



IEC PAS 61182-12

Edition 1.0 2014-08

# PUBLICLY AVAILABLE SPECIFICATION PRE-STANDARD



Generic requirements for printed board assembly products manufacturing  
description data and transfer methodology

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## TABLE OF CONTENTS

1	SCOPE.....	1
1.1	Focus and intent.....	1
1.2	Notation .....	1
2	APPLICABLE DOCUMENTS.....	2
2.1	Documentation conventions .....	2
3	REQUIREMENTS .....	5
3.1	Rules concerning the use of XML and XML Schema.....	7
3.1.1	File readability and uniformity.....	7
3.1.2	File markers.....	7
3.1.3	File extension .....	7
3.1.4	File remarks.....	7
3.1.5	Character set definition .....	7
3.2	Data organization and identification rules .....	7
3.2.1	Naming elements within a 258X File.....	8
3.2.2	The Use of XML elements and types.....	8
3.2.3	Attribute base types (governing templates).....	8
3.2.4	Coordinate system and transformation rules.....	10
3.3	Transformation characteristics (Xform).....	11
3.3.1	The x and y Offset attributes.....	12
3.3.2	The rotation attribute.....	12
3.3.3	The mirror attribute.....	13
3.3.4	The scale attribute.....	13
3.3.5	The x and y Location attributes.....	13
3.4	Substitution groups .....	14
3.4.1	ColorGroup.....	16
3.4.2	Feature .....	16
3.4.3	Fiducial .....	16
3.4.4	FirmwareGroup.....	17
3.4.5	FontDef.....	18
3.4.6	LineDescGroup.....	18
3.4.7	FillDescGroup.....	19
3.4.8	PolyStep .....	19
3.4.9	Simple .....	20
3.4.10	StandardPrimitive.....	20
3.4.11	StandardShape.....	22
3.4.12	UserPrimitive .....	22
3.4.13	UserShape.....	23
4	CONTENT .....	24
4.1	Content: FunctionMode .....	25
4.1.1	USERDEF mode.....	26
4.1.2	DESIGN mode .....	26

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 IEC PAS 61182-12:2014  
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4.1.3	FABRICATION mode .....	27
4.1.4	ASSEMBLY mode .....	27
4.1.5	TEST mode .....	27
4.2	Function levels .....	27
4.2.1	USERDEF Mode Level 1 .....	28
4.2.2	Design Levels .....	29
4.2.3	Fabrication Levels .....	31
4.2.4	Assembly Levels .....	33
4.2.5	Test Levels .....	35
4.3	Content: StepRef .....	37
4.4	Content: LayerRef .....	38
4.5	Content: BomRef .....	38
4.6	Content: AvlRef .....	39
4.7	Content: DictionaryStandard .....	39
4.7.1	StandardPrimitive: Butterfly .....	40
4.7.2	StandardPrimitive: Circle .....	42
4.7.3	StandardPrimitive: Contour .....	43
4.7.4	StandardPrimitive: Diamond .....	46
4.7.5	StandardPrimitive: Donut .....	47
4.7.6	StandardPrimitive: Ellipse .....	49
4.7.7	StandardPrimitive: Hexagon .....	50
4.7.8	StandardPrimitive: Moire .....	52
4.7.9	StandardPrimitive: Octagon .....	53
4.7.10	StandardPrimitive: Oval .....	54
4.7.11	StandardPrimitive: RectCenter .....	56
4.7.12	StandardPrimitive: RectCham .....	58
4.7.13	StandardPrimitive: RectCorner .....	60
4.7.14	StandardPrimitive: RectRound .....	62
4.7.15	StandardPrimitive: Thermal .....	64
4.7.16	StandardPrimitive: Triangle .....	66
4.8	Content: DictionaryUser .....	68
4.8.1	UserPrimitive, Simple .....	69
4.8.2	UserPrimitive: Text .....	75
4.8.3	UserPrimitive: UserSpecial .....	78
4.9	Content: DictionaryFont .....	79
4.9.1	FontDefEmbedded .....	80
4.9.2	FontDefExternal .....	81
4.9.3	FontDef: Glyph .....	81
4.9.4	FontDef: Glyph combination .....	82
4.10	Content: DictionaryLineDesc .....	82
4.10.1	LineDesc .....	84
4.10.2	LineDescRef .....	85
4.11	Content: DictionaryFillDesc .....	86
4.11.1	FillDesc .....	87

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IEC PAS 61182-12:2014

<https://standards.iteh.ai/catalog/standards/sist/d948495e-058e-4458-ad2e-45b5d942dc9/iec-pas-61182-12-2014>

