Pxx Mechatronic Engineering Studio

USER MANUAL

ver. 1.0

Read Me First

Contents

1. General information

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1.1. Read Me First

Welcome to the Pxx machines world, our solution for SMD technology.

What is the Pxx machines for?

Pxx is an automatic SMT pick & place machine with optical alignment system. It can be equipped with all instruments needed for produce electronic SMD.

KEY FEATURES:

- Precision automatic SMT pick and place machine with vision system,
- Automatic pick and place head,
- Automatic dispenser head for pasting middle and high viscosity liquids,
- Automatic nozzle changer (6 tools),
- Top camera system for automatic fiducial inspection,
- Bottom camera system for touchless components centering,
- Gerber and CAD editor (all CAD-systems),
- Control panel: PC keyboard/Mouse,
- Graphical user interface,
- Large application area,
- Suitable for small and medium volume production,
- Qualified for pick & place of standard and fine pitch components including SOIC, PLCC. BGA , µBGA, CSP, QFN , LED and more.

Important information:

 Security rules to follow.

 What is in the package - information about standard equipment.

 Machine installation procedure - how to prepare the machine to work.

To get started with the MES software click here.

1.2. Security rules

Machine working conditions:

INPUT VOLTAGE RANGE:	100 ~ 240 VAC, 50/60 Hz
AC CURRENT:	7A / 115VAC or 3.4A / 230VAC
RATED POWER:	450 W
INPUT PRESSURE:	0,6 ~ 0,8 MPa 50l/min
TEMPERATURE RANGE:	15 - 40 °C
HUMIDITY:	5 - 70%

Rules to follow:

- Please remember to close cover before pressing start button and do not open it while the machine is working (its arm is moving and the pick and place or dispense process is ongoing),
- Do not touch any moving parts of the machine,
- Do not move the machine head portal manually. It can only be controlled through the application,
- Do not look straight at the camera reflector. Too much bright light could damage Your sight,
- If there is any malfunction of the machine visible please press the protection red button immediately. It cuts the power off and all the electronics is stopped immediately.

Please also read and follow the machine maintenance rules described here.

1.3. What is in the package

Standard equipment includes:

- Precision automatic machine portal with optical alignment system,
- Image processing system,
- Gerber data CAD-Editor,
- PC with 19“ LCD and Windows 7,
- Magnetic PCB holder system:

Depending on machine type it can be equipped with:

- Automatic pick and place head,
- Automatic dispensing head with a very precise height measure system,
- Automatic nozzle changer with 6 standard nozzles,
- Manual strips tapefeeder block for different tape widths,
- Manual stick feeder block for different components sizes,
- Automatic tapefeeder block for different tape widths,
- Magnetic tray holder system:

1.4. Machine installation and operation procedure

There are a few steps to take to get the machine ready to work:

I. Put the machine on a stable base. The machine ought to be leveled. It may require to adjust machine legs,
II. It is mandatory to allow electronic equipment to acclimatize for several hours, after being brought in from the cold, before powering on,
III. Provide power source and pressure to the machine,
IV. Remover the bottom camera lens hood,
V. Connect monitor, keyboard and mouse to the machine PC,

VI. Press and hold the Green Power ON button for 5 seconds to turn the machine on:

VII. After operating system has started, double click on MechatronicEngineeringStudio program icon on desktop. It will start the MES software used to control the machine.

In order to turn the machine off press the red Power OFF button or shut down Windows 7 system.

1.5. Contact Us

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2. MES Software

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2.1. Getting started

Mechatronic Engineering Studio is advanced computer application for controlling pick and place machines of Pxx series. It is mainly used to create project, manage machine components (like feeders, nozzle changer, etc.) and overview all the place process.

This help is designed both as a course how to use Mechatronic Engineering Studio and as a reference document when working with the program.

The topics in this section provide some basic information about Mechatronic Engineering Studio application, what it is for and what You can do with it.

How to get started

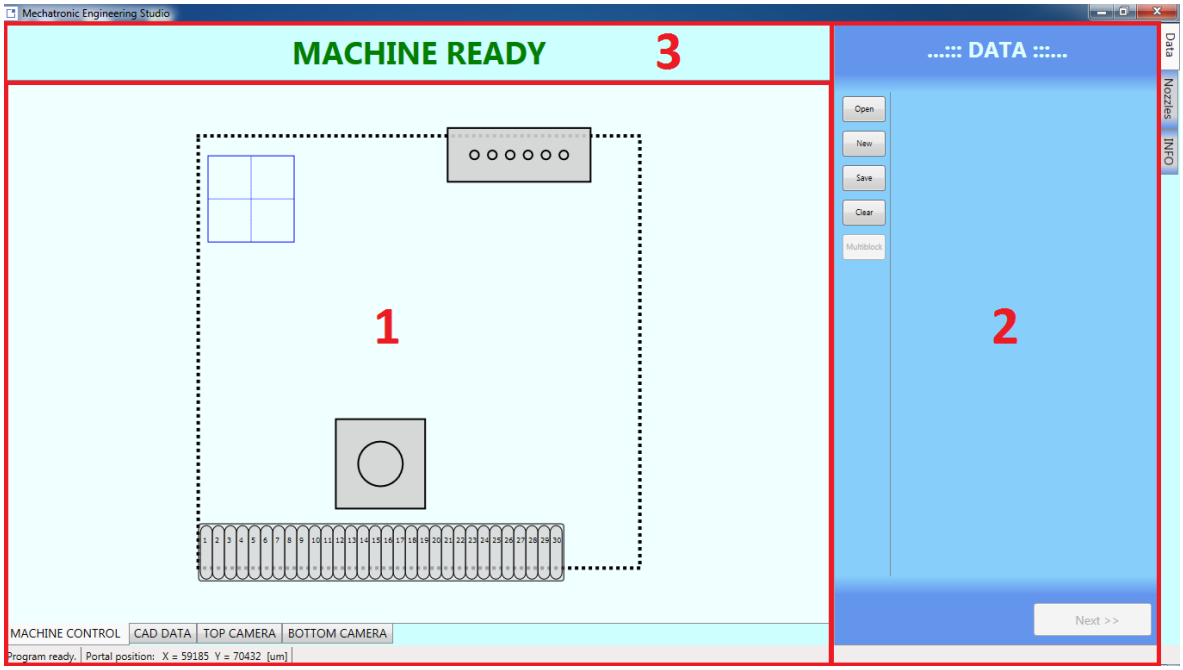
- Study this Introduction chapter and User Interface.
- Open Quick Guide Tutorials to familiarize yourself with using Mechatronic Engineering Studio.

Learning more

- See the Machine States section for detailed instruction on how to use the machine.
- If You are looking for answers please look at FAQ section.

2.2. User Interface

User interface is divided into three main areas:



- Main panels (1) - machine different view perspectives.
- Right panels (2) - project properties grouped by categories.
- Machine states (3) - information about actual machine state.

2.2.1. Main panels

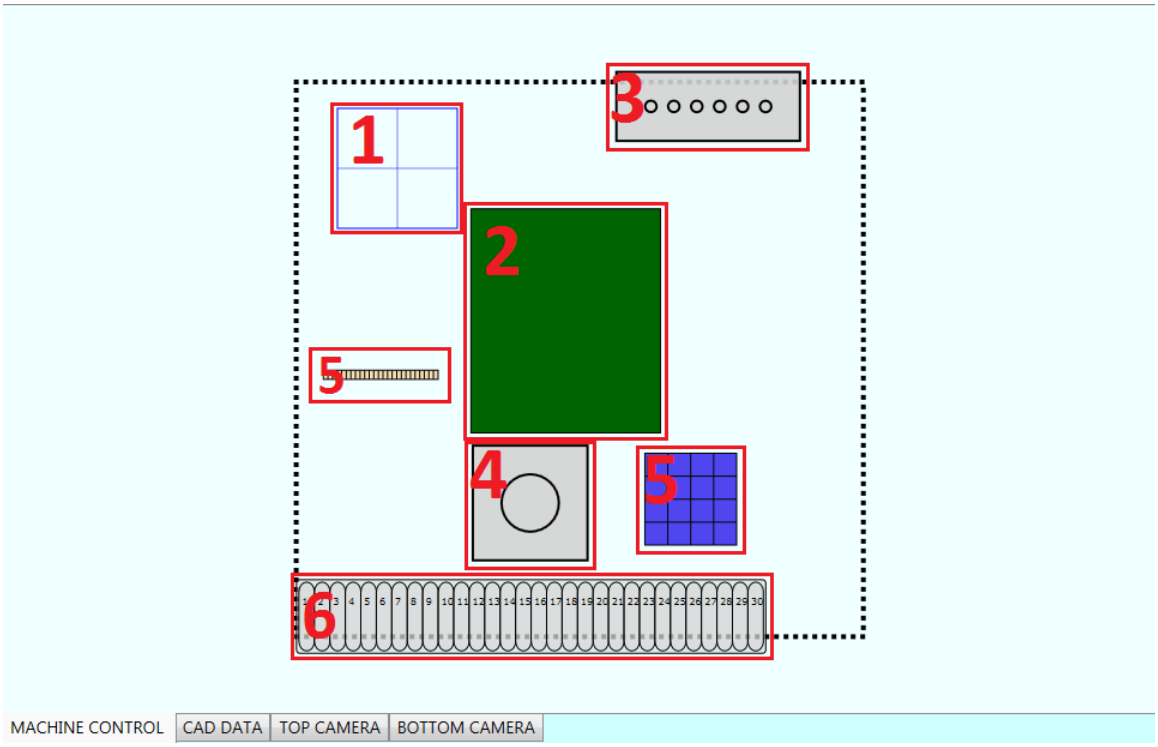
Main panels consist of four view perspectives:

- MACHINE CONTROL
- CAD DATA
- TOP CAMERA
- BOTTOM CAMERA

2.2.1.1. MACHINE CONTROL

The MACHINE CONTROL shows the machine working area, including:

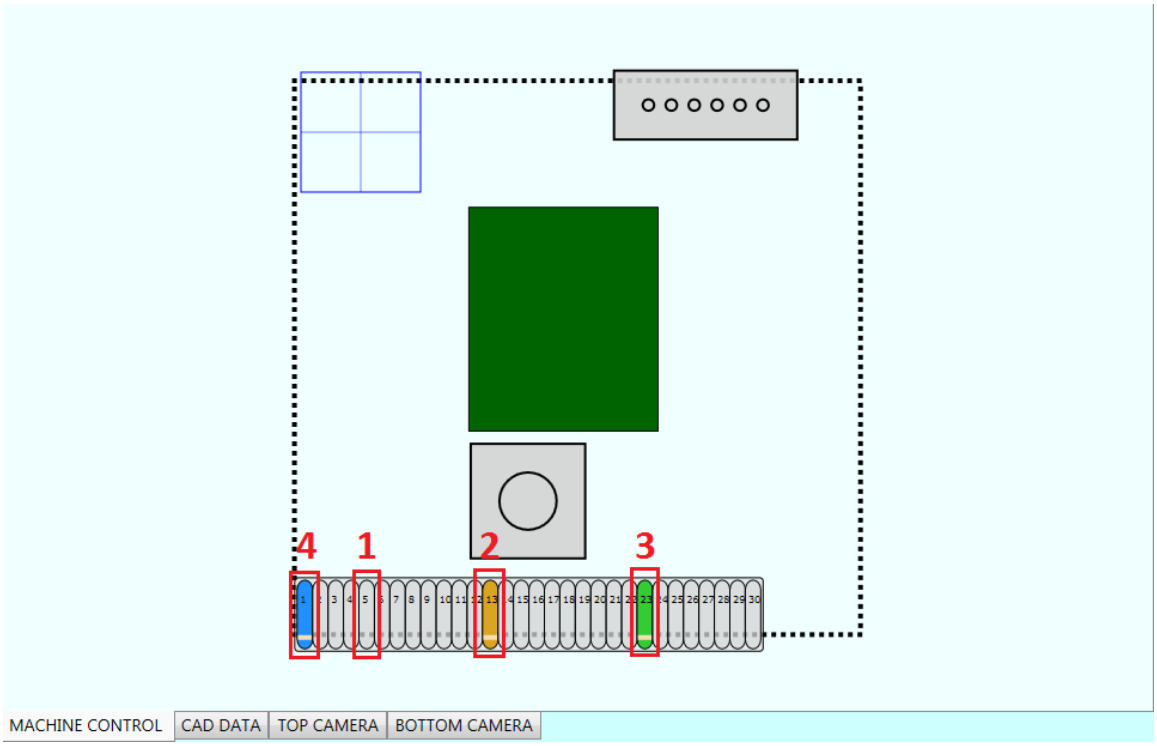
1. Information about arm coordinates,
2. PCB position on the machine,
3. Location of nozzle changer
4. Location of bottom camera,
5. Location of all active feeders.
6. Automatic feeder interface



This is an interactive view by which You can move the machine arm to different position. To do this move mouse cursor to the arm portal (1). Then press left mouse button and keep it down. Now move cross to a different location and release mouse button. The portal should move to indicated position.

2.2.1.1.1. Automatic feeder interface

Automatic feeder can take one of four states:



1. Empty slot
2. Loaded slot with unassigned feeder
3. Loaded slot with assigned feeder
4. Empty slot with assigned feeder

Empty slot:

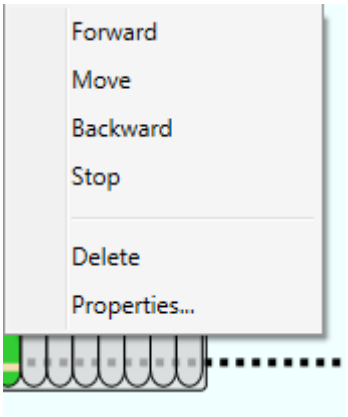
This state indicates that there is no feeder installed in a certain slot. Empty slot has gray color.

Loaded slot with unassigned feeder:

Feeder is installed, but there are no components assigned to it yet. Feeder is not yet operational (yellow color). Double click on this feeder will bring the feeders properties.

Loaded slot with assigned feeder:

Green color indicates that there is a certain component assigned to the feeder and it is ready for work. Right clicking on a feeder in this state will bring the feeder menu:



- Forward – move the tape forward (by one step) and take picture in it's position,
- Move – move selected feeders tape (forward/backward by specifying number of steps),
- Backward – move the tape backward (by one step),
- Stop – stop any movement operation of a feeder

To delete feeder there are two possible options:

- Right mouse button click on a selected feeder, and choose “Delete”. Feeder automatically changes its state to “Stored”,
- Phisically pull out that feeder, its state will automatically change to “virtual”,

Empty slot with assigned feeder:

This state occurs if there was an assigned feeder in the slot and then, it was uninstalled. If a feeder is going to be installed again in the machine, user will be asked either he wants to assign a component that was assigned before or delete it

2.2.1.2. CAD DATA

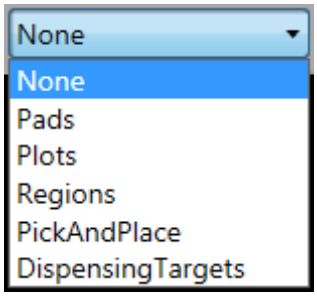
CAD Data is our center of visualization for CAD information from gerber files and pick and place files. At the top there is a toolbar with some buttons. These buttons are used to manipulate CAD data.

