

MIL-STD-252B(EL)

19 January 1970

SUPERSEDES

MIL-STD-252A(SigC)

22 October 1954

M I L I T A R Y S T A N D A R D

CLASSIFICATION OF VISUAL AND MECHANICAL DEFECTS FOR
EQUIPMENT, ELECTRONIC, WIRED, AND OTHER DEVICES



FSC MISC

MIL-STD-252B(EL)
19 January 1970

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C.

CLASSIFICATION OF VISUAL AND MECHANICAL DEFECTS FOR EQUIPMENT, ELECTRONIC,
WIRED AND OTHER DEVICES (Non Electronic)

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1. This standard has been approved by the Electronics Command, Department of the Army, and is mandatory for use by activities within the Department of the Army. All other military activities are required to employ this standard where suitable.
2. Recommended corrections, additions or deletions should be addressed to Headquarters, US Army Electronics Material Support Agency, Fort Monmouth, New Jersey.

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FORWARD

This standard has been revised to expand its area of coverage and to provide defect classifications for visual and mechanical defects in consonance with the present state-of-the-art of equipment, electronic, wired and associated devices and ancillary items (non-electronic included). It is intended for use where specific defect classifications have not been established in the contractual documents (specifications or drawings) or it may be used as a supplement to them. In the event of conflict between any defect classification in this document and that of an applicable detailed specification, the specification will necessarily govern.

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MILITARY STANDARD

CLASSIFICATION OF VISUAL AND MECHANICAL DEFECTS FOR
EQUIPMENT, ELECTRONIC, WIRED, AND OTHER DEVICES

1. SCOPE

1.1 Scope - This standard establishes the classification of defects for equipment, electronic, wired, and other devices, except for missile system equipment and additional specific requirements included in detailed specifications.

2. REFERENCED DOCUMENTS

2.1 Not Applicable

3. DEFINITIONS

3.1 Defect. Any non-conformance of a characteristic with specified requirements. (Source: MIL-STD-105)

3.2 Critical Defect. Not Applicable

3.3 Major Defect. A defect other than critical that is likely to result in failure or to reduce materially the usability of the unit of product for its intended purpose. (Source: MIL-STD-105)

3.4 Minor Defect. A defect that is not likely to reduce materially the usability of the unit of product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit.. (Source: MIL-STD-105)

4. GENERAL REQUIREMENTS OR STATEMENTS

4.1 Method of Classifying Defects. A classification of defects is the enumeration of possible defects of the unit of product classified according to their seriousness, as defined in para 3. Defects are grouped into one or more classes; however, defects may be grouped into other classes or into sub-classes within these classes. Other defects not classified herein of lesser import than "minor", having no effect upon functioning, assembly, maintenance or life (formerly classified as control defects) may be tolerated to the extent established by the Government, not to exceed 10%. Such defects are considered within the purview of workmanship only. When the rate of occurrence exceeds 10%, it may indicate a general degradation trend in workmanship and for control purposes such defects may be classified as

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minor defects on a case-by-case basis at the option of the Government.

4.2 Coding of Defects. The defects listed in Section 5 have been given key numbers to simplify the preparation and maintenance of inspection records. Recording the key number adequately identifies the defect and eliminates the need for the repetition of a detailed description. The first number indicates the general type of the defect, the second number indicates the specific kind of defect, and the middle letter, "A" or "B", denotes whether the defect is major or minor, respectively.

5. CLASSIFICATION OF VISUAL AND MECHANICAL DEFECTS

The defects listed below are grouped into general types of defects (families) with the groupings headed by the noun name preceded by the general type of defect number assigned to the family. The complete alpha/numeric number shown before each defect is the key number for the defect.

5.1 TYPE 1 - SOLDERING

1A. Major Defects.

1A1. Improper wrap. - Less than 1/4 turn.

1A3. Unsoldered joint. - Solder not applied where intended.

1A4. Insufficient solder. - Minimum dimension of solder bridge less than twice the diameter of the wire or less than 3/32 inch, whichever is greater.

1A5. Excess solder - Obscuring contour of wire

1A6. Cold solder joint. - Chalky appearance, lacks metallic luster, presents rough "pile up" appearance; movement of wire or solder upon pick or spudger application.

1A7. Rosin joint. - Presence of rosin; relative movement of wire or solder upon pick application.

1A8. Insulation in terminal hole. - Solder over insulation; no appearance of visible wire contour.

1B. Minor Defect.

1B1. Improper wrap. - 1/4 turn or more, but less than 1/2 turn; or more than 3/4 turn.

1B2. Wire end - Projecting more than 1/16 inch from surface. Note: When wire ends project to the extent that a possible short circuit could occur, the defect shall be evaluated in accordance with Type 6.

