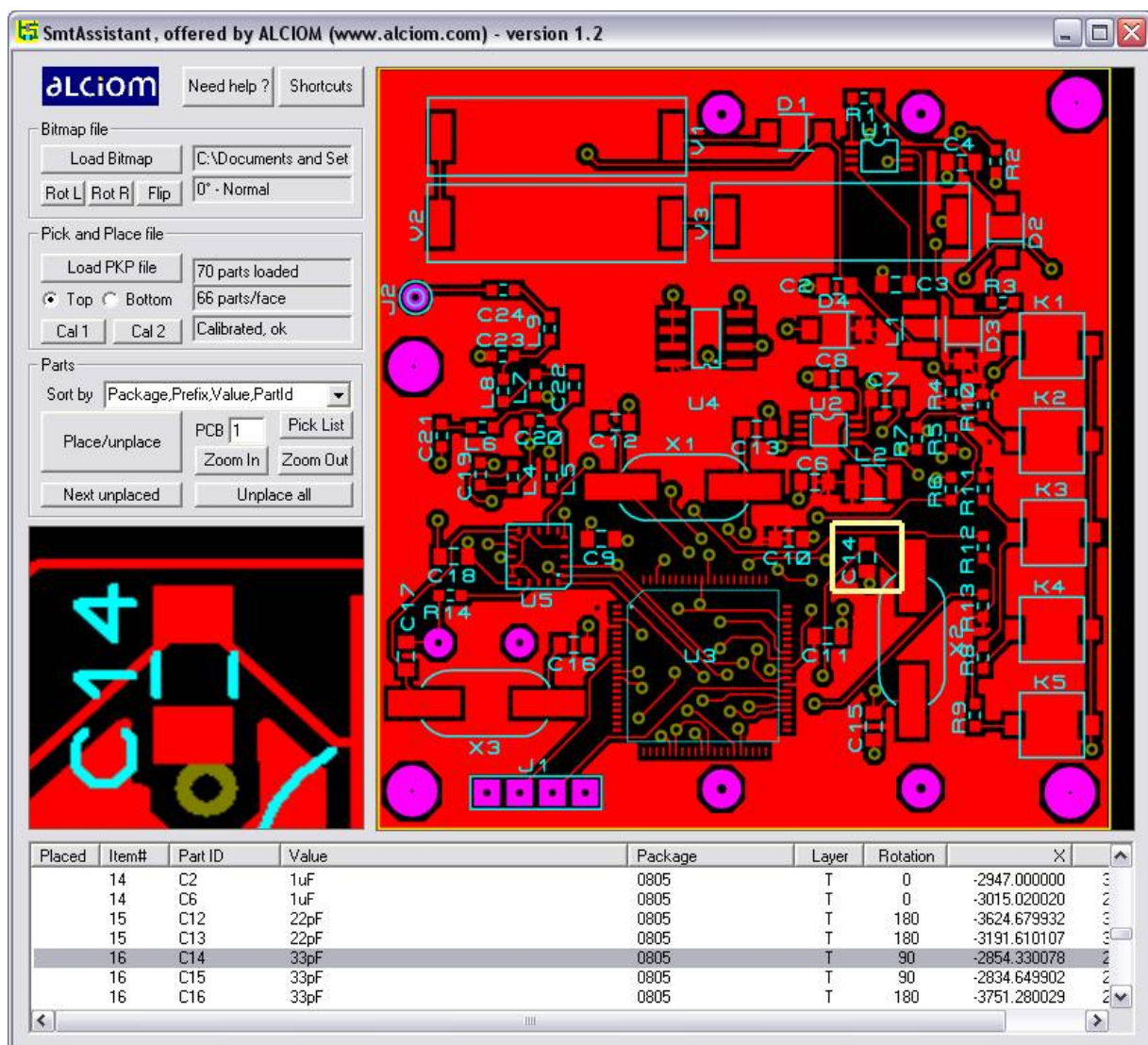# SmtAssistant - User Manual

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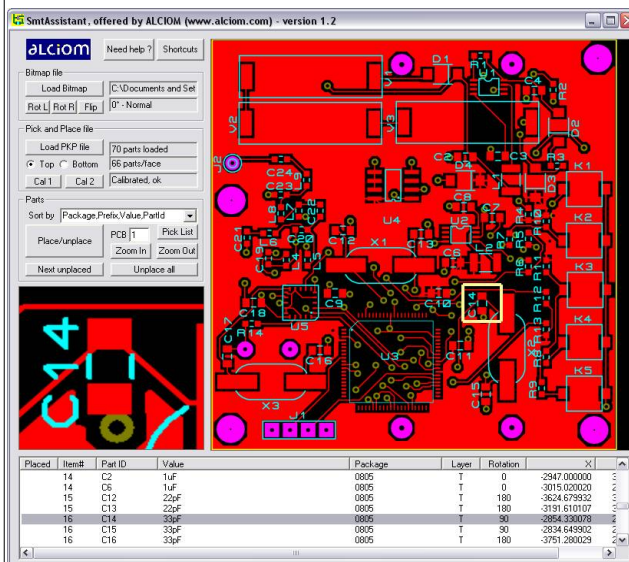
What is SmtAssistant ?

SmtAssistant is a simple but useful software which help you to **locate a given part on a printed circuit board (PCB)**, based on a <u>graphical bitmap of the PCB</u> and a <u>pick-list file</u> (PKP file).

The PKP file is a text file generated by nearly all CAD softwares. It defines the position and orientation of each part of the circuits. Usually this PKP file is used by automatic pick & place machines, but there are situations when you can use it "manually" :
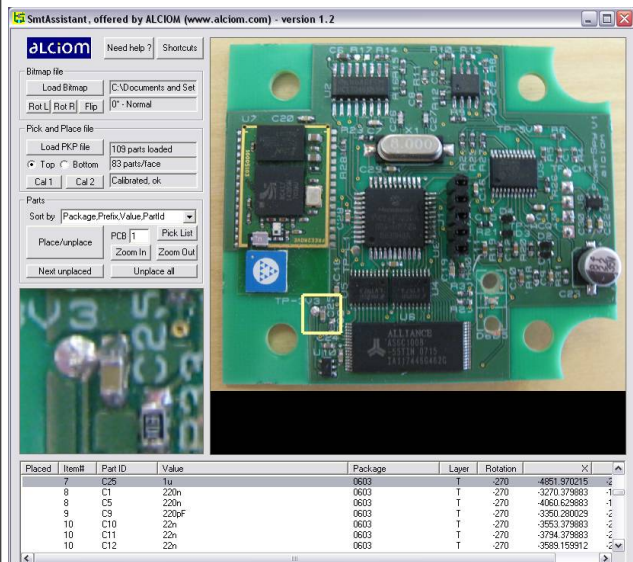
Prototype assembly	*Inspection or Repair*
When you need to **manually assemble prototype boards**. SmtAssistant could dramatically improves your speed and accuracy as you will no longer have to search for parts locations... SmtAssistant also helps you to prepare your part bins	For **inspection and repair operations**. SmtAssistant helps you to quickly find parts and tests points on complex boards, without having to go though the documentation ! You could even use an actual picture of the board...

We developed SmtAssistant for our own needs, so there isn't any fancy features. However it does the job and we think it does it quite nicely !

What do you need to prepare ?

Before starting SmtAssistant you need two files :

