

# Department of Defense



## Guidelines for Engineering, Manufacturing and Maintenance Documentation Requirements for Item Unique Identification (IUID) Implementation

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# Preface

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These guidelines are intended to provide suggested methods for minimizing the non-recurring engineering costs associated with incorporating marking requirements for DoD item unique identification (IUID) into engineering drawings, manufacturing instructions and maintenance work requirements. Key definitions are listed in Appendix A.

IUID is a system of marking items delivered to the Department of Defense (DoD) with unique item identifiers that have machine-readable data elements to distinguish an item from all other like and unlike items.. Items are marked with a Data Matrix, the contents of which are encoded in the syntax of ISO/IEC 15434 and the semantics of ISO/IEC 15418 or the ATA CSDD<sup>1</sup>. The Data Matrix contents may be either a Unique Item Identifier (Construct #1 or Construct #2) or a DoD recognized IUID equivalent.

With IUID, the DoD associates valuable business intelligence with an item throughout its life cycle and accurately captures and maintains data for valuation and tracking of items. A unique item identifier (UII) is a set of data elements marked on an item that is globally unique and unambiguous. For items that are serialized within the enterprise identifier, the UII data set includes the data elements of enterprise identifier and a unique serial number (Construct #1). For items that are serialized within the part, lot or batch number within the enterprise identifier, the UII data set includes the data elements of enterprise identifier, the original part, lot or batch number, and the serial number (Construct #2).

The basic UID requirements are contained in an Acting USD (AT&L) Memorandum of July 29, 2003, entitled Policy for Unique Identification (UID) of Tangible Items – New Equipment, Major Modifications, and Reprocurements of Equipment and Spares, which says that IUID is a mandatory requirement for all solicitations issued on or after 1 January 2004 by the Department.

In addition, the Department published a guide to uniquely identifying items, assuring valuation, accountability and control of government property. The most current guidance is available at <http://www.acq.osd.mil/dpap/UID>.

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<sup>1</sup> Text Element Identifiers are taken from the Air Transport Association Common Support Data Dictionary (CSDD).

c. A DFARS final rule regarding IUID, entitled Unique Item Identification and Valuation, was published in the Federal Register on April 22, 2005

d. MIL-STD-130M, which specifies Identification Marking of U.S. Military Property, was published on December 2, 2005 to include language on IUID.

Although IUID is a strategic imperative of the DoD, there are many opportunities for suppliers to actually plan and implement improvements around the IUID requirement. IUID can have a key role in traceability of individual items. Suppliers can use traceability data to create a history of an item through the manufacturing process for use later in supply chain management and repair depots. Traceability also improves quality by ensuring that the appropriate processes are performed in the correct sequence on the right items. In addition to eliminating manual part number data entry errors during production operations, IUID can also assist in data logging for safety, liability, and warranty issues, and satisfy requirements for permanently identifying high value items that are subject to theft or counterfeiting.

# Table of Contents

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Preface.....	ii
Executive Summary .....	1
The Item Identification Environment.....	1
The Definition of Item .....	1
Item Identification in Technical documentation .....	2
EIA-649, National Consensus Standard for Configuration Management .....	2
MIL-HDBK 61A(SE), Configuration Management Guidance.....	3
MIL-DTL-31000B, Technical Data Packages.....	3
ASME Y14.1000-2000, Engineering Drawing Practices .....	3
MIL-STD-130M, Identification Marking of U. S. Military Property.....	4
How IUID Has Changed the Traditional Requirements for Item Marking .....	4
Engineering Effort to Support IUID Implementation.....	7
How Engineering Impacts IUID .....	7
The Problem.....	7
Types of Technical Documentation Strategies in Use.....	7
Dependencies for Changing Technical Documentation .....	8
Factors to Take into Account.....	8
Leveraging Existing Marking Processes.....	9
Using Existing Qualification and Test Results for IUID Marking Scenarios.....	10
Summary .....	11
Appendix A - Definitions.....	12
Key Definitions.....	12
Appendix B - The Language of Item Unique Identification (IUID).....	20
What is the Language of IUID? .....	20
What does a DoD Unique Item Identifier (UII) Mark Look Like?.....	20
How is the DoD UII Mark Read? .....	21
How do You Build a DoD UII? .....	21
How are the Building Blocks' Data Elements Put Together?.....	22
Recognized DoD IUID Equivalents.....	24

# Executive Summary

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The implementation of IUID requirements means that qualifying items must be marked with machine-readable information (MRI). The supplier now has to place data elements for item unique identification (enterprise identifier, serial number and, for serialization within the part number only, original part, lot or batch number) in MRI media on items requiring marking.

The implementation of part marking to uniquely identify items with MRI may require non-recurring engineering changes in the supplier's manufacturing and maintenance processes if these processes have not already been enabled to mark items with MRI. The marking of military property has been a long-standing practice in DoD acquisitions. Thus, engineering, manufacturing and maintenance documentation on existing programs will address the marking of equipment, although marking through machine-readable means may not be the prevalent method in current use. This suggests that one method of reducing non-recurring costs to implement IUID part marking is to leverage the existing part marking processes. This leveraging could be accomplished by such practices as:

- Replacing/modifying existing data plates with IUID labels. Existing data plate documentation can be used. The current technical data already specifies the material and placement of the data plate. Human readable data other than IUID information can exist on the "new" data plate. The labels provide high contrast allowing interrogation of mark by lower cost readers.
- Issuing a global engineering change notice. This would provide instructions on a single drawing on how to mark qualifying items.
- Issuing IUID part-marking work orders into the existing manufacturing and enterprise resource planning processes, which minimizes the need to change drawings.
- When the necessary marking information and criteria do not change the form, fit, or function of the part, the change does not require an immediate drawing update, but rather can be accomplished by a coversheet with the marking instructions, thus permitting consolidation of drawing requirements.
- Direct part marking (DPM) will require more engineering analysis than labeling. The main issue that necessitates additional engineering analysis for DPM is the fact that the mark is made directly on the

component rather than attached like a label. Wherever possible, the engineering decisions for location and type of application should be made on documented results from previous analysis. Currently NASA has taken the lead in this area and their documentation has provided a wealth of information that has precluded much of the testing that would normally be required when one marks directly into the material of a component.

