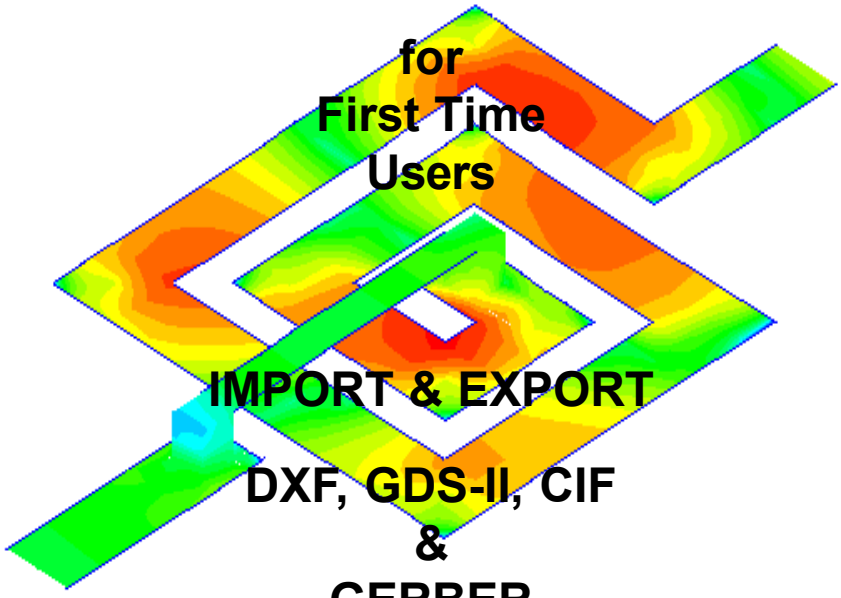
CADnex

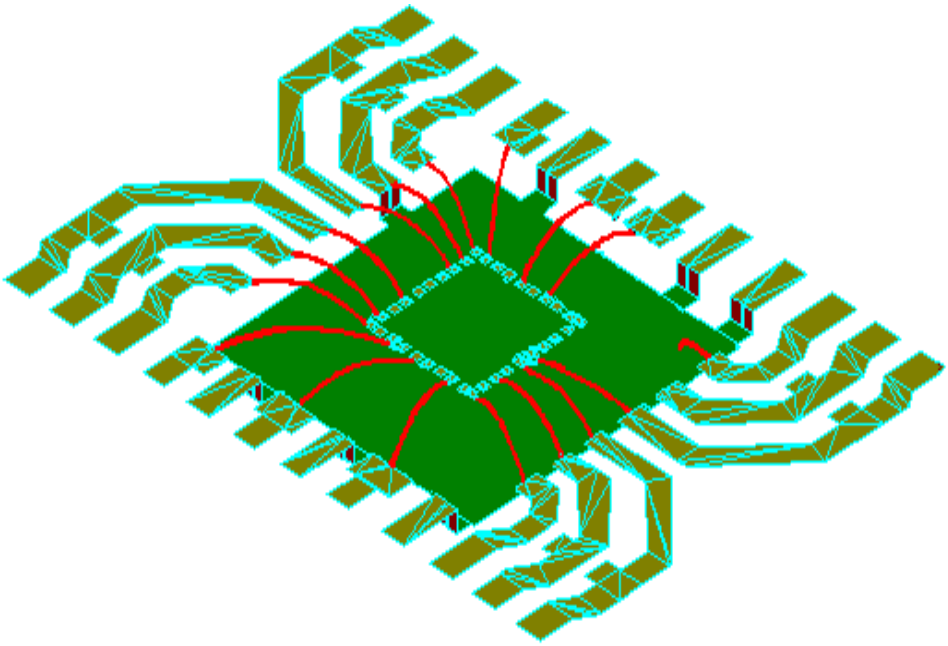
Quick Start

for First Time Users



IMPORT & EXPORT

DXF, GDS-II, CIF & GERBER



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Quick Reference Guide

This Quick Start manual shows how to import DXF, GDS-II, Gerber & CIF file formats along with notes on potential problems. The DXF guide shows where to place the files and how to start the editor and database resolution. The GDS-II, Gerber and CIF guide assume that the user has followed the file placement as described in the DXF section.

