

IPC Mission

IPC is a global trade association dedicated to furthering the competitive excellence and financial success of its members, who are participants in the electronics industry.

In pursuit of these objectives, IPC will devote resources to management improvement and technology enhancement programs, the creation of relevant standards, protection of the environment, and pertinent government relations.

IPC encourages the active participation of all its members in these activities and commits to full cooperation with all related organizations.

About IPC Standards

IPC standards and publications are designed to serve the public interest through eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay the proper product for their particular need. Existence of such IPC standards and publications shall not in any respect preclude any entity from manufacturing or selling products not conforming to such IPC standards and publication, nor shall the existence of such IPC standards and publications preclude their voluntary use.

IPC standards and publications are approved by IPC committees without regard to whether the IPC standards or publications may involve patents on articles, materials or processes. By such action, IPC does not assume any liability to any patent owner, nor does IPC assume any obligation whatsoever to parties adopting an IPC standard or publication. Users are wholly responsible for protecting themselves against all claims of liabilities for patent infringement.

IPC Position Statement on Specification Revision Change

The use and implementation of IPC standards and publications are voluntary and part of a relationship entered into by customer and supplier. When an IPC standard or publication is revised or amended, the use of the latest revision or amendment as part of an existing relationship is not automatic unless required by the contract. IPC recommends the use of the latest revision or amendment.

Standards Improvement Recommendations

IPC welcomes comments for improvements to any standard in its library. All comments will be provided to the appropriate committee.

If a change to technical content is requested, data to support the request is recommended. Technical comments to include new technologies or make changes to published requirements should be accompanied by technical data to support the request. This information will be used by the committee to resolve the comment.

To submit your comments, visit the IPC Status of Standardization page at www.ipc.org/status.



IPC J-STD-001JS

Space and Military Applications Electronic Hardware Addendum to IPC J-STD-001J Requirements for Soldered Electrical and Electronic Assemblies

If a conflict occurs between the English language and translated versions of this document, the English version will take precedence.

Developed by the J-STD-001 Space and Military Electronic Assemblies Task Group (5-22AS) of the Assembly & Joining Committee (5-20) of IPC

IPC Standards and Artificial Intelligence (AI) Statement – 2025

IPC explicitly prohibits:

- The integration or transfer of any data whether in the form of IPC books, standards, metadata, or other formats — into AI engines or algorithms by any person or entity, including authorized distributors and their end users.
- Activities involving data harvesting, text and data mining, enrichment, or the creation of derivative works based on this data, including the use of automated data collection methods or artificial intelligence.

Any breach of these provisions is considered a copyright infringement unless expressly and formally authorized by IPC.

Supersedes:

IPC J-STD-001HS –
April 2021
IPC J-STD-001GS-AM1 –
January 2020
IPC J-STD-001GS –
March 2018
IPC J-STD-001FS WAM1 –
January 2017
IPC J-STD-001FS –
January 2015

Users of this publication are encouraged to participate in the development of future revisions.

Contact:

IPC
3000 Lakeside Drive, Suite 105N
Bannockburn, Illinois
60015-1249
Tel 847 615.7100
Fax 847 615.7105

Space and Military Applications Electronic Hardware Addendum to IPC J-STD-001J Requirements for Soldered Electrical and Electronic Assemblies

Table of Contents

The following topics are addressed in this Addendum.

- 0.1 Scope
 - 0.1.1 Purpose
 - 0.1.2 Precedence
 - 0.1.3 Existing or Previously Approved Designs
 - 0.1.4 Use
 - 0.1.5 Red Plague (Cuprous Oxide Corrosion)
 - 0.1.6 Materials and Processes Traceability

Table of Contents for Table 1 Space and Military Applications Requirements

| | |
|---------|--|
| 1.1 | Scope |
| 1.2 | Purpose |
| 1.5.3.2 | High Frequency Applications |
| 1.5.3.3 | High Voltage Applications |
| 1.6.2 | Statistical Process Control |
| 1.7 | Order of Precedence |
| 1.10 | Personnel Proficiency |
| 1.11 | Acceptance Requirements |
| 1.13.2 | Inspection |
| 3.1 | Materials |
| 3.2 | Solder |
| 3.2.1 | Solder – Pb-Free |
| 3.3 | Flux |
| 3.6.1 | Component and Seal Damage |
| 3.7 | Tools and Equipment |
| 4.3 | Removal of Surface Finishes |
| 4.3.1 | Gold Removal |
| 4.7 | General Part Installation Requirements |
| 4.7.2 | Lead Deformation Limits |
| 4.12.3 | Drying/Degassing |
| 4.14.1 | Exposed Surfaces |
| 4.14.3 | Partially Visible or Hidden Solder Connections |
| 5.1.2 | Strand Damage |
| 5.3.6 | Terminal Installation – Soldering |
| 5.5 | Soldering to Terminals |
| 5.6.3 | Wire Staking |

