AUSTRALIAN GOVERNMENT

AUSTRALIAN DEFENCE STANDARD

DEF(AUST) 1000C / Issue 3 / Type S

Dated 02 Sep 2010

SUPERSEDING
DEF(AUST) 1000C / Issue 2 / Type S
Dated 25 Oct 2005

ADF PACKAGING STANDARD

PART 12: AUTOMATIC IDENTIFICATION TECHNOLOGY LABELLING AND MARKING

PUBLISHED UNDER AUTHORITY OF DEPARTMENT OF DEFENCE

USAGE: Maritime, Land, Air

NSC: Pack

DEF(AUST) 1000C Part 12 / Issue 3 / Type S Dated 02 Sep 10

DOCUMENT MANAGEMENT INFORMATION

Ownership and responsibility for approval and acceptance of this specification is detailed below.

Sponsoring Defence Group:	Vice Chief of Defence Force Group	
Sponsoring Organisation:	Joint Logistics Command	
Sponsoring Appointment:	DGSL	
Specification Author:	AIT Capability Management Office	Approved: 1 Jul 10
Approval Authority:	DGLEA	Approved: 02 Sep 10
Design Acceptance Authority Rep	DGLEA	Approved: 02 Sep 10
Executive Authority:	LEA - SEM	Approved: 02 Sep 10

WARNING

This document may call for use of substances and test procedures that may be injurious to health if adequate precautions are not taken. This document refers only to technical suitability and in no way absolves either the supplier or user from statutory obligations relating to health and safety at any stage of manufacture or use.

WARNING

In order to comply with Defence waste minimisation policy, users are reminded of their obligations to maximise use of recycled materials (where possible) and the intent of the National Packaging Covenant in material decisions. Further information is available at : http://www.defence.gov.au/environment/waste.

WARNING

This Standard is to be applied to the packaging of ammunition and explosives as follows:

All EO specific test equipment and non explosive items managed by Munitions Branch and Guided Weapons Branch should meet the requirements of this specification wherever possible.

All EO items (Class 1 Dangerous Goods) managed by Munitions Branch and Guided Weapons Branch that have been specifically identified as requiring barcodes as part of their management should meet the requirements of this specification wherever possible.

No EO item (Class 1 Dangerous Good) is to use RFID technologies until such time as the hazards associated with, and impacts on, EO items has been fully assessed and applicable policy and procedures promulgated.

DEF(AUST) 1000C Part 12 / Issue 3 / Type S Dated 02 Sep 10

ADF PACKAGING

Prepared by the Defence Packaging Committee under the Authority of the Defence Standardisation Coordination Group.

Specific inquiries regarding the application of this Standard to Requests for Tender or contracts should be addressed to the Procurement Authority named in the Request for Tender or to the Quality Assurance Authority named in the contract, as appropriate.

This Specification is mandatory for use by the RAN, Australian Army and RAAF, and Contractors to the ADF.

This Specification supersedes DEF(AUST)1000C PART 12 Amendment 2 dated October 2005

DEF(AUST)1000C is issued in 20 parts, with each part sub-divided into Sections. The 20 parts are:

PART 1: General Information[1]
PART 2: Packaging Requirements[1]
PART 3: Packaging Practices and Materials[1]
PART 4: Standard Packaging Test Procedures[1]
PART 5: Marking of Packages[1]
PART 6: Packaging of Dangerous Goods (Except Dangerous Goods Class 1); Packaging Requirements and Packaging Mediums[1]
PART 7: Packaging for Material Susceptible to Damage by Electrostatic Discharge[1]
PART 8: Defective Packaging Reporting System[1]
PART 9: Requirements for Reusable Containers[1]
PART 10: Australian Quarantine Inspection Service (AQIS) Requirements[1]
PART 11: Unitisation[1]
PART 12: AIT Labelling and Marking[1]
PART 13: Packaging Material Catalogue
PART 14: Minimum Packaging Specifications of Commercial Items[1]
PART 15: Packaging Specifications and Classification Systems[1]
PART 16: Creative Brief Template
PART 17: Packaging ILS Checklist
PART 18: Life Cycle Analysis
PART 19: Caching
PART 20: Techniques for Deployment, Packaging and Storage for Tropical Conditions

[1] Denotes available at http://www.defence.gov.au/dmo/lsd/standards/def_aust_1000.cfm

Two or more parts may apply to any one packaging requirement and it is essential that all parts be considered and used where appropriate.

TABLE OF CONTENTS

LIST OF ANNEXES

TABLE OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 FOREWORD

1.1.1 The purpose of this PART of the Defence Packaging Standard is to standardise the application of Automatic Identification Technology (AIT) to Defence packaging and Defence materiel.

1.1.2 Defence logistic information systems are to apply Automatic Identification and Data Capture (AIDC) techniques that are consistent with this standard in future enhancements and replacement systems.

1.1.3 Although PART 12 is designed to meet most contingencies it may be necessary for a Defence logistic information system to publish supplementary instructions to meet specific requirements.

1.1.4 PART 12 only addresses the AIT aspects for Defence packaging and materiel. It is essential that all parts of the packaging standard are considered and used where appropriate. PART 5 is particularly significant as it concerns the marking of packages (with or without AIT) and specifies the general requirements to be observed in the marking of Defence materiel.

1.2 SCOPE

1.2.1 This standard provides the requirements for the application of AIT labelling and marking to Defence packaging and Defence materiel.

1.2.2 This standard currently addresses the requirements for the following AIT:

a. Bar codes; and

b. Radio Frequency Identification (RFID).

1.3 DOCUMENT OVERVIEW

1.3.1 The intent of the standard is to align Defence AIT labelling and marking initiatives with:

a. International and Australian standards;

b. Industry practices; and

c. NATO standardisation agreements.

1.3.2 The method of applying international and Australian standards is to be consistent with NATO standardisation agreements. Whenever possible industry practices are to be accommodated to maximise the reuse of commercial AIT labelling and marking, minimising the requirement for commercial commodities to be repackaged and labelled.

1.3.3 Defence logistic information systems implementing AIDC techniques or planning to introduce new AIT labelling or marking methods are to be cognizant of the intent of this standard. AIDC can occur at many different levels in the supply chain, by different entities and by different information systems. Each system must be able to identify and trace the item so that reference can be made to associated information such as configuration, maintenance history, address, order number, contents, weight, sender, serial, batch or lot number. The information exchanged between systems depends upon AIT labelling and marking to have been applied to Defence packaging and materiel in a standardised and consistent manner.

1.3.4 This standard recognises the existence of a range of industry specific specifications for storing data within a range of AIT data carriers. Defence projects undertaking acquisition from specific industries (such as the aerospace industry) should review the standard and when there is the opportunity clearly articulate Defence AIT requirements within the contractual framework.

1.3.5 No part of this standard is classified for security purposes.

1.4 LABEL EXAMPLES

1.4.1 Figures of labels in this standard are provided to illustrate a bar code symbology, bar code placement and any associated Human Readable Interpretation (HRI) of the encoded data. The remaining text and layout of the label are examples only. DEF(AUST) 1000C Part 5 - Marking of Packages, provides the requirements for the marking and placement of labels to Defence packaging.

1.4.2 Figures provided in this standard are not to scale.

1.5 INTENDED AUDIENCE

1.5.1 The AIT Labelling and Marking standard is intended for use by:

a. Defence suppliers, including Original Equipment Manufacturers (OEM);
b. Defence warehouse and distribution operators, including contractors;
c. Defence capability project staff (major and minor);
d. Defence capability sustainment, Systems Program Office (SPO) staff;
e. Defence fleet managers;
f. Defence capability development staff; and
g. Defence Logistic Information Systems staff.

2 DOCUMENTS

2.1 GENERAL

2.1.1 The references listed in Annex A form part of the standard to the extent specified herein.

2.2 ORDER OF PRECEDENCE

2.2.1 In the event of a conflict between the text of this standard and the references cited herein, the text of this document takes precedence. However, nothing in this document supersedes applicable laws and regulations unless a specific exception has been obtained.

3 DEFINITIONS AND ACRONYMS

3.1 GENERAL

3.1.1 The Australian Macquarie Dictionary fourth edition, 2005 is the reference source for all terms used in this standard, except for those defined within the standard.

3.2 DEFINITIONS

3.2.1 The definitions for terms used within this standard are listed in Annex B.

3.3 ACRONYMS

3.3.1 Acronyms used within this standard are listed in Annex C.

4 AUTOMATIC IDENTIFICATION

4.1 GENERAL

4.1.1 There are considerable benefits if the identity of Defence packages and materiel is represented in some form of AIT media and attached to or applied to the item so that:

a. It can be read electronically, thus minimising errors;

b. One identity can be used by all parties;

c. Each party can use the identity to locate associated data within applicable information systems; and

d. Traceability is established between information exchanged by supply chain partners and the physical flow of the item.

4.1.2 AIT media may contain information in addition to a unique identifier for a range of AIDC processes. The additional information can remove or minimise the requirement to access associated data from an information system.

4.2 ITEMS OF PRODUCTION

4.2.1 Items of production refer to products grouped under the same manufacturer identifier and conforming to the same design, specifications and quality criteria. Supplementary information may be included to facilitate processing and unique identification, such as; batch/lot number, serial number, production date and expiry date.

4.3 TRADE ITEMS

4.3.1 A trade item is an item of production upon which there is a need to retrieve pre-defined information. A trade item may be priced, ordered or invoiced at any point in any supply chain.

4.3.2 The Global Trade Item Number (GTIN) is the required AIT identifier for a trade item.

4.3.3 To enable Defence to utilise a trade item GTIN as an identifier in AIT systems, procurement of Commercial-Off-The-Shelf (COTS) products shall consider Unit of Issue (UOI) quantities based upon established trade items. This will enable units to be issued with items packaged and labelled as a trade item.

4.3.4 Whenever a Defence project or acquisition activity has the opportunity to influence the allocation of an identifier to a trade item, the GTIN shall be recommended.

4.4 TRADE UNITS

4.4.1 Trade units are items of production not intended for sale at the retail Point-of-Sale (POS). They may be a standard and stable grouping or a series of single trade items intended to be scanned in situations such as a warehouse or production environment. Trade units may be presented in a wide variety of physical forms, such as; cartons, crates and pallets of trade items.

4.4.2 The GTIN is the required AIT identifier for a trade unit.

4.4.3 To enable Defence to utilise a trade unit GTIN as an identifier in AIT systems, procurement of COTS products shall consider Unit of Purchase (UOP) quantities based upon established trade units. This will enable Defence to procure and store stock already packaged and labelled as a trade unit.

4.4.4 Whenever a Defence project or acquisition activity has the opportunity to influence the allocation of an identifier to a trade unit, the GTIN shall be recommended.

4.5 ITEMS OF SUPPLY

4.5.1 The NATO Codification System (NCS) is based upon an "Item of Supply" concept, establishing an identifier for an object or group of objects that meet a specific requirement. All items of supply are identified by a unique identification number, the NATO Stock Number (NSN). The Military supply chain operates using the item of supply concept requiring products to be acquired, shipped, stored and supplied based upon the NSN.

4.5.2 An item of supply is not necessarily confined to the product of one manufacturer. Products from more than one manufacturer may be allocated the same NSN provided that the products satisfy the item of supply concept (same form, fit and function). A single NSN may reference multiple GTINs which may be interchangeable in application.

4.6 LOGISTIC UNITS

4.6.1 A logistic unit is an item of any composition established for transport and/or storage which needs to be managed through the supply chain.

4.6.2 Logistic units may consist of items, cases or cartons, part or whole pallets, containers and the like. Each packaging type itself may be composed of a single product or multiple products. A consignment may comprise of any number of logistic units.

4.6.3 Commercial suppliers may provide logistic units composed of a homogeneous product or products.

4.6.4 Military logistic units may comprise of a range of items of supply (one or more NSN) packaged to satisfy requisitions raised by one or more supported organisations.

4.6.5 The Serial Shipping Container Code (SSCC) shall be the preferred AIT identifier for logistic units.

4.6.6 The SSCC or 'licence plate' is the key that provides access to additional electronic information pertaining to the logistic unit. The identifier may be used by all trusted partners to retrieve information about the logistic unit itself or about the status of the physical movement of the logistic unit in the supply chain. It enables systems to track and trace individual logistic units.

4.7 UNIQUE IDENTIFICATION (UID)

4.7.1 Defence assets and inventory may be labelled or directly marked for the purpose of uniquely identifying and distinguishing them from other like and/or unlike items. Tangible items are distinguished from one another by the assignment of a unique identifier in the form of a unique data string and encoded in a bar code placed on the item[1].

4.7.2 A Unique Identification (UID) mark shall be applied directly to the surface of the item (direct part marking) or shall be applied to an identification plate, tag or label securely fastened to the item. The UID is intended to be a permanent mark and cannot be changed over the life of the item.

4.7.3 The unique data string derived from the UID and used by the associated information system(s) is called a Unique Item Identifier (UII).

[1] RFID tags may be used as UID for industry/commercial application. Defence does not currently accept RFID as an acceptable UID label.

5 SUPPLIER REQUIREMENTS

5.1 PRODUCT LABELS

5.1.1 Product labels shall be applied to the packaging of trade items and units by suppliers and manufacturers.

5.1.2 Whenever possible products acquired by Defence shall be apply AIT labelling and marking in accordance with the GS1 System. This applies to the acquisition of COTS and Military-Off-The-Shelf (MOTS) products.

5.1.3 Defence projects and acquisition activities acquiring MOTS products shall specify the GS1 System for AIT applied to product labels whenever the option exists to influence the OEM or supplier.

5.1.4 The GTIN is the unique identifier for a product label. In the case of retail labelling, the GTIN will be encoded in a single bar code (EAN/UPC or DataBar symbology). Table 1 summarises bar code options available to Defence suppliers under the GS1 System.

Product	Bar Code Symbology	
	GTIN	Attributes
Retail (Point of Sale) Trade Item	EAN/UPC DataBar	GS1-128 DataBar
Non-Retail Trade Item	EAN/UPC ITF-14[2] GS1-128	GS1-128

Table 1 - GTIN and Bar Code Options

5.1.5 Product attributes (such as; expiry date, batch/lot number and serial number) can be included within one or more additional GS1-128 bar codes. The GS1 System requires the additional attributes to be identified through the use of Application Identifiers (AI). Although multiple AI can be encoded in a single bar code, the need to add extra bar codes is dependent on a range of factors including size and shape of the substrate, the amount of data and the reading aperture of the scanning equipment. Refer to Annex D for AI detail.

