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RFID Tag for Asset Tracking Specification (Global Version)

Document Number and Revision:	950-6021-01, Revision 58

Overview

This document contains the information necessary to attach and program Radio Frequency Identification, (RFID) tag to products in order to meet the requirements of the Financial Services Technical Consortium, (FSTC).

Audience

Product Engineers and others who need to communicate with external manufacturers the RFID tag requirements.

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Introduction

The Financial Services Technical Consortium, (FSTC) sets standards for the financial community. Its members which include Bank Of America, Citi-Group, Wells Fargo and JP Morgan Chase are requiring computer vendors to include a RFID tag on the product for the purposes of asset identification. The FSTC have defined an asset identification scheme to be utilized across the financial industry that includes:

- A single, world-wide identification scheme for data warehouses in the financial industry.

- Representable in existing multi-dimensional bar code and passive radio frequency identification (pRFID) systems.

- Expandable for future versions and adaptable to changing requirements.

- Compatible with other globally accepted identification schemes

- Decentralized allocation of identifiers.

This means that initially every system product will need to have a RFID tag mounted on the front of the system.

1 Tagging Requirements

- EPC C1G2 compliant RFID tags must be logically locked and permanently attached to the front face of rack mounted assets.

- Tags will be pre-programmed and pre-labeled by the tag vendor. The tags are applied to the product by the EM or sub-tier supplier.

- The tags will contain a 96 bit EPC number that conforms to the FSTC numbering scheme which consists of five numbers, that when combined, uniquely identify the asset to which they are assigned. These five numbers are referred to as the Header, the Filter, the Partition, the Company Prefix and the Individual Asset Reference. Absolute uniqueness is obtained by combining the Company Prefix and the Individual Asset Reference. Refer to Section 4, Electronic Product Code Numbering Requirements for more information on how the EPC number is formatted.

- The Company Prefix number is assigned by EPCglobal, Oracle's company prefix number is 0x960F7 hex or 0614647 decimal.

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- A minimum 8-digit, (lower 32 bits of the Individual Asset Reference number), and maximum 24-digit hex version of the 96 bit EPC number will be printed in human readable format on the tag surface. It is the responsibility of the tag vendor to print the tag surface, labels are acceptable means of conveying this information.

- A 2-D Data Matrix code that contains the full 96 bit EPC number will also be printed on the tag surface by the tag vendor

- RFID tags are to be applied to any device physically visible from the front side of a data center rack including but not limited to: servers, blade chassis, blade servers, and network switches.

- If the tag is fully integrated within the asset chassis and therefore impossible to print human or machine readable data on the tag, the required data must be printed on a separate label and applied to the front of the device.

Figure 1 – Picture of RFID tag finished label, (263-4252) Scale 4:1

Figure 2 – Drawing of RFID tag finished label, (7345286) Scale 4:1

Figure 3 – RFID tag finished label, (7352477) 9.4 x 24.5 mm

Refer to the appropriate label specification for the print size and placement of the label on the tag

2 Performance Requirements

2.1 Range

Read range is affected by tag orientation and sensitivity as well as reader performance.

- Handheld Reader – 3 feet
- Fixed Reader – 6 feet

2.2 Orientation Sensitivity

Refers to the maximum axial angle of rotation between the tag and handhold reader that the combination must tolerate to achieve the range metric stated above making orientation and range interdependent in the handhold rack inventorying use case.

- Handheld Reader – 90 degrees

2.3 Velocity

The tag must be captured when moving through an RFID portal at this speed.

- Fixed Reader – 1 m/s

3 RFID Physical Tag Specification

The device specifications being used to meet the requirements of the FSTC are shown in the following tables.

