

Part Identification and Serialization

Standard Revision Table

Version/Rev	Process Owner	Process Participants	Changes from Previous Version
Rev 0	Manu Engineering	Engineering, Quality, Manufacturing, MRO, Flight Team, Materials, Receiving, Suppliers	Initial Release

Term Definition Table

Terms	Definition
Process Owner	A Process Owner is responsible for establishing, documenting, maintaining, implementing and improving the business process under their control.
Process Participants	Process Participants are responsible for using the process effectively and suggesting ways to continually improve the process.
Module	Single cell in a matrix symbology used to encode one bit of data, nominally a square shape in Data Matrix.
HRI	Human readable interface (Barcode)
ADRC	Authorized Depot Repair Center
ECC 200	Refers to Data Matrix symbols which are generated according to the latest and most sophisticated built-in error correction methods.
Code 128	A high-density linear barcode symbology defined in ISO/IEC 15417
UID	A unique identifier (UID) is an identifier that is guaranteed to be unique among all identifiers used for those objects and for a specific purpose.

Reference Table

ID	Description
A-A-208	Ink, Marking, Stencil, Opaque
ISO/IEC 15417	Automatic identification and data capture techniques - Bar Code Symbology Specification - Code 128
ISO/IEC 16022	Automatic identification and data capture techniques - Data Matrix Bar Code Symbology Specification.
IPC/WHMA-A-620	Requirements and Acceptance for Cable and Wire Harness Assemblies.
IPC-A-610	Acceptability of Electronic Assemblies
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-1168	Ammunition Lot Numbering and Ammunition Data Card
GSI-128	Application standard within Code 128 barcode Specification

1. Purpose & Scope

1.1. Purpose

This procedure outlines the requirements for physically marking Pivotal Aero parts and assemblies as directed by Purchase Order, drawing or procedure.

1.2. Audience

This standard will be used by Pivotal Aero and all suppliers of products thereof where part identification and Serialization is needed.

1.3. Background

Good business practice requires standardization of part identification and serialization. A so-called smart numbering system is going to be installed to help users readily identify suppliers, manufacturing dates, and revisions on parts without having to access the ERP database.

1.4. Scope

1.4.1. These requirements cover both the information to be in the marking and the materials and processes used for the marking.

1.4.2. This standard is to be specified by number and revision on applicable purchase orders and/or drawings.

1.4.3. If a conflict were to exist between the drawing and all other documents, the drawing would take precedence excluding UID requirements.

1.4.4. Any identification outside the scope of this document requires Pivotal Aero formal approval prior to usage.

1.4.5. This standard does not supersede or take precedence over any contractual and or UID marking requirements as directed in Mil-std-130.

1.4.6. This procedure will supplement IPC-A-610 for PCBA marking and IPC/WHMA-A-620 for cable marking. If a conflict were to exist, the IPC documents would take precedence.

1.4.7. When a specification is referenced, it is implied that the most recent revision is to be used.

2. General

2.1. Information contained in this section shall apply as applicable to required marking method.

2.2. Location

2.2.1. Regardless of method, the marking shall be on a suitable surface of the item.

2.2.2. Marking shall be located so that it is readily visible, with a minimum removal of covers, shield, adjacent parts and assemblies.

2.2.3. The location must be specified on the Pivotal Aero drawing, procedure or change order.

- 2.2.3.1. When location is not specified the manufacturer shall use their discretion in placing the marking.
- 2.2.3.2. Deviation labels, when location is not specified, must be placed immediately adjacent to the existing, current, Part Number and Revision identification.
- 2.2.3.3. Obvious mating surfaces, viewports, rotating pieces, sensitive areas, etc. are to be avoided.

2.3. Clarity

- 2.3.1. Marking color shall be of sufficient contrast to background color to be easily read for HRI.
- 2.3.2. Regardless of the marking method used, marking shall be initially legible and shall remain legible following completion of all inspections, handling and for the normal life expectancy of the item.
- 2.3.3. Marking shall not exhibit any defects that will affect its intended purpose.
- 2.3.4. AT no time shall the HRI be less than 0.047 inches in height.

