Productivity Toolbox User Guide

Label Tune

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1 Label Tune – Overview

During placement components will be mirrored and rotated in order to improve routability. The text labels (e.g. on *REF DES/ASSEMBLY_TOP*) are modified in the same way resulting in texts which a hard to read. On the other hand customers often create assembly drawings for review and documentation purposes. Therefore there is a need to adjust text parameters such as size, rotation, and justification. PCB Editor offers various editing capabilities, but a post processing of text labels using these commands is very time consuming and awkward. **Label Tune** is an application which allows the user to improve text label readability in a more automated way.

This document describes the features and use model of this toolkit.

The **Label Tune** module offers the following capabilities

- Automatic rotation of text labels to predefined values (e.g. 0 and 90 degrees) for better readability.

- Labels to be processed can be chosen from *Refdes*, *Value*, *Part Number*, *Device Type* and *Tolerance*

- Automatic centering of text labels inside a component outline

- Automatic fit operation by increasing the text size as long as the text fits into the symbol boundary.

- Automatic mirroring of text labels depending on placement side

Label Tune increases productivity and will help the customer to create readable assembly drawings in a very short time.
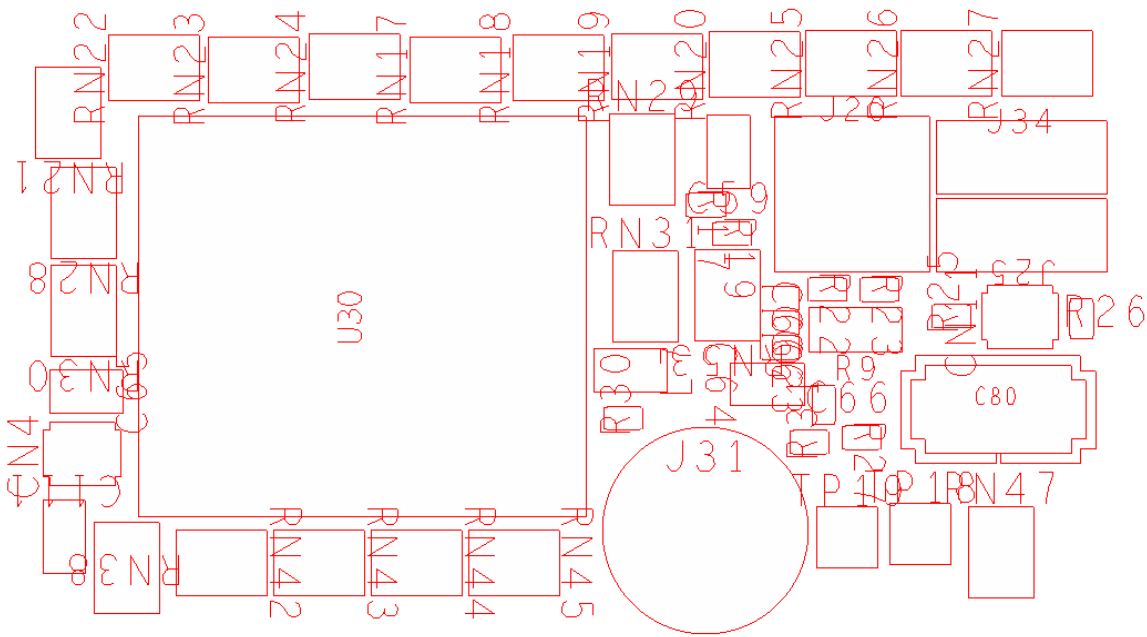