Table 1 – RFID Physical Tag Specification

Description	*PN: 542-0254*	*PN: 7309566*	*PN: 7341708*	*PN: 7345283*
Vendor PN:	AST1-042-0001	AST1-087-0001	AST1-117-0001	AST1-123-0001
Vendor Label	263-4252	263-4252	263-4252	7345286
Mounting Surface	Metal	Metal	Plastic	Metal
Frequency Range	860 Mhz to 960 Mhz	865.6 - 867.6 and 902 - 928 Mhz	865.6 - 867.6 and 902 - 928 Mhz	865.6 - 867.6 and 902 - 928 Mhz
Protocol	UHF EPC Class 1 Gen 2	UHF EPC Class 1 Gen 2	UHF EPC Class 1 Gen 2	UHF EPC Class 1 Gen 2
Read range on metal	6ft Stationary, 3 ft Hand held	6ft Stationary, 3 ft Hand held		6ft Stationary, 3 ft Hand held
Read range off metal			6ft Stationary, 3 ft Hand held	

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Attachment	3M 9472LE 5 mil self adhesive or equivalent	3M 9472LE 5 mil self adhesive or equivalent	3M 9472LE 5 mil self adhesive or equivalent	3M 9472LE 5 mil self adhesive or equivalent
Length (maximum)	1.430 ± 0.015 Inch 36.3 ± 0.381 mm	1.430 ± 0.015 Inch 36.3 ± 0.381 mm	1.430 ± 0.015 Inch 36.3 ± 0.381 mm	2.56±0.015 Inch 65±0.381 mm
Width (maximum)	0.430 ± 0.015 Inch 10.9 ± 0.381 mm	0.430 ± 0.015 Inch 10.9 ± 0.381 mm	0.430 ± 0.015 Inch 10.9 ± 0.381 mm	0.226±0.010 Inch 5.75±0.254 mm
Thickness (maximum)	0.224 ± 0.008 Inch 5.69 ± 0.203 mm	0.122 ± 0.008 Inch 3.0 ± 0.203 mm	0.224 ± 0.008 Inch 5.69 ± 0.203 mm	0.160±0.008 Inch 4.1±0.203 mm
Operating Temperature	-58ºF to 185ºF -50C to 85C	-58ºF to 185ºF -50C to 85C	-58ºF to 185ºF -50C to 85C	-58ºF to 185ºF -50C to 85C
Data Retention	50 years	50 years	50 years	50 years
Programming Cycles @ 25C	100000	100000	100000	100000

Table 2 – RFID Physical Tag Specification

Description	*PN: 7352476*	*PN: 7353683*	*PN:*	*PN:*
Vendor PN:	AST1-128-0001	CST1-139-0001		
Vendor Label	7352477	263-4252		
Mounting Surface	Metal	Metal or Plastic		
Frequency Range	860 Mhz to 960 Mhz	860 Mhz to 960 Mhz		
Protocol	UHF EPC Class 1 Gen 2	UHF EPC Class 1 Gen 2		
Read range on metal	5ft Stationary, 3 ft Hand held	6ft Stationary, 3 ft Hand held		
Read range off metal		5ft Stationary, 3 ft Hand held		
Attachment	3M 9472LE 5 mil self adhesive or equivalent	3M 9472LE 5 mil self adhesive or equivalent		
Length (maximum)	1..06 ± 0.007 Inch 26.9 ± 0.178 mm	3.937 inch 100 mm		
Width (maximum)	0.430 ± 0.015 Inch 10.9 ± 0.381 mm	1.850 inch 46.99 mm		
Thickness (maximum)	0.126 ± 0.008 Inch 3.20 ± 0.203 mm	See Figure 6		
Operating Temperature	-58ºF to 185ºF -50C to 85C	-58ºF to 185ºF -50C to 85C		

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Data Retention	50 years	50 years		
Programming Cycles @ 25C	100000	100000		

4 Electronic Product Code Numbering Requirements

The numbering scheme is compatible with the Global Individual Asset Identifier (GIAI) standard managed by EPCglobal of GS1 as documented in the Tag Data Standard Version 1.4 published on 11 June 2008. It consists of five numbers, that when combined in a quintuplet, uniquely identify the asset to which they are assigned based on the Company Prefix and the Individual Asset Reference. These five numbers are referred to as the Header, the Filter, the Partition, the Company Prefix and the Individual Asset Reference. These numbers and their values or range of values are outlined below in Table 3, RFID Numbering Scheme (EPC Global GIAI)

Table 3 – RFID Numbering Scheme (EPC Global GIAI)

Header	*Filter*	*Partition*	*Company Prefix*	*Individual Asset Reference*
8	3	3	20	62
0011 0100	000	110	1001 0110 0000 1111 0111	See section 4.1 Individual Asset Reference

4.1 Individual Asset Reference

The "Individual Asset Reference" always has bit 61 set as 1 and the lower 54 bits contain a number assigned by the tag vendor, who is responsible to ensure the uniqueness of the number.

