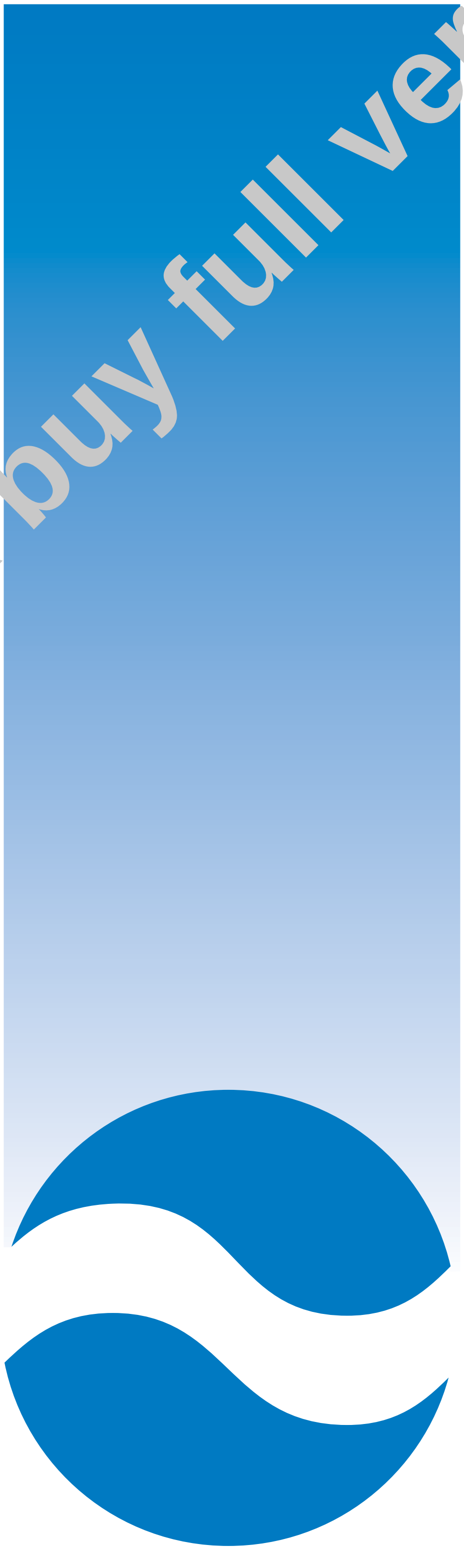
IPC J-STD-001F
July 2014
Supersedes Revision E April 2010

JOINT INDUSTRY STANDARD

Requirements for Soldered Electrical and Electronic Assemblies



IPC®

The Principles of Standardization

In May 1995 the IPC's Technical Activities Executive Committee (TAEC) adopted Principles of Standardization as a guiding principle of IPC's standardization efforts.

Standards Should:

- Show relationship to Design for Manufacturability (DFM) and Design for the Environment (DFE)
- Minimize time to market
- Contain simple (simplified) language
- Just include spec information
- Focus on end product performance
- Include a feedback system on use and problems for future improvement

Standards Should Not:

- Inhibit innovation
- Increase time-to-market
- Keep people out
- Increase cycle time
- Tell you how to make something
- Contain anything that cannot be defended with data

Notice

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 his particular need. Existence of such Standards and Publications shall not in any respect preclude any member or nonmember of IPC from manufacturing or selling products not conforming to such Standards and Publication, nor shall the existence of such Standards and Publications preclude their voluntary use by those other than IPC members, whether the standard is to be used either domestically or internationally.

Recommended Standards and Publications are adopted by IPC without regard to whether their adoption may involve patents on articles, materials, or processes. By such action, IPC does not assume any liability to any patent owner, nor do they assume any obligation whatever to parties adopting the Recommended Standard or Publication. Users are also wholly responsible for protecting themselves against all claims of liabilities for patent infringement.

IPC Position Statement on Specification Revision Change

It is the position of IPC's Technical Activities Executive Committee that the use and implementation of IPC publications is voluntary and is part of a relationship entered into by customer and supplier. When an IPC publication is updated and a new revision is published, it is the opinion of the TAEC that the use of the new revision as part of an existing relationship is not automatic unless required by the contract. The TAEC recommends the use of the latest revision. Adopted October 6, 1998

Why is there a charge for this document?