5.1.6 To enable products to be identified and managed by Defence as items of supply, product labels are expected to include the NSN as an additional attribute in a GS1-128 bar code.[3] The requirement to include the NSN shall be incorporated into the applicable procurement contract by the Defence project or acquisition activity (when considered cost effective). The NSN is identified by AI 7001.

5.1.7 Figure 1 is an example of a GS1-128 bar code to be included for an item of supply that has no attributes other than an NSN. This bar code would be provided in addition to the GTIN barcode (an EAN/UPC bar code).

Figure 1 - Example EAN/UPC Bar Code with NSN encoded in a GS1-128 Bar Code

[2] ITF-14 is used on packaging material such as fibreboard, where quality standards cannot be met with GS1-128.

[3] The NSN is included in accordance with the GS1 specification as an additional attribute in an existing bar code, an additional bar code or an additional label.

5.1.8 Defence AIT systems shall be used to produce an inventory label at the point of receipt (to a Defence warehouse) or issue (from a Defence warehouse) to enable products to be managed as items of supply within the Defence supply chain when the NSN has not been included as an attribute in the product label.

5.1.9 The GS1 specification provides the requirements for HRI of the AIT. Suppliers to Defence shall be expected to satisfy GS1 requirements.

5.1.10 DEF(AUST) 1000C Part 5 - Marking of Packages, provides the requirements for the marking and placement of labels to Defence packaging.

5.2 SHIPPING LABELS

5.2.1 Shipping labels are applied by a supplier to the outer packaging of a logistic unit for distribution and receipt by Defence.

5.2.2 *ISO 15394 - Packaging - Bar code and two-dimensional symbols for shipping, transport and receiving labels*, specifies the minimum requirements for the design of labels containing linear bar code and two-dimensional symbols on logistic units to convey data between trading partners. It also provides for traceability of logistic units via an identifier (licence plate).

5.2.3 *AS ISO/IEC 15459.1 - Unique Identifiers for Transport Units*, establishes the Australian standard for unambiguously identifying a logistic unit.

5.2.4 The GS1 Specification documents the requirements for industry shipping labels. Suppliers to Defence shall provide GS1 compliant shipping labels.

5.2.5 **Shipping Label Segments.** Label segments are logical groupings of information based on the data needs of the organisations distributing and tracking logistic units through the supply chain. Three segments are defined; carrier, customer and supplier. When the size and structure of the logistic unit permits, segments should be stacked vertically, from top to bottom, in the following order:

a. **Carrier Segment.** This section contains the information that is generally known at the time of shipment and is typically related to transport specific information such as; consignment numbers, route and handling.

b. **Customer Segment.** This section contains information that is generally known at the time of the order/requisition. Relevant information includes; ship-to, location, purchase order and requisition number.

c. **Supplier Segment.** This section contains the information that is generally known at the time of packaging. The SSCC is applied as the unit identifier. Other information relevant to the carrier and customer may also be applied such as; expiration, batch/lot number and serial numbers.

5.2.6 Within each segment, bar code information is separated from text information to facilitate separate manual processing from automatic data capture. Bar codes are represented in the lower part of each segment, while human readable information is shown in the upper part of the segment. Each label segment may be applied at a different point in time, as the relevant information becomes known.

5.2.7 The organisation responsible for printing and applying the label, determines the content, format and dimensions of the label.

5.2.8 Figure 2 (next page) is an example of a shipping label for a logistic unit comprising items of the same GTIN (a trade unit). The shipping label includes information the trading partner has requested (eg. Defence) based upon a specific order as well as the transport related information (for the commercial carrier). The label also illustrates how the supplier segment (comprising of AI 00, 02 and 37) may have been applied prior to the carrier and customer segment (comprising of AI 400, 401 and 410).

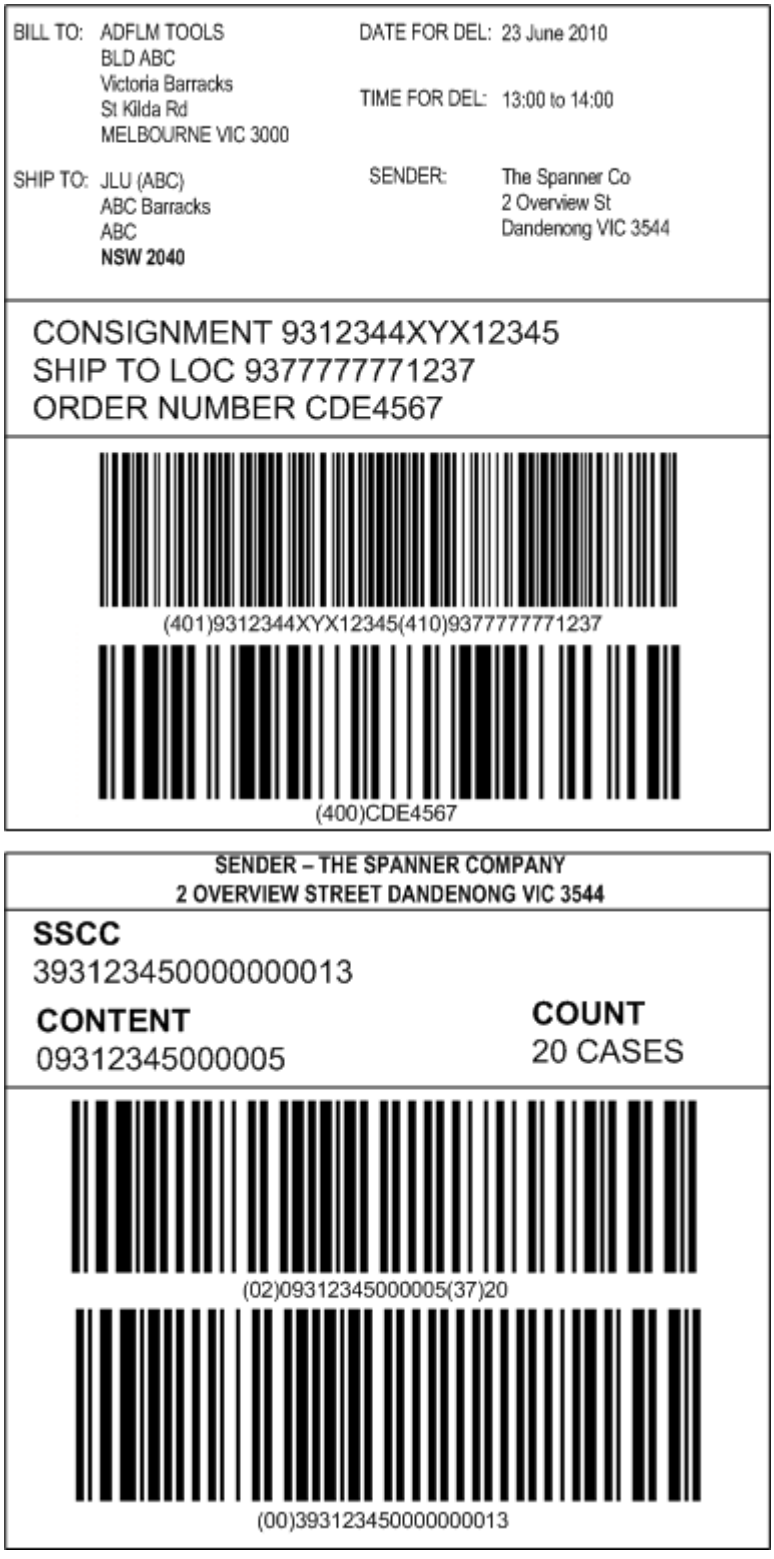


Figure 2 - Example OEM/Supplier Shipping Label (Two Labels)

5.2.9 Figure 3 is an example of a single shipping label produced by an OEM/supplier when all the information is known at the time of production/packaging by the supplier (and utilised by both the carrier and customer).

Figure 3 - Example OEM/Supplier Shipping Label (Single Label)

5.2.10 Table 2 identifies AI that may be applicable for inclusion within a bar code applied to a shipping label. Refer to Annex D for all available AI including format detail.

AI	Content	Data Title
00	Identification of a logistic unit (SSCC)	SSCC
02	GTIN of Trade Items contained in a logistic unit	GTIN
37	Count of Trade Items contained in a logistic unit	COUNT
330n[4]	Logistic weight, kilograms	GROSS WEIGHT (kg)
331n	Length or first dimension, metres, logistics	LENGTH (m), log
332n	Width, diameter or second dimension, metres, logistics	WIDTH (m), log
333n	Depth, thickness, height or third dimension, metres, logistics	HEIGHT (m), log
334n	Area, square metres, logistics	AREA (m^2), log
335n	Volume, litres, logistics	VOLUME (l), log
336n	Volume, cubic metres, logistics	VOLUME (m^3)
400	Customer's purchase order number	ORDER NUMBER
401	Global Identification Number for Consignment	GINC
402	Global Shipment Identification number	GSIN
403	Routing Code	ROUTE
410	Ship to (deliver to) GS1 Global Location Number	SHIP TO LOC
413	Ship for (deliver for forward to) GS1 Global Location Number	SHIP FOR LOC
420	Ship to (deliver to) postal code within single postal authority	SHIP TO POST
421	Ship to (deliver to) postal code with 3 digit ISO country code	SHIP TO POST
7001	NATO Stock Number	NSN

Table 2 - Example Shipping Label AI

5.2.11 Defence logistic systems shall utilise AI to receipt items of supply received as logistic units from a Defence Supplier (for example; AI 02, 37, 400 and 7001).

5.2.12 The minimum AIT media requirement for a shipping label is:

a. The SSCC shall be assigned by the organisation constructing the logistic unit;

b. The reallocation/reuse of an individual SSCC by an organisation shall occur in accordance with the GS1 specification;

c. The SSCC shall be encoded in a GS1-128 bar code;

d. The AI "00" shall be used as the data qualifier;

e. The minimum height of the SSCC bar code shall be 32mm;

f. The recommended minimum height for additional bar codes is 27mm;

g. The data encoded in the linear bar codes shall be presented in HRI below each bar code; and

h. The SSCC bar code shall be located on the bottom edge of the label.

5.2.13 The number of GS1-128 bar codes in the shipping label may be minimised by concatenating data elements, with the exception of the SSCC.

5.2.14 GS1 provides shipping label placement and location recommendations.[5]

[4] n indicates that these AI comprise of four digits. The first three identify the purpose of the AI and the fourth (n) indicates the position of the decimal point.

[5] The Australian Transport and Logistics Industry, Numbering and Bar-coding Guidelines and GS1 Australia User Manual.

5.3 UID LABELS AND DIRECT PART MARKING

5.3.1 Defence projects and acquisition activities that require the provision of a permanent AIT UID label or mark to be applied to items of production shall specify the provision of the applicable commercial UII shown in Table 3.

Commercial UII	Comment
GTIN + Serial Number	Serialised items of production
Global Individual Asset Identifier (GIAI)	For serial managed assets (in the Defence context this may be serial or equipment tracked assets)
Global Returnable Asset Identifier (GRAI)	For returnable assets containing a unique serial number (in the Defence context this identifier is most likely to have been applied by the vendor)
Vehicle Identification Number (VIN)	For vehicles only
International Mobile Equipment Identity (IMEI)	For cellular phones only

Table 3 - Defence Recognised Commercial UII

5.3.2 UII shall be encoded within GS1 compliant bar codes using AI as shown in Table 4.

Commercial UII	Required AI	Concatenated UII[6]
GTIN & Serial Number	01 & 21	<01> + <21>[7]
VIN	TBA	TBA
IMEI	8002	<8002>
GRAI	8003	<8003>
GIAI	8004	<8004>

Table 4 - UII Derived from AI

5.3.3 The manufacturer or supplier shall be responsible for assigning the UII to an item. This includes the responsibility to ensure uniqueness of the UII. Non-repeatable, worldwide uniqueness of the UII is achieved by ensuring the following:

a. The UII shall not change over the life of the item,

b. The component data elements of the UII shall not change over the life of the item, and

c. The enterprise shall ensure that the UII data string produced is unique in its concatenated form.

5.3.4 Rules for constructing a UII include:

a. The UII shall be constructed using only the specified AI (Table 4);

b. The value of the AI is removed from the data string;

c. All non-alphanumeric characters except for hyphen/minus "-" and solidus "/" will be deleted from the original part number and serial number.

d. The UII shall only contain uppercase English alphabet characters "A" through "Z", numeric characters 0 through 9, and the non-alphanumeric characters "-" and "/"; and

e. Use of the letters I, L, O and Q are discouraged from future use but are permitted.

[6] The enclosure of the AI in angle brackets, eg. <8003>, is the notation used to indicate the value (character string) associated with the data qualifier.

[7] The UII is the concatenation of the character strings found in AI 01 and AI 21 in the order shown.

5.3.5 The Defence preferred bar code symbology for AIT UID is the GS1 Data Matrix. The AI shall be encoded into the bar code in accordance with the GS1 Specification.

5.3.6 Figure 4 is an example of a UID label and Figure 5 is an example of a UID marked directly upon an item.

Figure 4 - Example GS1 GIAI UID Label

Figure 5 - Laser Etch UID Mark (with Serial Number as HRI)

5.3.7 The required marking shall be applied to an identification plate, identification band, identification tag, or identification label securely fastened to the item, or shall be applied directly to the surface of the item.

5.3.8 Direct identification marking methods shall account for final finished condition of the item including paints, coatings, and sealants to assure readability. Marking methods and guidance for UID labels and markings are included in Annex E and Annex F.

5.3.9 Marking of items shall be accomplished in a manner that will not adversely affect the item's ability to meet its required performance.

5.3.10 The responsible engineering design authority shall determine the appropriate labelling or marking method.

5.3.11 Whenever practicable, the location of the marking on the item shall ensure its readability during normal operational use.