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5.2 SOLDERING DEFECTS PECULIAR TO PRINTED WIRING ASSEMBLIES

5.2.1 Classifying Defects for Solder Connections in Printed Wiring Boards.

A determination of whether more than one defect will be applied to a single connection in a printed wiring board will depend upon the soldering process used in fabrication and application of components to a printed wiring board. When the process used applies solder to both sides of the board during one operation, missing or poor solder on either or both sides can only be classified as one defect. When the process used requires two separate applications of solder (one on each side of the board), missing or poor solder on both sides of the board will be classified as two defects.

1A. Major Defects

1A10. Any printed wiring solder joint that is not a complete concentric void-free fillet of solder wetting both the flange of the part (eyelet terminal post, etc.) or the component lead and the terminal area.

1A11. Clearance - Any buildup of solder or protruding of leads greater than 3/32 inch above the control laminate on the side opposite the component.

1A12. Charred Area - Any charred area between laminates.

1A13. Lead Terminations - Leads through termination holes not within specified dimensional tolerances.

5.3 TYPE - SOLDERLESS CONNECTORS

2A. Major Defects

2A4. Pre-insulation damaged, with high probability of potential short circuit.

2A5. Relative motion between terminal and conductor.

2A6. Incorrect size crimp tool (evidenced by coded tits on pre-insulation).

2A7. Incorrect terminal size for a given wire gauge.

2A8. Cracked metal part, affecting use.

2B Minor Defect

2B3. Pre-insulation broken, but no potential short circuit hazard.

2B6. Improper crimp (evidenced by round shape of basic wire edge).

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2B8. Cracked metal part, not affecting use.

5.4 TYPE 3 - CABLING AND WIRING

3A. Major Defects

3A1. Broken or nicked strands - More than 20% of wire, except:

a. In less than 7 strand wire, 1 broken or nicked strand.

b. In 7 strand wire, 2 broken or nicked strands.

3A3. Improper lead dress or cabling of wires which results in improper electrical operation or in interference with mechanical operation, leading to subsequent damage to the wire due to interference with moving mechanical parts, or in short circuiting of wires due to possible abrasion or melting of insulation.

3A4. Insulation burned, abraded, pinched, or deteriorated between two or more conductors, resulting in a potential short circuit.

3A5. Taut wire, - Wire exhibits no slack and subsequent breakage may occur due to stress on terminal or part.

3A6. Insulation frayed to the extent that a potential short circuit exists.

3A7. Insulation back from solder joints between 1/8 and 1/4" where potential short exists.

3A8. Insulation extending into solder joint or terminal hole.

3B. Minor Defects

3B1. Broken or nicked strands - 20% of wire: except in 7 strand wire, 1 broken or nicked strand.

3B3. Poor lead dress which could result in a melted or abraded insulation without the possibility of a short circuit; for example, a polystyrene lead dressed against a power tube.

3B4. Insulation burned, abraded, pinched, or deteriorated, with exposure of bare wire, but short circuit not possible.

3B5. Insulation back from joint between 1/8" and 1/4" where no potential short exists.

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5.5 TYPE 4. - FASTENERS, HARDWARE AND ASSEMBLY

4A. Major Defects: See Table I.4B. Minor Defects: See Table I.Table I - Classification of Type 4 Defects

CLASSIFICATION OF FACTORS OF DEFECTS	MECH ACTION INVOLVED	SEAL INVOLVED	MAINTAINING ADJUSTMENT	NO MECHANICAL ACTION INVOLVED*			
				1 of 1	1 of 2	1 of 3 or more	2 of 3 or more
MISSING FASTENER	4A1 MAJOR	4A2 MAJOR	4A3 MAJOR	4A4 MAJOR	4A5 MAJOR	4B6 MAJOR	4A7 MAJOR
DAMAGED FASTENER	4A11 MAJOR	4A12 MAJOR	4A13 MAJOR	4A14 MAJOR	4B15 MINOR	4B16 MINOR	4B17 MINOR
FASTENER NOT SEALED	4A21 MAJOR	4A22 MAJOR	4A23 MAJOR	4A24 MAJOR	4B25 MINOR	4B26 MINOR	4B27 MINOR
FASTENER IMPROPERLY LOCKED	4A31 MAJOR	4B32 MINOR	4B33 MINOR	4B34 MINOR	4B35 MINOR	4B36 MINOR	4B37 MINOR
FINGER - LOOSE FASTENER	4A41 MAJOR	4A42 MAJOR	4A43 MAJOR	4A44 MAJOR	4A45 MAJOR	4B46 MINOR	4A47 MAJOR
MISSING LOCKWASHER	4A51 MAJOR	4B52 MINOR	4B53 MINOR	4B54 MINOR	4B55 MINOR	4B56 MINOR	4B67 MINOR
BROKEN LOCKWASHER	4A61 MAJOR	4B62 MINOR	4B63 MINOR	4B64 MINOR	4B65 MINOR	4B66 MINOR	4B67 MINOR
MISSING FLAT WASHER	4B71 MINOR	4B72 MINOR	4B73 MINOR	4B74 MINOR	4B75 MINOR	4B76 MINOR	4B77 MINOR
BURRED SCREW HEAD WITH USELESS SLOT	4B81 MAJOR	4B82 MAJOR	4A83 MAJOR	4B84 MINOR	4B85 MINOR	4B86 MINOR	4B87 MINOR

*The four subdivisions respectively refer, for example, to one fastener missing where one was intended, one fastener missing where two were intended, one fastener missing where three or more were intended, and two fasteners missing where three or more were intended.