Table 4 – Individual Asset Reference

Individual Asset Reference Field				
Bit Location	61	60 . 58	57 . 55	54................................0
Field Values	1	<Tag Vendor>	<Tag PN Code>	<Unique ID>
		000 - Omni-ID	000 – Not Used	
		001 - Vizinex	001 – Not Used	
		010 - Oracle	010 -- 542-0254 Metal Mount	
		011 – GAO	011 -- 7309566 Metal Mount	
		100-111 Rsvd	100 -- 7341708 Plastic Mount	
			101 – 7345283 Metal Mount	
			110 – 7352476 Metal Mount	
			111 – 7353683 Flag Tag	

The 542-0254 and later tags contain an antenna tuned for the EU, US and Japan RFID frequency bands.

The vendor code of 010 [60.58] is used for tags that Oracle has programmed.

5 Tag Readers

There two types of tag readers: handheld and stationary. Both types have the capability to write the tags also.

5.1 Handheld RFID Readers

The handheld readers with a linear polarized antenna require the reader to be held in the same plane as the tag as shown in the following figure. The handheld devices that contain a circular polarized antenna do not require that the device be held in the same plane as the tag, however they typically have a shorter read range.

Figure 4 – Handheld Reader Orientations
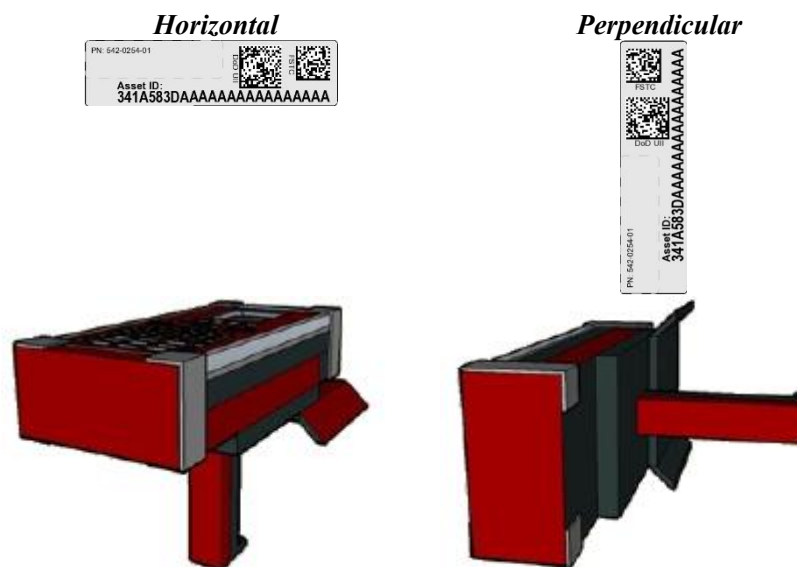
5.2 Stationary RFID Readers

There are many types of stationary RFID readers and they all have relatively the same performance. Stationary readers have a circular polarized antenna which allow the tag to be read regardless of the tag orientation.

6 RFID Tag Placement

From the FSTC specification, "RFID tags are to be applied to any device physically visible from the front side of a data center rack".

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6.1 Tag PN: 7309566 & 7352476 Placement – Metal Mount only

This tag is thinner than the 542-0254 part, the use of which is for products that cannot accommodate a pocket depth of 3.1 mm cut into the front bezel.

6.2 Tag PN: 542-0254 Placement – Metal Mount only

This tag is used on the majority of products that can accommodate a pocket cut into the front bezel to protect the tag from being knocked off or otherwise damaged. The performance of the tag will vary depending on the bezel material and pocket depth.   Pocket depth and width should be based on the appropriate tolerances for the material and process used. The following requirements need to be met in order for the tag to function properly:

1. If the bezel is metal the tag **MUST** be 2.6 ±0.2 mm above the bezel.

2. The tag **MUST** have a minimum 2.5º draft from the bottom of the pocket.

See Figure 5, RFID Pocket Depth Drawing (metal bezel) for an example metal pocket drawing.