5.3.12 The UID label shall be as permanent as the normal life expectancy of the item and be capable of withstanding the environmental tests and cleaning procedures specified for the item to which it is affixed.

5.3.13 The direct identification marking method should be selected to ensure the mark will withstand the specified rebuild processes.

5.3.14 If it is not feasible to mark an item with Machine Readable Information (MRI) that will survive its intended life cycle, the item shall be marked in a way that will survive its anticipated life cycle up to the point of rebuild. The rebuild process shall then ensure that the UII is linked with the item until the part can be remarked with the original UII data prior to leaving the rebuild facility.

5.3.15 HRI shall also be permanently applied to the item. The entire UII is preferred, in the case of a GTIN + Serial number UII the serial number will be acceptable.

5.3.16 Data qualifiers and data elements may be included as HRI on a UID label when sufficient space exists.

5.3.17 UII may be constructed by manufacturers and suppliers using alternate combinations of data elements and data qualifiers. Whilst these alternatives satisfy the requirement for uniqueness, the use of these UII in the Defence supply chain shall be by exception. Defence projects or acquisition activities introducing UID labels and markings with alternate UII shall consult with Strategic Logistics Branch (SLB), Joint Logistics Command (JLC) prior to acquisition.

5.3.18 The preferred and alternate UID are detailed in:

a. *STANAG 2290 - NATO Unique Identification of Items*.

b. *AS ISO/IEC 15459.4 - Unique Identifiers for Supply Chain Management*.

c. The Air Transport Association of America Specification 2000 (ATA Spec 2000) international standard (for aerospace items, both military and civil).

5.4 NON-GS1 COMPLIANT LABELS AND MARKINGS

5.4.1 The introduction of products into the Defence supply chain with non-GS1 compliant product labelling shall be by exception. Defence projects or acquisition activities introducing products to be stored and distributed within the Defence supply chain with non-GS1 compliant AIT shall consult with SLB, JLC prior to acquisition.

5.4.2 Products produced by some international sectors of the Defence industry do not follow the GS1 System. An example is the *ATA Spec 2000* international standard that applies to aerospace components.

5.4.3 The following requirements are applicable for non-GS1 compliant product labelling:

a. The NSN shall be included within the AIT;

b. The linear bar code symbology shall be Code 128;

c. The two dimensional bar code symbology shall be Data Matrix;

d. The preferred data qualifiers are AI; and

e. Alternate data qualifiers shall be either: Data Identifiers (DI)[8] or Text Element Identifiers (TEI)[9].

5.4.4 Defence AIT systems shall be used to produce an inventory label at the point of receipt (to a Defence warehouse) or issue (from a Defence warehouse) to enable these products to be managed as items of supply within the Defence supply chain.

[8] DI has been implemented by the Federation of Automatic Coding Technologies (FACT).

[9] TEI has been implemented by the ATA Spec 2000.

6 DEFENCE REQUIREMENTS

6.1 INVENTORY LABELS

6.1.1 Inventory labels are applied by Defence to the packaging of an item of supply held as inventory within Defence warehouses and shall be applied when:

a. Items of Supply are repackaged; and

b. Existing product labels can not be employed as an inventory label.

6.1.2 The NSN as the unique identifier is the minimum data to be encoded. The inventory tracking classification of the item determines the requirement to encode additional attributes. The item may be managed by one or more of the following attributes (in addition to the NSN):

a. Serial Number,

b. Equipment Tracking Number (Plant Number),

c. Batch lot, and

d. Shelf life.

6.1.3 Inventory labels shall be produced by Defence AIT systems. Figure 6 to Figure 11 are examples of interim inventory labels.

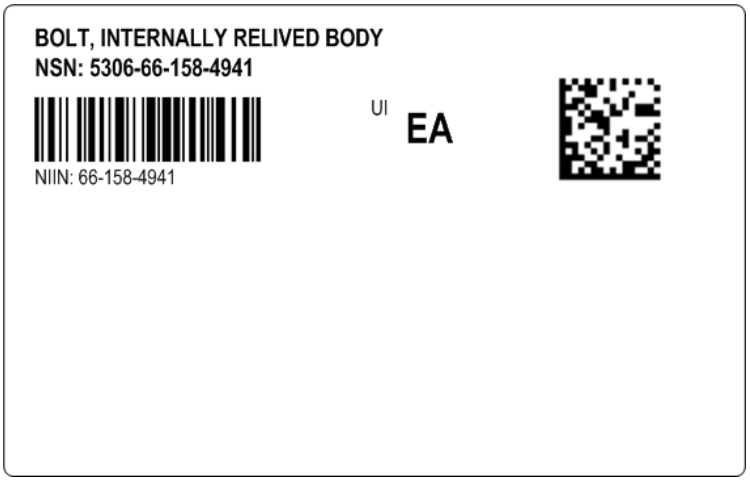


Figure 6 - Example Interim Quantity Tracked Item Inventory Label

Figure 7 - Example Interim Equipment Tracked Item Inventory Label

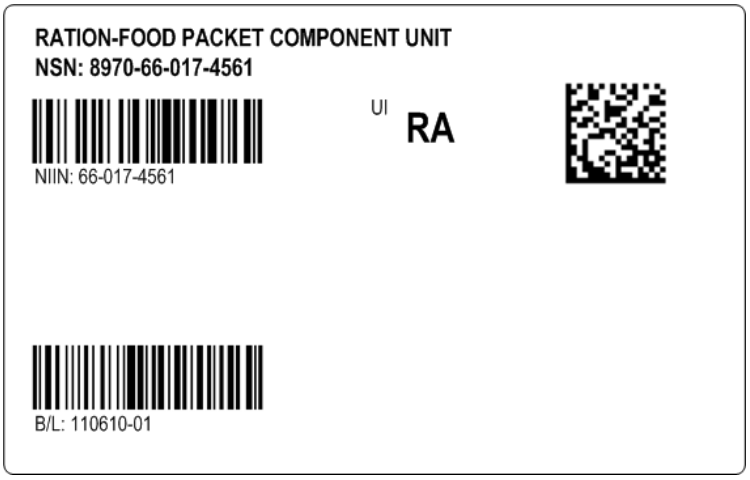


Figure 8 - Example Interim Batch Lot Managed Item Inventory Label

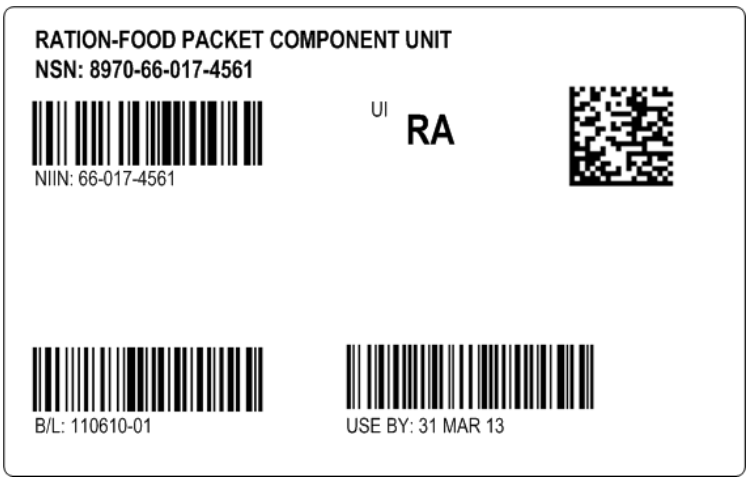


Figure 9 - Example Interim Batch Lot and Shelf Life Managed Item Inventory Label

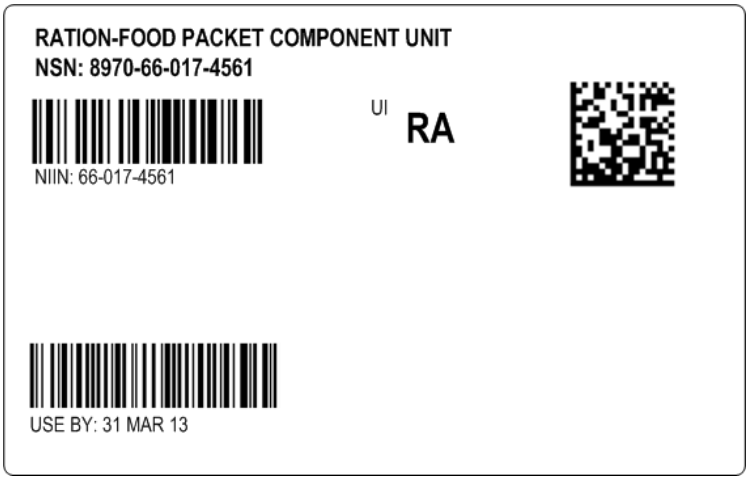


Figure 10 - Example Interim Shelf Life Managed Item Inventory Label

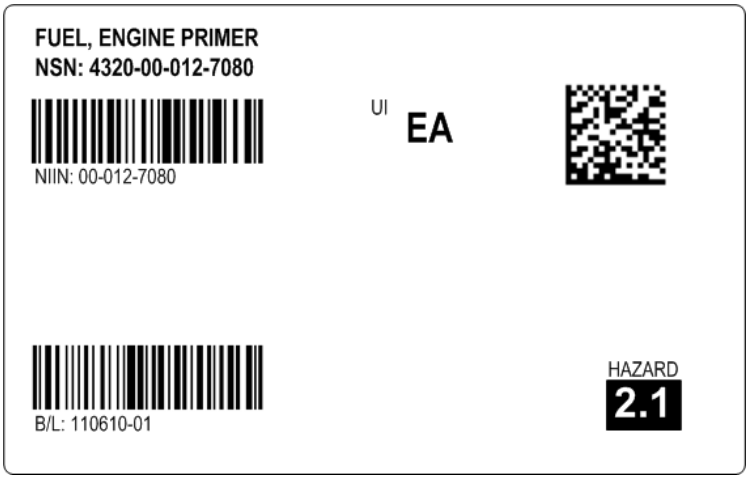


Figure 11 - Example Interim Batch Lot Managed Item with Hazardous Material code Inventory Label

6.1.4 Individual Code 128 bar codes shall be used to encode each of the attributes without data qualifiers. The format of the data is based upon the information in the existing Defence AIT systems. The encoded data is described in Table 5.

Attribute	Format[10]	Comment
NSN	n9	Only the NATO Identification Number (NIIN) is encoded
Serial Number	an..30	
Equipment Tracking Number	an..30	Also referred to as 'Plant Number'
Batch Lot	an..10	
Shelf Life	an9	"DD MMM YY" format

Table 5 - Legacy Inventory Label Data Elements

[10] "n" - numeric, "an" - alphanumeric, "an..30" - variable length up to 30, "an11" - fixed length of 11 alphanumeric characters.

6.1.5 A single GS1 Data Matrix bar code compliant with GS1 specifications shall be used to encode all the above attributes using AI data qualifiers. The data elements to be used are shown in Table 6.

Attribute	AI	Format	Comment
NSN	7001	n13	NSN numerical characters only, no separator character ("-").
Serial Number	21	an..20	Serial Number – may be original part number from supplier (20 characters or less in length)
	250	an..30	Secondary Serial Number (30 characters or less in length, to be used when a serial number is more than 20 characters in length)
Equipment Tracking Number	241	an..30	Customer Part Number
Batch Lot	10	an..20	Batch or Lot Number
Expiry Date	17	n6	"YYMMDD" format[11]

Table 6 - Inventory Label AI Data Elements

6.1.6 The data elements listed in Table 6 are not exhaustive and do not prevent projects, suppliers or internal Defence AIT systems from encoding additional data elements into the Data Matrix bar code. Examples of additional data elements are:

a. GTIN (when the contents are provided from a supplier),

b. GIAI (when the label has been applied to a package containing a single item), and

c. GRAI (when the label has been applied to a package containing a single item).

6.1.7 The data encoded in the linear barcodes shall be presented in HRI below each bar code. HRI for the GS1 Data Matrix bar code is not required.

6.1.8 Additional information on the inventory label includes:

a. The NSN in a format that includes the separator character;

b. The Item of Supply Name;

c. The UOI; and

d. The hazardous material code (if required).

6.1.9 DEF(AUST) 1000C Part 5 describes the information requirements to be applied to the packaging of items of supply including the placement of inventory labels.

[11] Refer to GS1 Specification regarding century calculations.

6.2 SHIPPING LABELS

6.2.1 Shipping labels are applied by the Defence supply chain to facilitate packing, dispatch, transportation and receipt. Shipping labels shall be applied to:

a. Logistic units transported and stored within the Defence supply chain (by military or commercial resources); and

b. Logistic units provided to allies and coalition partners for transportation and storage.

6.2.2 *STANAG 2494 - NATO Asset Tracking Shipping Label and Associated Symbologies* establishes the shipping label format conventions to facilitate NATO Asset Tracking by national asset tracking systems.

6.2.3 *STANAG 4281 – NATO Standard Marking for Shipment and Storage* complements the above standards requiring the SSCC as the minimum requirement for machine readable information.

6.2.4 Defence AIT systems shall accept and produce an SSCC as the unique identifier for a logistic unit.

6.2.5 The minimum AIT media requirements for a supplier shipping label also apply to a Defence produced shipping label.[12]

6.2.6 Figure 12 is an example of a basic GS1 logistic label. This label may be used internally by Defence to identify and manage the content of logistic units within a warehouse (such as; cases, cartons, pallets or containers). Defence logistic systems maintain the link between the unique identifier (the SSCC) and the physical content.

Figure 12 - Example Basic GS1 Logistic Label

[12] Refer to Section 5.2.

6.2.7 Figure 13 is an example of a minimum format shipping label (from *STANAG 2494*) for a logistic unit prepared for transportation. With the exception of the SSCC, the actual detail and format may vary to meet the requirements of the carrier (military or contractor).