4.11.2	FillDescRef .....	89
4.12	Content: DictionaryColor .....	90
4.12.1	Color .....	91
4.12.2	ColorRef .....	91
4.13	Content: DictionaryFirmware .....	92
4.13.1	CachedFirmware .....	93
4.13.2	FirmwareRef .....	93
5	LOGISTIC HEADER .....	94
5.1	LogisticHeader .....	94
5.2	Role .....	95
5.3	Enterprise .....	96
5.4	Person .....	98
6	HISTORY RECORD .....	100
6.1	HistoryRecord .....	100
6.2	FileRevision .....	101
6.3	SoftwarePackage .....	102
6.4	ChangeRec .....	103
7	BOM (Material List) .....	104
7.1	BOM Header .....	106
7.2	BomItem .....	106
7.2.1	BomDes .....	108
7.2.2	Characteristics .....	114
8	ELECTRONIC COMPUTER AIDED DESIGN (ECAD) .....	118
8.1	CadHeader .....	118
8.1.1	Spec .....	119
8.1.2	Property .....	133
8.1.3	ChangeRec .....	134
8.2	CadData .....	135
8.2.1	Layer .....	137
8.2.2	Stackup .....	143
8.2.3	Step .....	151
8.2.4	DfxMeasurementList .....	204
9	APPROVED VENDOR LIST (AVL) .....	207
9.1	AvlHeader .....	208
9.2	AvlItem .....	209
9.2.1	AvlVmpn .....	209
10	GLOSSARY .....	212
10.1	Process Flow Descriptions .....	212
10.2	Terms and Definitions .....	212
10.3	Enumerated strings of 2581 .....	213
11	REFERENCE INFORMATION .....	214
11.1	IPC .....	214
11.2	American National Standards Institute .....	214

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11.3 Department of Defense .....	215
11.4 Electronic Industries Association .....	215
11.5 International Organization for Standards (ISO) .....	215
Appendix A IPC-7351 Naming Convention for Land Patterns .....	216
Appendix B Panel Instance File .....	220
Appendix C Potential Reference Designator Assignment for Non Electrical Items .....	225

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# INTERNATIONAL ELECTROTECHNICAL COMMISSION

## GENERIC REQUIREMENTS FOR PRINTED BOARD ASSEMBLY PRODUCTS MANUFACTURING DESCRIPTION DATA AND TRANSFER METHODOLOGY

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The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
91/1182/PAS	91/1192/RVD

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# Generic Requirements for Printed Board Assembly Products Manufacturing Description Data and Transfer Methodology

## 1 SCOPE

This standard specifies the XML schema that represents the intelligent data file format used to describe printed board and printed board assembly products with details sufficient for tooling, manufacturing, assembly, and inspection requirements. This format may be used for transmitting information between a printed board designer and a manufacturing or assembly facility. The data is most useful when the manufacturing cycle includes computer-aided processes and numerical control machines.

The data can be defined in either English or International System of Units (SI) units. The format is a convergence of the IPC-2511 “GenCAM” and the Valor Computerized Systems “ODB-X” format structure.

### 1.1 Focus and intent

The generic format requirements are provided in a series of standards focused on printed board manufacturing, assembly, and inspection testing. This standard series consists of a generic standard (IPC-2581) that contains all the general requirements. There are seven sectional standards that are focused on the XML details necessary to accumulate information in the single file, that addresses the needs of the manufacturing disciplines producing a particular product.

The sectional standards (IPC-2582 through 2588) paraphrase the important requirements and provide suggested usage and examples for the topic covered by the sectional standard.

### 1.2 Notation

Although the data would be contained in a single file, the file can have different purposes as described in Section 4. The XML schema used for this standard follows the notations set forth by the W3C and is as follows:

- element – Element appears exactly one time
- element? – Element may appear 0 or 1 times
- element\* – Element may appear 0 or more times
- element+ – Element may appear 1 or more times

Any IPC-258X file is composed of a high level element (IPC-2581) that contains up to six sub-elements:

- Content – information about the contents of the 258X file
- LogisticHeader – information pertaining to the order and supply data
- HistoryRec – change information of the file
- Bom – Bill of Materials (Material List) information
- Ecad – Computer Aided Design (engineering) information
- Avl – Approved Vendors List information

## 2 APPLICABLE DOCUMENTS

The following documents contain requirements which, when referenced, constitutes provisions of IPC-2581. At the time of publication, the editions indicated were valid. All documents are subject to revision and parties entering into agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below.