- Firstly a **bitmap** (BMP format) of your PCB, more exactly of the side of the PCB you want to work on (top or bottom). Any scale and resolution will be acceptable, but the axis of the PCB should be as parallel as possible to the axis of the bitmap. Usually you will have a feature in your CAD software to export such a bitmap, ideally just with the copper and silkscreen layers on the selected side for easier reading. You can also use Gerber files, exporting a BMP with the help of a Gerber viewer like Viewmate (Pentalogic) or gerbv (sourceforge), or simply by displaying the bitmap on your screen and using a screen capture utility like MWSnap. Lastly you can also take a picture of your PCB, taking care to align the axes and to avoid distortion.

- Then you need the **PKP file**. This ASCII file is generated by the CAD software. There isn't any standardized PKP file format unfortunately, but basically PKP files are ASCII-formated files which includes the identification and coordinates of each part. SmtAssistant is delivered pre-configured for the Proteus Ares PCB cad PKP file format as we use this one, but is easy to configure to support nearly all CAD systems through the SmatAssistant.ini configuration file, see here after.

    Depending on your CAD system the PKP file may includes more or less fields, and could be either a tabulated or comma-separated file. SmtAssistant requires that your CAD includes at least the following fields in the PKP file : Part identifier (for example R12, U2, etc), layer (Top or Bottom), X and Y coordinates of the part. Optional but very useful fields would include part value, package name and rotation.