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5.6 TYPE 5 - FOREIGN OBJECTS

5A. Major Defects

5A1. Any metallic foreign object, not firmly attached, ^{/1} which could cause a short circuit, an electrical contact failure, or mechanical failure.

5A2. Two or metallic foreign objects.

5A3. Any non-metallic foreign object, such as insulation, dirt phenolic chips, or ceramic chips, that could cause jamming of a mechanism, damage to gear teeth or driving mechanism, or prevent electrical contact.

5B. Minor Defects:

5B1. Foreign objects that cannot be dislodged by the application of pressure with a pick or spudger shall be considered to be firmly attached. (Such objects, if becoming loosened due to environmental conditions in service, would not likely cause failures such as cited in 5A3). (Small size objects)

/1 Presence of any foreign objects either firmly or not firmly attached is very undesirable and is considered poor workmanship. Under environmental conditions, (shock, vibration, temperature). Firmly attached objects at factory inspection may become loosened and become dislodged in service, due to change in the adhesive, properties of the substance holding the foreign object. (Substances such as rosin flux, varnish, paint, etc. are in this category). Foreign objects such as screws, washers, chips of material, etc, which are inadvertently clamped between wires, components or component and chassis or other elements may become loosened or dislodged due to vibration during field use, which may cause failures such as cited in 5A1, 5A2 and 5A3.

5.7 TYPE 6 - POTENTIAL SHORT CIRCUIT

5.7.1 Applicability: The potential short classification covers instances where there are bare conducting members inadequately separated due to irregularities of workmanship during the manufacturing process, e.g., missing, frayed, or damaged insulation, excess solder, projecting wire ends, improper assembly, improper placement of uninsulated conductors, etc. Component leads and other conductors which are uninsulated and which are adjacent to each other must be separated sufficiently to prevent short circuits resulting from flashover or from low resistance leakage paths due to inadequate creepage distance. This precaution is especially important in equipment which will be subject to vibration and shock, or subjected to adverse environmental conditions. The potential short classification does not apply to spacing which is inherent in the design of the equipment e.g., normal space between variable capacitor plates, between socket terminals, subminiature and printed wiring circuit design, etc. The distance between the bare

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conducting surfaces should be measured after taking up any slack or free play in such direction as to simulate the worst condition of reduced spacing. In so doing, care should be taken to avoid exerting forces which may cause distortion beyond the range of normal possible movement. In determining the worst condition of inadequate spacing between bare conductor, sleeving which is not firmly fastened should be adjusted to simulate the most serious condition of exposure. Grounded shields, plates, and chassis parts should be considered as conducting members when questions arise relative to spacing from these parts to ungrounded conductors.

5.7.2 Clearance Requirements. - For bare minimum assurance of operating stability in wired equipment, the minimum separating distances for potential points must be shown in Table I below. These values are based on the point spark gap breakdown voltages under extreme probable operative conditions of high temperature and high altitudes.

6A. MAJOR DEFECT

6A1. Separation, potential short area, per Table I.

TABLE I - LIMITS FOR MAJOR DEFECT

VOLTS DC or AC Peak	DISTANCE (in inches) Less than the following:
0-100	1/64
101-300	1/32
301-600	1/16
601-1000	1/8
1001-2000	1/4
2001 and over	1/4 + 1/32 for each 1000 volts over 2000 of fraction thereof

