



*The Institute for
Interconnecting
and Packaging
Electronic Circuits*

IPC-D-355

Printed Board Assembly Description in Digital Form

IPC-D-355

January 1995

A standard developed by the Institute for Interconnecting
and Packaging Electronic Circuits

2215 Sanders Road
Northbrook, Illinois
60062-6135

Tel 847 509.9700
Fax 847 509.9798
URL: <http://www.ipc.org>

Table of Contents

1.0 SCOPE	1	5.12	Parameter VER (required).....	9
1.1 Purpose	1	5.13	Parameter SIDE(*)	9
1.2 Format Compatibility	1	6.0 COMMENT RECORDS		10
2.0 APPLICABLE DOCUMENTS	2	6.1 Allowable Character Set		10
2.1 IPC	2	6.2 Comment Records Utilizing 2-Byte Characters		10
2.2 American National Standards Institute	2	7.0 PLACEMENT RECORDS		10
2.3 Department of Defense	2	7.1 General Placement Records (required).....		10
2.4 Electronic Industries Association	2	7.1.1 General Placement Record (Panel).....		10
3.0 TERMS AND DEFINITIONS	2	7.1.2 General Placement Record (PCB) (required for multiple PCBs)		11
3.1 Field	2	7.2 “Bad Mark” Records (optional)		12
3.2 Record.....	2	7.3 Fiducial Mark Records (required for surface mount)		12
3.3 Comment Record.....	2	7.3.1 Panel Fiducial Mark Records.....		13
3.4 Data Record.....	2	7.3.2 PCB Fiducial Mark Record		13
3.5 Parameter Record	2	7.3.3 Component Fiducial Mark Record		14
3.6 General Record.....	2	7.4 PCB Placement Record (required).....		14
3.7 Data Information Module (DIM).....	3	7.5 Component Placement Record (required).....		14
3.8 Job Set	3	8.0 DESCRIPTION RECORDS		15
3.9 Modal Form.....	3	8.1 Acceptance Rule Record.....		15
3.10 Location Field/Position Field.....	3	8.2 Component Description Record.....		15
4.0 GENERAL REQUIREMENTS	3	8.2 Component Test Record (optional).....		16
4.1 Data Hierarchy	3	8.3 Component Force Record (optional)		16
4.1.1 Job Set Definition.....	3	8.4 Through Hole Component		17
4.1.2 Data Information Module (DIM) Definition	3	8.5 Glue Pattern Records (optional)		17
4.2 Basic Record Types.....	3	8.6 Solder Paste Records (optional).....		18
4.3 Data Set Descriptions.....	3	9.0 DESCRIPTION OF ASSEMBLY MACHINE (optional)		21
4.3.1 Absolute Data.....	3	APPENDIX A Examples		23
4.3.2 Electrical/Mechanical Correlation.....	3	APPENDIX B Component Rotation Convention		28
4.3.3 Format of Records.....	3			
4.3.3.1 Data Formats	3			
4.3.3.2 End-of-Record	5			
4.4 Transfer Media and Character Set.....	5			
5.0 PARAMETER RECORDS	5			
5.1 Parameter JOB (required)	5			
5.1.1 End-of-Job Record	6			
5.2 Parameter FORM (required)	6			
5.2.1 Variable Format Records.....	6			
5.3 Parameter CODE (optional).....	6			
5.4 Parameter DIM (Data Information Module)	6			
5.5 Parameter UNITS (required).....	7			
5.6 Parameter TITLE (required)	8			
5.7 Parameter NUM (required)	8			
5.8 Parameter REV (required).....	8			
5.9 Parameter TOL	8			
5.10 Parameter PCB	9			
5.11 Parameter ENDPCB	9			

Figures

Figure 1	Scope of IPC-D-355 Standard in Assembly Technology.....	1
Figure 2A	Data Hierarchy of IPC-D-355	4
Figure 2B	Data Hierarchy of IPC-D-355	5
Figure 3	Step and Repeat Tolerance (0) in a Panel	8
Figure 4	Pattern Tolerance on a PCB/Panel	9
Figure 5	Tolerance Types of Components With (3) and Without (2) Fiducials	9
Figure 6	Possible Points of Origin: Corner, Hole, or Fiducial	11
Figure 7	Definition of a Working Coordinate System.....	12
Figure 8	Possible Combinations of Fiducial within a Placement Description	12

