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Design Accuracy Vs. Artwork Accuracy

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Copyright Statement

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Purpose

This document describes how the design accuracy should be set so that it matches the artwork accuracy, thus avoiding problems when creating manufacturing data.

This is done to support legacy products, as some PCB users are using the GDSII stream output which has a much higher level of accuracy. (This is more commonly used in IC Package Design).

Audience

This document is intended for PCB designers who are setting up design databases but are not sure what settings need to be used to correctly produce artworks using different formats.

Design Accuracy Vs. Artwork Accuracy

When opening a new PCB design and selecting MILS, the highest accuracy allowed is 2.
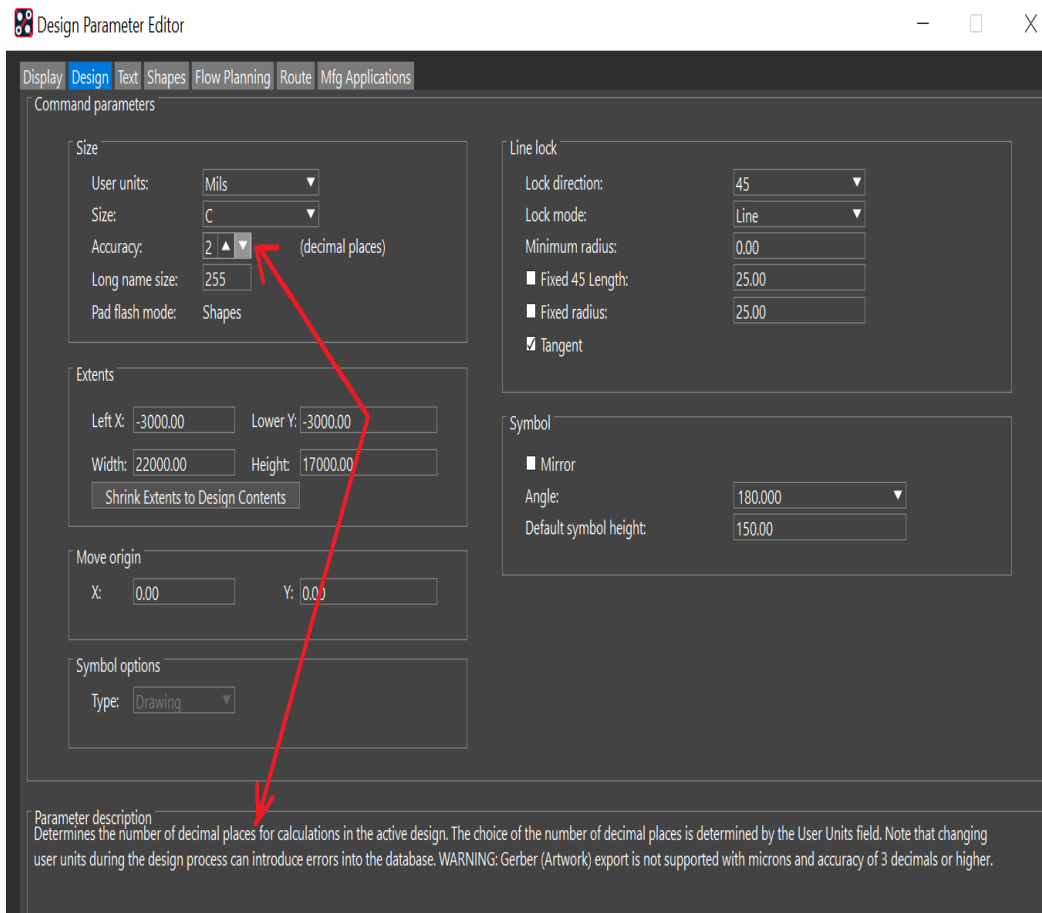
While the database units may be in MILS, the artwork and other manufacturing parameters such as NC Drill are output in Inches.

When setting the database design units, this change in units must be accounted for. In addition, when creating **raster-based** artwork, you should use artwork parameters that are one decimal place greater than the resolution of the database.

As an example, when your database units/accuracy are MILS 1, you should use an artwork format of x.5 which is the greatest accuracy at which an artwork can be generated.

Below is the information from the Allegro **Help** menu defining database accuracy:

Database Unit Accuracy	= Artwork Format
MILS 0	= x.3
MILS 1	= x.4
MILS 2	= x.5
MILS 3	= x.6 **(not available)**
MILS 4	= x.7 **(not available)**
INCH 3	= 2.3
INCH 4	= 2.4

Cadence recommends designing data **at or below** the accuracy level that the fabricator vendor supports.

Example

If the artwork is output in INCHES and the highest resolution is x.5, that is equal to .00001 inches. When using an RS274X artwork, you should use an output parameter that is one place greater than your database accuracy.

      x.5 INCHES = MILS 2

Therefore, the maximum resolution of your database should be MILS 1 or its equivalent. If design accuracy is set to high (4), an artwork cannot be generated that can be manufactured.

**With a variable, the user can expand the design accuracy for MILS to "4".**

Enabling the variable "**drawing_4mils**" found in the **User Preferences Editor > Drawing** category, you can use a greater accuracy than MILS 2. When setting the design parameter for accuracy to 3 or 4, you will be presented with the following confirmation dialog box:
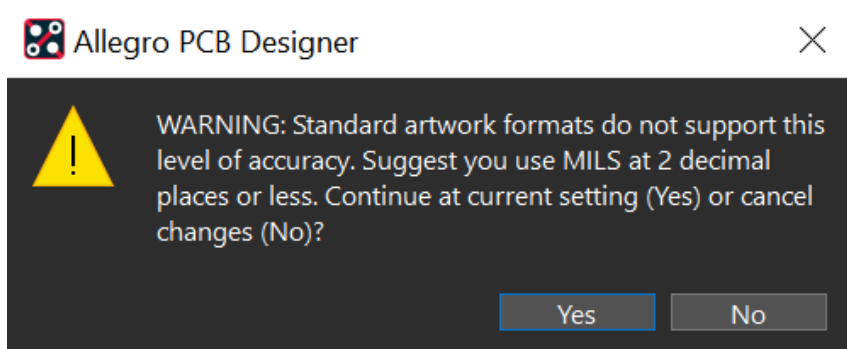
The user is asked to continue or cancel the change.

