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# GS1 EPCglobal RFID-based Electronic Articles Surveillance (EAS) Technical Implementation Guide

*Issue 1.0 Approved, September-2009*





## 10 Document Summary

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## 38 1. Introduction

### 39 1.1. Purpose of this Document

40 The purpose of this document is to provide the reader a technical guide to adopt and/ or implement RFID-  
41 based Electronic Article Surveillance in a Retail environment for reusable and/ or disposable tags as  
42 defined in section 2.1 of the Strategic Overview.

43 The document will clearly illustrate how to implement an RFID-based EAS solution using existing GS1 and  
44 EPCglobal standards.

### 45 1.2. Who Will Use this Document?

- 46 ■ Systems integrators and technical project leaders in retail operations.

### 47 1.3. Scope

48 There are many advantages to using EPC RFID throughout the supply chain. This document refers in detail  
49 to the EPC RFID-based in Retail Environment EAS functionality at:

- 50 ■ Point of Entry/ Exit (PoE)
- 51 ■ Point-of-Sale (PoS)
- 52 ■ Receiving goods

53 Other use cases may include the following; however, are not covered in detail in this document:

- 54 ■ Special goods receiving
  - 55 ○ Consumer Returns, with respect to this document, consumer returns can be seen as another form of
  - 56 goods receiving (see section 4.1).
- 57 ■ Additional read points can be seamlessly added to the system, but are out of scope for this document.
  - 58 ○ Fitting/Dressing Rooms
  - 59 ○ Compactor/ Trash Bins

## 60 2. Conditions for Implementation

61 This guide is applicable for the following conditions:

- 62 ■ EPC RFID Gen 2 compliant passive tag
- 63 ■ 96-bit EPC, SGTIN<sup>1</sup>
- 64 ■ A store or facility with one or more PoS stations, one or more PoE, and one or more goods  
65 receiving areas
- 66 ■ Readers, when transmitting, do not exceed the maximum power allowed by national or regional  
67 regulations
- 68 ■ A channel whose width is the maximum allowed by national or regional regulations

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<sup>1</sup> Reference: for further information on the scope, structure and encoding/decoding of the SGTIN, please consult the current version of GS1 EPCglobal Tag Data Standard (TDS)

- 69 ■ Centralized information available (database of SGTINs in the store that have not been sold)
- 70 ■ One of three operating temperature ranges (1) 0 to +40 °C, (2) –25 to +40 °C, (3) and –40 to +65
- 71 °C, and humidity from 0% to 90%, non-condensing; although Readers are not required to operate
- 72 with both condensing humidity AND temperature excursions below 0 °C
- 73 ■ An established communication link between the readers via a LAN
- 74 ■ A store or facility ready to adhere to the GS1 EPCglobal consumer guidelines. Further information is
- 75 available at: [http://www.epcglobalinc.org/public/ppsc\\_guide/](http://www.epcglobalinc.org/public/ppsc_guide/).

## 76 3. SGTINs Database

77 The SGTINs Database is an accounting of all individual items in the store, not only the stock keeping unit  
78 (SKU's). It is used by the system to check the items in the store or facility, at any read point. This database  
79 could be approximately the same size as a flat file with some sort of mechanism to ensure transaction  
80 integrity.

### 81 3.1. How to build the database of SGTINs in a store

- 82 ■ Complete an in-store inventory audit and add the SGTINs to a database.
- 83 ■ Build the database as new items are received, and a full inventory of SGTINs will be available after
- 84 the first complete inventory turnover. This approach will gradually implement RFID-based EAS
- 85 without significant migration issues. In the meantime prior to the full inventory turnover, RFID-
- 86 based EAS will be available only for those SGTINs in the system.

