

# **IPC-9271**

## **2025 – May**

### **Guidelines for In-System Programming**

*An IPC international standard developed by  
the Global Electronics Association*



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# **Guidelines for In-System Programming**

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

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## Acknowledgments

Any document involving a complex technology draws material from a vast number of sources across many continents. While the principal members of the In-System Device Programming Task Group (7-14a) of the Testing Committee (7-10) 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.

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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.

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## Guidelines for In-System Programming

### 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.