## Chapter 1

# The Item Identification Environment

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## THE DEFINITION OF ITEM

For the purposes of this guide, an item is a single hardware article or unit formed by a grouping of subassemblies, components, or constituent parts.<sup>2</sup> Items can be classified into the categories of Equipment, Repairables, Material, and Consumables.

Equipment is defined as items that are not held for sale or consumed in normal operations. This category includes military equipment, support equipment, general-purpose equipment, special test equipment, and special tooling. Includes Class VII, Major End Items, a final combination of end products that is ready for its intended use, that is, launchers, tanks, mobile machine shop, and vehicles, etc.<sup>3</sup>

A repairable is an item of supply subject to economical repair for which repair (at either depot or field level) is considered in satisfying computed requirements at any inventory level.<sup>4</sup> Examples include aircraft engines, rotors, guidance systems, and electronic circuit boards.

Material is defined as being of, composed of, or pertaining to physical substances.<sup>5</sup> Materials are items that may lose their identity when incorporated in an end item. (e.g., sheet metal). The FAR 45.301 defines material as property that may be incorporated into or attached to a deliverable end item or that may be consumed or expended in performing a contract. It includes assemblies, components, parts, raw and processed materials, and small tools and supplies that may be consumed in normal use in performing a contract. It does not include real property, repairables, or consumables.

A consumable is an item of supply that is normally expended or used up beyond recovery in the use for which it is designed or intended (e.g. clothing and supplies).<sup>6</sup> For purposes of this guide, explosives are treated as consumable items; and bulk petroleum, oil and lubricants delivered by pipeline are excluded.

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<sup>2</sup> DFARS 252.211-7003(a).

<sup>3</sup> DoD 4140.1-R.

<sup>4</sup> Ibid.

<sup>5</sup> The American Heritage Dictionary.

<sup>6</sup> DoD 4140.1-R, op. cit.

## ITEM IDENTIFICATION IN TECHNICAL DOCUMENTATION

Item identification has traditionally been a requirement for technical documentation. The processes affected include configuration management, defense specifications, technical documentation, engineering drawing practices and identification marking. These processes define item identification basically to differentiate between different products by coupling enterprise identifiers with part numbers. Serialization is added to distinguish between individual items with the same item identifier. Serialization can be within the part number or within the enterprise. Items are marked with the item identifiers and serial numbers as required. Item marking requirements were traditionally expressed in human readable information (HRI) inscribed on data plates or directly on the item. More recently, automatic identification technology (AIT) media (bar codes, contact memory buttons, and radio frequency identification) have been used to supplement the HRI markings, either as labels, tags, or direct part markings. The following documents address item identification:

- EIA-649, National Consensus Standard for Configuration Management
- MIL-HDBK 61A(SE), Configuration Management Guidance
- MIL-DTL-31000B, Technical Data Packages
- ASME Y14.1000-2000, Engineering Drawing Practices
- MIL-STD-130M, Identification Marking of U. S. Military Property

### EIA-649, National Consensus Standard for Configuration Management

Product identifiers are described by Principle 11: All products are assigned unique identifiers so that one product can be distinguished from other products; one configuration of a product can be distinguished from another; the source of a product can be determined; and the correct product information can be retrieved. The product identifier most commonly consists of a part number and a code representing the design activity/manufacturer/supplier.

Identifying individual units of a product is described by Principles 12 and 13:

- Principle 12: Individual units of a product are assigned a unique product unit identifier when there is a need to distinguish one unit of the product from another unit of the product;
- Principle 13: When a product is modified, it retains its original product unit identifier even though its part identifying number is altered to reflect a new configuration.



The most widely accepted method is to assign a unique serial number to each unit and apply the manufacturer's organization code and that serial number to the unit.

## **MIL-HDBK 61A(SE), Configuration Management Guidance**

The item identification concepts include:

- All products are assigned unique identifiers (e.g., Nomenclature, CAGE code, Part/Item Number).
- Individual units of a product are assigned a unique product unit identifier (Serial Number) when there is a need to distinguish one unit of the product from another unit of the product.
- When a product is modified, it retains its original product unit identifier (Serial Number) even though its part identifying number is altered to reflect a new configuration.
- The part number must uniquely identify the specific part and all configuration items are marked with their identifiers, unless otherwise specified.

## **MIL-DTL-31000B, Technical Data Packages**

The following requirements apply to product drawings and associated lists:

- Requires that the product be defined to the extent necessary for a competent manufacturer to produce an item, which duplicates the physical, interface, and functional characteristics of the original product, without additional design engineering effort or recourse to the design activity.
- Requires that basic engineering drawing practices for other than strictly commercial activities, for example DoD design activities, refer to ASME Y14.100 and associated Appendices B through E, as applicable.
- Contains a Data Item Description for Product Drawings and Associated Lists, which requires:
  - Hardware marking requirements.
  - CAGE Code and document numbers – either contractor or Government CAGE code and document numbers as specified in the Technical Data Package Option Selection Work Sheet incorporated in the contract or purchase order.

## **ASME Y14.1000-2000, Engineering Drawing Practices**

Numbering, Coding and Identification are addressed as follows:

- Requires use of CAGE code to identify drawings.
- A Part Identifying Number (PIN) is the same as, or is based on, the controlling drawing number.
- The combination of the original design activity PIN and activity identification establishes identification unique to that item.
- PINs can change for a variety of reasons.
- A serial number is a unique number identifying individual units within a series of like items. The serial number tracks the number of items that were produced under the PIN.