NOTE: A Detailed Printed Manual is available for $ 50.00 Plus Shipping. Manual has >150 (8.5 x 11 inch) pages in 3 hole punch binder.

Quick Reference Guide

DXF IMPORT

In order to import DXF files you will need to start CADnex and select the MCM editor mode. Then select the appropriate database units and resolution. Unless you are going to use the editor to export Gerber files, it is recommended that the MCM editor mode be used. There are differences between the PCB, IC and MCM editor modes. The IC and MCM modes allow the selection of Mils, mm and microns database units, while the PCB mode uses Mils only. Also the IC & MCM modes allow database resolution of 1, 0.1 and 0.01 while the PCB mode has a fixed resolution of 1 Mil. There is a difference between the IC and MCM/PCB modes. The IC mode uses a flat end cap (at vertex) on thick lines, while the MCM & PCB modes use a round end cap where the radius of the end cap is at the vertex point (see above)

IC Mode

MCM & PCB Mode

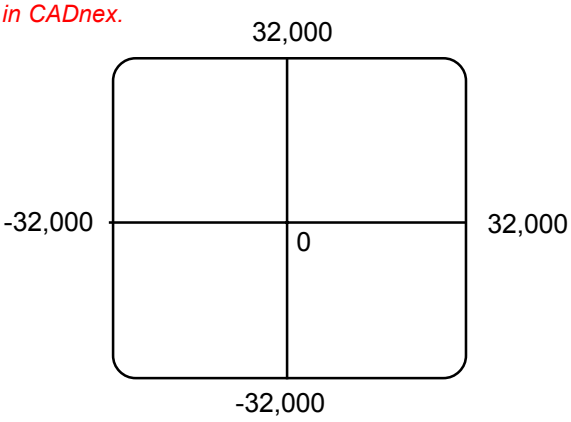
Note: *As the database resolution is increased, the total size of the database is reduced by the same decimal amount.*

Also note that AutoCAD normally uses the lower left corner as the 0,0 . This means a D size sheet will not fit into a CADnex 1 Mil

resolution database unless the 0,0 location is moved to the center of the D sheet before the DXF file is exported from AutoCAD.

In most cases, geometries will be well within the database size, even at the highest 0.01 resolution.

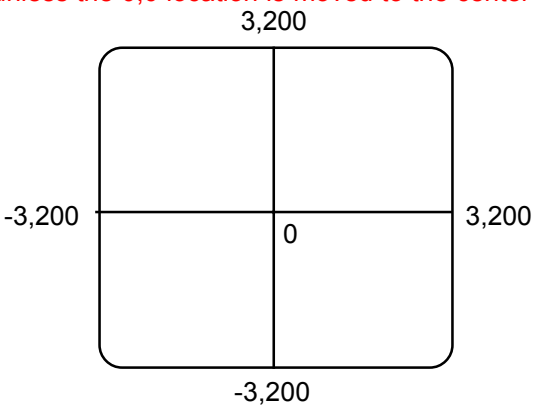
Note: *DXF files do not contain any information regarding the database units, therefore, you need to know the database units of the file before you select the database units in CADnex.*



Database Resolution Equal 1

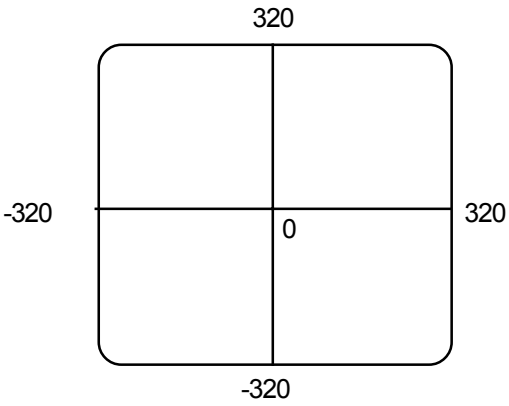
Note: As the database resolution is increased, the total size of the database is reduced by the same decimal amount.

