Intermediate Data Format

Mechanical Data Exchange Specification for the Design and Analysis of Printed Wiring Assemblies

Version 2.0

Revision 3 (Final)
January 5, 1993

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Revision History, IDF 2.0

Initial Draft, June 18, 1992

Revision 2, November 10, 1992

(Page numbers refer to Initial Draft, June 18, 1992)

Page 7 Changed format of date string to yyyy/mm/dd.hh:mm:ss in Record 2, Field 4.

Page 9 Changed last sentence in first paragraph to "Multiple other outline sections may be specified."

Page 17 Changed Drilled Hole Section to Drilled Holes Section.

Changed last sentence in first paragraph to "This section only appears once in the Board File, but multiple, non-overlapping holes are allowed."

Changed section keyword, Record 1, Field 1 to .DRILLED_HOLES

Changed section end keyword, Record 3, Field 1 to .END_DRILLED_HOLES

Page 18 Added additional placement status value, PLACED, to Record 3, Field 5.

Page 19 Added new Board File example.

Page 21 Changed format of date string to yyyy/mm/dd.hh:mm:ss in Record 2, Field 4.

Page 23 Changed section keyword, Record 1, Field 1 to .MECHANICAL

Page 24 Added new Library File example.

Revision 3, January 5, 1993

(Page numbers refer to Revision 2, November 10, 1992)

Page 1 Added items to list in section 1.2 indicating changing the name of the .OUTLINE section to .BOARD_OUTLINE, moving the board units from the .BOARD_OUTLINE section to the .HEADER section, and deleting the "type or value" field from Record 2 of the .PLACEMENT section.

Page 3 The list item in section 2.1 restricting float values to 5 decimal places has been removed.

Page 3 Added item to list in section 2.1 on maintaining the case of value strings.

Page 4	Corrected various typos in list.
Page 5	Inserted a new record in the Header Section for the board model name and units.
Page 5	Changed example in Record 2, Field 3 to "ACME CAD rel. 5.0"
Page 6	Removed board name and units from Record 2.
Page 6	Changed .OUTLINE and .END_OUTLINE to .BOARD_OUTLINE and .END_BOARD_OUTLINE, respectively.
Page 12	Added a paragraph after Record 2 explaining the meaning of the maximum and minimum heights.
Page 16	Removed Field 2 (Type or value) from Record 2.
Page 16	Added explanation of component location.
Page 17	Added picture of component locations.
Page 18	Updated the Board File example to reflect the above changes.
Page 20	Added two mechanical components to the Board File example.
Page 22	Changed example in Record 2, Field 3 to "ACME CAD rel. 5.0"
Page 25	Changed example in Record 2, Field 3 of Header Section to "ACME CAD rel. 5.0"

Table Of Contents

1.0 Introduction

This specification defines an Intermediate Data Format (IDF) for exchanging data between electrical and mechanical CAD/CAE systems for use in 3D design and analysis of printed wiring assemblies (PWAs), thus allowing users of these systems to participate concurrently in the design of electro-mechanical products. In a typical electro-mechanical design process for example, a mechanical CAE system may require a solid model of a PWA for form fit analysis in designing the enclosure for the final product. The electrical CAE system, on the other hand, requires 2D board outline and critical component placement information to layout and route the PWA design.

1.1 Scope

Limitations inherent in the systems that exchange data using this IDF may affect the interpretation of the data it contains. For example, a receiving system may not contain a data type for simple closed curves that include arcs. As a result, that system's translator may break up the arcs into a series of line segments. As another example, the current version of a translator may not be able to read or write all types of data contained in this version of the IDF. This specification does not attempt to describe these limitations; it is the responsibility of translator developers to communicate any such limitations to their users.

This specification does not address change management or configuration control of the IDF files. Change management and configuration control is the responsibility of the translators that read and write this format.

1.2 Summary of Changes, Version 2.0

A number of changes have been made to the Intermediate Data Format for Version 2.0:

- The Interface File has been renamed "Board File".
- The Profiles File has been renamed "Library File".
- The .OUTLINE section in the Board File has been renamed ".BOARD_OUTLINE".
- Each section in the Board File and Library File begins with a keyword and ends with a corresponding keyword: .BOARD_OUTLINE and .END_BOARD_OUTLINE, for example.
- A Header section replaces the Issue section in the Board File.
- The board name and units have been moved from the .BOARD_OUTLINE section to the .HEADER section of the Board File.
- A Header section has been added to the Library File.

- Sections have been added to the Board File for general outlines, routing outlines, placement outlines, routing keepouts, via keepouts, placement keepouts, placement group areas, and drilled holes.