1. Reset to default position:

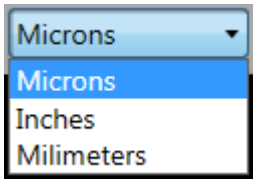
2. Flip PCB horizontal/vertical, rotate PCB:

- flip horizontally
- flip vertically
- rotate counterclockwise
- rotate clockwise

3. Selection subset:



4. Mouse position units:



5. Options:

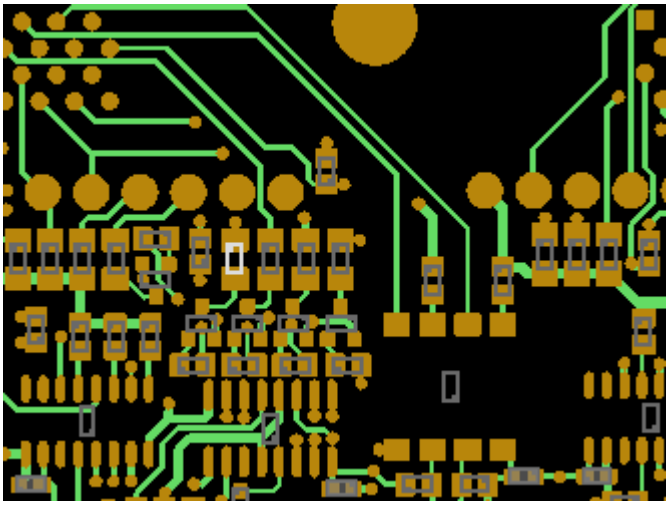
- Pads to fereground
- Consider circles as pads
- Draw path outlines

Mouse and keyboard shortcut:

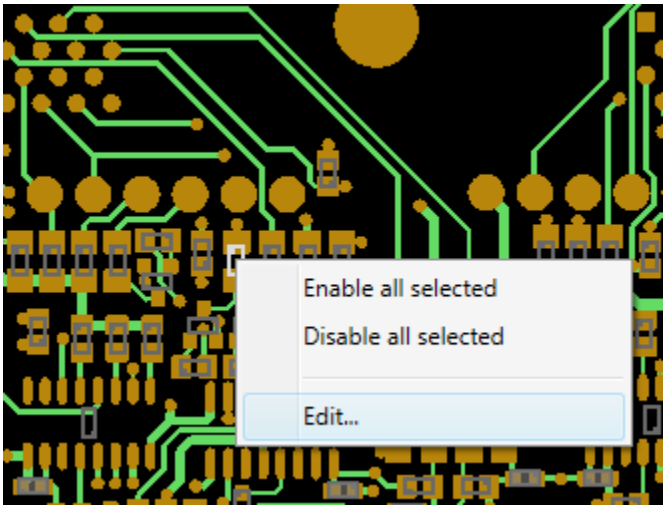
- hold right mouse button + move - move PCB view
- mouse wheel - zoom in/out PCB view
- SHIFT + hold left mouse button + move - measure distance

2.2.1.2.1. Pick and Place selection

Pick and Place View contains information about PCB view, and component place position. Press Ctrl and using left mouse button mark component:



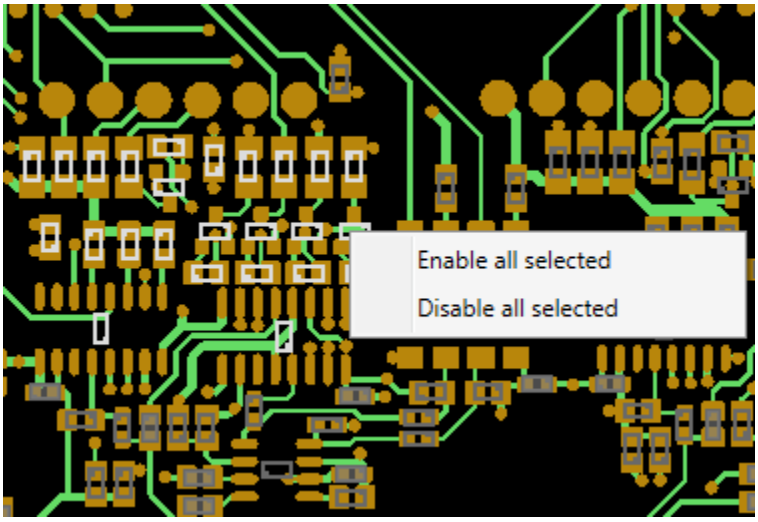
Press right mouse button on selected component:



Click "Edit" to display component properties:

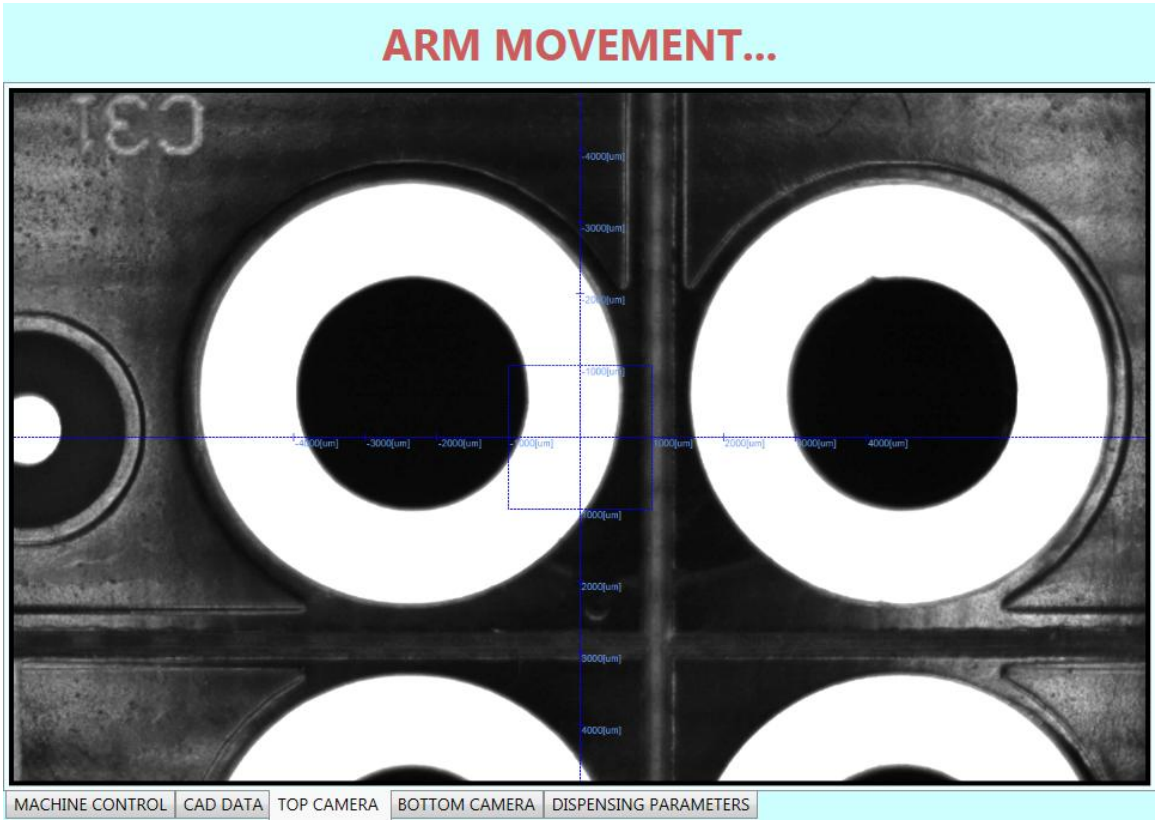
You can correct placing parameters (position, angle) manually for each component.

By pressing Ctrl and using left mouse button, You can mark a few components. If You press now right mouse button, You can disable or enable them:



2.2.1.3. TOP CAMERA

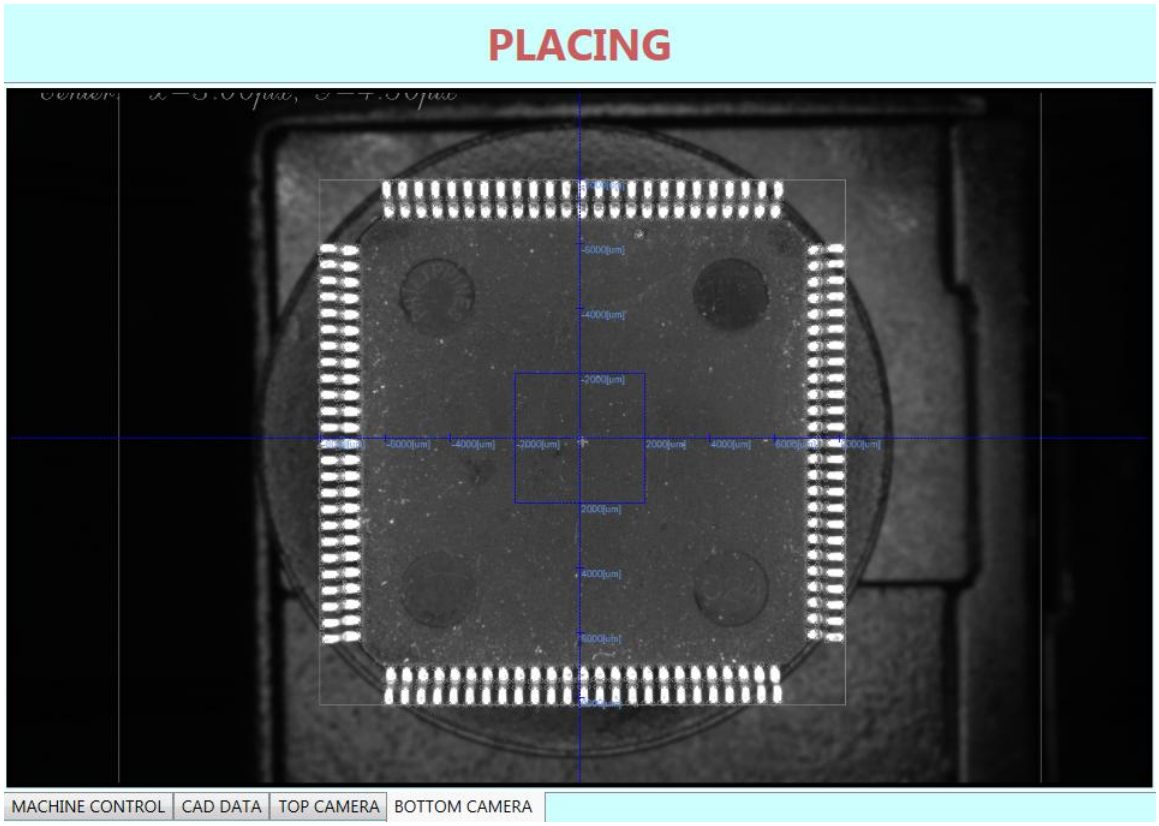
Top camera view gives an overview to machine area surface using top camera system.



It is possible to move the machine arm very accurately by clicking left mouse button on the TOP CAMERA panel. The arm will move to the pointed position.

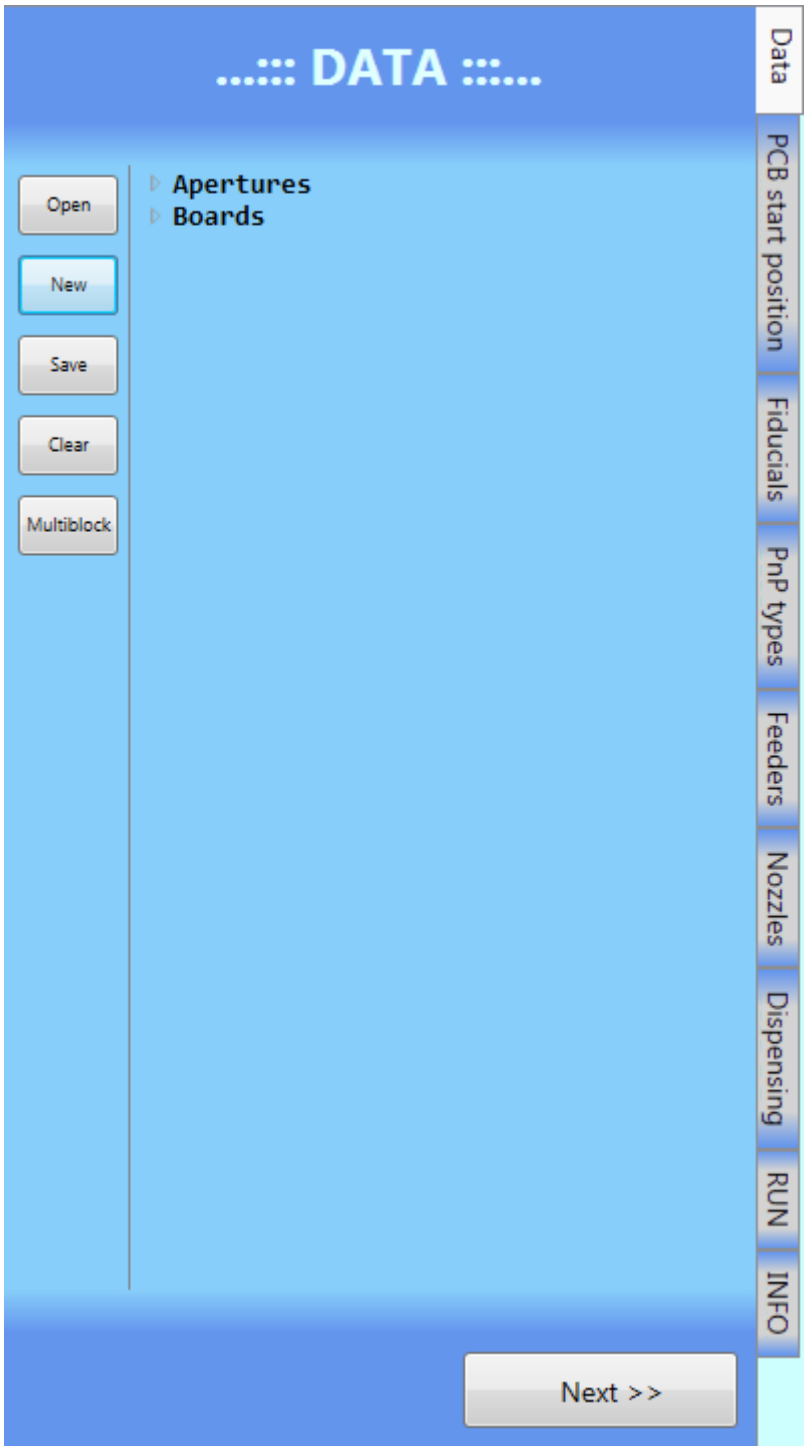
2.2.1.4. BOTTOM CAMERA

Bottom camera view panel is used only to visualize the component positioning process done by the bottom camera. User can see how component is measured and its position is adjusted.