    As an example here is the format of the PKP file generated by Proteus Ares :

```
LABCENTER PROTEUS PICK AND PLACE FILE
=====================================

Component positions for example.LYT

Fields: Part ID, Value, Package, Layer, Rotation, X, Y
Units:  Rotation - degrees, X, Y  - thou
Notes:  The X, Y value is the centre of package as drawn in ARES.
        The origin for these values is the Output Origin.
        The values are a guide only and must be checked manually when
        setting up automatic insertion equipment.

"K1","SPC21106","BUTT",TOP,0,-2289.72,3344.25
"V1","XOD17-12B","CELL",TOP,270,-3801.86,3977.6
"V2","XOD17-12B","CELL",TOP,90,-3804.86,3715.01
"C1","1200uF/4V","ELECT-8X10",BOT,0,-3803.72,3840.17
"C2","1uF","0805",TOP,0,-2947,3525
"U1","MAX1674","TSSOP8",TOP,0,-2816.8,3920.2
etc
```

How to use it, step by step ?

Let's explain how to use SmtAssistant step by step on an example, using the demo files supplied with the software. Assume that you need to assemble a couple of PCBs...
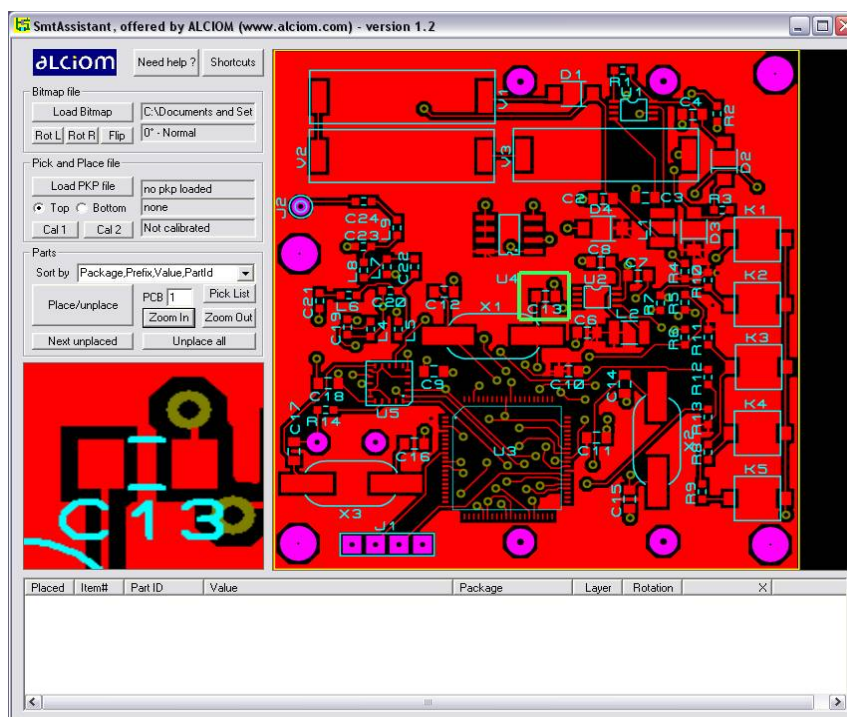
Install and run the software