- Fields have been added to the Placement section in the Board File to indicate if a component is unplaced or placed, and whether its placement is fixed. A value of NOREFDES for the reference designator indicates that the component is a mechanical component.

- The keywords .ELECTRICAL and .MECHANICAL have been added to the Library File to distinguish electrical and mechanical components.

- The "type or value" field has been removed from Record 2 of the .PLACEMENT section.

- The contents of field 2 in the first record of a component definition in the Library File has been changed from device type to part number

- The format has been changed from fixed field to free format. One or more blank characters are used to delimit fields in a record.

- The pound sign (#) at the beginning of a record defines the record as a comment.

2.0 Structure of the Intermediate Data Format

The Intermediate Data Format consists of two files: the Board File and the Library File. Data is organized by sections in these files. Each section begins with a keyword indicating the type of data the section contains, and a matching keyword at the end of the section. All data between the section keyword and its corresponding ending keyword pertains to that section. Sections cannot be nested. Unless otherwise noted, sections can be in any order.

Data within the sections is represented by one or more records consisting of one or more fields. Each line in a file is a separate record; fields within a record are separated by one or more blanks. Records within a section and fields within a record must be in a specific order. Records are free format which means that the fields they contain can be any length, and each field can begin in any column as long as the order of fields is maintained.

2.1 General Format Rules

The following general rules apply to the Intermediate Data Format:

- Sections are delimited by keywords beginning with a period (.).
- Records are delimited by a single new line character.
- Fields within a record are delimited by one or more space characters.
- Records and fields can be any length.
- Three data types are supported: string, float, and integer.
- Strings containing blank characters must be delimited by surrounding them with double quotes (").
- Keyword strings are not case sensitive; they are generally capitalized to enhance readability.
- The case sensitivity of value strings is determined by the sending and receiving systems. Therefore, it is best to maintain the case of value strings.
- The comment character is the pound sign (#). A comment must be a separate line (record) and the comment character must be in column 1. Comments should be located between, but not within sections of the IDF files.

3.0 Board File Format

The Board File contains the physical description of the PCB itself and the locations of components that are placed on the board. The physical descriptions for the components are contained in the Library File and referenced by the Board File.

The Board File contains the following sections:

- **Header** for information on the Board File itself
- **Board outline** for defining the outline, cutouts, and thickness of the board
- **Other outline** for defining the outline, cutouts, and thickness of another outline
- **Route outline** for defining an area to route electrical connections within
- **Place outline** for defining an area to place electrical components within
- **Route keepout** for defining an area within which routing is not allowed
- **Via keepout** for defining an area within which vias are not allowed
- **Place keepout** for defining an area within which electrical components are not allowed
- **Place region** for defining an area to place similar electrical components within
- **Drilled holes** for defining drilled holes in the board
- **Placement** for defining the locations of components on the board

The Header section must be the first section in the file, the second section must be the Outline section, and the last section must be the Placement section. All other sections may be in any order.

The following pages describe these sections.

3.1 Header Section

This section contains information on the Board File itself.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.HEADER

Record 2

Field, Description		Type	Value	
1	File type	string	BOARD_FILE	
2	IDF version number	float	1.0 2.0	First version This version
3	Source system identification	string	Any	Example: "ACME CAD rel. 5.0"
4	Date	string	format = yyyy/mm/dd.hh:mm:ss	
5	Board File version #	integer	Any	

Record 3

Field, Description		Type	Value	
1	Board name	string	Any	
2	Units definition	string	MM TNM THOU	millimeters ten nanometers (10-e8 meters) mils (thousandths of an inch)

The units specified in Field 2 apply to all values in the Board File.

Record 4

Field, Description		Type	Value
1	Section end keyword	string	.END_HEADER

3.2 Board Outline Section

This section defines the board outline and its internal cutouts as a 2D profile with thickness. The board outline and cutouts consist of simple closed curves made up of arcs and lines. Only one board outline may be specified, but multiple cutouts are allowed.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.BOARD_OUTLINE

Record 2

Field, Description		Type	Value
1	Board thickness	float	Any

Record 3

Field, Description		Type	Value	
1	Loop label	integer	0 1 n	Indicates board outline (points specified in counter-clockwise direction) Indicates board cutout (points specified in clockwise direction) Indicates additional board cutouts labeled sequentially from one
2	X coordinate of point	float	Any	
3	Y coordinate of point	float	Any	
4	Include angle (degrees)	float	0 _ 0	Indicates that a straight line is to be created between Xn-1, Yn-1 and Xn, Yn. Indicates an arc is to be created between Xn-1, Yn-1 and Xn, Yn. If positive, the arc is counter-clockwise.

Record 3 is repeated for each point that defines the board outline or a cutout on the board. For each loop (outline or cutout), the last pair of coordinates should be the same as the first.

