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Guidelines for In-System Programming

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

Developed by the IPC-9271 In-System Device Programming Task Group (7-14a) of the Global Electronics Association.

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

Contact:

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

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Testing Committee (7-10)	In-System Device Programming Task Group (7-14A)	Technical Liaison of the IPC Board of Directors
Chair Joseph Russeau Precision Analytical Laboratory, Inc.	Chair Pietro Poletto SMH Technologies S.r.l.	Bob Neves Microtek (Changzou) Laboratories
Vice-Chair Matthew McQueen Naval Surface Warfare Center		

IPC recognizes this A-Team for their exceptional leadership and effort in the development of this standard. IPC A-Teams are dedicated groups of volunteers who undertake a significant amount of work in standards development on behalf of their group.

Flash A-Team

Jaume Montiel 6TL – SA Sistel	Manuel Dos Santos ALL Circuits	Jeff Kalukin Keysight Technologies, Inc.
Caius Tanasie Alfa Test	Vincent Munier IPTE Factory Automation	Pietro Poletto SMH Technologies S.r.l.
Raul Ionel Alfa Test	Jean-Luc Blouet IPTE N.V.	Serena Ruzza SMH Technologies S.r.l.

In-System Device Programming Task Group (7-14A)

Jaume Montiel 6TL – SA Sistel	Sanel Merdovic Columbia Elektronik	Falco Kolar Magna Powertrain GmbH & Co. KG
Caius Tanasie Alfa Test	Symon Franklin Custom Interconnect Ltd.	Sathish B Schneider Electric
Raul Ionel Alfa Test	Vincent Munier IPTE Factory Automation	Pietro Poletto SMH Technologies S.r.l.
Manuel Dos Santos ALL Circuits	Jean-Luc Bloue IPTE N.V.	Serena Ruzza SMH Technologies S.r.l.
Terry Hoffman Cisco Systems, Inc.	Jeff Kalukin Keysight Technologies	Zhiman Chen Zhuzhou CRRC Times Electric Co., Ltd.
Gerardo Echeagaray Continental Automotive Occidente S.A. de C.V.	Pietro Vergine Leading Edge	

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1.0 SCOPE

This document provides guidelines for device-level In-System Programming (ISP) as part of the printed circuit board assembly (PCBA) process. It is an aggregate of information collected from market feedback and is intended for electronic assemblies.

1.1 Purpose This document prescribes the guidelines for an ISP process to follow during printed board design and to be used for increasing efficiency, reducing programming costs, and improving productivity and quality in the production environment. The main topics of the document are the PCB design for ISP, the integration of the programmer in the production environment and fundamental characteristics when choosing an ISP programmer.

1.2 Background In-System Programming (ISP) is the capability of modern microcontrollers, memories, and other programmable devices to be programmed while already installed in a system, rather than requiring the chip to be programmed prior to being mounted into the board. A problem a test engineer must solve is that of integrating In-System Programming (ISP) into an existing test system. Usually, an Automatic Test Equipment (ATE) performs parametric and functional tests on the Unit Under Test (UUT) that is placed inside a custom, unit-specific test fixture. The fixture routes several ATE test lines to the various test points on the UUT. The same fixture is used to In-System Program the target device(s) (or DUP, Device Under Programming) in the UUT. In-System Programming usually takes place after the component parametric test and before the functional test. See Figure 1-1.

Figure 1-1 Example of Manufacturing Processes Flowchart

Note: Many other process flowcharts are possible depending on the focus of production throughput optimization for high-volume production or minimizing investments for low-volume production. They could also depend on the global test strategy. For example, a first ISP step is used to embed a particular program for functional test use only. After that, a final ISP step is necessary to program the customer file.

The great advantage is that the programmable device will be configurable with data and firmware at the time of testing the board and can also be reprogrammed subsequently without having to remove the device. Now, this process has become an integral part of the production cycle.

1.3 Definition of Requirements This document is intended to be used as a guide. No specific requirements or criteria are included unless separately and specifically called out in a contractual agreement or other documentation.

The word "should" reflects recommendations and is used to reflect general industry practices and procedures for guidance only.

Line drawings and illustrations are depicted herein to assist in the interpretation of the written requirements of this Standard. The text takes precedence over the figures.

1.4 Appendices Appendices to this standard are not binding requirements unless separately and specifically required by this standard, the applicable contracts, assembly drawing(s), documentation or purchase orders.

1.5 Abbreviations and Acronyms Periodic table elements are abbreviated in the standard. See Appendix A for full spellings of abbreviations (including elements) and acronyms used in this standard.

1.6 Terms and Definitions Other than those terms listed below, the definitions of terms used in this standard are in accordance with IPC-T-50.