United States Department of Defense
Suppliers' Passive RFID Information Guide

Version 9.0

Table of Contents

List of Figures

What's New in this Version

Date of Change	Version	Reason for Change	Summary of Change
3/05	7.0	Policy Update	Updated policy information to detail our phased implementation approach.
3/05	7.0	Completed Milestones	Removed items in the "Upcoming Milestones" section that have already passed.
3/05	7.0	EPC update	Updated the definition of EPC Technology to reflect the approval of Gen 2 and note that this type of technology still needs to become readily available.
3/05	7.0	Additional Information	Added the section entitled "Number Formats and Representations."
3/05	7.0	Data Construct Update	Changed the binary header that specifies that the tag is encoded as a DoD-96 Identity Type.
3/05	7.0	Additional Information	Updated terminology in the graphic for the example encoding of a 96-bit tag to focus more on binary elements.
10/05	8.0	EPCglobal Update	Changed "Tag Data Construct" to "Identity Type" to be consistent with EPCglobal terminology.
10/05	8.0	EPCglobal Update	Revised Section 3.7 — Identity Types to reference the EPC™ Tag Data Standards document for instructions on use of EPCglobal Identity Types, including General Identifier (GID-96).
10/05	8.0	Data Construct Update	Updated Figure 2 — Example encoding of a 64-bit tag. The incorrect CAGE code was used in Step 5 in the example, resulting in the encoding CE71 133ECEFC1C35, which should actually be CE71133E 31FC1C35.
10/05	8.0	Implementation Approach Update	Updated implementation timeline (Section 2.2).
10/05	8.0	Credit Card Requirement Update	Updated Guidelines and Requirements (Section 3.0) to include information concerning exemption of credit purchases from the RFID requirement.
10/05	8.0	Tag Placement Picture Update	Updated Figure 6 in Section 3.8 (Tag Placement) to include a 2-cm border.
10/05	8.0	ASN Information	Updated Section 3.4 with new ASN information.

2/07	9.0	Policy Update, EPC Update, Additional Information	Updated the Introduction Section (Background, Potential Benefits, Implementation, Definitions, Implementation Approach.
2/07	9.0	Policy Update, EPC Update, Additional Information	Updated the Guidelines and Requirements Section (Contract/Solicitation Requirements, Case and Pallet Tagging, Advance Shipment Transactions, Tag Classes and Sizes, Number Formats and Representations, DoD 64 Identity Type, Encoding a 64 Bit Tag Figures, DoD 96 Identity Type, Encoding a 96 Bit Tag Figures, Tag Placement, Contacts, Acronyms.

DoD Suppliers' Passive RFID Information Guide

1. Introduction

1.1 Background

The United States Department of Defense (DoD) is dedicated to adopting passive Radio Frequency Identification (RFID) technology. RFID is a truly transformational technology that will play a vital role in achieving the DoD vision for implementing knowledge-enabled logistic support to the warfighter through fully automated visibility and asset management. Our goal is to employ mature and emerging supply chain technologies to optimize the supply chain. RFID is an integral part of a comprehensive Automatic Identification Technology (AIT) technology suite facilitating accurate, hands-free data capture. RFID, as a part of the AIT technology suite, supports DoD business processes in an integrated end-to-end supply chain enterprise.

In order to achieve this goal, the Department requires cooperation and concerted efforts from many entities, primarily our suppliers and the diverse U.S. military community. The final RFID policy, released in July 2004, requires passive RFID tagging at the case (shipping and exterior container), pallet (palletized unit load) and the item packaging (unit pack) level, when the appropriate contract clause is included, in accordance with the implementation plan, downloadable from http://www.dodrfid.org/supplierimplementationplan.htm. The DoD amended the Defense Federal Acquisition Regulations Supplement (DFARS) via an interim rule published on 19 May 2006 requiring suppliers to affix passive RFID tags at the case (shipping and exterior containers) and pallet (palletized unit load) level for shipments of classes/commodities to 18 DLA depots and 3 Air Mobility Command Terminals (detailed later in this guide). The DoD has many contracts with its suppliers that are renewed and recompeted regularly. As these new contracts become effective, the requirement for RFID will be included, according to the supplier implementation plan (www.dodrfid.org).

DoD has been actively delivering RFID related information and requirements to its supplier community. Throughout this effort, DoD amended the DFARS clause to include RFID relevant information, held three supplier summits to discuss RFID concepts and concerns, and established open channels of communication with our supplier community.

This document serves as a summary of the Department of Defense's requirements and guidelines related to passive RFID implementation for our supplier community. This guide will be updated as necessary as the technology and supporting business processes evolve.

1.2 Potential Benefits of RFID Technology

The benefits associated with RFID technology are numerous for both the Department and our suppliers. The incorporation of passive RFID technology into certain business processes enables

non-line of sight data capture resulting in efficient recording of materiel transactions as well as increased efficiencies within our supply chain. Specific benefits are realized in the areas of inventory management and visibility, operational improvements, shrinkage and asset tracking. By streamlining our supply chain and improving business functions, our global warfighting requirements will be better served.

Within each area, there are substantial benefits for the DoD as well as our suppliers, including collaborative benefits. Highlighted benefits include:

Supplier Benefits:

- Improved planning
- Faster demand responses
- Reduced Bull Whip Effect
- Streamlined business processes
- Improved efficiency in the recall of defective items
- Increased ability to ensure that product(s) remain stocked on DoD's shelves
- Faster receipt of payments for supplied goods

DoD Benefits:

- Improved inventory management
- Improved labor productivity
- Elimination of duplicate orders
- Replacement of manual procedures
- Automated receipt and acceptance
- Improved inventory and shipment visibility and management
- Reduced shrinkage
- Enhanced business processes within the DoD
- Improved asset tracking

We expect that each supplier organization will explore its own unique benefits, and determine the most cost-effective way to incorporate RFID technology into its organization.