Your purchase of this document contributes to the ongoing development of new and updated industry standards and publications. Standards allow manufacturers, customers, and suppliers to understand one another better. Standards allow manufacturers greater efficiencies when they can set up their processes to meet industry standards, allowing them to offer their customers lower costs.

IPC spends hundreds of thousands of dollars annually to support IPC's volunteers in the standards and publications development process. There are many rounds of drafts sent out for review and the committees spend hundreds of hours in review and development. IPC's staff attends and participates in committee activities, typesets and circulates document drafts, and follows all necessary procedures to qualify for ANSI approval.

IPC's membership dues have been kept low to allow as many companies as possible to participate. Therefore, the standards and publications revenue is necessary to complement dues revenue. The price schedule offers a 50% discount to IPC members. If your company buys IPC standards and publications, why not take advantage of this and the many other benefits of IPC membership as well? For more information on membership in IPC, please visit www.ipc.org or call 847/597-2872.

Thank you for your continued support.

IPC J-STD-001F

Requirements for Soldered Electrical and Electronic Assemblies

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

A joint standard developed by the J-STD-001 development team including Task Group (5-22A), Task Group Asia (5-22ACN) and Task Group India (5-22AIN) of the Assembly and Joining Committees (5-20 and 5-20CN) of IPC

Supersedes:
J-STD-001E - April 2010
J-STD-001D - February 2005
J-STD-001C - March 2000
J-STD-001B - October 1996
J-STD-001A - April 1992

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

Contact:
IPC
3000 Lakeside Drive, Suite 309S
Bannockburn, IL 60015-1249
Phone (847) 615-7100
Fax (847) 615-7105

ADOPTION NOTICE

J-STD-001, "Requirements for Soldered Electrical and Electronic Assemblies", was adopted on 19-JUL-01 for use by the Department of Defense (DoD). Proposed changes by DoD activities must be submitted to the DoD Adopting Activity: Commander, US Army Tank-Automotive and Armaments Command, ATTN: AMSTA-TR-E/IE, Warren, MI 48397-5000. Copies of this document may be purchased from the The Institute for Interconnecting and Packaging Electronic Circuits, 2215 Sanders Road, Northbrook, IL 60062-6135. http://www.ipc.org/

Custodians:
Army - AT
Navy - AS

Adopting Activity:
Army - AT
(Project SOLD-0059)

Reviewer Activities:
Army - AV, MI

AREA SOLD

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

Acknowledgment

Any standard involving a complex technology draws material from a vast number of sources across many continents. Shown below are the principal members of the J-STD-001 development team including Task Group (5-22A), Task Group Asia (5-22ACN) and Task Group India (5-22AIN) of the Assembly and Joining Committees (5-20 and 5-20CN). It is not possible to include all of those who assisted in the evolution of this standard. To each of them, the members of the IPC extend their gratitude.

Assembly and Joining Committee

Chair
Leo P. Lambert
Eptac Corporation

Vice Chair
Renee J. Michalkiewicz
Trace Laboratories - Baltimore

Technical Liaison of the IPC Board of Directors

Bob Neves
Microtek (Changzhou) Laboratories

J-STD-001 Task Group

Co-Chairs
Teresa M. Rowe

Daniel L. Foster
Missile Defense Agency

J-STD-001 Task Group – China

Chair
Zhang Yuan
Huawei Technologies Co., Ltd.

J-STD-001 Task Group – India

Chair
T. S. Nanjundaswamy
IPC Technology
Consulting Pvt Ltd

Members of J-STD-001 Task Group (5-22A)