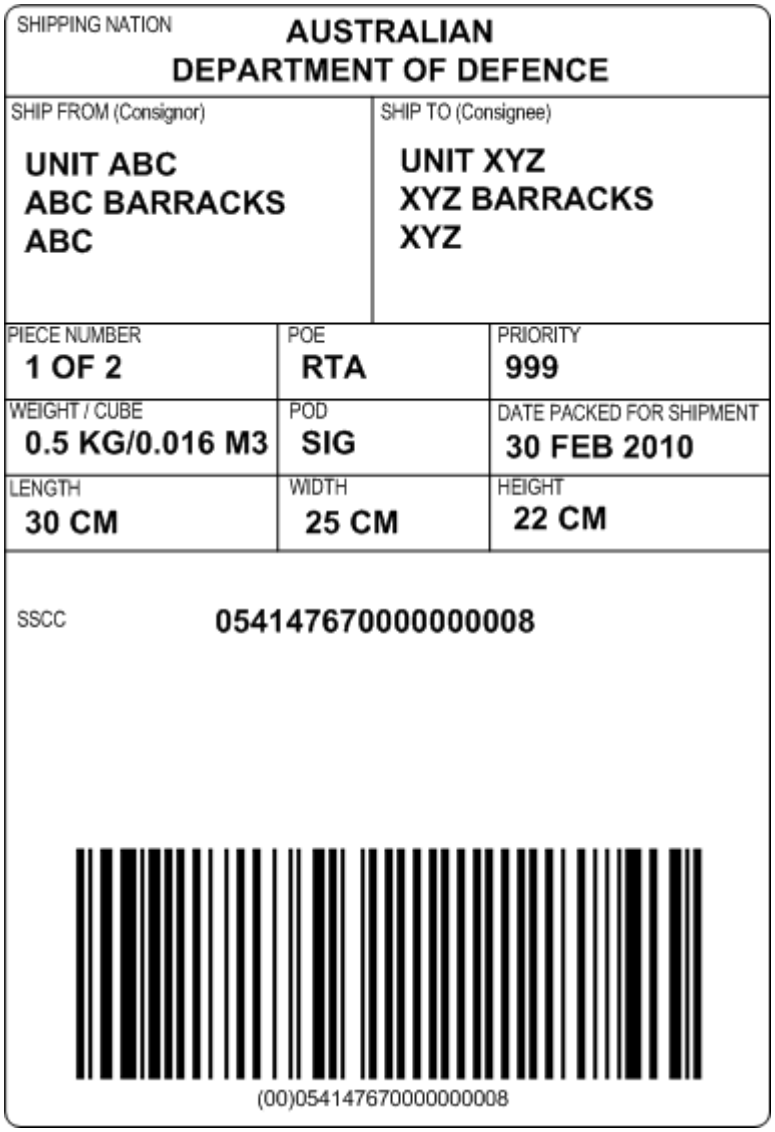


Figure 13 - Example Minimum Format Shipping Label

6.2.8 Defence consignment and in-transit systems may utilise a range of AI for internal distribution (by military or commercial resources) to track and receipt items of supply distributed internally (for example; AI 02, 37 and 400).

6.2.9 Figure 14 is an example of a shipping label that includes the carrier's consignment number (AI 401) in an additional GS1-128 bar code.

Figure 14 - Example Shipping Label with Consignment Number

6.2.10 *ISO 15384* and *STANAG 2494* allow for the inclusion of a PDF417 bar code to encode detailed supply and transportation data. The data qualifiers shall be AI with the Format '05' syntax in accordance with *ISO/IEC 15434 - Syntax for high-capacity ADC media*.

6.2.11 Figure 15 is an example of shipping label that includes a PDF417 bar code.

Figure 15 - Example Shipping Label with PDF417 Bar Code

6.2.12 HRI for a PDF417 bar code is not required.

6.2.13 DEF(AUST)1000C Part 5 describes the information requirements to be applied to the packaging of logistic units including the placement of shipping labels.

6.3 UID LABELS AND DIRECT PART MARKING

6.3.1 The preferred method for the application of UID labels or markings to Defence assets and inventory is to acquire the items with a manufacturer applied UID.

6.3.2 The assignment of UII and the application of the relevant UID label/mark to existing assets or inventory require the original OEM/supplier data elements to be determined or Defence specific data elements to be identified.

6.3.3 When original OEM/supplier data elements can not be determined Defence shall allocate GTIN, GIAI or GRAI values as appropriate and in accordance with both the GS1 specification (refer to section 5.3) and *STANAG 2290*.

6.3.4 The retrospective assignment of UII and the application of UID labels/marks shall only occur with the approval of SLB, JLC. This includes the retrospective application of UII using either original OEM/supplier or Defence data elements.

6.3.5 The application of the label or direct marking of the item shall satisfy the same requirements described in section 5.3.

6.3.6 The responsible engineering design authority shall determine the appropriate labelling or marking method. Marking methods and guidance for UID labels and markings are included in Annex E and Annex F.

7 BAR CODE SYMBOLOGY REQUIREMENTS

7.1 GENERAL REQUIREMENTS

7.1.1 All label bar codes shall be printed as black on white, unless otherwise specified by the applicable Defence project, Defence application or acquisition contract documentation.

7.1.2 The marking method for applying direct part marking (UID) bar codes shall be determined by the engineering authority responsible for the item. Marking methods and guidance are included in Annex E and Annex F.

7.1.3 Defence applications shall only encode as data the ASCII characters listed in Annex G.[13] The default character set for Defence applications shall be the numbers 0 to 9, the capital letters "A" to "Z" and the limited special characters.

7.1.4 Symbology Identifiers (SI) shall be implemented according to *ISO/IEC 15424 - Data Carrier Identifiers (including Symbology Identifiers)* and the relevant symbology specification.

7.1.5 The syntax and message format for multiple data elements (using AI data qualifiers) with GS1 bar codes shall be implemented according to the GS1 Specification using the Function 1 Symbol Character (FNC1) and field separator character as required.

7.1.6 The message formats for encoding multiple data elements that combine AI, DI, TEI and free text within a bar code shall be implemented according to *ISO/IEC 15434 - Syntax for high-capacity ADC media* and the relevant symbology specification.

7.1.7 Regardless of which barcode is used, it is the responsibility of the bar code supplier to provide evidence that the quality of the bar code has been verified. Applicable supporting standards are:

a. ISO/IEC 15415 - Information Technology - Automatic Identification and Data Capture Techniques - Bar Code Print Quality Test Specification - Two Dimensional Symbols; and

b. ISO/IEC 15416 - Information Technology - Automatic Identification and Data Capture Techniques - Bar Code Print Quality Test Specification - Linear Symbols.

7.1.8 The applicable NATO supporting standard is *AAP-44 - NATO Standard Bar Code Handbook*.

[13] The actual character set shall be limited by both the application and the chosen bar code symbology.

7.2 EAN/UPC

7.2.1 Usage

7.2.1.1 The purpose of the EAN/UPC symbology is to encode the unique identifier of a trade item or trade unit (the GTIN).[14]

7.2.1.2 The most common use of the symbology is by POS applications.

7.2.1.3 The EAN/UPC is not a NATO approved symbology and it is unlikely that Defence will produce bar codes with this symbology. EAN/UPC bar codes when provided on commercial packaging may be used internally by Defence applications to identify the associated item of supply identifier (the NSN).

7.2.1.4 EAN/UPC is part of the GS1 family of symbologies.

7.2.2 Requirement

7.2.2.1 The EAN/UPC symbology is defined in *ISO/IEC 15420 - EAN/UPC Bar Code Symbology Specification*.

7.2.2.2 The use of the EAN/UPC symbology is restricted by and subject to compliance with the GS1 rules and registration procedures. The GS1 System is designed to ensure identification codes assigned to particular items are globally unique, for example the GTIN in the case of trade items and units.

7.2.2.3 GS1 publishes detailed information regarding the EAN/UPC symbology (www.gs1au.org).

7.2.2.4 The EAN/UPC symbology consists of four symbol types:

a. EAN-13 encodes a GTIN-13;

b. EAN-8 encodes a GTIN-8;

c. UPC-A encodes a GTIN-12; and

d. UPC-E encodes a zero suppressed GTIN-12.

7.2.2.5 Figure 16 and Figure 17 are examples of the respective EAN/UPC symbol types.

Figure 16 - Example EAN-13 and EAN-8 Bar Codes

Figure 17 - Example UPC-A and UPC-E Bar Codes

7.2.3 Print Quality

7.2.3.1 GS1 Australia provides a testing service to ensure compliance to the GS1 standards through a testing process based on *ISO/IEC 15416*. GS1 provides symbol quality guidance.

[14] From a Defence perspective and for the purposes of this standard.

7.3 GS1 DATABAR

7.3.1 Usage

7.3.1.1 GS1 DataBar symbology is more compact than the EAN/UPC suitable for use on smaller hard-to-mark packages (such as fresh fruits, vegetables and small cosmetics).

7.3.1.2 From 2010 the symbology joins EAN/UPC as an option for POS product scanning.

7.3.1.3 The GS1 DataBar is not a NATO approved symbology and it is unlikely that Defence will produce bar codes with this symbology. The GS1 DataBar when provided on commercial packaging may be used internally by Defence applications to identify the associated item of supply identifier (the NSN).

7.3.2 Description

7.3.2.1 The GS1 DataBar, formally called Reduced Space Symbology (RSS) is defined in *ISO/IEC 24724 - RSS bar code symbology specification*. GS1 publishes detailed information regarding the DataBar symbology (www.gs1au.org).

7.3.2.2 GS1 DataBar is a family of bar code symbologies. Some are very small and intended mainly for produce and small consumer packages. Some are larger and intended to carry more data needed for identifying variable-measure foods and the required content on coupons. Some are omni directional, making them suitable for POS applications.

7.3.2.3 Symbols intended for retail POS scanning, are:

a. **GS1 DataBar Omnni directional.** Half the height of an EAN/UPC bar code, carries the GTIN only.

b. **GS1 DataBar Stacked Omni directional.** Half the width of a EAN/UPC bar code, carries the GTIN only.

c. **GS1 DataBar Expanded.** Can carry up to 74 numeric or 41 alphanumeric data characters in a single row. Can carry a SGTIN (GTIN + Serial Number) in about the same space as an EAN/UPC bar code (Figure 18).

d. **GS1 DataBar Expanded Stacked.** Can carry up to 74 numeric or 41 alphanumeric data characters in up to 11 stacked rows. Can carry a SGTIN (GTIN + Serial Number) in about the same space as an EAN/UPC bar code.

7.3.2.4 Symbols that are not intended for retail POS scanning and designed for very small products, are:

a. **GS1 DataBar Truncated.** Carries the GTIN only.

b. **GS1 DataBar Limited.** 14 numeric characters.

c. **GS1 DataBar Stacked.** 14 numeric characters.

Figure 18 - Example GS1 DataBar Expanded

7.3.3 Data Content

7.3.3.1 The symbology supports multiple data elements using AI data qualifiers.

7.3.4 Print Quality

7.3.4.1 GS1 Australia provides symbol quality guidance.

7.4 ITF-14

7.4.1 Usage

7.4.1.1 An Interleaved 2 of 5 (ITF) symbol is restricted for use on trade items not passing through the retail POS. ITF-14 is designed to overcome print quality limitations on packaging materials, such as fibreboard, where quality standards cannot be met using GS1-128.

7.4.1.2 The ITF-14 is not a NATO approved symbology and it is unlikely that Defence will produce bar codes with this symbology. ITF-14 bar codes when provided on commercial packaging may be used internally by Defence applications to identify the associated item of supply identifier (the NSN).

7.4.1.3 ITF-14 is part of the GS1 family of symbologies.

7.4.2 Requirement

7.4.2.1 The ITF-14 symbology is defined in *ISO/IEC 16390 - Interleaved 2 of 5 Bar Code Symbology Specification*.

7.4.2.2 The use of the ITF-14 symbology is restricted by and subject to compliance with the GS1 rules and registration procedures. The GS1 System is designed to ensure identification codes assigned to particular items are globally unique, for example the GTIN in the case of trade items and units.

7.4.2.3 GS1 publishes detailed information regarding the ITF-14 symbology (www.gs1au.org).

7.4.2.4 An ITF-14 bar code can encode a GTIN-14, a GTIN-13, or a GTIN-12 but must always encode 14 digits[15].

7.4.2.5 Figure 19 is an example of an ITF-14 bar code.

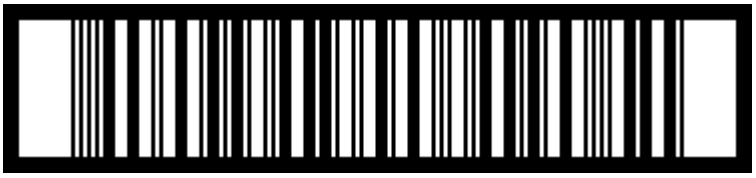


Figure 19 - Example ITF-14 Bar Code

7.4.3 Print Quality

7.4.3.1 The print quality of an ITF-14 bar code shall be assessed using the methods and parameters defined in *ISO/IEC 15416*. In most applications a minimum grade of 1.0/20/660 is required.[16]

7.4.3.2 GS1 Australia provides symbol quality guidance.

[15] Filler zeros are used to ensure the GTIN-13 and GTIN-12 are encoded to fourteen digits.
[16] Refer to the Print Quality section of Code 39 for an explanation of the minimum grade.

7.5 GS1-128

7.5.1 Usage

7.5.1.1 GS1-128 is the preferred symbology for packaging from Defence suppliers.

7.5.1.2 GS1-128 is the preferred symbology for packaging from Defence suppliers when encoding information in addition to GS1 bar codes provided on existing commercial packaging.

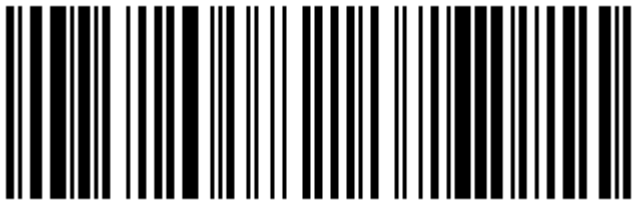
7.5.1.3 GS1-128 is the preferred linear symbology for use by Defence logistic applications.

7.5.2 Description

7.5.2.1 GS1-128 is a variant of the Code 128 symbology utilised for specific industry and logistic requirements. GS1 publishes detailed information regarding the GS1-128 symbology (www.gs1au.org).

