CadPack

Import from Redac Cadstar

Software tool for Redac Cadstar format Cad data import

Technical Info

Version : 2
Code : 81190415.120

SPEA SpA
16, Via Torino
10088 Volpiano - Italy
Tel.: + 39 011 9825 400
Fax: + 39 011 9825 405
E-mail: info@spea.com
Web: www.spea.com

Contents

Introduction

CAD files are the base for the automatic generation of test program for InCircuit of any technology.

In order to generate the ICT test program in a short time and without errors, both Bed of Nails and Flying Probe testers require the circuit information available on CAD format.

The Import from Cadstar CAD import driver enables to import data present in Cadstar CAD file and convert them in SPEA Board data format.

Conventions, symbols and abbreviations

In the document, the ⓘ symbol is used to highlight information or notes useful to the reader.

This manual can be updated in accordance with the evolution of the system and associated software.
It may contain preliminary contents or it may not be entirely updated with the latest versions used in the system.

Any remarks on errors and imperfections, or suggestions, can be addressed to:

SPEA SpA
Ufficio Documentazione
16, Via Torino
10088 Volpiano – Italy
Tel.: +39 011 9825400
Fax: +39 011 9825405
Email: info@spea.com
Web: www.spea.com

1. Cadstar file data

With the “Cadstar CAD files” words we refer to the output information generated by the Cadstar CAD-CAE programs for the electrical diagrams design and PCB development, used to develop a test application (test program and adapter design).

Information stored in the “Cadstar CAD files” concern an electronic board and can be used by an appropriate program to generate a test program and its test adapter design (Bed of Nails or list of movement for Flying Probes).

Information can be grouped in 4 different categories and typically concern the printed circuit:

Part List
It is the list of all used devices, it must contain: devices drawing reference, part numbers, value, tolerances, device type, etc.
Net List
It is also called wiring list, containing device interconnection data; basically it is presentation of the electrical diagram.
Coordinate and access list
It is the list containing the devices coordinates, concerning their barycentre and pins.
Wiring and Routing list
It is the list containing the path of the Net tracks in the PCB.

For the import of the information above mentioned SPEA has developed the specific program for the translation, stored in a specified format, to its common data bank called “Board Data”.
The name of this type of program is “CAD import driver”.

For the required information, see the list in the following paragraphs.

1.1 Part List

The Part List is an ASCII text file, containing the list of all the parts used to assemble the board; sometimes it can be called **Bill of Material** (BOM).

In the Part List all information concerning the mounted and not mounted parts must be present.
For every part the following information must be defined:

Information	Description
Drawing Reference	Reference designator (e.g. U10, R105, D23, etc.).
Part Number	Device code (e.g. 132549.012, C4QW08, 001-58-AA, etc.).
Value	Device value (e.g. 10KΩ, 10µF, 1mH, etc.).
Tolerance	Positive and negative device tolerances (e.g. 1%, 5%, etc.).
Mounting side	The legal values for this item can be: - **Top** (Component side) - **Bottom** (Soldering side) - **Not mounted Top** - **Not mounted Bottom**
Rotation [1]	Device mounting rotation angle (e.g. 0°, 180°, etc.).
Dimensions [1]	Device dimensions.
Case code [1]	Device package (case) code.

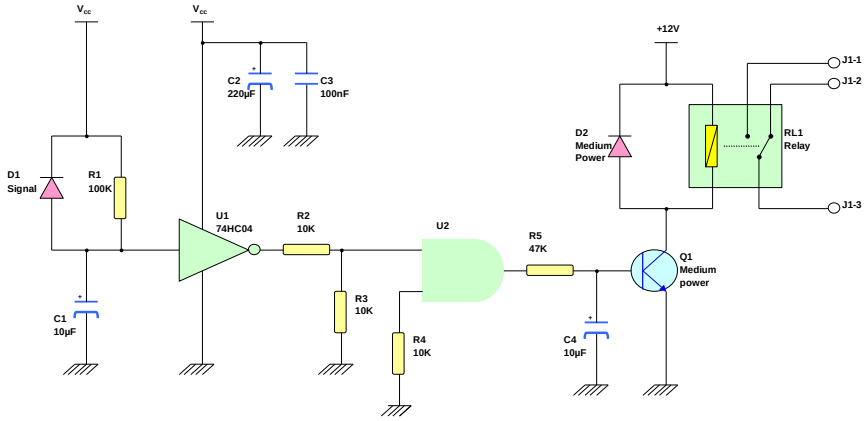
[1] **Optional data (not yet managed)**

1.2 Net List

The Net List is an ASCII text file containing the device interconnection data; it is also called wiring list.
This list must contain the interconnection between devices, including pad and via.
Basically, it is the representation of the electrical diagrams.