6.3 Tag PN: 7341708 Placement – Plastic Mount only

This tag is designed for product that have a plastic bezel it will not respond well when mounted on metal surfaces

6.4 Tag PN 7345283 Placement – Metal Mount only

This long skinny tag is designed for applications with restricted space, the label for this tag is different to accommodate the size, The part number and description is, 7345162-02 LBL, EZ SynSN+MACID, white, 40x5.5mm

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6.5 Tag PN 7353683 "Flag Tag" Placement

The first 1.969 inches of the non-dropped portion of the tag contains an adhesive used to attach to the surface of an asset, it is the dropped portion of the tag that contains the RFID chip and antenna.

Figure 5 – RFID Pocket depth drawing (metal bezel)
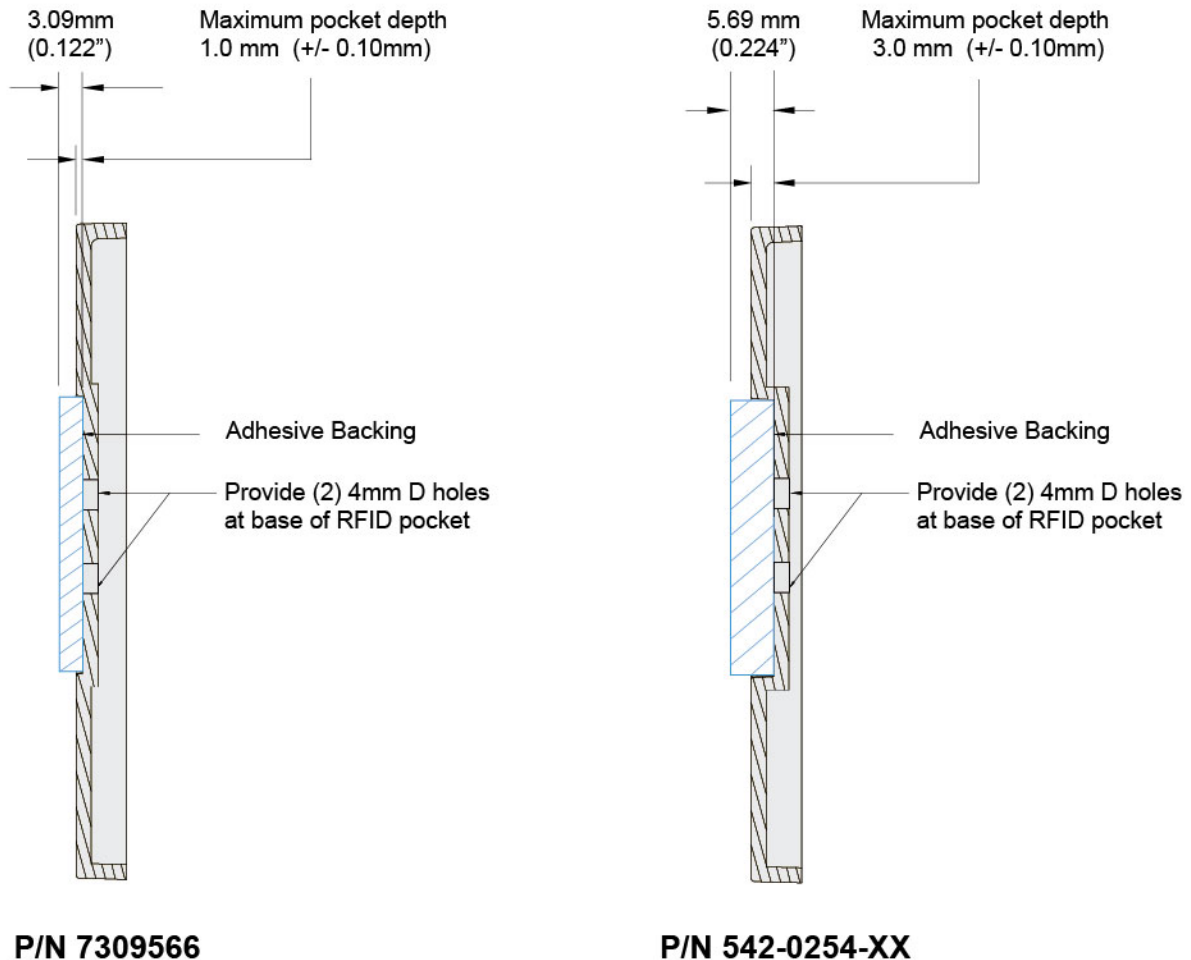
REFER TO MECHANICAL DWG FOR EXACT PLACEMENT OF POCKET

