

CadPack

Import from FEX

Software tool for import from BOSCH FEX Cad format

Technical Info

Version : 2
Code : 81190636.154



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

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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 in CAD format.

The “Import from FEX” CAD import driver allows to import the data present in the FEX CAD file and convert them in the SPEA Board data format.

Conventions, symbols and abbreviations

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

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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. FEX file data

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

Information stored in the “FEX 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. 10K Ω , 10 μ F, 1mH, etc.).
Tolerance	Positive and negative device tolerances (e.g. 1%, 5%, etc.).
Mounting side	The legal values for this item can be: <ul style="list-style-type: none">◆ 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.

Table 1 – Part List

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.

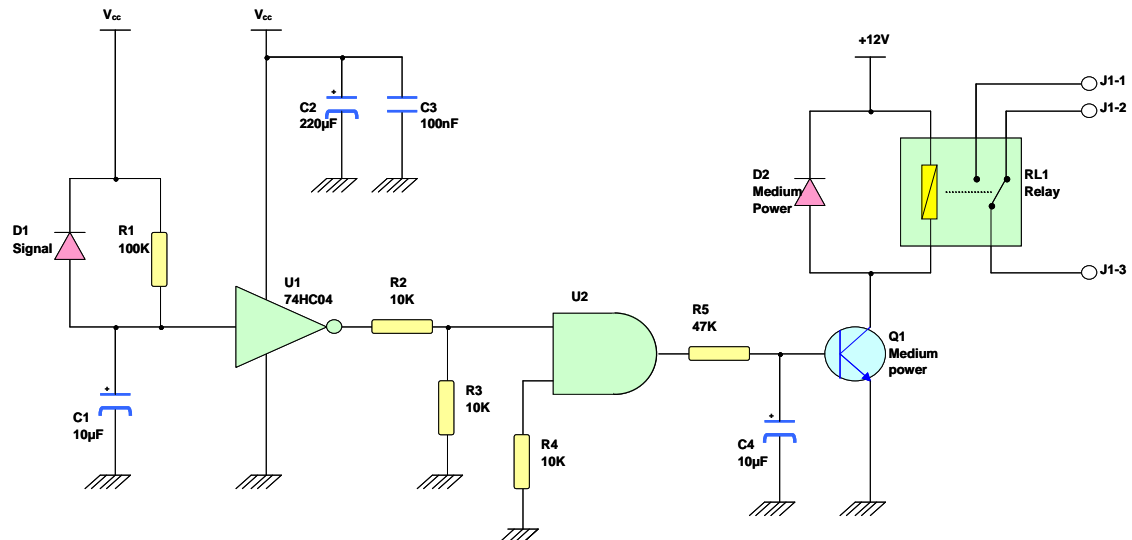


Figure 1 – Electrical diagram example

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: <ul style="list-style-type: none"> ◆ Top (Device side access) ◆ Bottom (Soldering side access). ◆ Not accessible ◆ All (both top and bottom side access)

Table 2 – Net List

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.

Table 3 – Coordinates and access list

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.

Table 4 – Wiring and Routing list

Example:



Figure 2 – Net track example

¹ Optional data

2. FEX file generalities

2.1 FEX file names

The FEX files have the following name and extensions:

- ◆ **<BoardName>.NZT-FEX**: Netlist
- ◆ **<BoardName>.MPT-FEX**: Test point coordinates
- ◆ **<BoardName>.SMD-FEX**: Pin coordinates and netlist for the SMD parts
- ◆ **<BoardName>.DRA-FEX**: Pin coordinates for TH pins
- ◆ **<BoardName>.AUF-FEX**: Reference holes / fiducials

It is an ASCII text file and it contains the information related to the board, component and their connections.

2.2 FEX file conversion from Unix to MS-DOS

When the schematic entry has been entered and checked on the FEX CAD workstation, the FEX files 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.

In case that the FEX workstation uses the Unix operating system the output ASCII text file has to be converted from Unix to MS-DOS format.

Please ref. to the appendix “A - Note about the FEX ASCII text file format” in order to perform the conversion.

2.3 FEX file transfer

Basically, the CAD file can be transferred from the CAD-CAE workstation to the Leonardo programming/test station via:

- ◆ Floppy disk / USB Pen Drive / CD / DVD
- ◆ Remote disk (LAN)

The transferred files can be stored into a user defined folder; the “Import from FEX” CAD import driver can retrieve the FEX files from each visible and available disks and folders.