For every net the following information must be defined:

Information	Description
Net name	Net identifier (e.g. +5V, RESET, A01, etc.).
Drawing reference	Reference designator of the device connected to the net (e.g. U10, R105, D23, etc.).
Pin name	Name of the device pin connected to the net (e.g. 1, 15, Anode, K, Negative, etc.).
Pin access side	Access side for the device pin, legal values are: - **Top** (Device side access). - **Bottom** (Soldering side access). - **Not accessible** - **All** (both top and bottom side access)



1.3 Coordinates and access list

The Coordinates and access list is an ASCII text file containing the devices coordinates concerning their barycentre and pins. Below, the required information:

Information	Description
Drawing Reference	Reference designator of the device connected to the net (e.g. U10, R105, D23, etc.).
Pin name	Name of the device pin connected to the net (e.g. 1, 15, Anode, K, Negative, etc.).
Pin X position	Pin X-coordinate.
Pin Y position	Pin Y-coordinate.
X barycentre [1]	Device X barycentre.
Y barycentre [1]	Device Y barycentre.

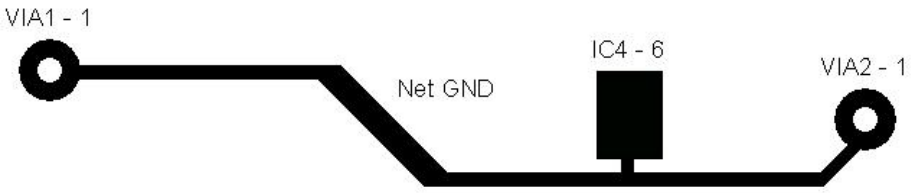
1.4 Wiring and Routing list

The Wiring and Routing list is an ASCII text file that contains all the coordinates of the Net tracks on the PCB and the link with the Net List. So the path of each net on the PCB is described in this file.

For every net the following information must be defined:

Information	Description
Net name	Net identifier (e.g. +5V, RESET, A01, etc.).
X Start	Track segment start X-coordinate.
Y Start	Track segment start Y-coordinate.
X End	Track segment end X-coordinate.
Y End	Track segment end Y-coordinate.
Width	Net segment thickness.
Layer	Layer the segment belongs to.

Example:



[1] **Optional data**

2. Cadstar file generalities

2.1 Cadstar file name

The Cadstar Neutral file name has to have the **.CDI** extension.
It is an ASCII text file and it contains the information concerning the board, device and their connections.

2.2 Cadstar file conversion from Unix to MS-DOS

When the diagram entry has been performed and checked on the Cadstar CAD workstation, the Cadstar file **.CDI** should be made available for the SPEA system.

The SPEA system is based on a PC platform operating in a Windows® environment, this means that the CAD import driver can manage ASCII Text file in MS-DOS format.

Due to the fact that the Cadstar workstation typically uses the Unix operating system, the output ASCII text file has to be converted from Unix to MS-DOS format.

In order to perform the conversion, please refer to appendix A – **Note about the Cadstar ASCII text file format**.