Appendix B, Noncommercial Drawing Practices, addresses DoD requirements as follows:

- Drawings shall specify marking requirements for items, including item identification.
- Delineation of part identification markings on drawings shall be consistent with the requirements of section 6 of ASME Y14.100-2000 and MIL-STD-130.

## **MIL-STD-130M, Identification Marking of U. S. Military Property**

MIL-STD-130M provides increased insight and guidance for the implementation of machine-readable information (MRI) processes for IUID marking to facilitate automatic data capture. It provides implementing instructions for marking items with the DoD UII constructs. The standard notes that MRI provides a valuable tool for asset management from acquisition through manufacture to logistics. However, it also notes that application of human-readable (HRI) item identification marking is still necessary for many end users of the identified item. Finding the most effective use of both, either singly or in combination, is the prime responsibility of the Government requiring activity.

The standard provides the criteria by which product designers develop specific item identification marking requirements. It notes that product designers must include in product definition data specific requirements as to marking content, size, location, and application process.

## **HOW IUID HAS CHANGED THE TRADITIONAL REQUIREMENTS FOR ITEM MARKING**

The implementation of IUID requirements means that qualifying items must be marked with machine-readable information (MRI). Appendix B informs the reader of this guide on the language of the DoD UII mark.

The Government requiring activity determines an item qualifies for unique identification if it meets the requirements of DFARS 211.274, Item Identification and Valuation<sup>7</sup>. The Government requiring activity identifies these qualifying items in paragraph (c)(1) of DFARS Clause 252.211-7003. The supplier shall place data elements for unique identification (enterprise identifier, serial number and, for serialization within the part number only, original part, lot or batch number) in MRI media on items requiring marking, based on the criteria provided in MIL-STD-130M, Identification Marking of U.S. Military Property.

The implementation of part marking to uniquely identify items with MRI may require changes in the supplier's manufacturing and maintenance processes if these processes have not already been enabled to mark items with MRI. If item designs are final and do not enable MRI marking, changes to enable MRI marking must be incorporated in the engineering drawings and/or technical data that define the item. Figure 1 illustrates some considerations faced by suppliers in developing a compliant approach to DoD IUID requirements using MRI part marking.

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<sup>7</sup> 211.274-2 Policy for unique item identification.

(a) It is DoD policy that DoD unique item identification, or a DoD recognized unique identification equivalent, is required for-

- (1) All delivered items for which the Government's unit acquisition cost is \$5,000 or more;
- (2) Items for which the Government's unit acquisition cost is less than \$5,000, when identified by the requiring activity as serially managed, mission essential, or controlled inventory;
- (3) Items for which the Government's unit acquisition cost is less than \$5,000, when the requiring activity determines that permanent identification is required; and
- (4) Regardless of value--
  - (i) Any DoD serially managed subassembly, component, or part embedded within a delivered item; and
  - (ii) The parent item (as defined in 252.211-7003(a)) that contains the embedded subassembly, component, or part.

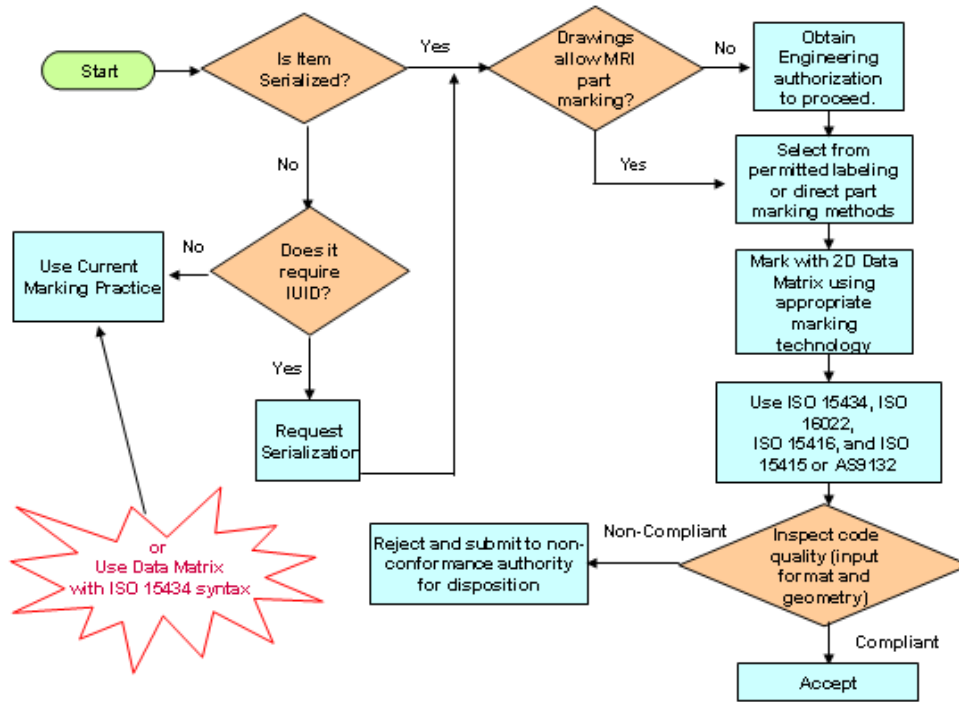


Figure 1. Supplier Considerations in MRI Part Marking

## Chapter 2

# Engineering Effort to Support IUID Implementation

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## HOW ENGINEERING IMPACTS IUID

### The Problem

The implementation requirements of a part-marking program may not be included in engineering data, manufacturing instructions or maintenance work directives for a system that has completed its final design review. Yet, the manufacturing or maintenance processes must be instructed in some manner on how to place the UII mark on qualifying items. Such instruction must be timely because the requirement exists to include IUID in solicitations issued after January 1, 2004. It must also be efficient, since neither the DoD nor industry can afford a burdensome cost for non-recurring engineering charges to modify technical documentation to enable IUID implementation.