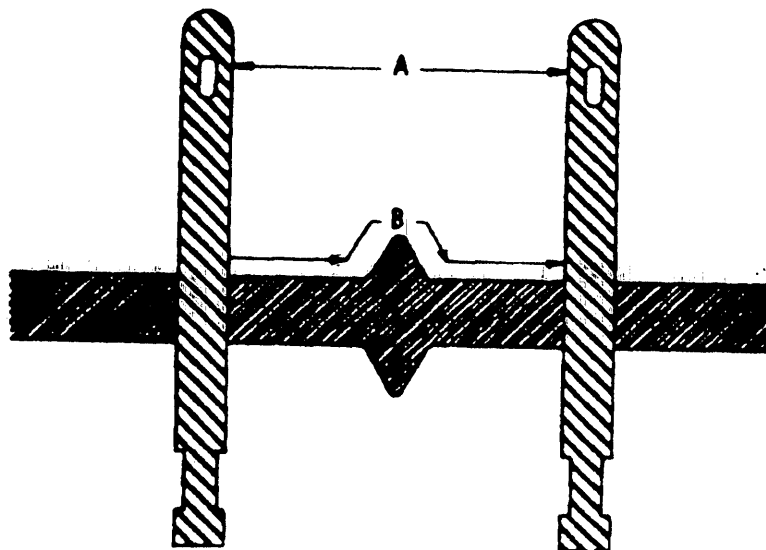
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5.7.3 Practical Considerations - For maximum assurance, modification of the bare minimum distances given in Table I is necessary due to factors encountered in actual operating conditions. The factor of creepage distance must be considered, since the collection of dust, moisture and other contamination between conductors effectively reduces the dielectric constant of the insulating material. Practical distance of spacing must provide for:

- a. The possible movement of conductors.
- b. The reduction in intervening space between conductors due to accumulation of dust.
- c. The effect of continued electrical stress at the operating voltages during the life of the equipment.
- d. The possibility of shorting by minute foreign metallic particles.
- e. The deterioration of insulating properties of the leakage path between conductors due to environmental conditions.

Table II shows the minimum intervening distances that can be considered satisfactory for good workmanship. It specifies both electrical clearance and creepage distance. To differentiate between the two - electrical clearance is the direct path for a potential flashover between any two conductors (air gap); creepage distance is the leakage path for a potential short circuit between any two conductors (insulating material - surface path). (See Figure 1).



A- ELECTRICAL CLEARANCE
B- CREEPAGE DISTANCE

FIGURE I

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Table II - Electrical Clearance and Creepage Distance
LIMITS FOR TYPE 6 MAJOR DEFECTS

Voltage Peak AC or DC	Condition	Clearance Less than	Creepage Enclosure I Enclosure II Distance in Inches Less than	
To 150	A	1/16	1/16	1/16
	B	1/8	1/8	1/4
	C	1/4	3/8	3/4
151-300	A	1/16	1/16	1/16
	B	1/8	1/8	1/4
	C	1/4	1/2	3/4
301-600	A	1/16	1/8	1/8
	B	1/8	1/4	1/4
	C	1/4	1/2	3/4
601-1000	A	1/8	3/8	1/2
	B	1/4	3/4	1
	C	1/2	1-1/2	2

Condition A - For use where the effect of a short circuit is limited to the unit, and where normal operating power does not exceed 50 watts.

Condition B - For use where short circuit protection in the form of fuses, circuit breakers, etc, is provided, and where normal operating power does not exceed 2000 watts.

Condition C - For use where short circuit protection in the form of fuses, circuit breakers, etc, is provided, and where normal operating power exceeds 2000 watts.

Enclosure I - Enclosure I is an equipment enclosure which has no openings, or in which the openings are so constructed that drops of liquid or solid particles striking the enclosure at any angle 0° to 15° from the downward vertical cannot enter the enclosure either directly or by striking and running along a horizontal or inwardly inclined surface. ("Drip-proof" enclosure for other than motors, generators, and similar machines" of Standard MIL-STD-108 meets this description.)

Enclosure II - Enclosure is any equipment enclosure which affords less protection than Enclosure I.

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5.7.4 Printed Circuit Boards (PC BOARDS)

5.7.4.1 Table III shows the minimum intervening distances between conductors under conditions "A", and "B" as defined below.

TABLE III
LIMITS FOR TYPE 6 MAJOR DEFECTS, PC BOARDS

VOLTAGE (DC OR AC PEAK)	CONDUCTOR SPACING DISTANCE IN INCHES LESS THAN:	
	CONDITION "A"	CONDITION "B"
≤ 50	0.010	0.20
$> 50 \leq 100$	0.020	0.040
$> 100 \leq 300$	0.030	0.060
$> 300 \leq 500$	0.060	0.120

Condition A - For equipment operated at or near sea level and having a maximum available input power of 50 watts.

Condition B - For applications where secondary short circuit protection in the form of fuses, circuit breakers, etc., is provided and where the normal operating power is greater than 50 watts, but does not exceed 2,000 watts.

5.7.5 Sub-Miniature Construction. - The potential short problem is inherent in sub-miniature construction where very small clearances are common. When differences of opinion arise between the contractor and the inspector relative to the actual clearance at a disputed point, a potential short defect may be evaluated by one of the following tests:

a. With operating voltages applied, the suspected unit may be vibrated upon a standard vibration table in a manner outlined in the equipment specification. Successful operation of the unit during vibration may be considered as an indication that the spacing between the potential short is adequate.

b. With operating voltages applied, the unit may be pounded with a rubber mallet of such weight and with such force as to duplicate the conditions in (a) above. Continued operation of the unit during this test may be considered as an indication that the spacing between the potential short is adequate.