Note: If you want to suppress the confirmation dialog box, set another variable called **drawing_no_4mils_msg**.

Both variables are shown in the graphic below:
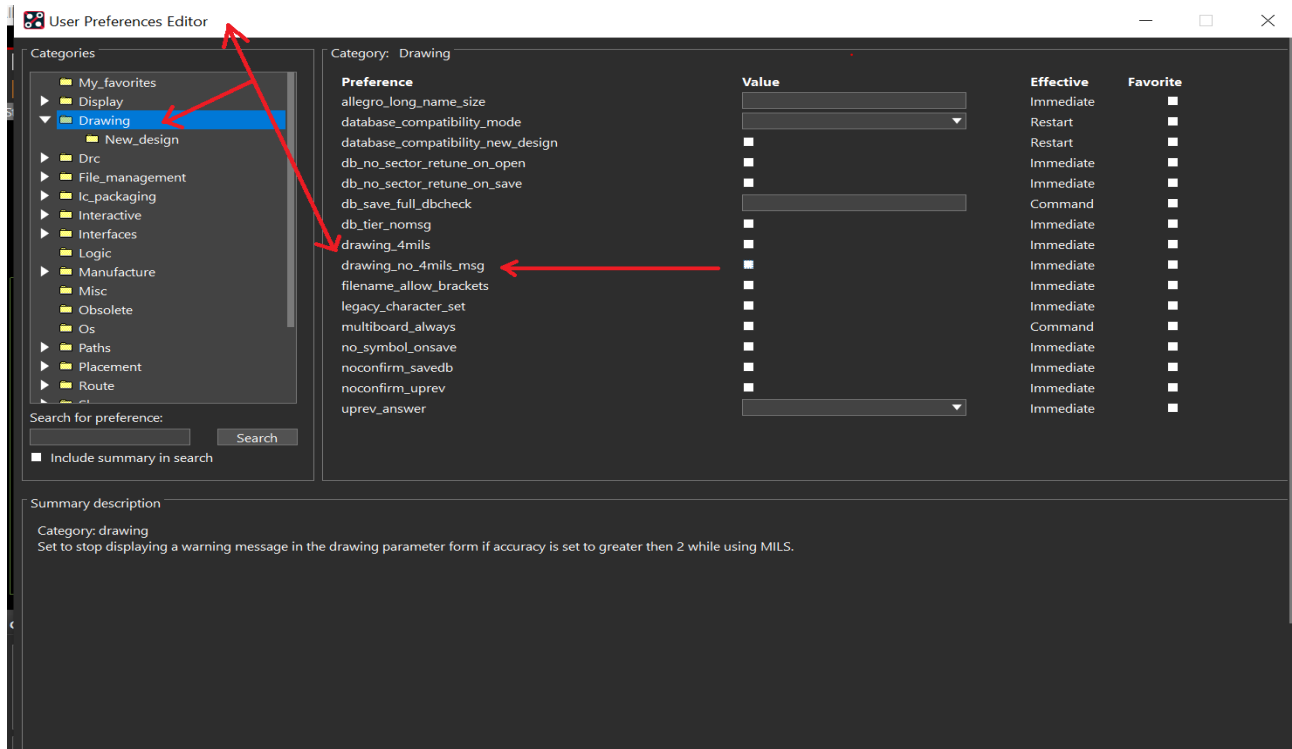
By setting the **drawing_no_4mils_msg** variable, you acknowledge that you will **no longer** get the accuracy warning message.

Should PCB users set this variable for standard PCB designs?

It is not advisable to use accuracies greater than MILS 1 for a design when you intend to output a raster-based artwork or MILS 2 when creating a vector-based artwork.

Because MILS 3 and MILS 4 are accuracy levels that the fab shops cannot truly support, problems with rounding down of data can cause board failure.

What can happen?

When arcs are rounded down, they can invert. A fab shop receiving an artwork file at a high accuracy may round down the data with their CAM software. The CAM software may flip the direction of arcs in shape data and that causes shorts on boards.

What Cadence has done

This is the reason Cadence has added a safeguard to the unit setup.

You **must** enable the variable if you wish to work in units greater than what is currently the fab standard for boards.

PCB Editor has also been updated to prevent a PCB Editor artwork from containing that type of inverted arc, but Cadence does not have control on the software used by the fab community to manipulate artwork files.

Recommendations

Plan the Design

For that reason and for the integrity of the design, Cadence suggests that you plan the design unit/accuracy based on the fabrication process.

Review Data

As always, you should review the photoplot.log file for any warnings and/or error messages and take the needed action to resolve those before sending the files to your fabricator.

While artworks that contain warnings will be created, you are taking the risk that the fab shop will round down the data, leaving you with a board that possibly does not meet the requirements that you set. Even worse, it can contain shorts because the arcs can invert (flip).

Reset Accuracy

If you have a design with design units of MILS and an accuracy of 3 or 4, you should reset the accuracy to a value that your fab shop can support.

It is far better to deal with potential DRCs prior to releasing the product than to pay for fabrication of boards that are of no use.

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