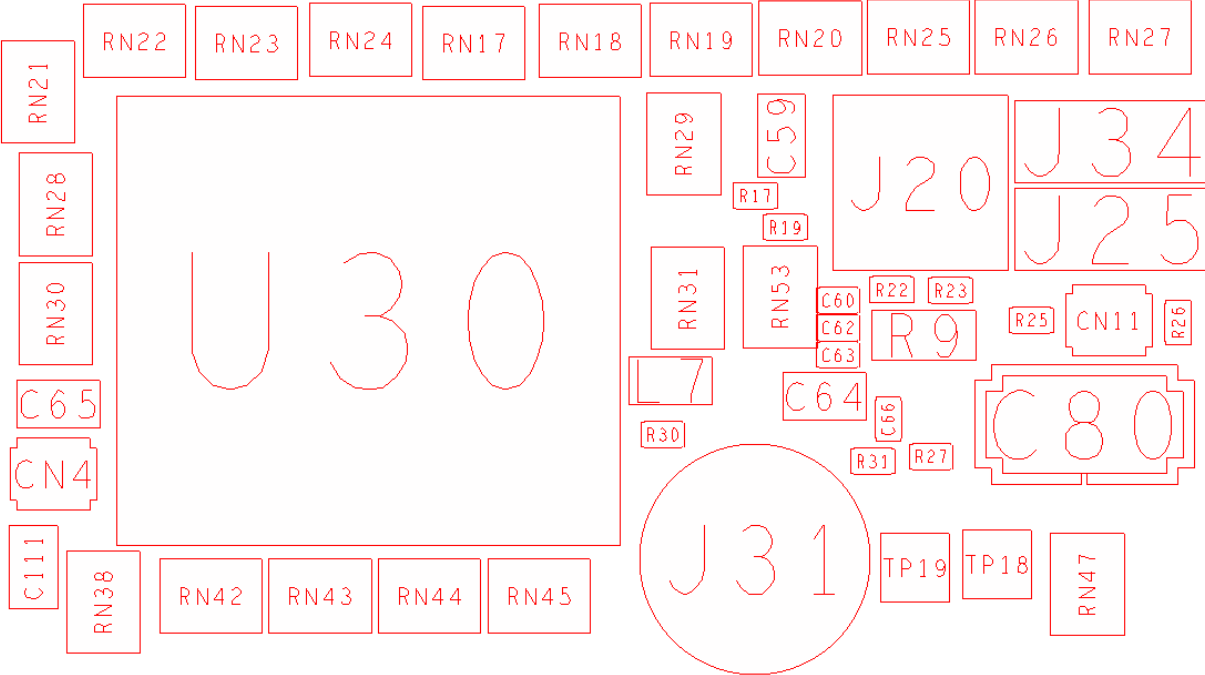
Figure 1: Typical example for bad readability

Figure 2: Result after running Label Tune

2 Use Model

Label Tune can be started from Pulldown menur by entering the command `tbx labeltune` in the console window. After launching the **Label Tune** application a form appears. It contains two tabs *Main* and *Advanced*.
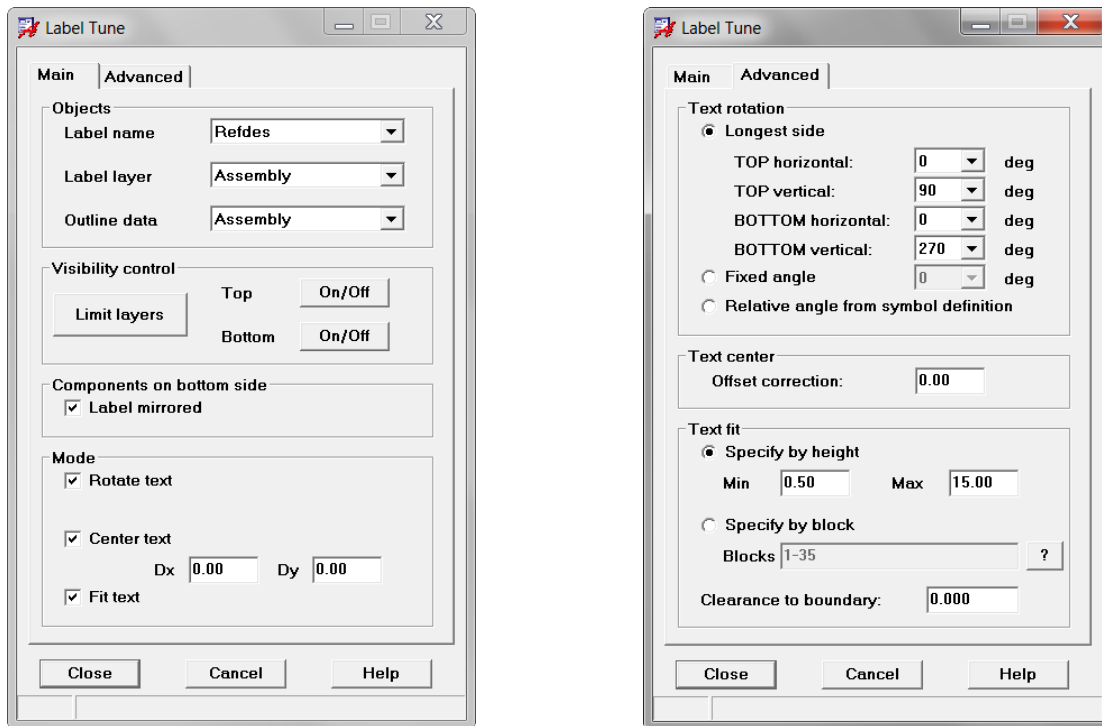