2.4. Ink

- 2.4.1. All ink used in marking, except for label printing, shall comply with the current revision of Commercial item description A-A-208.
 - 2.4.1.1. All requirements of Sections 2.2 & 2.3 apply to this method.
- 2.4.2. Permanency must comply with the requirements of commercial item description A-A-208

2.5. Labels

- 2.5.1. Where space permits, labels shall have a border (quiet zone) on each edge of no less than 0.0625 inch.
- 2.5.2. The opacity of labels shall be sufficient to hide completely the background in which they are applied.
- 2.5.3. Labels shall not curl, shift, separate, wrinkle, blister, crack, delaminate, peel, soften, discolor, fade or loosen when exposed to water, IPA and standard processing temperatures.
- 2.5.4. All requirements of sections 2.2 & 2.3 apply to this method.

2.6. Other HRI

- 2.6.1. If barcode identification is not specified, marking may be accomplished by other means such as stamping, etching, branding, engraving, molding, or photosensitive printing.
 - 2.6.1.1. Section 2.6 may only be utilized if no other requirements are specified via drawing, purchase order, or change order.
 - 2.6.1.2. All requirements of sections 2.2 & 2.3 apply to these alternate methods.

2.7. General Barcode Information

- 2.7.1. The barcode may be a separate label from the corresponding text (HRI) if space is an issue.

- 2.7.1.1. If separate labels are used the HRI is to be located as close as possible to one another to make it apparent that they are a part/group.
- 2.7.2. The barcode is to only contains information as defined in Sections 3, 4, & 7 as specified in this document.
 - 2.7.2.1. Identification prefixes, such as "S/N", "P/N", "REV", etc. are not permitted within the barcode.
- 2.8. Exceptions
 - 2.8.1. Exceptions to the standards established within this document are allowed for the following specific situations.
 - 2.8.1.1. Where serialization of a Pivotal Aero part or assembly is derived from a pre-printed label or plate that is part of the BOM (i.e. GCU Systems, Air Vehicle Numbers, System Numbers, etc.). These are usually purely numeric and contain no other date coding or vendor elements and are assigned to top level assemblies.
 - 2.8.1.2. Where Pivotal Aero or the supplier cannot, or it is impractical to, comply due to reasons arising from the nature, design or function of the component assembly. Examples:
 - 2.8.1.2.1. COTS items which already have a serialization scheme from the supplier, and it is impractical for the supplier to change the serialization for the items they will supply to Pivotal Aero.
 - 2.8.1.2.2. Items that are in some type of controlled status (SASSM's, explosives with lot coding, etc.) and it is inappropriate to alter the existing serialization of the item.
 - 2.8.1.2.3. Where the serialization of an item is integral to some function of that item and Pivotal Aero standard serialization cannot be accommodated.
 - 2.8.1.3. When customer requirements call for a specific serialization and/or lot numbering scheme to suit their internal needs (must be clearly stated in the contract).
 - 2.8.1.4. Where the Government or other legal/regulatory classification of an item mandates the use of a specific serialization and/or lot numbering scheme to assure proper compliance with the related regulations, such as, but not limited to Munitions identification MIL-STD-1168

3. Lot Code Identification

3.1. Lot Date Code Structure: YYWWVV

where YY = last 2 digits of the year of manufacture. E.G. 2009 = 09.

WW = 2-digit representation of the week of manufacture. The counting of weeks will commence on the 1st week of the calendar year (01) and end the last week of the calendar year.

VV = 2-character alpha designation of the manufacturer or ADRC as assigned by the Pivotal Aero purchasing department.

3.1.1. The supplier or ADRC shall only use the 2-character alpha designation (VV) as directed by Pivotal Aero Purchasing.

3.1.1.1. "PA" is reserved for Pivotal Aero.

3.2. Expiration Lot Code Structure: YYNNNNNN

Where YY = Last 2 digits of the calendar year of manufacture. E.g. 2006 = 06.

Where NNNNNN = The sequential numeric numbering of items manufactured by supplier. Each number will increase by one for each item produced.

3.2.1. In the case of child lots, the pre-fix "C" will be added to create the structure: C-YYNNNNNN

3.2.2. Maintained and monitored by Pivotal Aero Stock Room for expired material. Number generated by Pivotal Aero Enterprise Resource Planning System.

3.3. Pivotal Aero shall be notified immediately, in writing, upon discovery of any repeats, omissions, or errors in marking of product, including labels manufactured for Pivotal Aero.

3.4. HRI Marking Method

3.4.1. Marking shall be of such size as to promote maximum legibility (see section 2.3) under adverse conditions and, in any case, shall be at least 0.047 inch high.

3.4.2. Acceptable fonts are derived from the Serif, or Sans Serif family, monospaced or proportionally spaced.

3.4.2.1. The most common fonts, complying with the above requirements, are Arial, Helvetica, Times Roman and Courier.

3.4.3. The lot date code identification, as described in Section 3.1, shall be one continuous, unbroken, string when displayed as HRI.