2.2.2. Right panels

The availability of Right panel menus depends on machine and project type selected.

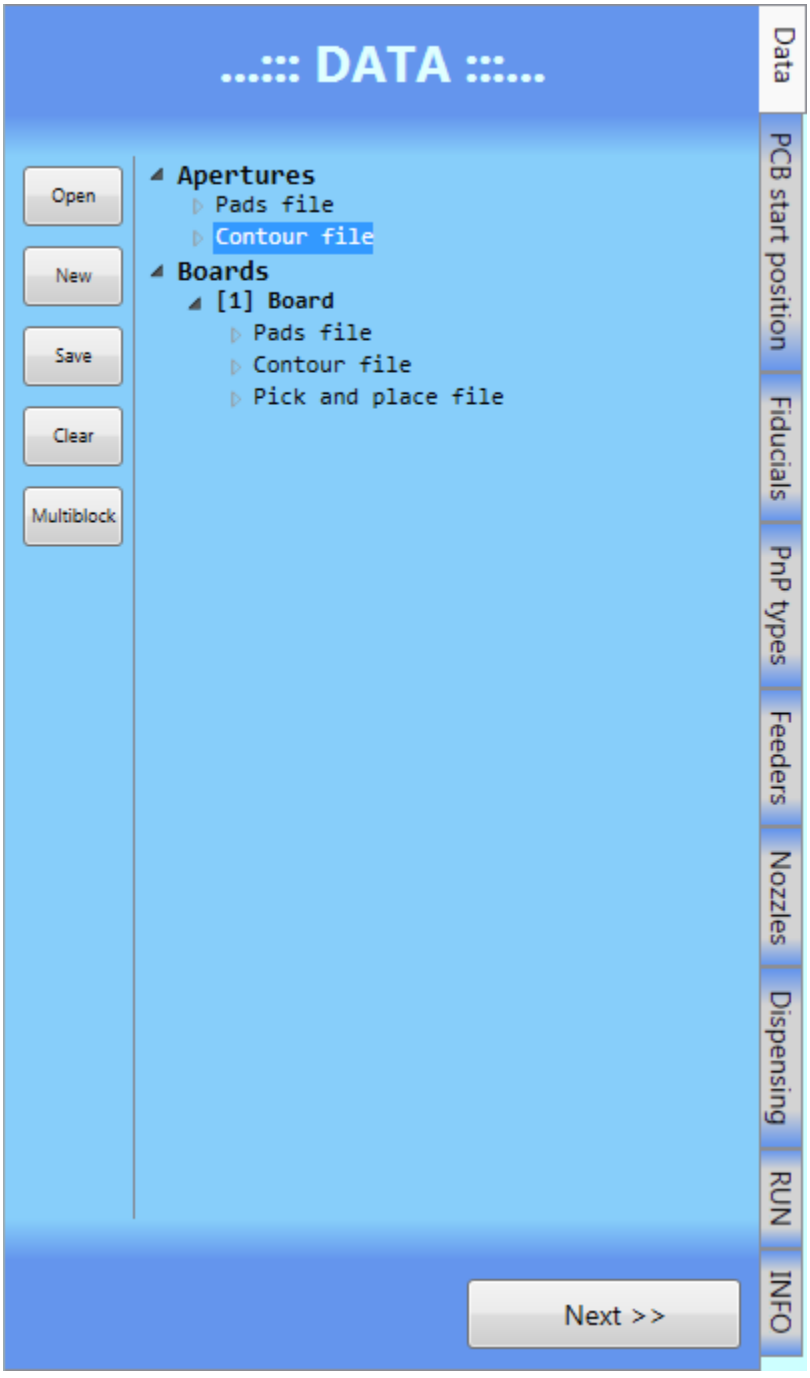


All possible combinations consist of the following panels:

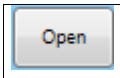
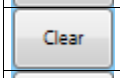
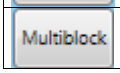
- Data
- PCB start position
- Fiducials
- PnP types
- Feeders
- Nozzles
- RUN
- INFO

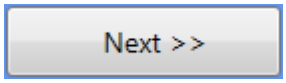
2.2.2.1. Data

This panel shows data structure from gerber and pick and place files.



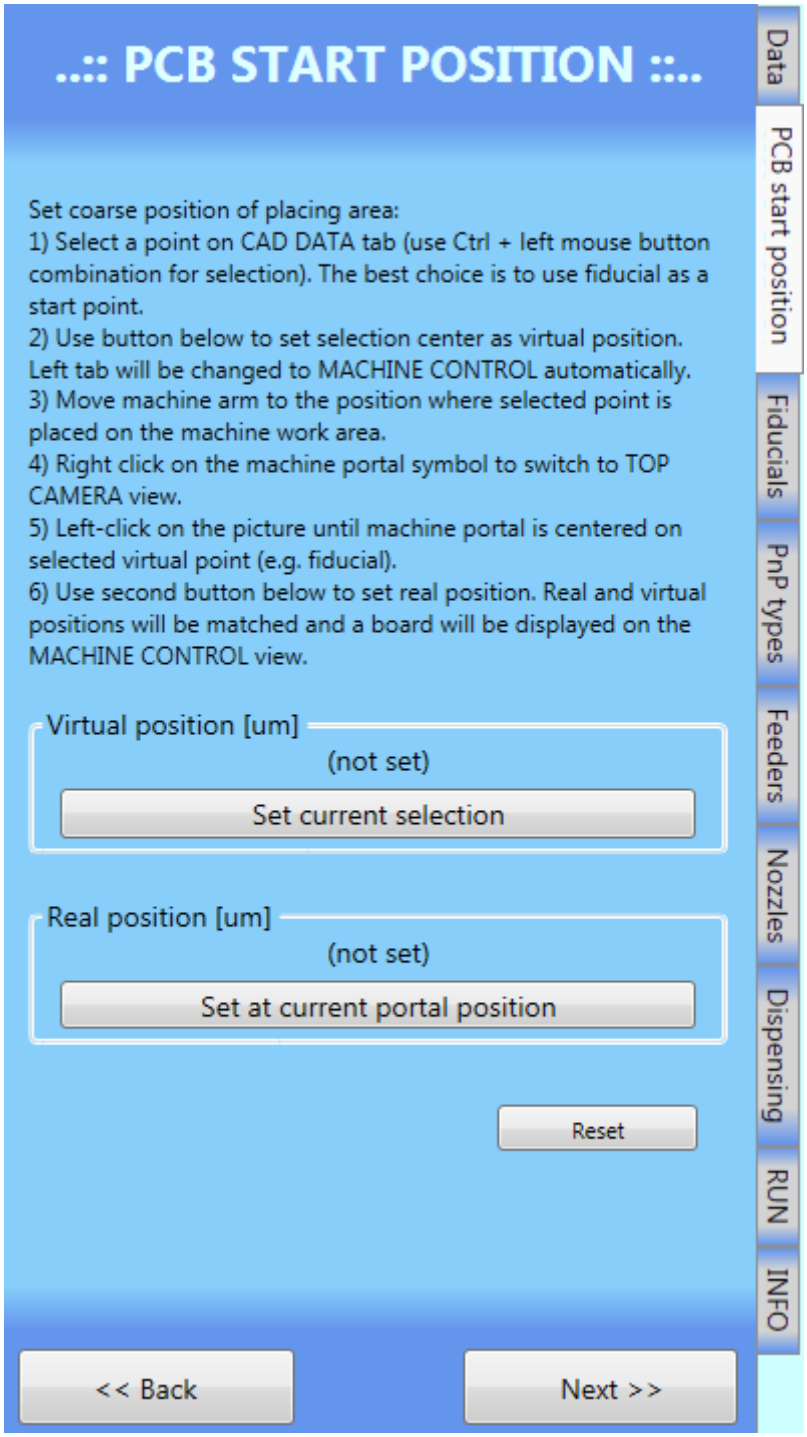
Available options:

	Open an existing project file. User can load previously saved project and continue placing or dispensing process.
	Create a new project. Click it to open a wizard that helps make a new project data.
	Save a project file. User can save prepared project for future use.
	Clear a project. Clear all files and machine settings.
	Create multiblock

 button allows to move forward.

2.2.2.2. PCB start position

PCB can be placed in every place of the working area of the pick and place machine. In order to set up the PCB location the PCB START POSITION menu is used.

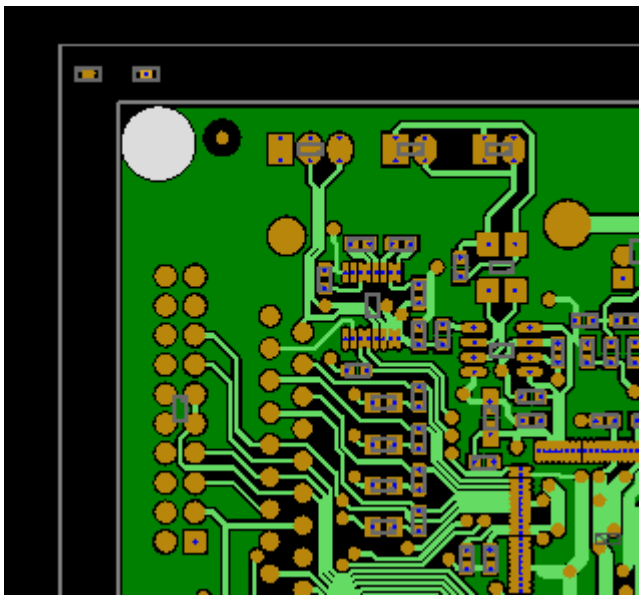


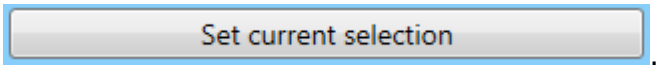
Terminology:

Virtual position:	Selected point on CAD data visualization
Real position:	Selected point on real PCB by camera view

It is important for machine to search reference points in appropriate location. In order to perform this operation correctly a virtual starting point should point out to a real starting point of PCB.

To select virtual position on CAD DATA, use Ctrl + left mouse button combination.



After that click 

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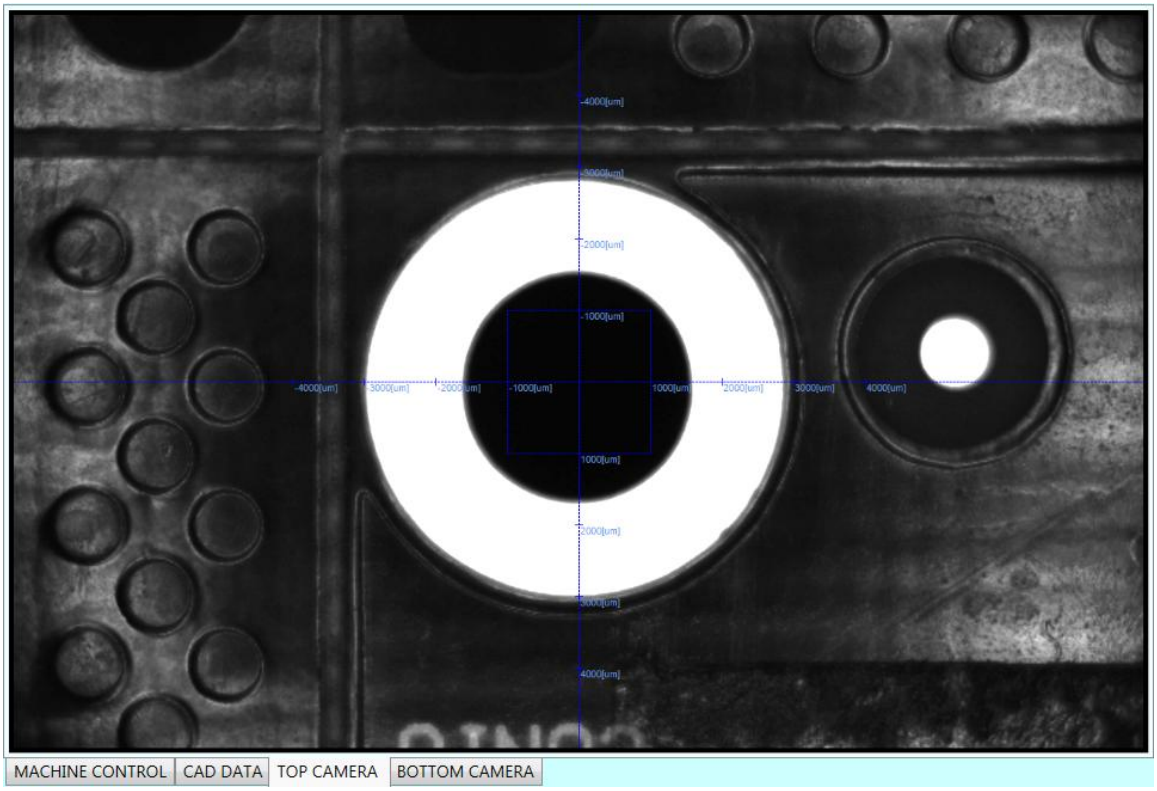
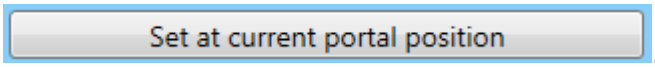
Now move the machine arm close to the PCB (drag the arm on MACHINE CONTROL view). Afterwards, choose TOP CAMERA view and move to the point on PCB that is pointed by virtual position:



Afterwards, click 

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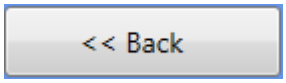
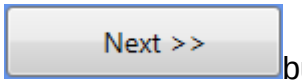
Tip: If something goes wrong click 

button and set PCB position again.