Jon Roberts
Doug Rogers
Teresa Rowe
Donald McFarland, 3i
Arye Grushka, A. A. Training Consulting and Trade A.G. Ltd.
Alejandro Cruz, ACME Training & Consulting
Tim Brown, ACME Training & Consulting
Constantino Gonzalez, ACME Training & Consulting
Rhonda Troutman, Actron[illegible] Inc
Debbie Wade, Advanced Rework Technology-A.R.T.
John Vickers, Advanced Rework Technology-A.R.T.
Michael Wie[illegible]eski, Aerojet Rocketdyne
Sam Tioe[illegible]er, Aerojet Rocketdyne
Joseph Smetana, Alcatel-Lucent
Russell Nowland, Alcatel-Lucent
Ronald McIlnay, American General Contracting
Sean Keating, Amphenol Limited (UK)
Bruce Hughes, Amrdec [illegible]S&T EPPT
Christopher Sattler, AQS - All Quality & Services, Inc.
Bill Strachan, ASTA - Portsmouth University
Mark Sh[illegible]an, ATK Armament Systems
Agnieszka Ozarowski, BAE Systems
Joseph Kane, BAE Systems Platform Solutions
Marvin Banks, Ball Aerospace & Technologies Corp.
Jonathon Vermillion, Ball Aerospace & Technologies Corp.
Andre Baune, Bautech Inc.
Gerald Leslie Bogert, Bechtel Plant Machinery Inc.
Vinay Goyal, Beckman Coulter Inc.
Norman Mier, BEST Inc.
Robert Wettermann, BEST Inc.
Dorothy Cornell, Blackfox Training Institute
Jay Messner, Boeing Company
Karl Mueller, Boeing Company
Thomas Carroll, Boeing Company
Edward Cuneo, Boeing Company
Joseph Riendeau, Boeing Research & Development
Mary Bellon, Boeing Research & Development
Jack Olson, Caterpillar Inc.
Zenaida Valianu, Celestica
Alanis Heriberto, Chamberlain
Angel Deluna, Circuit Technology Inc.
Steven Perng, Cisco Systems Inc.
Marilyn Lawrence, Conformance Technologies, Inc.
Israel Martinez, Continental Automotive Nogales S.A. de C.V.
Laura Cote, Continental Automotive Systems
Cynthia Gomez, Continental Temic SA de CV
Jose Servin, Continental Temic SA de CV
Miguel Dominguez, Continental Temic SA de CV
Mary Muller, Crane Aerospace & Electronics

John Marshall, dataCon Inc.

Lowell Sherman, Defense Supply Center Columbus

Wallace Ables, Dell Inc.

John Borneman, Delphi Electronics and Safety

Irene Romero, Delta Group Electronics Inc.

Michael Mora, Delta Group Electronics Inc.

Vicki Hagen, Delta Group Electronics Inc.

Gabriel, Rosin, Elbit Systems Ltd.

Pam McCord, Elbit Systems of America

Yaakov Zissman, Elta Systems Ltd.

Imelda Avila, EPIC Technologies

Helena Pasquito, EPTAC Corporation

Leo Lambert, EPTAC Corporation

Barrie Dunn, European Space Agency

Nancy Chism, Flextronics

Omar Karin Hernandez, Flextronics Manufacturing Mex, SA de CV

Eric Camden, Foresite, Inc.

Terry Munson, Foresite, Inc.

Stephen Fribbins, Fribbins Training Services

Gary Ferrari, FTG Circuits

Graham Naisbitt, Gen3 Systems Limited

Richard Stadem, General Dynamics Advanced Information Systems

Deepak Pai, General Dynamics Info. Sys. Inc

Kristen Troxel, Hewlett-Packard Company

Elizabeth Benedetto, Hewlett-Packard Company

Curtis Wray, Hewlett-Packard Company

John Pickett, Honeywell Aerospace

John Mastorides, Honeywell Aerospace

Amir Begay, Honeywell Canada

Richard Rumas, Honeywell Canada

William Novak, Honeywell International

Riley Northam, Honeywell Technology Solutions Inc.

Jennie Hwang, H-Technologies Group

Zhang Yuan, Huawei Technologies Co., Ltd.

Poul Juul, HYTEK

Bert El-Bakri, Inovar, Inc.

Jagadeesh Radhakrishnan, Intel Corporation

John Yu, I-SAC Electronic Co. Ltd.

Ricardo Moncaglieri, INVAP SE

Alan Young, Jet Propulsion Laboratory

Reza Ghaffarian, Jet Propulsion Laboratory

Frank Hules, Johanson Dielectrics Inc.

