also used on coupons.
GS1 DataBar Expanded Stacked		Up to 74 numeric or 41 alphabetic characters	Concatenated strings using GS1 Application Identifiers	The GS1 DataBar Expanded Stacked is used for marking products that cross point of sale applications. It encodes any of the GS1 Identification Numbers plus supplementary AI Element Strings, such as Weight and Best Before Date, in a stacked linear symbol that can be scanned omnidirectionally by suitably programmed slot scanners.	Encodes information such as expiration date on fresh foods Also used on coupons.

Barcode	Display	Alpha/ Numeric	Data Structure	Usage	Usage Examples
GS1 DataMatrix		Up to 2,335 characters	Concatenated strings using GS1 Application Identifiers	GS1 DataMatrix is a Two-dimensional matrixed symbol with specific healthcare applications in the GS1 System. It requires image based scanners and it is specified for healthcare items.	Direct part marking of surgical instruments.
GS1 QR Code		Up to 4,296 characters	Mandatory GS1 Application Identifiers AI (01) and AI (8200). Other GS1 AIs are optional.	GS1 QR Code is a Two-dimensional symbol denoting the Extended Packaging URL for a trade item has been captured. It is processed to obtain one URL address associated with the trade item identified by the Global Trade Item Number (GTIN).	Marketing information retrieved by a consumer from a POS product