4. Serialization Identification

4.1. Structure:

4.1.1. Alpha-Numeric YYWWVVANNN

where YY = last 2 digits of the year of manufacture. E.G. 2009 = 09.

WW = 2-digit representation of the week of manufacture. The counting of weeks will commence on the 1st week of the calendar year (01) and end the last week of the calendar year.

VV = 2-character alpha designation of the manufacturer or ADRC as assigned by the Pivotal Aero purchasing department.

ANNN = The sequential alpha-numeric numbering of items manufactured by the supplier. The first position is an alpha character starting with "A" and sequencing through the alphabet. The following 3 characters are numeric and will increment by one for each item produced. E.g. The 1st item produced by VV would be identified as "A001", the 2nd as "A002", the 999th as "A999" and the 1000th as "B000".

Note: The entire sequence (YYWWVVANNN) is considered the serial number. The supplier, at his discretion, may restart the sequential numbering (ANNN) each week. Section 4.2.3 shall not be violated.

4.1.2. Numeric NNN (3 or more digits)

Where NNN = At least 3-digit Numeric sequence that will increment by one for each item produced. Typically, this is used on Air Vehicles and other Upper-Level Assemblies (Hub, RF Head, GCU, UBC, etc.).

4.2. HRI Marking Method

4.2.1. When space is an issue, the HRI marking may be separated by hyphens "-".

4.2.1.1. Hyphens may only be placed between logical groups of characters. E.g. YYWW-VV-ANNN is acceptable. YYW-WVVA-NNN an example is not acceptable.

4.2.1.1.1. HRI "separation hyphens" are not to be embedded in any barcode.

4.2.2. The sequential numbering "ANNN" shall be determined and maintained by the manufacturer/supplier.

4.2.3. No marking, with serialization, shall repeat for identical part numbers.

4.2.3.1. E.g. Part numbers 12345 and 34567 may have the same serial number. Hence, the part number must be paired with its serial number as a test for uniqueness.

5. Data Matrix Barcode Identification

5.1. A data matrix (2D) barcode shall be present on the label if this section is specified on the drawing, purchase order or change order.

5.1.1. All 2D barcodes shall comply with ISO/IEC 16022.

5.1.2. ECC 200 encoding shall be utilized.

- 5.1.3. The amount of data to be encoded will dictate the actual barcode size.
 - 5.1.3.1. Minimum module width is 3 elements.
 - 5.1.3.2. Quiet zone is 2 element widths on all 4 sides.
 - 5.1.3.3. At no time shall the overall width/height (excluding quiet zones) of the barcode be less than 0.110 inches.
 - 5.1.3.4. The maximum size of the barcode shall be no larger than what will fit on the label, including the quiet zones.
 - 5.1.3.5. No check characters shall be used.
- 5.2. Unless otherwise specified on the drawing, purchase order, or change order, all 2D barcodes are to display the HRI equivalent.
 - 5.2.1. The HRI is to appear below and centered on the barcode when possible.
 - 5.2.1.1. Section 4.2 applies if serialization is specified.
 - 5.2.1.2. Section 3.4 applies if lot date code is specified.

6. Linear Barcode Identification

- 6.1. A code 128 linear barcode, encoding the human readable information, shall be present on the label if this section is specified on the drawing, purchase order, or change order.
 - 6.1.1. Reference ISO/IEC 15417 for GS1-128 compliance.
 - 6.1.2. Symbol requirements for Code 128 barcodes:
 - 6.1.2.1. a. module/element width: 0.25mm Minimum
 - 6.1.2.2. b. Barcode height: 5mm minimum
 - 6.1.2.3. c. Minimum print quality: 1.5/05/660 (+/- 10 nm)
 - 6.1.2.4. d. No data identifiers are to be contained in the machine readable symbology (See Section 2.7.2.1)
- 6.2. Unless otherwise specified on the drawing, purchase order, or change order, all linear barcodes are to display the HRI equivalent.
 - 6.2.1. The HRI is to appear below and centered on the barcode
 - 6.2.1.1. Section 4.2 applies if serialization is specified.
 - 6.2.1.2. Section 3.4 applies in lot date code is specified.