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5.8 TYPE 7. - FINISH

7A. Major Defects

7A1. Color not as specified.

7A3. Gloss not in accordance with applicable specification.

7A4. Adhesion. - Fails specified scrape test or thumbnail test.

7A5. Material not as specified.

7B. Minor Defects

7B2. Scratches, cuts, abrasions, etc.

7B4. Adhesion - Flaking, peeling or chipping.

5.9 TYPE 8. - MARKING

8A. Major Defects

8A1. Safety or warning - Missing, illegible, or wrong safety or warning marking, such as are found near high-voltage interlocks, moving gears, field storage tanks, etc.

8A2. Operation - Missing, illegible, or wrong operational markings, such as "On-Off" nameplates, tuning instructions on meters, direction of rotation on panel controls, voltage markings, "Gain," terminal post markings, etc.

8A4. Identification - Missing, illegible, or wrong markings on equipment.

8A5. Schematic - Missing, illegible, or wrong markings on equipment.

8B. Minor Defects

8B3. Maintenance - Missing, illegible, or wrong maintenance markings, such as cleaning instructions, alignment instructions, lubrication instructions, replacement instructions after certain color indications, etc.

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5.10 TYPE 9 - PARTS

NOTE: These defects apply to inspection of end equipment for defects resulting from fabrication of parts, see para. 5.12 below (Type II - Fabrication of Parts).

9A. Major Defects

9A1. Missing, inoperative, improperly assembled, defective, or wrong part which could cause equipment to become inoperative or unsafe in service

9B. Minor Defects

9B1. Missing, inoperative, improperly assembled, defective, or wrong part which could reduce efficiency of equipment in service.

9B2. Cracks or chipped surfaces in ceramic, glass, plastic or fibre material which affect appearance only, but could not cause equipment failure.

9B3. Sand holes or surface roughness in castings affecting appearance only.

5.11 TYPE 10 - CONTACTS

10A. Major Defects

10A1. Open contacts - No physical contact between mating contacts (see Fig. 2), resulting in no electrical continuity; or contact pressure less than required by applicable specification.

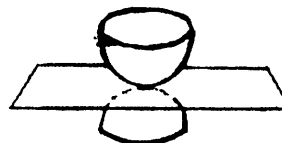


Figure 2

Contacts may appear to be, but are not touching. (A paper sheet passes through).

10A2. Closed contacts - Contacts do not open upon release action of device to provide proper clearance. (see Type 6, Table II, Min. Clearances).

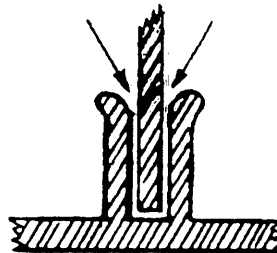


Figure 3

10A3. Improper Knifing - No contact, or no pressure exists between knife blade and mating contacts (see Figure 3).

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10B. Minor Defects

- 10B3. Round flat contacts (mismatching).
Relative displacement of centers
greater than $D/4$, but actual contact
still exists. (See Figure 4)

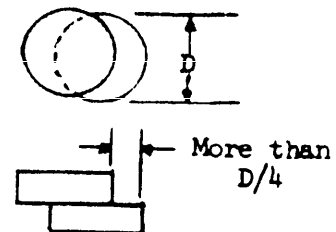


Figure 4

- 10B4. Spherical contacts (mismatching).
Relative displacement of centers
greater than $D/4$, but actual contact
still exists. (See Figure 5)

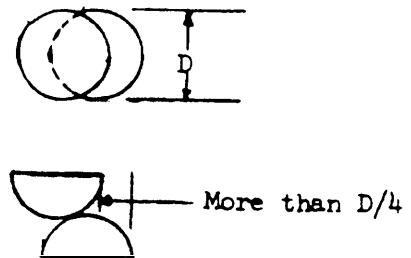


Figure 5

- 10B5. Spherical and flat contacts (mismatching).
Center of spherical contact is off edge
of flat contact, but actual contact
still exists. (See Figure 6)

Center off
edge

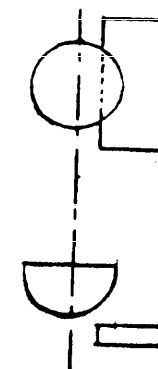


Figure 6

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5.12 TYPE - FABRICATION OF PART

11A Major Defects

11A1. Wrong parts or material.

11A2. Improper adjustment or assembly causing parts to be inoperative or unsafe in service.

11A3. Deformed or damaged parts, inoperative or do not function properly in service.

11A4. Levers, toggles and other such mechanisms that are inoperative or do not function properly for use intended and could cause failure in use.

11A5. Improper machining resultant in sharp burrs or imperfections which would cause parts to be dangerous to handle or cause major difficulty in assembly or repair operations.

