NOT MEASUREMENT SENSITIVE

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PERFORMANCE SPECIFICATION

PRESSURE-SENSITIVE ADHESIVE LABELS FOR BAR CODING

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for pressure-sensitive adhesive labels that meet or exceed the end user's necessary performance criteria for use in the implementation of bar code marking/reading operations.

1.2 Classification. The labels furnished in accordance with this specification will be of the following types, grades, styles and compositions as specified in the contract or order (see 6.2):

1.2.1 Types. The types of pressure-sensitive adhesive labels are as follows:

Type I	Blank label sheet(s)
Type II	Blank label roll(s)
Type III	Barcoded label(s) cut on sheet(s)
Type IV	Barcoded label(s) cut on roll(s)
Type V	Special (specify)

Comments, suggestions, or questions on this document should be addressed to Chief, USAMC LOGSA Packaging, Storage, and Containerization Center, ATTN: AMXLS-AT, 11 Hap Arnold Boulevard, Tobyhanna, PA 18466-5097 or e-mailed to toby.pt@us.army.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil.

AMSC N/A FSC 7690

1.2.2 Grades. The grades of pressure-sensitive adhesive labels are as follows:

Grade A	Multiple durability requirements (see 3.15.1)
Grade B	Adhesion, abrasion, and Ultraviolet (UV) light condensation only
Grade C	Adhesion only
Grade D	Special durability requirements (specify)

1.2.3 Styles. The styles of pressure-sensitive adhesive labels are as follows:

Style 1 *	Non-porous surfaces
Style 2 *	Porous surfaces
Style 3 *	Special surfaces (for example, styrofoam, rubber, composites)

* The user will specify the style label according to the surface the label would be mounted on, such as anodized or painted aluminum (enamel, Chemical Agent Resistant Coating (CARC), and others).

1.2.4 Compositions. The compositions for pressure-sensitive adhesive labels are as follows:

Composition a	Paper (with or without laminate)
Composition b	Plastic (with or without laminate) (includes materials such as polyester, mylar, vinyl, and others)
Composition c	Polyamide (with or without laminate)
Composition d	Metal (specify) (includes steel, anodized aluminum)
Composition e	Anodized, photo sensitive, aluminum (matte finish)
Composition f	Ceramic
Composition g	Special (specify)

1.3 Part or Identifying Number (PIN). The following numbering system should be utilized to identify the labels ordered through this specification:

M 61002- I A 1 a
- a — Composition
- 1 — Style
- A — Grade
- I — Type
- 61002 — Specification number
- M — M prefix

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-131 - Barrier Materials, Watervaporproof, Greaseproof, Flexible, Heat-Sealable

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-130 – Identification Marking of U.S. Military Property

(Copies of these documents are available online at http://assist.daps.dla.mil or http://assist.daps.dla.mil/quicksearch or from the Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
ASSOCIATION FOR AUTOMATIC IDENTIFICATION AND MOBILITY (AIM)

ANSI/AIM BC1 - Uniform Symbology Specification Code 39

(Copies are available at www.aimglobal.org or from the Association for Automatic Identification and Mobility, 125 Warrendale-Bayne Road, Warrendale, PA 15086.)

ASTM INTERNATIONAL

ASTM B 117	-	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D 3330/ D 3330M	-	Standard Test Method for Peel Adhesion of Pressure-Sensitive Tape
ASTM D 3611	-	Standard Practice for Accelerated Aging of Pressure-Sensitive Tapes
ASTM D 3889	-	Adherence to Linerboard of Pressure-Sensitive Tape at Low Temperature
ASTM D 5181	-	Standard Test Method for Abrasion Resistance of Printed Matter by the GA-CAT Comprehensive Abrasion Tester
ASTM D 5570	-	Standard Test Method for Water Resistance of Tape and Adhesives
ASTM G 154	-	Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

(Copies of ASTM publications are available at www.astm.org or from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

INTERNATIONAL STANDARDS ORGANIZATION (ISO)
INTERNATIONAL ELECTROTECHNICAL COMMITTEE (IEC)

ISO/IEC 15394	–	Packaging – Bar Code and Two-Dimensional Symbols for Shipping, Transport and Receiving Labels
ISO/IEC 16388	–	Information Technology – Automatic Identification and Data Capture Techniques – Bar Code Symbology Specification – Code 39

(Copies of this document are available at www.iso.org or www.ansi.org or from the American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036.)

MATERIAL HANDLING INDUSTRY OF AMERICA (MHIA)

MHIA MH10.8.1	–	Linear Bar code and Two-Dimensional Symbology Used in Shipping, Receiving and Transport Applications

(Copies of this document are available at www.mhia.org or from the Material Handling Industry of America, 8720 Red Oak Boulevard, Suite 201, Charlotte, NC 28217-3992.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General requirements. This specification contains performance criteria and durability requirements which labels shall meet or exceed to ensure the use and total functionality of pressure sensitive labels in various climatic environments.

3.2 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.1.2.

3.3 Materials. The labels shall be manufactured from such materials and by such processes as to ensure performance compliance with this specification.

