



## General Specifications Change Notification (GSCN)

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WR #	GSCN Name	Effective Date
<b>20-326</b>	Continuous Improvement – EPC/RFID Addition Gen Spec	

### Associated Work Request (WR) Number:

20-207 – Gen Spec Continuous Improvement

### Background: Gen Spec Continuous Improvement

Language is being added section 5 of the *General Specifications* to describe EPC/RFID since it is an accepted data carrier for some GS1 application standards.

### GS1 General Specification Change:

The recommended changes are highlighted below, relative to GS1 General Specifications version 2020.

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## 5.1 Introduction

A data carrier is a means of representing data in machine readable form. [Data carriersBarcode symbologies](#) that are endorsed by GS1 are described in sections [5.1.1-5.1.4](#), [5.2](#), [5.3](#), [5.4](#), [5.5](#), [5.6](#), [5.7](#), [5.8](#), [5.115-9](#); barcode production and quality assessment are covered in section [5.125-10](#). [EPC/RFID is described in section 5.13](#).

The GS1 system specifies the data carrier used to represent any given element string. Section 2 covers rules indicating which data carrier should be used to represent which element strings in particular applications.

### 5.1.1 Overview of GS1 barcodes

The GS1 system uses the following data carriers:

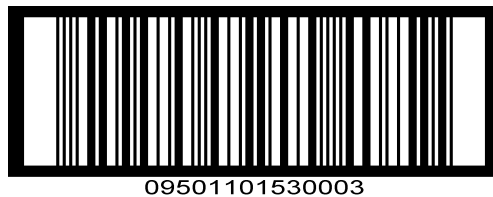
- The EAN/UPC symbology family of barcodes (UPC-A, UPC-E, EAN-13, and EAN-8 barcodes and the two- and five-digit add-on symbols) can be read omnidirectionally. These symbols must be used for all items that are scanned at the point-of-sale and may be used on other trade items.

**Figure 5.1-1.** UPC-A and EAN-13 barcodes



- ITF-14 (Interleaved 2-of-5) barcodes carry ID numbers only on trade items that are not expected to pass through the point-of-sale. ITF-14 symbols are better suited for direct printing onto corrugated fibreboard.

**Figure 5.1-2.** ITF-14 barcode



- The GS1-128 barcode is a subset of the Code 128 barcode symbology. Its use is exclusively licenced to GS1. This extremely flexible symbology encodes element strings using GS1 Application Identifiers.

**Figure 5.1-3.** GS1-128 barcode



### 5.1.15.1.2 International data carrier standards

A number of national and regional standardisation bodies have developed barcode technical standards. The International Organisation for Standardisation (ISO) has published standard barcode symbology specifications via a subcommittee of ISO/IEC JTC1 (International Organisation for Standardisation/International Electrotechnical Commission Joint Technical Committee 1).

GS1 is actively involved in developing these standards. The objective is for GS1 system standards to remain fully compatible with relevant published national, regional, and international symbology standards. The pertinent documents for section 5 include the latest published version of:

- **Section 5.1:** *ISO/IEC 15424: Information technology; automatic identification and data capture techniques; data carrier/symbology identifiers.*
- **Section 5.2:** *ISO/IEC 15420: Information technology; automatic identification and data capture techniques; bar code symbology specifications; EAN/UPC.*
- **Section 5.3:** *ISO/IEC 16390: Information technology; automatic identification and data capture techniques; bar code symbology specifications; ITF-14.*
- **Section 5.4:** *ISO/IEC 15417: Information technology; automatic identification and data capture techniques; bar code symbology specifications; GS1-128 Symbology specifications.*
- **Section 5.5:** *ISO/IEC 24724: Information technology; automatic identification and data capture techniques; GS1 DataBar bar code symbology specification.*
- **Section 5.6:** *ISO/IEC 16022: Information technology; automatic identification and data capture techniques; Data Matrix bar code symbology specification, as it pertains to GS1 DataMatrix.*
- **Section 5.7:** *ISO/IEC 18004:2015: Information technology; automatic identification and data capture techniques; QR Code bar code symbology specification, as it pertains to GS1 QR Code.*
- **Section 5.8:** *AIM Rev 3.0, August 2014: Information technology; automatic identification and data capture techniques; bar code symbology specification - DotCode.*
- **Section 5.9:** *ISO/IEC 16022: Information technology; automatic identification and data capture techniques; Data Matrix bar code symbology specification.*
- **Section 5.10:** *ISO/IEC 18004: Information technology; automatic identification and data capture techniques; QR Code bar code symbology specification*
- **Section 5.119:** *ISO/IEC 24723: Information technology; automatic identification and data capture techniques; EAN.UCC Composite bar code symbology specification.*
- **Section 5.120:** Bar Code Production and Quality Assessment:
  - *ISO/IEC 15415: Information technology; automatic identification and data capture techniques; bar code print quality test specification; two-dimensional symbols.*
  - *ISO/IEC 15416: Information technology; automatic identification and data capture techniques; bar code print quality test specification; linear symbols.*
  - *ISO/IEC 15419: Information technology; automatic identification and data capture techniques; bar code digital imaging and printing performance testing.*
  - *ISO/IEC 15421: Information technology; automatic identification and data capture techniques; bar code master test specifications.*
  - *ISO/IEC 15426-1: Information technology; automatic identification and data capture techniques; bar code verifier conformance specification - Part 1: Linear symbols.*
  - *ISO/IEC 15426-2: Information technology; automatic identification and data capture techniques; bar code verifier conformance specification - Part 2: Two-dimensional symbols.*
  - *ISO 1073-2: Alphanumeric character sets for optical recognition – Part 2: Character set OCR-B Shapes and dimensions of the printed image.*
  - *ISO/IEC TR 29158: Information technology; Automatic identification and data capture techniques; direct part marking (DPM) Quality Guideline.*
- **Section 5.13:** UHF and HF EPC/RFID:

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- *ISO/IEC 18000-63 Information technology — Radio frequency identification for item management — Part 63: Parameters for air interface communications at 860 MHz to 960 MHz Type C*
- *ISO/IEC 18000-3 Information technology — Radio frequency identification for item management — Part 3: Parameters for air interface communications at 13,56 MHz*
- **All sections:** *ISO/IEC 646: Information technology; ISO 7-bit coded character set for information interchange.*

### 5.13 UHF and HF EPC/RFID

Radio Frequency Identification (RFID) is an acronym that covers many different technologies, all of which have the following two points in common:

- data and all other additional protocol information are stored (in a binary format) in a microelectronic chip
- RFID tags communicate with dedicated readers by means of radio frequency waves or fields

One can classify all these technologies following these main features:

- Passive vs. Active
- The operating frequency band
- Batteryless vs. battery powered tags

It is worth noting that the choice of one of the available RFID technologies is globally independent from the data and identifiers that the RFID tags carry.

EPC/RFID is a subset of RFID technologies that are used within the GS1 system. There are two types of EPC/RFID data carriers optimised for different application requirements. Both are passive technologies and are designed to carry Electronic Product Codes (EPC) formats including GS1 identification keys and Application Identifiers.



**Note:** EPC, Electronic Product Code, is designed to facilitate business processes and applications that need to manipulate visibility data – data about observations of physical objects. The EPC is a universal identifier that provides a unique identity for any physical object. The EPC is designed to be unique across all physical objects in the world, over all time, and across all categories of physical objects. It is expressly intended for use by business applications that need to track all categories of physical objects, whatever they may be. There is a well-defined correspondence between EPCs and GS1 keys. This allows any physical object that is already identified by a GS1 key (or GS1 key + serial number combination) to be used in an EPC context where any category of physical object may be observed. Likewise, it allows EPC data captured in a broad visibility context to be correlated with other business data that is specific to the category of object involved and which uses GS1 keys. For more information, see: *GS1 EPC Tag Data Standard (TDS)*.

The first type, UHF EPC/RFID, works in the UHF (Ultra High Frequency) bands and is defined in the “*EPC Radio-Frequency Identity Protocols Generation-2 UHF RFID Standard, Specification for RFID Air Interface Protocol for Communications at 860 MHz – 960 MHz*”. This standard has established itself as the backbone for UHF RFID implementations across multiple sectors.

The second type, HF EPC/RFID, works in the HF (High Frequency) band and is defined in the “*EPC Radio-Frequency Identity Protocols EPC Class-1 HF RFID Air Interface Protocol for Communications at 13.56 MHz*”.



**Note:** For reasons of simplicity, since UHF EPC/RFID is much more widely used than HF EPC/RFID, simple reference to EPC/RFID usually means UHF EPC/RFID.



**Note:** Air interface protocol standard defines the way readers and tags make use of a dedicated frequency band of the radio spectrum to communicate. It also defines a set of standardised commands and responses.

For encoding and decoding procedures, and technical specifications related to the management of EPC/RFID Tags memory banks, the GS1 General Specifications make normative reference to GS1’s *EPC Tag Data Standard (TDS)*.