## Types of Technical Documentation Strategies in Use<sup>8</sup>

### **Build to Print**

Build-to-Print (BTP) procurement acquires parts that are identical to the original parts with only approved changes allowed by the Government to be incorporated into the new items. While this process is very inflexible with regards to incorporating design changes and emerging technologies, it does reduce the inherent risks involved with new/changed designs.

### **Modified Build-to-Print**

Modified Build-to-Print (MBTP) procurement allows process changes, which do not denigrate performance or fit, otherwise it provides a product equivalent in material and is consistent with the original design. MBTP is used when the supplier has proven past performance and is thereby given flexibility to change manufacturing processes only.

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<sup>8</sup> Source: JACG Flexible Sustainment Guide, change 2, July 1999, page 5.

## **Form-Fit-Function-Interface**

Form-Fit-Function-Interface (F<sup>3</sup>I) is a mechanism to link design to performance requirements, i.e., replacing an item/system based on form, fit, function and interface characteristics. It does not specify material or support characteristics unless they are requirement/interface driven. This capability can reside in the same organization, either government or industry. Key product performance characteristics and product acceptance criteria are specified; but there is flexibility to change the design while meeting performance requirements, as well as flexibility to change the manufacturing processes to produce the design. The end item performance must be verified to be unaffected by the design and/or process change. These changes must consider total life cycle cost impacts as part of the overall decision process. Again, prior customer approval of changes may or may not be required depending on the demonstrated capability of the supplier. Technology insertion without the need for equipment modification can often be accomplished with commercial substitutes.

## **Dependencies for Changing Technical Documentation**

Changing technical documentation to accommodate IUID instructions will depend on whether the design is defined by BTP, MBTP or F<sup>3</sup>I methods. F<sup>3</sup>I and MBTP methods would enable changes that do not impact the form, fit or function of an item. BTP is less flexible. Strategies to minimize non-recurring engineering costs should be developed in the context of the technical documentation strategy currently being used in manufacturing and maintenance.

The part-marking effort should have the objective of minimizing the non-recurring costs for documenting implementation requirements and instructions. These requirements would typically include defining the set of parts to mark, the method in which to mark them, any associated engineering analysis, and the required process documentation. The involvement of engineering, manufacturing and logistics entities is crucial. There must be close coordination with the DoD requiring activities, original equipment manufacturers and vendors in order to minimize the non-recurring costs to accomplish the required updates to engineering documentation and manufacturing and maintenance instructions.

## **FACTORS TO TAKE INTO ACCOUNT**

The following factors should be taken into account when deciding how to modify technical documentation to enable consistent IUID, while

minimizing the non-recurring engineering costs associated with the changes:

- The costs will be a direct function to the number of engineering drawings that need to be changed.
- There will be limited resources to review and determine extent of change to drawings.
- A drawing change does not always instruct immediate change to the product due to lead times for analysis, approval, documentation and dissemination.
- A drawing directs, in a methodical way, how to accomplish the task or process.
- Data plate changes require cosmetic change (e.g., change to the photograph).
- Drawing changes have an impact on or may affect other customers (e.g., subcontractors, other users).
- A company part marking quality standard will contain instructions on part marking processes that apply company-wide.

## LEVERAGING EXISTING MARKING PROCESSES

The marking of military property has been a long-standing practice in DoD acquisitions. Thus, engineering, manufacturing and maintenance documentation on existing programs will address the marking of equipment, although marking through machine-readable means may not be the prevalent method in current use. This suggests that one method of reducing non-recurring costs to implement IUID part marking is to leverage the existing part marking processes. This leveraging could be accomplished by such practices as:

- Replacing/modifying existing data plates with UII labels. Existing data plate documentation can be used. The current technical data already specifies the material and placement of the data plate. Human readable data other than IUID information can exist on the “new” data plate. The labels provide high contrast allowing interrogation of mark by lower cost readers.
- Issuing a global engineering change notice. This would provide instructions on a single drawing on how to mark qualifying items.
- Issuing IUID part-marking work orders into the existing manufacturing and enterprise resource planning processes, which minimizes the need to change drawings.

- Changing company part marking quality standards to include IUID requirements.
- When the necessary marking information and criteria do not change the form, fit, or function of the part, the change does not require an immediate drawing update, but rather can be accomplished by a coversheet with the marking instructions, thus permitting consolidation of drawing requirements.
- Direct part marking (DPM) will require more engineering analysis than labeling. The main issue that necessitates additional engineering analysis for DPM is the fact that the mark is made directly on the component rather than attached like a label. Wherever possible, the engineering decisions for location and type of application should be made on documented results from previous analysis. Currently NASA has taken the lead in this area and their documentation has provided a wealth of information that has precluded much of the testing that would normally be required when one marks directly into the material of a component.

## USING EXISTING QUALIFICATION AND TEST RESULTS FOR IUID MARKING SCENARIOS

Established in July 2005, the Joint Marking Qualification Working Group (JMQWG), jointly sponsored by the Government Electronics and Information Technology Association (GEIA) and OSD, has the objective to provide valuable guidance on appropriate 2D marking methods for an 80% common solution set of standard material types and environments for IUID marking. The guidance consists of a comprehensive Marking Matrix backed-up by real world qualification test data for various marking scenarios. The JMQWG Matrix is being prepared and populated by the University of Alabama – Huntsville, under funding from the DoD Office of Material Readiness and Sustainment Policies. This data enables companies to streamline and reduce material and process engineering qualification activities and allow design engineering to quickly focus on an optimum marking solution. Decision trees and other helpful guidance tools are also provided to aid both first time and experienced personnel sort through the realm of marking options and parameters.