3.4 Design. The labels shall be designed to ensure performance compliance with this specification for the specified type, grade, composition, and style. Blank label stock shall not require a laminate. A laminate may be required to meet the durability requirements for a given grade of preprinted label. When a laminate is used, the final composite label design shall be designated by its basic substrate material and tested as a composite unit label (see 1.2).

3.5 Construction. The labels shall be made from materials conforming to 3.3. The labels shall be completely coated on the back side with a uniform film of adhesive and shall be mounted on a backing sheet. The labels shall be furnished in the form of individual labels, sheets or rolls, as specified in the contract or order. Labels furnished in sheet form shall be die-cut to facilitate removal of individual labels from the backing sheet. Types II and IV labels furnished in roll form shall be die-cut or butt-cut and shall be individually attached to a backing sheet strip which is uniformly wound on a convolute or spiral wound paperboard core. The quantity of labels per sheet or roll shall be in accordance with standard commercial practice unless otherwise specified in the contract or order (see 6.2). Exceptions to the above mentioned core are the compositions (see 1.2) which are too rigid to be wound. Thickness of the label stock shall be in accordance with standard commercial practice unless otherwise specified in the contract or order (see 6.2).

3.6 Printed symbol. Types III, IV, and V (if applicable) labels shall be printed with symbols that meet standard and uniform symbology as defined in MIL-STD-130. ISO/IEC 16388 and ANSI/AIM BC1 also conform to Code 39 bar code symbology specifications. The encoded message, code density, and bar height of the bar code symbol shall be as specified in the contract or order (see 6.2).

3.7 Print requirements. The bar code symbol parameters (reflectance, print contrast, and dimensions) will be printed in accordance with symbology specifications exemplified and defined in documents such as MIL-STD-130, ISO/IEC 15394, and MHIA MH10.8.1.

3.8 Adhesive. The adhesive shall be pressure-sensitive, liquid insoluble, and shall require no moisture, heat, or other preparation prior to, or after application to, clean, dry surfaces. Any other surface conditions or method of application shall be specified. There shall be no excessive bleeding of adhesive from the edges of the labels (see 6.2).

3.9 Application temperature. The adhesive being utilized must conform to the characteristics of the specified grade and style (see 1.2) between 40 degrees F and 110 degrees F. If the labels are to be applied at temperatures lower than 40 degrees F or higher than 110 degrees F, the procuring activity will specify the application, surface, and overall environmental temperatures as to meet the performance objectives of this specification (see 6.2).

3.10 Backing sheet. The backing sheet shall be coated with a suitable release coating that will provide adequate converting and dispensing of the pressure-sensitive adhesive coated facestock.

3.11 Dimensions.

3.11.1 Labels. The length and width dimensions of the individual labels shall be as specified in the contract or order (see 6.2). The tolerance on dimensions up to and including 3.0 inches (76.2 mm) shall be +/- 0.0312 inch (0.794 mm). Dimensions over 3 inches the tolerance shall be +/- 0.0625 inch (1.58 mm). All tolerances shall be maintained unless otherwise specified.

3.11.2 Sheets. When the labels are furnished in sheet form, the length and width dimensions of the individual sheets or labels shall be specified in the contract or order (see 6.2). If not specified, the contractor shall make the decision based on standard commercial manufacturing practice.

3.11.3 Rolls. When the labels are furnished in roll form, the paperboard core of the roll shall have a minimum inside diameter of 3.0 inches (76.2 mm) with a tolerance of +/- 0.625 inch (15.88 mm), unless otherwise specified in the contract or order (see 6.2). The width of the core shall have a tolerance +/- 0.625 inch (15.88 mm) or as specified in the contract or order (see 6.2) and shall be no smaller than the width of the roll.

3.12 Color. Unless otherwise specified in the contract or order (see 6.2), the labels shall have a white background with black printing. In all cases, the bar reflectance and print contrast signal of the bar code symbol shall conform to symbology specifications exemplified and defined in documents such as MIL-STD-130, ISO/IEC 15394, and MHIA MH10.8.1.

3.13 Workmanship. Labels shall be free of adhesive on the printable surface. Label edges shall be smooth and clean cut. The labels shall be free from lint, dust, grit, spots, wrinkles, folds, holes, tears and other imperfections. The backing sheet shall be free of die-cuts, slits, or any other defect that may affect serviceability.

3.14 Storage markings. All packages of labels shall be marked with the type of storage, temperature range, and shelf-life (to include last usable date) that is required to ensure proper storage of the label stock(s). Also, due to some adhesive's short shelf-life, the contractor shall specify for each delivery the date when the adhesive was purchased. Labels, with adhesive that were purchased more than three months prior to the date of delivery, will not be accepted unless the procuring agency is prepared to use the labels before the expiration of the shelf-life date.

3.15 Performance requirements.

3.15.1 Label grades. The grade of label shall meet the following performance requirements (see 6.1.2.3):

a. Grade A – Adhesion, UV light, condensation, abrasion resistance, solvent resistance, detergent resistance, accelerated aging.

b. Grade B – Adhesion, UV light, condensation, abrasion resistance.

c. Grade C – Adhesion.

d. Grade D – As specified in the contract or order (see 6.2).