The revision of the document in effect at the time of solicitation **shall** take precedence.

**IPC-T-50** *Terms and Definitions for Interconnecting and Packaging Electronic Circuits*

**IPC-2501** *Definition for Web-Based Exchange of XML Data*

**IPC-2524** *PWB Fabrication Data Quality Rating System*

**IPC-2511** *Generic Requirements for Implementation of Product Manufacturing Description Data and Transfer XML Schema Methodology*

**IPC-2571** *Generic Requirements for Electronics Manufacturing Supply Chain Communication - Product Data eXchange (PDX)*

**IPC-2576** *Sectional Requirements for Electronics Manufacturing Supply Chain Communication of As-Built Product Data - Product Data eXchange*

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**IPC-2577** *Sectional Requirements for Supply Chain Communication of Manufacturing Quality Assessment - Product Data eXchange (PDX)*

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**IPC-2578** *Sectional Requirements for Supply Chain Communication of Bill of Material and Product Design Configuration Data - Product Data eXchange*

**IPC-7351** *Generic Requirements for Surface Mount Design and Land Patterns*

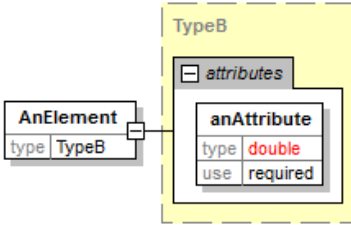
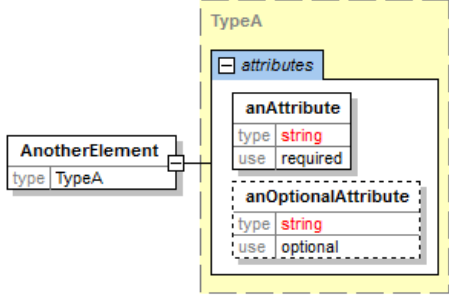
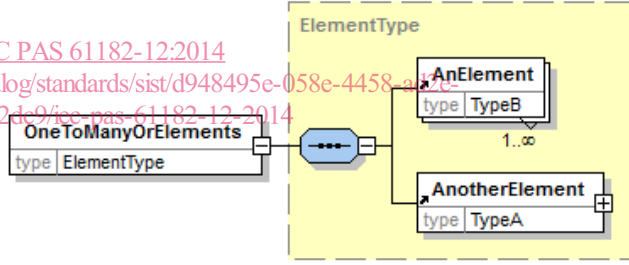
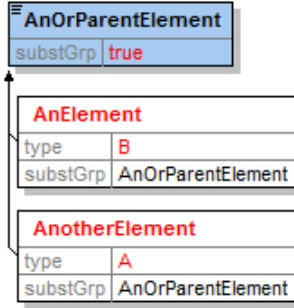
### 2.1 Documentation conventions

The XML file format standard and the XML Schema definition language standard, as defined the by World Wide Web Consortium (W3C), have been adopted by IPC for use in the IPC-2500 series of standards.

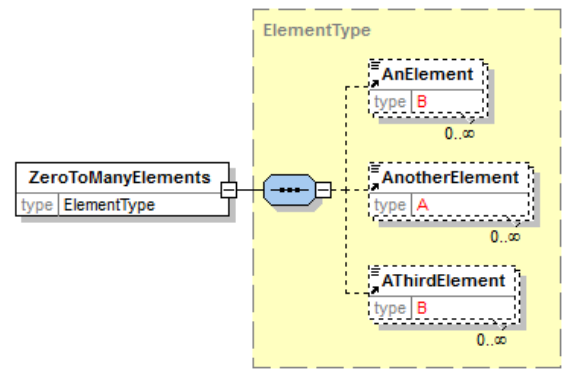
In addition to the text based schema notation, this document provides graphical representation of the structure of the file format. The XML diagrams are designed to effectively illustrate the structure and cardinality of elements and attributes that make up any IPC-258X file. The notation in the graphics does not provide a complete visualization of the schema definition for the file format, but it does provide a good top down overview. Should there be any conflict between the graphical notation and the schema notation, the authoritative definition is the schema notation.

Table 1 provides an overview of the graphical notation used in the document.