11A6. Sand holes, blow holes or other imperfections in castings causing structural weakness.

11A7. Holes or holes missing, improperly aligned, or unuseable because of size or fill.

11A8. Insulators or insulation missing or damaged so as to affect intended mechanical or electrical use.

11A9. Color coding wrong, missing, or illegible.

11A10. Staking or riveting missing or defective so as to cause probable mechanical or electrical failure.

11A11. External or internal threads missing, wrong size, or so damaged as to prevent proper use.

11A12. Weight not within specified limits (when applicable).

11A13. Seal missing or defective.

11A14. Lubrication missing (dry reservoir) or incorrect type (too heavy for principal mechanism to function properly).

11A15. Ceramic, glass, porcelain, or plastic parts cracked, chipped, or broken, which could cause part to be unuseable or unsafe, or could cause mechanical or electrical failure in service.

11A16. Dimensions out of tolerance which will affect interchangeability, assembly, or operation.

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11A17. Missing, broken or incomplete welds (resultant in structural weakness).

11A18. Welds having evidence of poor penetration or poor fusion.

11A19. Welds containing blow holes, cracks or slag inclusion.

11A21. Corrosion - corrosion which could cause mechanical, operational or electrical failure.

11B. Minor Defects

11B2. Improper adjustment or assembly which could reduce efficiency of operation or use but not inoperative or unsafe in service.

11B3. Deformed or damaged parts which do not affect operation or use in service.

11B4. Levers, toggles and other such mechanism which function improperly reducing efficiency of operation but would probably not cause failure in use.

11B5. Burrs or imperfections on parts due to improper machining which will not interfere with proper use in operation, assembly, or disassembly, or cause an unsafe condition in service.

11B8. Insulators or insulation damaged, but would not cause possible mechanical or electrical failure in use.

11B10. Staking or riveting defective, but would not cause mechanical or electrical failure.

11B14. Lubrication: Insufficient, incorrect type (mechanism functions properly); excessive (cause possible malfunction).

11B16. Dimensions out of tolerance which would not affect interchangeability assembly, or operation.

11B20. Incomplete removal of welding flux residue which may subsequently affect the application of a finish.

11B21. Corrosion - Corrosion on parts which would not cause mechanical, operational or electrical failure, but exceeds 5% of total area applicable.

5.13 TYPE 12 - CLASSIFICATION OF DEFECTS FOR PRINTED WIRING BOARDS AND ASSEMBLIES

12A. Major Defects

12A1. Bonding of conductor to board and peeling of conductor: any

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looseness of bond on any conductor length, any peeling of conductor (defect most prevalent at terminals and ends of conductor contacts.

12A2. Broken Eyelet: Part of eyelet missing, circumferential splits.

12A3. Seating of Eyelet: Eyelet not properly seated perpendicular to the board.

12A4. Plated - through hole: (1) Plating missing in excess of 10% plated surface through hole, (2) Voids at interface of hole (3) Circumferential separation (4) A non-continuous plug of solder from one side of the board to the other when the plated through hole is used as an interfacial connection.

12A5. Location of holes: Holes not entirely within terminal area. Edge of hole beyond edge of terminal area at any point.

12A6. Superfluous conductor: Potential cause of short circuit. Clearances less than specified in Table III (See Type 6 defects).

12A8. Reduction in effective width of conductor at anyone point exceeding 35%.

12A9. Terminal Area - View of board indicates that terminal area is completely missing (drilled away or never present) on any side of board containing conductor or does not meet the minimum terminal dimensions specified for the type PC board involved.

12A10. Peeling of Conductor: Any indication of peeling of conductors. (Defect most prevalent in terminal areas, at change in conductor direction and at ends of conductor contacts).

12A11. Conductor spacing: Evaluate for potential short base upon clearances specified in Table III (See Type 6 defects).

12A12. Plating on Conductors and Conductor Contacts: Lack of plating when plating is specified, or plating thickness is not within the tolerances specified.

12A13. Cracks or Chips in Board: Cracks, chips, bulges on board surfaces which tend to weaken the board or conductor on the board. (Holes shall be free from cracks or chips extending more than 0.020 inches back from edge of holes. Cracks or chips on edges of board shall not be greater than 1/8 inch, except none allowed at contact ends.

12A14. Unspecified removal of board material: Any visible unspecified removal of board material (such as removal about conductors to increase

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insulation resistance - an indication of contamination). A minor change in surface appearance due to removal of superfluous copper shall not be considered unspecified surface material.

12A15. Warp or twist of Board: Warp or twist in any board that exceeds the specified allowed minimum.

12A16. Spacing of Holes: Spacing of holes exceeding the tolerances specified resulting in inadequate material between holes (could cause breakthrough between holes).