2. Implementation

The DoD views RFID as a means to facilitate accurate, non-line of sight data capture in support of business processes in an integrated DoD supply chain enterprise that, in turn, serves as an integral part of a comprehensive suite of Automatic Identification Technology (AIT). The key to future functionality of the unique item data in the DoD Supply Chain will be the ability to temporarily associate "conditional state" information about the item — whether for transportation, supply management, maintenance, distribution or disposal. In order to accomplish this goal as the available technology matures, the Department expects to fully embrace the use of EPC technology as well as approved EPC identity types (previously known as tag data constructs) in a supporting DoD data environment. The efficiencies created by the use of RFID are quickly being realized as a valuable component of the suite of AIT. Active RFID has already improved the ability to track and trace materiel through the supply chain. Combining passive and active RFID technologies will create greater efficiencies and data accuracy. Leveraging RFID to the

fullest extent possible will improve the ability to get the warfighter the right materiel, at the right place, at the right time, and in the right condition.

Our combined efforts are laying the foundation for improving supply chain efficiencies. The Department is working with various industry associations to ensure that its suppliers' implementation approaches align with the requirements of the DoD RFID policy.

2.1 Definitions

For clarification, the following definitions apply to passive RFID technology and tags in support of the DoD requirement to mark/tag material shipments to DoD activities in accordance with the DoD RFID policy:

EPC Technology: Passive RFID technology (readers, tags, etc.) that is built to the most current published EPCglobal Class 1 Generation 2 UHF Standard and Class 0 and Class 1 specifications that meet interoperability test requirements as prescribed by EPCglobal™.

Unit Pack for Items: A MIL-STD-129 defined unit pack, specifically, the first tie, wrap, or container applied to a single item, or to a group of items, of a single stock number, preserved or unpreserved, which constitutes a complete or identifiable package.

Bulk Commodities: These items are not be tagged in accordance with passive RFID tagging requirements. Bulk commodities are products carried or shipped in rail tank cars; tanker trucks; other bulk, wheeled conveyances; or pipelines.

Examples of bulk commodities are:

- Sand
- Gravel
- Bulk liquids (water, chemicals, or petroleum products)
- Ready-mix concrete or similar construction materials
- Coal or combustibles such as firewood
- Agricultural products, such as seeds, grains, and animal feeds

In addition, munitions and explosives are not to be tagged until the following certification requirements are met for the passive RFID tag: electromagnetic effects on the environment (E3) and Hazards of Electromagnetic Radiation to Ordnance (HERO).

Case: Either an exterior container within a palletized unit load or an individual shipping container.

> *Exterior Container:* A MIL-STD-129 defined container, bundle, or assembly that is sufficient by reason of material, design, and construction to protect unit packs and intermediate containers and their contents during shipment and storage. It can be a unit pack or a container with a combination of unit packs or intermediate

containers. An exterior container may or may not be used as a shipping container.

Shipping Container: A MIL-STD-129 defined exterior container that meets carrier regulations and is of sufficient strength, by reason of material, design, and construction, to be shipped safely without further packing (e.g., wooden boxes or crates, fiber and metal drums, and corrugated and solid fiberboard boxes).

Palletized Unit Load: A MIL-STD-129 defined quantity of items, packed or unpacked, arranged on a pallet in a specified manner and secured, strapped, or fastened on the pallet so that the whole palletized load is handled as a single unit. A palletized or skidded load is not considered to be a shipping container.

2.2 Implementation Approach

Considering the volume of contracts and the variety of commodities managed, the Department has developed a plan for passive RFID tagging that delivers best value to the warfighting customer. This implementation plan provides a roadmap that targets critical distribution functions within the defense distribution depots, depot maintenance operations and strategic aerial ports.

RFID technology is being implemented through a phased approach, applied both to supplier requirements and to DoD sites. Shipments of goods and materials are being phased in by procurement methods, classes/commodities, locations and layers of packaging for passive RFID.

For DoD suppliers, the following implementation approach applies:

2005 Commencement

RFID tagging is required for all DoD manufacturers and suppliers who have contracts, issued with the appropriate RFID contract clause, according to the following implementation guidelines.

For Class I, Class II, Class VI, and Class IX commodities being shipped to the Defense Distribution Depot, Susquehanna, PA (DDSP) (DoDAACs: W25G1U and SW3124) and to Defense Distribution Depot, San Joaquin, CA (DDJC) ([DoDAACs: W62G2T and W3224), RFID tags are required on all individual cases (shipping containers), all cases (exterior containers) packaged within palletized unit loads, and all palletized unit loads. Specific commodities included in the four Classes of Supply are the following:

- Class I —Subclass — Packaged Operational Rations
- Class II — Clothing, Individual Equipment, and Tools
- Class VI — Personal Demand Items
- Class IX — Weapon Systems Repair Parts & Components

2006 Commencement

RFID tagging is required for all DoD manufacturers and suppliers who have new contracts, issued with the appropriate RFID contract clause, according to the following implementation guidelines.

In addition to the four Classes of Supply listed above (Class I — Subclass, Class II, Class VI, and Class IX), the 2006 commencement adds the following Classes of Supply:

- Class III(P) — Packaged Petroleum, Lubricants, Oils, Preservatives, Chemicals & Additives
- Class IV — Construction & Barrier Equipment
- Class VIII — Medical Materials (except Pharmaceuticals, Biologicals, & Reagents)

All seven Classes of Supply require RFID tags to be placed on all individual cases (shipping containers), all cases (exterior containers) packaged within palletized unit loads, and all palletized unit loads (pending appropriate safety certification) when these commodities are shipped to DDSP, DDJC, and the following Distribution Depots and Aerial Ports:

DEFENSE LOGISTICS AGENCY (DLA)
Defense Distribution Depot, Albany, GA
Defense Distribution Depot, Anniston, AL
Defense Distribution Depot, Barstow, CA
Defense Distribution Depot, Cherry Point, NC
Defense Distribution Depot, Columbus, OH
Defense Distribution Depot, Corpus Christi, TX
Defense Distribution Depot, Hill Air Force Base, Ogden, UT
Defense Distribution Depot, Jacksonville, FL
Defense Distribution Depot, Tinker Air Force Base, Oklahoma City, OK
Defense Distribution Depot, Norfolk, VA
Defense Distribution Depot, Puget Sound, WA
Defense Distribution Depot, Red River, TX
Defense Distribution Depot, Richmond, VA
Defense Distribution Depot North Island, San Diego, CA
Defense Distribution Depot, Tobyhanna, PA
Defense Distribution Depot, Warner Robins, GA

USTRANSCOM
Air Mobility Command Terminal, Charleston Air Force Base, Charleston, SC
Air Mobility Command Terminal, Naval Air Station, Norfolk, VA
Air Mobility Command Terminal, Travis Air Force Base, Fairfield, CA

2007 Commencement

The DoD will not require suppliers to apply passive RFID tags to the unit pack during the 2007 calendar year. The Department will continue to evaluate the appropriate time frame to begin tagging at the unit pack level and will promulgate this requirement in advance of future issuances.