Also note that AutoCAD normally uses the lower left corner as the 0,0 location This means a D size sheet will not fit into a CADnex 1 Mil resolution database unless the 0,0 location is moved to the center of the D sheet before the DXF file is exported from AutoCAD.



Database Resolution Equal 0.1

In most cases, geometries will be well within the database size, even at the highes 0.01 resolution.



Database Resolution Equal 0.01

IMPORT DXF FILES

Note: DXF format supported is AutoCAD 12. From AutoCAD 13, you can export AutoCAD 12 DXF files. Also, you can use LinkCAD to Import DXF and then Export DXF. The DXF Export file from LinkCAD is AutoCAD 12.

1. Before you start the editor, copy the DXF files into the CADNEX directory.
2. Start the editor from the CADNEX directory by typing CADNEX [Enter].
3. Select the **MCM** Editor mode and then the database units and desired resolution.
4. Now select the **FILE** Menu and the **Import** button.
5. Select the **DX** button and at the prompt, press the left mouse button to display the DXF files. Select the DXF file to be imported.
6. At the 'Library and Database to Create?' prompt **press the left mouse button**. This will create a library and database with the same name as the DXF file.
7. At the next prompt, **press the left mouse button** for the default resolution. One of two things will occur. The file will be imported or the system will beep with a 'DXF In Failure' prompt. If you get an error, import the DXF file again and select a smaller scale.
8. If you do not see the imported structures, place the cursor in the center of the screen and press the **Page Down** key and zoom out until the geometry is in view. Use the **Page Up** key to zoom in.

The DXF file is imported as a series of shapes/cells or blocks. So it is necessary to explode these cells down to flat geometries.

9. Select the **ID** Menu and the **Identify Entity** button. Place the cursor over the cell and **press the left mouse button**. To make sure that all cells have been selected, **press the left mouse button** again to recall the command and a second time to select any remaining cells. You will get an 'Err13' when all cells have been selected.
10. Select the **LIB** Menu and the **Explode Shape** command. Just like in 9. above, continue to **press the left mouse button** (exploding Shapes) until Err 174 appears that confirms all cells have been exploted. **Press the right mouse button** to deselect the geometries.

In most cases, DXF files will need to be modified, where polygons are individual polylines and unwanted items need to be deleated. In order to check polygons for proper closure, you will need to turn the fill mode on for the layers being displayed. When the fill mode is on, polygons and thick lines are displayed as solid geometries.

Note: *The default fill mode is turned off so the editor will redraw the display faster and vertices can be located much easier.*

11. Select the **LAYER** Menu and the **Set Fill Layers** button. Use the cursor to turn fill on the layers the geometries are located. Select **Okay** to close the menu.

Now you can confirm how many geometries are closed polygons, and if any will need to be repaired. The editor has a Join command that will tie separate line entities that form a polygon into one entity forming a closed polygon.

12. Select the **UTIL** Menu and then the **Join Entity** button.

Now you should see filled polygons. However, if the structures contain arcs to form corners, you will need to convert them from a 3 vertex structure to an open polyline by using the convert circle/arc command. You can then use the join command to tie the polylines together.

Note: *CAD systems create circles and arcs by using a center point and radius for circles (2 points) and a center point, a start and stop point for arcs (3 points) These geometries are not acceptable in most modlers.*

13. Select the **UTIL** Menu and then the **Circle/Arc > Poly** button. Move the cursor over the arc and **press the left mouse button**. At the number of segments prompt, enter a low value such as **6 or 8** and **press the left mouse button**. Use this command to convert all arcs to polylines.