7.5.2.2 GS1-128 can encode all 128 ASCII characters in accordance with ISO/IEC 646.

7.5.2.3 Figure 20 is an example of a GS1-128 bar code.



(7001)6240660272059

Figure 20 - Example GS1-128 Bar Code

7.5.3 Data Content

7.5.3.1 The symbology supports multiple data elements using AI data qualifiers.

7.5.3.2 The range of AI including their data format is provided in Annex D.

7.5.3.3 When data elements are encoded into a GS1-128 bar code then the GS1 Function 1 Symbol Character (FNC1) shall be used in lieu of the *ISO/IEC 15434* syntax. The FNC1 (ASCII character 29) shall be used in accordance with the GS1 specification to indicate both a GS1 bar code and a separator character between the AI data elements (when required).

7.5.3.4 The number of decoded and transmitted characters (data and separator characters) from a GS1-128 bar code shall not exceed 48.

7.5.4 HRI

7.5.4.1 The HRI shall include the AI values, bracketed, as shown in Figure 20.

7.5.4.2 The HRI may be printed anywhere in the area surrounding the symbol with below preferred. It shall not encroach on the quiet zones. The characters may be in any easily read font. The HRI is not intended to be machine readable.

7.5.5 Print Quality

7.5.5.1 GS1 Australia provides a testing service to ensure compliance to the GS1 standards through a testing process based on *ISO/IEC 15416*. GS1 provides symbol quality guidance.

7.5.5.2 Suppliers and Defence projects creating labels/markings including GS1-128 bar codes for Defence material and packaging shall submit the bar codes for compliance testing by GS1 Australia.

7.6 DATA MATRIX

7.6.1 Usage

7.6.1.1 The most common use of the Data Matrix symbology is in small article identification.

7.6.1.2 The Data Matrix bar code will be found applied to items as a UID by OEM and suppliers.[17]

7.6.1.3 The GS1 Data Matrix is the preferred variant of the symbol to be used by Defence.

7.6.2 Description

7.6.2.1 The Data Matrix is a true 2D matrix symbology composed of square modules arranged within a perimeter finder pattern. Data Matrix symbols are read by two-dimensional imaging scanners or imaging systems. The symbology is defined in *ISO/IEC 16022 - Data Matrix Bar Code Symbology Specification*.

7.6.2.2 GS1 publishes detailed information regarding the GS1 Data Matrix symbology (www.gs1au.org).

7.6.2.3 *ATA Spec 2000* describes the application of the Data Matrix symbol in the aerospace industry.

7.6.2.4 The default error correction scheme shall be ECC 200 unless otherwise agreed.

7.6.2.5 Data Matrix may be printed in a square or rectangular format. The square format is usually used as it has a larger range of sizes and is the only format available for symbols encoding a large amount of data. Data characters per symbol (for the maximum symbol size):

a. Rectangular symbol: 98 digits;

b. Alphanumeric data: up to 2335 characters;

c. Eight-bit byte data: 1556 characters; and

d. Numeric data: 3116 digits.

7.6.2.6 Figure 21 is an example of a Data Matrix bar code.

Figure 21 - Example Data Matrix Bar Code

7.6.3 Data Content

7.6.3.1 The symbology supports multiple data elements using AI, DI or TEI data qualifiers.[18] A GS1 Data Matrix symbol shall be used to encode data elements using just AI. The encoding of GS1 Data Matrix symbols shall be in accordance with the GS1 Specification.

7.6.4 HRI

7.6.4.1 HRI is recommended. However, due to the symbol's capacity a literal one may not be practical. HRI shall not interfere with the symbol itself or the quiet zones. The preferred location is below the symbol. The GS1 System recommends that the primary AI be supplied as HRI.

7.6.5 Print Quality

7.6.5.1 The print quality of a Data Matrix bar code shall be assessed using the methods and parameters defined in *ISO/IEC 15415*. GS1 provides symbol quality guidance.

7.6.5.2 A Data Matrix may be applied directly to an item by applying the methods and guidance provided in Annex E and Annex F.

[17] Refer to the Unique Item Identification section of this standard for additional detail.

[18] Refer to the "Bar Code Message Syntax and Data Format" section of this standard for additional detail.

7.7 CODE 128

7.7.1 Usage

7.7.1.1 The symbology is used in 'licence plate' applications and to depict logistics information.

7.7.1.2 Code 128 is the preferred symbology for Defence in circumstances where the GS1-128 symbology is inappropriate.

7.7.2 Description

7.7.2.1 The Code 128 is a variable length, continuous, self-checking, bi-directional, alphanumeric linear bar code symbology. The symbology is defined in *ISO/IEC 15417 - Code 128 Bar Code Symbology Specification*.

7.7.2.2 *ATA Spec 2000* describes the application of Code 128 within the aerospace industry.

7.7.2.3 Code 128 can encode all 128 ASCII characters in accordance with ISO/IEC 646 and can with the use of a function code can encode characters with ASCII values 128 to 255 in accordance with ISO 8859.

7.7.2.4 Figure 22 is an example of a Code 128 bar code.

123456789

Figure 22 - Example Code 128 Bar Code

7.7.3 Data Content

7.7.3.1 The symbology supports both free form text and multiple data elements using AI, DI or TEI data qualifiers.[19]

7.7.3.2 A GS1-128 symbol shall be used to encode data elements using AI data qualifiers.

7.7.4 HRI

7.7.4.1 HRI of the data characters (not the control characters) shall be printed with the Code 128 symbol.

7.7.4.2 The HRI may be printed anywhere in the area surrounding the symbol, below is preferred, but it shall not encroach on the quiet zones. The characters may be in any easily read font. The HRI is not intended to be machine readable.

7.7.4.3 The default nominal character height shall be 5.1 mm.

7.7.5 Print Quality

7.7.5.1 The print quality of a Code 128 bar code shall be assessed using the methods and parameters defined in *ISO/IEC 15416*. In most applications, a minimum grade of 1.0/0.5/660 is required.[20]

[19] Refer to the "Bar Code Message Syntax and Data Format" section of this standard for additional detail.

[20] Refer to the Print Quality section of Code 39 for an explanation of the minimum grade.

7.8 PDF417

7.8.1 Usage

7.8.1.1 PDF417 is a stacked bar code symbology that has a large capacity and unlike true matrix codes, it is possible to read using a laser scanner. PDF417 is a NATO approved symbology for the encoding of “shipping and receiving” or “support documentation” and may be included on shipping labels (*STANAG 2494*).

7.8.2 Description

7.8.2.1 The PDF417 is a continuous, multi-row (stacked 2D) bi-directional symbology with error correction and self-checking. The symbology is defined in *ISO/IEC 15438 - PDF417 Bar Code Symbology Specification*. *ATA Spec 2000* describes the application of the PDF417 symbol within the aerospace industry.

7.8.2.2 The symbol consists of a stack of 3 to 90 vertically aligned rows. Each row with 1 to 30 symbol characters or code words (column) plus start/stop and row indicator columns with a quiet zone on all four sides.

7.8.2.3 The default Error Correction Level (ECL) shall be ‘5’ unless otherwise agreed, requiring a total of 64 Error Correction Codes (ECC) to be incorporated into the PDF417 symbol.

7.8.2.4 A range of compaction modes can be selected, including:

a. Text compaction mode. Allows all printable ASCII characters to be encoded (values 32 to 126 inclusive);

b. Byte compaction mode. Allows 256 8-bit values to be encoded, all ASCII characters (values 0-127 inclusive) and provides for international character set support (*ISO 8859*); and

c. Numeric compaction mode. Allows for efficient encoding of long numeric data digit strings.

7.8.2.5 Figure 23 is an example of a PDF417 bar code.

Figure 23 - Example PDF417 Bar Code

7.8.3 Data Content

7.8.3.1 The symbology supports multiple data elements using AI, DI or TEI data qualifiers.[21]

7.8.4 HRI

7.8.4.1 HRI is recommended. However, due to the symbol’s capacity a literal one may not be practical. The HRI shall not interfere with the symbol itself or the quiet zones. The preferred location is below the symbol.

7.8.5 Print Quality

7.8.5.1 The print quality of a PDF417 bar code shall be assessed using the methods and parameters defined in *ISO/IEC 15415*.

[21] Refer to the “Bar Code Message Syntax and Data Format” section of this standard for additional detail.

7.9 CODE 39

7.9.1 Usage

7.9.1.1 The Code 39 is the original NATO standard bar code, used to convey relatively short alphanumeric messages and in 'licence plate' applications. It is found in use by many legacy Defence applications.

7.9.2 Description

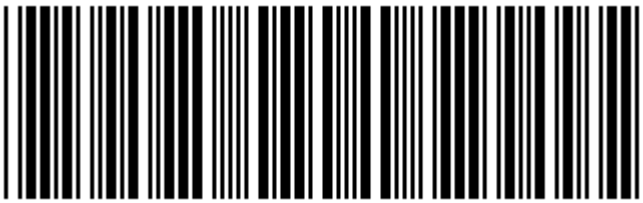
7.9.2.1 The Code 39 is a variable length, discrete, self-checking, bi-directional, alphanumeric linear bar code symbology. The symbology is defined in *ISO/IEC 16388 - Code 39 Bar Code Symbology Specification*.

7.9.2.2 *ATA Spec 2000* describes the application of Code 39 within the aerospace industry.

7.9.2.3 The base version of Code 39 encodes the characters "0 to 9, A to Z, $, %, +, -, /" and a start-stop character (*). In a special mode the full 128 ASCII character set can be encoded.

7.9.2.4 Each character is encoded as a pattern of nine elements: five bars and four spaces. Three of the nine elements are wide (binary value 1) and six elements are narrow (binary value 0).

7.9.2.5 Figure 24 is an example of a Code 39 bar code.



123456789

Figure 24 - Example Code 39 Bar Code

7.9.3 Data Content

7.9.3.1 The symbology does not support multiple data elements in a single bar code.

7.9.3.2 The maximum number of encoded characters in single bar code shall be 32; comprising of 30 data characters and two control characters (the start and stop character).

7.9.4 HRI

7.9.4.1 HRI of the data characters (not the control characters) shall be printed with the Code 39 symbol.

7.9.4.2 The HRI may be printed anywhere in the area surrounding the symbol, below is preferred. It shall not encroach on the quiet zones. The characters may be in any easily read font. The HRI is not intended to be machine readable.

7.9.5 Print Quality

7.9.5.1 The print quality of a Code 39 bar code shall be assessed using the methods and parameters defined in *ISO/IEC 15416*. In most applications, a minimum grade of 1.0/0.5/660 is required, where:

a. 1.0 is the overall symbol quality grade;

b. 0.5 is the measuring aperture reference number; and

c. 660 is the peak response wavelength in nanometres.

8 BAR CODE TECHNICAL REQUIREMENTS

8.1 BAR CODE MESSAGE SYNTAX AND DATA FORMAT

8.1.1 AI are the preferred data qualifier for bar codes containing multiple data elements.

8.1.2 When AI are the only data elements to be encoded the GS1 Specification shall be used to encode multiple data elements into GS1 linear and 2D bar codes. The FNC1 (ASCII character 29) shall be used in accordance with the GS1 specification to indicate both a GS1 bar code and a separator character between the AI (Annex D) data elements (when required).

8.1.3 When multiple data elements comprising of free text, AI, DI or TEI data qualifiers the message syntax defined in *ISO/IEC 15434* shall be used. The recommended symbology is PDF417. The message structure is:

a. A Message Envelope consisting of:
   i. A Message Header;
   ii. One or more Format Envelopes; and
   iii. A Message Trailer (when required).

b. Each Format Envelope within the Message Envelope shall consist of:
   i. A Format Header;
   ii. Data, formatted according to the rules defined for that format; and
   iii. A Format Trailer (when required).

8.1.4 The syntax for the Message Envelope is shown in Table 7.

Component	Syntax	Comment
Message Header[22]	[ )>$^{R}_{S}$	ASCII Characters 91, 41, 62 and 30
Message Trailer	$^{E}O_{T}$	ASCII Character 4

Table 7 - Message Envelope Syntax

8.1.5 The syntax for the applicable Format Envelopes is shown in Table 8.

Data Qualifier	Component	Syntax	Comment
AI	Format Indicator	05 $^{G}_{S}$	ASCII Characters 48, 53 and 29
	Data Element Separator	$^{G}_{S}$	ASCII Characters 29 (when required)
	Format Trailer	$^{R}_{S}$	ASCII Character 30
DI	Format Indicator	06 $^{G}_{S}$	ASCII Characters 48, 54 and 29
	Data Element Separator	$^{G}_{S}$	ASCII Characters 29 (when required)
	Format Trailer	$^{R}_{S}$	ASCII Character 30
Free Text	Format Indicator	07	ASCII Characters 48 and 55
	Data Element Separator		Not applicable
	Format Trailer	$^{R}_{S}$	ASCII Character 30
TEI	Format Indicator	12 $^{G}_{S}$	ASCII Characters 49, 50 and 29
	Data Element Separator	$^{G}_{S}$	ASCII Characters 29 (when required)
	Format Trailer	$^{R}_{S}$	ASCII Character 30

Table 8 - Format Envelope Syntax

[22] An artificial “space” has been added between the “[“ and “)” characters so as to not be misinterpreted as the character “D”.

8.1.6 **ATA Spec 2000.** Aerospace specific AIT systems within Defence may be required to decode OEM and supplier bar codes using *ATA Spec 2000* syntax with TEI data qualifiers, as follows:

a. TEI are four characters in length, consisting of three alphabetic characters followed by a space;

b. A slash ("/") delimiter separates the data fields; and

c. In the case of UID barcodes the *ATA Spec 2000* requires *ISO/IEC 15434* syntax to be applied.

8.2 BAR CODE SYMBOLOGY IDENTIFIERS

8.2.1 Defence AIT systems may include the barcode format with the decoded message using a Symbology Identifier (SI) (*ISO/IEC 15424*). The SI prefix is a three character string "]C*m..*", where:

a. "]" is the SI flag indicator (ASCII character 93);

b. "C" is the symbology code character; and

c. "*m..*" is the modifier character(s) for the given symbology.

8.2.2 Table 9 details the SI code and modifier characters for the bar codes described in this standard. *ISO/IEC 15424* describes the SI requirements for devices to differentiate between given data carriers.