RFID tagging will continue to be required for all DoD manufacturers and suppliers who have contracts issued with the appropriate RFID contract clause. This clause requires DoD manufacturers/suppliers to apply RFID tags on the case (shipping and exterior container) and pallet (palletized unit load) level for the classes of supply and ship to locations identified in the previous section entitled "2006 Commencement."

3. Guidelines and Requirements

The cost of implementing and operating RFID technology is considered a normal cost of conducting business. DoD contractors should work directly with their contracting officers concerning any questions regarding this requirement.

Per current DoD regulations, DoD Purchase Cards may be used to acquire items on existing government contracts and also to acquire items directly from suppliers that are not on a specific government contract. At the current time, Wide Area Workflow (WAWF) is not capable of handling Advance Shipment Notices (ASNs) for items purchased with the use of a DoD Purchase Card. As such, at this time, items purchased with a DoD Purchathe Department has the capability to accept ASNs for those items procured with the DoD Purchase Card.

3.1 Contract/Solicitation Requirements

All solicitations awarded with the appropriate contract clause require that passive RFID tags be affixed at the case (shipping and exterior container) and pallet (palletized unit load) level for materiel delivered to the Department, in accordance with the phased implementation plan, which is located above in the section entitled: "*Implementation Approach."* The plan is also available at: http://www.dodrfid.org/supplierimplementationplan.htm. Suppliers are to ensure that: 1) the data encoded on each passive RFID tag are unique (i.e., the binary number is never repeated on any and all contracts); 2) each passive tag is readable at the time of shipment; and 3) the passive tag is affixed at the appropriate location on the specific level of package.

3.2 Case and Pallet Tagging

Cases (shipping and exterior containers) and pallets (palletized unit loads) of materiel (except bulk commodities as defined in the Definitions section of this document) will be tagged at the point of origin (manufacturer/vendor) with passive RFID tags for those contracts that contain the appropriate DFARS clause. The RFID tag and data written to the tag must meet the published DoD standards as outlined in the following sections.

3.3 Advance Shipment Notice (ASN) Transactions

The current acceptable method for ASN submission is through WAWF. The RFID DFARS clause requires that all vendors who are contractually obligated to affix passive RFID tags to materiel must also send an ASN via WAWF. The ASN is not a new process/transaction, rather it is the same existing Material Inspection Receiving Report (MIRR) transaction being sent to WAWF with additional data (RFID data elements) added to the transaction. In April 2005, WAWF added the RFID tag ID as an additional data element in the MIRR.
If you have questions about WAWF, please visit https://wawf.eb.mil or contact the DISA Customer Service Center (WAWF Help Desk) at 1-866-618-5988 or 801-605-7095.

WAWF Guides

The WAWF guides can be found at the WAWF Training website at: https://wawftraining.eb.mil

- Go to https://wawftraining.eb.mil
- Click on Logon to WAWF (Registered user only) ***Note: Click this hyperlink even if you are not a registered user.*
- At the WAWF Logon page, enter the following account information: Either User ID = Vendor11 and the Password = Vendor1$ (Case sensitive) or User ID = Vendor22 and the Password = Vendor2$ (Case Sensitive).
- Click the 'Submit' button.
- Once logged in, users should click on the link entitled: "FTP/EDI Guides & Other Supporting Documents" located in the menu bar on the left side of the Web page.

The five files pertinent to the RFID initiative are:

1. Receiving Report User Defined Format (UDF) Vendor FTP
2. Receiving Report for Pack Update UDF Vendor FTP
3. Combo Invoice & RR UDF Vendor FTP
4. 856 WAWF 4010 EDI Detail Receiving Report
5. 856 Pack Update WAWF 4010 EDI Detail Receiving Report for Pack Update

Electronic Data Interchange (EDI) and File Transfer Protocol (FTP) Testing Assistance

To obtain assistance in EDI or FTP testing, vendors must initiate a trouble ticket with the DISA Customer Service Center (WAWF Help Desk) at 1-866-618-5988 or 801-605-7095. The Customer Service Center will put the vendor in contact with the Joint Interoperability Test Command (JITC), which provides EDI and FTP testing assistance.

Additional Information

The Advance Shipment Notice (ASN) transaction enables the sender to relate the passive RFID tag ID at various levels of detail to the contents and configuration of a shipment. The tag ID is written to the tag in binary format. However, within the ASN, you must provide the ID of every RFID tag in a shipment and must represent this passive tag ID in a hexadecimal format. Typically, the hexadecimal format is the format used by passive RFID software in printers and readers, thus the binary to hexadecimal translation process should be done automatically by the software.

3.4 Tag Classes and Sizes

DoD has established an expiration date ("sunset date") of 28 February 2007 for EPC Gen 1 Class 0 and Class 1 Specification tags and will accept UHF Gen 2 EPC Standard tags only thereafter. This corresponds to DoD's goal of migrating to the use of an open standard UHF Gen 2 EPC tag that supports DoD end-to-end supply chain integration.

3.5 Number Formats and Representations

The following sections of this document discuss the specific details of generating the unique number or ID that must be programmed in each RFID tag, either by a manufacturer in the case of Class 0 read-only tags, or by anyone possessing the appropriate equipment in the case of Class 1 read-write tags. In this guide, numbers may be represented in binary, decimal or hexadecimal format as indicated in the surrounding text. It should be noted that the RFID tag stores its ID in electronic memory which stores data in binary format. Generating the ID being programmed to the tag involves the setting of specific bit patterns in specific positions of the tag memory. Thus, the contents of the RFID tag are often represented in binary format. However, once determined by the encoding process, this ID can be represented in any base (e.g., 1110 (binary) = 14 (decimal) = E (hexadecimal)).