Record 4

Field, Description		Type	Value
1	Section end keyword	string	.END_BOARD_OUTLINE

3.3 Other Outline Section

This section defines an additional outline with cutouts that can be used for other purposes than the board outline such as for defining a heatsink or board core. The outline and cutouts consist of simple closed curves made up of arcs and lines. Multiple other outline sections may be specified.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.OTHER_OUTLINE

Record 2

Field, Description		Type	Value	
1	Outline identifier	string	Any	Unique identifier for the outline, such as a part name or layer name
2	Extrude thickness	float	Any	

Record 3

Field, Description		Type	Value	
1	Loop label	integer	0 1 n	Indicates outline (points specified in counter-clockwise direction) Indicates cutout (points specified in clockwise direction) Indicates additional cutouts labeled sequentially from one
2	X coordinate of point	float	Any	
3	Y coordinate of point	float	Any	
4	Include angle (degrees)	float	0 _ 0	Indicates that a straight line is to be created between Xn-1, Yn-1 and Xn, Yn. Indicates an arc is to be created between Xn-1, Yn-1 and Xn, Yn. If positive, the arc is counter-clockwise.

Record 3 is repeated for each point that defines the outline or its cutouts. For each loop (outline or cutout), the last pair of coordinates should be the same as the first.

Record 4

Field, Description		Type	Value
1	Section end keyword	string	.END_OTHER_OUTLINE

3.4 Routing Outline Section

This section defines a routing outline for the board. Each routing outline specifies a region of the board within which routing must be confined, and consists of a simple closed curve made up of arcs and lines. Routing outlines apply to all routing layers in the board. Multiple, non-overlapping routing outlines may be defined.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.ROUTE_OUTLINE

Record 2

Field, Description		Type	Value	
1	Loop label	integer	0 1	Indicates points specified in counter-clockwise direction Indicates points specified in clockwise direction
2	X coordinate of point	float	Any	
3	Y coordinate of point	float	Any	
4	Include angle (degrees)	float	0 _ 0	Indicates that a straight line is to be created between Xn-1, Yn-1 and Xn, Yn. Indicates an arc is to be created between Xn-1, Yn-1 and Xn, Yn. If positive, the arc is counter-clockwise.

All X and Y coordinate values are absolute (relative to the board origin).

Record 2 is repeated for each point that defines the routing outline. The last pair of coordinates should be the same as the first.

Record 3

Field, Description		Type	Value
1	Section end keyword	string	.END_ROUTE_OUTLINE

3.5 Placement Outline Section

This section defines a placement outline for the board. Each placement outline specifies a region of the board within which components must be placed, and consists of a simple closed curve made up of arcs and lines. Placement outlines apply to both sides of the board. Multiple, non-overlapping placement outlines may be defined.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.PLACE_OUTLINE

Record 2

Field, Description		Type	Value	
1	Loop label	integer	0 1	Indicates points specified in counter-clockwise direction Indicates points specified in clockwise direction
2	X coordinate of point	float	Any	
3	Y coordinate of point	float	Any	
4	Include angle (degrees)	float	0 _ 0	Indicates that a straight line is to be created between Xn-1, Yn-1 and Xn, Yn. Indicates an arc is to be created between Xn-1, Yn-1 and Xn, Yn. If positive, the arc is counter-clockwise.

All X and Y coordinate values are absolute (relative to the board origin).

Record 2 is repeated for each point that defines the placement outline. The last pair of coordinates should be the same as the first.

Record 3

Field, Description		Type	Value
1	Section end keyword	string	.END_PLACE_OUTLINE

3.6 Routing Keepout Section

This section defines a routing keepout for the board. Board-level routing keepouts specify regions on routing layers of the board where routing is not allowed. Routing keepouts can exist on top, bottom, both top and bottom, or all routing layers. Each keepout consists of a simple closed curve made up of arcs and lines. Multiple, overlapping keepouts are allowed.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.ROUTE_KEEPOUT

Record 2

Field, Description		Type	Value	
1	Routing layers	string	TOP	Keepout applies to top routing layer only
			BOTTOM	Keepout applies to bottom routing layer only
			BOTH	Keepout applies to both top and bottom routing layers only
			ALL	Keepout applies to all routing layers

Record 3

Field, Description		Type	Value	
1	Loop label	integer	0	Indicates points specified in counter-clockwise direction
			1	Indicates points specified in clockwise direction
2	X coordinate of point	float	Any	
3	Y coordinate of point	float	Any	
4	Include angle (degrees)	float	0	Indicates that a straight line is to be created between Xn-1, Yn-1 and Xn, Yn.
			_ 0	Indicates an arc is to be created between Xn-1, Yn-1 and Xn, Yn. If positive, the arc is counter-clockwise.