Unzip the delivered zip file on your desk, or copy it in your Program Files directory. SmtAssistant doesn't require any other resources. Open the SmtAssistant directory, and launch **SmtAssistant.exe** (you may of course add a shortcut on your desktop or startup menu if you wish). Depending on your operating system you may have a security warning message, of course accept it...
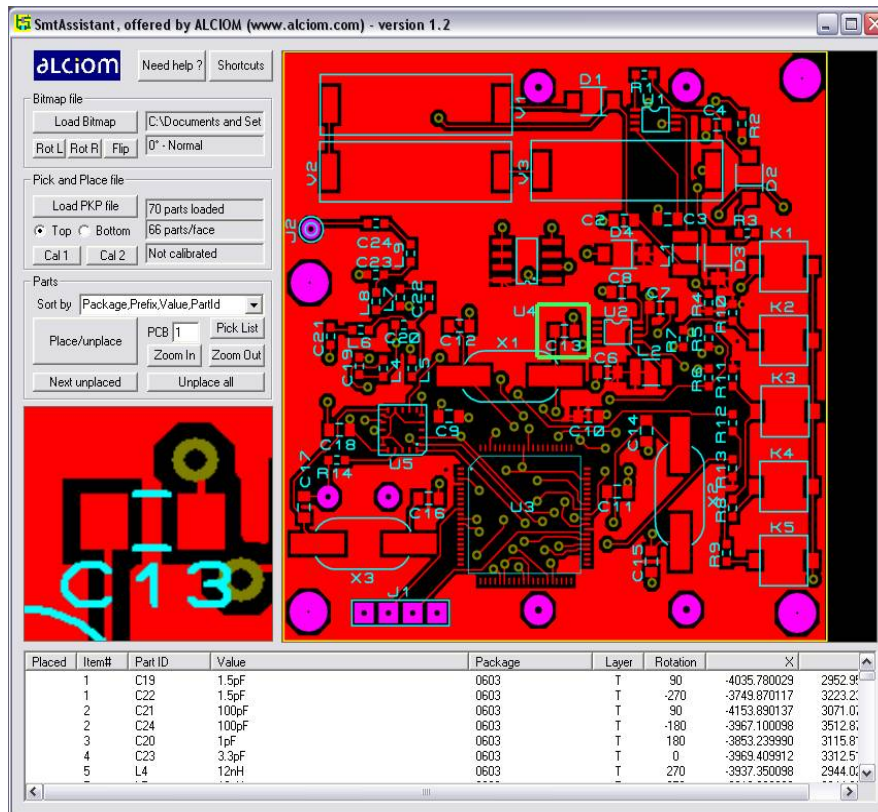
Load the bitmap file

Then you need to load the bitmap file representing your PCB. Click on "**Load Bitmap**" button, enter "example" directory and select "example_top.bmp" file. The PCB will be displayed on the right. You can rotate it with the "**RotL**" and "**RotR**" buttons, and flip it with the "**Flip**" button if needed.

Try to click or drag your mouse on the bitmap : a zoomed image will be displayed in the ancillary view. This is the <u>manual zoom mode</u>. You can change the zoom factor with the "**Zoomin**" and "**Zoomout**" buttons.

Load the PKP file

Then you need to load the corresponding PKP file. Just click on "**Load PKP file**", and select the "example.PKP" file. The part list will be displayed on the bottom area.

Click on the "**Top**" or "**Bottom**" selectors, the part list will be updated to show only the parts on the selected PCB side. The total part count on that side is also displayed. Leave the selector on "Top".
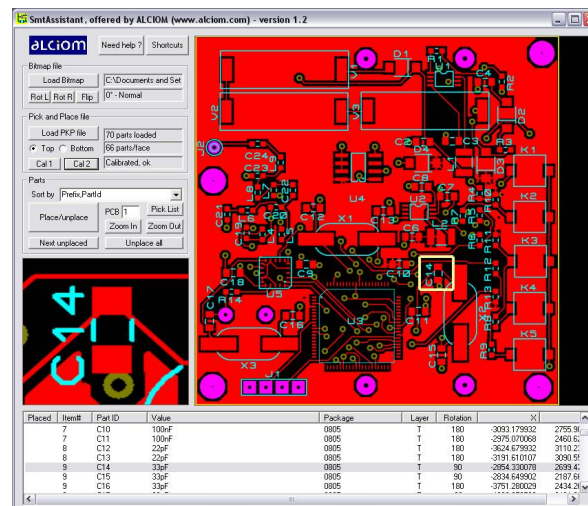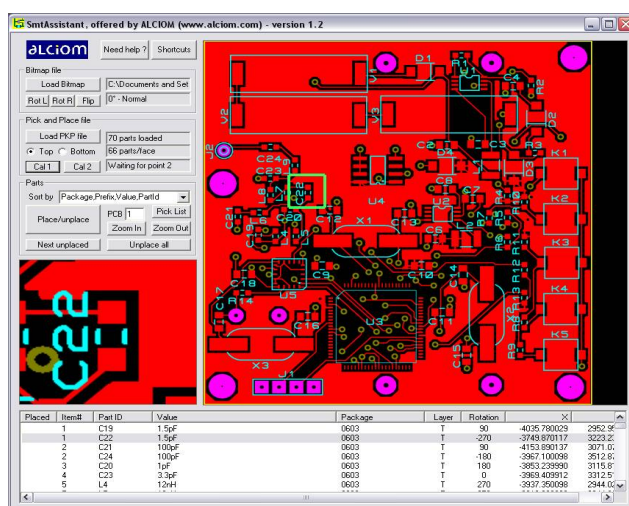
The part list could be sorted with different criteria, try to change it with the "**Sort by**" selector. By default the sort order is the more adequate for manual PCB assembly : parts are sorted first by package (0603 first, etc), then by the prefix (the letters at the beginning of the part identifier, like C for capacitors etc), then by value, and lastly by part identifier. This allows to group all components of the same value, and to place all components with the same package at the same time, and this is a great time saver... You can also select alternative sort orders. In particular sorting by prefix and part Id is the easiest for repair operations or to locate a specific part.

