IEC 61182-2-2

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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Printed board assembly products – Manufacturing description data and transfer methodology –
Part 2-2: Sectional requirements for implementation of printed board fabrication data description

Produits pour cartes imprimées équipées – Données descriptives de fabrication et méthodologie de transfert –
Partie 2-2: Exigences intermédiaires pour la mise en œuvre de cartes imprimées – Description des données de fabrication

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PRINTED BOARD ASSEMBLY PRODUCTS – MANUFACTURING DESCRIPTION DATA AND TRANSFER METHODOLOGY –

Part 2-2: Sectional requirements for implementation of printed board fabrication data description

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The text of this standard is based on the following documents:

FDIS	Report on voting
91/1025/FDIS	91/1038/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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**PRINTED BOARD ASSEMBLY PRODUCTS –
MANUFACTURING DESCRIPTION DATA
AND TRANSFER METHODOLOGY –**

**Part 2-2: Sectional requirements for implementation
of printed board fabrication data description**

1   Scope

This part of IEC 61182 provides the information on the manufacturing requirements used for fabricating printed boards. This standard determines the XML schema details, defined in the generic standard IEC 61182-2 and some of the sectional standards that are required to accomplish the focused tasks. When other standards are invoked, their requirements become a mandatory part of the fabrication details as defined in the IEC 61182-2.

The IEC 61182-2 contains all the requirements necessary to build an electronic product. The cardinality indicated in the IEC 61182-2 may be superseded by a restriction of an attribute (enumerated string ID) or indication of a requirement that is noted as being optional in the generic standard. However, this standard renders the requirement mandatory based on the supply chain communication need.

In order to assist the users of this standard, all the applicable XML schema elements that apply to the board fabrication function are listed in Annex A. The list is grouped by topics and shows the absolute path for the elements that pertain to the focus of this standard. If the parent element is not present no children are considered in the implementation either. However, all attributes identified for a particular element follow the cardinality of the IEC 61182-2, unless a restriction is stated in this standard.

2   Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60194, *Printed board design, manufacture and assembly – Terms and definitions*

IEC 61182-2, *Printed board assembly products – Manufacturing description data and transfer methodology – Part 2: Generic requirements*

3   Terms and definitions

For the purposes of this document, the terms and definitions of IEC 60194 as well as the following apply.

3.1
data
intelligent information that may be used directly by machine in order to accomplish a particular manufacturing event

3.2
drawings
hard copy or un-intelligent documentation (e.g. PDF) to which all formatting criteria apply

3.3
printed circuit board
PCB
composite of organic and inorganic material with external and internal wiring allowing electronic components to be mechanically supported and electrically connected

3.4
supplier
organization or company responsible for providing the goods and/or services required to produce an electronic product which includes physical items as well as intellectual/software characteristics and is documented as either user procurement, supplier data or contractual agreements

3.5
user
individual, organization, company or agency responsible for the procurement of electrical/electronic hardware, and having the authority to define the class of equipment and any variation or restrictions (i.e., the originator/custodian of the contract detailing these requirements)

3.6
via
opening in the dielectric layer(s) through which a conductor passes upwards or downwards to subsequent chip or package conductive layers for electrical interconnections or for heat transfer

4 General principles

4.1 Requirements

The requirements of IEC 61182-2 are a mandatory part of this standard. The generic details specifically provide data related to design, printed board manufacturing, assembly and test.

The XML schema of the IEC 61182-2 consists of four major functions each of which have several children who then become new parent elements. Several of these major elements and their associated new parents are defined in other sectional specifications, thus the requirements of those standards are also a mandatory part of the board fabrication standard to the extent of their description and any restrictions contained in this standard.

Each of the standards and the elements defined therein has a specific function or task respectively, and although they may at times be used independently, they become an important addition to the requirements of the board fabrication descriptions. As such the following paragraphs provide the total requirements for the three types of board fabrication files that are supported by the principles of the IEC 61182-2.