All X and Y coordinate values are absolute (relative to the board origin).

Record 3 is repeated for each point that defines the routing keepout. The last pair of coordinates should be the same as the first.

Record 4

Field, Description		Type	Value
1	Section end keyword	string	.END_ROUTE_KEEPOUT

3.7 Via Keepout Section

This section defines a via keepout for the board. Board-level via keepouts specify regions on the board where vias are not allowed (although routing is still allowed). Each keepout consists of a simple closed curve made up of arcs and lines. Multiple, overlapping via keepouts are allowed. Only through vias (vias that go all the way through the board) are supported.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.VIA_KEEPOUT

Record 2

Field, Description		Type	Value	
1	Loop label	integer	0 1	Indicates points specified in counter-clockwise direction Indicates points specified in clockwise direction
2	X coordinate of point	float	Any	
3	Y coordinate of point	float	Any	
4	Include angle (degrees)	float	0 _ 0	Indicates that a straight line is to be created between Xn-1, Yn-1 and Xn, Yn. Indicates an arc is to be created between Xn-1, Yn-1 and Xn, Yn. If positive, the arc is counter-clockwise.

All X and Y coordinate values are absolute (relative to the board origin).

Record 2 is repeated for each point that defines the via keepout. The last pair of coordinates should be the same as the first.

Record 3

Field, Description		Type	Value
1	Section end keyword	string	.END_VIA_KEEPOUT

3.8 Placement Keepout Section

This section defines a placement keepout for the board. Board-level placement keepouts specify regions on the board where components cannot be placed. The keepout can apply to all components, or to only those components above or below a specified height. Placement keepouts can exist on the top, bottom, or both top and bottom of the board. Each keepout consists of a simple closed curve made up of arcs and lines along with maximum and minimum height restrictions. Multiple, overlapping keepouts are allowed.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.PLACE_KEEPOUT

Record 2

Field, Description		Type	Value	
1	Board side	string	TOP BOTTOM BOTH	Keepout applies to top side of board only Keepout applies to bottom side of board only Keepout applies to both sides of board
2	Maximum height	float	Any	
3	Minimum height	float	Any	

The maximum height is used to exclude components from the keepout that, when mounted, exceed this height. The minimum height is used to exclude components from the keepout that are mounted less than the minimum height off the board. Currently, mounting heights are not supported by the IDF; all components are assumed to be mounted flush to the board. Therefore, the component heights specified in the Library File are the same as their mounted heights.

A value of 0 or less for the maximum height excludes all components from this area. A minimum height greater than the maximum height also excludes all components from this area. If the maximum and minimum heights are equal, the minimum height defaults to 0.

Record 3

Field, Description		Type	Value	
1	Loop label	integer	0 1	Indicates points specified in counter-clockwise direction Indicates points specified in clockwise direction
2	X coordinate of point	float	Any	
3	Y coordinate of point	float	Any	
4	Include angle (degrees)	float	0 _ 0	Indicates that a straight line is to be created between Xn-1, Yn-1 and Xn, Yn. Indicates an arc is to be created between Xn-1, Yn-1 and Xn, Yn. If positive, the arc is counter-clockwise.

All X and Y coordinate values are absolute (relative to the board origin).

Record 3 is repeated for each point that defines the placement keepout. The last pair of coordinates should be the same as the first.

Record 4

Field, Description		Type	Value
1	Section end keyword	string	.END_PLACE_KEEPOUT

3.9 Placement Group Area Section

This section specifies an area of the board where a group of similar components is to be placed. For example, it may be desirable to place all analog components in a particular area for thermal considerations. Each placement group area consists of a simple closed curve made up of arcs and lines along with a name designating the group of components to be placed in that area. Multiple, overlapping areas are allowed.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.PLACE_REGION

Record 2

Field, Description		Type	Value	
1	Board side	string	TOP BOTTOM BOTH	Group area applies to top side of board only Group area applies to bottom side of board only Group area applies to both sides of board
2	Component group name	string	Any	

Record 3

Field, Description		Type	Value	
1	Loop label	integer	0 1	Indicates points specified in counter-clockwise direction Indicates points specified in clockwise direction
2	X coordinate of point	float	Any	
3	Y coordinate of point	float	Any	
4	Include angle (degrees)	float	0 _ 0	Indicates that a straight line is to be created between Xn-1, Yn-1 and Xn, Yn. Indicates an arc is to be created between Xn-1, Yn-1 and Xn, Yn. If positive, the arc is counter-clockwise.

All X and Y coordinate values are absolute (relative to the board origin).

Record 3 is repeated for each point that defines the placement group area. The last pair of coordinates should be the same as the first.