Use 

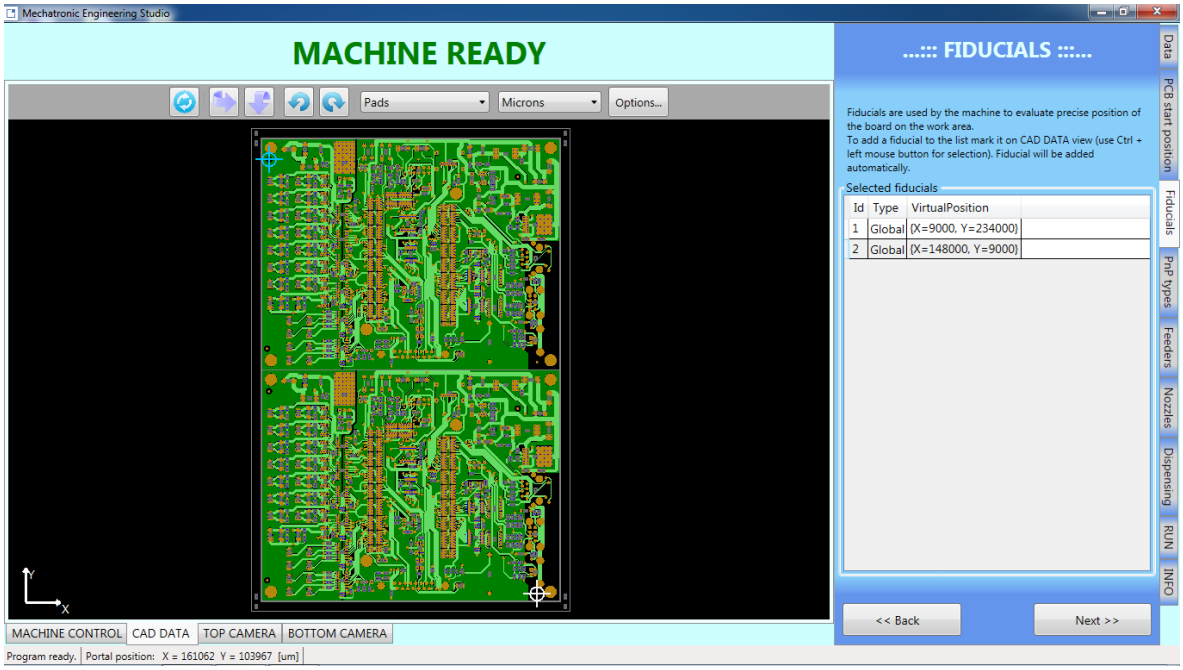
button to move backward. 

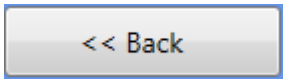
button allows to move forward.

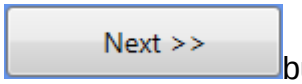
2.2.2.3. Fiducials

This panel is used to select the reference point on PCB. Two fiducials are required to perform placing or dispensing processes correctly. To add a fiducial to the list mark it on CAD DATA view (use Ctrl + left mouse button for selection). Fiducial will be added automatically.

As a result, the selected fiducials should be shown on a list and marked on CAD DATA:



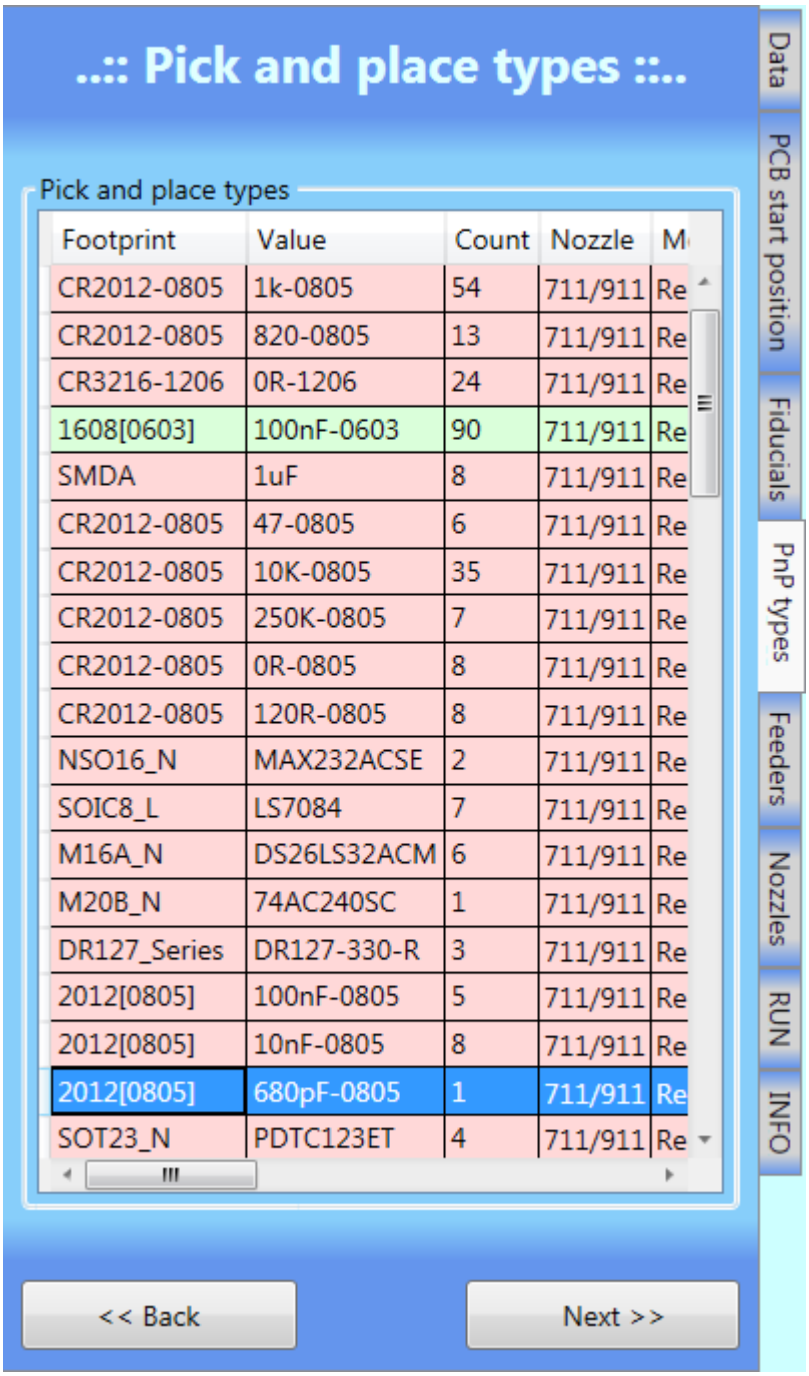
Use 

button to move backward. 

button allows to move forward.

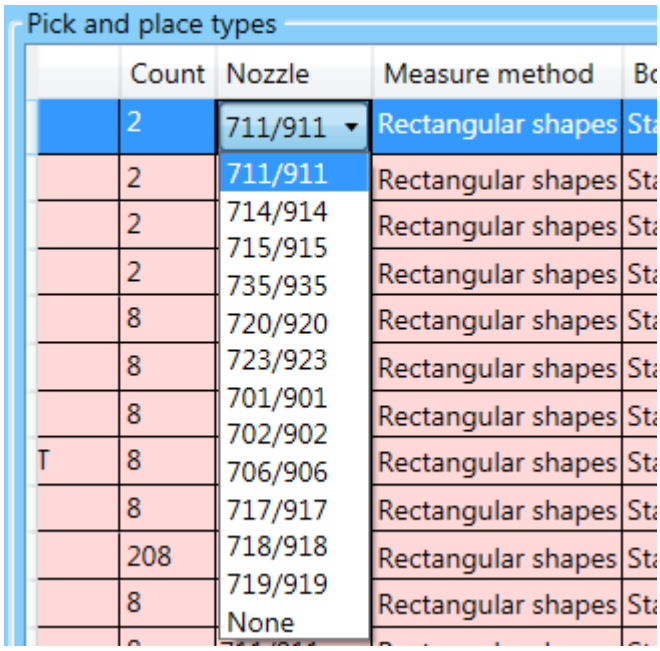
2.2.2.4. PnP Types

This tab includes information about all components (footprint, value, count).

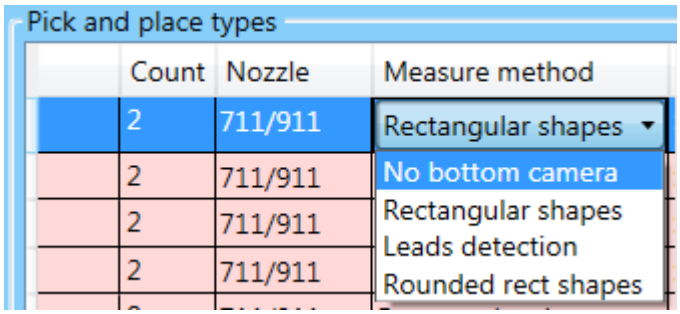


Using this tab, You can specify parameters for all components:

- Nozzle – choose from list suitable nozzle:

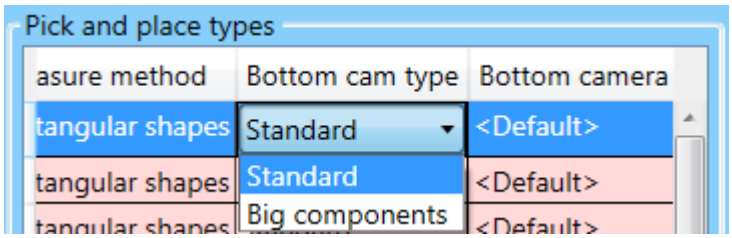


- Measure method – choose from list suitable measure method:

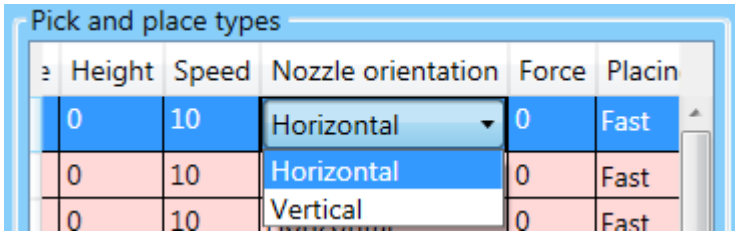


  - No bottom camera - without bottom camera correction
  - Rectangular shapes - suitable for passive components, SOT23 and other nonsymmetrical components.
  - Leads detection - suitable for symmetrical chips (e.g. TQFP44)
  - Rounded rect shapes – suitable for components with rounded shapes

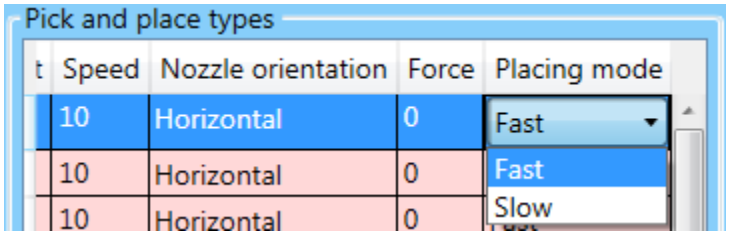
- Bottom camera type – choose from list suitable camera:



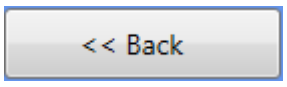
  - Standard
  - Big component (if equipped) – for component up to 40x40mm
- Bottom camera profile (to recognize some specific components it can be created special camera profile)
- Height of component – You can specify component height manually instead of automatic measurement
- Speed of placing mode – You can specify placing speed from 1 to 10.
- Nozzle orientation – choose from the list suitable nozzle orientation

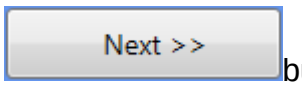


- Force - parameter used during the placing process. It can be set from 0 to 3 [N].
- Placing mode – choose from the list suitable placing mode



  - Fast
  - Slow

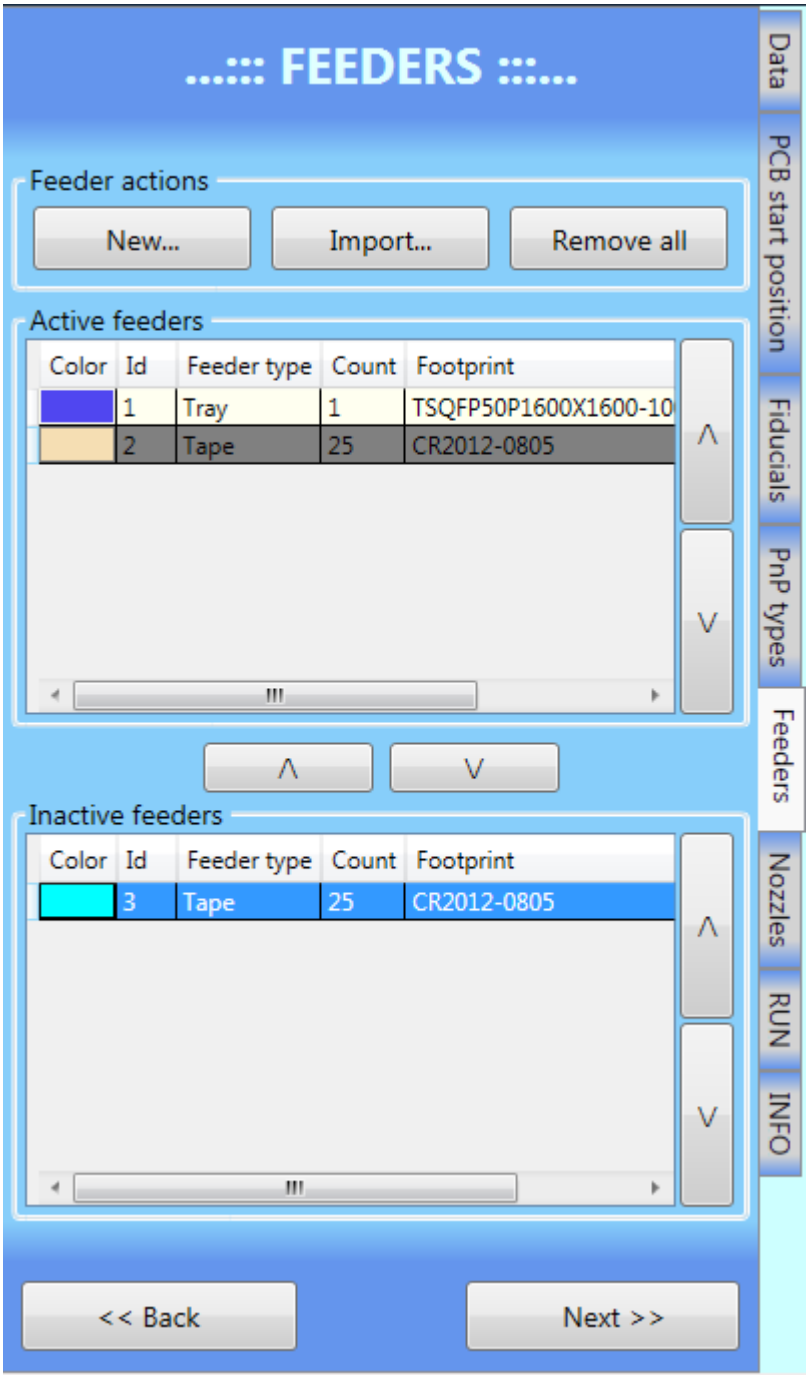
Use 

button to move backward. 