Accordingly, the information interchange for the specific purpose of printed board fabrication is only possible if all the XML instances have been properly prepared for such a purpose.

4.2 Interpretation

"Shall", the emphatic form of the verb, is used throughout this standard whenever a requirement is intended to express a provision that is mandatory. Deviation from a "shall" requirement is not permitted, and compliance testing is required in order to demonstrate that the XML instances are correct according to the W3C directives and this standard. The XML

schema shall be the method to check syntax and semantics. Any appropriate software tool that prompts the user, to correct the ambiguity or to insert missing information, may be used for this purpose.

The words "should" and "may" are used whenever it is necessary to express non-mandatory provisions.

"Will" is used to express a declaration of purpose.

4.3 Categories and content

Table 1 provides the major functions that shall be addressed by this standard. The descriptions relate to the appropriate printed board fabrication processes. There are fifteen (15) unique functions that can be defined by the use of the XML elements and the resulting XML instances.

Table 1 indicates the relationships of the requirements for various elements and topics within the descriptions for a particular process.

Table 1 – Function relationship of an IEC 61182-2-2 fabrication file

Name	Fabrication			Comment and standard reference
	1	2	3	
File content descriptions	M	M	M	Elements indicated in IEC 61182-2 according to their cardinality and restrictions of this standard.
Logistic descriptions	M	M	M	
File history descriptions	O	M	M	
BOM	M	M	M	Elements indicated in IEC 61182-2 according to their cardinality and restrictions of this standard.
AVL	–	M	M	
Miscellaneous image layers	–	O	O	Elements indicated in IEC 61182-2 according to their cardinality and restrictions of this standard.
Documentation layers	O	M	M	
Design for excellence (Dfx) analysis	O	O	O	
Component packages [a]	–	–	O	Elements indicated in this sectional standard, according to cardinality of IEC 61182-2 and any restrictions contained in the following paragraphs of this standard.
Land patterns [a]	–	–	O	
Soldermask, legend layers	M	M	M	
Drilling and Routing (tooling) layers	M	M	M	
Net list (soft tooling) [a]	O	M	M	
Outer conductive layers	M	M	M	
Inner conductive layers	M	M	M	
Board construction	M	M	M	
Abbreviations: BOM Board fabrication materials AVL Board material suppliers Dfx Design for eXcellence Key: M Mandadory O Optional (may or may not be pertinent to the particular file or data interchange) – Extraneous section (not necessary) Although software tools used to parse the file will permit the extraneous data, it is recommended that only the requirements identified as mandatory or optional are included in the file in order to reduce file size transfer.				
[a] Component packages and land patterns will be further defined in future IEC 61182-2-3[1], and net lists in future IEC 61182-2-4[1], their XML schemas are repeated in this standard.				

_____
[1] Under consideration

It should be understood that without a net list it is difficult to verify that the produced board meets the design intent.