3.15.2 Performance test parameters. The labels, when tested as specified for grade test requirements should show no evidence of smearing or erosion of the blank label stock, bar coded symbol, delamination, percentage loss of adhesion, discoloration, wrinkling, cracking, or any effect which is detrimental to the label. Bar coded labels shall remain readable and conform to the reflectivity and print contrast requirements of symbology specifications exemplified and defined in documents such as MIL-STD-130, ISO/IEC 15394, and MHIA MH10.8.1. Non-conformance to this performance requirement shall be construed as loss of adhesion to the substrate and/or non-readability of the bar code symbol either of which will constitute failure and the performance test shall be terminated.

3.15.2.1 Abrasion resistance. Tested as specified in 4.2.1.

3.15.2.2 Solvent resistance. Tested as specified in 4.2.2.

3.15.2.3 Detergent resistance. Tested as specified in 4.2.3.

3.15.2.4 Ultraviolet (UV) light condensation. Tested as specified in 4.2.4.

3.15.2.5 Adhesion. Tested as specified in 4.2.5.

3.15.2.6 Moisture/rain resistance. Tested as specified in 4.2.6.

3.15.2.7 Extreme temperature resistance. Tested according to ASTM D 3889 (low temperature) and ASTM D 3611 (high temperature).

NOTE**:** Both the Rain and Temperature Resistance Tests are recommended to be performed when the shipping or storage environment suggests such conditions.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 3.2 and 4.1.2).
b. Conformance inspection (see 4.1.3).

4.1.1 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in 3.15.2.

4.1.2 First article inspection. First article inspection shall be performed on samples from each lot of labels. The inspection shall include judging all of the performance parameters itemized in 3.15.2 before and after performing the pertinent label grade tests as delineated in 3.15.1 (also see 6.2).

4.1.3 Conformance inspection. Conformance inspection consists of tests for all of the requirements specified in section 3 as specified in the contract or purchase order (see 6.2).

4.2 Performance tests. The labels, upon completion of each performance test, shall be examined to meet or exceed compliance with this specification.

4.2.1 Abrasion resistance.

4.2.1.1 Apparatus. The apparatus shall consist of a GA-CAT Comprehensive Abrasion Tester as described in ASTM D 5181, or an equivalent (for example, Taber Tester).

4.2.1.2 Standard conditions. Standard conditions shall be a temperature of 73.5 degrees F, +/- 2 degrees F and a relative humidity at that temperature of 50 +/- 4 percent.

4.2.1.3 Preparation of test labels. Prior to testing, the test label and specimen mounting sheets shall be conditioned for a minimum of 24 hours in an atmosphere maintained at standard conditions (see 4.2.1.2).

4.2.1.4 Method. Test labels shall be tested to meet or exceed the following test criteria as described in ASTM D 5181: Place two labels on a piece of back-up bond paper, equally spaced across the paper with the bar code in the direction of abrasion using a 600 grit receptor. Mount both the sample and receptor using the adhesive backed foam. The GA-CAT Abrasion Tester shall be set to the following parameters: cycle - 30 seconds, frequency - 2 Hz, span - 1.5 inches, offset - .13 inches, side pressure 10 pounds, and top pressure - 50 pounds.

NOTE: The initial cycle may require reduced pressure settings when a new receptor is used (side pressure - 7 pounds, top pressure 45 pounds). Run one cycle at a time to initiate abrasion resistance of the bar code label. Four individual cycles shall be run during each test to determine bar code acceptance. A cool off period of 1 minute or more is required between cycles. Acceptance to conformance will be readability of the bar code label after four cycles.

4.2.2 Solvent resistance.

4.2.2.1 Preparation of test labels and test panels. Test labels and test panels shall be prepared as specified in 4.2.1.3.

4.2.2.2 Method. The test specimen shall be immersed for 15 minutes +/- 1 minute in the environmentally safe solvent/degreaser that the procurement of the labels was intended to meet or exceed the performance requirements associated with the end objectives of the application. At the end of the soaking period, the labels shall be removed from the solvent, and the labels shall be examined immediately to determine compliance to 3.15.2.2. If a test panel has not been specified, smooth plate glass panels approximately 3 by 9 inches in size will be used.

4.2.3 Detergent resistance.

4.2.3.1 Preparation of test labels and test panels. Test labels and test panels shall be prepared as specified in 4.2.1.3.

4.2.3.2 Method. The test specimens shall be immersed for 15 minutes +/- 1 minute in a solution of 20 grams of detergent powder (laboratory or hospital grade), dissolved in 1,000 ml of distilled water. The detergent solution shall be at a temperature of 120 degrees F +/- 10 degrees F during the soaking period.

4.2.4 Ultraviolet (UV) light condensation.

4.2.4.1 Apparatus. The apparatus shall consist of an Ultraviolet (UV) light condensation cabinet as described in ASTM G 154, or equivalent.

4.2.4.2 Preparation of test labels and test panels. The labels and test panels shall be prepared as specified in 4.2.1.3 and ASTM G 154. Porous test panels, such as wood and fiberboard, shall be backed with MIL-PRF-131 barrier material.