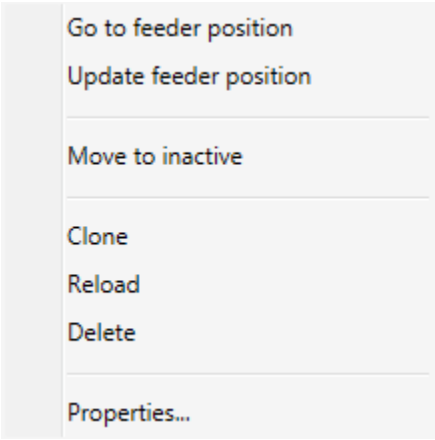
button allows to move forward.

2.2.2.5. Feeders

This tab includes information about all defined feeders:

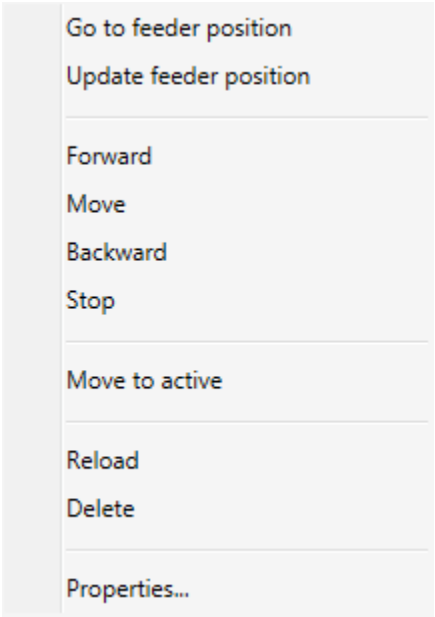


By clicking right mouse button on a selected feeder (manual tape, tray, manual stick) You can choose one of below options:



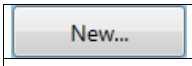
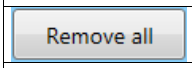
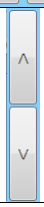
Go to feeder position	Move arm to feeder position and update camera image on TOP CAMERA view.
Update feeder position	Change position to actual arm position. User can move using TOP VIEW to set position properly.
Move to inactive/active	Move feeder to inactive/active feeders list
Clone	Clone feeder to make another one source for this same type components. It could protect user from need to reload feeder during placing process.
Reload	Manually reload empty feeder.
Delete	Delete selected feeder.
Properties	Open feeder property dialog.

By clicking right mouse button on a selected automatic feeder You can choose one of below options:

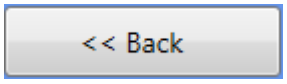
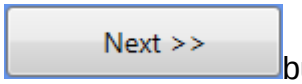


Go to feeder position	Move arm to feeder position and update camera image on TOP CAMERA view.
Update feeder position	Change position to actual arm position. User can move using TOP VIEW to set position properly.
Forward	Move automatic feeder forward and show it on TOP CAMERA view
Move	Move automatic feeder forward/backward specified number of steps
Backward	Move automatic feeder backward
Stop	Stop automatic feeder if moving
Move to inactive	Move feeder to inactive feeders list.
Reload	Manually reload empty feeder.
Delete	Delete selected feeder.
Properties	Open feeder property dialog.

Panel buttons:

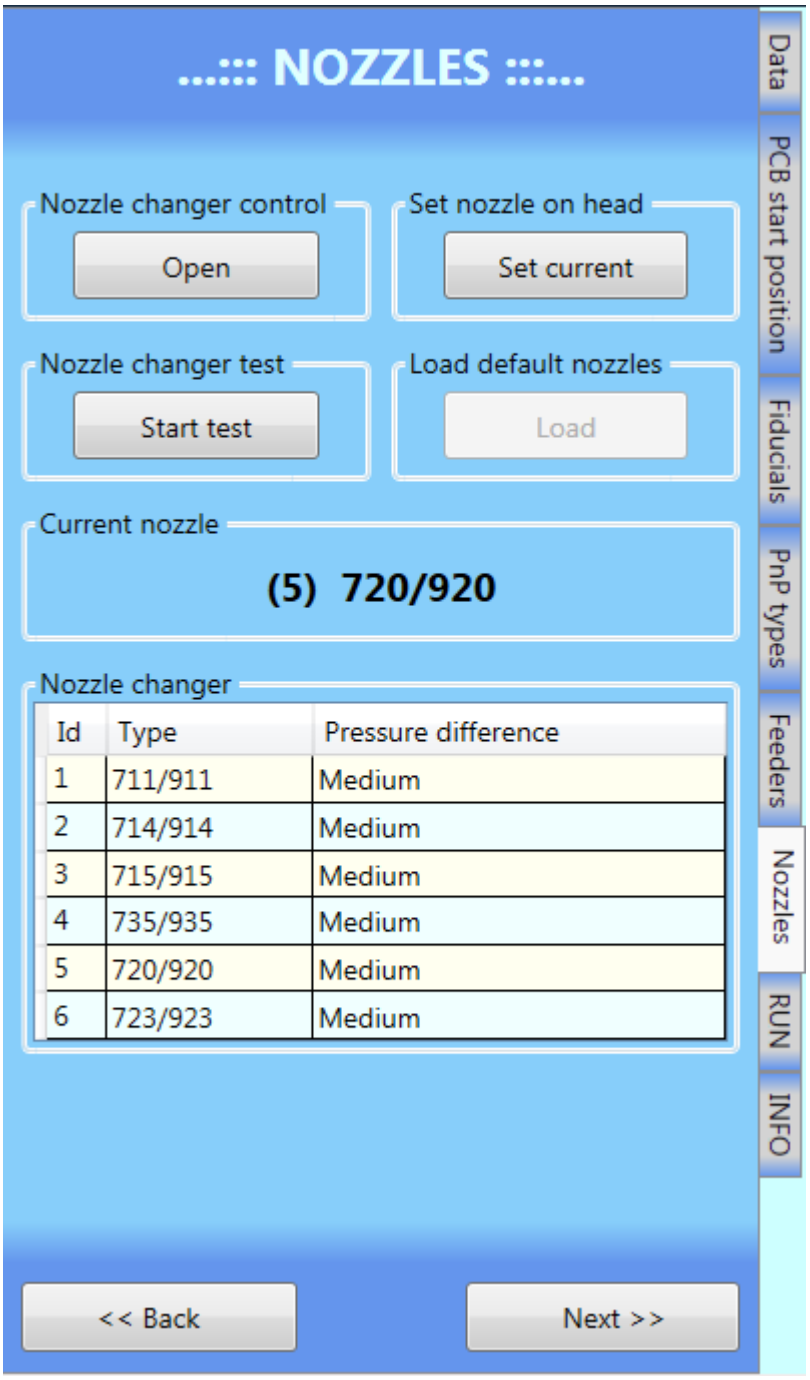
	New feeder. Click button to open New feeder dialog.
	Import settings. Click button to open Import feeders properties dialog.
	Remove all feeders. It will remove all feeders from project.
	Move selected feeders between active and inactive feeders list.
	Move feeder up/down. Upper feeders will be placed first.

Tip: Only feeders from active list will be used during placing process.

Use  button to move backward.  button allows to move forward.

2.2.2.6. Nozzles

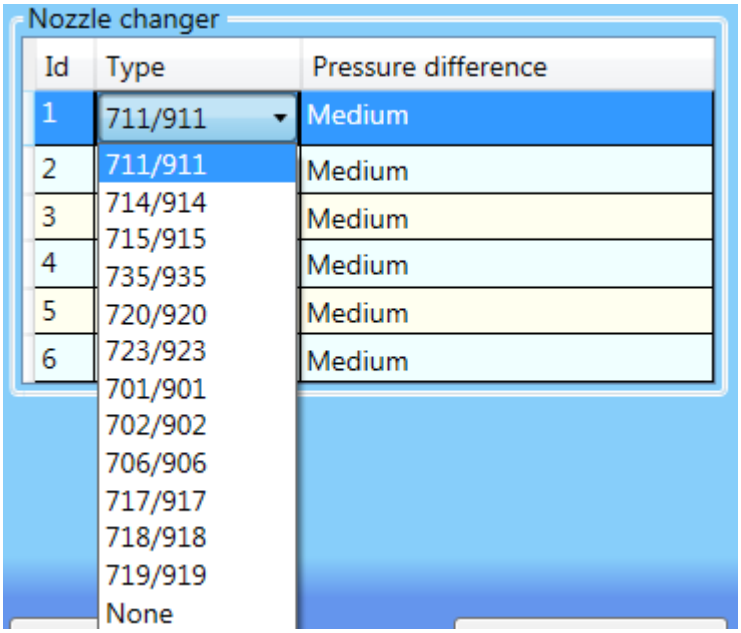
This is a place where user can manage the nozzle changer. Default nozzle changer uses six nozzles as shown below:



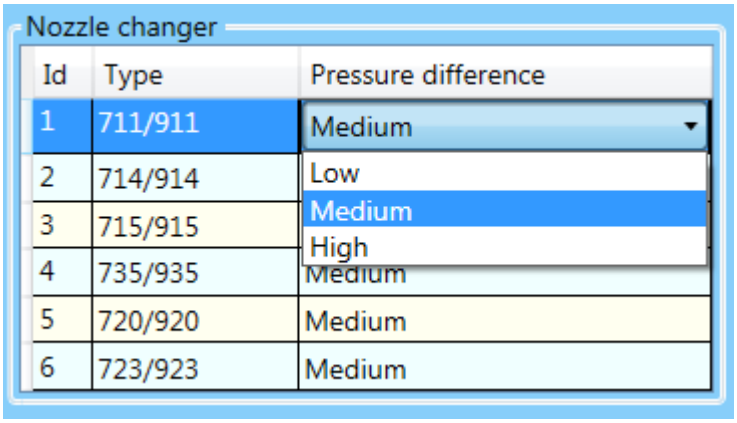
Panel buttons:

Open	Open the nozzle changer to change nozzles.
Start test	Run the nozzle changer test to check how it works.
Set current	Choose from the list nozzle, which is currently installed on placer head and press “Set current” button.

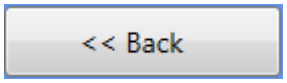
Click on Type grid cell to define nozzle type in selected slot:

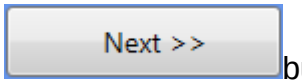


Click on Pressure difference grid cell to define pressure tolerance for selected nozzle:



Medium	Default setting.
Low	Low pressure difference. Use this setting when the placer head picks component from the feeder but machine claims that component is not present on the nozzle.
High	High pressure difference. Use this setting when the placer head does not pick component from the feeder but machine claims that component is present on the nozzle.

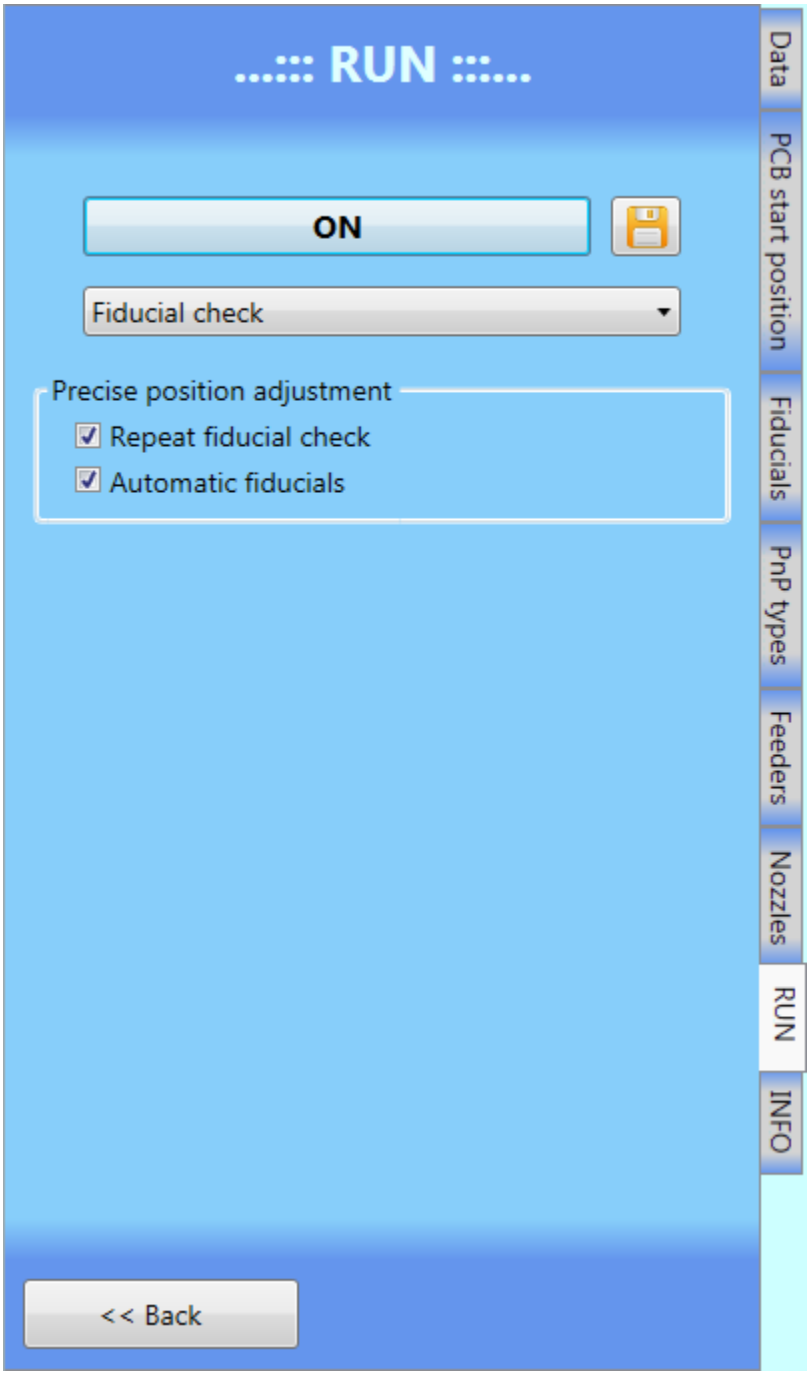
Use 

button to move backward. 