After the contents of the tag have been determined by the encoding process, suppliers may either order a tag pre-programmed with this ID or program the tag themselves. If ordering a pre-programmed tag, you will provide this ID to the tag supplier in the format specified by the supplier. If programming the tag yourself, the specific software that is used to write the ID to the tag will determine the required number format, often hexadecimal. If you are uncertain of the required number representation required by your software, contact the software provider for details.

Regardless of how the supplier procures the RFID tag, when it is applied to goods being shipped to the DoD, the supplier must transmit an ASN indicating the relationship of this ID to a specific shipment as previously discussed. Within this ASN, a supplier must provide the ID of every RFID tag in a shipment and this ID must be represented in hexadecimal format.

The supplier has three options for entering data into the WAWF website. The supplier can manually enter the RFID tag ID into the data, use an 856 EDI document, or use a User Defined File (UDF) to transfer into WAWF. The latter two methods facilitate a more automated data capture and ASN creation process.

3.6 Identity Types

Suppliers to DoD must encode an approved RFID tag using the instructions provided in the EPC™ Tag Data Standards document. Suppliers that are EPCglobal subscribers and possess a unique EPC™ company prefix may use any of the identity types and encoding instructions described in the EPC™ Tag Data Standards document to encode tags. Please consult the EPC™ Tag Data Standards document at: http://www.epcglobalinc.org/standards for details.

Suppliers who choose to employ the DoD Identity Type will use their previously assigned Commercial and Government Entity (CAGE) code and encode the tags per the rules that follow. Regardless of the selected encoding scheme, suppliers are responsible for ensuring that each tag contains a unique identifier.

3.6.1 DoD Identity Type Option

This option should be selected by any DoD supplier who is:

- Not a member of EPCglobal and does not intend to join
- Has already been assigned a CAGE code

Similar to the unique company prefix assigned to EPCglobal members/subscribers, the CAGE code is a unique identifier assigned and managed by the DoD. It is a sequence of five alphanumeric characters used to uniquely identify the supplier among all other suppliers. It is used to ensure that the RFID tag from a given supplier cannot contain the same identifier as those from another supplier. The supplier's CAGE code is required for encoding of all RFID tag classes and sizes

3.6.2 DoD-64 Identity Type

This identity type should be used to encode 64-bit Class 0 and Class 1 tags for shipping goods to DoD. The 64-bit tag is divided into a number of fields as indicated in Figure 1**.**

Header	Filter	Government Managed Identifier	Serial Number
8 bits	2 bits	30 bits	24 bits

Figure 1. DoD-64 Identity Type Encoding

Fields:

Header — specifies that the tag data are encoded as a DoD 64-bit tag construct, use binary number 1100 1110.

Filter — identifies a pallet (palletized unit load), case (shipping and exterior container), or unit pack associated with tag, represented in binary number format using the following values:

- 00 = pallet (palletized unit load)
- 01 = case (shipping and exterior container)
- 10 = unit pack
- 11 = reserved for future use

Government Managed Identifier — This field will be encoded with the respective supplier's CAGE code. This code identifies the supplier and ensures uniqueness of serial numbers across all suppliers, and is represented in truncated ASCII format. In order to properly fit the CAGE code within the allocated 30-bit Government Managed Identifier field of the DoD-64 Identity Type, the CAGE code must be compressed. This is done by using a simple algorithm involving the truncation of the two most significant bits of the standard 8-bit ASCII representation of the CAGE code characters. Once truncated, the remaining 6 bits still uniquely identify the original ASCII characters and can be properly decoded after the encoding scheme. Figure 2 details the mapping scheme for this compression.

Serial Number — uniquely identifies up to 224 = 16,777,216 tagged items, represented in binary number format. After the serial number is converted into binary format, it must be left-padded with zeros to 24 bits total. It is the responsibility of the supplier to ensure that this is a unique number across all shipments to the DoD. The "serial number" required in the RFID tag ID data construct does not refer to the serial number of the product being shipped. The "serial number" in the RFID tag ID is merely a unique number assigned by the supplier to represent a specific RFID tag. This "serial number" combined with the supplier's Government Managed Identifier, or CAGE code, together with the header and filter values comprise the RFID tag ID.

CAGE Code Character	Truncated Binary Value
A	00 0001
B	00 0010
C	00 0011
D	00 0100
E	00 0101
F	00 0110
G	00 0111
H	00 1000
I	Invalid CAGE Character
J	00 1010
K	00 1011
L	00 1100
M	00 1101
N	00 1110
O	Invalid CAGE Character
P	01 0000
Q	01 0001
R	01 0010
S	01 0011
T	01 0100
U	01 0101
V	01 0110
W	01 0111
X	01 1000

Y	01 1001
Z	01 1010
0	11 0000
1	11 0001
2	11 0010
3	11 0011
4	11 0100
5	11 0101
6	11 0110
7	11 0111
8	11 1000
9	11 1001
SPACE	10 0000

Figure 2. Truncated ASCII Character to CAGE Code Character Mappings

In order to clarify the steps required to encode a tag using the DoD-64 identity type, an example follows. See Figure 11 for hexadecimal conversion assistance.