Bar Code	Code Character	Modifier Characters
Code 39	A	0…7
Code 128	C	0, 1 (indicates GS1-128), 2 or 4
EAN/UPC	E	0, 1, 2, 3 or 4
ITF-14	I	0, 1 or 3
PDF417	L	0…5
Data Matrix	d	1, 2 (indicates GS1 Data Matrix), 3, others not for use in NATO

Table 9 - SI Code and Modifier Characters

8.2.3 The symbology identifier is a prefix to the data transmitted by a decoder. Data carrier/symbology identifiers are not encoded in the symbol.

8.3 BAR CODE SYSTEM CONFORMANCE

8.3.1 The following standards are applicable to systems encoding or decoding bar codes:

a. ISO/IEC 15419 - Bar code digital imaging and printing performance testing;

b. ISO/IEC 15421 - Bar code master test specifications;

c. ISO/IEC 15423 - Bar code scanner and decoder performance testing;

d. ISO/IEC 15426.1 - Bar code verifier conformance specification - Linear symbols; and

e. ISO/IEC 15426.2 - Bar code verifier conformance specification - Two-dimensional symbols.

8.3.2 A decoder's valid set of symbologies should be limited to those needed by a given application to maximise performance and reading security.

8.3.3 If a reader is enabled to transmit symbology identifiers, it shall always transmit a symbology identifier at the beginning of each message (*ISO/IEC 15424*). The application must know whether or not the reader has symbology identifiers enabled. Therefore, the symbol data may start with a "]" and still be interpreted unambiguously.

9 RADIO FREQUENCY IDENTIFICATION REQUIREMENTS

9.1 GENERAL

9.1.1 Supply Chain Layers

9.1.1.1 Figure 25 is a graphical representation of the supply chain displaying the possible supply chain relationships of physical things that may be identified through the use of RFID tags. It is not a one-for-one representation, as some common supply chain physical items fit in several layers. For example, a repetitively used pallet under constant ownership would be identified as a Returnable Transport Item (RTI); a pallet that is part of a consolidated unit load would be identified as a logistic unit; and a pallet that is integral to a single item would be identified as item packaging.

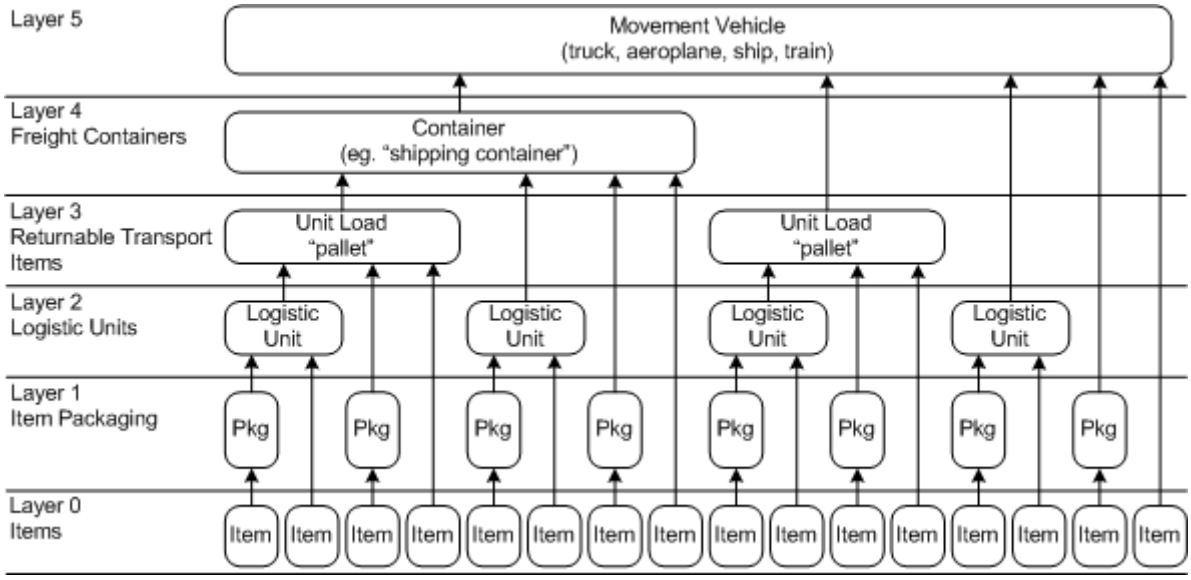


Figure 25 - Supply Chain Layers

9.1.1.2 Table 10 lists the applicable standards for the application and use of RFID tags for the respective layers of Figure 25. These standards define the technical aspects and data hierarchy of information required in each layer of the supply chain.

Layer	Standards
Layer 5	ISO/TC 204/WG 7 (not addressed in the Defence Packaging Standard)
Layer 4	ISO 17363 Supply chain applications of RFID – Freight containers
Layer 3	ISO 17364 Supply chain applications of RFID – Returnable transport items (RTIs)
Layer 2	ISO 17365 Supply chain applications of RFID – Transport units
Layer 1	ISO 17366 Supply chain applications of RFID – Product Packaging
Layer 0	ISO 17367 Supply chain applications of RFID – Product Tagging

Table 10 – Supply Chain RFID Standards

9.1.1.3 The generic RFID architecture concepts for item identification for logistics and the supply chain is described in *ISO/IEC 18000.1 - Radio frequency identification for item management*.

9.1.2 Unique Identifiers

9.1.2.1 Each RFID tag shall have a unique tag ID. This tag ID shall conform to *ISO/IEC 15963 - Unique identification for RF Tags*.

9.1.2.2 Identification and discrimination between like items using RFID tags shall occur by encoding UII (in addition to the tag ID). Defence preferred UII include:

a. Returnable Transport Items – GRAI,

b. Logistic Units – SSCC, and

c. Individual Items – Serialised GTIN (SGTIN) or GIAI,

9.1.2.3 Identification of trade units and trade item types (but not unique items) shall occur by encoding the applicable GTIN, Additional discrimination may be achieved by encoding batch or lot number attributes to the tag.

9.1.3 Bar Code Representation and Human Readable Information

9.1.3.1 Bar codes should be considered as a primary backup to RFID tags enabling the applicable UII, trade item or trade unit identifier to be encoded. The requirements described in Section 7 of this standard shall apply.

9.1.3.2 HRI of the data encoded to a tag is optional, except when required by regulation or statute.

9.1.3.3 Human readable translation of selected data encoded to a tag may also be applied to the item or packaging.

9.1.4 Data Security

9.1.1 The encoding and subsequent transmission of additional data is permitted as long as security and information classification issues have been addressed.

9.1.4.1 **Confidentiality.** When appropriate additional data encoded to the tag shall be secured and protected.

9.1.4.2 **Data Integrity.** When appropriate additional data shall be locked to prevent alteration or erasure.

9.1.4.3 **Data Preservation.** When appropriate tags shall be protected from being disabled, for example by a kill-command.

9.1.4.4 **Interrogator Authentication.** When appropriate tags shall require authentication from an interrogator prior to reading tag data with the exception of the tag ID.

9.1.4.5 **Non-repudiation/Audit Trail.** When appropriate tags may be required to provide evidence that a specific action has occurred.

9.1.5 Safety and Regulatory Considerations

9.1.5.1 RF transmission, power levels, duty cycles, channel width and separation (if applicable) for Defence RFID capabilities introduced within Australia shall conform to the requirements of:

a. Australian Communications and Media Authority; and

b. Defence Spectrum Office.

9.1.5.2 Defence RFID capability deployed overseas will be required to comply with the requirements of the hosting nation.

9.1.5.3 RFID systems shall ensure compliance with Defence, National and International air safety regulations, including Airworthiness Certifications, controlling or limiting radio transmission when air carriage is involved.

9.1.5.4 RFID systems shall ensure compliance with Defence Naval regulations, including controlling or limiting radio emanations when naval carriage is involved.

9.1.5.5 RFID systems (tags and interrogators) implemented within Defence shall conform to the applicable Federal and State safety and regulatory requirements, such as:

a. The limits of human exposure to RF;

b. The limits for exposure to fuels and fuel vapours;

c. The limits for exposure to ammunition and explosives (including those with electronic components); and

d. Electromagnetic interference and spectrum compatibility.

9.1.6 Exclusions

9.1.6.1 This standard excludes radio frequency data communications and the application of Radio Frequency (RF) tracking capabilities and Near Real Time Locating Systems (RTLS).

9.1.6.2 This standard does not include the use of RFID tags as electronic cargo seals (e-Seals) described in the *ISO 18185 – Freight containers – Electronic seals* series of standards.

9.2 ACTIVE RFID

9.2.1 Active RFID technology may be used in Defence to support consignment and asset tracking (Layer 4 as shown in Figure 25). Active RFID tags will complement both logistic and shipping labels and shall be applied to bulk commodities.

9.2.2 The active RFID capability shall conform to *ISO/IEC 18000.7 - Parameters for active air interface communications at 433 MHz*.

9.2.3 *STANAG 2233 - NATO Consignment and Asset Tracking by RFID*, provides the standards for active RFID capabilities to support NATO consignment and asset tracking by member nations. It encourages the same standards to be applied internally.

9.2.4 For active RFID tags it shall be possible to identify the tag ownership (Owner ID) from the Tag Data Routing Code (TDRC) found in the broadcast message response format (*ISO/IEC 18000.7*). The TDRC for the Australian Defence Organisation is “KAU000”, decomposed as follows:

a. “K” the IAC for Government;

b. “AU” the two alphanumeric characters for “Australia”; and

c. “000” a 3-digit sub-code.

9.2.5 STANAG 2233 provides NATO recognised TDRC and IAC registration procedures.

9.2.6 Information systems receiving, storing or processing TDRC should be capable of handling the varying length commercial TDRC described in *ISO/IEC 18000.7*.

9.2.7 It is recommended that the active RFID tag shall contain the SSCC for the consignment when appropriate. If not the Defence AIT system shall be required to maintain the relationship between a given tag ID and the associated SSCC.

9.2.8 All active tag data (when used) shall be identified using GS1 AI data qualifiers and structured in accordance with ISO 15434 using Format ‘05’.

9.2.9 Air interface protocols between interrogators and tags shall be in accordance with *ISO/IEC 18000.7*.

9.2.10 Data message protocols for the exchange of information between nations shall conform to *STANAG 2185 - NATO Asset Tracking Electronic Data Interchange (EDI)*.

9.2.11 *STANAG 2183 - NATO Consignment Tracking Communication and Security Requirements*, provides the principles and procedures for establishing connectivity and interoperability with allies and coalition partner consignment tracking systems.

9.3 PASSIVE RFID

9.3.1 The introduction of passive RFID technology into Defence facilitates automated visibility and process improvement within the supply chain. Passive RFID tags will compliment both shipping labels from suppliers (warehouse receipts) and inventory labels (eg. issues, receipts, stocktaking, in-use and in-process activity).

9.3.2 Passive RFID systems implemented by Defence shall be based upon the Electronic Product Code (EPC^{tm}) global standards, requiring:

a. Passive tags to be *ISO/IEC 18000.6 Type C* compliant;

b. Passive tag identity types to be encoded according to the EPC Tag Data Standard, including entities such as:

i. **GID**. GS1 global identifier;
ii. **GIAI**. GS1 global individual asset identifier (assets);
iii. **SSCC**. GS1 individual logistic loads;
iv. **SGTIN**. GS1 global specific (serialised) products;
v. **GRAI**. GS1 returnable/reusable assets; and
vi. **Serialised Global Location Number (GLN)**. A specific location.

c. Air interface protocols between interrogators and tags shall be in accordance with the EPC Class 1 Generation 2 UHF Air Interface Protocol Standard; and

d. System performance and conformance shall be in accordance with the EPC UHF Class 1 Gen 2 Conformance Requirements Standard.

9.4 SEMI-PASSIVE RFID

9.4.1 Reserved

10 OTHER AIT REQUIREMENTS

10.1.1 Reserved

ANNEX A

REFERENCES

The following documents form a part of this specification to the extent specified herein.
The latest issue of the following documents at the issue date of this specification shall apply.

AAP-44	NATO Standard Bar Code Handbook
ATA Spec 2000	Air Transport Association Specification 2000, Chapter 9 - Automated Identification and Data Capture
DEF(AUST)1000C Part 5	Defence Packaging Standard, Part 5 - Marking of Packages
GS1 Specification	GS1 Australian User Manual, Numbering and Bar Coding and Bar Code Symbol Technical Details
GS1 Guidelines	GS1, The Australian Transport and Logistics Industry, Numbering and Bar-Coding Guidelines
ISO 15394	Packaging - Bar code and two-dimensional symbols for shipping, transport and receiving labels
ISO/IEC 15415	IT - AIDC Techniques - Bar code print quality test specification - Two dimensional symbols
ISO/IEC 15416	IT - AIDC Techniques - Bar code print quality test specification - Linear symbols
ISO/IEC 15417	IT - AIDC Techniques - Code 128 bar code symbology specification
ISO/IEC 15418	IT - AIDC GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance
ISO/IEC 15419	IT - AIDC Techniques - Bar code digital imaging and printing performance testing
ISO/IEC 15420	IT - AIDC Techniques - EAN/UPC bar code symbology specification
ISO/IEC 15421	IT - AIDC Techniques - Bar code master test specifications
ISO/IEC 15423	IT - AIDC Techniques - Bar code scanner and decoder performance testing
ISO/IEC 15424	IT - AIDC Techniques - Data Carrier Identifiers (including Symbology Identifiers)
ISO/IEC 15426.1	IT - AIDC Techniques - Bar code verifier conformance specification - Linear symbols
ISO/IEC 15426.2	IT - AIDC Techniques - Bar code verifier conformance specification - Two-dimensional symbols
ISO/IEC 15434	IT - AIDC Techniques - Syntax for high-capacity ADC media
ISO/IEC 15438	IT - AIDC Techniques - PDF417 bar code symbology specification
ISO/IEC 15459.1	IT - Unique identifiers - Unique identifiers for transport units
ISO/IEC 15459.2	IT - Unique identifiers - Registration procedures
ISO/IEC 15459.4	IT - Unique identifiers - Unique identifiers for supply chain management
ISO/IEC 15963	IT - RFID for Item Management - Unique identification for RF tags
ISO/IEC 16022	IT - AIDC Techniques - Data Matrix bar code symbology specification
ISO/IEC 16388	IT - AIDC Techniques - Code 39 bar code symbology specification
ISO/IEC 16390	IT - AIDC Techniques - Interleaved 2 of 5 bar code symbology specification
ISO 17363	Supply chain applications of RFID – Freight containers
ISO 17364	Supply chain applications of RFID – Returnable transport items (RTIs)
ISO 17365	Supply chain applications of RFID – Transport units
ISO 17366	Supply chain applications of RFID – Product Packaging
ISO 17367	Supply chain applications of RFID – Product Tagging
ISO/IEC 18000.1	IT - RFID for Item Management - Reference architecture
ISO/IEC 18000.6	IT - RFID for Item Management - Parameters for active air interface communications at 860 MHz to 960 MHz
ISO/IEC 18000.7	IT - RFID for Item Management - Parameters for active air interface communications at 433 MHz
ISO/IEC 19762	IT - AIDC Techniques - Harmonised vocabulary
ISO/IEC 24724	IT - AIDC Techniques - Reduced Space Symbology (RSS) bar code symbology specification
STANAG 2183	NATO Consignment Tracking Communication and Security Requirements
STANAG 2185	NATO Asset Tracking Electronic Data Interchange (EDI)
STANAG 2233	NATO Consignment and Asset Tracking by RFID
STANAG 2290	Unique Identification (UID) of Items
STANAG 2494	NATO Asset Tracking Shipping Label and Associated Symbologies
STANAG 2495	Data Formats for Asset Tracking
STANAG 4281	NATO Standard Marking for Shipment and Storage
STANAG 4329	NATO Standard Bar Code Symbologies

ANNEX B

DEFINITIONS

Active Tag. RFID device having the ability of producing its own radio signal not derived from an external radio signal. To generate a radio signal active tags must employ some source of power.