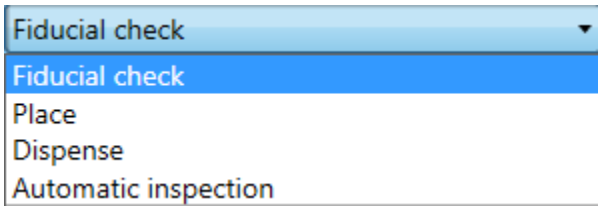
button allows to move forward.

2.2.2.7. RUN

This panel is used to execute a few of processes.



User can choose one of the following actions of the machine:



Action	Meaning
Fiducial check	Tests fiducials recognition for PCB.
Place	Placing components on PCB.
Dispense	Dispensing process
Automatic inspection	Inspects placing or dispensing targets

Click 

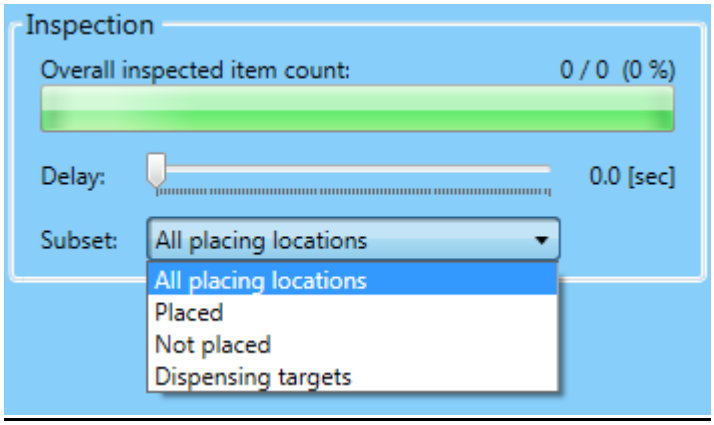
to start the selected process.

Click 

to abort the process.

Tip: Uncheck "Automatic fiducials" for manual fiducials selecting.

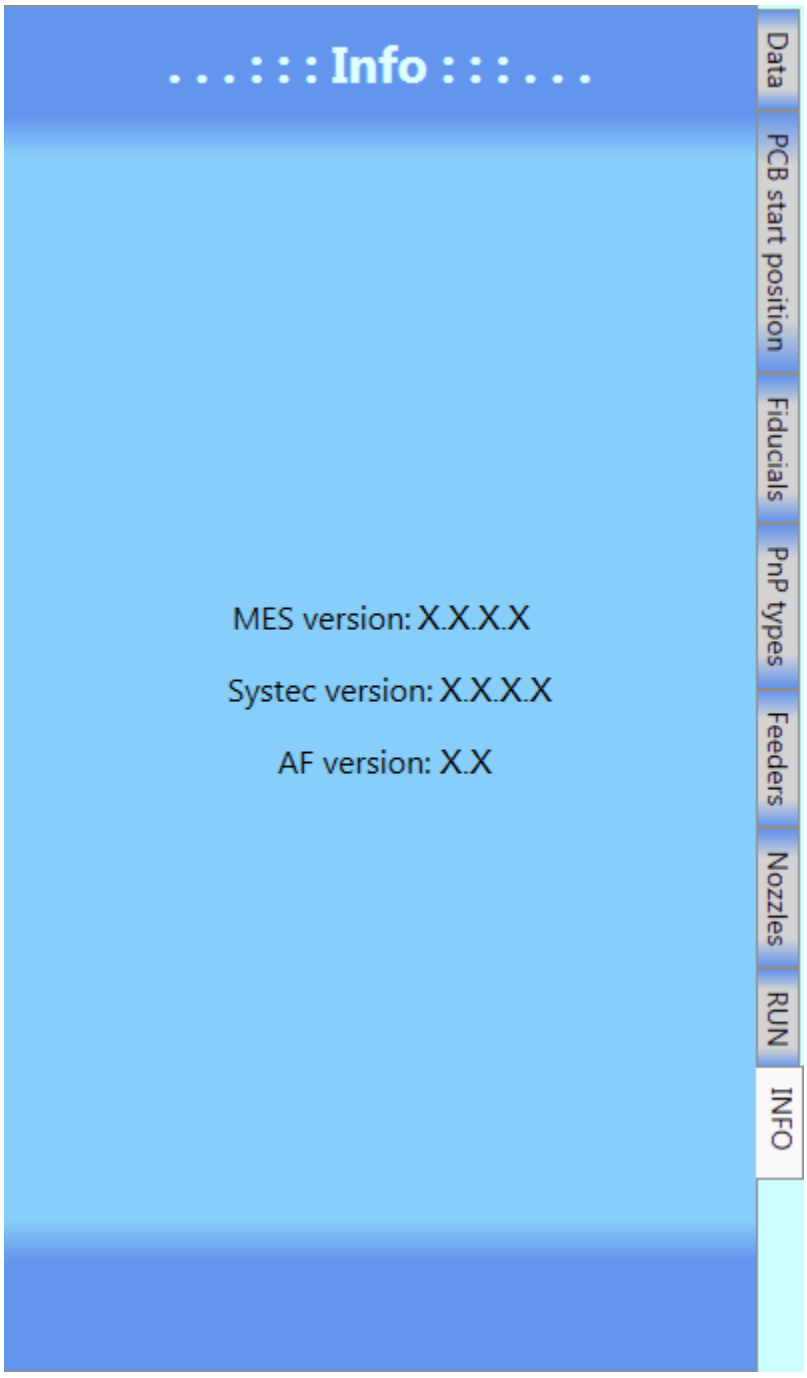
Automatic inspection action can be used for checking position of:



Option	Meaning
All placing locations	Inspect all placing locations.
Placed	Inspect all already placed components.
Not placed	Inspect all not placed components.
Dispensing targets	Inspect all dispensed points.

2.2.2.8. INFO

This panel shows the software version which is currently running.



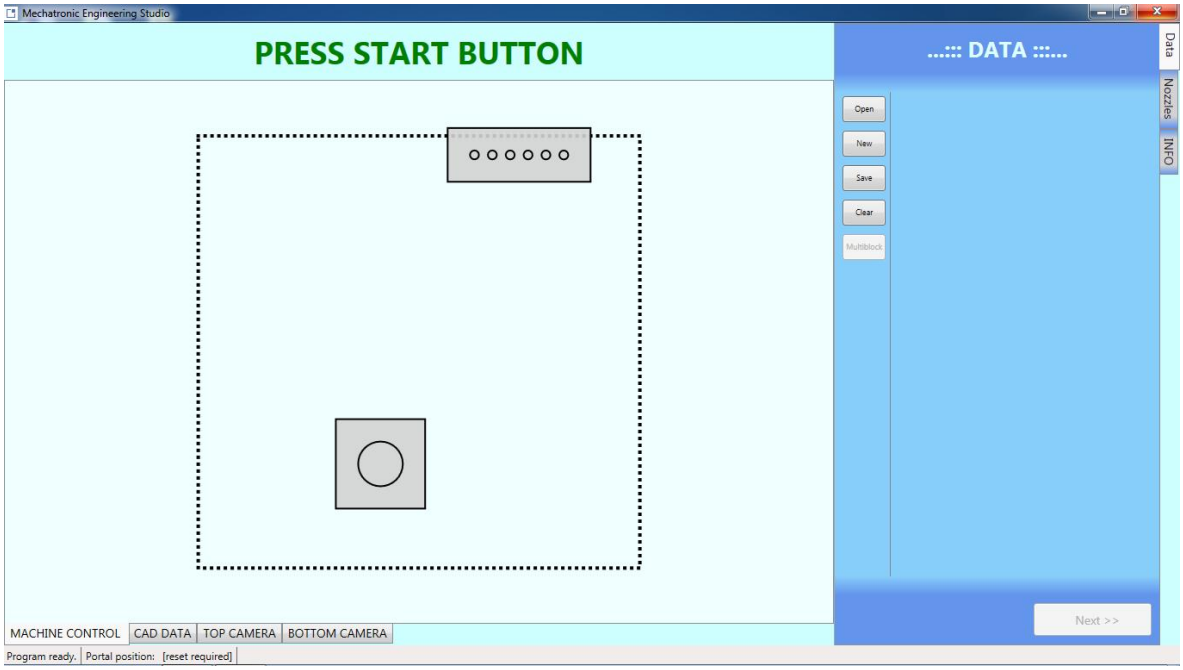
2.2.3. Machine States

The Machine can be in one of the following states:

- Start
- Reset
- Idle
- Moving
- Working

2.2.3.1. Start

The following view can be seen just after the MES software was started:

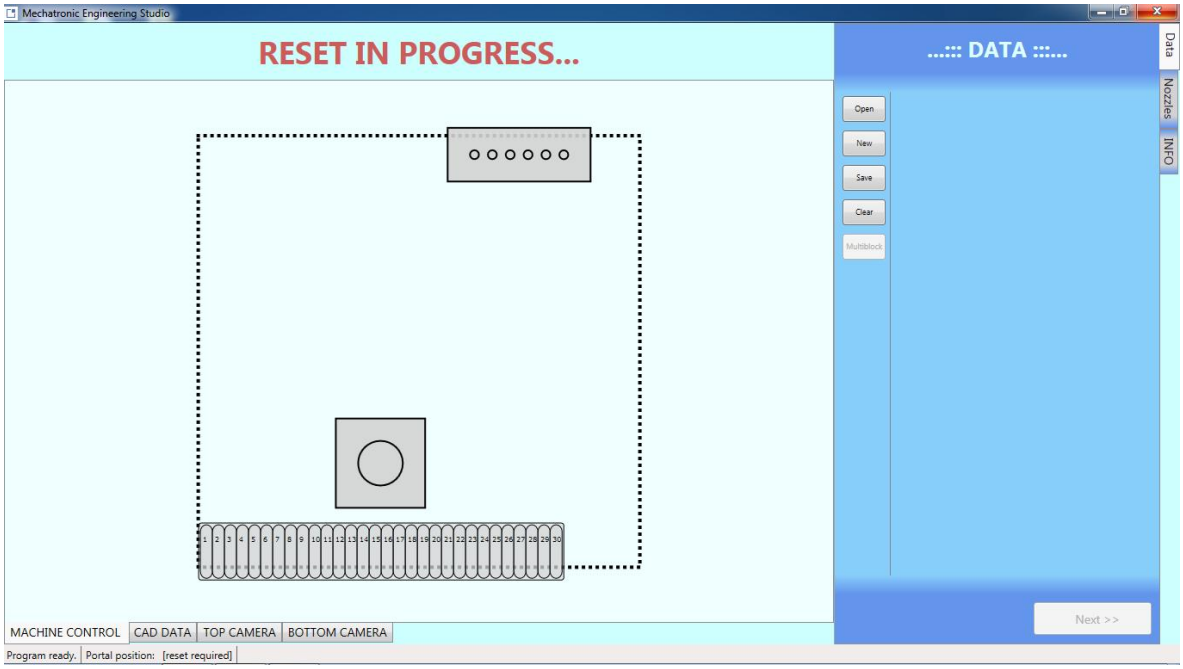


To start the machine working user has to press the green start button on the left machine side.

2.2.3.2. Reset

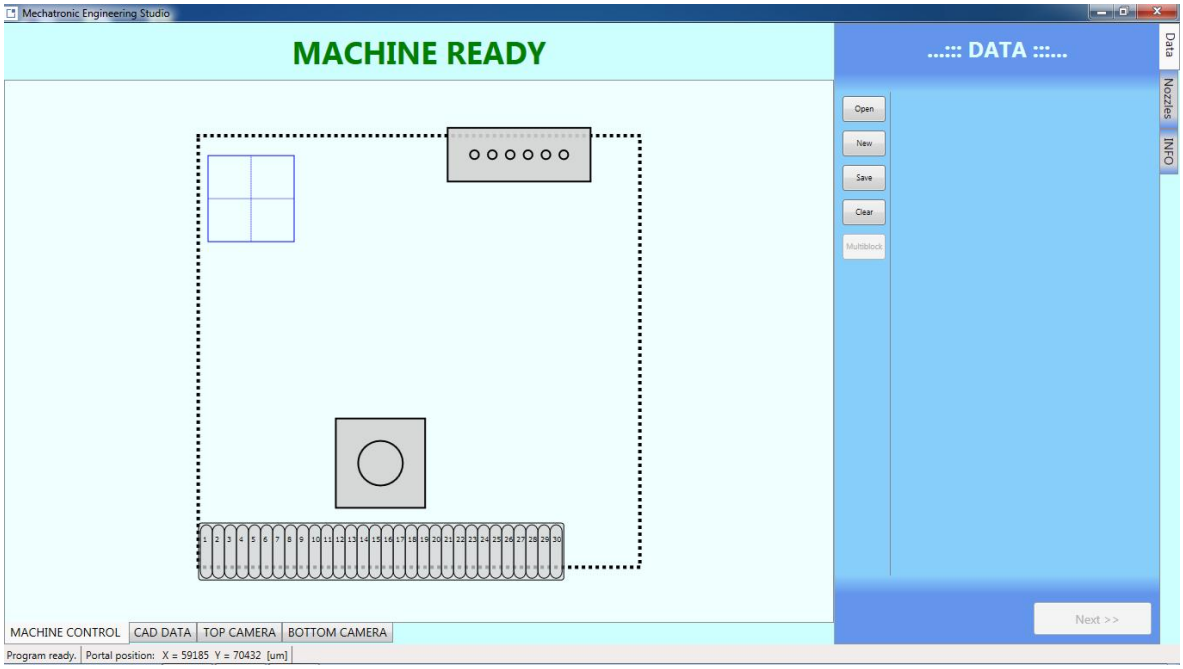
After the start button has been pressed the machine starts a reset procedure. The reset initiates the machine systems as follows:

- Heads,
- Machine arm,
- Automatic feeders Block (if equipped).