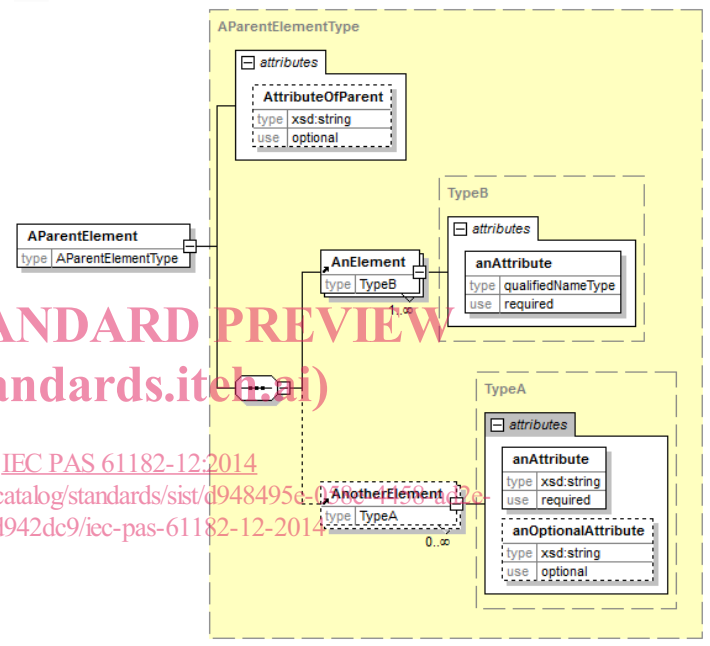
Table 1 Graphical Notation Overview

<p>This diagram depicts an element named AnElement that is of type TypeB. There is one attribute, named anAttribute, that is of type double. The attribute is required.</p>	 <p>The diagram shows a box for 'AnElement' with 'type   TypeB'. A line connects it to a larger box for 'TypeB' which has a tab labeled 'attributes'. Inside this box, there is an attribute 'anAttribute' with 'type   double' and 'use   required'.</p>
<p>Example: &lt;AnElement anAttribute="14.44e-3"/&gt; Note that all attribute values must be enclosed in quotes, regardless of type.</p>	
<p>This diagram depicts an element named AnotherElement that is of type TypeA with two attributes. The attribute anAttribute is required. The second attribute, anOptionalAttribute, is optional. Both attributes are of type string.</p>	 <p>The diagram shows a box for 'AnotherElement' with 'type   TypeA'. A line connects it to a larger box for 'TypeA' which has a tab labeled 'attributes'. Inside, there are two attributes: 'anAttribute' with 'type   string' and 'use   required', and 'anOptionalAttribute' with 'type   string' and 'use   optional'.</p>
<p>Examples: &lt;AnotherElement anAttribute="red" anOptionalAttribute="a string" /&gt; &lt;AnotherElement anAttribute="blue" /&gt;</p>	<p style="text-align: center; color: red; font-weight: bold;">STANDARD PREVIEW (standards.itech.ai)</p>
<p>The ElementType OneToManyOrElements is the parent of an unordered list of one or more instances of the elements AnElement and AnotherElement. The type TypeA occurs only once while TypeB can occur many times.</p>	 <p>The diagram shows a box for 'OneToManyOrElements' with 'type   ElementType'. A line connects it to a larger box for 'ElementType' which has a tab labeled 'OneToManyOrElements'. Inside, there are two elements: 'AnElement' with 'type   TypeB' and '1..∞' multiplicity, and 'AnotherElement' with 'type   TypeA' and a '+' sign.</p>
<p>The arrow indicates a substitution of the element named AnOrParentElement. The substitution declares that one and only one occurrence is allowed. The AnOrParentElement can have one of AnElement or AnotherElement as a child element.</p>	 <p>The diagram shows a box for 'AnOrParentElement' with 'substGrp   true'. An arrow points from it to two boxes below: 'AnElement' with 'type   B' and 'substGrp   AnOrParentElement', and 'AnotherElement' with 'type   A' and 'substGrp   AnOrParentElement'.</p>

The optional indication for the three element children shows that none may be present or many versions of all three are possible.