3. Cadstar file format

This is a partial extract of an example of a Cadstar output ASCII text file:

```
.REM CADSTAR PCB LAYOUT

……

.ASS
……
TRA 0 -  00.008
TRA 1 -  00.010
TRA 2 -  00.012
TRA 3 -  00.020
TRA 4 -  00.060
TRA 5 -  00.025
TRA 6 -  00.040
TRA 7 -  00.012
……

.CMP
L  2885   8
02.100 01.175 02.100 01.175
……
.PAD
 02.009 01.300  1
 01.909 01.340  1
 02.009 01.380  1
 01.909 01.420  1
 02.009 01.460  1
 01.909 01.500  1
 02.100 01.165 33
 02.100 01.635 33
L  3579   2
 01.100 01.100 01.150 01.150
……
.PAD
 01.061 01.100 40
 01.139 01.100 40
L  1360   1
 01.000 01.000 01.000 01.000
……
.PAD
 01.000 01.000  0

……

.COM
CN3    0  00.000  00.000 0 L 14000 0 2 09.700 09.400 1 0
C200   1  00.145  00.060 0 L  7108 0 3 08.325 09.200 1 0
C201   3  00.010  00.180 0 L  3579 0 2 08.050 08.825 1 0
C202   1  00.175  00.050 0 L  7108 0 3 06.700 08.075 1 0
C504   2  00.130 -00.040 0 L  9008 1 3 04.750 07.500 1 0
C505   0 -00.205 -00.020 0 L  9008 1  1 05.200 06.800 1 0
D200   2  00.375 -00.020 0 L 10004 0 2 07.300 09.000 1 0
D201   2  00.390 -00.005 0 L 10004 0 2 06.700 09.000 1 0
D205   2  00.390  00.000 0 L 10004 0 2 06.700 08.600 1 0
R248   2  00.125  00.100 0 L  6001 1 2 06.000 07.825 1 0
R250   2  00.290  00.040 0 L  6001 1 2 06.000 06.775 1 0
R520   0 -00.045  00.040 0 L  6001 1 1 04.975 07.775 1 0
R522   0 -00.045  00.050 0 L  6001 1 1 05.375 07.775 1 0
R526   0 -00.210 -00.015 0 L  6001 1 1 04.500 06.800 1 0
Q230   1  00.015  00.050 0 L 13002 1 0 06.200 08.125 1 0
Q231   0 -00.045  00.050 0 L 13002 1 0 06.200 07.600 1 0
U400   1  00.030  00.025 0 L  2885 1 0 07.950 05.275 1 0
……

.CON
.REM TREE   0
.REM ROUTED
.COD 0
Q229 C   Q230 B
Q230 C   Q231 C
Q231 B   R200    1
.REM TREE   1
R200    2   R207    2
R207    1   R248    2
R250    1   R520    2
Q229    2   R526    1
```

```
……

.ROU
.REM TREE   0
.COD 0
/ Q229     3 Q230     3
 06.160 06.350 L  1 N
 06.050 06.350
/ Q230     3 Q231     3
 06.160 06.350 L  1 N
 06.200 06.350 L  1 N
 06.200 06.510
/ Q231     3 R200     1
 06.050 06.350 L  1 N
 06.050 06.250 L  1 N
 06.035 06.250
.REM TREE   1
/ R200     2 R207     2
 05.960 06.350 L  1 N
 05.915 06.350 L  1 N
 05.915 06.450 L  1 N
 05.960 06.450
/ R207     1 R248     2
 05.960 06.350 L  1 N
 05.915 06.350 L  1 N
 05.915 06.250
/ R250     1 R520     2
 05.960 06.450 L  1 N
 05.915 06.450 L  1 N
 05.915 06.550 L  1 N
 05.960 06.550
/ Q229     2 R526     1
 05.960 06.550 L  1 N
 06.050 06.550
……
.REM TREE  40
.COD 0
/ D200     1 R250     1
 06.260 06.450 L  1
 06.295 06.450 L  1
 06.295 06.620 L  1
 06.380 06.620 L 16 V 0  0
 06.380 06.940 L 16
 06.410 06.940 L 16
 06.410 06.975 L  1 V 0  0
 06.260 06.975
.COD 1
/ R527     1 D500     2
 06.260 06.450 L  1 N
 06.635 06.450 L 16 N V 0  0
 06.635 06.245 L 16 N
 06.945 06.245 L 16 N
 06.945 05.900 L 16 N
 07.090 05.900 L 16 N
 07.090 05.455 L  1 N V 0  0
 06.975 05.455 L  1 N
 06.975 05.510

……

.EOD
```

The Import from Cadstar CAD driver is able to correctly identify and use the following sections:

- **.ASS**
- **.CMP**
- **.COM**
- **.CON**
- **.ROU**

In the next paragraphs, a short description for each section is provided.