The correlation between the various descriptions identified in this standard is indicated in Figure 1. It shows the relationship of test coupons, individual board, phototools, etc. The illustration identifies those characteristics that are available in the CAD tools and are usually transferable to the CAM station. The left hand side illustrates combinations of the design intent including assembly characteristics and embedded components. Some of these concepts are important for IEC 61182-2-2 FAB1, FAB2 or FAB3 file and are illustrated for the board manufacturing processes shown on the right hand side of the illustration.
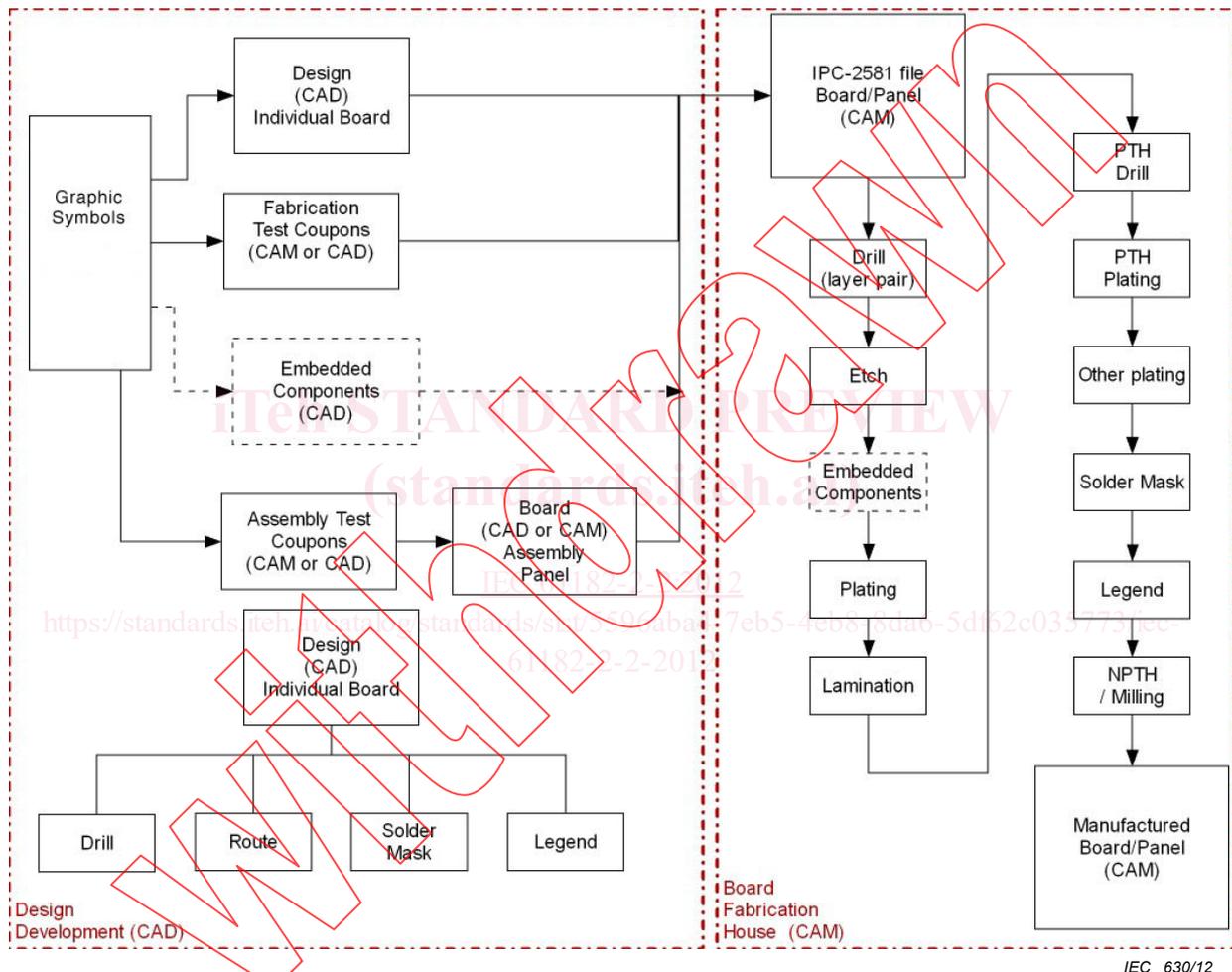
Figure 1 – Board fabrication data relationship

5 General rules

5.1 Overview

The following details reflect the rules used in describing the printed board characteristics in order to meet the requirements for board fabrication. These rules are intended to meet the needs of the manufacturer to understand the customer requirements. Wherever necessary, additional requirements have been detailed to reflect precision.

The attributes and rules described in IEC 61182-2 are required. Wherever necessary, detailed descriptions or definitions of the entities, attributes or characteristics are reproduced as defined in IEC 61182-2 in an attempt to clearly define the mandatory descriptions.

5.2   File content descriptions

The file content descriptions shall be in accordance with IEC 61182-2. This is a mandatory requirement for all FAB layers, FAB1, FAB2, and FAB3.

The only restriction in `Content` is that a `BomRef` is mandatory (1-1). A `Bom` for board material description will appear in the future IEC 61182-2-1[2] file.