Figure 3: Label Tune Main and Advanced tab

After the tool has been launched, the main form will appear. Various options are available. The basic use model may look like this:

- Specify the label to be processed, possible values *are Refdes, Value, Part Number, Device Type* and *Tolerance*

- Specify the label layer to process. For example in case of *Refdes* labels may appear on

  - *REF DES/ASSEMBLY_TOP (BOTTOM)*

  - *REF DES/DISPLAY_TOP (BOTTOM)*

  - *REF DES/SILKSCREEN_TOP (BOTTOM)*

- Specify the component outline to be used during calculations.

- Specify the text operation to be performed, such as *Rotate*, *Center, Fit*

- Now you can select components by pick or by dragging window. Once a selection has been made, the text labels of the corresponding components will be processed.

Note: **Label Tune** also supports user defined subclasses. In terms of text labels it means that all subclasses from the corresponding label (e.g. *Refdes* or *Value*) will be displayed. In terms of outline data all _TOP and _BOTTOM subclasses from *PACKAGE GEOMETRY*, except Soldermask and Pastemask, will be derived and displayed.

Figure 4: Visibility control

For visibility control there are three additional switches:

- *Limit layers*
  Pressing this button will limit the display to component outline and label layers as specified in *Objects* section including *BOARD GEOMETRY/OUTLINE*.

- *Top On/Off*
  Will toggle outline and label display for components on TOP side only.

- Bottom On/Off
  Will toggle outline and label display for components on BOTTOM side only.

2.1 Text Rotation

This is the basic text operation. Text labels will be rotated in such a way that the texts become readable, as an example for horizontal alignment 0 degrees and for vertical alignment 90 degrees.

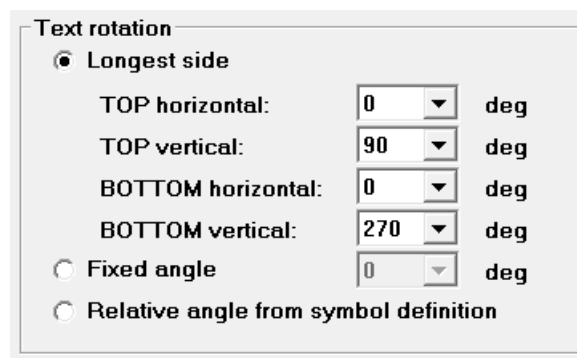In the *Advanced* tab you can modify text rotation parameters:

Figure 5: Text rotation parameters

Three modes are available:

- *Longest side*

- *Fixed Angle*

- *Relative angle from symbol definition*

2.1.1 Longest side

Label Tune calculates the extents of the component instance outline. For example if the horizontal extents are greater then the vertical extents and the component is placed on the top side, the value from field *TOP horizontal* will be taken to rotate the text. You can specify parameters for components on the bottom side separately. This mode is particularly suitable, when the components are rotated with standard values such as 0, 90, 180 and 270 degrees. Using this mode for components rotated at an odd angle may lead to undesirable results, as **Label Tune** always calculates bounding box extents in order to decide which side is longer.
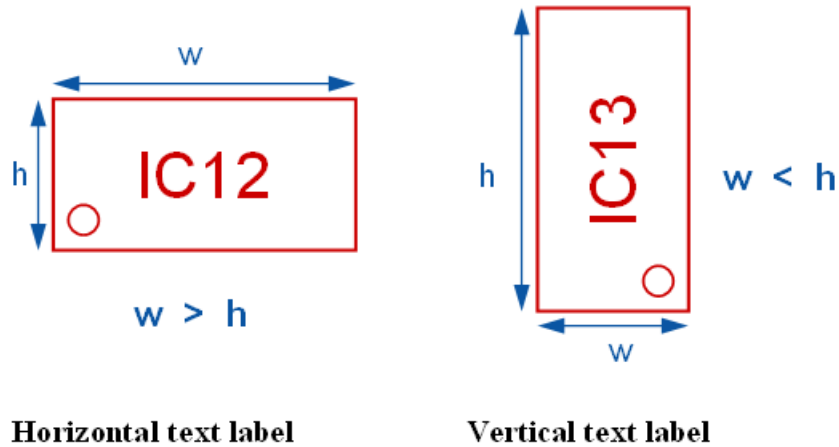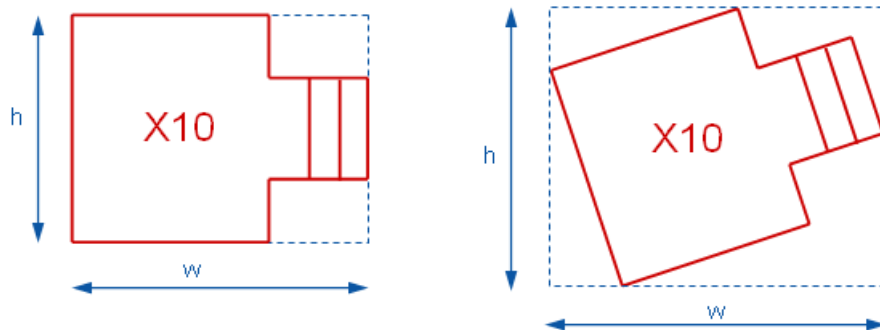

Figure 6: Ratio width by height

Figure 7: Component outermost extents

The figure above shows once again how width and height are calculated. Only the outermost corners from the component outline layer will be considered. Any objects inside (additional lines, circles etc.) will be ignored. Using these corners a bounding box will calculated (blue dashed line). **Label Tune** compares width and height of the bounding box.

The calculation will be done as follows:

1. Calculate the outermost extents (bounding box) from component instance outline. The layer has to be specified in the *Main* form. The default layer is *PACKAGE GEOMETRY/ASSEMBLY_TOP* and *PACKAGE GEOMETRY/ASSEMBLY_BOTTOM* depending on placement side.

2. Compare width by height

3. Determine final text rotation, based on the following table. The default values can be modified in the *Advanced* tab. For horizontal texts possible values are 0 and 180 degrees, for vertical texts 90 und 270 degrees respectively. You may distinguish between texts on TOP and on BOTTOM side.

Ratio width by height	Placement	Final text rotation (deg)
Width > height	TOP	0
Width < height	TOP	90
Width > height	BOTTOM	0
Width < height	BOTTOM	270

2.1.2 Fixed Angle

Using this mode the user can force a fix value for rotation. Possible angles are 0, 90, 180 and 270 degrees.

2.1.3 Relative angle from symbol definition

When the components are rotated in an arbitrary way, you can also use this mode to calculate the text parameters. In this mode **Label Tune** looks into the symbol definition (library element) and extracts the default text label rotation. With this value and the current rotation of the component instance, **Label Tune** will calculate the text rotation value for better readability.
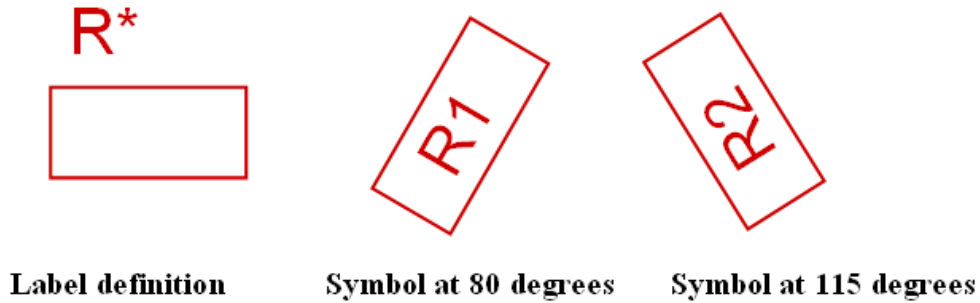