Record 4

Field, Description		Type	Value
1	Section end keyword	string	.END_PLACE_REGION

3.10 Drilled Holes Section

This section specifies holes that are to be drilled in the board and used for mounting or tooling purposes. Drilled holes are distinguished from circular cutouts in the board outline in that they are always drilled (as opposed to punched or routed) and may be plated with conductor. This section only appears once in the Board File, but multiple, non-overlapping holes are allowed.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.DRILLED_HOLES

Record 2

Field, Description		Type	Value	
1	Hole diameter	float	Any	
2	X coordinate of center	float	Any	
3	Y coordinate of center	float	Any	
4	Hole type	string	PTH NPTH	Plated (conducting) through hole Non-plated (non-conducting) through hole
5	Associated part	string	BOARD NOREFDES Reference Designator	Indicates that hole is defined in board part Indicates that hole is defined in a non-electrical part Reference designator of the electrical component in which hole is defined

All X and Y coordinate values are absolute (relative to the board origin).

Record 2 is repeated for each drilled hole.

Record 3

Field, Description		Type	Value
1	Section end keyword	string	.END_DRILLED_HOLES

3.11 Component Placement Section

This section specifies the locations of all components on the board. A location consists of an X coordinate and Y coordinate relative to the board's origin, a rotation about the component's origin, and a side of the board. Components can be either placed or unplaced. Placed components can have their locations "fixed" to prevent changes to be made to them in the receiving system.

The package name and part number fields in Record 2 for each component are used to reference the component's description in the Library File.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.PLACEMENT

Record 2

Field, Description		Type	Value	
1	Package name	string	Any	Part name for package geometry
2	Part number	string	Any	Component part number
3	Reference designator	string	Any	Electrical component instance reference designator
			NOREFDES	Indicates that component instance is a mechanical component

Record 3

Field, Description		Type	Value	
1	X coordinate of location	float	Any	
2	Y coordinate of location	float	Any	
3	Rotation angle (degrees)	float	Any	
4	Side of board	string	TOP	Component is placed on the top of the board
			BOTTOM	Component is placed on the bottom of the board
5	Placement status	string	FIXED	Component location is fixed and cannot be moved
			UNPLACED	Component is currently unplaced
			PLACED	Component is placed but not fixed

A component is located by first moving its origin to the specified X,Y coordinates (All X and Y coordinate values are absolute, relative to the board origin). Then, if the component is on the bottom of the board, it is flipped around its local Y axis. Finally, the component is rotated the specified amount about its origin (positive rotations are counter-clockwise, relative to the component's coordinated system). See Figure 1.

If field 5 of record 3 is blank, the component is assumed to be placed. If the value of this field is "UNPLACED", the values in fields 1-4 can be ignored.

Records 2 and 3 are repeated for each component on the board.