The Working Group consists of Industry, Academia and Government personnel. High-level test summaries and detailed test reports are posted on the collaboration website being hosted by the Defense Acquisition University (DAU) and their Acquisition Community Connection. The Working Group's technical data and the latest results achieved, can be found at: <https://acc.dau.mil/CommunityBrowser.aspx?id=30743>.



## SUMMARY

The performing activity needs to evaluate and determine what drawings really do need to be changed in full consideration of the timing of compliance and the available resources. Contract requirements will ultimately drive compliance actions. Company quality standards may be utilized to centralize changes required to implement IUID. Text changes should be considered versus physical drawing changes. Authorization for changes can be provided by “fly sheet” – authorization sheet that supersedes existing instructions. Finally, companies should communicate IUID as an enabler for process improvement.


## Appendix A - Definitions

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### Key Definitions

<b>Word or Phrase</b>	<b>Definition</b>	<b>Source</b>
<b>Automatic identification device</b>	A device, such as a reader or interrogator, used to retrieve data encoded on machine-readable media.	DFARS 252.211-7003
<b>Compliant unique item identifier</b>	For DoD purposes, a compliant UII is either a Construct #1, Construct #2, Global Individual Asset Identifier (GIAI), Global Returnable Asset Identifier (GRAI), Vehicle Identification Number (VIN), or Electronic Serial Number ((ESN), for cell phones and other wireless handheld devices only), all of which have their data elements encoded in a data matrix in the ISO/IEC 15434 syntax with ISO/IEC 15418 or ATA CSDD <sup>9</sup> semantics.	DoD Guide to Uniquely Identifying Items
<b>Concatenate</b>	To link together in a series or chain.	Merriam-Webster Online Dictionary
<b>Concatenated unique item identifier</b>	<ol style="list-style-type: none"> <li>1. For items that are serialized within the enterprise identifier, the linking together of the unique item identifier data elements in order of the issuing agency code, enterprise identifier, and unique serial number within the enterprise identifier; or</li> <li>2. For items that are serialized within the original part, lot or batch number, the linking together of the unique item identifier data elements in order of the issuing agency code, enterprise identifier, original part, lot or batch number, and serial number within the part, lot or batch number.</li> </ol>	DFARS 252.211-7003

<sup>9</sup> Air Transport Association Common Support Data Dictionary

<p><b>Controlled inventory</b></p>	<p>Those items that are designated as having characteristics that require that they be identified, accounted for, segregated, or handled in a special manner to ensure their safeguard and integrity. Includes classified items (require protection in the interest of national security), sensitive items (require a high degree of protection and control due to statutory requirements or regulations, such as precious metals; items of high value, highly technical, or hazardous nature; and small arms), and pilferable items (items having a ready resale value or application to personal possession, which are especially subject to theft) (See DoD 4100.39-M, Volume 10, Table 61); and safety controlled items.</p>	<p>DoD 4140.1-R DoD 4100.39-M</p>
<p><b>Data carrier</b></p>	<p>The medium selected to record, transport or communicate data. For unique identification purposes, the data carrier is the Data Matrix symbol.</p>	<p>The American Heritage Dictionary</p>
<p><b>Data Matrix</b></p>	<p>A two-dimensional matrix symbology containing dark and light square data modules. It has a finder pattern of two solid lines and two alternating dark and light lines on the perimeter of the symbol. A two-dimensional imaging device such as a charge-coupled device camera is necessary to scan the symbology. Data Matrix is designed with a fixed level of error correction capability. It supports industry standard escape sequences to define international code pages and special encodation schemes. Data Matrix is used for small item marking applications using a wide variety of printing and marking technologies. The data matrix symbol looks like this:</p> 	<p>See ANSI/AIM BC11 International Symbology Specification - Data Matrix</p>

<b>Data qualifier</b>	A specified character (or string of characters) that immediately precedes a data field that defines the general category or intended use of the data that follows.	DFARS 252.211-7003
<b>DoD item unique identification</b> <sup>10</sup>	A system of marking items delivered to the Department of Defense with unique item identifiers that have machine-readable data elements to distinguish an item from all other like and unlike items. Items are marked with a Data Matrix, the contents of which are encoded in the syntax of ISO/IEC 15434 and the semantics of ISO/IEC 15418 or the ATA CSDD <sup>11</sup> . The Data Matrix contents may be either a Unique Item Identifier (Construct #1 or Construct #2) or a DOD recognized IUID equivalent.	DFARS 211.274 -01 through -04
<b>DoD serially managed items</b>	<p>Includes reparable items down to and including sub-component reparable unit level; life-limited, time-controlled, or items requiring records (e.g., logbooks, aeronautical equipment service records, etc.); and items that require technical directive tracking at the part level.</p> <p>A distinction must be made between “serialized items” and “DoD serially managed” items. While DoD may use an item that has been serialized by the manufacturer, DoD may not manage the item by means of its serial number. When DoD elects to serially manage an item it becomes "DoD serially managed". This means it is a tangible item used by DoD, which is designated by a DoD, or Service Item Manager to be uniquely tracked, controlled or managed in maintenance, repair and/or supply by means of its serial number<sup>12</sup></p>	See DoD I 4151.19

<sup>10</sup> Formerly known as DoD unique item identification.

<sup>11</sup> Text Element Identifiers are taken from the Air Transport Association Common Support Data Dictionary.

<sup>12</sup> A serial number is an assigned combination of numbers and/or letters to an item instance that separately identifies that item instance from all others.

