



1
2
3
4
5
6
7
8

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

Issue 1.0 Approved, September-2009





10 Document Summary

Document Item	Current Value
Document Title	GS1 EPCglobal RFID-based Electronic Articles Surveillance (EAS) Technical Implementation Guide
Date Last Modified	24- September-2009
Current Document Issue	Issue 1.0 Approved
Status	Final Draft ready for Board Approval
Document Description	Technical Implementation Guide for RFID-based EAS using existing GS1 EPCglobal Standards.

11 Log of Changes in Issue 1.0 Approved

Issue No.	Date of Change	Changed By	Summary of Change
0.1	April 2009	Luis Camargo	Creation of Document
0.2	20 May 2009	Natalie Debouvry	Included line numbers and comments
0.3	1 June 2009	EAS F2F	Updated based on group comments
0.4	2 June 2009	EAS F2F	Updated based on group comments
0.5	19 June 2009	Natalie Debouvry	Updated based on comment matrix resolution
0.6	13 July 2009	Natalie Debouvry	Updated based on comment matrix resolution
0.7	3 August 2009	Luis Camargo	Updated based on comment
0.8	4 September 2009	Natalie Debouvry	Updated based on GS1 AG comments
1.0	24 September 2009	Natalie Debouvry	Approved by Board

12 Disclaimer

13 Whilst every effort has been made to ensure that the guidelines to use the GS1 standards contained in the document
14 are correct, GS1 and any other party involved in the creation of the document HEREBY STATE that the document is
15 provided without warranty, either expressed or implied, of accuracy or fitness for purpose, AND HEREBY DISCLAIM
16 any liability, direct or indirect, for damages or loss relating to the use of the document. The document may be
17 modified, subject to developments in technology, changes to the standards, or new legal requirements. Several
18 products and company names mentioned herein may be trademarks and/or registered trademarks of their respective
19 companies.

20



Table of Contents

21

22 **1. Introduction 4**

23 1.1. Purpose of this Document 4

24 1.2. Who Will Use this Document? 4

25 1.3. Scope 4

26 **2. Conditions for Implementation 4**

27 **3. SGTINs Database..... 5**

28 3.1. How to build the database of SGTINs in a store..... 5

29 3.2. How to maintain the database of SGTINs in a store..... 5

30 **4. Implementation Options..... 6**

31 4.1. Stores with a standalone reader(s) containing a database of SGTINs 7

32 4.1.1. Minimum Requirements 7

33 4.2. Reader(s) connected to local area network..... 8

34 4.2.1. Minimum Requirements 8

35 **5. Flowchart 9**

36

37

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, SGTIN¹
- 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

¹ 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/.

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.
 - 119 **!** **Important:** If a foreign tag enters the store, then an alarm will not be raised as this SGTIN is not
 - 120 part of the SGTIN database.
 - 121 **!** **Important:** If an item enters the store and the SGTIN is not available, then the item needs to be
 - 122 processed. GS1 has created a guideline, Missing Identification Resolution, to assist in this

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.

127

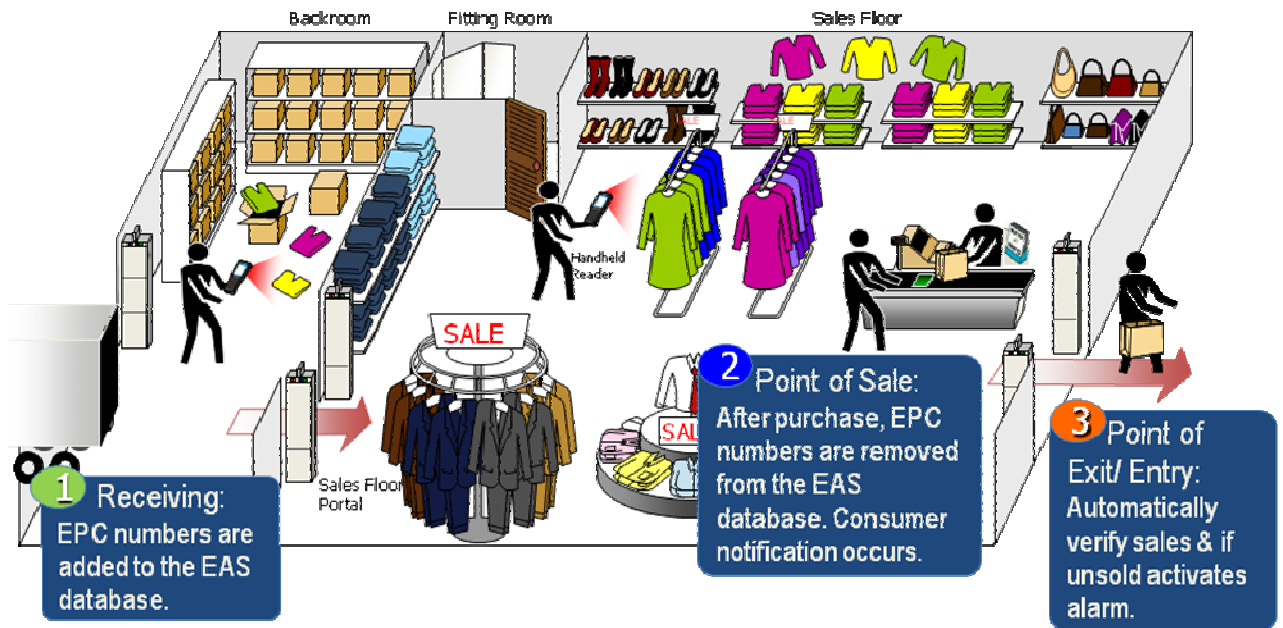
128 This implementation is for a store or facility that needs to implement a solution for local area network and