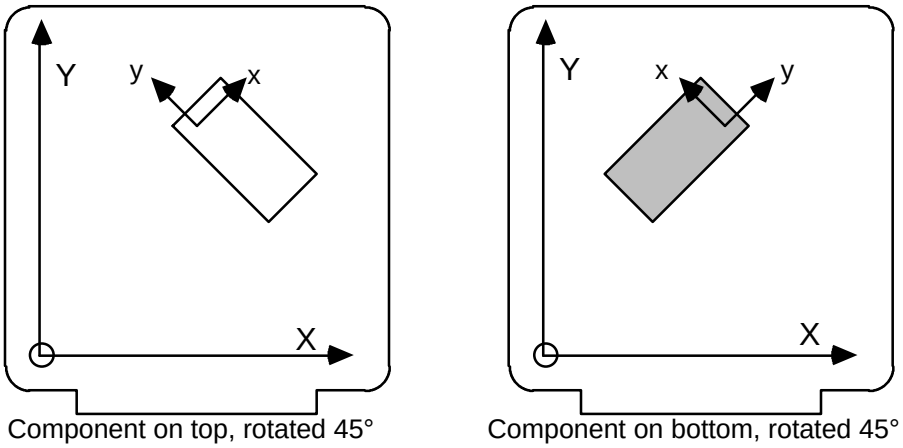

Figure 1

Record 4

Field, Description		Type	Value
1	Section end keyword	string	.END_PLACEMENT

4.0 Board File Example

```
.HEADER
board_file   2.0   "ACME CAD rel. 5.0"   11/11/92.14:48:03   1
test_design   THOU
.END_HEADER
.BOARD_OUTLINE
62.00000
0    7000.00000   4750.00000       0.000
0    6750.00000   5000.00000      90.000
0     250.00000   5000.00000       0.000
0       0.00000   4750.00000       0.000
0       0.00000    250.00000       0.000
0     250.00000      0.00000       0.000
0    6750.00000      0.00000       0.000
0    7000.00000    250.00000       0.000
0    7000.00000   4750.00000       0.000
1     976.40000   4400.00000       0.000
1    1423.60000   4400.00000    -180.000
1     976.40000   4400.00000    -180.000
.END_BOARD_OUTLINE
.OTHER_OUTLINE
HEATSINK   62.00000
0     200.00000    250.00000       0.000
0     300.00000    150.00000       0.000
0    6700.00000    150.00000       0.000
0    6900.00000    350.00000       0.000
0    6900.00000   4650.00000       0.000
0    6700.00000   4850.00000       0.000
0     400.00000   4850.00000       0.000
0     200.00000   4650.00000       0.000
0     200.00000    250.00000       0.000
1    2800.00000   4450.00000       0.000
1    2850.00000   4500.00000     -90.000
1    4250.00000   4500.00000       0.000
1    4300.00000   4450.00000     -90.000
1    4300.00000   4350.00000       0.000
1    4250.00000   4300.00000     -90.000
1    2850.00000   4300.00000       0.000
1    2800.00000   4350.00000     -90.000
1    2800.00000   4450.00000       0.000
2    1440.00000   1400.00000       0.000
2    1320.00000   1280.00000     -90.000
2    1270.00000   1280.00000       0.000
2    1150.00000   1400.00000     -90.000
2    1150.00000   2021.60000       0.000
2    1440.00000   2016.45000    -305.419
2    1440.00000   2016.50000       0.000
2    1440.00000   1400.00000       0.000
3    2500.00000   1800.00000       0.000
3    4200.00000   3500.00000       0.000
3    4400.00000   3300.00000       0.000
3    2700.00000   1600.00000       0.000
3    2500.00000   1800.00000       0.000
4    4952.80000   3600.00000       0.000
4    5847.20000   3600.00000    -180.000
4    4952.80000   3600.00000    -180.000
.END_OTHER_OUTLINE
```

```
.ROUTE_OUTLINE
0     100.00000    400.00000       0.000
0     200.00000    300.00000       0.000
0     200.00000    200.00000       0.000
0     300.00000    100.00000       0.000
0    1200.00000    100.00000       0.000
0    1250.00000     50.00000       0.000
0    5850.00000     50.00000       0.000
0    5900.00000    100.00000       0.000
0    6700.00000    100.00000       0.000
0    6800.00000    200.00000       0.000
0    6800.00000    350.00000       0.000
0    6900.00000    450.00000       0.000
0    6900.00000   4650.00000       0.000
0    6600.00000   4650.00000       0.000
0    6350.00000   4900.00000       0.000
0     700.00000   4900.00000       0.000
0     650.00000   4900.00000       0.000
0     400.00000   4650.00000       0.000
0     100.00000   4650.00000       0.000
0     100.00000   2050.00000       0.000
0     100.00000    400.00000       0.000
.END_ROUTE_OUTLINE
.PLACE_OUTLINE
0     250.00000    250.00000       0.000
0    6750.00000    250.00000       0.000
0    6750.00000   4440.00000       0.000
0    5750.00000   4890.00000       0.000
0    1250.00000   4890.00000       0.000
0     250.00000   4440.00000       0.000
0     250.00000    250.00000       0.000
.END_PLACE_OUTLINE
.ROUTE_KEEPOUT
ALL
0     600.00000   3400.00000       0.000
0     600.00000   2900.00000       0.000
0    1100.00000   2600.00000       0.000
0    1100.00000   3000.00000       0.000
0    1400.00000   3000.00000       0.000
0    1400.00000   3400.00000       0.000
0     600.00000   3400.00000       0.000
.END_ROUTE_KEEPOUT
.PLACE_REGION
BOTH         memory
0     300.00000    400.00000       0.000
0    6725.00000    400.00000       0.000
0    6725.00000   4875.00000       0.000
0     300.00000   4875.00000       0.000
0     300.00000    400.00000       0.000
.END_PLACE_REGION
.PLACE_KEEPOUT
BOTTOM        250     0
0     300.00000   1100.00000       0.000
0     300.00000    400.00000       0.000
0    6700.00000    400.00000       0.000
0    6700.00000   1100.00000       0.000
0     300.00000   1100.00000       0.000
.END_PLACE_KEEPOUT
.DRILLED_HOLES
61.00000     1370.00000   200.00000  NPTH   P1
```

```
61.00000     5650.00000   200.00000  NPTH   P1
150.00000    6800.00000  4750.00000   PTH   BOARD
100.00000    6630.00000  4750.00000  NPTH   BOARD
100.00000     370.00000  4750.00000  NPTH   BOARD
61.00000      100.00000   300.00000  NPTH   BOARD
.END_DRILLED_HOLES
.PLACEMENT
cc1210              pn-cap              C1
2150.00000          2425.00000          0.000               TOP       PLACED
cc1210              pn-cap              C10
5825.00000          1800.00000          0.000               TOP       PLACED
cc1210              pn-cap              C11
5825.00000          3050.00000          0.000               TOP       PLACED
cc1210              pn-cap              C2
950.00000           1150.00000          0.000               TOP       PLACED
cc1210              pn-cap              C3
2925.00000          1150.00000          0.000               BOTTOM    PLACED
cc1210              pn-cap              C4
1100.00000          1150.00000          0.000               BOTTOM    PLACED
cc1210              pn-cap              C5
5275.00000          1150.00000          0.000               TOP       UNPLACED
cc1210              pn-cap              C6
3525.00000          1150.00000          0.000               BOTTOM    PLACED
cc1210              pn-cap              C60
5425.00000          3050.00000          0.000               BOTTOM    UNPLACED
cc1210              pn-cap              C7
2775.00000          2425.00000          0.000               TOP       PLACED
cc1210              pn-cap              C8
4650.00000          1800.00000          0.000               TOP       PLACED
cc1210              pn-cap              C9
2150.00000          1800.00000          0.000               TOP       PLACED
conn_152            pn-conn_152         P1
5400.00000          300.00000           180.000             TOP       FIXED
lcc32               IDT-71256s55LB.l    U1
3100.00000          4450.00000          0.000               TOP       PLACED
lcc20               IDT-54fct244LB.l    U10
1925.00000          1000.00000          0.000               BOTTOM    PLACED
lcc20               IDT-54fct245LB.l    U11
4400.00000          1000.00000          0.000               BOTTOM    PLACED
lcc32               IDT-71256s55LB.l    U2
0.00000             0.00000             0.000               TOP       UNPLACED
lcc32               IDT-71256s55LB.l    U3
3875.00000          4450.00000          0.000               TOP       PLACED
lcc32               IDT-71256s55LB.l    U4
4675.00000          4450.00000          0.000               TOP       PLACED
lcc32               IDT-71256s55LB.l    U5
0.00000             0.00000             0.000               TOP       UNPLACED
lcc32               IDT-71256s55LB.l    U6
0.00000             0.00000             0.000               TOP       UNPLACED
lcc32               IDT-71256s55LB.l    U7
0.00000             0.00000             0.000               TOP       UNPLACED
lcc32               IDT-71256s55LB.l    U8
0.00000             0.00000             0.000               TOP       UNPLACED
lcc20               IDT-54fct244LB.l    U9
5625.00000          1000.00000          0.000               BOTTOM    PLACED
extractor           pn-extractor        norefdes
6630.00000          4750.00000          0.000               BOTTOM    PLACED
extractor           pn-extractor        norefdes
370.00000           4750.00000          0.000               TOP       PLACED
.END_PLACEMENT
```

