MERITOR *GUIDELINE*	**Location:** NA Truck Manufacturing Sites	**Guideline Number:** MFG-002
	Issue Date: April 24, 2018	**Revision Date:** April 24, 2018
	Issuing Function: Corporate Manufacturing	**Content Owner/Title:** Kent Potts / Industrialization

Guideline Title: Meritor NA Truck Component Barcode ID Guideline

1.0 Purpose: to provide a general Operations guideline for both a human-readable text and a machine-readable barcode ID (identification) in NA Truck component marking and labeling applications.

2.0 Scope: All Meritor components which have a Component Barcode ID Specification (WTDoc) listed on any of these:

- Product Drawing
- Bill of Material
- Attachment of WTDoc in Windchill

3.0 Responsibilities in the typical project process flow of a New Component Barcode ID Project

1. ***Project Manager*** gathers this preliminary information:
- What other similar products have a barcode ID now that could possibly work to use the exact ID Spec in your new application?
- Where do you want the barcode placed on the component? See Location Guidelines below. Provide a dimensioned product drawing showing the size of the area available for either a label or a direct part mark.
- Is that location approved by Product Engineering, Supplier, and Operations?
- What information is required and what information is Optional to be marked in the barcode symbol? See section 4.3.
- Is marking or labeling this component with a Barcode ID covered under an existing capital project budget and an existing understanding of a potential product cost change?

2. ***Industrialization*** reviews the preliminary information and proposes either to use an existing Component Barcode ID Spec or generate a new Spec to the Project Manager.

3. ***Project Manager*** reviews both this guideline MFG-002 and the Component Barcode ID Spec ID-xxx that is proposed by Industrialization with Controls Engineering and either:
- For internal processes, generates a SOW for equipment vendors to quote equipment, tooling, and lead-times.
- For purchased components, provides both documents to Procurement to contact the supplier with marking or labeling requirements.

4. ***Project Manager*** may need to generate and receive AR approval for items in section 3.3.

5. ***Industrialization*** after AR approval from the Project Manager, determines if an existing ID Spec is sufficient or generates a new ID-xxx to meet the need.

6. ***Industrialization*** adds all new ID Specs to Windchill. The document ID-xxx is created in Windchill for this particular 2D or 1D component ID barcode spec. A future revision may be needed to ID-xxx to revision B, but it is a standard part document, and ready for Specs or Product Engineering to associate as a reference document in Windchill on the Engineering View Part.

7. ***Specs or Product Engineering*** perform associative reference linkage of ID-xxx, the particular Component Barcode ID Specification, to the component part per section 2.0.

8. ***Procurement*** includes the Component Barcode ID Specification in the Technical Review Meeting.

4.0 Definitions

- **Code 39** is a 1D barcode format reportedly developed by Dr. David Allais and Ray Stevens of Intermec around 1974.

- **DataMatrix/ECC200** is a 2D barcode format reportedly developed by Acuity CiMatrix / Siemens around 2005. It is the preferred 2D symbol format by Meritor. DataMatrix format uses roughly 10% less space for the same content as the QR format 2D barcode and 30 times less space than a Code 39 format 1D barcode. It is compliant to Military Standard 130 and many automotive OEM standards. DataMatrix format is reportedly very forgivable in terms of readability. Barcodes that are damaged as much as 60% and grading a C or worse score are reported to have capable recognition by barcode scanners.

- **QR** is a 2D barcode format reportedly developed by Denso Wave around 1994.

- **Dot peen direct part marking technology** machines use a pneumatically-driven marking pen or stylus to peen an array of very small dots in a 2D barcode pattern. Quality of the barcode is controlled by: air pressure, air supply CFM, dot spacing and pen setup/condition. Various dot peen barcode formats are available. DataMatrix/ECC200 is the required (not optional) 2D dot peen symbol format by Meritor.

The barcode DataMatrix shown is <u>not compliant</u> to Meritor's Guideline as it contains PA 3211M5733#1#080#A#18

The same contents in the required Meritor format is #PA 3211M5733#L1080A18

- **Laser direct part marking technology** machines apply 2D barcode and text to surfaces by burning a small amount of parent material. The technique does not involve the use of inks, nor does it involve tool bits which contact the engraving surface and wear out, giving it an advantage over alternative engraving or marking technologies where inks or bit heads have to be replaced regularly.