Calibrates !

SmtAssistant has no way to know the relationship between the bitmap image and the coordinates provided in the PKP file. Therefore a quick calibration step is required. This calibration requires you to manually indicate the position of two parts. You can use any two parts, but for a proper calibration these parts shouldn't be aligned either vertically, horizontally or in diagonal. This allows SmtAssistant to automaltically identify both the scale and the orientation of the bitmap.

The procedure is the following :

1. Click and drag on the bitmap area and center the cursor on any given part, for example C22.

2. In the part list, look for C22 and select it

3. Click on "**Cal1**". The text on the right of the calibration button indicates "Waiting for point 2"

4. Click and drag on the bitmap area and center the cursor on any other part, not aligned verticaly, horizontally or in diagonal with the first one, for example C14.

5. In the part list, look for C14 and select it. You may change the sort order to "Prefix, PartId" to find it more easily

6. Click on "**Cal2**". The text on the right of the calibration button indicates "Calibrated ok"

That's it. The zoom selection square is now highlighed in yellow, stating that you are now in part zoom mode : the zoomed area corresponds to the selected part.

If you have done something wrong the calibration may fail. In that case just start again with another couple of parts...
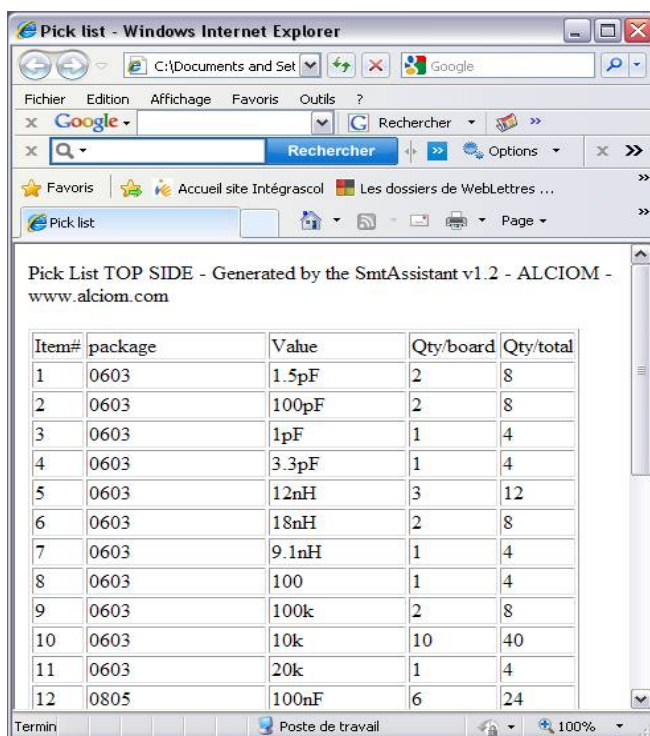
Verify the calibration

You can now verify the calibration. Just select any part in the part list, its position will be highlighted and zoomed on the bitmap. Great, isn't it ?

