Pick and Place Machine Guide

This guide aims to document how to use the TMA240A pick and place machine that is available in the electronics room. It is assumed that the pcb was manufactured and the solder was applied using a stencil. We'll now cover the steps needed to place the components on the pcb, including how to prepare various files needed in the process. Here, we go through the process specifically for files created in Altium. However, for other programs much of the process should be the same.

Generating the required files (in Altium)

1. Set the origin to the bottom left of the pcb
2. Export the pick and place files: Go to "Generate Pick and place files". Then select the options 'csv' and 'metric'.
3. Open the file (e.g. using a text editor or excel) and delete unwanted entries(/components) in the file.

If you have a pcb with a bottom and a top layer, you need to follow some extra steps for the bottom layer:

1. Mirror the pcb in Altium
2. Set the origin to the bottom left of the pcb and export (same as above)

You now have two files, one for the top and one for the bottom layer. In the csv files generated there is a column indicating 'T' or 'B', standing for top or bottom. Manually edit the files such that the top file only contains components belonging to the top layer. Similarly, do the same for the bottom layer.

Converting the files to the required format

Now we'll use the stack management tool provided by the manufacturer of the pick and place machine to convert our files to a format that the pick and place machine understands. In the tool do the following:

1. "Open file" (bottom left of the window). You should see a pop-up saying "File type is correct, Correct reading". Otherwise something went wrong before.
2. "Convert file" (also at bottom left). This saves the file that the pick and place machine needs.

You don't have to do anything else in the stack management tool. If you don't like the auto-generated assignment of your components to specific stacks, you can open the generated file in excel (or a text editor) and manually change it. Also, you might want to change the "skip flag" of some of the components, e.g. headers & connectors that will be soldered on manually at a later time.

If you encounter a "side-by-side" error when starting the stack management tool, this means that you lack the right version of "Microsoft Visual C++ Redistributable". Downloading and installing "Microsoft Visual C++ Redistributable 2005 x86" (not x64!) solves the issue (exact version: 8.0.50727.42). http://download.microsoft.com/download/d/3/4/d342efa6-3266-4157-a2ec-5174867be706/vcredist_x86.exe [http://download.microsoft.com/download/d/3/4/d342efa6-3266-4157-a2ec-5174867be706/vcredist_x86.exe]

Using the pick and place machine

Copy the file generated above onto the SD card and put it into the machine.

Aligning the PCB

1. Place your pcb into the machine. Align it at the bottom left of the working area. There's a dent in the holder that marks the origin.
2. Insert the SD card, open your file and choose "Edit"
3. Navigate down the file until you see one of your components or 'landmarks'. Press enter, and then click the joystick symbol in the middle of the screen. This moves the head of the machine to where it thinks this component should be placed on the pcb
4. Check the alignment. If it does not match, you can change the origin of the coordinate system by modifying the 2nd line in the file. After doing so, you can again check the alignment as described above. However, manually changing the origin is quite tedious, shouldn't be required, and is a hint that one messed previously.

Loading the reels

Put in the reels into the right slots. Make sure that the covering film is spanned tightly.

Pick & Place

1. Go back into the main menu and now "Load" your file (instead of "Edit" as we did before)
2. At the start, it is usefull to manually step through the placement of your components to make sure everything is set up correctly. In this context, "one step (单步)" means e.g. moving the head to the reel, advancing the reel, picking up a component, rotating the component, moving the head to the place where the component belongs, moving the head down and placing the component, etc… So placing a single component encompasses a lot of these small steps.
3. Once you are convinced that everything works as intended, you can let it run automatically. You can then use pause to interrupt the process. Also, if the machine fails to place a component three times in a row, it will stop automatically and wait for your guidance. In that case, one can just step through manually again, and once the issue is resolved let the machine run automatically again.

Tips & Tricks

- The adhesive that keeps the small film covering the components on the reel can be quite strong. For some components we had to manually pull on the film in order to free the components.
- Be careful with the empty part of the reels. They can easily hit your pcb, changing the alignment etc. So make sure to guide them below the pcb.
- Use short filenames, as the display on the machine only shows the first few letters
- When modifying the files in Excel, make sure that the csv file format is kept, and that excel really uses a comma as a separator. We've encountered all sorts of issues due to excel changing the format seemingly arbitrarily.

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