5.0 General Guidelines for component barcodes

1. Location guidelines. See testing requirements for all cases.

	Overall Initial CapEx	Cast Surface	Machined Surface	Painted Surface	Oily Surface	Composite Surface
Label	Lowest		Good	Good	Poor	
Thermal printed label						Low heat applications only
Direct Laser Marking Barcode	Highest	Okay if a pre-burn is acceptable. See testing requirements.	Unknown impact regarding finish and hardness. Flat area is preferred.	Unknown impact regarding rust initiation point	Best	
Direct Marking Ink Jet		Not Recommended	Best		Poor	Best
Direct Marking Dot Peen	Consider cycle time. Faster than laser.	Not Recommended	Dots will raise surface 0.002" max	Good	Best	Poor

2. Unless otherwise allowed by the specific ID-xxx specification, the encoded text in either the 1D or the 2D data matrix MUST BE the exact Meritor Oracle Part Number with the dashes or spaces as seen on the Oracle created PO (purchase order) with a hash symbol "#" and capital "P" directly in front of the Oracle part number. It CANNOT have any added dashes or spaces unless they appear in the Meritor Oracle Part Number. In the example below, the 2D matrix would scan as: #P3264U1503#S12345678901#R--A#V123456#L12434567#J18365

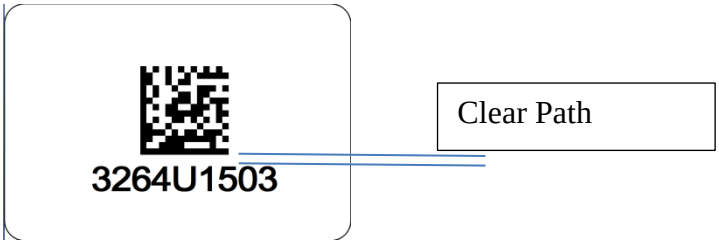
3. 2D barcodes may have additional fields embedded. If optional prefixes are used, this specific ordering is required.

- Required - #P prefix leading the full alpha/numeric Oracle part number
- Optional, ID-xxx specific – #S prefix leading 11-digit Serial number
- Optional, ID-xxx specific – #R prefix leading 3-digit drawing Revision
- Optional, ID-xxx specific – #V prefix leading 6-digit Supplier ID number
- Optional, ID-xxx specific – #L prefix leading 7-digit Lot number
- Optional, ID-xxx specific – #J prefix leading 5-digit Julian Date number

- For numeric values less than the field, lead with zeros ”0”.
- For alphabetic values less than the standard field length, lead with a dash “-“. Example is shown below for the Meritor drawing revision letter.

4. The clear-path, margin, or quite zone around the barcode will be a minimum of two modules on all edges.

5. The human-readable, printed numeric part number text representation omits the “#P” prefix. This is an example.



6. The human-readable font is Arial Font, in minimum of 1/16 inch tall characters, unless otherwise specified in ID-xxx.

7. A logo may also either be optional or required within the printed field. See the specific ID-xxx specification for details.

6.0 Guidelines for Labeling or Direct Part Marking Sources and Vendors

1. Label stock sources include:

6.1.1 Pressure sensitive adhesive-backed paper label approved sources include:
- MPI Label Systems
- AALSTEC DATA CORP
- SIGMA SUPPLY OF NORTH AMERICA

6.1.2 Thermal transfer printing label media approved sources include:
- AALSTEC DATA CORP
- SIGMA SUPPLY OF NORTH AMERICA

6.1.3 Mylar label approved sources include: AALSTEC DATA CORP

6.1.4 Labels must be scratch free on both the barcode area and the human-readable text

2. Direct part marking approved equipment vendors include:
- Keyence laser marking systems are used by Meritor.
- Telesis Pin Stamp Dot Marking systems are used by Meritor.
- Mecco Pin Stamp Dot Marking systems are used by Meritor and are reportedly faster than some Telesis models due to using a spring return stylus technology.
- Couth Pin stamp Dot Marking machines are in use in Lindesberg
- Keyence ink jet printing systems have not been fully tested yet by Meritor.
- OCR (Optical Character Recognition) direct marking systems are not recommended.

7.0 Guidelines for 1D Barcodes

1. Acceptable 1D barcode formats: Code 39 preferred. Code 128 is approved alternate unless otherwise stated in the ID-xxx specification.

2. Laser marked 1D barcodes have not been tested to-date, and are not recommended. 1D barcodes are recommended for label use only.

3. Pin Stamp Dot Marking for 1D barcodes is not acceptable to Meritor.

8.0 Guidelines for 2D Barcodes and Pin Stamping

1. Acceptable 2D laser codes: DataMatrix (ECC200) code format is preferred. QR code is an approved alternate unless otherwise stated in ID-xxx.