Akikazu Shibata, JPCA-Japan Electronics Packaging and Circuits Association

Nancy Bullock-Ludwig, Kimball Electronics

Augustin Stan, L&G Advice Serv SRL

Leopold Whiteman, L-3 Communications

Shelley Holt, L-3 Communications

Robert Fornefeld, L-3 Communications

Keld Maaloee, LEGO Systems A/S

Josh Goolsby, Lockheed Martin

Linda Woody, Lockheed Martin Missile & Fire Control

Vijay Kumar, Lockheed Martin Missile & Fire Control

Roger Buisson, Lockheed Martin Missiles & Fire Control

Sam Polk, Lockheed Martin Missiles & Fire Control

Sharissa Johns, Lockheed Martin Missiles & Fire Control

Kimberly Shields, Lockheed Martin Mission Systems & Training

Pamela Petcosky, Lockheed Martin Mission Systems & Training

Steven Nolan, Lockheed Martin Mission Systems & Training

Dominik Alder, Lockheed Martin Space Systems Company

Neil Wolford, Logic PD

Daniel Foster, Missile Defense Agency

Bill Kasprzak, Moog Inc.

William Draper, Moog Inc.

Edward Rios, Motorola Solutions

Jeannette Plante, NASA Goddard Space Flight Center

Robert Humphrey, NASA Goddard Space Flight Center

Anthony Wong, NASA Johnson Space Center

Robert Cooke, NASA Johnson Space Center

Scott Worley, NASA Marshall Space Flight Center

James Blanche, NASA Marshall Space Flight Center

Charles Gamble, NASA Marshall Space Flight Center

Adam Gowan, NASA Marshall Space Flight Center

Gary McGuire, NASA Marshall Space Flight Center

Mahendra Gandhi, Northrop Grumman Aerospace Systems

Randy McNutt, Northrop Grumman Corp.

Mac Butler, Northrop Grumman Corporation

Tana Soffa, Northrop Grumman Corporation

Doris McGee, Northrop Grumman Corporation

Toshiyasu Takei, NSK Co., ltd.

Kenneth Lee, NSWC - Corona

Andrew Ganster, NSWC Crane

Gary Latta, NSWC Crane

Eric Scott, NSWC Crane

Joseph Sherfick, NSWC Crane

William May, NSWC Crane

Angela Pennington, NuWaves Engineering

Brian Langley, OK International

Ken Moore, Omni Training Corp.

Raymond Falkenthal, Optimum Design Associates

Gustavo Arredondo, Para Tech Coating Inc.