IEC 61182-2/Content/BomNameRef=1

5.3   Logistic descriptions

All requirements for the logistic descriptions shall be in accordance with IEC 61182-2. The only restriction being if the file will be used as a transfer of information outside the domain that creates the file. In this case, the `RoleRef` attribute of `Person` shall exist and is no longer optional.

IEC 61182-2/LogisticHeader/Person@RoleRef=1

It is required that the `Role` name be one of the 9 enumerated strings listed in IEC 61182-2 with a recommendation that if no other obvious name exists, the name SENDER should be used.

IEC 61182-2/LogisticHeader/Role@name=SENDER

It should be understood that the sender of the file may not actually have electronic means to add data or modify the existing XML schema instance. If a dialog occurs between the sender and receiver of the data, verification should be made to establish file hierarchy and modification capability at either end.

5.4   File history descriptions

5.4.1   General

All requirements for the history descriptions are in accordance with IEC 61182-2. The restrictions are slightly different for the various fabrication levels and pertain to:

FAB1 has no restrictions and meets all requirements of IEC 61182-2.

FAB2 takes the `changeRecord` and makes it a mandatory requirement (1-*n* instead of 0-*n*).

FAB3 requires that `changeRecord` and the `Approval` element are a mandatory part of the instance file.

IEC 61182-2/HistoryRecord/ChangeRec=1-n
IEC 61182-2/HistoryRecord/ChangeRec/Approval=1-n

Figure 2 provides a case study of the HistoryRecord. Figure 2 and subsequent subclauses show the trend in communication between design at the OEM level and manufacturing.
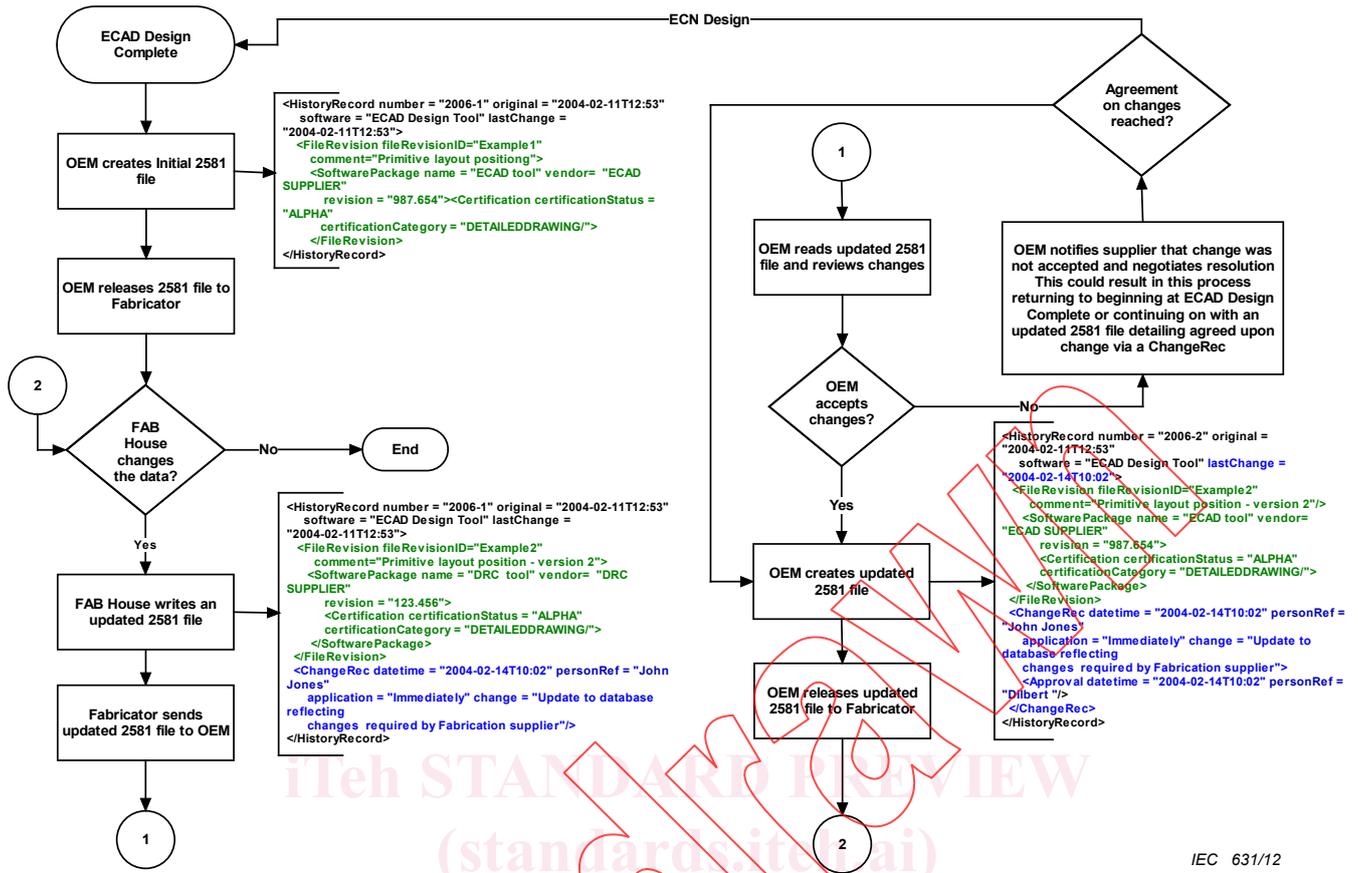
_____
2   Under consideration.