2. Acceptable 2D Pin Stamp Dot Marking code: DataMatrix (ECC200) is required. No other format is permitted.

3. Acceptable OCR (Optical Character) character stamps are not recommended for use.

9.0 General guidelines for label and direct marking equipment and approved equipment integrators

1. All direct part marking equipment shall have implemented an immediate reader and self-testing method to ensure that the barcode the machine just etched in the part is readable, and if not take action before passing on the part. The readability test is integrated into the device that applies the barcodes.

2. All labeling and direct part marking applications are suggested to conduct a pre-production readability study comparing the readability of both the supplier's barcoded component parts and the Meritor site's barcode reader before supplier PPAP submission.

3. Approved System Design, Build Integrators

- Wes-Tech Automation Solutions, LLC, attn.: Greg Hall, ghall@wes-tech.com, Phone (847) 419-7948
- Meritor Controls Engr, attn.: Sam Addison
- Other, untested, equipment integrators may be suitable. Consult Meritor Controls Engineering for your project vendor needs.

10.0 Guidelines for label printing equipment.

1. Typical IS direction is to purchase and use Honeywell (former Intermec) general label printers. The model varies, but most printers are Intermec model PD42 printers (no longer available) so we are now purchasing Honeywell (they bought out Intermec) model PM43.

2. IS direction for Mylar laminated label printers is to use the Protector 5 Printer Laminator equipped with a PX4i Barcode Label Printer. The vendor for the Mylar is Image Technology Corp.

11.0 Guidelines for laser barcode marking equipment.

1. The approved marking system is based on a Keyence MD-X1500 laser. 50 Watts and 3 Axis head. Typical cast spider cycle time for conveyor input, laser mark, and conveyor output is 42 seconds with the actual marking time of roughly 30 seconds.

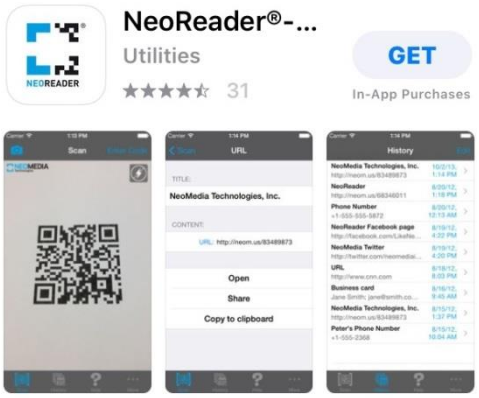
2. Wes-Tech has reported good results with a Telesis model Vari-Z and F-series laser marking system that also has integrated symbol quality grading. **These systems have not been tested yet by Meritor Controls Engineering.**
3. Other, untested systems may be suitable as long as they meet Meritor Safety and readability requirements.
4. Meritor HSE has additional guidelines for laser etching systems. Eg. enclosures, window tint, safety circuitry, and light intensity limitations.

12.0 Guidelines for barcode scanners (readers).

1. Zebra brand barcode scanners are preferred and the model depends on the application.
   - LI3678-FZ for 1D barcodes only, standard scanning range of roughly 2 feet distance, RS232 connection.
   - DS3678-SR for both 1D and 2D barcode scanning applications, standard range, RS232 connection.
   - DS3678-DP for 1D, 2D, and dot pin stamped barcode applications, standard range, and RS232 connection.

2. Other brand industrial barcode scanners that have been tested and found acceptable
   - Motorola DS3578-DPM – for 1D/2D Labels & Direct part marking (ie: laser marking and dot pin stamp scanning)
   - Motorola DS3578 – for 1D & 2D Labels
   - Motorola LS3578 – for 1D Labels
   - Any 1D off the-shelf-scanner
3. Fixed-mount scanners have not been tested by Meritor. Consult IT and Meritor Controls Engineering before selection of any barcode scanner due to connectivity options.

4. For a non-industrial, engineering test only, App for your phone to read barcode symbols, this App seems to work well.



13.0 References:

Drafting standard D-004

AIAG barcoding standard B-10

SQSR Supplier Quality Systems Requirements

Tech Review Template

ECC 200 Code Sizes : https://www.pepperl-fuchs.com/usa/en/6404.htm

Barcode Grading: ISO/IEC TR 29158

Date	Revision Change
April 24, 2018	Initial Release

Director Approval:

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Title: Sr. Director, Industrialization