Figure 9	Example of a Fiducial Mark and its Clearance Area (SMEMA Standard 3.1).....	13	Figure 16	Examples for Bending Angles and Directions of Leads	21
Figure 10	Fabrication Panel and Printed Circuit Board Fiducial Marks (SMEMA Standard 3.1)...	13	Figure 17	PCB to be Assembled in the Example.....	23
Figure 11	Individual Printed Circuit Board with Global and Local Fiducial (SMEMA Standard 3.1).....	13	Figure 18	Panel to be Assembled in the Example.....	25
Figure 11	Individual Printed Circuit Board with Global and Local Fiducial (SMEMA Standard 3.1).....	14	Figure 19	Component Vector Concept.....	28
Figure 12	Horizontal and Vertical Mounting of Components	15	Figure 20	PLCC Package Rotations	28
Figure 13	Component Zero Degree Orientations.....	15			
Figure 14	Glue Pattern of a Component	17			
Figure 15	Solder Pattern of a Component	18			

Tables

Table 1	Number of Native Codes Code.....	7
Table 2	Record Interrelationship	7
Table 3	Data Record Field Description	18

Printed Board Assembly Description in Digital Form

1.0 SCOPE

This standard is used to describe the relationship between components (electronic, electro-mechanical, and mechanical) and the printed boards used as the major form of interconnection. Included in these descriptions are the physical characteristics of components and boards required as input to an automated assembly system.

The physical characteristics used in the electronic design process shall be described in digital form, in order to enable the data exchange and archiving capability between systems which support design, fabrication, assembly and testing.

This structure provides the capability for describing all elements in their final form upon completion of manufacturing. It may be used for component preparation (sequencing, lead bonding, etc.), component insertion, adhesive application and component placement.

1.1 Purpose The purpose of IPC-D-355 is to provide the data required to assemble a printed circuit board, including placement information as well as the physical characteristics and locations of all components, sockets, and connectors. The physical dimensions and locations of fiducial marks, glue pattern dispensing, and solder paste dispensing are also included. The standard explicitly does not include determinations of how the manufacturing processes are to be performed (see Figure 1).

1.2 Format Compatibility The concepts detailed in this specification are supplemented by the description defined in the other IPC-D-35X digital description standards. Information redundancy is kept to a minimum by use of the applicable digital description standards described below.