3.1 .ASS

In this section, the **TRA** identifier is used to specify the track width.

Every single row of the Cadstar file, in this section, contains the following information:

1. Not used
2. **Track code**
3. Not used
4. **Track width**

The following example shows the syntax used for the **TRA** identifier:

1	2	3	4
Not used	Track code	Not used	Track width
TRA	0		00.008
TRA	7		00.012

The following example shows the used syntax for the **TRA** identifier:

```
.....
.ASS
TRA 0 -  00.008
TRA 1 -  00.010
TRA 2 -  00.012
TRA 3 -  00.020
TRA 4 -  00.060
TRA 5 -  00.025
TRA 6 -  00.040
TRA 7 -  00.012
.....
```

3.2 .CMP

The component library is introduced by the**.CMP** keyword.

This section is used to describe the package properties (name, number of pins, pin coordinates); data are separated by blanks in a row of the Cadstar file.

It is composed by two subsections:

- **L**
- **.PAD**

3.2.1 L

The **L** subsection defines the package name and the number of the pin.

Every single row of the Cadstar file, in this subsection, contains the following information:

1. Not used
2. **Package name**
3. **Pin count**
4. **Barycentre X**
5. **Barycentre Y**
6. Not used
7. Not used

The following example shows the syntax used for the **L** subsection:

1	2	3	4	5	6	7
Not used	Package name	Pin count	Barycentre X	Barycentre Y	Not used	Not used
L	3779	2				
			01.100	01.100	01.150	01.150

Typically, **L** subsection, as shown in the following example:

```
.....
L  3579   2
01.100 01.100 01.150 01.150
.....
```

3.2.2 .PAD

The **.PAD** subsection defines the coordinates of the pin.
This line contains the offset of the pin. This offset is referred to the barycentre of the package.

Every single row of the Cadstar file, in this subsection, contains the following information:

1. **X-Coordinate**
2. **Y-Coordinate**
3. Not used

The following example shows the syntax used for the **.PAD** subsection:

1	2	3
X Coord.	Y Coord.	Not used
01.061	01.100	40
01.139	01.100	40

The following example shows **.PAD** subsection:

```
.....
.PAD
01.061 01.100 40
01.139 01.100 40
.....
```

3.3 .COM

The component section is introduced by the**.COM** keyword.
Basically this section contains the part list and mounting data of each single device present in the Cadstar CAD file; data are separated by blanks.

Every single row of the Cadstar file, in this section, contains the following information:

1. **Drawing reference**
2. Not used
3. Not used
4. Not used
5. Not used
6. Not used
7. **Part number/Package name**
8. **Access side**
    - 0 = Accessible from all the board sides
    - 1 = Accessible from the components side
    - 2 = Accessible from the soldering side
9. **Rotate**
    - 0 = No rotation
    - 1 = 90 degrees
    - 2 = 180 degrees
    - 3 = 270 degrees
10. **X-coordinate**
11. **Y-coordinate**
12. Not used
13. **Mount side**
    - 0 = Component side
    - 1 = Soldering side

The following example shows the syntax used for the **.COM** section:

1	2 - 6	7	8	9	10	11	12	13
Drawing ref.	Not used	Part num./Package name	Access side	Rotate	X Coord.	Y Coord.	Not used	Mount side
CN3		14000	0	2	09.700	09.400	1	0
C200		7108	0	3	08.325	09.200	1	0
R250		6001	1	2	06.000	06.775	1	0

The following example shows the **.COM** section:

```
.....
.COM
CN3    0  00.000  00.000 0 L 14000 0 2 09.700 09.400 1 0
C200   1  00.145  00.060 0 L  7108 0 3 08.325 09.200 1 0
D200   2  00.375 -00.020 0 L 10004 0 2 07.300 09.000 1 0
R250   2  00.290  00.040 0 L  6001 1 2 06.000 06.775 1 0
Q230   1  00.015  00.050 0 L 13002 1 0 06.200 08.125 1 0
U400   1  00.030  00.025 0 L  2885 1 0 07.950 05.275 1 0
.....
```

3.4 .CON

The net list section is introduced by the**.CON** keyword.