12A17. Annular ring measuring less than specified (at narrow point).

12A19. Size of holes: Not as specified.

12A20. Conductor edges: Conductor edge roughness greater than 0.005 inches.

12A21. Loose Standoff Terminal: Any standoff that can be turned or removed by hand prior to soldering.

12A22. Repairs: Any evidence of repair to a conductor pattern.

12A23. Approved configuration: Any envelope dimensions, mounting hole locations deviating from approved configuration.

12A24. Mounting Defects: Supported or unsupported parts not according to specified requirements.

12A25. Delamination - Internal or external separation of layers of base material (paper or glass).

12B. Minor Defects

12B2. Broken Eyelet: Multiple radial splits, more than one, but less than four.

12B8. Reduction in effective width of conductor: Any form of reduction in effective width of conductors from 20 to 35 percent.

12B13. Cracks or chips in board: Cracks or chips which do not weaken the board, result in objectionable electrical degradation (cracks or chips, other than above up to 1/8 inch allowed at edge of board, except at conductor - contact edge).

12B16. Spacing of holes: Spacing between holes less than thickness of board. Spacing to edges of board less than the thickness of board. When spacings show evidence of breakthrough, evaluate in accordance with defect

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12A16. (Unless dimension for spacing is otherwise specified, in which case minimum tolerances apply).

12B.18. Cuts, cracks, or scratches in conductor: Board not visible through copper, but copper may be visible through plating, when plating is specified. Area of defect is completely across conductor or more than 1/2 inch along conductor (when this type of defect can be considered a reduction in area of conductor, evaluate in accordance with defect 12A8 or 12B8, as applicable).

5.14 TYPE 13 - CLASSIFICATION OF DEFECTS FOR INDIVIDUAL TOOLS

13A. Major Defects

13A1. Missing or broken pieces, bent or otherwise distorted parts which prevent proper use of item.

13A2. Non-operative item (mechanically or electrically).

13A3. Items not in accordance with, or which do not include changes required by preproduction or qualification approvals.

13A4. Major deviation from the applicable specification, drawing, etc., (which may affect its intended function or use, or endanger the safety of the user).

13B. Minor Defects

13B4. Minor deviations from the applicable specification, drawing, etc., (which may not affect its intended function or use).

13B5. Markings are not in accordance with the requirements.

13B6. Finish is cracking, peeling, or chipping.

5.15 TYPE 14 - CLASSIFICATION OF DEFECTS FOR ASSEMBLED TOOL EQUIPMENT KITS

14A. Major Defects

14A1. Item missing from kit.

14A2. Incorrect quantity in unit package or assembled kit.

14A3. Preservation of critical surfaces not in accordance with requirement.

14A4. Incorrect method of unit packaging. (Method is inferior to requirements and will materially affect the storage life of the item).

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14A5. Incorrect stock number, nomenclature, and quantity marking on unit package.

14A6. Placement of packages in assembled kit not arranged as specified, which may lead to breakage of items in kit.

14A7. Improperly sealed unit packages.

14A8. Unit packages punctured or torn.

14B. Minor Defects

14B3. Inadequate preservation on other than critical surfaces.

14B6. Placement of packages in assembled kit not arranged as specified but not likely to cause breakage of items in kit.

5.16 TYPE 15 - BALLOONS

15A. Major Defects

15A1. Balloon contains impurities, lumps, foreign matters.

15A2. Balloon contains patches.

15A3. Balloon contains holes or cracks.

15A4. Balloon contains non-removable pinches.

15A5. Neck not securely attached to balloon.

15A6. Balloon not dusted inside and outside.

15A7. Wrong Color.

15A8. Uneven thickness.

15A9. Improper size or shape.

15A10. Omission of date; or date indicates that balloon is more than 120 days old.

15A11. Wrong weight.

15B. Minor Defects

15B7. Uneven coloring.

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15B12. Balloon contains scraped, bruised or rubbed areas, which may result in a weakened surface area.

15B13. Identification marking, missing, illegible, or incorrect.

5.17 TYPE 16 - COMMERCIAL QUARTZ CRYSTAL UNITS

16A. Major Defects

16A1. Parts - Missing, wrong, or defective so as not to perform intended function or use in service.

16A2. Dimensions - Outline dimensions exceeded.

16A3. Pins - Pins out of alignment.

16A4. Seal - Cracked glass seal.

16A5. Seal - Any unit showing evidence of leakage after seal test. (Immersion in water between +90C and +95C for five minutes).

16A6. Foreign material - Loose solder or other foreign particles in holder (inspected by holding unit by the pins and shaking close to ear).

16A7. Corrosion - Any visible corrosion of metallic surface.

16A8. Fastening device - Finger loose screw, nut or other fastening device, or fastening device missing.

16A9. Screw or screw insert thread stripped.