Matt Garrett, Phonon Corporation

Ron Fonsaer, PIEK International Education Centre (I.E.C.) BV

Frank Huijsmans, PIEK International Education Centre (I.E.C.) BV
Rob Walls, PIEK International Education Centre (I.E.C.) BV
Kirk Van Dreel, Plexus Corp.
Richard Kraszewski, Plexus Corp.
Sam Theabo, Plexus Corporation
Timothy Pitsch, Plexus Corporation
Bill Barthel, Plexus Manufacturing Solutions
Guy Ramsey, R & D Assembly
Lisa Maciolek, Raytheon Company
Steven Corkery, Raytheon Company
James Saunders, Raytheon Company
David Nelson, Raytheon Company
Michael Blige, Raytheon Company
Lynn Krueger, Raytheon Company
Charles Gibbons, Raytheon Company
David Tucker, Raytheon Company
Kamran Nahid, Raytheon Company
William Ortloff, Raytheon Company
Fonda Wu, Raytheon Company
James Daggett, Raytheon Company
Kathy Johnston, Raytheon Missile Systems
Lance Brack, Raytheon Missile Systems
George Millman, Raytheon Missile Systems
Robert Morris, Raytheon Missile Systems
William Russell, Raytheon Professional Services LLC
Patrick Kane, Raytheon System Technology
Steven Herrberg, Raytheon Systems Company
Linda Haining Hall, Raytheon UK
Paula Jackson, Raytheon UK
Udo Welzel, Robert Bosch GmbH
Lisa Cottone, Robins AFB
Caroline Ehlinger, Rockwell Collins
Douglas Pauls, Rockwell Collins
David Hillman, Rockwell Collins
David Adams, Rockwell Collins
Gary Roper, Roper Resources, Inc.
Greg Hurst, RSI, Inc.
Neil Johnson, Saab - Electronic Defence Systems
Casimir Budzinski, Safari Circuits Inc.
Alisha Asbell, SAIC
Gaston Hidalgo, Samsung Telecommunications America
Mary James, Schlumberger Well Services
Giovanni Casanova, Schweitzer Engineering Laboratories Inc.
Dan Kelsey, Scienscope International Corporation
Finn Skaanning, Skaanning Quality & Certification -SQC
Craig Pfefferman, Southern California Braiding Company Inc.
Gregg Owens, Space Exploration Technologies
Paul Pidgeon, STEM Training
Mel Parrish, STI Electronics, Inc.
Patricia Scott, STI Electronics, Inc.
Floyd Bertagnolli, STM - Service To Mankind
Terry Clitheroe, Surface Mount Circuit Board Association
Andres Ojalill, Tallinn Polytechnic School
Tracy Clancy Vecchiolli, Technical Training Center
Steven Kummerl, Texas Instruments Inc.
Katie Feistel, The Aerospace Corporation
Calette Chamness, U.S. Army Aviation & Missile Command
David Carlton, U.S. Army Aviation & Missile Command
Jennifer Day, CGI Federal
Sharon Ventress, U.S. Army Aviation & Missile Command
Heidi Havelka, Unipower Corporation
Scott Meyer, UTC Aerospace Systems
Constantin Hudon, Varitron Technologies Inc.
Gabriela, Ventana Medical Systems
Linda Tucker-Evoniuk, Vergent Products, Inc.
Lawrence (Skip) Foust, Veteran Affairs Hospital
Gerjan Diepstraten, Vitronics Soltec
Lionel Fullwood, WKK Distribution Ltd.

Members of J-STD-001 Task Group – China (5-22ACN)

He Yun
Zhou Guanjun
Cao Yanling, Alcatel-Lucent Shanghai Bell Co., Ltd.
Liu Zhijie, Beijing Dinghan Technology Co., Ltd
Zhao Jack, Emerson Network Power Co. Ltd.
Zhao, Charlie, Emerson Network Power Co. Ltd.
Zhang Cylin, Flextronics Electronics Technology (Suzhou) Co. Ltd.
Yuan Zhang, Huawei Technologies Co., Ltd.
Tu Yunhua (Danny), Huawei Technologies Co., Ltd.
Gong Peter, Huawei Technologies Co., Ltd.
Cao Xi, Huawei Technologies Co., Ltd.
He Dapeng, Huawei Technologies Co., Ltd.
Zhou Huilin, Huawei Technologies Co., Ltd.
Chen Yenchi, Integrated Service Technology (Kunshan)
Wang Renhua, Jabil Circuit (Shanghai) Ltd.
Sun Learner, Jabil Circuit (Shanghai) Ltd.
Wan Yi, Jabil Circuit (Shanghai) Ltd.
Li Liyi, Jabil Circuit (Shanghai) Ltd.
Zhao Johnson (Songtao), ShenZhen Easyway Science & Technology Co. Ltd.
Luo Jinsong, Shenzhen KaiFa Technology Co., Ltd.
Jia Bianfen, ZTE Corporation
Gao Yunhang, ZTE Corporation
Tang Xuemei, ZTE Corporation

Members of J-STD-001 Task Group – India (5-22AIN)

Jithashree Nayakarahalli, Centum Electronics Limited

Nagaraja Upadhya, Centum Rakon India Pvt. Ltd.

Rentachintala Sudhakar, Electronics Test & Development Center

Appanallur Saravanan, Indian Institute of Science

Panchapakesan Kannan, Indsoltech

Tirumalai Phanishayee, IPC Technology Consulting Pvt Ltd

T. Nanjundaswamy, IPC Technology Consulting Pvt Ltd

Chandrashekaraiah Nagaraj, IPC Technology Consulting Pvt Ltd

Dilip Rane, IPC Technology Consulting Pvt Ltd

Sasikala Jabili, IPC Technology Consulting Pvt Ltd

B. J. Srinivas, Kreative Technologies

Table of Contents

Figures

Tables