Generate the pick list and prepare your parts bins

SmtAssistant can also help you to prepare your parts for assembly. Select the defaut (first) sorting order. On the part list table the first column is "Item#". This field is incremented any time the package or part value is changed so it basically identifies the part bin. To prepare your parts for assembly, just follows this procedure :

1. Verify that the sort criteria is the default (first) one

2. Enter the number of boards to assemble in the "PCB" box (this will multiply the part count by this value for each part type)

3. Click on "**Pick list**". Your internet browser will be automatically launched, and will display the list of parts to prepare to populate your boards. This list is sorted in the same order than the pick list displayed by SmtAssistant, and the Item# matches. A copy of the list is automatically available in the clipboard if you wish.
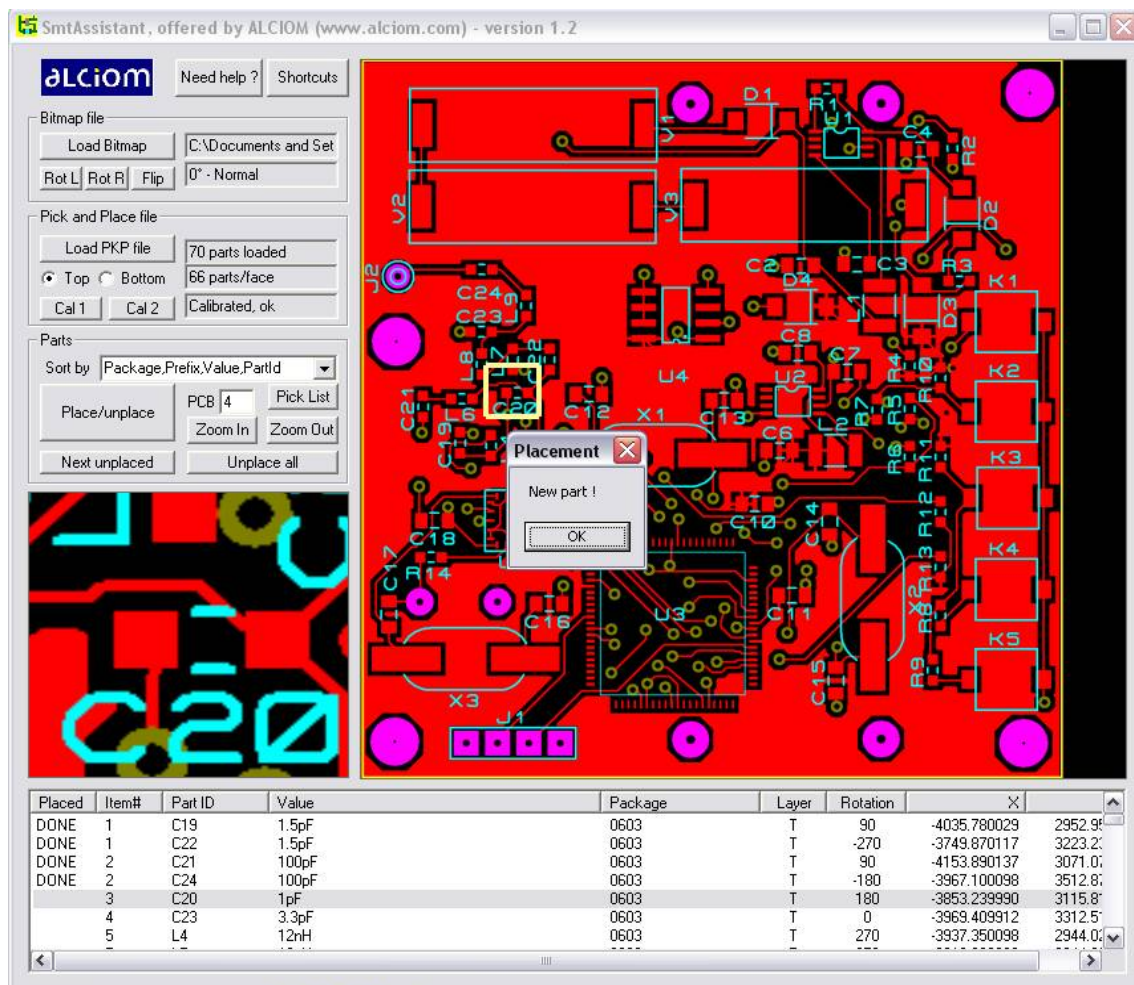

4. Just prepare the corresponding parts in the required quantities, and label the part boxes with the indicated item#...

Place your parts !

Then you can place your parts : Select the first component of the list. It will be automatically highlighted and zoomed. Look at the corresponding item#, get of part from the corresponding box, place it and click on "**Place**". The cursor will automatically shows the next unplaced component. An alert message will be displayed if the part value or package is different from the previous one, to reming you to use the next part box.