Complementing TDS and EPC/RFID Air Interface protocols, other GS1 standards related to the implementation and use of EPC/RFID can be found at: <https://www.gs1.org/standards/epc-rfid>

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Term	Definition
non- <del>human readable interpretation text (non-HRI)</del> HRI text	Characters such as letters and numbers that can be read by persons and may or may not be encoded in GS1 AIDC data carriers and are not confined to a structure and format based on GS1 standards (e.g., a date code expressed in a national format that could be used to encode a date field in a GS1 AIDC data carrier, brand owner name, consumer declarations).
odd parity	A characteristic of the encodation of a symbol character whereby the symbol character contains an odd number of dark modules.
omnidirectional linear barcode	A linear barcode <del>symbol designed to be read in segments by suitably programmed lasers</del> symbol designed to be omnidirectionally read in segments by suitably programmed high-volume omnidirectional point-of-sale (POS) scanners.
packaging component	<del>Entities</del> Objects such as bottles, caps, and labels to package a consumer trade item.
packaging component number	Global Trade Item Number (GTIN) attribute used to establish a relationship between a finished consumer trade item and packaging components.
payment slip	The end customer's notification of a demand for payment for a billable service (e.g., utility bill) comprising an amount payable and payment conditions.
point-of-care (POC)	<del>Location where dispensing or use of a non-retail, regulated healthcare pharmaceutical or medical device to or for a patient occurs.</del> Dispensing or use of a non-retail, regulated healthcare pharmaceutical or medical device to a patient based on right product, dose, and route of administration.
point-of-sale (POS)	Refers to the retail checkout where omnidirectional linear barcodes must be used <del>to support high-volume laser-based scanning or low volume checkout where linear barcodes (or for regulated healthcare trade items, GS1 DataMatrix)</del> to enable very rapid scanning or low volume checkout where linear or 2D matrix barcodes are used with image-based scanners.
predefined assortments	An assortment that comprises a fixed count of two or more different trade items, each identified with a unique GTIN that is declared on the package. The trade items contained within the assortment may be trade items of one or more manufacturers. When an assortment contains items from multiple manufacturers the GTIN requirement for the assortment is the responsibility of the organisation that creates the assortment. Any change in the configuration of the assortment is considered a new trade item.
<del>price check digit</del>	<del>A digit calculated from the price element in a Restricted Circulation Number (RCN) encoded using the EAN/UPC symbology. Used to check that the data has been correctly composed.</del>
price verifier digit	<del>A digit calculated from the price element in a Restricted Circulation Number (RCN) that is used to check that the data has been correctly composed.</del> See price check digit.
<del>primary barcode</del>	<del>The barcode containing the identification number of the item (e.g., GTIN, SSCC). Used to determine the placement of any additional barcode information.</del>
product model	A base product design or specification from which a trade item is derived.
QR Code <del>symbology</del>	A two-dimensional matrix symbology consisting of square modules arranged in a square pattern. The symbology is characterised by a unique finder pattern located at three corners of the symbol. QR Code symbols are read by two-dimensional imaging scanners or vision systems.
Quiet Zone	<del>A clear space which precedes the start character of a barcode and follows the stop character of a linear barcode or surrounds a 2D symbol.</del> Formerly referred to as "clear area" or "light margin".
Quiet Zone Indicator	A greater than (>) or less than (<) character, printed in the human readable field of the barcode, with the tip aligned with the outer edge of the Quiet Zone.
radio frequency	Any frequency within the electromagnetic spectrum associated with radio wave propagation. When <del>a</del> radio frequency <del>current power</del> is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. <del>A radio frequency signal that can be processed by a radio frequency receiver.</del> Many wireless technologies are based on radio frequency field propagation.
radio frequency identification (RFID)	<del>A technology that uses radio frequency electromagnetic fields or waves to automatically identify and track tags attached to objects. An RFID system consists of RFID tags and readers. When triggered by a radio frequency electromagnetic interrogation signal from a nearby RFID reader, the RFID tag transmits digital data, usually a unique identifier like an EPC, back to the reader.</del> <del>A data carrier technology that transmits information via signals in the radio frequency portion of the electromagnetic spectrum. A radio frequency identification system consists of an antenna and a transceiver, which read the radio frequency and transfer the information to a processing device, and a transponder, or tag, which is an integrated circuit containing the radio frequency circuitry and information to be transmitted.</del>

Commented [DM47]: All preceding edits were part of WR20-207, continuous improvement of glossary