Because the converted arcs will snap to the subgrid (the database resolution) there maybe a missalingment of the arc to the connecting line segments. If the arc end points need to be adjusted, you will use the Ledit menu commands. We will assume that a arc polyline needs adjustment in the next 3 steps.

14. Move the cursor over the end of a arc polyline and continue to press the **Page Up** key until you can see if the arc and connecting line are at the same location in the database.

15. If the arc end point needs to be moved, select the **LEDIT** Menu and then the **Move Vertex** button. Place the cursor over the end point of the arc and **press the left mouse button**. Follow the prompts to move the end point and then **press the right mouse button** to deselect the arc.

16. After the arc end points have been edited, use the Join Entity command to tie the polylines together as defined in step 12.

You can use the other editing commands in the Ledit Menu to modify the structures to meet your needs. and then you can export the file in the CIF format.

17. Select the **FILE** Menu and then the **Export** button. Then select the **CF** CIF button.

18. At the Gen CIF prompt, **press the left mouse button** for the default Database output. **Press the left mouse button** for the default CIF file name.

19. The editor will check to confirm if there are any remaining circles or arcs (2 or 3 point entities) that need to be converted to polygons and polylines. Again select a low value such as **6 or 8.**

IMPORT PROBLEMS

1. AutoCAD database physical size or the location of the 0,0 coordinate is the most reported problem. This is where the coordinate values exceed the CADnex max value of +32,000 or -32,000. In most cases, if the 0,0 is located in the center of the geometries import problems will be removed.

   Some simple tests to confirm physical size or coordinate location is not going to be a problem:

   A. When opening a database and if in IC or MCM, select a resolution of 1/1.

   B. When importing a DXF file and a resolution default of (3) is displayed. Enter (0) so the geometry will be at the smallest size.

   C. After geometries are displayed, Zoom out by pressing the PgDn key until the white database boundary limit is displayed. If there is sufficient space, you can import the file using a larger resolution value.

2. AutoCAD supports architect design and mechanical solid modeling that require special entities. These commands are generally not used in microwave stripline and packaging applications. Therefore, CADnex will have problems importing the following entities:

   HATCH are geometries with special fill codes

   SHAPES are an alternative to BLOCKS with additional attributes. TRACES are similar to a PLINE but automatically calculates the miter for adjacent segments after endpoints are defined.

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   SOLIDS are filled areas entered in a triangular order.

   POINTS are placed in the database as reference items.

   DIMENSIONS are used to define entity size

   3DPOLY are polylines used to define 3D entities

   ATTDEF are attributes that can be attached to an entity or block such as a bill of materials.

   3DFACE are used in 3D entities where a defined line can be made visible.

   You should remove and purge all of the above items before creating the DXF file.

3. In AutoCAD, Circles and Arcs are created by a center point and radius (circle), center point and start/stop points for arcs. IE3D will not accept this type of entity, this means they have to be converted into a polygon or polyline before they can be imported into IE3D. Use the **CC** (Convert Circle) command located in the Utility Menu. It is recommended that you use 6 or 8 vertices so you can keep the number of IE3D cells to a minimum.

4. DXF files can have blocks within blocks at an unlimited hierarchical level. IE3D will not accept hierarchical blocks, so you must break these blocks (shapes) down to "flat" geometries before you export the file into CIF. Use the **XP** (Explode Shape) command located in the **LIB** Menu.

5. Arcs can be used to construct a polygon. In this case, you need to convert the arcs into polylines as defined in 1. Above and then glue them together with the other polylines by using the **Join** (JO) command.

   TIPS: After converting arcs to polylines, you may have to change the width of the polyline to zero, in order to match the width of the adjoining lines. The best way to do this is to select all geometries by selecting the **ID** Menu and the **Identify Window** command.