3. FEX file format

3.1 Net List file – NZT-FEX

This is a partial extract of an example of an NTZ-FEX file:

-NTZ-3338310588-V09		
! STROMLAUFPLAN: Y 486 C15 107		
! 02.04.2003		
NETZ 2	(ACT_AUX_V)	Net name
D260	A1	
I10	F26	
MP2	1	
NETZ 3	(ACT_DIFF1)	
D260	A2	
I10	K25	Drawing reference
MP3	1	
NETZ 4	(ACT_HSS_TCM_SO)	
I10	A8	
MP4	1	
R300	2	
R301	2	Pin Name
...		

3.2 Test Point Coordinates – MPT-FEX

This is a partial extract of an example of an MPT-FEX file:

-MPT-3338310588-V09		
!INFO Mittwoch, 2. April 2003		
NDH1	00.7480 00.6693	
NDH2	01.5689 00.6791	Drawing reference
NDH3	03.7618 00.6811	
NDH4	04.8091 00.6772	Pin X Coordinate
NDH5	05.6811 01.0532	
MP2	02.3622 02.9567	Pin Y Coordinate
MP3	02.3169 03.7382	
MP4	05.3386 02.2362	
...		

This file contains the Test point defined ; data are separated by spaces.

3.3 Pin Coordinates for SMD Parts file – SMD-FEX

This is a partial extract of an example of an SMD-FEX file:

-SMD-3338310588-V09									
! INFO 02.04.2003									
C24	03.2205	03.2992BO090	1	1	03.2205	03.3278	IS_M_FRONT		Drawing reference
C24	03.2205	03.2992BO090	2	2	03.2205	03.2707	GND_1		Barycenter X coordinate
C42	04.0000	03.9843 BO090	1	1	04.0000	04.0128	GND_1		Barycenter Y coordinate
C42	04.0000	03.9843BO090	2	2	04.0000	03.9557	VDD5L		
C65	04.0669	03.9843 BO 090	1	1	04.0669	04.0128	GND_1		Board Side (BO = Component side)
C65	04.0669	03.9843BO 090	2	2	04.0669	03.9557	N_I10_W25		Part rotation
C72	03.2165	03.5158BO180	1	1	03.1880	03.5158	GND_1		
C72	03.2165	03.5158BO180	2	2	03.2451	03.5158	STAT_LAMP_OUT1		Part Id
C100	02.7106	02.9055BO090	1	1	02.7106	02.9341	N_I100_31		Pin name
C100	02.7106	02.9055BO090	2	2	02.7106	02.8770	VSSPLL		
C110	03.1929	03.6417BO090	1	1	03.1929	03.6703	STAT_UZ		Pin X coordinate
C110	03.1929	03.6417BO090	2	2	03.1929	03.6132	GND_1		Pin Y coordinate
C122	02.5315	02.9410BO270	1	1	02.5315	02.9124	GND_1		Net name (not loaded, it is imported from the NZT-FEX file)
...									

This file contains the mounting data of each SMD device present; data are separated by spaces.

3.4 Pin Coordinates for TH Parts file – DRA-FEX

This is a partial extract of an example of an DRA-FEX file:

-DRA-3338310588-V09									
!INFO Mittwoch, 2. April 2003									
Q113	02.7071	02.6811RA	1						Drawing reference
Q113	02.9071	02.6811RA	2						
X1	00.7520	00.4819HA	1						Pin X coordinate
X1	00.7520	00.3441 HA	2						Pin Y coordinate
X1	00.7520	00.2063HA	3						
X1	00.9488	00.4819 HA	4						Board Side (BO = Component side)
X1	00.9488	00.3441HA	5						Pin Id
X1	00.9488	00.2063HA	6						
...									

This file contains the mounting data of each TH device ; data are separated by spaces.

3.5 Reference Holes AUF-FEX

This is a partial extract of an example of an AUF-FEX file:

-AUF-3338310588-V09		
! INFO 02.04.2003		
AUF5	+00.2953+01.6748	Drawing reference
AUF6	+06.0039+01.6748	
ECK1	+00.0000+00.0000	
ECK2	+06.3000+04.6100	Coordinates
END		

3.6 Pin function assignment

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

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

A. Note about the FEX ASCII text file format

The FEX CAD-CAE, typically, runs under Unix operating system and generates its neutral ASCII output file in Unix format. The Unix ASCII text files use as end of line identifier, the ASCII character "0a_{hex}". The Windows (MS-DOS) operating system uses for ASCII text files, as end of line identifier, the ASCII characters "0d_{hex}" and "0a_{hex}".

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 FEX ASCII file with this editor and save it; this operation will automatically perform the conversion from ASCII Unix format to ASCII Windows format.