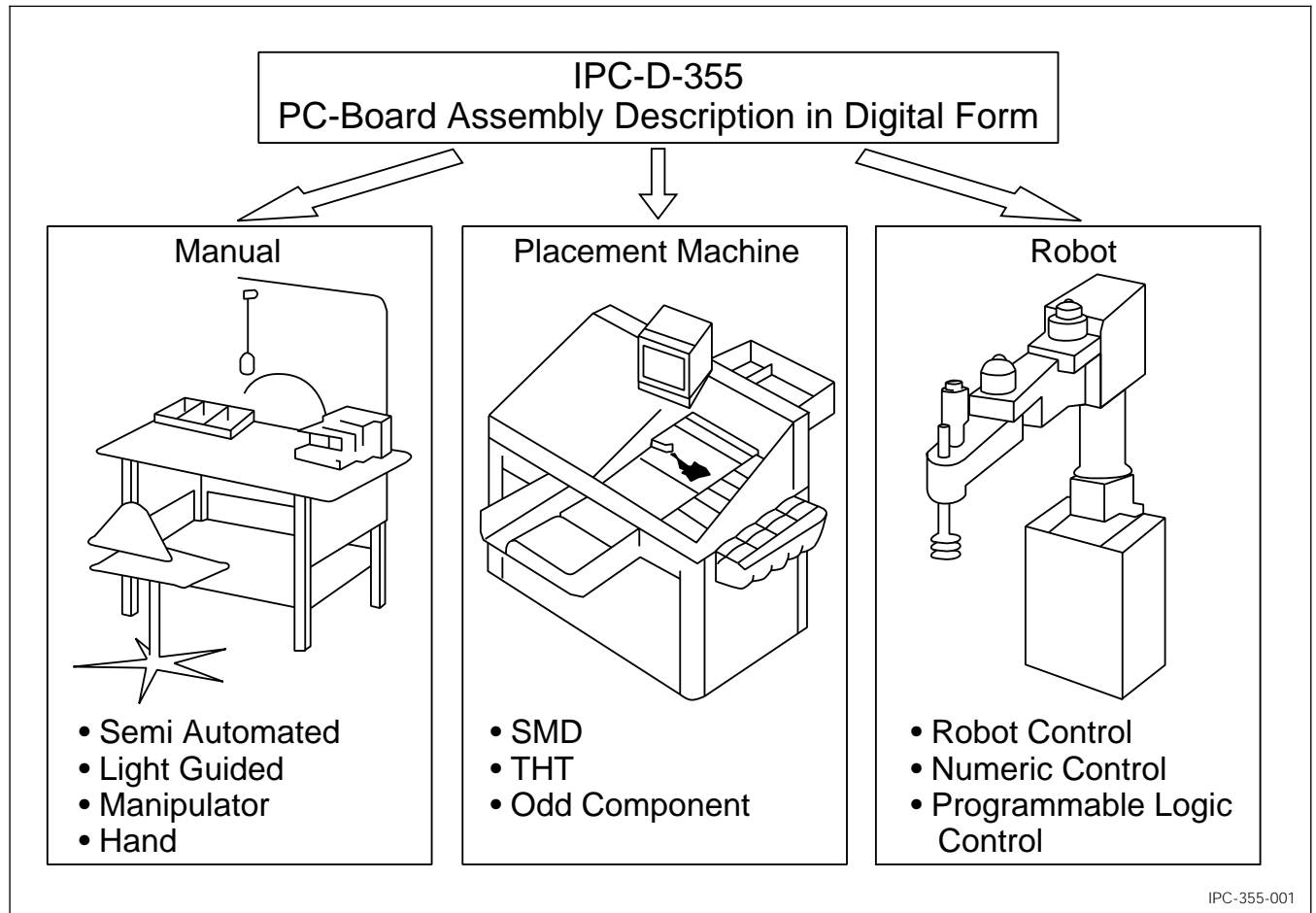


Figure 1 Scope of IPC-D-355 Standard in Assembly Technology

Standards	Record Format
IPC-D-350	Artwork Records
IPC-D-350	Board Description Records
IPC-D-351	Schematic Drawing Records
IPC-D-351	Master Drawing Records
IPC-D-351	Assembly Drawing Records
IPC-D-351	Miscellaneous Part Drawing Records
IPC-D-352	Electrical Description Records
IPC-D-352	Bill of Material Records
IPC-D-353	Testing Format Records
IPC-D-354	Library Description Records
IPC-D-355	Printed Board Assembly Records
IPC-D-356	Bare Board Electrical Test Records
IPC-D-357	Automatic Optical Test Records

Users are encouraged to archive data in a self-sufficient form, one that is not affected by changes in supplementary data used in the design process. Thus, library description records may be repeated in archived data. All records shall be in the appropriate format defined in the related IPC standard.

2.0 APPLICABLE DOCUMENTS

The following documents, of the issue currently in effect, form a part of this standard to the extent specified herein.

2.1 IPC¹

IPC-T-50	Terms and Definitions
IPC-D-300	Printed Board Dimensions and Tolerances
IPC-D-310	Guidelines for Artwork Generation and Measurement Techniques for Printed Circuits
IPC-D-325	Printed Board Documentation
IPC-D-350	Printed Board Description in Digital Form
IPC-D-351	Printed Board Drawings in Digital Form
IPC-D-352	Electronic Design Data Base Description for Printed Boards in Digital Form
IPC-D-353	Automatic Test Information Description in Digital Form
IPC-D-354	Library Format Description for Printed Board Digital Data Bases

2.2 American National Standards Institute²

ANSI X3/TR-1-77	American National Dictionary for Information Processing
ANSI X3.12	Subroutine Record Format Standardization
ANSI Y14.5	Dimensioning and Tolerancing for Engineering Drawing
ANSI Y32.1	Logic Diagram Standards
ANSI Y32.16	Electrical and Electrical Reference Designators
ANSI Z210.1	Metric Practice Guide (ASTME380-72)

2.3 Department of Defense³

DoD-STD-100 Engineering Drawings

2.4 Electronic Industries Association⁴

3.0 TERMS AND DEFINITIONS

Unless otherwise specified herein, terms and definitions shall be in accordance with IPC-T-50, ANSI X3.12, and the following

3.1 Field A data element (unit of information) which defines a characteristic of the feature(s) being described.

3.2 Record An ordered set of fields (data elements) of ASCII characters. There are four types of records: comment records, data records, parameter records, and general records.

3.3 Comment Record Record that provides or refers to additional descriptive materials which may clarify the meaning of the data set.

3.4 Data Record Record or group of records which describes information related to the physical and location aspects of features, as well as introductions for use of previously defined data.

3.5 Parameter Record Record which defines the characteristics of a subsequent set of records, such as job identification, tolerances, etc. Parameter records direct the computer program on how to interpret the records that follow in the job stream. Parameters are modal (see 3.9). Examples are JOB, UNITS, and FORM.

3.6 General Record Record which continues or terminates a processing sequence. General records include continuation and end-of-job. If a record contains more information than can be placed on one line, continuation records (code 000) may be used. Data in continuation records belong to the record that precedes the continuation records.

1. Publications are available from IPC, 2215 Sanders Road, Northbrook, IL 60062-6135

2. Publications are available from American National Standards Institute, 1430 Broadway, New York, NY 10018.

3. Publications are available from Naval Publications & Forms Center, 5801 Tabor Rd., Philadelphia, PA 19120.

4. Publications are available from Electronic Industries Association, Engineering Department, 2001 Pennsylvania Ave., N.W., Washington, DC 20006.