### 87 3.2. How to maintain the database of SGTINs in a store

88 The SGTINs Database must be maintained during all the processes. There are different ways to maintain  
89 it:

- 90 ■ Read the tags upon goods receiving.
  - 91  In a simple installation one may use a reader to read the tags and with an application layer
  - 92 add them to the SGTINs database.
  - 93  In a more complex environment, one may use read points at various locations to read SGTINs
  - 94 from areas such as in-store drop shipments locations, consumer returns desks, or inter-store
  - 95 transfers areas.
  - 96 ■ Take the SGTINs from the Dispatch Advice (DESADV) or Advanced Shipment Notice (ASN) and
  - 97 add these SGTINs to the existing database in the retail store once the product(s) has been
  - 98 received.
  - 99 ■ Point of Sale (PoS)
    - 100 □ PoS must be able to read SGTINs.
    - 101 □ After the payment transaction has been completed, the recorded SGTIN may be removed or
    - 102 flagged and decremented from the inventory database.

103 **Hint:** Cancellations of transactions are always made before finalization of payment. For  
104 purposes of RFID-based EAS system after payment finalization, then the item is treated similar  
105 to a customer return.

106 **Note:** Consideration should be given how to handle post void transactions.

107

- 108
- 109 ■ Point of Entry/ Exit (PoE)
  - 110 □ The reader at a PoE must read the SGTIN and check to see if the item is still in the database
  - 111 □ of known SGTINs. Potentially, the store could have multiple databases of SGTINs, but the
  - 112 □ reader at PoE must only check if it is in the EAS SGTIN database.
  - 113 □ If the item is not removed from the database, then notification occurs to alert the store
  - 114 □ personnel that the item is leaving the store illegitimately. The response to the alarm is retailer
  - 115 □ specific and is not covered in this document.
  - 116 ■ For mobile external PoS systems (e.g. sidewalk or tent sales) information is removed from the
  - 117 □ database prior to going out of the store. No RFID-based EAS functionality will be available for
  - 118 □ these items since there is no EAS perimeter set-up.
- 118 ! **Important:** If a foreign tag enters the store, then an alarm will not be raised as this SGTIN is not
- 119 part of the SGTIN database.
- 120 ! **Important:** If an item enters the store and the SGTIN is not available, then the item needs to be
- 121 processed. GS1 has created a guideline, Missing Identification Resolution, to assist in this
- 122 process at the refund counter or PoS.

## 123 4. Implementation Options

124 This guide is designed around the current GS1 Standards that can be universally used for reusable and

125 disposable tags. At the time of this guide's completion, tagging bits on a tag has not been GS1 EPCglobal

126 standardized for EPC RFID-based EAS.

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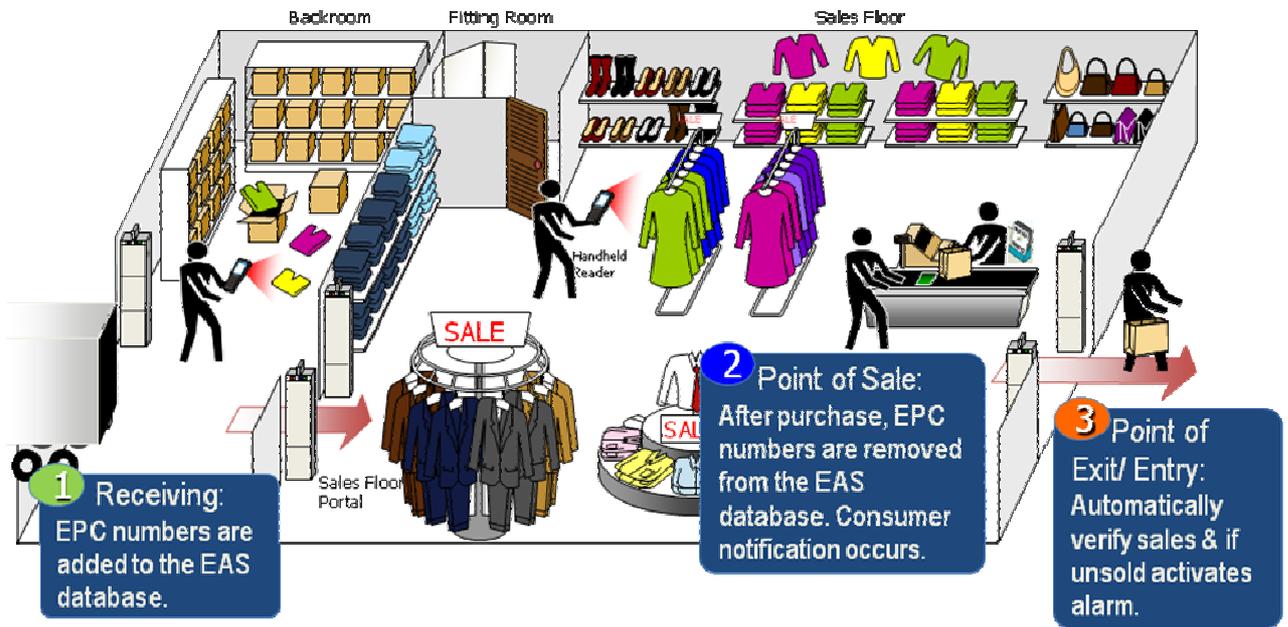
128 This implementation is for a store or facility that needs to implement a solution for local area network and