Air Interface Protocol. The complete communication link between a Reader and a Tag, including the physical layer, collision arbitration algorithm, command and response structure and data-coding methodology.

Automatic Identification and Data Capture (AIDC). A technology used to automatically capture data. AIDC technologies include bar code symbols, smart cards, biometrics and RFID.

Automatic Identification Technology (AIT). Automatic Identification Technology represents a broad category of technologies that enable machines to identify products, humans and animals. AIT includes the hardware and software required to create the data storage medium, read the information stored on that medium and integrate that data with other logistics data to improve logistics chain effectiveness, efficiency and decision-making.

Electromagnetic Interference. Interference caused when radio waves emitted by a device degrade the performance of another device. For example, signals for devices operating in the same frequency band as RFID tags may reduce the ability to read those tags.

Electronic Data Interchange (EDI). A standard format for computer-to-computer transmission of business information and transactions between trading partners, such as invoices and purchase orders.

Electronic Product Code (EPC). An identification scheme for universally identifying physical objects (eg. trade items, assets, and locations) via RFID tags and other means. The standardised EPC data consists of an EPC (or EPC Identifier) that uniquely identifies an individual object, as well as an optional Filter Value when judged to be necessary to enable effective and efficient reading of the EPC tags.

Global Trade Item Number (GTIN). The GS1 Identification Key used to identify trade items.

GS1. A global system of standards around the identification, automatic capture and sharing of data related to products, processes, services and locations administered by GS1 GO globally and represented by GS1 Australia locally.

Human Readable Interpretation (HRI). Information provided adjacent to a machine-readable medium, representing the encoded data within the data carrier.

License Plate. An RFID tag or other data carrier that contains a unique identifier for the physical object to which it is affixed and no other business information. Other business information must be associated with the license plate identifier through an external database or other means.

Logistic Unit. An item of any composition established for transport and/or storage that needs to be managed through the supply chain. It is identified with an SSCC.

Passive Tag. Refers to a Tag in which the microchip is powered by the RF field created by the Reader.

Radio Frequency Identification (RFID). A method of automated identification using electronic tags capable of receiving/storing and/or transmitting digital information by means of, and in response to, RF energy.

Semi-Passive Tag. An RFID device whose transceiver is powered by the RF field and uses a battery to improve its functionality and range.

Serial Shipping Container Code (SSCC). The GS1 Identification Key used to identify logistics units.

Trade Item. Any item (product or service) upon which there is a need to retrieve pre-defined information and that may be priced, ordered, or invoiced at any point in any supply chain.

Unique Identification (UID). UID is the set of data pertaining to a tangible asset that is unambiguous and globally unique. A UID ensures data quality and integrity throughout the life cycle of the item and supports multiple business applications and users.

ANNEX C

ACRONYMS

Acronym	Description
ACMA	Australian Communications and Media Authority
ADF	Australian Defence Force
ADR	Australian Design Rules
AI	Application Identifier
AIDC	Automatic Identification and Data Capture
AIT	Automatic Identification Technology
ANSI	American National Standards Institute
aRFID	active Radio Frequency Identification
ATA	Air Transport Association
CAMM2	Computer Aided Maintenance Management
CMO	Capability Management Office
COTS	Commercial-Off-The-Shelf
CSDD	Common Support Data Dictionary
DI	Data Identifiers
DoD	Department of Defence
EDI	Electronic Data Interchange
EID	Enterprise Identification
EIRP	Effective Isotropic Radiated Power
EPC	Electronic Product Codes
ESN	Electronic Serial Number
FACT	Federation of Automatic Coding Technologies
FMS	Foreign Military Sales
FMVSS	Federal Motor Vehicle Safety Standard
FNC1	GS1 Function 1 Symbol Character (ASCII character 29)
GDSN	Global Data Synchronisation Network
GIAI	Global Individual Asset Identifier
GID	Global Identifier
GINC	Global Identification Number for Consignment
GLN	Global Location Number
GRAI	Global Returnable Asset Identifier
GS	General Specifications
GSIN	Global Shipment Identification Number
GSM	Global System for Mobile
GSRN	Global Service Relation Number
GTIN	Global Trade Identification Number
HAZMAT	Hazardous Material
HRI	Human Readable Interpretation
IAC	Issuing Agency Code
IMEI	International Mobile Equipment Identity
ITF	Interleaved 2 of 5 (bar code)
IUID	Item Unique Identification
JLC	Joint Logistics Command
MILIS	Materiel Logistics Information Systems
MOTS	Military-Off-The-Shelf
MRI	Machine Readable Information
NATO	North Atlantic Treaty Organisation
NCS	NATO Codification System
NSN	NATO Stock Number
OEM	Original Equipment Manufacturer
POS	Point of Sale
PILS	Pharmaceutical Information Logistics System
pRFID	passive Radio Frequency Identification
RF	Radio Frequency
RFID	Radio Frequency Identification
RSS	Reduced Space Symbology
RTLS	Real Time Locating Systems
SDSS	Standard Defence Supply System
SGTIN	Serialised GTIN
SI	Symbology Identifier
SLB	Strategic Logistics Branch

Acronym	Description
SPO	Systems Program Office
SSCC	Serial Shipping Container Code
TEI	Text Element Identifiers
UI	Unique Identifier
UID	Unique Identification
UII	Unique Item Identifiers
UOI	Unit of Issue
UOP	Unit of Purchase
UPC	Universal Product Code
US	United States (of America)
VIN	Vehicle Identification Number

ANNEX D

APPLICATION IDENTIFIERS (AI)

AI	Full Title	Format		Data Title	Defence Label[¥]	
		AI	Data		Shipping	Inventory
00	Serial Shipping Container Code	n2	n18	SSCC	☑	
01	Global Trade Item Number	n2	n14	GTIN		✓
02	GTIN of Trade Items Contained in a Logistic Unit	n2	n14	CONTENT		
10	Batch or Lot Number	n2	an..20	BATCH/LOT		✓
11[*]	Production Date (YYMMDD)	n2	n6	PROD DATE		
12[*]	Date Due (YYMMDD)	n2	n6	DUE DATE	✓	
13[*]	Packaging Date (YYMMDD)	n2	n6	PACK DATE	✓	
15[*]	Best Before Date (YYMMDD)	n2	n6	BEST BEFORE or SELL BY		
17[*]	Expiration Date (YYMMDD)	n2	n6	USE BY or EXPIRY		✓
20	Product Variant	n2	n2	VARIANT		
21	Serial Number	n2	an..20	SERIAL	✓	✓
22	Secondary Data for Specific Health Industry Products	n2	an..29	QTY/DATE/BATCH		
240	Additional Product Identification Assigned by the Manufacturer	n3	an..30	ADDITIONAL ID		
241	Customer Part Number	n3	an..30	CUST. PART NO.		✓
242	Made-to-Order Variation	n3	n...6	VARIATION NUMBER		
250[+]	Secondary Serial Number	n3	an..30	SECONDARY SERIAL	✓	✓
251[+]	Reference to Source Entity	n3	an..30	REF. TO SOURCE		
253	Global Document Type Identifier	n3	n13+n..17	DOC. ID		
254	GLN Extension Component	n3	an..20	GLN EXTENSION		
30	Variable Count	n2	n..8	VAR. COUNT		✓
310n[±]	Net Weight - Kilograms - Trade	n4	n6	NET WEIGHT (kg)		
311n[±]	Length of First Dimension - Metres - Trade	n4	n6	LENGTH (m)		
312n[±]	Width, Diameter, or Second Dimension - Metres - Trade	n4	n6	WIDTH (m)		
313n[±]	Depth, Thickness, Height, or Third Dimension - Metres - Trade	n4	n6	HEIGHT (m)		
314n[±]	Area - Square Metres - Trade	n4	n6	AREA (m2)		
315n[±]	Net Volume - Litres - Trade	n4	n6	NET VOLUME (l)		
316n[±]	Net Volume - Cubic Metres - Trade	n4	n6	NET VOLUME (m3)		
330n[±]	Gross Weight - Kilograms - Logistic	n4	n6	GROSS WEIGHT (kg)	✓	
331n[±]	Length or First Dimension - Metres - Logistic	n4	n6	LENGTH (m), logistic	✓	
332n[±]	Width, Diameter, or Second Dimension - Metres - Logistic	n4	n6	WIDTH (m), logistic	✓	
333n[±]	Depth, Thickness, Height, or Third Dimension - Metres - Logistic	n4	n6	HEIGHT (m), logistic	✓	
334n[±]	Area - Square Metres - Logistic	n4	n6	AREA (m2), logistic	✓	
335n[±]	Gross Volume - Litres - Logistic	n4	n6	VOLUME (l), logistic	✓	
336n[±]	Gross Volume - Cubic Metres - Logistic	n4	n6	VOLUME (m3), logistic	✓	
337n[±]	Kilograms Per Square Metre	n4	n6	KG PER m2		
37	Count of Trade Items Contained in a Logistic Unit	n2	n..8	COUNT	✓	
390n[±]	Amount Payable - Single Monetary Area	n4	n..15	AMOUNT		
391n[±]	Amount Payable - With ISO Currency Code	n4	n3+n..15	AMOUNT		

AI	Full Title	Format		Data Title	Defence Label¥	
		AI	Data		Shipping	Inventory
392n±	Amount Payable for a Variable Measure Trade Item - Single Monetary Unit	n4	n..15	PRICE		
393n±	Amount Payable for a Variable Measure Trade Item - With ISO Currency Code	n4	n3+n..15	PRICE		
400	Customer's Purchase Order Number	n3	an..30	ORDER NO.		
401	Global Identification Number for Consignment	n3	an..30	GINC	✓	
402	Global Shipment Identification Number	n3	n17	GSIN	✓	
403	Routing Code	n3	an..30	ROUTE	✓	
410	Ship To - Deliver To GS1 Global Location Number	n3	n13	SHIP TO LOC.	✓	
411	Bill To - Invoice to GS1 Global Location Number	n3	n13	BILL TO		
412	Purchased From GS1 Global Location Number	n3	n13	PURCHASE FROM		
413	Ship For - Deliver For - Forward To GS1 Global Location Number	n3	n13	SHIP FOR LOC.		
414	Identification of a Physical Location GS1 Global Location Number	n3	n13	LOC. NO.		
415	GS1 Global Location Number of the Invoicing Party	n3	n13	PAY TO		
420	Ship To - Deliver To Postal Code Within a Single Postal Authority	n3	an..20	SHIP TO POST	✓	
421	Ship To - Deliver To Postal Code With Three-Digit ISO Country Code	n3	n3+an..9	SHIP TO POST	✓	
422	Country of Origin of a Trade Item	n3	n3	ORIGIN	✓	
423	Country of Initial Processing	n3	n3+n..12	COUNTRY - INITIAL PROCESS	✓	
424	Country of Processing	n3	n3	COUNTRY - PROCESS		
425	Country of Disassembly	n3	n3	COUNTRY - DISASSEMBLY		
426	Country Covering Full Process Chain	n3	n3	COUNTRY - FULL PROCESS		
7001	NATO Stock Number	n4	n13	NSN	✓	☑
7002	UN/ECE Meat Carcasses and Cuts Classification	n4	an..30	MEAT CUT		
7003	Expiration Date and Time	n4	n10	EXPIRY DATE/TIME		
703s±	Approval Number of Processor with ISO Country Code	n4	n3+an..27	PROCESSOR # s4		
8001	Roll Products - Width, Length, Core Diameter, Direction, and Splices	n4	n14	DIMENSIONS		
8002	Electronic Serial Identifier for Cellular Mobile Telephones	n4	an..20	CMT NO.		
8003	GS1 Global Returnable Asset Identifier	n4	n14+an..16	GRAI		
8004	GS1 Global Individual Asset Identifier	n4	an..30	GIAI		
8005	Price Per Unit of Measure	n4	n6	PRICE PER UNIT		
8006	Identification of the Components of a Trade Item	n4	n14+n2+n2	GCTIN		
8007	International Bank Account Number	n4	an..30	IBAN		
8008	Date and Time of Production	n4	n8+n..4	PROD. TIME		
8018	GS1 Global Service Relation Number	n4	n18	GSRN		
8020	Payment Slip Reference	n4	an..25	REF. NO.		
8100	GS1-128 Coupon extender Code - U.P.C Prefix + Offer Code	n4	n1+n5	-		
8101	GS1-128 Coupon Extender Code - U.P.C Prefix + Offer Code + End of Offer Code	n4	n1+n5+n4	-		
8102	GS1-128 Coupon Extended Code - U.P.C Prefix	n4	n1+n1	-		
90+	Information Mutually Agreed Between Trading Partners	n2	an..30	INTERNAL	✓	✓
91-99+	Company Internal Information	n2	an..30	INTERNAL	✓	✓

