IPC-2591
2019 - March

Connected Factory Exchange (CFX)

An international standard developed by IPC

Association Connecting Electronics Industries

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IPC CFX

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- Minimize time to market
- Contain simple (simplified) language
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- Focus on end product performance
- Include a feedback system on use and problems for future improvement

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- Increase time-to-market
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Connected Factory Exchange (CFX)

Developed by the Connected Factory Initiative Subcommittee (2-17) of the Connected Factory Initiative Subcommittee – China (2-17CN) of the Electronic Product Data Description Committee (2-10) of IPC

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

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Acknowledgment

Any document involving a complex technology draws material from a vast number of sources across many continents. While the principal members of the Connected Factory Initiative Subcommittee (2-17) of the Connected Factory Initiative Subcommittee – China (2-17CN) of the Electronic Product Data Description Committee (2-10) are shown below, 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.

Electronic Product Data Description Committee

Chair
Gary J. Carter
ThingWeaver Solutions, LLC

Vice-Chair
Michael Ford
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Bob Neves
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Heller Industries Inc.

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David Adams, Rockwell Collins

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Christopher Almeras, Raytheon Company

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Paul Austen, Electronic Control Design Inc.

Silvia Ayerdi, JBC Soldering, S.L.

Jimmy Baccam, Lockheed Martin Missiles & Fire Control

Jinhee Bae, Yamaha

Dan Bailey, Mentor Graphics (Ireland) Ltd

Jun Balangue, Keysight Technologies

B. Balasaravanan, Nutek Private Limited

HyunJin Bang, Samsung/Hanwha

David Barastegui, JBC Soldering, S.L.

Michael Barnes, Heller Industries Inc.

Ian Barnes, TE Connectivity

Mark Bartholomew, Europlacer Ltd.

Erwin Beck, ANSYS

Greg Bell, iTAC Software, Inc.

Michael Berger

Tom Bergeron, KIC

Mike Bixenman, Kyzen Corporation

Tom Blaszczyk, Celestica International L.P.

Peter Bollinger, iTAC Software AG

Kurt Braganza, Celestica International L.P.

James Brand, Innovative Creations Ltd

Paul Brockett, BAE Systems Electronic Systems

Desiree Buchanan, SEHO North America, Inc.

Ken Caluwaerts, Autodesk, Inc.

Michael Campagna, Pemtron Technology

Erica Candela, ITW EAE

Bill Cardoso, Creative Electron, Inc.

Gary Carter, ThingWeaver Solutions, LLC

Ranjan Chatterjee, Cimetrix Inc.

Jacky Chien, Lite-ON Technology Corporation

Arthur Choi, Koh Young Technology Inc.

Yi Choi, Koh Young Technology Inc.

Huang Chunguang, Huawei Technologies Co., Ltd.

David Cielinski, Miyachi Unitek Corporation

Michael Cieslinski, Panasonic Factory Solutions Co. of America

Sean Clancy, HZO Inc

Thomas Cleere, BAE Systems

Mark Clemons, ITW EAE

Marie Cole, IBM Corporation

Peter Collier, MTC Operations Limited

Michael Collier, Teledyne Leeman Labs

Dylan Cramer, CTI Systems

Luke Cranford, CTI Systems

Jean-François Cucarro, VI Technology

Nick Dajda

Brian D'Amico, MIRTEC Corporation

Dan Denenberg, FlexLink Systems, Inc.

Rob DiMatteo, BTU International

Ray Doherty, iTAC Software AG

Even Dong, Prime Technology (Guang Zhou) Inc.

Michael Durkan, Mentor Graphics Corporation

Stan Earley, Simplimatic Automation

Zac Elliott, Mentor Graphics

Hilal Erbay

Kenneth Espenschied, Nordson ASYMTEK

Glenn Farris, Universal Instruments Corporation

David Fenton, Europlacer Ltd.