<p><b>DoD recognized unique identification equivalent</b></p>	<p>A unique identification method that is in commercial use and has been recognized by DoD. The IUID equivalents are the Global Individual Asset Identifier (GIAI), Global Returnable Asset Identifier (GRAI), Vehicle Identification Number (VIN), and Electronic Serial Number ((ESN), for cell phones only). While the constructs are equivalent, they must be placed on the items in a Data Matrix symbol encoded with ISO 15434 syntax and semantics of ISO 15418 in order to be compliant with DoD IUID policy.</p>	<p>DFARS 252.211-7003</p>
<p><b>Enterprise</b></p>	<p>The entity (e.g., a manufacturer or vendor) responsible for assigning unique item identifiers to items.</p>	<p>DFARS 252.211-7003</p>
<p><b>Enterprise identifier</b></p>	<p>A code that is uniquely assigned to an enterprise by a registered issuing agency.</p>	<p>DFARS 252.211-7003</p>
<p><b>Equipment</b></p>	<p>A tangible article of personal property that is complete in-and-of itself, durable, nonexpendable, and needed for the performance of a contract. Equipment generally has an expected service life of one year or more, and does not ordinarily lose its identity or become a component part of another article when put into use.</p> <p>Includes military equipment, support equipment, general-purpose equipment, special test equipment, and special tooling. Includes Class VII, Major End Items, a final combination of end products that is ready for its intended use, that is, launchers, tanks, mobile machine shop, and vehicles, etc. It does not include real property, reparables, consumables or materials.</p>	<p>DoD 4140.1-R</p>
<p><b>Issuing agency</b></p>	<p>An organization responsible for assigning a non-repeatable identifier to an enterprise (i.e., Dun &amp; Bradstreet's Data Universal Numbering System (DUNS) Number, Uniform Code Council (UCC)/EAN International (EAN) Company Prefix, Allied Committee 135 Commercial and Government Entity (CAGE) Code) or DoD Activity Address Code (DODAAC).</p>	<p>DFARS 252.211-7003</p>

<b>Issuing agency code</b>	A code that designates an agency with authority to issue unique enterprise identifiers.	DFARS 252.211-7003
<b>Item</b>	A single hardware article or unit formed by a grouping of subassemblies, components, or constituent parts.	DFARS 252.211-7003(a)
<b>Item essentiality</b>	A measure of an item's military worth in terms of how its failure (if a replacement is not immediately available) would affect the ability of a weapon system, end item, or organization to perform its intended functions.	AP16.61 DoD 4140.1-R
<b>Item identification</b>	Sufficient data to establish the essential characteristics of an item that give the item its unique character and differentiate it from other supply items.	DoD 4140.1-R
<b>Legacy items</b>	DoD-owned items and end items that have already been produced and deployed for use, or that have been produced and placed in inventory or storage pending issue for use.	USD(AT&L) Memorandum, dated 23 Dec 04, Policy for Unique Identification (UID) of Tangible Personal Property Legacy Items in Inventory and Operational Use, Including Government Furnished Property (GFP)
<b>Lot/Batch number</b>	An identifying number assigned by the enterprise to a designated group of items, usually referred to as either a lot or a batch, all of which were manufactured under identical conditions.	DFARS 252.211-7003
<b>Machine-readable media</b>	An automatic information technology media, such as bar codes, contact memory buttons, radio frequency identification, or optical memory cards.	DFARS 252.211-7003

<b>Marking</b>	The application of legible numbers, letters, labels, tags, symbols, or colors to ensure proper handling and identification during shipment and storage.	DoD 4140.1-R
<b>Mission essential</b>	A measure of an item's military worth in terms of how its failure (if a replacement is not immediately available) would affect the ability of a weapon system, end item, or organization to perform its intended functions.	DoD 4140.1-R
<b>Operating materials and supplies</b>	Personal property to be consumed in normal operations. Excluded are (a) goods that have been acquired for use in constructing real property, (b) stockpile materials, and (c) inventory. FMR, Volume 4, Chapter 4, Operating Materials and Supplies and Stockpile Materials, January 1995.	DoD 7000.14 -R
<b>Original part number</b>	A combination of numbers or letters assigned by the enterprise at asset creation to a class of items with the same form, fit, function, and interface.	DFARS 252.211-7003
<b>Parent item</b>	The item assembly, intermediate component or subassembly that has an embedded item with a unique item identifier or DoD recognized unique identification equivalent.	DFARS 252.211-7003
<b>Personal property</b>	Property of any kind or any interest therein, except real property.	JCS DoD Dictionary
<b>Pilferable items</b>	Items that have a ready resale value or application to personal possession and that are, therefore, especially subject to theft. (See DoD 4100.39-M, Volume 10, Table 61)	E2.16.3 DoD I 5000.64
<b>Property accountability record</b>	The official record of personal property, including inventory, owned by the Department that is maintained to identify the quantities of items on-hand, unit prices, locations, physical condition, receipt and issue records, authorized stock numbers, item descriptions, and other such information necessary to properly account for materiel and exercise other inventory management responsibilities.	AP16.104 DoD 4140.1-R

<b>Registration authority</b>	Refers to the Nederlands Normalisatie-instituut (NEN), Registration Authority for ISO/IEC 15459, which is responsible for assigning codes to issuing agencies with conforming systems for issuance of unique enterprise identifiers.	DAFRS 252.211-7003
<b>Sensitive items</b>	Items that require a high degree of protection and control due to statutory requirements or regulations, such as narcotics and drug abuse items; precious metals; items that are of a high value, highly technical, or a hazardous nature; and small arms, ammunition, explosives, and demolition material. (See DoD 4100.39-M, Volume 10, Table 61)	E2.16.2 DoD I 5000.64
<b>Serialization within the enterprise identifier</b>	Each item produced is assigned a serial number that is unique among all the tangible items produced by the enterprise and is never used again. The enterprise is responsible for ensuring unique serialization within the enterprise identifier.	DFARS 252.211-7003
<b>Serialization within the part, lot or batch number</b>	Each item of a particular part, lot or batch number is assigned a unique serial number within that part, lot or batch number assignment. The enterprise is responsible for ensuring unique serialization within the part, lot or batch number within the enterprise identifier.	DFARS 252.211-7003