4.2.4.3 Method. The test labels shall be positioned in the test chamber and tested in accordance with the procedures specified in ASTM G 154. An arbitrary time greater than eight hours of radiant exposure may be used, evaluation performed in exposure increments to determine any significant change in test specimens, if required for conformance to a particular specification.

4.2.4.4 Required exposure. When a single exposure period is used, a time or radiant exposure period is used that will produce the largest performance differences between the test material and the control material.

4.2.4.5 Minimum exposure time. The minimum exposure time used shall be that necessary to produce a substantial change in the material being evaluated. An exposure time that produces a significant change in one type of material cannot be assumed applicable to other types of materials.

4.2.5 Adhesion.

4.2.5.1 Apparatus. The apparatus shall consist of a holding fixture that will rigidly support test panels with their label mounting surfaces in a vertical (or horizontal) position.

4.2.5.2 Preparation of test labels and test panels. Prior to testing, test labels and test panels shall be conditioned for a minimum of 24 hours in an atmosphere maintained at standard conditions (see 4.2.1.2). Style 1 test panels (stainless steel), as specified in ASTM D 3330, shall be cleaned with diacetone alcohol (non-residual, technical grade or better) using a lint free absorbent material such as surgical gauze, wiped dry with fresh absorbent material, and cleaned twice again with 95% methyl alcohol and fresh absorbent material. Style 2 and 3 test panels shall be wiped free of dust and other surface contaminates using lint-free absorbent material, such as surgical gauze or equivalent material so as not to contaminate the test specimen. Style 2 test panels shall utilize the Standard Reference Materiel 1810a, attached to a rigid panel with double coated tape.

4.2.5.3 Method. Before removal from their release liners, each label shall be trimmed lengthwise to 0.5 inch (12.7mm) width (if applicable). Place a 1-inch by 2-inch (25.4 mm by 50.8 mm) strip of paper/chipboard with a hole in one end for attaching a weight or equivalent, on a cleaned surface of the test panel. Peel each test label from its release liner and gently place the label, adhesive side down, on a test panel and over the 1 inch (25.4 mm) edge of paper/chipboard such that approximately 1.125 inch (28.575 mm) of the label is in contact with the test panel and the remaining length of test label is on the paper/chipboard and approximately centered with the 1 inch (25.4 mm) edge. Secure the test label to the test panels and paper/chipboard strips by rolling each label once in each lengthwise direction with a steel, rubber-covered roller as described in ASTM D 3330. If any bubbles or wrinkles appear on the label, discard it and replace it with a new one using the same procedure. Place the panels with the labels on the bottom surface in the holding fixture and gently attach a 25-gram +/- 1-gram weight to the free end of the paper/chipboard strips such that the line of force of the 25-gram weight and the test panel form an angle of approximately 90 degrees. The weight shall remain as a peeling force for 4 hours +/- 5 minutes.

4.2.6 Moisture/rain resistance.

4.2.6.1 Preparation of test labels. Test labels shall be prepared as specified in 4.2.1.3.

4.2.6.2 Method. The test specimens shall be immersed for 30 minutes, +/- one minute in plain tap water. The water shall be maintained at a temperature of 120 degrees F, +/- 10 degrees F during the soaking period.

4.2.6.3 Performance tests. Performance parameters shall be as specified in paragraph 3.15.2.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory).

6.1 Intended use.

6.1.1 Intended use of specification. The following basic considerations summarize the intended use of this specification. Consider the type, grade, style, and composition of the intended label (see 1.2). Selecting the grade will automatically affect the composition (paper labels will not satisfy Grade A requirements).

6.1.2 Intended use of labels. These labels are intended for use in the bar code marking/reading operations within the military logistics system. These labels may be applied to all styles of classification. Refer to tables I and II when determining the classification of labels.

6.1.2.1 Application factors. Some factors to consider when developing a contract or placing an order:

a. Environment (see 3.15.1).

b. Applied surface (smooth, rough) (see table I).

c. Application temperature (if less than 40 degrees F) (see 3.9).

d. Surface temperature (frozen or refrigerated).

e. Label permanency (permanent or temporary).

f. Service temperature (commodity location).

g. Solvent resistance (see 3.15.2.2 and 4.2.2).

h. Tampering (destructible or tamper evident).

i. Pilferable (omit HRI).

j. Moisture/water resistance (when required) (see 3.15.2.6 and 4.2.6).

k. Abrasion resistance (when required) (see 3.15.2.1 and 4.2.1).

l. Label life.

m. Performance requirements (see 3.15.1).

6.1.2.2 Label drawing. A sketch of the label should be included with the contract or order. The size of the label is one of the most important aspects to be considered.

TABLE I. Bar code label consideration.