Label definition   Symbol at 80 degrees   Symbol at 115 degrees

Figure 8: Relative angle from symbol definition

The calculation will be done as follows:

1. Extract text label rotation from symbol definition (footprint)

2. Extract symbol rotation from selected component

3. Calculate `total_rotation = symbol_rotation + text_label_def_rotation`

4. Determine final text rotation based on the following table

Placement	**Total rotation** `alpha` **(deg)**	**Final text label rotation** `beta` **(deg)**
TOP	0 <= alpha < 135	beta = alpha
TOP	135 <= alpha < 315	beta = alpha + 180 (*)
TOP	315 <= alpha < 360	beta = alpha
BOTTOM	0 <= alpha <= 45	beta = alpha
BOTTOM	45 < alpha <= 225	beta = alpha + 180 (*)
BOTTOM	225 < alpha < 360	beta = alpha

(*) calculate beta = beta – 360.0 when beta > 360 degrees
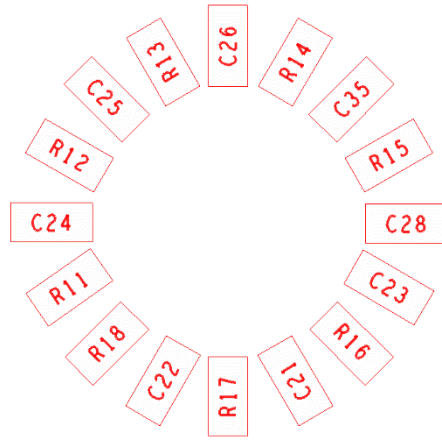
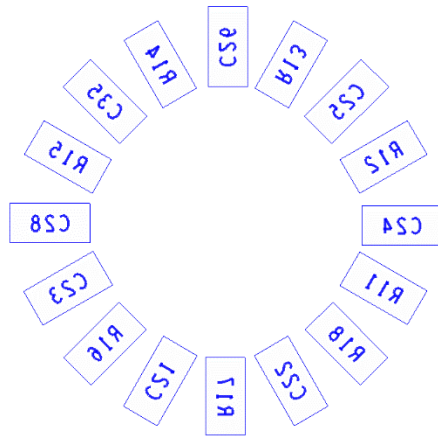**Figure 9: Any angle labels on top side**

Figure 10: Any angle labels on bottom side

2.2 Text Centering

The initial text justification is derived from the symbol definition (library element) and may be changed interactively in *PCB Editor*. Using this option will change the justification to *CENTER* and will place the text exactly to the calculated center (not the symbol origin) of the selected component bounding box.

In addition you can specify a distance in *Dx* and/or *Dy* direction (referenced to the calculated center point of the component outline) which will then move the text labels accordingly.
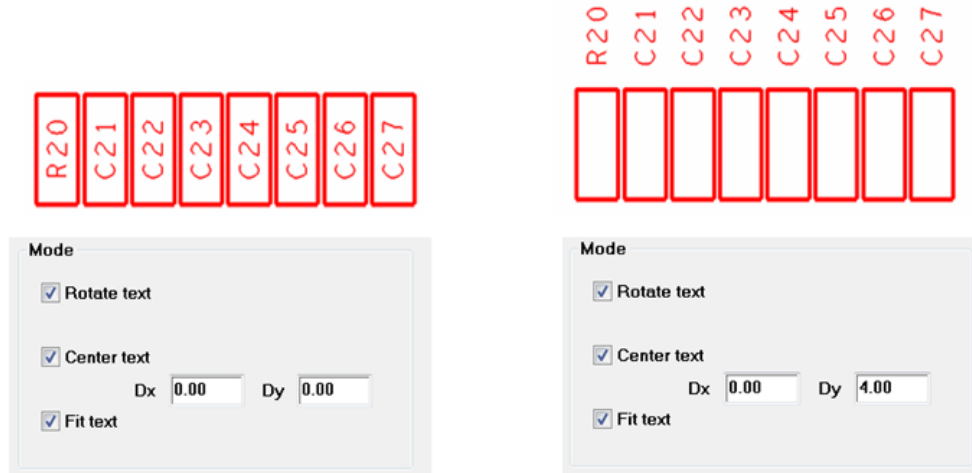