Brent Fischthal, Koh Young Technology

Ron Folkeringa, Intercon 1

Michael Ford, Aegis Software

Thomas Forsythe, Kyzen Corporation

Alexis Fouquet, Europlacer

Nicolas Francheteau, Europlacer

Sarah Frisicano, Harris RF Communications

Carla Furanna, CyberOptics Corporation

Ricardo Gallardo, Sanmina Corporation

Daniel Gamota, Printovate Technologies, Inc.

Jae Gan, Nordson ASYMTEK

Ricardo Garcia, Sanmina Corporation

Tan Gek, iTrox Technologies Sdn. Bhd.

Bobby Gladwell, Kyzen Corporation

Stephen Golemme, Google Inc.

Constantino Gonzalez, ACME Training & Consulting

Josh Goolsby, Lockheed Martin Missiles & Fire Control

Jay Gorajia, Mentor Graphics-Valor Divison

Michele Gray, Aegis Software

James Gregory, Mycronic AB

Curtis Grosskopf, IBM Corporation

Larry Groves, Trans-Tec America

Sang Hyun Han

Michael Holdmann, CYTIot, Inc.

Darin Holt, Optimum Design Associates

Dick Hsieh, Delta Electronics (Thailand) P.C.L.

Khoo Hua, ViTrox Technologies Sdn. Bhd.

Eric Huang, Huawei Technologies Co., Ltd.

P. Huang, Delta Electronics, Inc. Chungli Facility

Jennie Hwang, H-Technologies Group

Kazuhiko Inoue, Juki Corporation

Nils Jacobsson, Mycronic AB

JeongUk Jo, Hanwha Precision Machinery

Dick Johnson, CyberOptics

Mattias Jonsson, Mycronic AB

Yongjong Joo, Koh Young Technology Inc.

Denis Kang, Koh Young Technology

Ryoji Kashiwagi

Ben Kauss

Bill Kazmierowicz, KIC

Jason Keeping, Celestica International L.P.

Matt Kelly, IBM Corporation

Michael Kimpton, Fuji America Corporation

Yusaku Kono, Japan Unix Co., Ltd.

Jahyun Koo, Hanwha Precision Machinery

Kevin Kusiak, Lockheed Martin Space Systems Company

Cheol-Hun Kwak, Samsung/Hanwha

Michelle Lam, IBM Corporation

Sean Lee, Mirtec Co., Ltd.

Positive Lee, Hanwha Precision Machinery

Chee Yeong (Gary) Leong, ViTrox Technologies Sdn. Bhd.

Terry Liu, Huawei Technologies Co., Ltd.

James (Chunguang) Liu, Asian Centre for Aerospace

James Liu, Nanjing New Power Automation Co., Ltd.

Michael Lo, Foxconn

Wilson Loh

Christophe Lotz, Aster Technologies

Bjorn Lundberg, Mycronic AB

Michael Ma, Nanjing New Power Automation Co., Ltd.

Todd MacFadden, Bose Corporation

Daniela Malvisini, SPEA S.p.A.

Thomas Marxscheffel, ASM Assembly Systems Singapore Pte Ltd.

Kristen Mattson, BTU International

Karen McConnell, Northrop Grumman Corporation

Mark McMeen, STI Electronics, Inc.

Daniel Melo

Roberto Messa, SPEA S.p.A.

Markus Mittermair, Rehm Thermal Systems GmbH

Markus Moeller

Francois Monette, Cogiscan Inc.

Cheolgon Moon

Miles Moreau, KIC

Miles Moregu

Enrique Moreno, JBC Soldering, S.L.

Arne Neiser, SEHO Systems GmbH

Jarda Neuhauser, SAKI EUROPE

Anh Nguyen, Creative Electron, Inc.

Hoa Nguyen, OK International

Ron Nowak, Lockheed Martin Mission Systems & Training

Mark Ogden, ASM Assembly Systems

Matt Orlowski, TE Connectivity

Guillaume Osbert, Vitechnology

Benoit Ouellet, Cogiscan Inc.

Gerry Padnos, Juki Automation Systems, Inc.