Item	Label Construction Substrate	Laminate	Additional Considerations
	PAPER		(Example – 61002-IIB2a)
1A	70# Paper	P-propylene	Least expensive durable label. Cardboard, smooth surfaces.
1B	70# Paper	P-propylene	For frozen environments.
1C	70# Paper	P-propylene	Removable adhesive.
1D	T.Transfer	P-propylene	Thermal transfer printing.
	THERMAL PAPER		(Example – 61002-IIC2a)
2A	Thermal	N/A	Buff colored label. For indoor use only.
2B	Thermal	N/A	For low temperature or frozen environments.
2C	Thermal	N/A	For “no stick” surfaces.
2D	Thermal	N/A	Removable adhesive; can be repositioned.
	VINYL		(Example – 61002-IIIA1b)
3A	Vinyl	P-propylene	Most economic choice for intermittent outdoor exposure.
3B	Vinyl	P-propylene	For “no stick” and textured surfaces (office equipment, etc.).
3C	Vinyl	P-propylene	Removable adhesive. Can be repositioned.
3D	Vinyl	P-propylene	Good for most untreated metal surfaces.
3E	Destructible	P-propylene	For destructible asset management labels.
3F	PVF	PVF	UV resistant label for extended outdoor use.
3G	PVF	PVF	UV resistant label for outdoor use, esp. untreated metal.
	SPECIAL PLASTICS		(Example – 61002-IIA1g)
4A	P-propylene	P-propylene	Substitute for 3A. Better tear resistance.
4B	P-propylene	P-propylene	Acid resistant. Especially good for “no stick” surfaces.
4C	Acrylic	PVF	UV resistant label for extended outdoor use.
4D	----------	RED	Red overlaminating film for “photocopy proof" labels.
4E	----------	BLACK	Black overlaminating film for non-human readable labels.

TABLE I. Bar code label considerations – Continued.

Item	Label Construction Substrate	Laminate	Additional Considerations
	POLYESTER (PE)		(Example – 61002-IIA1b)
5A	Polyester	Polyester	Best all around durable label.
5B	Polyester	Piggyback	Used for painting, staining operations.
5C	Metallized	Polyester	Metal tag appearance - asset management.
5D	Met. "VOID"	Polyester	Metal tag appearance - asset management; tamper evident.
5E	White "VOID"	Polyester	Asset management; tamper evident.
5F	Polyester	Polyester	For automatic application. Same properties as 5A.
5G	Polyester	Polyester	Autoclave resistant. Excellent for glass surfaces.
5H	Polyester	Polyester	For untreated metal surfaces.
5I	Polyester	PVF	UV resistant label for extended outdoor use.
5J	High Temp PE	Polyester	Non-solder side of PCBs during manufacturing process.
5K	High Temp PE	Polyester	Non-solder side of PCBs; laminate on backing paper.
5L	High Temp PE	Polyimide	Low cost alternative for solder side of PCBs.
	POLYIMIDE		(Example – 61002-IIA2c)
6A	Polyimide	Polyimide	General use for solder side use in PCB manufacture.
6B	Polyimide	Polyimide	Higher temperatures than 6A.
6C	Polyimide	Polyimide	Higher temperature performance for solder side of PCBs.

NOTES:
1. Use of table - the first consideration in each group pertains to the entire group. The additional comments in each group should be considered separately as each individual requirement will affect the type of adhesive to be used. In general, each succeeding group is more durable and more expensive. The example classifications are given only for the basic group. The additional considerations would have to be specified as they would affect the type of adhesive required and whether or not the label would require a laminate.
2. PVF – polyvinyl fluoride.
3. Adhesive thickness – surface roughness should be considered when specifying adhesive thickness. Some suggested thicknesses are 2 mils for pebble grain office equipment, 2-3 mils for wood surfaces, and 5 mils for exterior use on military vehicles.

TABLE II. Relative label environmental suitability.

Label Material	Service Temp Range (deg F) 1/	Abrasion Resist	UV Resist	Moist Resist	Salt Fog Resist	Svc Life 2/
Paper, (Thermal)	-50 to 140	Fair	Poor	Poor	Poor	< 1 yr
Paper w/o Laminate	-50 to 140	Poor	Fair	Poor	Poor	< 1 yr
Paper with Laminate	-50 to 140	Good	Fair	Fair	Fair	1-3 yrs
Plastic w/o Laminate	-50 to 200	Poor	Good	Good	Good	1-3 yrs
Plastic with Laminate	-50 to 600+ short duration	Very Good	Good	Very Good	Very Good	1-3 yrs
Polyimide	-50 to 200	Poor w/o Lam	Good	Good	Good	1-5 yrs
PVF	-50 to 200	Poor w/o Lam	Excellent	Very Good	Good	1-5 yrs
Photo-Sens. Aluminum	-50 to >1,000 3/	Excellent	Excellent	Excellent	Excellent	Over 5 yrs
Metal	-50 to >1,000 3/	Good	Excellent	Excellent	Good	Over 5 yrs
Ceramic	-50 to >1,000 3/	Good	Fair	Excellent	Excellent	Over 5 yrs

NOTES:
1. Labels suitable for application temperatures lower than 40°F will be specified; performance values will be measured according to ASTM D 3889.
2. Service life of paper and plastic labels may be improved by use of protection overlaminate. Service life shown is for harsh environment, compliant with ASTM D 3611 test measures.
3. Fasteners such as screws and rivets may also be used.