The **TREE** keyword identifies a net.

The “Import from Cadstar” import CAD driver manages the following data:

1. **Drawing reference start**
2. **Pin name start**
3. **Drawing reference end**
4. **Pin name end**

The following example shows the syntax used for the **.CON** section:

1	2	3	4
Drawing ref. start	Pin name start	Drawing ref. end	Pin name end
Q229	C	Q230	B
Q230	C	Q231	C
Q231	B	R200	1

The following example shows the **.CON** section:

```
.....
.CON
.REM TREE   0
.REM ROUTED
.COD 0
Q229 C   Q230 B
Q230 C   Q231 C
Q231 B   R200    1
.....
```

3.5 .ROU

The route section is introduced by the keyword **.ROU**.
The **TREE** keyword identifies a net while **.COD** identifies the track width as described in **.ASS** section.

This section is used to specify the properties for the tracks data (layer name, net coordinates, net width, net name).

Data are separated by blanks in a row of the CAD file and the “Import from Cadstar” import CAD driver manages the following labels:

1. **Drawing reference start**
2. **Pin name start**
3. **Drawing reference end**
4. **Pin name end**
5. **X-coordinate**
6. **Y-coordinate**
7. Not used
8. **Layer**

ⓘ **Note:** The **V** keyword indicates the presence of the via in the current coordinates.

The following example shows the syntax used for the **.ROU** section:

1	2	3	4	5	6	7	8
Drawing ref. start	Pin name start	Drawing ref. end	Pin name end	X coord.	Y coord.	Not used	Layer
D200	1	R250	1				
				06.260	06.450	L	1
				06.260	06.975		

The following example shows the **.ROU** section:

```
.....
.REM TREE  40
.COD 0
/ D200     1 R250     1
06.260 06.450 L  1
06.295 06.450 L  1
06.295 06.620 L  1
06.380 06.620 L 16 V 0  0
06.380 06.940 L 16
06.410 06.940 L 16
06.410 06.975 L  1 V 0  0
06.260 06.975
.....
```

4. Import setting

4.1 Pin function assignment

This assignment table must be filled in order to correctly execute the CAD file import.

In order to test correctly some polarized devices such as diodes, bipolar transistors, etc., it is basic to correctly identify the pin function (i.e. anode, base, etc.) of each pin.

The fields contained in the table are described below:

Field	Description
Device Type	Identifies the type of device (example: Resistors, Capacitors, Digital Devices, Diodes etc.).
Pin Function	Function concerning the Pin.
Pin Name	Pin reference.
Cad Pin	Pin reference in Cad file.

4.2 Drawing ref. initials/device type assignment

The Cadstar file typically contains all information about the devices, such as value, tolerances and type; which are fundamental from the test program generation point of view.

The fields contained in the table are described below:

Field	Description
Drawing Reference	Initial letter identifying the **Device Type**.
Device Type	Identifies the type of device (example: Resistors, Capacitors, Digital Devices, Diodes etc.).
Default Tol+, Tol-	Value and tolerance of the device only if required (as for resistors).

It could happen that in the CAD file they are missing. For each drawing reference initial, the displayed table enables to define the following data default values:

- Device type
- Default positive tolerance
- Default negative tolerance

This means that if, for any reason, the CAD file does not contain the information mentioned above, the default values will be used.

A. Note about the Cadstar ASCII text file format

The Cadstar CAD-CAE typically runs under Unix operating system and generates its neutral ASCII output file in Unix format.

The Unix ASCII text files use the "$0a_{hex}$" ASCII character as end of line identifier.
The Windows® (MS-DOS) operating system uses "$0d_{hex}$" and "$0a_{hex}$" the ASCII characters as end of line identifier for ASCII text files.
This means that output ASCII text files may require an ASCII format conversion (from Unix to Windows® format).

This operation can be performed using "WordPad" a standard text file editor.
Open the Cadstar ASCII file with this editor and save it, this operation will automatically perform the conversion from ASCII Unix format to ASCII Windows® format.