HyungGun Park

Hoon Park, Parmi USA, Inc.
John Pendlebury, Keysight Technologies
Marc Peo, Heller Industries Inc.
Sylvain Perron, Cogiscan Inc.
John Perrotta, Europlacer North America
Scott Peters, Europlacer North America
Petko Petkov, Tempo Automation
Tony Picciola, Fuji America Corporation
Mussie Pietros
Oliver Pirou, Vitechnology
Martin Radeck
Jeevan Kumar, Rathod
Manvir Raulji, Universal Instruments Corporation
Daniel Reder, BECOM Electronics GmbH
David Reyes, JBC Tools, USA
David Richards, CYTIot, Inc.
Patrick Riechel, Electro Scientific Industries, Inc.
Michael Ringel
Florian Ritter, ASYS Group
Lars Rosenboom
Todd Rountree, Austin American Technology
Jeremy Saise
Carsten Salewski, Viscom Inc.
Neaven Seo, Keysight Technologies
Chris Shaw, Fujitsu Network Communications
Cameron Shearon, Shearon-Consulting
Carl Silkey, ITW EAE
Liang Sime Ong, FlexLink Engineering Sdn Bhd
Daniel Siran, Aster Technologies
Patricia Skelton, Delphi Technologies
Simon Smith, Pillarhouse International, Ltd.
Gary Sortino, DIS Inc.
Jason Spera, Aegis Software
Jesse Squire, Creative Electron, Inc.
Joseph Tan, Keysight Technologies
Ming Tat Chan, FlexLink Engineering Sdn Bhd
Bill Thomas, FlexLink Systems, Inc.
Dror Trifon, Heller Industries Inc
Hans Van der Aa, ASM Assembly Systems
Marco van Oosterhout, Kulicke & Soffa Netherlands B.V.
John Vaughn, Fujitsu Network Communications
Christian Vega, GPD Global, Inc.
Richard Vereijssen, Yamaha Motor Europe N.V.
Todd Vick, Universal Instruments Corporation
John Walls, Aegis Software
Karen Walters Walters Ebner, Raytheon Identification Systems
Peter Wang, Huawei Technologies Co., Ltd.
Brad Ward, Omron Electronics LLC
Jarrod Webb, Lockheed Martin Missiles & Fire Control
Siew-Siew Wee, Keysight Technologies
Tang Wei, ViTrox Technologies Sdn. Bhd.
Ling Wen, Electro Scientific Industries, Inc
Christopher Wilson, Tempo Automation
Christoph Wimmer, Microscan Systems Inc.
Robert Yebra, Test Research Inc.
Wee-Sheng Yong, Keysight Technologies
Paul Young, Prime Technology (Guang Zhou) Inc.
Edward Zamborsky, OK International
Andreas Zerfas, iTAC Software AG
Scott Zerkle, Yamaha Motor Corporation
Ben Zhai, Swissmic
Johnny Zhu, Vayo (Shanghai) Technology Co., Ltd.
Jack Zhu, Veoneer China CO., LTD

Connected Factory Initiative Subcommittee – China

Heaven Cen, FCI Connectors Dongguan Ltd.
Luke Chen, Xiamen Macro-s Industrial Co., Ltd.
Peter Chiang, MSI Computer (Shenzhen) Co., Ltd.
Jacky Chen, Lite-ON Technology Corporation
Huang Chunguang, Huawei Machine Co., Ltd.
Nancy Deng, Ford Motor Research & Engineering (NanJing) Co., Ltd
John Gardener
David Guo, FCI Connectors Dongguan Ltd.
Fei Huang, Shanghai Austor Technology Co., Ltd.
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Jia Liang, AVIC TaiYuan Aero-Instruments Co., Ltd.
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Zhang Yingjun, Dongguan Shinyou Intelligent Technology Co., Ltd

CS You, Selcom Electronics (Shanghai) Co. Ltd.

Yunhui Yu, Shenzhen JT Automation Equipment Co., Ltd.

Taotao Yuan, Siemens Numerical Control Ltd.

Huaidong Zhang, Askey Technology (Jiangsu) Co. Ltd.

GuoYi Zhang, Shenzhen JT Automation Equipment Co., Ltd.