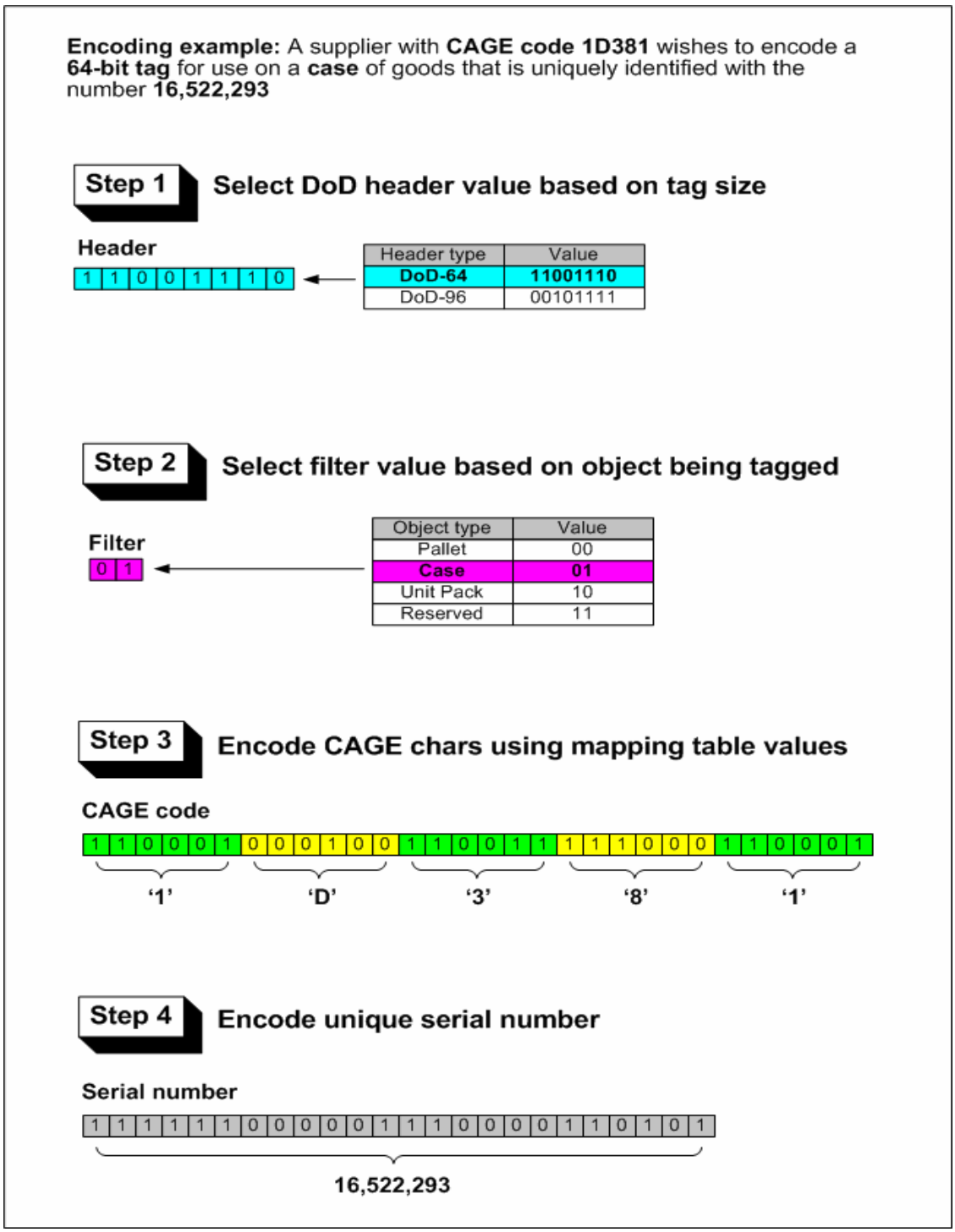

Figure 3. Example Encoding of a 64-bit Tag (Steps 1–4)

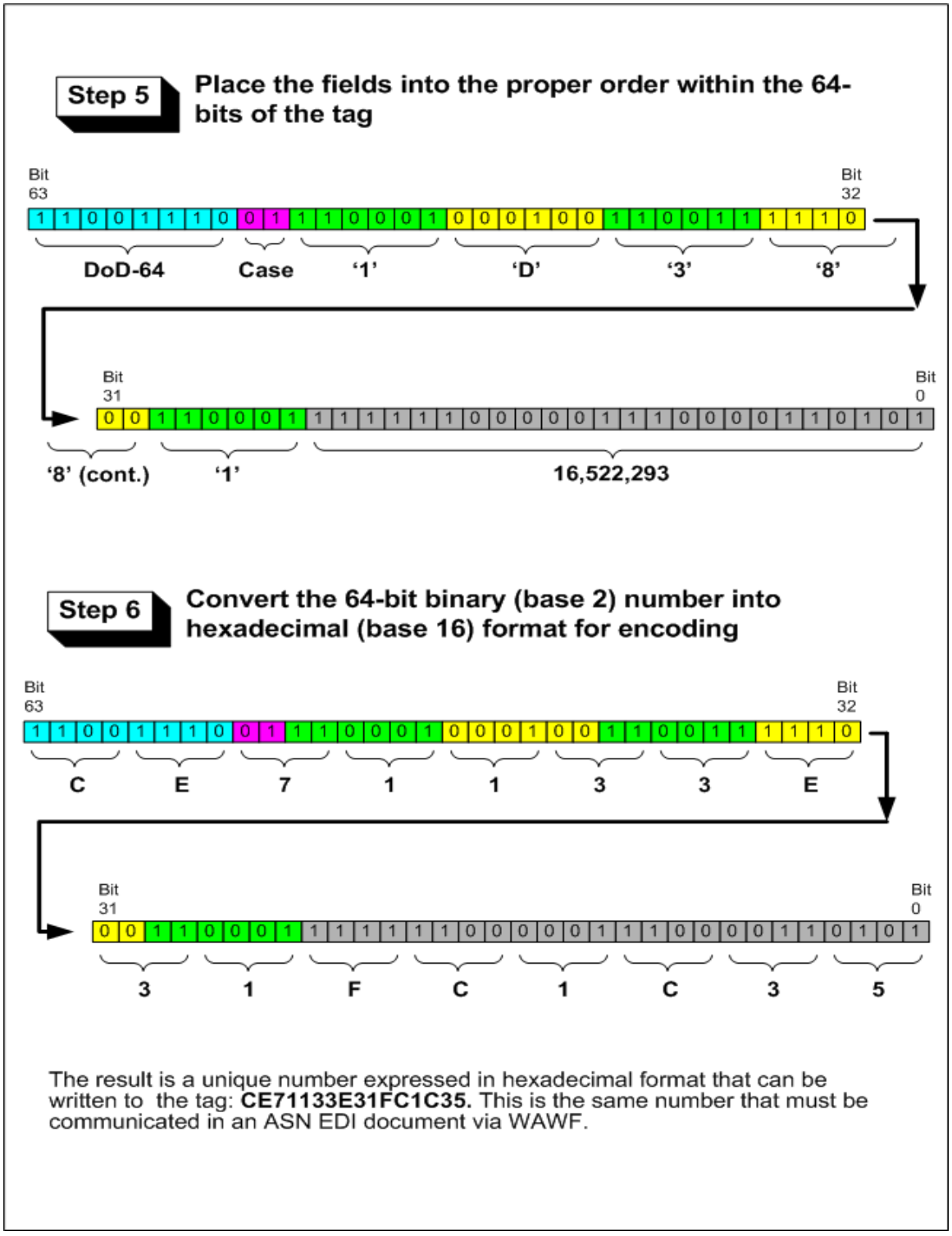

Figure 4. Example Encoding of a 64-bit Tag (Steps 5–6)

3.6.3 DoD-96 Identity Type

This identity type should be used to encode 96-bit Class 0 and Class 1 tags for shipping goods to the DoD. The 96-bit tag is divided into a number of fields as indicated in Figure 5. The details of what information to encode into these fields are explained below. After all the field values have been determined, the entire contents of the tag can be viewed as a single unique number used to identify a shipment to the DoD.