| | |
|------------|---|
| 6.1 | Through-Hole – Placement – General |
| 6.1.1 | Lead Forming |
| 6.1.2 | Through-Hole Component Lead Length and Clinching |
| 6.2.2 | Supported Through-Hole Soldering |
| 6.3.1 | Unsupported Through-Hole Soldering |
| 7.0 | Surface Mount Soldering |
| 7.1.3 | Unintentional Bending |
| 7.5.6 | Castellated Terminations |
| 7.5.7 | Flat Gull Wing Leads |
| 7.5.8 | Round or Flattened (Coined) Gull Wing Leads |
| 7.5.14 | Surface Mount Area Array Packages |
| 7.5.16 | Components with Bottom Thermal Pads (D-Pak) |
| 7.5.17 | Flattened Post Leads |
| 7.5.19 | Vertical Cylindrical Cans with Outward L-Shaped Leads |
| 8.0 | Cleaning and Residue Requirements |
| 8.1 | Qualified Manufacturing Process |
| 8.1.1 | Cleaning Designator |
| 8.3.1 | Level 1 – Major Changes Requiring Validation |
| 8.4 | Foreign Object Debris (FOD) |
| 8.5 | Visible Residues |
| 9.1.1 | Blistering/Delamination |
| 9.1.2 | Weave Exposure/Cut Fibers |
| 9.1.4 | Edge Delamination |
| 9.1.11 | Measles |
| 10.0 | Coating, Encapsulation, Staking and Bonding |
| 10.1.3 | Application |
| 10.1.11 | Rework or Touchup |
| 10.4 [NEW] | Bonding (Adhesive) |
| 12.2 | Repair |

0.1 Scope This Addendum provides requirements to be used in addition to, and in some cases, in place of, those published in J-STD-001J to ensure the reliability of soldered electrical and electronic assemblies that must survive the vibration and thermal cyclic environments in space and military applications.

0.1.1 Purpose When required by procurement documentation/engineering documentation, this Addendum supplements or replaces specifically identified requirements of J-STD-001J.

0.1.2 Precedence The contract takes precedence over this Addendum, referenced standards and User-approved drawings. In the event of a conflict between this Addendum and the applicable documents cited herein, this Addendum takes precedence. Where referenced criteria of this Addendum differ from the published J-STD-001J, this Addendum takes precedence. In the event of conflict between the requirements of this Addendum and the applicable assembly drawing(s)/documentation, the applicable User approved assembly drawing(s)/documentation take precedence. See 1.7 Order of Precedence of this Addendum.

0.1.3 Existing or Previously Approved Designs This Addendum **shall not** constitute the sole cause for the redesign of previously approved designs. When drawings for existing or previously approved designs undergo revision, they should be reviewed and changes made that allow for conformance with the requirements of this Addendum.

0.1.4 Use This Addendum is not to be used as a stand-alone document.

Where criteria are not modified through change or addition, the Class 3 requirements of J-STD-001J **shall** apply. Where J-STD-001J criteria are altered or new criteria are added by this Addendum, the clause is listed in J-STD-001JS, Table 1, Space and Military Applications Requirements, and the entire J-STD-001J clause is replaced by this Addendum except as specifically noted. Clauses found only in this Addendum will have “[NEW]” after the clause number in the table.

Clauses, Tables, Figures, etc., in J-STD-001J that are not listed in this Addendum **shall** be used as-published.

0.1.5 Red Plague (Cuprous Oxide Corrosion) Red Plague can develop in silver-coated soft or annealed copper conductors (component leads, single and multistranded wires and printed board conductors) when a galvanic cell forms between the copper base metal and the silver coating in the presence of moisture (H₂O) and oxygen (O₂). Once initiated, the sacrificial corrosion of the copper base conductor can continue indefinitely in the presence of oxygen. The color of the corrosion by-product (cuprous oxide crystals) may vary depending on the different levels of oxygen available, but is commonly noted as a red/reddish-brown discoloration on the silver coating surface.

The use of silver coating over any form of copper, e.g., component leads, printed board traces, wire/cable **shall** require the implementation of a User-approved Red Plague Control Plan (RPCP). See IPC-WP-113, Guidance for the Development and Implementation of a Red Plague Control Plan (RPCP), for technical guidance and a generic RPCP template.

0.1.6 Materials and Processes Traceability When required, the traceability of materials and processes used in the manufacture of electrical/electronic hardware **shall** be in compliance with IPC-1782, Standard for Manufacturing and Supply Chain Traceability of Electronic Products. Traceability Level **shall** be determined between the Manufacturer and the User.