129 information system. In traditional EAS systems, there is no LAN cable outlet required. In this

130 implementation a wireless LAN can be used which sometimes is included with the readers.

131

Figure 4-1 RFID-based EAS in the Retail Store Environment<sup>2</sup>



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**!** Important: EPC numbers are used for Item Level Identification.

#### 134 4.1. Stores with a standalone reader(s) containing a database of SGTINs

135 This implementation is for a store or facility that doesn't have an existing local area network and an  
136 information system.

##### 137 4.1.1. Minimum Requirements

138 These are the minimum requirements for the reader(s):

##### 139 ■ Memory

140 Sufficient resident memory to store and to act upon the number of items representing store  
141 inventory items (not sku, actual individual items)

142 **✓ Example:** If using a flat file, the memory required can be calculated as:

143 
$$\text{Memory} = \text{individual items in store} * (96 \text{ bits plus separator})$$

##### 144 ■ Speed

145 The maximum allowable time for the information to go from PoS to PoE is determined by the  
146 minimum time it takes for a customer to reach the PoE after completing the sold transaction.

147 **✓ Note:** The assumption is that a minimum of two seconds is always available and sufficient  
148 though this timing should be confirmed upon installation.

##### 149 ■ Connectivity

150 Equipment that is capable of hosting an application that can communicate between the readers  
151 and is compliant with IEEE and IETF standard networking protocols.

<sup>2</sup> Source: Sanjay Sarma, Checkpoint Systems

152 The IEEE 802 Standard comprises a family of networking standards that cover the physical layer  
153 specifications of technologies from Ethernet to wireless.

154 The mission of the IETF is to produce protocol standards that influence the way people design, use  
155 and manage the Internet in an efficient manner.

## 156 4.2. Reader(s) connected to local area network

157 This implementation is for a store or facility that has an existing local area network and an information  
158 system that can be leveraged.

### 159 4.2.1. Minimum Requirements

160 These are the minimum requirements for the reader(s):

#### 161 ■ **Memory**

162 For PoE reader(s), two options are listed below:

- 163 □ Information sent back to the centrally kept database of SGTINs to confirm sold (pro: more  
164 affordable readers needed)
- 165 □ Information residing on the PoE reader (pro: faster response time). This option of information  
166 residing on readers is suitable, but not necessarily limited to small and medium enterprises.

#### 167 ■ **Speed**

168 The maximum allowable time for the information to go from PoS to PoE is determined by the  
169 minimum time it takes for a customer to reach the PoE after completing the sold transaction.

170  **Note:** The assumption is that a minimum of two seconds is always available and sufficient  
171 though this timing should be confirmed upon installation.

#### 172 ■ **Connectivity**

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174 and is compliant with IEEE and IETF standard networking protocols.

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176 specifications of technologies from Ethernet to wireless.

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178 and manage the Internet in an efficient manner.