6.1.2.3 Grade consideration. In general the label grade is specified to satisfy one of the following conditions.

a. Grade A labels are intended for those applications where the labels will have to endure prolonged (longer than 2 weeks) outdoor conditions.

b. Grade B labels are intended for long term indoor applications with short term (2 weeks or less).

c. Grade C labels are intended to be used when only short-term shipping or indoor conditions are expected.

d. Grade D label requirements are specified when none of the above grades will suffice. The requirements may be selected from 3.15.2.

6.1.2.4 Composition considerations. In general, the primary consideration is whether the label should be a paper-based or plastic-based label. Unlaminated paper labels should be considered for Grade C requirements. Laminated paper labels may be considered for Grade B requirements and provide the required abrasion protection. Laminated plastic labels should be considered for most Grade A requirements. Labels composed of materials other than paper or plastic should be considered for special applications such as marking weapons, printed circuit boards, and other end items. The type of plastic label (vinyl, polyester, polypropylene, and others) may be specified when necessary. The thickness of photosensitive aluminum labels will be specified (see 6.2).

6.2 Acquisition requirements. The contract or order should specify the following:

a. Title, number, and date of this specification.

b. Type, grade, style, and composition that label will conform to (see 3.4).

c. Laminate for protection and durability (see 3.4).

d. Surface(s) to which the label is to be applied for testing if different than the style specified in 6.2 (see 3.4).

e. Continuous or cut label stock (see 3.5 for Type I and III).

f. Quantity of labels per sheet or roll (see 3.5).

g. Thickness of label stock (see 3.5).

h. Message encoded in the printed symbol (see 3.6).

i. Code density and bar height of the bar code symbol on the label (see 3.6).

j. Marking technology (for example, photo composition) (see 3.6) (see tables III and IV).

k. When a first article is required (see 3.2, 3.15.1, 3.15.2 and 4.1.2).

l. Conformance inspection (see 4.1.3).

m. Packaging requirements (see 3.14, 5.1).

TABLE III. Bar code marking methods vs. label materials.

Marking Technology	Paper	Vinyl	PE 1/	PM 1/	PPP 1/	PVF	Metal	Ceramic	Photo Sens. Alum.
Direct Print	*	*	*	*	*	*	*2/	*2/	3/
Dot Matrix Impact	*	4/	4/				*2/	*2/	3/
Formed Character Impact	*	*	*	*	*	*			3/
Ion Deposition	*	*	*						3/
Laser Toner	*	*	*						3/
Photo Composition	*	*	*	*					*
Thermal, Direct	*								3/
Thermal Transfer	*	*	*		*	*			3/
Laser Etch							*	*	

NOTES:
1. PE = Polyester; PM = Polyimide; PPP = Polypropylene; PVF = Polyvinyl fluoride.
2. Special printer required to print metal and ceramic labels.
3. Print technology generates master – utilizes photographic process.
4. Normally available by special order only.

* Indicates that this label material is compatible with the indicated marking technology.

TABLE IV. Bar code marking technologies.

Marking Technology	Description	Uses	Employment
Laser Etch	Marking process which employs a microprocessor controlled laser to destroy the surface molecular structure. Etched material must produce a bar code with the required PCS.	For plastics, metals or ceramics where highly durable bar code markings are required and where no contaminants are present.	Appropriate for application at manufacturing, depot, and support maintenance facilities.
Direct Print	Conventional print process involving the deposit of ink under pressure to imprint an image. Includes such print technologies as flexography, offset lithography letterpress, letterset, silk-screen and rotogravure.	To produce large quantities of high quality, identical markings or labels. May be integrated with rotary printer or another print technology to sequence or otherwise vary bar coded information. May also be employed to mark items or containers directly.	Appropriate for production at printing plants. Pressure sensitive tags or labels can be applied on site.
Dot Matrix Impact	Computer controlled printhead produces a series of dots in a pattern so that it forms a character. A series of solenoid driven needles strike an inked ribbon, ink is transferred to the label stock.	Flexible, low cost production of bar coded labels, tags, or forms. Shuttle bar printer is used for line printing and serial, or moving head printer, for character printing.	Most common kind of in-house printer but also appropriate for use in a plant setting. Least desired technology for marking bar codes.

TABLE IV. Bar code marking technologies – Continued.

Marking Technology	Description	Uses	Employment
Formed Character Impact	Characters to be printed are etched on a drum over which label stock and carbon ribbon are fed. The hammer strikes when the designated character comes around on the rotating drum, forming one complete bar code character.	Production of bar coded label or tags.	Suitable for on site printing and application.
Ion Deposition	Ions projected from a computer-controlled print cartridge form a latent image on a dielectric cylinder which is developed by adhesion of toner to the charged areas. The toner is simultaneously transferred and fixed to the printed surface under high pressure.	Production of labels and tags. Often integrated w/direct printing in a continuous web operation to add variable into such as sequentially numbered bar codes to labels printed by another process.	Appropriate for printing or computer facility but labels or tags can be applied on site.
Laser Toner	Computer controlled laser beam forms image by neutralizing charges on a charged photo-sensitive drum. A carbon toner is applied and adheres to the charges areas, developing the image which is transferred to the substrate and fixed by heat and pressure.	To produce bar coded labels, tags, and forms on cut sheets media where heat and pressure will not adversely affect label adhesives.	High speed printers are normally used in a printing or computer facility. Low speed printers are suitable for light duty use on site. Easily applied on site.