Pocket Height and width should be based on the appropriate tolerances for the material and process used.

- The pocket for P/N 7309566 to be 1.0mm Max (+/- 0.10mm)
- The pocket for P/N 542-0254-XX to be 3.0mm Max (+/- 0.10mm)
- Pocket should have a minimum of 2° draft from the bottom of the pocket.

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Figure 6 – Drawing of the 7353683, "Flag Tag"

Side View

Top View

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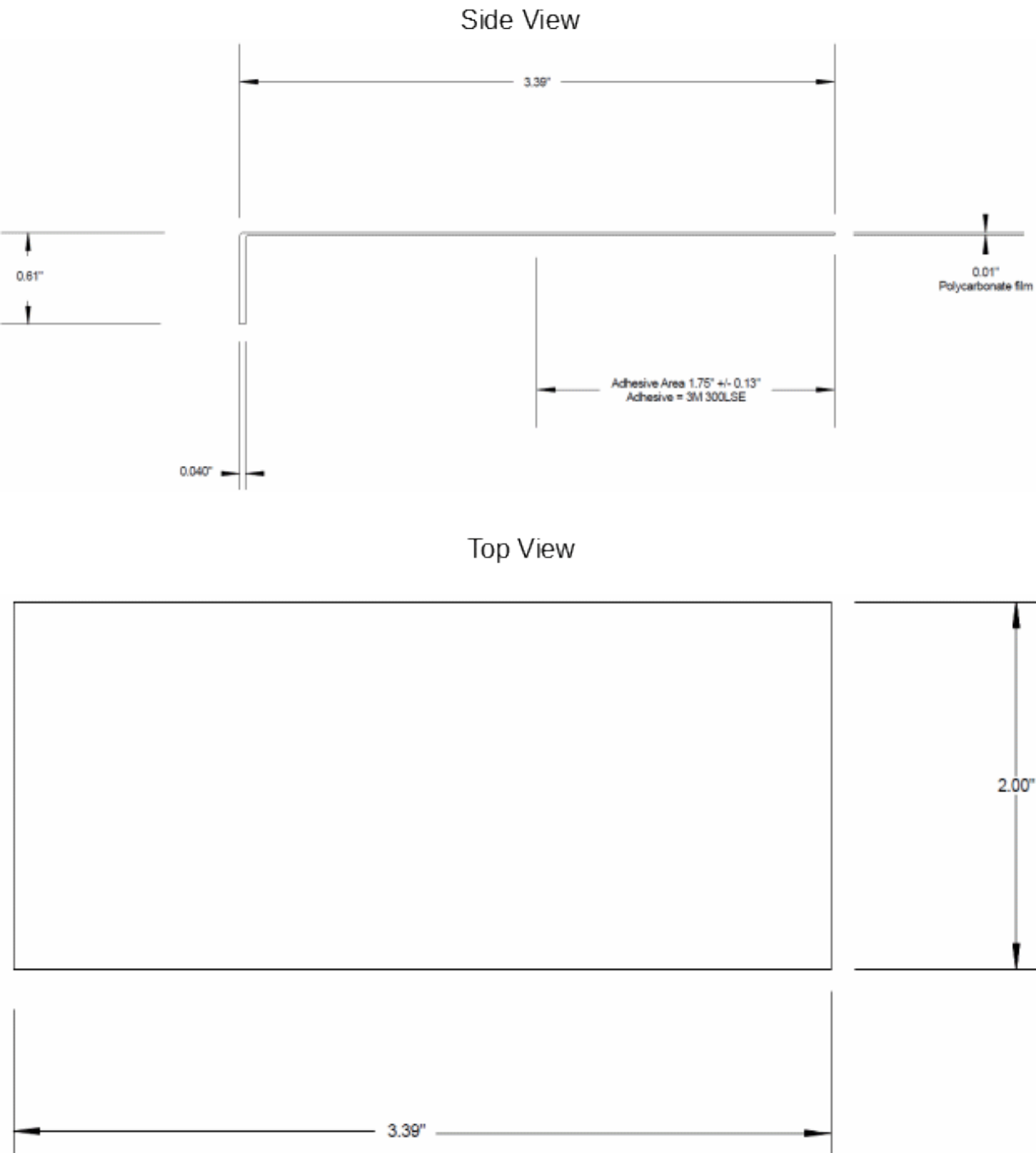
7 DoD UII Data Matrix