5.0 Library File Format

The Library File contains definitions for each unique electrical and mechanical component (based on part number) used in the PWA. The component definitions in the Library File are referenced by their part numbers in the Board File.

Each component definition includes an outline and height which can be used by the receiving mechanical system to extrude approximate solid models of the components. Detailed models of some or all of the components may be substituted for the extruded shapes in the mechanical system. Note that the ability to perform this substitution is a function of the mechanical system, not the IDF itself.

The Library File contains the following sections:

- **Header** for information on the Library File itself
- **Electrical** for defining an electrical component
- **Mechanical** for defining a mechanical component

The Header section must be the first section in the file; Electrical and Mechanical sections can be in any order after the Header section.

The following pages describe these sections.

5.1 Header Section

This section contains information on the Library File itself.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.HEADER

Record 2

Field, Description		Type	Value
1	File type	string	LIBRARY_FILE
2	IDF version number	float	1.0 First version 2.0 This version
3	Source system identification	string	Any Example: "ACME CAD rel. 5.0"
4	Date	string	format = yyyy/mm/dd.hh:mm:ss
5	Library File version #	integer	Any

Record 3

Field, Description		Type	Value
1	Section end keyword	string	.END_HEADER

5.2 Electrical Component Section

This section defines an electrical component that is to be placed on the PCB. An electrical component is defined as being electrically connected to other electrical components in the PWA, such as resistors, connectors and IC packages. The outline of an electrical component consists of a simple closed curve made up of arcs and lines. The Library File contains an electrical component section for each electrical part number in the PWA.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.ELECTRICAL

Record 2

Field, Description		Type	Value	
1	Geometry name	string	Any	
2	Part number	string	Any	
3	Units definition	string	MM TNM THOU	millimeters ten nanometers (10-e8 meters) mils (thousandths of an inch)
4	Component height	float	Any	

The units definition applies to this component only.