Legend

¥	Applies only to Defence specific labels created internally, suppliers and OEM to produce GS1 compliant Trade Item, Trade Unit and Logistic labels (including AI 7001 when applicable)
☑	Unique identifier for this label type
✓	Indicative only, does not exclude the use of additional AIs for these label types
*	When only year and month are required DD must be filled with “00”
+	The actual data title may be specified by the issuer of the data
±	The fourth digit of the AI “n” - indicates the decimal point indicator “s” - indicates the sequence of the processors in the supply chain

Conventions

a	alphabetic characters
n	numeric characters
an	alphanumeric characters

Examples

n3	three numeric characters, fixed length
n..10	up to ten numeric characters, variable length
an..30	up to thirty alphanumeric characters, variable length

ANNEX E

MARKING METHODS GUIDANCE

Marking Methods	Mark Characteristics	HRI*	1D*	2D*	Recommended Use
Blast (grit) (with pre-encoded stencils)	Variable depth or height	Y	N	N	Abrasive method which can be used on most surfaces.
Acid Etch (with pre-encoded stencils)		Y	N	Y	Characters produced by use of acid. Use on metal and glass.
Vibro Peen		Y	N	N	Metal or non-metallic parts that may deform if metal stamped. Hand held operation.
Metal Stamp		Y	N	N	Metal or non-metal parts that will not deform under the stamping pressure required. Also, the alteration of the surface roughness finish will not be detrimental to proper functioning.
Dot peening		Y	N	Y	Metal or non-metal parts that may deform if metal stamped.
Engraving		Y	N	N	Sheet metal fabrication that will deform if metal stamped. Functional marking with colour filler
Embossing		Y	N	N	Thin sheet metal, plastics on non-functional surfaces
Cast or forged (with pre-encoded stencils)		Y	N	Y	Castings or forgings - characters raised or depressed depending on method of manufacture, unless otherwise specified on the drawing. Marking should be used on non-machined surfaces only
Molded (with pre-encoded stencils)		Y	N	Y	Usually plastic or rubber parts may be either raised or depressed, unless otherwise specified.
Electro-chemical etch (electrolytic process)		Y	Y	Y	Characters normally depressed, but may be raised. Used on fine surface finishes without protective coating, also high hardness parts (HRC 50 or higher)
Laser Discoloration	Surface mark	Y	Y	Y	Heat from the laser discolours the material surface without associated metal removal
Laser (Paint pigmentation)		Y	Y	Y	Chemicals added to some plastics that will react by changing colour when contacted with a laser.
Laser (Bonding)	Raised mark	Y	Y	Y	Mark produced by bonding a medium to the surface of an item, marking with a laser and producing a raised mark.
Laser (Engraving)	Variable depth	Y	Y	Y	Very good resolution of alpha numeric and machine-readable marking symbology. Character height and width range from .007 to 4.0 inches.
Laser (Etching)					Generally limited to 0.001 inch max. depth, done at lower power settings
Laser Markable Inks/Paints	Surface Mark	Y	Y	Y	Inks and paints containing pigments that discolour when struck with a laser beam

Marking Methods	Mark Characteristics	HRI*	1D*	2D*	Recommended Use
Rubber stamp, Ink Jet with pre-encoded stencils)	Surface Mark	Y	N	N	Non-metallic labels, fabrics, wood, plastics. On metal parts with protective finish (i.e., phosphate) cover with clear lacquer. Apply before oiling. Also temporary marking; work in progress.
Decalcomania		Y	Y	Y	Instructional plates, part identification, when other methods are not available, temporary marking, protect with clear lacquer. Apply before oiling.
Metal or plastic tags		Y	Y	Y	When other methods are not available.
Photo Anodizing		Y	Y	Y	Name plates, foil plates, placards, etc. Refer GG-P-455 for severe applications
Thermal Spray Combustion, Electric Arc, HVOF, Plasma)		Y	Y	Y	All metals and composites. Raised cells. All surface finishes. Requires abrasive blast. Can tailor the applied materials. Works well when painted over.
Metal paste through a pre-encoded stencil		Y	N	N	Apply specified metal paste through pre-encoded stencils. The stencil is removed and the metal paste is fused to the substrate via heat treat cycle, induction, laser or torch. Pre-blast required.
Epoxy applied through a pre-encoded stencil		Y	N	N	Epoxy is applied through a stencil and the stencil may or may not be removed for contrast. Requires a pre-blast. Good for all materials. Performs well under paint if the stencil is removed.
Pre-Encoded Inserts materials are in contrast to the part)		Y	Y	Y	Composites new build or retrofit. For new build, the pre encoded inserts are placed tool or bag side preferably under fibre glass and cured in. Use epoxy and vacuum bag for retrofit.
Digitally Printed	Subsurface mark	Y	Y	Y	Labels, tags & plates

* Y (recommended) and N (not recommended)

An unrestricted set of 2D Data Matrix mark qualification test and report data is available from the Joint Marking Qualification Working Group (JMQWG), US DoD at https://acc.dau.mil/CommunityBrowser.aspx?id=30743.

ANNEX F
CRITERIA TO CONSIDER IN THE SELECTION OF MARKING METHODS

Protective finish	Surface roughness	Marking method	Remarks
No protective finish or a coating of light oil applied after marking.	3.2 microns or coarser	Cast, forged, moulded, thermal spray, Metal fusion, epoxy	Specify “raised” or “depressed” only when necessary; used on non-machined surfaces.
		Metal stamp	On machined surfaces
	3.2 to 1.6 microns	Moulded, engraved metal stamp, dot peen, vibro peen	Specify “depressed”, when marking a functional surface.
	All surfaces	Laser markable inks or paints and epoxies, thermal spray and metal fusion Photo Anodizing	Additive marking. Cover with matte finish clear coat for additional protection
		Electro-chemical etch (electrolytic process)	Specify depth of depression or, if raised, the amount of build-up.
Phosphate, dry film, anodize, or plating	13.2 microns or coarser	Cast, forged, moulded, metal stamped, thermal spray, Metal fusion, epoxy	Specify “depressed” when marking a functional surface, plus mark prior to application of finish.
		Laser engraved	As above, may be marked after anodizing or plating.
	3.2 to 1.6 microns	Moulded, engraved metal, stamp, dot peen, vibro peen, acid etch, blast (grit) , thermal spray, Metal fusion, epoxy.	As above, plus mark prior to application of finish
		Laser engrave	On ground or sanded surfaces after anodize or plating.
	1.6 microns or finer	Decalcomania, laser discoloration, laser (paint pigmentation), laser (bonding), epoxy, thermal spray, Metal fusion, Photo Anodizing	Apply over protective coating before oiling, cover with clear lacquer or equivalent
		Laser engrave	Specify depth of penetration, especially on plated surfaces.
	All surfaces	Rubber stamp, pre-encoded stencil, ink jet	Apply over protective finish before oiling. Use ink in accordance with A-A-208, type I, or an equivalent type, cover with clear lacquer on nonporous surfaces.
		Laser markable inks or paints and epoxies, Thermal spray, Metal fusion.	Additive marking. Cover with matte finish clear coat for additional protection
Paint	All surfaces	Rubber stamp, epoxy and pre-encoded stencil, decalcomania, ink jet, Thermal spray, pre-encoded inserts, Metal fusion, Photo Anodizing	As above.
	3.2 microns or coarser		Painted, machined surfaces.
	3.2 to 1.6 microns		Painted, ground, or sanded surfaces
	1.6 microns or finer		Do not penetrate dry film thickness.
Epoxy or urethane coating	All surfaces	Rubber stamp, pre-encoded stencil, Ink Jet, marking machine, decalcomania, hand brush or laser markable inks or paints and epoxies with clear coat, Thermal spray, Metal fusion, Photo Anodizing.	For marking of printed wiring boards and assemblies, epoxy base fungus resistant, non-conducting ink in accordance with A-A-56032 may be used
Polycarbonate/Polyester with hard coating		Matte texture /	Digitally printed subsurface
		Velvet matte	

ANNEX G

ENCODED DATA CHARACTERS

HEX	DEC	Symbol	Name	HEX	DEC	Symbol	Name
21	33	!	Exclamation mark	4D	77	M	Capital letter M
22	34	“	Quotation mark	4E	78	N	Capital letter N
25	37	%	Percent sign	4F	79	O	Capital letter O
26	38	&	Ampersand	50	80	P	Capital letter P
27	39	‘	Apostrophe	51	81	Q	Capital letter Q
28	40	(	Left parenthesis	52	82	R	Capital letter R
29	41	)	Right parenthesis	53	83	S	Capital letter S
2A	42	*	Asterisk	54	84	T	Capital letter T
2B	43	+	Plus sign	55	85	U	Capital letter U
2C	44	,	Comma	56	86	V	Capital letter V
2D	45	-	Hyphen/Minus	57	87	W	Capital letter W
2E	46	.	Full stop	58	88	X	Capital letter X
2F	47	/	Solidus	59	89	Y	Capital letter Y
30	48	0	Digit zero	5A	90	Z	Capital letter Z
31	49	1	Digit one	5F	95	_	Low line
32	50	2	Digit two	61	97	a	Small letter a
33	51	3	Digit three	62	98	b	Small letter b
34	52	4	Digit four	63	99	c	Small letter c
35	53	5	Digit five	64	100	d	Small letter d
36	54	6	Digit six	65	101	e	Small letter e
37	55	7	Digit seven	66	102	f	Small letter f
38	56	8	Digit eight	67	103	g	Small letter g
39	57	9	Digit nine	68	104	h	Small letter h
3A	58	:	Colon	69	105	i	Small letter i
3B	59	;	Semicolon	6A	106	j	Small letter j
3C	60	<	Less-than sign	6B	107	k	Small letter k
3D	61	=	Equals sign	6C	108	l	Small letter l
3E	62	>	Greater-than sign	6D	109	m	Small letter m
3F	63	?	Question mark	6E	110	n	Small letter n
41	65	A	Capital letter A	6F	111	o	Small letter o
42	66	B	Capital letter B	70	112	p	Small letter p
43	67	C	Capital letter C	71	113	q	Small letter q
44	68	D	Capital letter D	72	114	r	Small letter r
45	69	E	Capital letter E	73	115	s	Small letter s
46	70	F	Capital letter F	74	116	t	Small letter t
47	71	G	Capital letter G	75	117	u	Small letter u
48	72	H	Capital letter H	76	118	v	Small letter v
49	73	I	Capital letter I	77	119	w	Small letter w

HEX	DEC	Symbol	Name	HEX	DEC	Symbol	Name
4A	74	J	Capital letter J	78	120	x	Small letter x
4B	75	K	Capital letter K	79	121	y	Small letter y
4C	76	L	Capital letter L	7A	122	z	Small letter z

Comments

Default characters for Defence are numbers 0 to 9 and capital letters “A” to “Z” and the non-alphanumeric characters in this table.

Note. External barcodes may contain capital and small characters

Note. Refer to Annex D for the range of characters to be found in Application Identifiers (AI)

Capital letters I, L, O and Q to be avoided in a UID

Small letters to be converted to capital letters in a UII

All non-alphanumeric characters other than Hyphen/Minus “-“ and Solidus “/” to be removed from a UII

ANNEX H

DOCUMENT IMPROVEMENT PROPOSAL

DEF(AUST) 1000C Part 12/ Issue 3 / Type S - Automatic Identification Technology Labelling and Marking

STANDARD

The purpose of this form is to solicit comments that will assist in maintaining this document as both practical and realistic. When completed, the form and any additional papers, should be forwarded to the Sponsoring Appointment named in this document or to:

Assistant Program Coordinator
Army Standardisation
Land Engineering Agency
3rd Floor, Defence Plaza Melbourne
661 Bourke Street
MELBOURNE VIC 3000

Question 1	**Has any part of this document created problems or required interpretation in use? State paragraph no(s) and any rewording suggested.**
Answer 1	
Question 2	**Has any new technology rendered any process obsolete? Suggestions supported by examples are welcome where the new process/hardware has proved satisfactory.**
Answer 2	
Question 3	**Comments on any requirements considered to be too rigid/too expensive.**
Answer 3	
Question 4	**Remarks (attach any relevant data that may be of use in improving this document).**
Answer 4	

Note: Comments submitted do not constitute or imply authorisation to waive any requirement of the document or to amend contractual requirements.

REQUESTS FOR DOCUMENTS

Requests for copies of this Standard, or certain of the listed Applicable Documents, may be directed to the appropriate source listed below:

DEPARTMENT OF DEFENCE (Maritime)

Director Naval Platform Systems
Department of Defence (Navy Office)
Campbell Park Offices (CP4-SP-013)
CANBERRA ACT 2600
Attention: NSTDC
Telephone: (02) 6266 2906
Facsimile: (02) 6266 2105

DEPARTMENT OF DEFENCE (Land)

Land Engineering Agency
Attention: Technical Data Centre
3rd Floor, Defence Plaza Melbourne
661 Bourke St
MELBOURNE VIC 3000
Email: LEATechnicalData@drnex.defence.gov.au
Facsimile: (03) 9622 2942

DEPARTMENT OF DEFENCE (Air)

Areospace Technical Standards Document Centre (ATSDC)
Common Services System Support Office (CSSSO)
Building L7-1
RAAF Williams
Laverton VIC 3027
Telephone: (03) 9256 4236
Facsimile: (03) 9256 4888

DEFENCE RESTRICTED NETWORK (DRN)

Army Standardisation:

http://vbmweb.sor.defence.gov.au/SPECS/Triservice/Directory.htm

Aerospace Technical Standards Document Centre:

http://wilap006.sor.defence.gov.au/Specs/defence.asp

ADF Maritime Material Requirements Set:

http://defweb.cbr.defence.gov.au/navysyscom/mrs/HomePage.htm

Note: The above websites addresses may change at any time without notice.

Copies of DEF(AUST) documents are obtainable from sources shown above