<p><b>Unique item identifier</b></p>	<p>The unique item identifier (UII) is defined in two separate contexts:</p> <ol style="list-style-type: none"> <li>1. DoD UII Data Set. A UII is a set of data elements marked on an item that is globally unique and unambiguous. For items that are serialized within the enterprise identifier, the UII data set includes the data elements of enterprise identifier and a unique serial number (Construct #1). For items that are serialized within the part, lot or batch number within the enterprise identifier, the UII data set includes the data elements of enterprise identifier, the original part, lot or batch number, and the serial number (Construct #2).</li> <li>2. Use. The generic term, UII, has evolved through usage to mean the concatenated UII as a common data base key without regard to the data set construct being used. In this context, the term “UII” may be used to designate UII Constructs #1 and #2, or the DoD recognized IUID equivalents of Global Individual Asset Identifier (GIAI), Global Returnable Asset Identifier (GRAI), Vehicle Identification Number (VIN), or Electronic Serial Number ((ESN), for cell phones only).</li> </ol>	<p>DFARS 252.211-7003</p>
<p><b>Unique item identifier type</b></p>	<p>A designator to indicate which method of uniquely identifying a part has been used. The current list of accepted unique item identifier types is maintained at <a href="http://www.acq.osd.mil/dpap/UII">http://www.acq.osd.mil/dpap/UII</a>.</p>	<p>DFARS 252.211-7003</p>

# Appendix B - The Language of Item Unique Identification (IUID)

## WHAT IS THE LANGUAGE OF IUID?

A DoD Unique Item Identifier (UII) permanently identifies an individual item distinctly from all other individual items that DoD buys and owns. See Table 1 for what a DoD UII is and is not.

A UII Is:	A UII Is Not:
<ul style="list-style-type: none"> <li>✓ A globally unique unambiguous item identifier</li> <li>✓ Permanent through life</li> <li>✓ Created by concatenating a string of specific data elements</li> <li>✓ Stored within a 2-D matrix</li> <li>✓ A means of creating and utilizing life cycle data</li> </ul>	<ul style="list-style-type: none"> <li>✓ A physical method of communicating data, such as radio frequency identification (RFID) tags, contact memory buttons, linear bar codes, or 2-D data matrices</li> <li>✓ A replacement for the national stock number</li> <li>✓ Intelligent stand-alone data that contain information about an item</li> </ul>

**Table 1**

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.

## WHAT DOES A DoD UNIQUE ITEM IDENTIFIER (UII) MARK LOOK LIKE?

Recognizing the need for high data capacity and direct part marking capability, the DoD UII mark, as contained in MIL-STD-130M, is data matrix, a high density 2 dimensional matrix style bar code symbology that can encode up to 3116 characters from the entire 256 byte ASCII character set. The symbol is built on a square or rectangular grid arranged with a finder pattern around the perimeter of the bar code symbol. A data matrix symbol looks like this. Obviously, it is not possible for the human eye to read what has been encoded in the data matrix symbol.



## HOW IS THE DoD UII MARK READ?

Automatic identification technology (AIT) is used to mark (or write) the UII data elements within the data matrix symbol on an item and to read the UII, using an automated reader. To do this, the data elements have to be described to the AIT device by a prefix used to represent instructions to the device. These “prefixes“ are known as data qualifiers, referred to as semantics. “Data qualifier” means a specified character (or string of characters) that immediately precedes a data field that defines the general category or intended use of the data that follows. Data qualifiers can take one of three forms in commercial use: alphanumeric Data Identifiers (DI), numeric Application Identifiers (AI), or alpha Text Element Identifiers (TEI). For additional information on data qualifiers to be used in DoD IUID, refer to the DoD Guide to Uniquely Identifying Items at <http://www.acq.osd.mil/dpap/UID/Guides.html>.

## HOW DO YOU BUILD A DoD UII?

There are two methods to construct the UII for an item. These methods are: (1) Serialization within the Enterprise Identifier, called Construct #1, and (2) Serialization within the Original Part, Lot or Batch Number (within the enterprise identifier), called Construct #2. The UII data elements for Construct #1 and Construct #2 are summarized in Table 2.

	UII Construct #1	UII Construct #2	
Based on current enterprise configurations	If items are serialized within the Enterprise	If items are serialized within Part, Lot or Batch Number	
UII is derived by concatenating the data elements IN ORDER:	Issuing Agency Code* Enterprise ID Serial Number	Issuing Agency Code* Enterprise ID	
		Original Part # Serial Number	Lot or Batch # Serial Number
Data Identified on Assets Not Part of the UII (Separate Identifier)	Current Part Number**	Current Part Number**	
<small>*The Issuing Agency Code (IAC) represents the registration authority that issued the enterprise identifier (e.g., Dun and Bradstreet, EAN.UCC). The IAC can be derived from the data qualifier for the enterprise identifier and does not need to be marked on the item.  **In instances where the original part number changes with new configurations (also known as part number roll), the current part number may be included on the item as a separate data element for traceability purposes.</small>			

Table 2

The concatenated UII is not normally marked on the item because the UII can be constructed from its component data elements each time the data matrix symbol is read, as long as those elements are contained in the data matrix. The current part number is not part of the UII. It is an additional, separate data element. Table 3 shows the data qualifiers to be used in constructing the UII.