Place a window around all geometries. Now you simply type **CW** (change width). At the prompt, if the default prompt is not 0, enter 0. After this is done you can type **JO** (join) and this should glue the arc polyline and the other lines together. To confirm that this has been accomplished, select the **ID** Menu and the **Select Entity** command. If all segments are highlighted, then they are joined together. If not, zoom into the area where the arc meets a straight line and you will have to use the **Move Vertex** (MV) command to move the end of the arc to the straight line location. The reason for this is the resolution of the CAD system is not enough to locate points that coincide with the connecting lines. AutoCAD can use double precision to produce arcs (12 digits).

Confirmation of a closed polygon can be done by typing **FI A** [Enter] which turns fill on for all layers. All thick lines and closed polygons will be filled. A broken polygon will not be filled, therefore, you must find the point where it is open and use the move vertex command to edit the polygon.

6. AutoCAD DXF files can contain references to geometries or blocks that have been deleted. If the deleted geometries are larger or out of range of what the CADnex database physical size can support, CADnex will display an error and abort the import process.

   To correct this, use the WBLOCK command located in AutoCAD.

   While in the AutoCAD database, take the following steps.

   a. Type WBLOCK - The system will prompt for a Drawing name. Enter a name.

   b. The system will prompt for a Block name.

   c. The system now prompts for Insertion of base point. Select the center of the geometries.

   d. The system will prompt to Select Objects. Use the left mouse button to place a window around the geometries.

   e. The System prompts for Select Objects.
   Press Enter

   f. Now you will need to open the Drawing (DWG) file named in a. above. and then export a DXF file from the drawing.

NOTES

1. AutoCAD can support geometries with unlimited verticies as well as arcs that are smaller than the CADnex database resolution. When these geometries are entered into the CADnex database, CADnex will report an error such as 'entity has only one vertex or entity exceeds 1024 verticies'. These errors can be fixed by typing **PK ER [Enter].** Note, that the geometry has been removed from thedatabase and not fixed.

GERBER PHOTOPLOT FILE IMPORT

The quickest way to import Gerber files is a three step process. First load the Gerber files into CADnex using a blank aperture list. As apertures are used, they are added to the aperture list. step two is to edit the apertures. The final step is to delete the geometries with the default 10 aperture size and reload the Gerber files that will use the correct aperture sizes.

DATABASE SETUP

To make sure you have adequate database space, you will need to confirm you do not have deleted geometries in the deleted list. Select the Util menu and the Pack Database command. This removes all geometries from the deleted storage buffer.

LOADING GERBER FILES

1. Select the File Menu. Then the IMPORT command.
2. The DataBase In menu pops down. Select the PH (Gerber) button from the menu.
3. The system prompts for CADnex (C) or Foreign (F) files. Enter F for foreign.
4. The system will prompt for an Aperture Filename? Enter Space (space bar) for no name.
5. The system prompts Number of Trailing Digits. Enter the precision of the Gerber file. Usually 3 or 4.
6. At the next prompt, Layer Number to Load Data? press Enter to place the data on the default layer 41.
7. The system will prompt for the next layer file name. Enter the layer name. The layer to load data will be the sequential layer (42). To terminate the entry of additional layers simply press the Esc key.
8. Select the Aperture menu and the Aperture command. Modify the apertures to match the aperture list of the Gerber files.
9. Select the Okay button & respond Yes to the Save the Aperture File prompt.
10. Select the Aperture menu and the Update Layer command. At the Layer to Clear List prompt, enter A (for all)
11. The Select the Util menu and the Pack Database command.
12. You are now ready to reload the gerber files. In this procedure, strart with item #1 above.

NOTES

1. Modal format is not supported. Modal is where an X or Y valure is not entered when the valure has not changeed from the previous entry. In CAD systems, Modal output can be turned off.
2. G74, G75, G91 I & J Codes for Arcs are **not** supported.
3. Special Apertures such as Oval, Moire, Octagon, Polygons and other special apertures are **not** supported.
4. Absolute format for data is required. Absolute format means that all X and Y coordinate valuse are relative to a zero location.