Header	Filter	Government Managed Identifier	Serial Number
8 bits	4 bits	48 bits	36 bits

Figure 5. DoD-96 Identity Type Format

Fields:

Header — specifies that the tag data are encoded as a DoD 96-bit tag construct. Use binary number 0010 1111.

Filter — identifies a pallet (palletized unit load), case (shipping and exterior container), or unit pack associated with tag, represented in binary number format using the following values:

- 0000 = pallet (palletized unit load)
- 0001 = case (shipping and exterior container)
- 0010 = unit pack
- all other combinations = reserved for future use

Government Managed Identifier — This field will be encoded with the respective supplier's CAGE code. This code identifies the supplier and ensures uniqueness of serial number across all suppliers, and is represented in standard 8-bit ASCII format. For the DoD-96 identity type, an ASCII space character must be pre-pended to the CAGE code to make the code a total of 6 ASCII characters. Figure 6 can be used to determine the correct binary value of any valid CAGE code character.

Serial Number — Uniquely identifies up to 2^{36} = 68,719,476,736 tagged items, represented in binary number format. After the serial number is converted into binary format, it must be left-padded with zeros to 36 bits total. The "serial number" required in the RFID tag ID data construct does not refer to the serial number of the product being shipped. The "serial number" in the RFID tag ID is merely a unique number assigned by the supplier to represent a specific RFID tag. This "serial number" combined with the supplier's Government Managed Identifier, or CAGE code, together with the header and filter values comprise the RFID tag ID.

CAGE Code Character	Binary Value
A	0100 0001
B	0100 0010
C	0100 0011
D	0100 0100
E	0100 0101
F	0100 0110
G	0100 0111
H	0100 1000
I	Invalid CAGE Character
J	0100 1010
K	0100 1011
L	0100 1100
M	0100 1101
N	0100 1110
O	Invalid CAGE Character
P	0101 0000
Q	0101 0001
R	0101 0010
S	0101 0011
T	0101 0100
U	0101 0101
V	0101 0110
W	0101 0111
X	0101 1000
Y	0101 1001
Z	0101 1010
0	0011 0000
1	0011 0001
2	0011 0010
3	0011 0011
4	0011 0100
5	0011 0101
6	0011 0110
7	0011 0111
8	0011 1000
9	0011 1001
SPACE	0010 0000

Figure 6. ASCII Character to CAGE Code Character Mappings

The following figures outline the steps of encoding a 96-bit tag using the DoD-96 identity type. Refer to Figure 11 for hexadecimal conversion assistance.

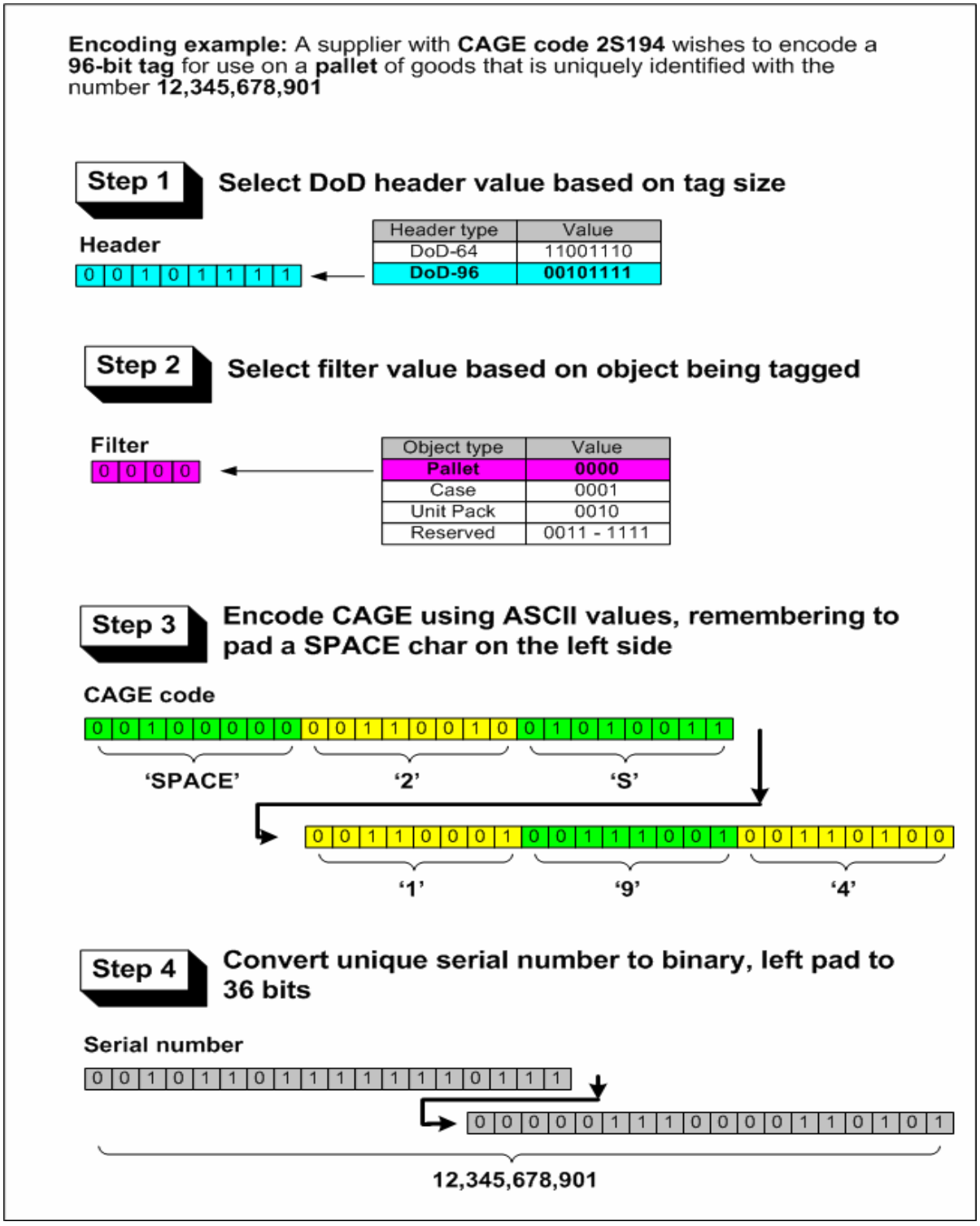

Figure 7. Example Encoding of a 96-bit Tag (Steps 1–4)