Figure 2 – HistoryRecord use case

5.4.2 HistoryRecord use case – Initial design release

5.4.2.1 General

The EDA design tool creates the initial IEC 61182-2 file is with the LogisticHeader, HistoryRecord and the HistoryRecord child FileRevision elements.

5.4.2.2 LogisticHeader

The LogisticHeader contains the contact information for the OEM personnel who have defined roles for the design project. There are many methods for getting contact information into the EDA tool for export to an IEC 61182-2 file. These methods will range from manual manipulation such as using a dynamic dialog box to automatically importing from a contacts.xml file or corporate database.

The `Role` name and `Person` name shall be unique names. The `Person` name may be an actual name, such as John Smith; title, such as senior designer, or department name, such as purchasing department.

Ideally, the ability to import all preferred supplier information from external sources will be available in order to include preferred suppliers in the `LogisticHeader` element. Below is a sample of the minimum data necessary for a complete `LogisticHeader` element with optional fields populated.

```
<LogisticHeader>
```

```
<Role name = "OEM Account Manager" description = "OWNER"
      publicKey = "x3d8rf7ko90mKMC07" authority = "OEM
      purchasing agent"/>

<Enterprise id = "OEM" name = "Design House" code="34567"
      codeType = "DUNS" address1 = "123 Avenue Street " city =
      "Bigcity" stateProvince = "PV" country = "US" postalCode
      = "99999-1111" phone = "888-555-1212" fax = "888-555-
      1212" email="purchasing@oem.com" url =
      "http://www.oem.com" />

<Person name="Purchasing Manager" enterpriseRef ="OEM" title =
      "Senior Purchasing Manager" email =
      "purchasing.manager@oem.com" phone = "888-555-1212ext123"
      fax = "888-555-1212" roleRef = "OEM Account Manager "/>

<Logistic Header>
```

5.4.2.3   HistoryRecord

The `HistoryRecord` is the location of log type information for maintaining revision control of the IEC 61182-2 file for a design's life cycle. This does not mean that the entire history is present in any IEC 61182-2 file. It gives the OWNER a data record, which could be exported to a corporate database.