Yesong Zheng, Askey Technology (Jiangsu) Co. Ltd.

HL Zheng, Stadium Asia

Johnny Zhu, Vayo (Shanghai) Technology Co., Ltd.

Richard Zyz

Special Recognition

IPC recognizes the following group of people who showed exceptional leadership and effort in the development of IPC-2591. Their efforts accelerated the process of publishing this much needed international standard.

Michael Ford, Aegis Software

Alexis Fouquet, Europlacer

Michael Kimpton, Fuji America Corporation

Thomas Marktscheffel, ASM Assembly Systems Singapore Pte Ltd

Anh Nguyen, Creative Electron, Inc.

Simon Smith, Pillarhouse International, Ltd.

John Walls, Aegis Software

Table of Contents

Figures

Tables

Connected Factory Exchange (CFX)

1 SCOPE

This standard establishes the requirements for the omni-directional exchange of information between manufacturing processes and associated host systems for assembly manufacturing. This standard applies to communication between all executable processes in the manufacture of printed board assemblies, automated, semi-automated and manual, and is applicable to related mechanical assembly and transactional processes.

1.1 Purpose With the growth and acceptance of digital modelling and practices in manufacturing, the lack of a holistic IIoT (Industrial Internet of Things) standard for the transfer of information between machines, systems and processes has become a severe limitation to the growth of digitization and computerization in the electronics manufacturing industry, inhibiting technology innovations such as ''Industry 4.0'' and ''Smart Factories'' being available to all companies in the industry, regardless of size, sector and location.

The CFX standard provides a true ''plug and play'' IoT communication environment throughout manufacturing, where all equipment, manufacturing processes and transactional stations can communicate with each other without the need for the development and use of bespoke interfaces. CFX-enabled equipment and solutions from different vendors work seamlessly together. There are many types of users of the CFX standard, including equipment vendors, solution providers, in-house IT groups, etc. The many types of data included in CFX are used in different ways depending on the application; for example, closed-loop feedback systems, live production dashboards, traceability (IPC-1782), MES control, lean supply chain management, active quality management, production control and many more.

As CFX data is fully omni-directional, any CFX endpoint connection can consume data as well as create it. As an illustration, consider the scenario where a single machine from a certain vendor is connected in-line with other machines from different vendors. CFX messages are sent from the single machine to other machines in the line, and to host systems such as MES. The single machine can also receive CFX messages from all the other machines in the line, as well as from the host systems in order to optimize the machine operation and allow the vendor of the machines to create added-value functionality, such as to support machine-specific Industry 4.0. In this way, a smart, digital, Industry 4.0 factory will be comprised of many different Industry 4.0 computerization applications, each of which can be provided by different suppliers, at the machine, line, site and even enterprise levels, all working together, sharing data seamlessly through CFX.

The CFX standard supports the concept of ''big data'' by including data of different types from across the factory, including performance, materials, resources, users, quality events, product tracking, etc., all of which can be combined to create a ''big data'' environment. CFX, therefore, provides many kinds of added value opportunities to the whole manufacturing operation, including, for example, improving operational efficiency and productivity, quality and reliability, agility and responsiveness. The CFX standard helps organizations ensure that end users/consumers will receive products and services that meet or exceed their expectations and in the timeliest and most economically viable method.

1.2 Application of This Standard This standard defines the communication protocol and content across all assembly production processes, irrespective of type or method of operation. It can also be applied to transactional operations. There are no restrictions in terms of product classification sector, size of operation or location. SMT production is not required to be a part of the factory. Though intended to support all aspects of printed board production, the use of CFX can be extended downstream to include, for example, mechanical assembly, personalization, packing and shipping, as well as up-stream to include, for example, electrical and mechanical subassemblies.

1.3 CFX and the Hermes Standard The CFX standard is complementary to The Hermes Standard (IPC-HERMES-9852). The Hermes Standard, as an advanced intelligent SMEMA replacement, provides near-instant line control, passing information about production units as they pass down the line. CFX provides vertical messaging that is complementary to Hermes.