TABLE IV. Bar code marking technologies – Continued.

Marking Technology	Description	Uses	Employment
Photo Composition	Image is projected onto a photo-sensitive substrate. The substrate is then processed in the same manner as a photograph to fix the image.	To produce archival quality, bar coded labels and tags on paper, plastic, and metal substrates.	Most appropriate for offsite production by an outside vendor but can be applied on site.
Thermal Direct	Microprocessor-controlled printhead contains an array of tiny, resistive dots which provide heat necessary to cause a chemical reaction in a specially treated paper as it moves past the printhead, turning the exposed areas black.	Low cost, flexible format labels and tags. Widely used in retail sales and food industry to mark items and shelves. Indoor use only.	Simple, reliable technology appropriate for on-site printing and application. Can be used with paper labels only.
Thermal Transfer	Similar to thermal direct but uses a thermally sensitive printing ribbon. Stylus are heated selectively, melting waxy ink onto the medium to form an image.	Combines flexibility of thermal printing with quality and durability of impact printing.	Appropriate for on-site printing. Comparable in terms of simplicity and reliability with thermal direct printing.

6.3 Criteria. The following inspection criteria may be utilized by the ordering activity when pressure-sensitive adhesive labels are received.

6.3.1 Labels. The sample unit will be one label. Sample units will be examined for the following defects:

101. Materials, design, or construction, not as specified.

102. Label, not completely coated on backside with a uniform film of adhesive.

103. Label, not mounted on a backing sheet.

104. Label, not furnished in the specified form (sheets or rolls).

105. Printed symbol, not standard DoD symbology. (Types III, IV, and V (if applicable)).

106. Message encoded information in the printed symbol, not as specified. (Types III, IV, and V (if applicable)).

107. Bar code symbol missing. (Types III, IV, and V (if applicable)).

108. Human-readable interpretation missing, or does not represent the characters encoded in the bar code symbol. (Types III, IV, and V (if applicable)). Symbol, not printed in accordance with symbology specifications exemplified and defined in documents such as MIL-STD-130, ISO/IEC 15394, and MHIA MH10.8.1. (Types III, IV, and V (if applicable)).

109. Adhesive, not pressure-sensitive, or as specified.

110. Adhesive requires moisture, heat, or other preparation prior to, or after application to, clean, dry surfaces.

111. Label does not tack upon contact with the specified test surface(s).

112. Backing sheet, not coated with a release coating as specified.

113. Label or backing sheet delaminates or tears when the label is manually peeled from the backing sheet.

114. Labels indicate separation from the backing sheet as received.

115. Dimensions of label, not as specified.

116. Dimensions of label, not within the tolerance applicable to the specified dimensions.

117. Density or bar height of the bar code symbol, not as specified. (Types III, IV, and V (if applicable)).

118. Color, as specified.

119. Workmanship, not as specified.

6.3.2 Sheets. The sample unit will be one sheet. Sample units will be examined for the following defects:

120. Labels, not die-cut or butt-cut (as specified).

121. Quantity or format of labels per sheet, not as specified.

122. Dimensions of the individual sheets of labels, not as specified.

6.3.3 Rolls. The sample unit will be one roll. Sample units will be examined for the following defects:

123. Labels, not die-cut or butt-cut (as specified) and individually attached to the backing sheet strip.

124. Label stock not continuous or contains splices.

125. Backing sheet strip with labels, not uniformly wound on the paperboard core.

126. Core, missing or not as specified.

127. Quantity of labels per roll, not as specified.

128. Inside of diameter of core, not within tolerance, or as specified.

129. Width of core, not equal to the width of the roll, or within specified tolerances.

6.3.4 Package. The sample unit will be one package. Sample units will be examined for the following defects:

130. Military packaging marking requirements, not as specified.

131. Type of storage and temperature range not marked on package, if specified.

132. Shelf-life, not marked on package, if specified.

6.4 Definitions.

6.4.1 Definition criteria. For the purpose of this document, definitions are given herein. The definitions contained in this document take precedence over any reference document.

6.4.2 Backing Sheet. The material to which the label and its adhesive is attached in order to protect the adhesive prior to use.

6.4.3 Butt-cut. A label with square corners which is separated from any adjacent label by only a cut through label (face stock) but not the backing sheet.

6.4.4 Composition. The material of which the label is made.

6.4.5 Characters Per Inch (CPI). The number of bar coded characters in one inch.

6.4.6 Curing time. The time required for an adhesive label to reach its optimal bond strength. Maximum curing time should not exceed 72 hours.

6.4.7 Die-cut. A label with rounded corners that is separated from any adjacent label by an area where some label (face stock) has been removed leaving only backing sheet.