The EDA tool shall create a `HistoryRecord` for each IEC 61182-2 file by providing a means to enter the `HistoryRecord` number and the `FileRevision` `fileRevisionID`. This data could be entered by manual manipulation such as using a dynamic dialog box.

```
<HistoryRecord number = "2006-1" original = "2004-02-11T12:53"
      software = "ECAD Design Tool" lastChange = "2004-02-11T12:53">

   <FileRevision fileRevisionID="12345ENG-0"
         comment="Primitive layout position">

      <SoftwarePackage name = "ECAD tool" vendor= "ECAD
            SUPPLIER"
            revision = "987.654">

         <Certification certificationStatus = "ALPHA"
               certificationCategory = "DETAILEDDRAWING/">

      </SoftwarePackage>

   </FileRevision>

</HistoryRecord>
```

5.4.3   Supply chain modifications

5.4.3.1   General

A modification is added to the initial IEC 61182-2 file by a member of the supply chain. This modification can be as simple as adding a test coupon or panelizing the board to finding problems with the design and requiring design modification in order to produce a finish board.

5.4.3.2   LogisticHeader update

In order to add the `ChangeRec` to the `HistoryRecord`, the supply chain may need to update the `LogisticHeader` with additional information to provide the `Role`, `Enterprise` and `Person` data for the supply chain.

The supplier shall not modify the information associated with any enterprise id other than their own. Updating the `LogisticHeader` shall create a `ChangeRec` even if no other data was modified. This will provide the means for the OEM to update their contacts information.

There are many methods for getting this information into the file that range from manual manipulation to importing a contacts.xml. Below is a sample of a contacts.xml file.

```
<LogisticHeader>

    <Enterprise id = "OEM" name = "Design House" code="34567"
            codeType = "DUNS" address1 = "123 Avenue Street " city =
            "Bigcity" stateProvince = "PV" country = "US" postalCode
            = "99999-1111" phone = "888-555-1212" fax = "888-555-
            1212" email="purchasing@oem.com" url =
            "http://www.oem.com" />

    <Role name = "OEM Account Manager" description = "OWNER"
            publicKey = "x3d8rf7ko90mKMC07" authority = "OEM
            purchasing agent"/>

    <Person name="Purchasing Manager" enterpriseRef ="OEM" title =
            "Senior Purchasing Manager" email =
            "purchasing.manager@oem.com" phone = "888-555-1212ext123"
            fax = "888-555-1212" roleRef = "OEM Account Manager "/>

    <Enterprise id = "Fab" name = "Board Shop" code="23456"
            codeType = "DUNS" address1 = "123 Street Avenue" city =
            "Mytown" stateProvince = "ST" country = "US" postalCode =
            "00000-1111" phone = "800-555-1212" fax = "800-555-1212"
            email="support@boardshop.com" url =
            "http://www.boardshop.com" />

    <Role name = "Supply Chain Customer Account Manager"
            description = "CUSTOMERSERVICE" publicKey =
            "x6d8rf7xd90mJHR13" authority = "Feed back to OEM"/>

    <Role name = "FAB Project Lead Engineer" description =
            "ENGINEER" publicKey = "x444rf7xd90mJHR13" authority =
            "FAB Lead Engineer"/>

    <Person name="Account Manager" enterpriseRef ="Fab" title =
            "Senior Global Account Manager" email =
            "customer.service@boardshop.com" phone = "800-555-
            1212ext123" fax = "800-555-1212" roleRef = "Supply Chain
            Customer Account Manager "/>

    <Person name="Project Engineer" enterpriseRef ="Fab" title =
            "Manager, Fabrication" email =
            "project.engineer@boardshop.com" phone = "800-555-
            1212ext456" fax = "800-555-1212" roleRef = " FAB Project
            Lead Engineer "/>

<Logistic Header>
```

5.4.3.3 HistoryRecord update

The `HistoryRecord` parent shall remain unchanged by the supply chain's software. It is identified in the example by the use of underlined text. The supply chain's software uses the `FileRevision` to identify the software used to create the updated IEC 61182-2 file.

```
<HistoryRecord number = "2006-1" original = "2004-02-11T12:53"
        software = "ECAD Design Tool" lastChange = "2004-02-11T12:53">
```