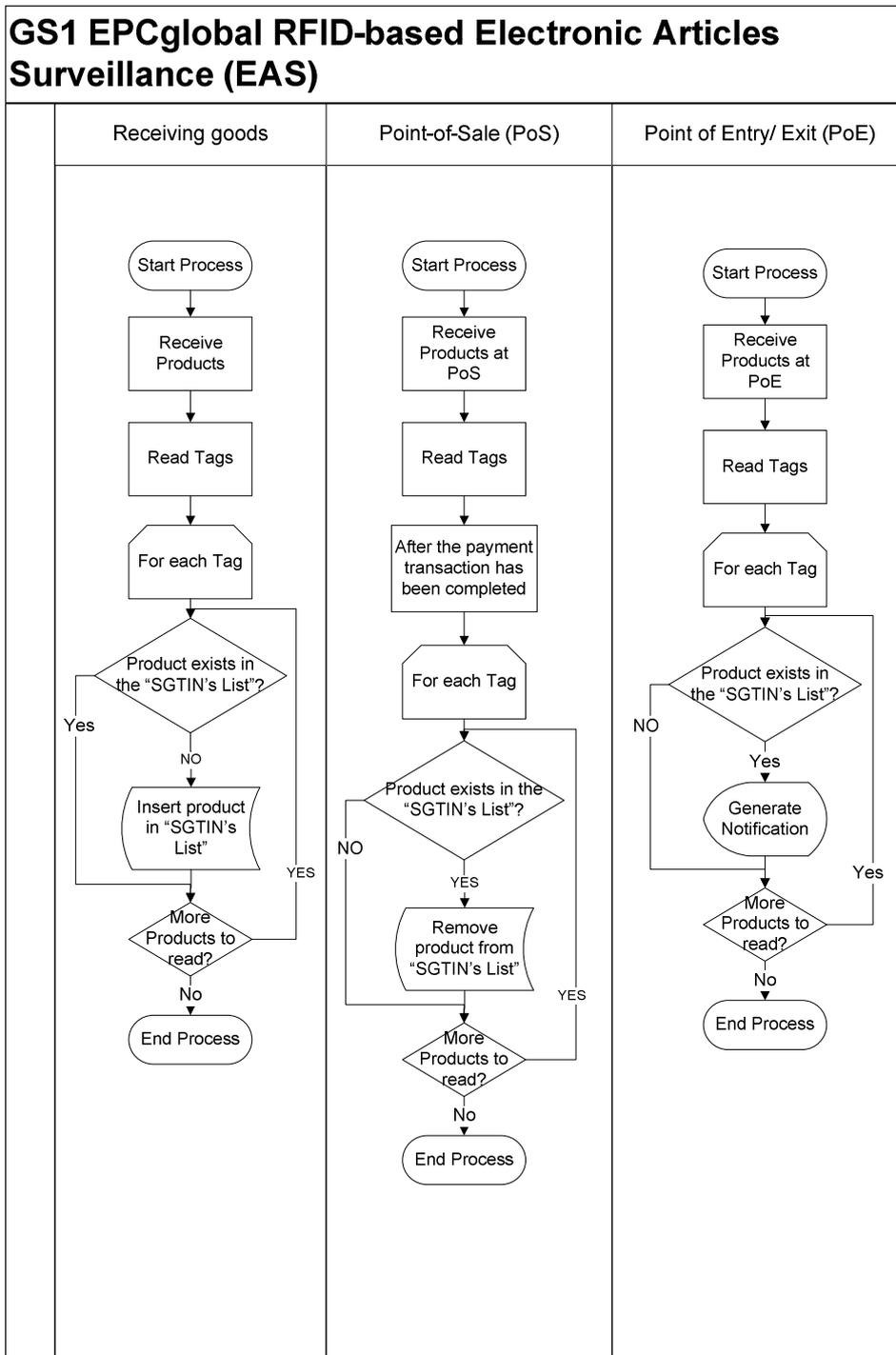
179  **Note:** Realize with the options of a centralized database, if the database goes down, then RFID-  
180 based EAS functionality will be lost although this loss is not obvious to a customer. It is assumed  
181 that the SGTINs sold during the downtime are captured and removed from the database at a later  
182 point.  
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## 5. Flowchart

The following simple flowchart is to be used as an example.



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