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 Environment²



132

133 **!** 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:

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

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.

² 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**

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

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

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

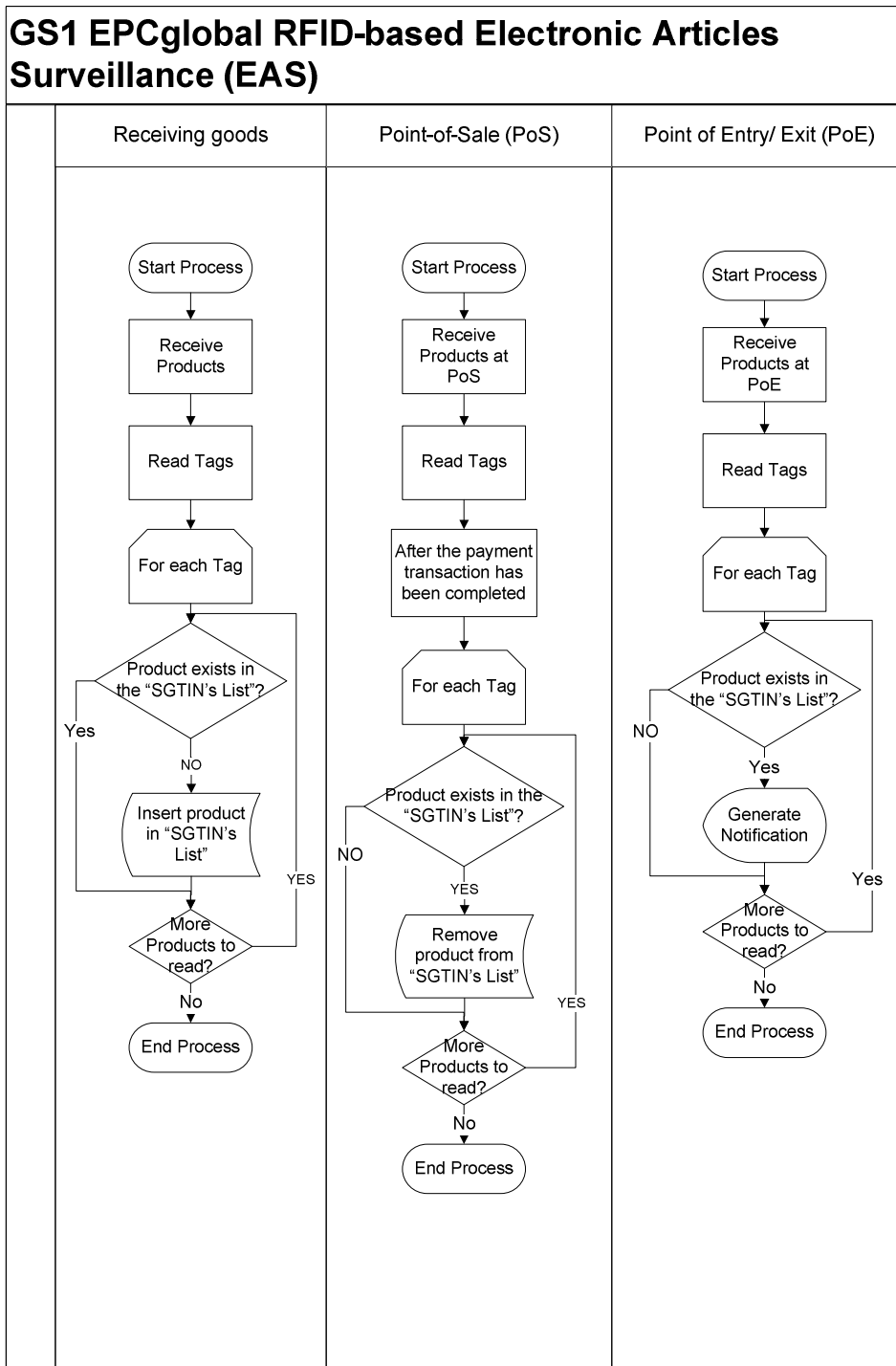
179  **Note:** Realize with the options of a centralized database, if the database goes down, then RFID-
180 based EAS functionality will be lost although this loss is not obvious to a customer. It is assumed
181 that the SGTINs sold during the downtime are captured and removed from the database at a later
182 point.
183

184

185
186
187

5. Flowchart

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



188