You can also manually skip a part : just select another part. Placed parts are indicated by "DONE" in the first column. If you have declared a part as placed by mistake, just reselect it and click on "**Place/Unplace**" again, it will be unplaced.

When a board is finished, click on "**Unplace all**" to start again with the next board.

Shortcuts ?

SmtAssistant main usage is on lab benches, where space is a scarce resource : Usinga mouse or a standard PC keyboard may be a challenge. Therefore we designed it to work with only a small numeric keypad. You will need a mouse to select the bitmap and PKP files and to calibrate it, but then you can just control SmtAssistant with the following keys :

Number Lock	/ Rot Right	* Rot Left	— Zoom Out
7 First Part Home	8 Prev Part ↑	9 Prev Page PgUp	+ Zoom In
4 ←	5	6 →	
1 Last Part End	2 Next Part ↓	3 Next Page PgDn	Enter Place / Unplace
0 Ins		· Next Unplaced Del	

You can click on "**Shortcuts**" to see this mapping. The "**help**" button shows this manual.

How to configure it ?

SmtAsssitant needs to know how is structured the PKP file generated by your CAD tool. By default it understands Proteus Isis PKP file format but you can freely customize it by editing the **SmtAssistant.ini** file, which is in the installation directory. Just open and look at this file : Only the first three lines are meaningfull. They looks like the following :

```
12
,
1,5,6,2,7,3,4
```

The first line states **how many lines must be skipped** at the top of the PKP file. Usually this corresponds to some header information lines added by your CAD software and useless for SmtAssistant.

The second line should contain a single character. This is the character which is used as a **separator** in your PKP file between the different columns : it could be a comma for CSV-like files, a tab or anything else.

Lastly the third line specifies the **meaning of the columns of your PKP files**. It is formated in the same order than your PKP file, and indicates for each column its meaning with codes from 1 to 7 :

```
Mandatory fields :
1 : Part ID (should be letters followed by a number, as R101 or CP5)
2 : layer (any string starting with B or b will be understood as Bottom)
3 : X position(should be a signed decimal number, separator is a dot)
4 : Y position (should be a signed decimal number, separator is a dot)

Optionnal fields :
5 : Part value (any string)
6 : Package (any string)
7 : Rotation (should be a signed decimal number, separator is a dot)
0 : unused field, ignored
```

For example the default SmtAssistant.ini file listed above indicates that each line of the PKP file starts with the part id (code 1), followed by the part value (5), package (6), layer (2), rotation (7), then X and Y positions (3&4), as :

```
"C2","1uF","0805",TOP,0,-2947,3525
"U1","MAX1674","TSSOP8",TOP,0,-2816.8,3920.2
```

Just customize it to map with your CAD tool behavior !

Lastly strings in the PKP file could be either enclosed between double quotes ("STRING") or without double quote if they never include the separator character.

Is it free ?

Yes, we developped SmtAssistant for our own needs and thought that it may be useful for others, not to make money. So SmtAssistant, at least in its current version, could be used entirely freely for any commercial or non-commercial application.

However SmtAssistant is neither open source nor uncontrolled free software. The following constraints do apply :

– Alciom remains the only intellectual property owner of this software. In particular we keep the right to develop a more advanced commercial version in the future or to transfer this right to a third party.

– SmtAssistant can be redistributed as long as it is redistributed for free. No fees should be charged in any way without our explicit agreement.

– SmtAssistant should always be distributed unaltered, in the form of the original zip file including executable, manual and accompanying files and with this copyright notice.

As SmtAssistant is provided for free, Alciom doesn't provides any warranty nor support of any kind : just use SmtAsssitant at your own risks and helps yourself, or don't use it ! We will unfortunately not be able to respond to any support request. However if you find bugs in the software, if you would like to give us your feedback or to share your customization files or improvement ideas just send them to contact@alciom.com , they will be appreciated !

Who is Alciom ?

ALCIOM is a consultancy and design house company specialized in mixed signal devices, from radiofrequencies and microwaves to high speed electronic systems, digital signal processing and ultra-low power embedded systems. Based in France, near paris, we served more than 100 customers worldwide since 2003. We are Microchip certified wireless design center and gold partners, Cypress gold partners, Texas Instruments low power RF specialists and accredited Analog Devices experts. So PC software development is not our main job but we do use SMT devices from time to time !

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