Semantics Translation Between Data Identifiers (DI), Application Identifiers (AI), and Text Element Identifiers (TEI)

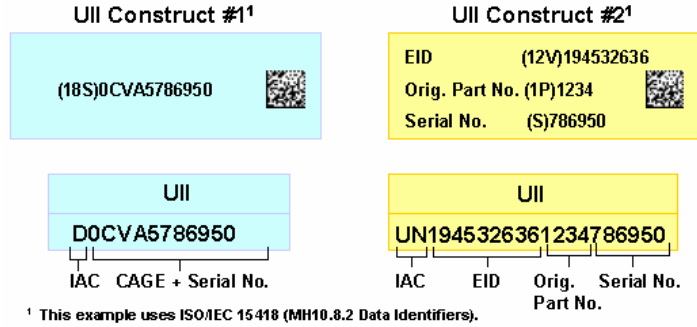
Enterprise ID	DI	AI	TEI
CAGE/NCAGE	17V		CAG, MFR or SPL
DUNS	12V		DUN
EAN.UCC	3V	95	EUC
Serial No. w/in Enterprise Identifier			SER or UCN
Serial No. w/in Original Part No.	S	21	SEQ
Original Part No.	1P	01	PNO
Unique Identifier (With IAC)	25S	8004	
Item Identifier (Without IAC)	18S		UID, USN or UST
Current Part No.	30P	240	PNR

Table 3

## HOW ARE THE BUILDING BLOCKS' DATA ELEMENTS PUT TOGETHER?

Once the data elements are identified to the AIT device, the AIT device needs instructions on how to put the data element fields together to create the UII. The instructions are referred to as message syntax. For items that require a UII, DoD requires syntax that follows ISO/IEC 15434, Information Technology – Syntax for High Capacity ADC Media. Standard syntax is crucial to the UII, since the process of identifying and concatenating the data elements must be unambiguous.

Figure 1 shows examples of the data elements and Data Identifiers that are placed on the item within the Data Matrix symbol. The ISO/IEC 15434 syntax encoded in the data matrix, using ISO/IEC 15418 (MH10.8.2 Data Identifiers) Format Indicator 06, for Construct #1 is  $]\rangle^R_s06^G_s18S0CVA5786950^R_s^E_o_T$ . For Construct #2, the encoded syntax is  $]\rangle^R_s06^G_s12V194532636^G_s1P1234^G_sS786950^R_s^E_o_T$ . The figure further shows how the AIT devices would output the data elements in a concatenated UII according to the syntax instructions. Notice that the UII data elements contained in the Data Matrix symbol can also be included on the item in human readable form.



**Figure 1**

Figure 2 shows an example of the data elements and Application Identifiers that are placed on the item within the Data Matrix symbol. When using EAN.UCC Application Identifiers (ISO/IEC 15418) for purposes of unique identification, enterprises must use the General EAN.UCC Specifications to construct the unique identifier. Within the General EAN.UCC Specifications, the Global Individual Asset Identifier (GIAI) is considered a IUID equivalent. The application identifier (8004) indicates that the data field contains a GIAI. The GIAI is made up of the EAN.UCC Company Prefix and an individual asset reference number. This is equivalent to the UII Construct #1. The data is encoded as follows under Format Indicator 05 for Application Identifiers of the ISO/IEC 15434 syntax:  $[>^R_s05^G_s800406141411A0B9C3D6^R_s^E_o_T]$ . For Construct #2, the encoded syntax is:  $[>^R_s05^G_s0100614141999996^G_s211A0B9C3D6^R_s^E_o_T]$ . The figure further shows how the AIT devices would output the data elements in a concatenated UII according to the syntax instructions.



**Figure 2**

Figure 3 shows examples of the data elements and Text Element Identifiers that are placed on the item within the Data Matrix symbol. The ISO/IEC 15434 syntax encoded in the data matrix, using the Format Indicator 12, for Construct #1 would be  $[>^R_s12^G_sMFR\ 0CVA5^G_sSER\ 786950^R_s^E_o_T]$ . For Construct #2, the encoding would be:

$[ ] >^R_s 12^G_s \text{MFR } 0\text{CVA}5^G_s \text{PNO } 1234^G_s \text{SER } 786950^R_s \text{E}_T$ . The figure further shows how the AIT devices would output the data elements in a concatenated UII according to the syntax instructions.

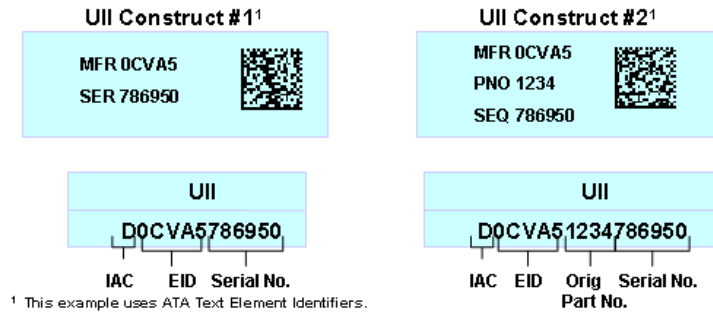


Figure 3

## RECOGNIZED DoD IUID EQUIVALENTS

A commercial identifier can be considered for use as a DoD IUID equivalent if it meets all of these criteria: (1) Must contain an enterprise identifier, (2) Must uniquely identify an individual item within an enterprise identifier, product or part number, and (3) Must have an existing Data Identifier (DI) or Application Identifier (AI) listed in American National Standard (ANS) MH10.8.2, Data Identifier and Application Identifier Standard. The commercial unique identifiers meeting these criteria that the Department recognizes as IUID equivalents are the EAN.UCC Global Individual Asset Identifier (GIAI) for serially-managed assets, the EAN.UCC Global Returnable Asset Identifier (GRAI) for serialized returnable assets, the ISO Vehicle Identification Number (VIN) for vehicles, and the Electronic Serial Number (ESN) for cellular telephones and other wireless handheld devices only.

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