APERTURE CODES

D - Select aperture or set aperture use mode
D01 - Light on for next move
D02 - Light off for next move
D03 - Flash (light on and off) after move

X - Move to X value

Y - Move to Y value

G - Various setup codes
G01 to G03 - Future or reserved commands.
G04 - Ignore rest of block
G54 - Prepare to change apertures
G74 - Future arcs are quadrant arcs
G75 - Future arcs are full 360 arcs
G90 - Absolute data
G91 - Incremental data

M - Various control codes
M00 - Full Stop
M01 - End of Plot
I - Relative X location for arc center
J - Relative Y location for arc center

IMPORTING A GDS-II FILE

This section explains how GDS-II stream files are imported into the editor.

NOTES:

1. The overall extent of the database may not exceed the rante of: +32,768/Resolution to -32,768/Resolution, where Resolution is the number of CADnex database units per 'User Unit' (Microns, Mils or mm)

2. In most cases no problems will arise while importing stream files. However, data truncation may be minimized if knowledge of the process drawing rules are understood. The user should determine the most appropriate database Resolution for the incoming stream file, prior to conversion. The data should have an integer result when divided by the inverse of the Resolution. ie.. 29.125uM/(1/R) or 29.125uM/.125.

3. GDSII stream utilizes database resolutions comparable to the system with the exception of the 1000 DB units per user units (microns). GDS users have used the 1000 resolution as a standard in and effort to diminish the round off and truncation errors that may occur in large vectors numbers

4. When opening the database, the user must choose the resolution that fits there needs. If the database must match an existing database that has been designed at 1000 DBU/user unit, then output to GDSII stream at 1000. When designing a library with the option to choose the resolution that best suits the design, then we would suggest that a common resolution be maintained between GDSII stream and the database. An example of this may be that the user is designing

a 1 and 1/4 micron CMOS process. All geometries and spacings may be digitized on a minimum of 1/4 micron grid increments. A high degree of database accuracy may be maintained by choosing a database resolution of 1/8 micron or 1/2 of the minimum grid units. Regardless of the resolution used, the output GDS-II stream resolution will be 1000.

OPERATION GDS-II STREAM IMPORT

1. Select the “FILE” Menu. Then select the ‘Import’ button. Now select the ‘Stream’ button.

2. At the “StreamFile name?” prompt, press <>. A listing of all files with the .GDS extension will be displayed in a menu. Select the [filename].GDS file with the cursor. The system will prompt ‘Library to create?’ that is asking for a library name you want to use to hold the cells in the stream file. Enter a name. The system will convert the stream file into the library file.

3. At the ‘Add Lib to List?’ prompt, press <>.

4. To load and edit a cell in the library you created, select the “LIB” Menu. Then select the ‘Get Shape’ button. Select the appropriate library. A listing of the cells will be displayed. If the Stream file was generated by this editor and of the database,the top level cells name will be the database name.Select a cell and place it in the database.

5. In order to edit a cell you need to explode or flatten it at least one level. Select ‘Explode Cell’ from the “LIB” Menu and place the cursor near the cell reference point and press the left mouse button.

OPERATION CIF IMPORT

1. Select the “FILE” Menu. Then select the ‘Import’ button. Now select the ‘CIF’ button.

2. At the “CIF Filename to Load? prompt, press <>. A listing of all files with the .CIF extension will be displayed in a menu. Select the [filename].CIF file with the cursor. The system will prompt ‘Library to create?’ that is asking for a library name you want to use to hold the cells in the CIF file. Enter a name or use the default name that is the same as the CIF file name. The system will convert the CIF file into the library file.

4. To load and edit a cell in the library you created, select the “LIB” Menu. Then select the ‘Get Shape’ button. Select the appropriate library. A listing of the cells will be displayed. If the CIF file was generated by this editor and of the database,the top level cells name will be the database name.Select a cell and place it in the database.

5. In order to edit a cell you need to explode or flatten it at least one level. Select ‘Explode Cell’ from the “LIB” Menu and place the cursor near the cell reference point and press the left mouse button.