Figure 11: Specifying values Dx and Dy

You may specify an offset correction value, which is a factor between -0.5 and +0.5. As an example a negative offset value will move a text with rotation 0 degrees slightly into the negative y direction, while a positive value will move it into the positive y direction respectively. The default value is 0. Please note the value specified here is dimensionless.
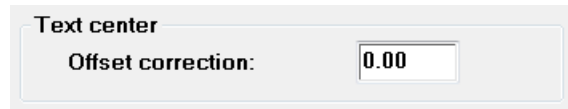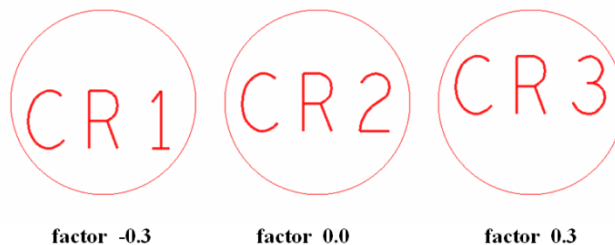

Figure 12: Text center parameters

Figure 13: Text label offset correction

2.3 Text Fitting

In this mode **Label Tune** does the following steps:

1. Adjusting text rotation for better readability

2. Centering the text labels into the component outline

3. Increasing the text size as long as the text value fits into the component outline.

When you activate the checkbox, the other checkboxes for *Rotate Text* and *Center Text* are automatically enabled.
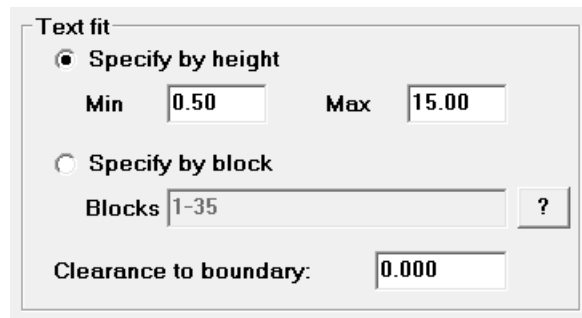

Figure 14: Text fit parameters

This mode is particularly suitable if you want to emphasize the text labels from larger components. Those components will be found more quickly, when their labels have bigger text sizes. **Label Tune** calculates the component instance outline and increases the text size as long as the text value will fit into the component outline. You can specify minimum and maximum values to be used either by text height or by block number.

- *Specify by height*
  The minimum and maximum values refer to the text height of a text block. **Label Tune** will sort the text table with respect to text height in background before the fit operation is started. This mode always ensures correct results due to the sorting procedure.

- *Specify by block*
  Alternatively a list of text blocks to be used can be specified. Individual blocks have to be separated by white space. The "-" character can be used to specify a range of blocks. The values can be entered in an arbitrary order. The application will sort the text blocks internally by its height.
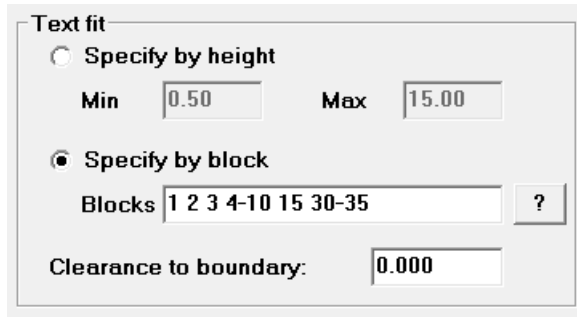
Figure 15: Specifying a list of text blocks

Note: In either case **Label Tune** iterates always over existing block numbers. **Label Tune** does not modify any text block definitions nor does it add new text blocks to the database.

- *Clearance to boundary*
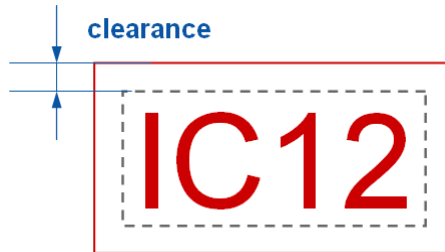 You can specify an additional clearance to the boundary outline that has to be honoured during calculations.

Figure 16: Text clearance to boundary