

# NSWC Corona Successfully Implements IUID for Marine Corps Gage Program

**Background** - The Naval Surface Warfare Center (NSWC) at Corona began implementing Item Unique Identification (IUID) in 2005 to support the United States Marine Corps Infantry Weapon Gage Calibration Program (IWGCP). This program was established in the early 1980's to assist with the calibration of weapon gages, addressing the needs for physical interchangeability and mechanical interoperability.

The program is an integral part of many weapon systems and ensures that interface control requirements are met. Gages are used to ensure both **weapon safety** and **predictable weapon performance**. Although weapons become hazardous when grossly out of calibration, a significant and relevant hazard arises when inaccurate weapons allow return-fire from the enemy. **When Marines lose confidence in the performance of their weapons other hazards also arise due to hesitation and slowing the pace of war.**

**What is IUID?** - IUID differentiates one item from another by assigning Unique Item Identifiers (UII). A UII is a set of data for tangible assets that is globally unique and unambiguous. It ensures data integrity and data quality throughout the item's life. Key identification information is encoded and marked on each individual item by using a 2D Data Matrix (Figure 1).



Figure 1. 2D Data Matrix

**IUID Requirements** - The IUID requirement has been specified and effective in policy since 29 July 2003 as per Mr. Michael Wynne in his role as acting Under Secretary of Defense for Acquisition, Technology & Logistics. **IUID is required for items with an initial acquisition cost of \$5,000 or greater.** For items costing less than \$5,000, **IUID is required if the requiring activity determines that they are DoD serially managed, mission critical, or controlled inventory, or if permanent identification is desired.** IUID also applies to DoD serially managed subassemblies, components, or parts that are embedded in delivered items, as well as the parent item of the embedded item.

Of the 57 different varieties of infantry weapon gages,

totaling more than 25,000, few individual gages meet the \$5,000 financial threshold. However, **nearly all of the gages are serially managed and therefore require IUID** policy implementation.

## **IUID Implementation** -

Once it has been determined that IUID is required, one of the next steps is to determine the method for marking the 2D Data Matrix. Potential methods include **direct part marking (e.g, laser etching, dot pen and electro-chemical etching), labels or data plates.** NSWC Corona implemented laser marking and uses Telesis Zenith 10F Laser for most of the gages which are metal based, and the Telesis SABRE 30CO<sub>2</sub> marking system (used for organic marking). After months of marking and implementing IUID, NSWC Corona learned many valuable lessons. First, laser etching is an art, not a well-defined science. Factors such as **contrast, lighting, materials, surface, spatial geometries and marking products** all play important roles.



Figure 2. Gage marked with 2D Data Matrix

NSWC Corona also stressed the importance of establishing an IUID team. Marking on surfaces with low tolerances can impact the item. For example, the M-16 rifle uses a gage that checks the straightness of its barrel. This gage is a straight rod of steel that cannot be bent more than .0002 of an inch. The laser etching of the 2D Data Matrix in the center of the gage creates enough heat to "warp" the gage, making it unusable. However, etching the mark near either end of the gage prevents warping. Another lesson learned was that a low power setting with multiple passes created a clear data matrix symbol that met the quality standards. Incorporating an IUID technical lead or engineer early in the process of IUID implementation and marking helps to determine the hidden risks to the

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program, such as warping the gages.

**Benefits** are being realized with the implementation of IUID. General IUID benefits include **cost reductions, increased efficiency** of data input, **decreased manual entry errors, and increased validity of important information.** The Gage Pilot Program expects additional benefits built on enhanced data quality realized through their IUID implementation. With high quality data, analysts are able to determine the longest possible calibration intervals. This will maximize the gage's availability and thereby lower costs by reducing shipping and lab time. IUID also significantly reduces lab time by eliminating the need to research original serial numbers for gages after Marines execute a maneuver known as "in field re-serialization." Prior to utilizing IUID technology, Marines in the field would often manually re-serialize gages by removing the gage's serial number and replacing it

core reason to mark the gages with a 2D Data Matrix. In addition, incorporating the 2D Data Matrix has led to saving **4-5 man hours per week** (conservative estimate). The man hours saved are associated with time spent attempting to locate gages, reading the in-field serialization, and matching the gages to documentation.

### General Benefits of IUID:

- Improves item acquisition, management, deployment, and repair
- Increases asset visibility and traceability
- Provides greater business intelligence
- Improves systems / equipment operational availability
- Lowers asset management costs
- Enables clean financial audits
- Increases productivity



Figure 3. Example of in field re-serialized gage damaged beyond repair or use.

with a serial number matching their inventory list. In field re-serialization not only increases lab time and costs for each re-serialized gage, it injects errors into the data. "Noisy" data leads to wider confidence intervals during analysis and masks subtle, though potentially significant, trends. Eliminating this problem for the program was in fact the



Figure 4. NSWC Corona marks IUID 2D Data Matrix on USMC gages for small arms (shown above in use by warfighters in theater).