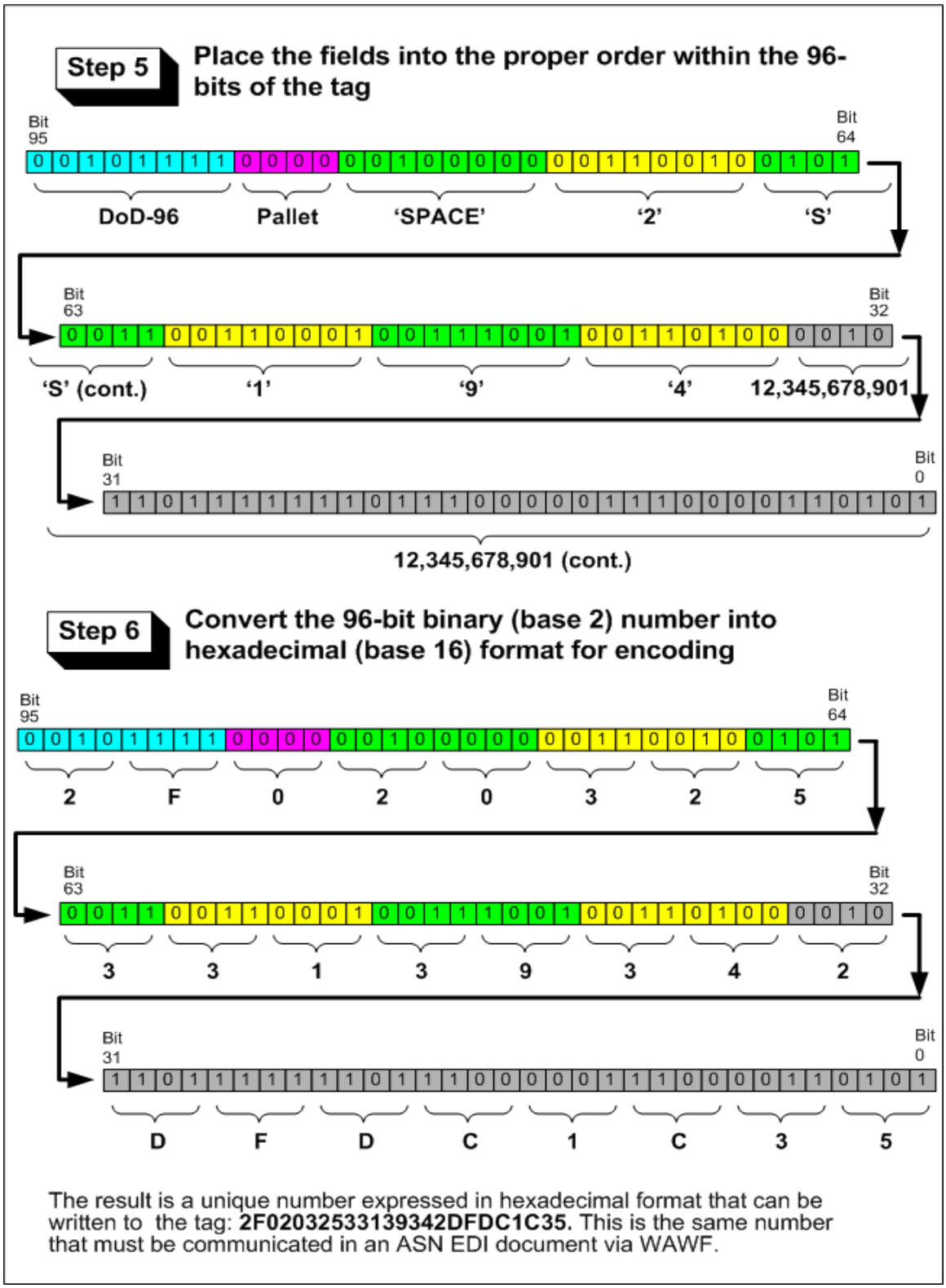

Figure 8. Example Encoding of a 96-bit Tag (Steps 5–6)

3.7 Tag Placement

The transponder (RF tag) may be integrated with the shipping label (RFID-enabled labels), or may be an independent entity (where a separate shipping label would also be necessary).

All address labels and RF tags should be affixed at a suitable location where there is a minimum risk of damage and highest potential for successful interrogation. See Figure 9.

The bottom edge of the address label containing the unit load information should be within the range of 81 cm to 122 cm (32 to 48 in) from the bottom of the pallet (palletized unit load). If the loaded pallet (palletized unit load) is less than 102 cm (40 in) in height, the label should be placed as high as possible on the pallet (palletized unit load), but not closer than 5 cm (2 in) to the natural top of the unit load.

Each unit load must include one RF tag, independent or part of an address label, which contains the unit load information. Additionally, if the pallet (palletized unit load) is reusable, a RF tag containing a unique returnable asset identifier may be used.

RFID-enabled labels are to be applied to shipping containers or palletized unit loads in accordance with the standards presented in MIL-STD-129.

- The address label should be placed on the identification-marked side and right of center on a vertical face, allowing a minimum of 5 cm (2 in) from all edges. An additional address label may be placed on the identification-marked end for styles that, because of their configuration, allow access by materials handling equipment only to the end of the container.

- The RFID-enabled label should not be placed over a seam nor should sealing tape or bands be placed over the label in a manner that interferes with the scanning of the label bar codes or reading the transponder data.