Record 3

Field, Description		Type	Value	
1	Loop label	integer	0 1	Indicates points specified in counter-clockwise direction Indicates points specified in clockwise direction
2	X coordinate of point	float	Any	
3	Y coordinate of point	float	Any	
4	Include angle (degrees)	float	0 _ 0	Indicates that a straight line is to be created between Xn-1, Yn-1 and Xn, Yn. Indicates an arc is to be created between Xn-1, Yn-1 and Xn, Yn. If positive, the arc is counter-clockwise.

All X and Y coordinate values are relative to the component origin.

Record 3 is repeated for each point that defines the component outline. The last pair of coordinates should be the same as the first.

Record 4

Field, Description		Type	Value
1	Section end keyword	string	.END_ELECTRICAL

5.3 Mechanical Component Section

This section defines a mechanical component that is to be placed on the PCB. A mechanical component has no electrical connectivity to other components in the PWA. Examples of mechanical components include card extractors, stiffeners, and mounting hardware. The outline of a mechanical component consists of a simple closed curve made up of arcs and lines. The Library File contains a mechanical component section for each mechanical part number in the PWA.

Record 1

Field, Description		Type	Value
1	Section keyword	string	.MECHANICAL

Record 2

Field, Description		Type	Value	
1	Geometry name	string	Any	
2	Part number	string	Any	
3	Units definition	string	MM TNM THOU	millimeters ten nanometers (10-e8 meters) mils (thousandths of an inch)
4	Component height	float	Any	

The units definition applies to this component only.

Record 3

Field, Description		Type	Value	
1	Loop label	integer	0 1	Indicates points specified in counter-clockwise direction Indicates points specified in clockwise direction
2	X coordinate of point	float	Any	
3	Y coordinate of point	float	Any	
4	Include angle (degrees)	float	0 _ 0	Indicates that a straight line is to be created between Xn-1, Yn-1 and Xn, Yn. Indicates an arc is to be created between Xn-1, Yn-1 and Xn, Yn. If positive, the arc is counter-clockwise.

All X and Y coordinate values are relative to the component origin.

Record 3 is repeated for each point that defines the component outline. The last pair of coordinates should be the same as the first.

Record 4

Field, Description		Type	Value
1	Section end keyword	string	.END_MECHANICAL

6.0 Library File Example

```
.HEADER
library_file   2.0   "ACME CAD rel. 5.0"   11/11/92.14:48:04   1
.END_HEADER
.ELECTRICAL
cc1210              pn-cap              THOU      67.00000
         0           -49.00000            60.00000          0
         0           -49.00000           -60.00000          0
         0           191.00000           -60.00000          0
         0           191.00000            60.00000          0
         0           -49.00000            60.00000          0
.END_ELECTRICAL
.ELECTRICAL
conn_152            pn-conn_152         THOU      0.00000
         0          -450.00000           300.00000          0
         0          -450.00000          -100.00000          0
         0          4200.00000          -100.00000          0
         0          4200.00000           300.00000          0
         0          -450.00000           300.00000          0
.END_ELECTRICAL
.ELECTRICAL
lcc20               IDT-54fct244LB.l    THOU      180.00000
         0          -172.50000            47.50000          0
         0          -220.00000            -0.50000          0
         0          -220.00000          -392.50000          0
         0           220.00000          -392.50000          0
         0           220.00000            47.50000          0
         0          -172.50000            47.50000          0
.END_ELECTRICAL
.ELECTRICAL
lcc20               IDT-54fct245LB.l    THOU      180.00000
         0          -172.50000            47.50000          0
         0          -220.00000            -0.50000          0
         0          -220.00000          -392.50000          0
         0           220.00000          -392.50000          0
         0           220.00000            47.50000          0
         0          -172.50000            47.50000          0
.END_ELECTRICAL
.ELECTRICAL
lcc32               IDT-71256s55LB.l    THOU      140.00000
         0          -232.00000            65.00000          0
         0          -280.00000            17.00000          0
         0          -280.00000          -615.00000          0
         0           280.00000          -615.00000          0
         0           280.00000            65.00000          0
         0          -232.00000            65.00000          0
.END_ELECTRICAL
```

```
.MECHANICAL
extractor           pn-extractor        thou      100.00000
         0          -200.00000            0.00000          0
         0          -200.00000          300.00000          0
         0          1000.00000          300.00000          0
         0          1300.00000          500.00000          0
         0          1350.00000          450.00000          90.00000
         0          1300.00000          500.00000          0
         0           800.00000          100.00000          0
         0             0.00000          200.00000          0
         0          -200.00000            0.00000          90.00000
.END_MECHANICAL
```