16A10. Marking - Type designation, specified manufacturer's code, or other required markings missing, incorrect or illegible.

16A11. Marking method not as specified.

16A12. Marking - Any unit whose marking is smeared or is illegible as a result of the seal test.

16B. Minor Defects

16B1. Parts - Metal soiled or dented, burrs or sharp edges not removed; does not interfere with intended function or use in service.

16B8. Fastening Device - Incorrect mounting of cover to base.

16B10. Marking - Marking not located properly.

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16B13. Plastic parts - Plastic parts chipped or cracked around screw heads; warped, blistered, soiled, scratched, or burned.

16B14. Gaskets - Gaskets torn, twisted, soiled, or extruding more than 1/32 inch.

5.18 TYPE 17 - COMMERCIAL TRANSISTOR AND CRYSTAL RECTIFIER

17A. Major Defects

17A1. Missing, or wrong parts.

17A2. Corroded metal - Any visible corrosion of metallic surface.

17A3. Plastic cracked or broken in main body or adjacent to support points.

17A4. Required markings incorrect, missing, or illegible.

17A5. Finish incorrect or missing.

17A6. Burrs, splinters, sharp edges, likely to cause personal injury.

17A7. Outline dimensions exceeded.

17A8. Deformed or damaged parts which will affect operation or use in service.

17A9. Marking method not as specified (method of application).

17A10. Base material exposed after soldering and cleaning.

17B. Minor Defects

17B3. Plastic chipped or cracked at corners or on edges.

17B4. Marking legible but blurred, or improperly located.

17B5. Finish incomplete or rubs off.

17B6. Burrs or imperfections which will not affect use or make part unsafe in service.

17B8. Deformed or damaged parts which do not affect operation or use in service.

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5.19 TYPE 18 - DRY BATTERIES

18A. Major Defects

18A1. Electrolyte leakage.

18A2. Incorrect dimensions where ability to make connections are affected.

18A3. Cell aging requirements not met.

18A4. Torn jackets - any tear or rip the greatest dimension of which is 1/2 inch or greater (does not apply to metallic jackets) where leakage is probable.

18A5. Case blistered, chipped, scaled, dented or bulged.

18A6. Improper jacket closure.

18A7. Weight limitations exceeded.

18A8. Excess solder on center terminal extending to within 1/32 inch of the cell container.

18A9. Cell tops are brittle (mercury).

18A10. Grommets which disappear under crimped edge of can.

18A11. Spot welds which show partial penetration or poor fusion.

18A12. Inadequate insulation between anode and cathode (mercury cell).

18B. Minor Defects

18B1. Defectively crimped metallic jackets - no leakage probable but sharp or jagged edges appear.

18B2. Paper cell block container not wax impregnated.

18B3. Date of manufacture not coded.

18B4. Dented cans (mercury batteries).

18B5. Metal, wax, pitch or other sealing compound or cement on outside surface.

18B6. Protective coating omitted where required.

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5.20 TYPE 19 - STORAGE BATTERIES (Wet Cells)

19A. Major Defects

19A1. Wrong parts or material.

19A2. Improper assembly causing parts to be inoperative or unsafe in service.

19A3. Deformed or damaged parts, inoperative or do not function properly in service.

19A4. Improper machining resulting in sharp burrs or imperfections which would cause parts to be dangerous to handle or cause major difficulty in assembly or repair operation.

5.21 TYPE 20 - CONNECTIONS, ELECTRICAL, SOLDERLESS, WRAPPED

20A. Major Defects

20A1. No insulation or insufficient insulation wrap.

20A2. Improper spacing between wraps on the same wrapost.

20A3. Overlapping wrapper turns (same level).

20A4. Insufficient number of wrapper turns.

20A5. End tail protruding from wrapost. (Contour of wire not the same as other wrapper turns).

20A6. Overlapping wrapper turns (different levels).

20A7. Space between adjacent wrapper turns exceeding one-half the diameter of the uninsulated conditions at one or more points of wrap.

20A8. Wrapost dimensions incorrect.

20A9. Wrapost reference corners nicked, burned over 0.0015 inch or edge radius exceeds 0.003 inch.

20A10. Loose wrap on wrapost. (Must meet strip-force limits established for applicable wire size).

20A11. Re-wrapped wire on wrapost.

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APPENDIX I

10.0 References

10.1 The following documents have been used in the technical development of this standard; however, they are not specifically referenced and do not form a part of this document.

10.2. Military

MIL-P-55110 Printed Circuit Boards

10.3. Standards

MIL-STD-454 Standard General Requirements for Electronic Equipment

10.4. AD-612054 Department of Commerce Standards of Workmanship for Wired Equipment (Quality Assurance Pamphlet)

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Army—EL

Review activities:

Army— "EL", "MI", "MU", "AT", "ME", "AV", "SM", "WC", "GL".

Preparing activity:

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