- The RFID-enabled label should not be placed in a manner that overlaps any other existing RF transponder. There should be at least a 10-cm (4-in) separation.

- If RFID-enabled address labels are not used, attach a separate passive RFID tag and a separate address label(s).

- The passive RFID tag should be placed on the identification-marked side and right of center on a vertical face, allowing a minimum of 5 cm (2 in) from all edges.

- A passive RFID tag should not be placed in a manner that overlaps any other existing radio frequency (RF) transponder. There should be at least a 10-cm (4-in) separation.

- The passive RFID tag on a palletized unit load should not be attached to an exterior container if the cargo within the exterior container will not be removed for receipt processing and storage.

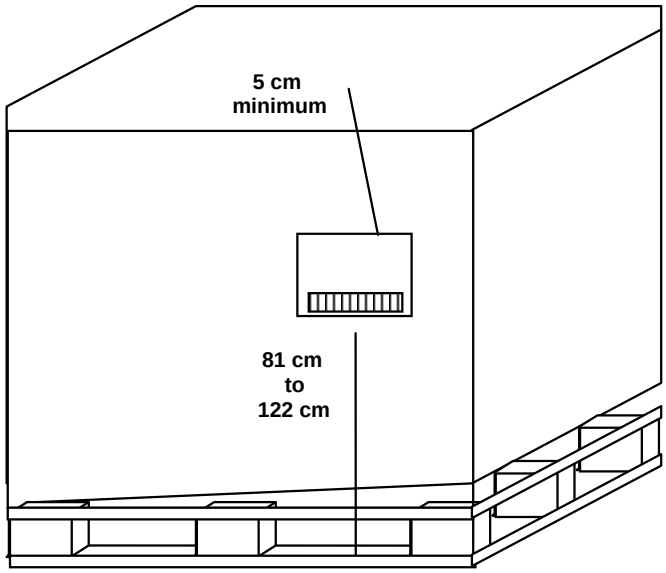

Figure 9. RFID-enabled Label Placement on Palletized Unit Load

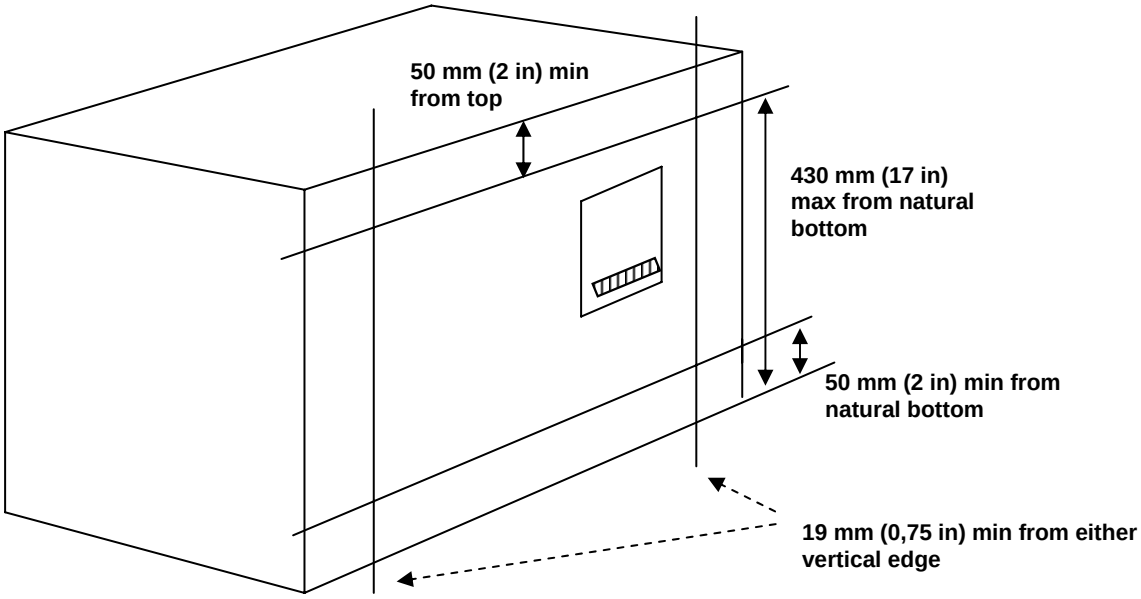

Figure 10. RFID-enabled Label Placement on Case (Shipping and Exterior Container)

4. Frequently Asked Questions

For the answers to frequently asked questions as well as additional information regarding the RFID policy please refer to the Department of Defense website http://www.dodrfid.org. The website contains FAQs, background information, and Policy to assist your efforts in being RFID compliant.

5. Future Amendments

Future policy amendments may be needed in order to keep up with evolving RFID standards, technology, and the business environments. DoD RFID policies and business rules will continue to be refined as passive RFID capabilities are implemented over the next few months.

Please check for updates to the *Supplier Implementation Plan* (http://www.dodrfid.org/supplierimplementationplan.htm) and this *Supplier Passive RFID Information Guide* (http://www/.dodrfid.org/supplierguide.htm), for implementation dates and details as well as detailed information concerning the applicable commodities.

6. Contacts

We strongly encourage suppliers to investigate RFID benefits and applications within their organizations as soon as possible. Below are contacts that will help suppliers in the effort.

- Visit EPCglobal on the internet: http://www.epcglobalinc.org/
- Additional information and RFID FAQs are available at http://www.dodrfid.org

Please note: This guide is subject to updates and information contained in this guide is subject to change. Please use http://www.dodrfid.org to keep abreast of the most current requirements.

7. Acronyms

ASN	Advance Shipment Notice
CAGE	Commercial and Government Entity
EPC	Electronic Product Code
RFID	Radio Frequency Identification
UHF	Ultra High Frequency
UID	Unique Identification

8. Number Conversion Table

The following table is included as a convenience to the user. It can be used to determine the hexadecimal and binary representations of the decimal numbers 0–15 inclusive.

Decimal	Hex	Binary		Decimal	Hex	Binary
0	0	0000		8	8	1000
1	1	0001		9	9	1001
2	2	0010		10	A	1010
3	3	0011		11	B	1011
4	4	0100		12	C	1100
5	5	0101		13	D	1101
6	6	0110		14	E	1110
7	7	0111		15	F	1111

Figure 11. Numeric Conversion