The Department of Defense (DoD) Unique Item Identifier (UII) permanently identifies an individual item distinctly from all other individual items that DoD buys and owns. With the UII, the DoD can associate valuable business intelligence with an item throughout its life cycle and accurately capture and maintain data for valuation and tracking of items.

The Individual Asset Reference Field from the EPC code for the RFID tag is used to form part of the DoD UII data matrix.

To generate the DoD UII data matrix:

1. Start with the binary bits [81:0] of the 96 bit EPC, (Reference section 4. Electronic Product Code Numbering Requirements on page 5)

2. Convert bits [61:0] to Hexadecimal

3. Convert bits [81:62] to 7 digit Decimal

Add fixed header and footer value

Table 5 – DoD UII Format

DoD Header				*DoD UII*		*DoD Footer*	
ISO 15434 Message Header	Format Code	Group Separator	GIAI Application Identifier	Company Prefix	Individual Asset Reference	Record Separator	End of Transmission
-----	--	--	----	81.............................78	61.........................0	--	---
[)>^{R}$_S$	05	^{G}$_S$	8004	0614647		^{R}$_S$	^{E}$_{OT}$
				Must be 7 decimal digits	Must be 23 characters or fewer		

Key

^{R}$_S$ = Record Separator = ~d030
^{G}$_S$ = Group Separator = ~d029
^{E}$_{OT}$ = End of Transmission = ~d004

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8 Packaging Notification Label

All products that ship with a RFID tag should also include notification of the tag on the external package of the products, the following label has been designed for this purpose:

Figure 7 – RFID Notification Label, (263-4227-01)

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Related Information

Reference Documents and Records

Document Title	Location
FSTC RFID Basic Functional Requirements – Data Center Assets	http://www.fstc.org
FSTC Data Center – RFID Numbering Requirements	http://www.fstc.org

Document History

Dash	Rev	Date	Description of Change	Originator
01	A	09/03/09	Draft	N/A
01	50	12/22/09	Release, Added section on DoD UII, cleaned up section 6 and figure 5	N/A
01	51	04/10/15	Changed RCD to Vizinex as RCD changed the name Added the thinner tag to be used on systems that cannot accommodate a pocket.	N/A
01	52	07/29/15	Updated the pocket drawing with the one provided by June Lee. Changed to Oracle template	N/A
01	53	03/08/17	Added 7341708 & 7345283, to Table 1 and to section 6. Added row to Table 1 to show vendor part number	N/A
01	54	05/08/17	Added label 7345283, updated product table to reflect correct label. Removed reference to readers as this information is outdated.	N/A
01	55	08/07/17	Added short tag 7352476	N/A
01	56	01/19/18	Added "flag tag" 7353683	N/A
			Fusion History	
01	57	06/09/22	Update table 4: added 011-GAO, 100-111 Rsvd. Modified 57.55 column to show 001 not used. In section 4.1, removed "542-0147 is obsolete and no longer in use" statement and changed the vendor code statement to "The vendor code of 010 [60.58] is used for tags that Oracle has programmed." Updated document to Redwood format. Removed reference to" Higgs-3 ASIC from Alien Technology, http://www.alientechnology.com"	N/A
01	58	10/14/22	Corrected record separator in table 5 from g/s to r/s.	N/A

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