6.4.8 Discoloration. Loss of contrast of the color of the label or printed symbol.

6.4.9 First read rate. Expressed as a percent. The number of correct readings, while the scanner is being used in accordance with the correct operating procedures that will be obtained by the scanner per 100 attempts.

6.4.10 Human Readable Interpretation (HRI). The exact or specified interpretation of the encoded bar code data presented in a human readable font.

6.4.11 Grade. The durability of the bar coded label.

6.4.12 Laminate. A coating of material placed over the bar coded label.

6.4.13 Matte finish. Non-reflective, dull, or frosted in appearance.

6.4.14 Readability. The ability to read the bar code according to the specifications set by the first read-rate.

6.4.15 Rolls. A continuous length of backing material, wrapped around a core, to which the bar code labels are attached for shipment.

6.4.16 Sheet(s). A solid piece of backing material to which the bar code labels are attached for shipment.

6.4.17 Special. As not adhering to a classification of either type, grade, style, or composition; therefore, requiring specific detailed description in the acquisition document.

6.4.18 Standard DoD Bar Code Symbology (SDS). The 3-of-9 bar code with a Human Readable Interpretation (HRI) printed above, beside, or below the bar code.

6.4.19 Style. Refers to the surface to which the label is to be applied.

6.4.20 Type. Refers to the form of the label material.

6.5 Sealant protection (optional).

6.5.1 Use of sealant. For application of an edge sealant on the bar coded label, a clear epoxy-polyamide coating (sealant) may be used. This procedure is designed for extreme environmental elements which could attack the adhesive backing on the labels. The edge sealant is strictly an option to use for label protection. This is a non-specified procedure for which the procuring agent is totally responsible.

6.5.2 Application of sealant. The clear epoxy-polyamide coating (sealant) will be applied by brush to the entire outside edge of the label, to seal the label against environmental elements. The coating is not to be applied to the bar coded label surface.

6.5.3 Ordering information. The epoxy-polyamide coating may be procured as follows:

NSN 8010-01-313-8702 (kit)

Reference: GSA Catalog (J8010-Industrial)

6.5.4 Curing time. The specified curing time and conditions for the clear epoxy-polyamide coating, recommended by the manufacturer, will be used.

6.6 Standard Reference Material 1810a. Reference material is available from the Office of Standard Reference Material, National Institute of Standards and Technology, Washington, DC 20234.

6.7 Surface preparation. The area of application of the bar coded label will be clean, dry, and free of oil and grease. An evaporative solvent is generally recommended for cleaning the surface.

6.8 Bar code height vs. code density. The bar code height can vary to suit specific reading and marking requirements. The bar code height listed below should be used for corresponding ranges of bar code density. For those applications where these heights are not suitable, height requirements will be as specified by the procuring activity.

Density Range		Minimum Height		Maximum Height	
(Characters per inch)		(in)	(mm)	(in)	(mm)
1.7	< CPI < 3.0	0.75	19.05	1.25	31.75
3.0	< CPI < 6.5	0.375	9.53	0.985	25.02
6.5	< CPI < 9.4	0.25	6.35	0.50	12.7
9.4	< CPI < 12.5	0.125	3.18	0.375	9.53
12.5	< CPI < 15.5	0.625	15.9	0.250	6.35

6.9 Application examples. Extreme environmental considerations may lead to degradation of the label, adhesive, and laminate. This degradation may affect the bar reflectance, space reflectance, reflectivity difference, and element uniformity of the label. The net effect of degradation will be a reduction in the conformance level of a symbol and may even lead to a symbol being unreadable. Following is a list of application areas affected by these factors, environmental factors of concern, and recommended user actions which may be appropriate.

Application Examples	Environmental Factor	Recommended Action
Outside marking Receiving docks Refrigerated area PC board processing Engine areas	Low Temperature High Temperature	ASTM D 3889 ASTM D 3611
High humidity areas Warehouses	Humidity	ASTM D 3611
Marine application	Salt spray Water resistance	ASTM B 117 ASTM D 5570
Outdoor storage	Solar radiation	ASTM G 154
Shipping	Abrasion	ASTM D 5181
Miscellaneous	Chemicals	Identify chemicals and degree of exposure to labels
Hospitals Machine shops Ultrasonic cleaners	Solvents, cleaners	Identify solvents, cleaners and degree of exposure to labels
Lubricated materials	Lubricants	Specify
Tropics	Fungi resistant	Specify antifungal treatment

6.10 Subject term (key word) listing.

Acrylic	Photosensitive
Durability	Polyester
Laminate	Polyamide
LOGMARS	Symbology
Markings	Thermal
Mylar	Thermal transfer
Photo-image	Vinyl

6.11 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

CONCLUDING MATERIAL

Custodians:
Army – SM
Navy – SA
Air Force – 11
DLA – DH

Preparing activity:
Army – SM
(Project 7690-2006-001)

Review activities:
Army – AR, AT, AV, CR, EA, GL, MI, MT
Navy – AS, CG, EC, MC, OS, SH
Air Force – 70, 71, 84, 99
DLA – CT, DM, GS2, IS

Civil agency:
GSA – FLAS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at http://assist.daps.dla.mil.