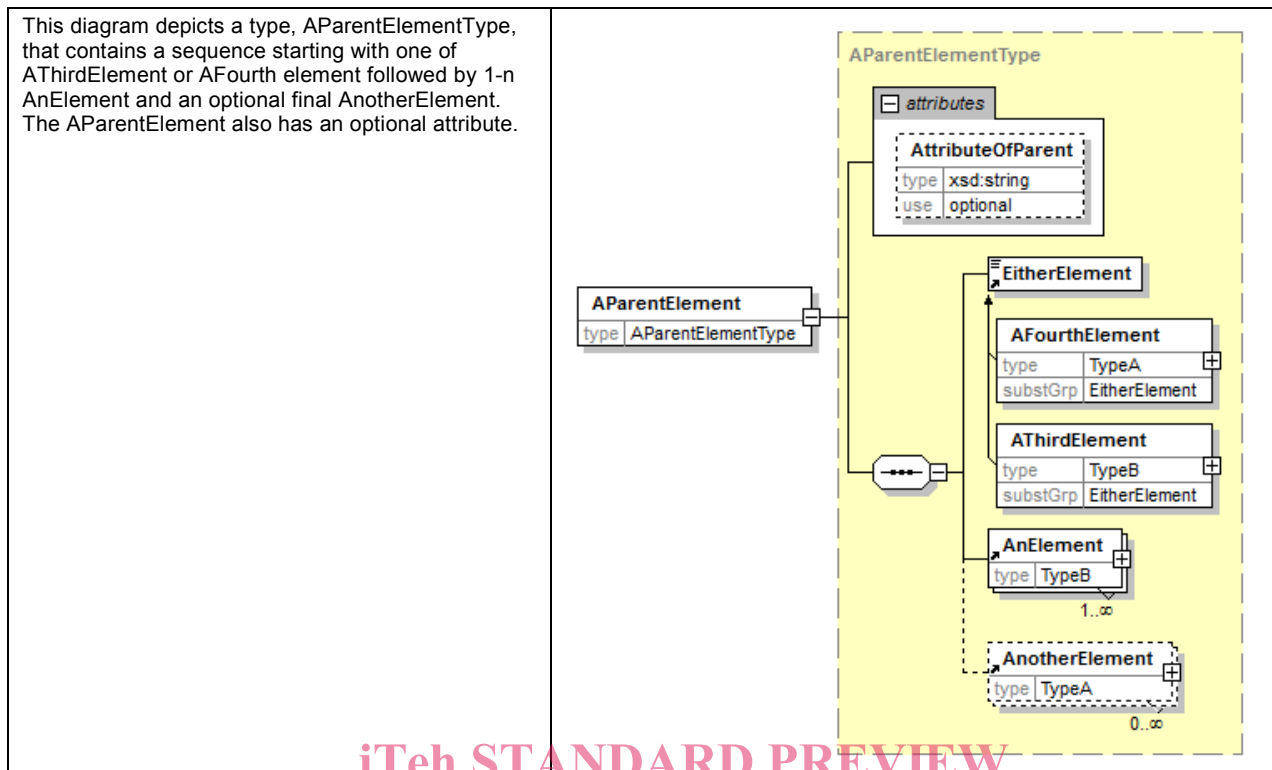


This diagram depicts an element, AParentElement, of type AParentElementType. This element has one attribute, attributeOfParent, which is optional. The lines indicate that occurrences of AnElement and AnotherElement appear in the order with AnElement indicated as required while AnotherElement is optional. Both elements have a required attribute; however, if AnotherElement is instantiated, anOptionalAttribute is also possible.



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### 3 REQUIREMENTS

The XML schema contained in this document describes the structure of a generic computer-aided manufacturing 258X exchange format. The document specifies data elements specifically designed to establish the information exchange related to the data needed by printed board manufacturing, and assembly including inspection of those products.

The XML schema defines the configuration of mandatory and optional elements, as well as mandatory and optional attributes. The Top Level (TopElement) of the schema contains six major elements. The schema notation specifies that the 6 top-level elements are required to appear in the order shown in Figure 1. The order of appearance in the file is significant. For instance, the appearance of graphics on a layer is dependent on the order of appearance in the file. The order is also important because elements often reference information that is defined elsewhere in the file in order to eliminate redundancy within the file. The file is structured to allow all references to be resolved in one pass.

An implementation of the XML schema must be able to facilitate the reading and/or writing of all characteristics defined within the requirements stated in the `Mode` function of this standard. Some tools may have only read capability; some may have only write capability. Some tools may have both read/write capability. All schema defined in the standard as mandatory (1-1, 1-n occurrences) **shall** be executed as appropriate. Tool providers **shall** identify their capability by Mode Level (USERDEF 1, Design 1, 2 or 3, Fabrication 1, 2, or 3 etc.) plus 2581R; 2581W; or 2581RW.

Each element has a specific function or task. Accordingly, the information interchange for a specific purpose is possible only if that element is populated. The ability to select those characteristics that are appropriate for a given task makes the schema a robust methodology for defining only those areas and characteristics that are necessary to produce a given product. Figure 1 shows the potential children elements of the Top Element (IPC-2581).