7. Part Number and Revision Identification

- 7.1. The part number and revision shall be present if this section is specified on the drawing, purchase order, or change order.
- 7.2. When embedded in a barcode, the part number, revision and lot date code (or Serial number) is to be comma delimited with no spaces present.
 - 7.2.1. Examples:
 - 7.2.1.1. When Section 7 & (5 or 6) is specified: 56100-100,A
 - 7.2.1.2. When Sections 4,7 & (5 or 6) are specified: 56100-100,A,0725PAB103
 - 7.2.1.3. When Sections 3, 7 & (5 or 6) are specified: 56100-100,A,0725PA

8. UID Requirements

- 8.1. If an item requires a UID, then UID must be created using Construct 1 or Construct 2 as specified in MIL-STD-130. The preferred method is Construct 2.
- 8.2. The UID marking may have an HRI portion if there is enough room on the label.
 - 8.2.1. The HRI may be the entire string of characters or part of the string (i.e. Serial Number).
- 8.3. All UID Markings must be verified prior to applying the label to the hardware by using a UID verifier.
 - 8.3.1. The verification must have a grade "C" or better and show proper identifiers and semantics were used.
 - 8.3.2. The verification may be printed or filed electronically. The name of the save file shall be "Part Number, Serial Number".
 - 8.3.3. Common causes of a failed UID verification are described below. Consult with Manufacturing Engineering for Troubleshooting.
 - 8.3.3.1. Contrast (Colored label)
 - 8.3.3.2. Overprint (Data matrix is too dark)
 - 8.3.3.3. Quiet Zone (Data matrix is too close to edge of label)
 - 8.3.3.4. Size Limit (Data matrix may be too small)
 - 8.3.3.5. Improper Delimiters and Semantics (Wrong UID structure used)
 - 8.3.4. UID registration into the DoD Registry is not within the scope of this document.

9. Software and Versions

- 9.1. Software and version when applied to a label shall be HRI only.
- 9.2. Version shall be preceded by "VER:" (e.g. Ver: 1.0.6).
- 9.3. Software shall be preceded by "S/W:" and shall include revision information (e.g. S/W: 58830 A).

10. Change Order Identification

- 10.1. This standard may be specified for change order (ECO & Deviation) identification.
- 10.2. The location of the label must always be specified by Pivotal Aero
- 10.3. The label may never be combined with other information and shall not exhibit a barcode. I.e. only the change order number may be present on the label.
- 10.4. Sections 2.1 and 2.6 shall apply.

11. Labeling at Authorized Depot Repair Centers (ADRC)

- 11.1. Unless instructed otherwise, ADRC's shall print a new label anytime they open a part or assembly.
- 11.2. Label is to contain all the same information as the original label, with the ADRC 2-character alpha designation in place of the original manufacturer 2-character alpha designation.

11.2.1. Example: Serial number 1622PAA123 would become 1622VVA123.

11.3. Serial numbers of parts that fall within Section 2.8 or Section 4.1.2 are not to be changed.

12. Specifying Label Size

12.1. Generally the smallest label possible should be used given the data to be present.

13. Specifying Procedure Sections

13.1. Use the matrix below to callout specific sections within this procedure to achieve the desired identification construct.

13.1.1. E.g.: To specify a part number, revision, serial number with a 2D barcode label Procedure Sections 2,4,5 & 7 would be specified. Using this example a sample note may be constructed as:

Identify assembly with Part Number, Revision, Serial Number and 2D barcode per Procedure DOC-PVTL-0000231 Sections 2,4,5 & 7 Latest revision.

This translates into a 2D barcode that reads - 51220,A,2405PAB1451 that the supplier/manufacturer will put on the assembly.

	Procedure Section						
	2	3	4	5	6	7	8
Lot Date Code	X	X					
Lot Date Code with 2D Barcode	X	X		X			
Lot Date Code with 128 Barcode	X	X			X		
Lot Date Code, PN & Rev	X	X				X	
Lot Date Code, PN & Rev with 2D Barcode	X	X		X		X	
Lot Date Code, PN & Rev with 128 Barcode	X	X			X	X	
Serial Number	X		X				
Serial Number with 2D Barcode	X		X	X			
Serial Number with 128 Barcode	X		X		X		
Serial Number, PN & Rev	X		X			X	
Serial Number, PN & Rev with 2D Barcode	X		X	X		X	
Serial Number, PN & Rev with 128 Barcode	X		X		X	X	
Serial Number, PN & Rev with UID							
Serial Number, PN & Rev with 2D Barcode and UID							
Serial Number, PN & Rev with 128 Barcode and UID							
PN & Rev with 2D Barcode	X			X		X	
PN & Rev with 128 Barcode	X				X	X	