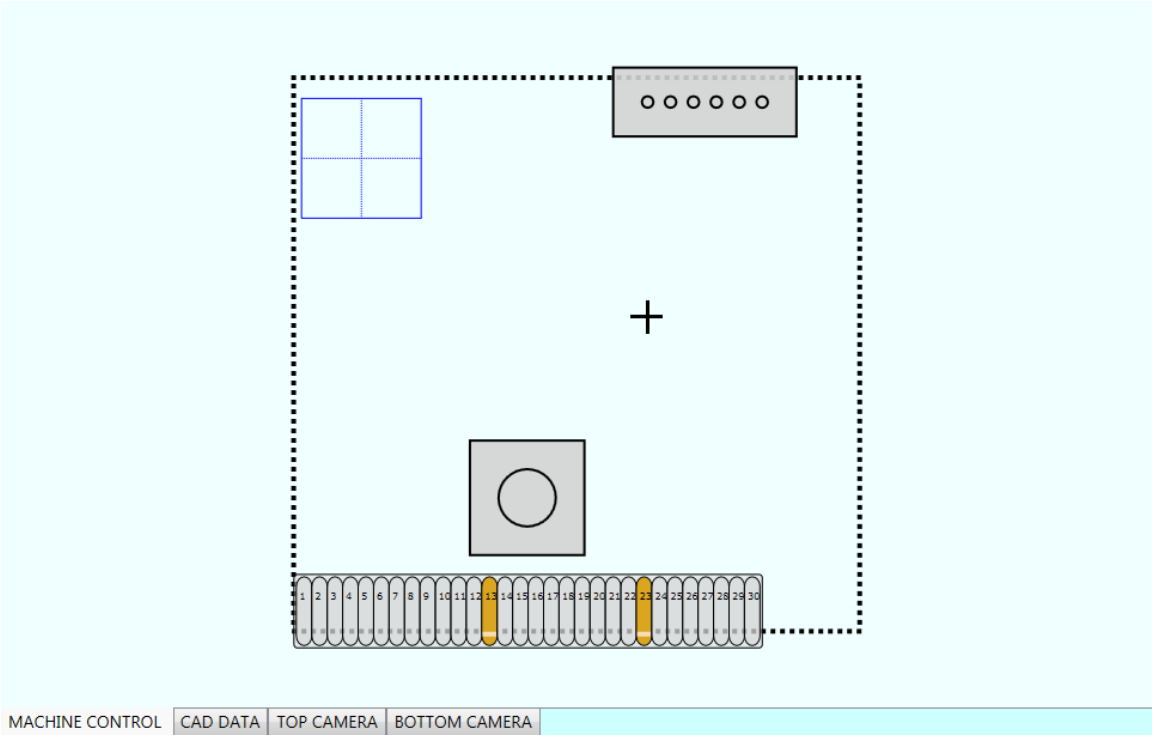
2.2.3.3. Idle

After successful reset procedure machine is ready to work. At this state user can control the machine arm by dragging it on MACHINE CONTROL view or by left mouse button click on TOP CAMERA view panel.

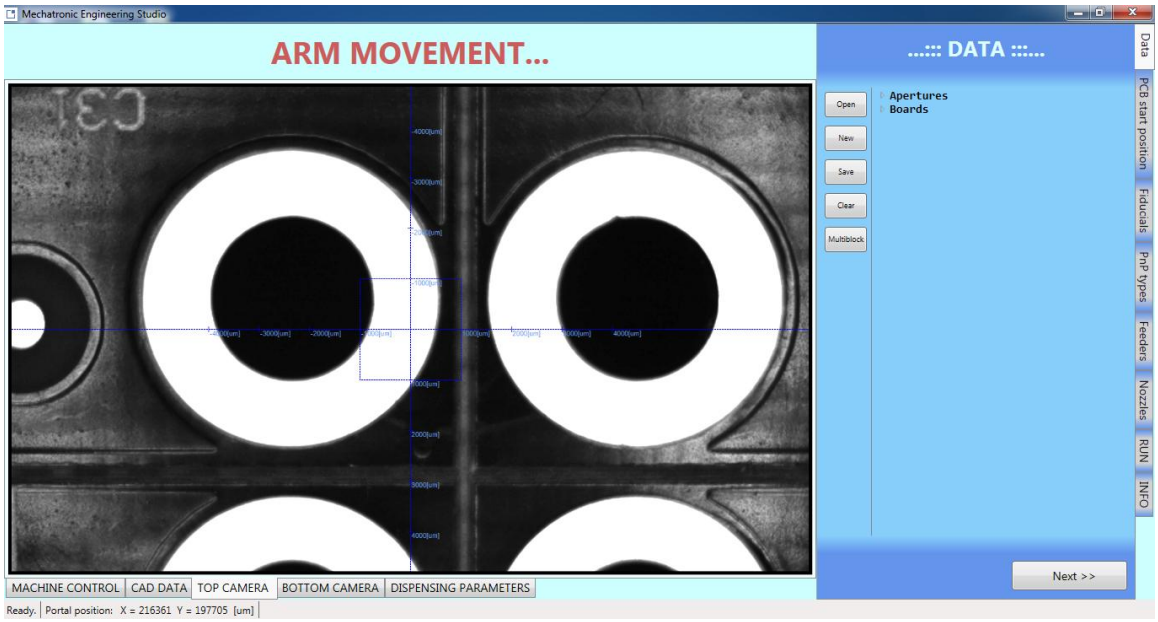


2.2.3.4. Moving

To move the machine arm point it by the mouse cursor on MACHINE CONTROL view. Left mouse button click and hold it down. Move the cursor (with cross) to a new location. Release the mouse button after that. The machine arm will move to the new location. When the new location is reached the machine will go back to Idle state.



For more precision movement user can use TOP CAMERA panel. Movement is realized by left mouse button click on the top camera view. The machine arm will move to the pointed position.



2.2.3.5. Working

When automat is working (placing or dispensing process is ongoing) many of GUI interactions are disabled. If user wants to make changes in the project the machine must be stopped first, do necessary changes and continue process after that.

2.2.4. Dialogs

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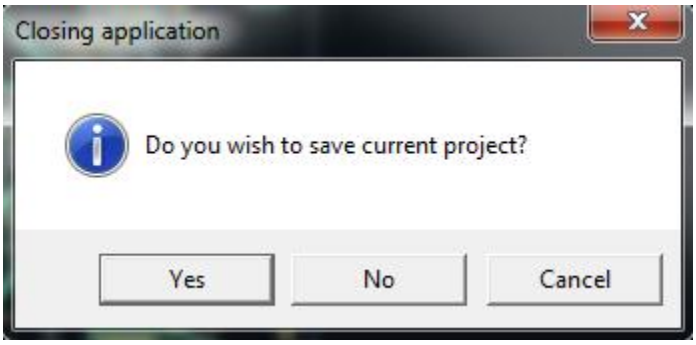
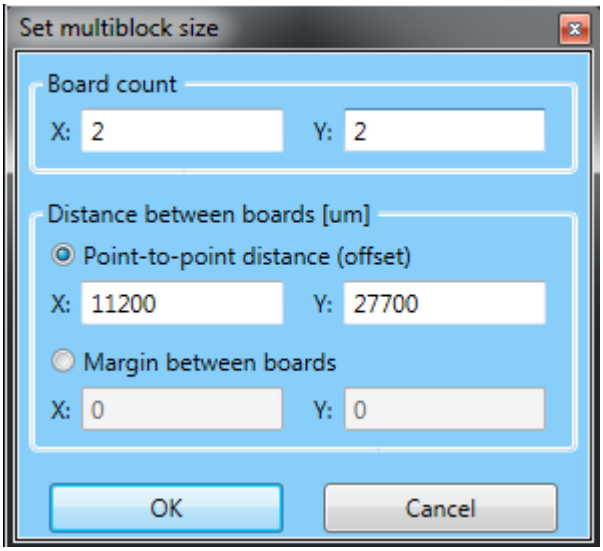
2.2.4.1. Exit

When closing the program You will be asked about saving project setting file:



2.2.4.2. Create multiblock

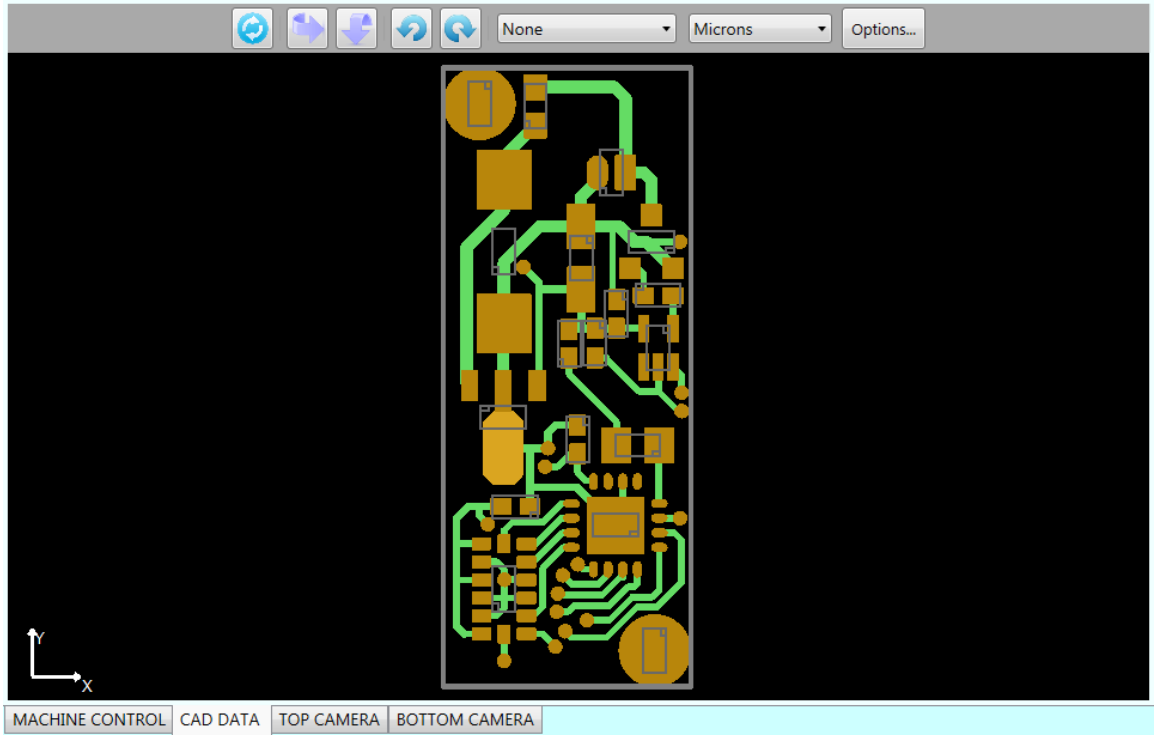
To create a multiblock panel from a single PCB the following dialog is used:



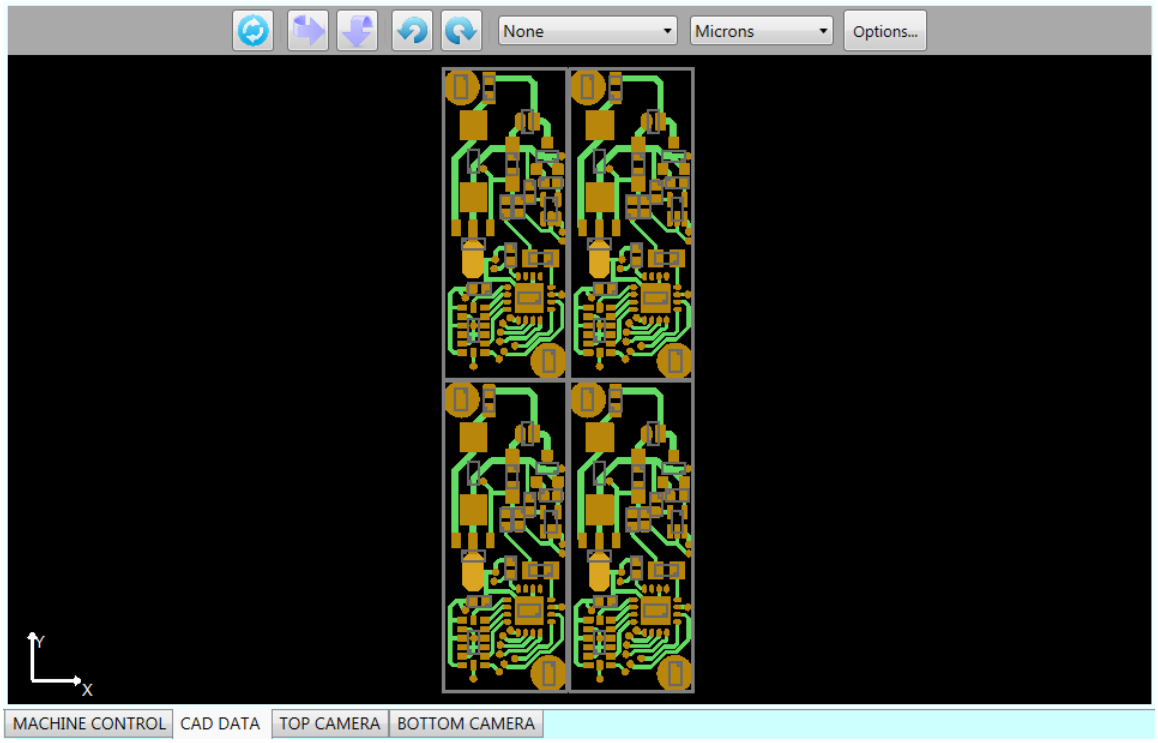
Board count:	number of boards in X axis number of boards in Y axis
Distance between boards:	offset between boards in X axis offset between boards in Y axis

The result of creating multiblock is presented below:

I. A single PCB used to create a multiblock panel:

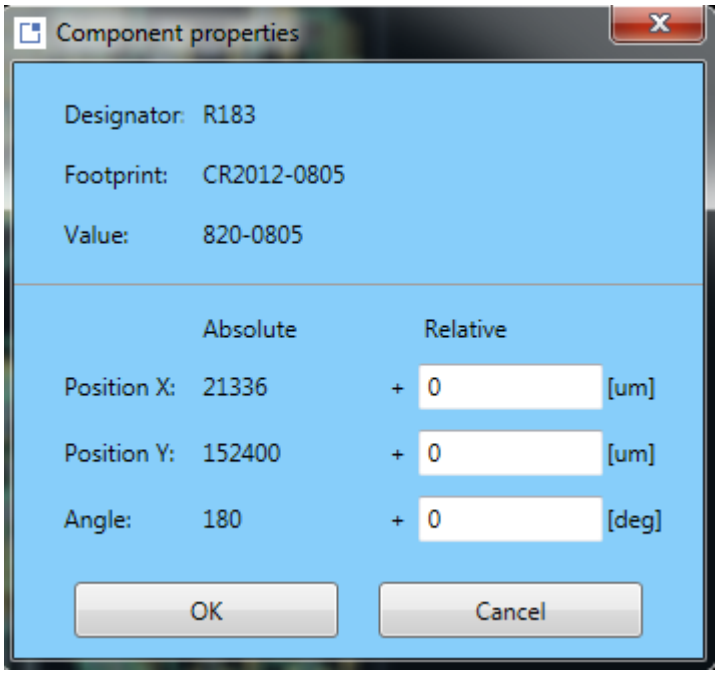


II. And the multiblock panel created:



2.2.4.3. Component properties

This dialog is used for manual changing a component place position and its rotation:



Designator:	Component designator
Footprint:	Component footprint
Value:	Component value
Position:	Component position in X axis (editable) Component position in Y axis (editable)
Angle:	Component rotation (editable)

2.2.4.4. Feeders

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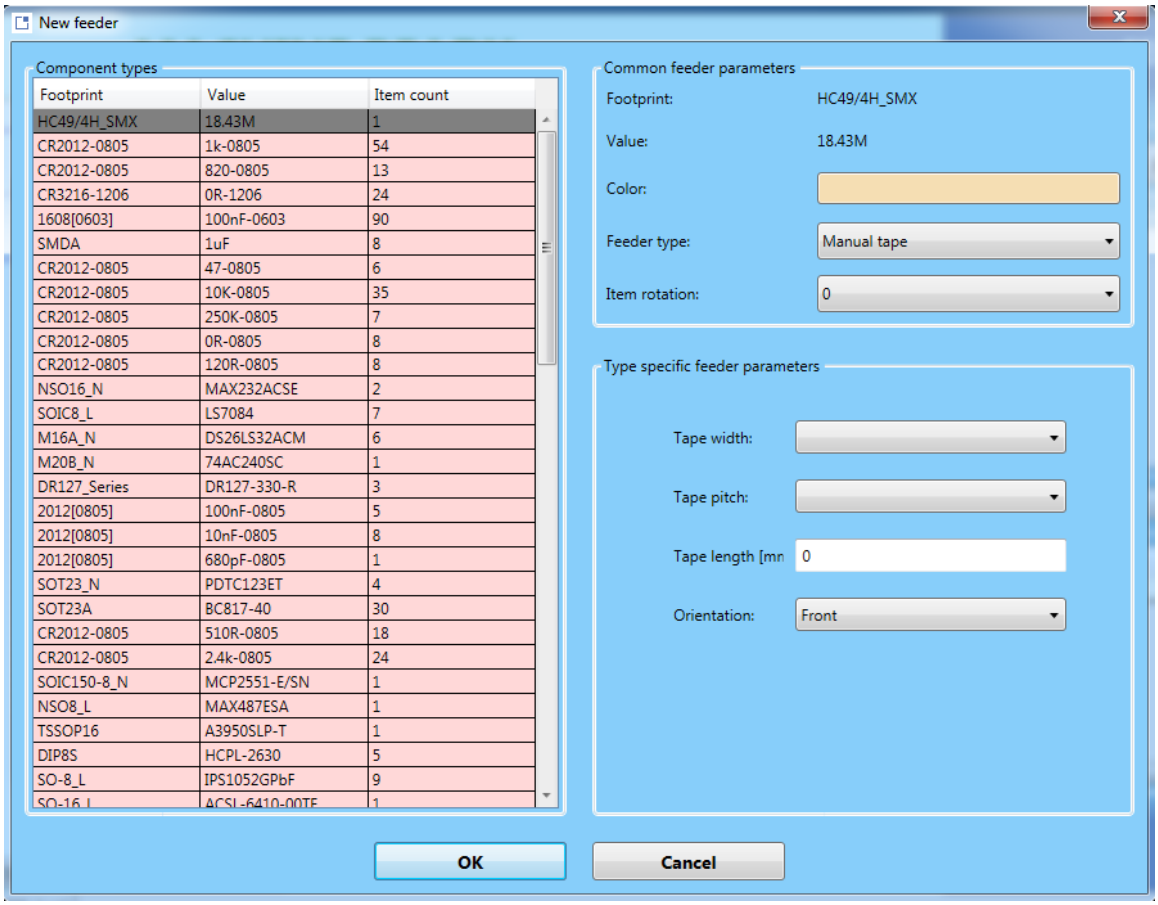
2.2.4.4.1. Manual tape feeder

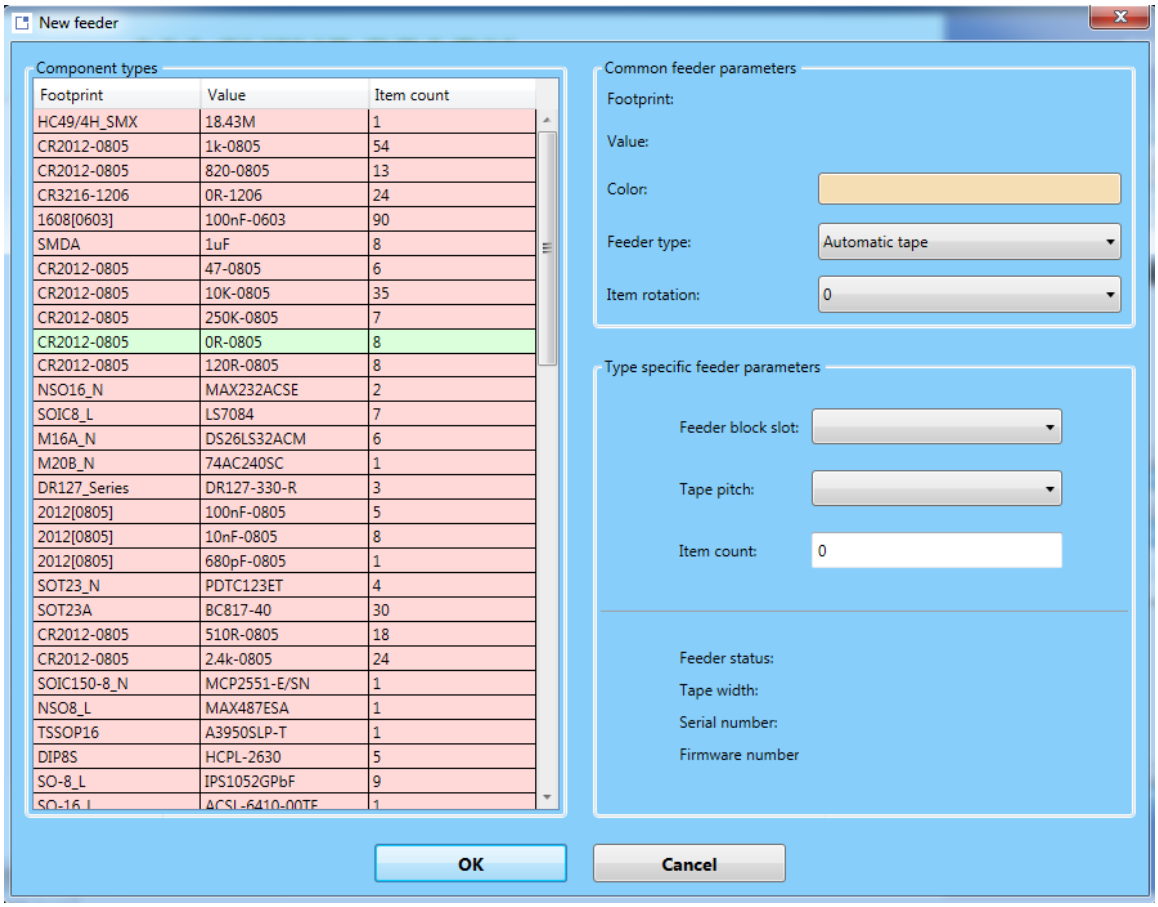
Manual tape feeder properties dialog is used for setting up a new manual feeder.



Property	Value	Meaning
Footprint:	Component footprint	Info
Value:	Component value	Info
Color	Feeder color	Info
Feeder type:	Feeder type	Type of feeder
Item rotation:	0 90 180 270	Angle of component within feeder.
Tape width:	8 12 16 24 32	Tape width in millimeter.
Tape pitch:	2 4 8 12 16 20 24	Tape pitch between components in millimeter.
Tape length		Tape length in mm
Orientation:	Front Left Right	Feeder location on the machine.

2.2.4.4.2. Automatic tape feeder

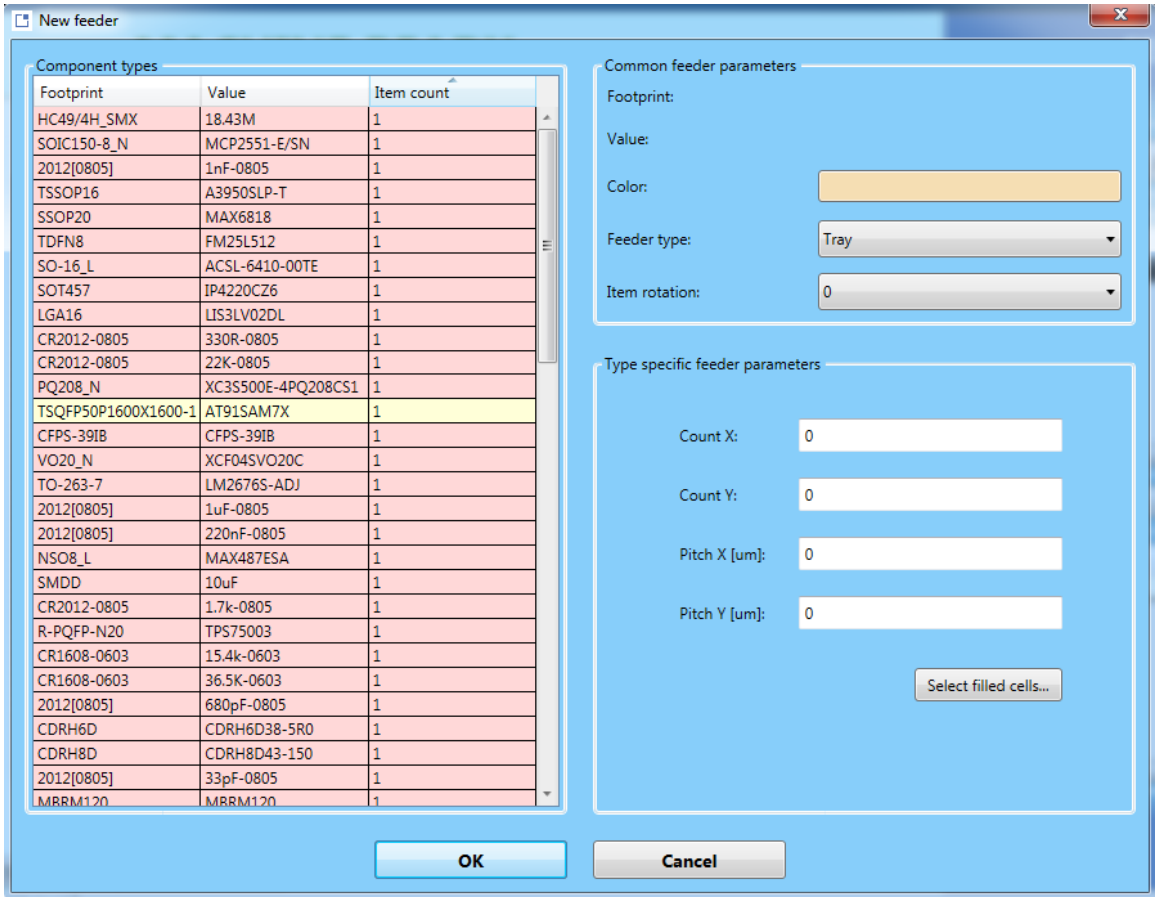
Automatic tape feeder properties dialog is used for setting up a new automatic feeder. It can be accessed both by double clicking on unassigned feeder (yellow) or by clicking "New" in the Feeders panel.



Property	Value	Meaning
Footprint:	Component footprint	Info
Value:	Component value	Info
Color	Feeder color	Info
Feeder type:	Feeder type	Type of feeder
Item rotation:	0 90 180 270	Angle of component within feeder.
Feeder block slot	1-33	Slot number
Tape pitch:	2 4 8 12 16 20 24	Tape pitch between components in millimeter.
Item count		Quantity available components

2.2.4.4.3. Tray feeder properties

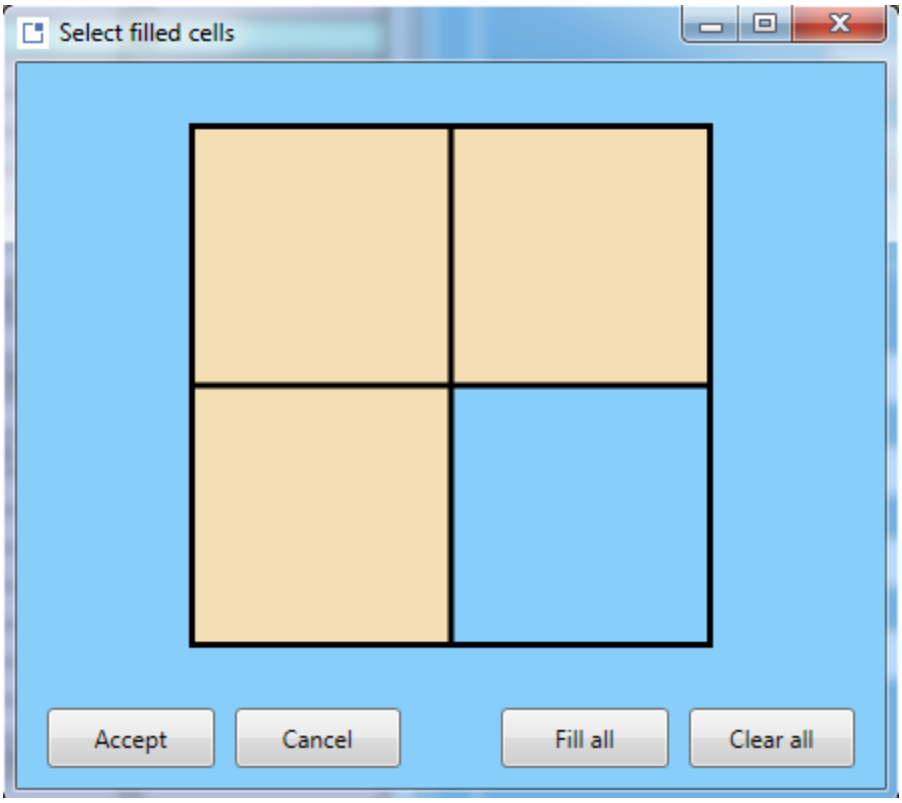
Tray feeder properties dialog is used for setting up a new tray feeder:



Property	Value	Meaning
Footprint:	Component footprint	Info
Value:	Component value	Info
Color	Feeder color	Info
Feeder type:	Feeder type	Type of feeder
Item rotation:	0 90 180 270	Angle of component within feeder.
Count X	Feeder X size	Number of component along X axis.
Count Y	Feeder Y size	Number of component along Y axis.
Pitch X	Feeder X distance	Tray pitch along X axis.
Pitch Y	Feeder Y distance	Tray pitch along Y axis.

By clicking 

You can specify active cells in tray feeder:

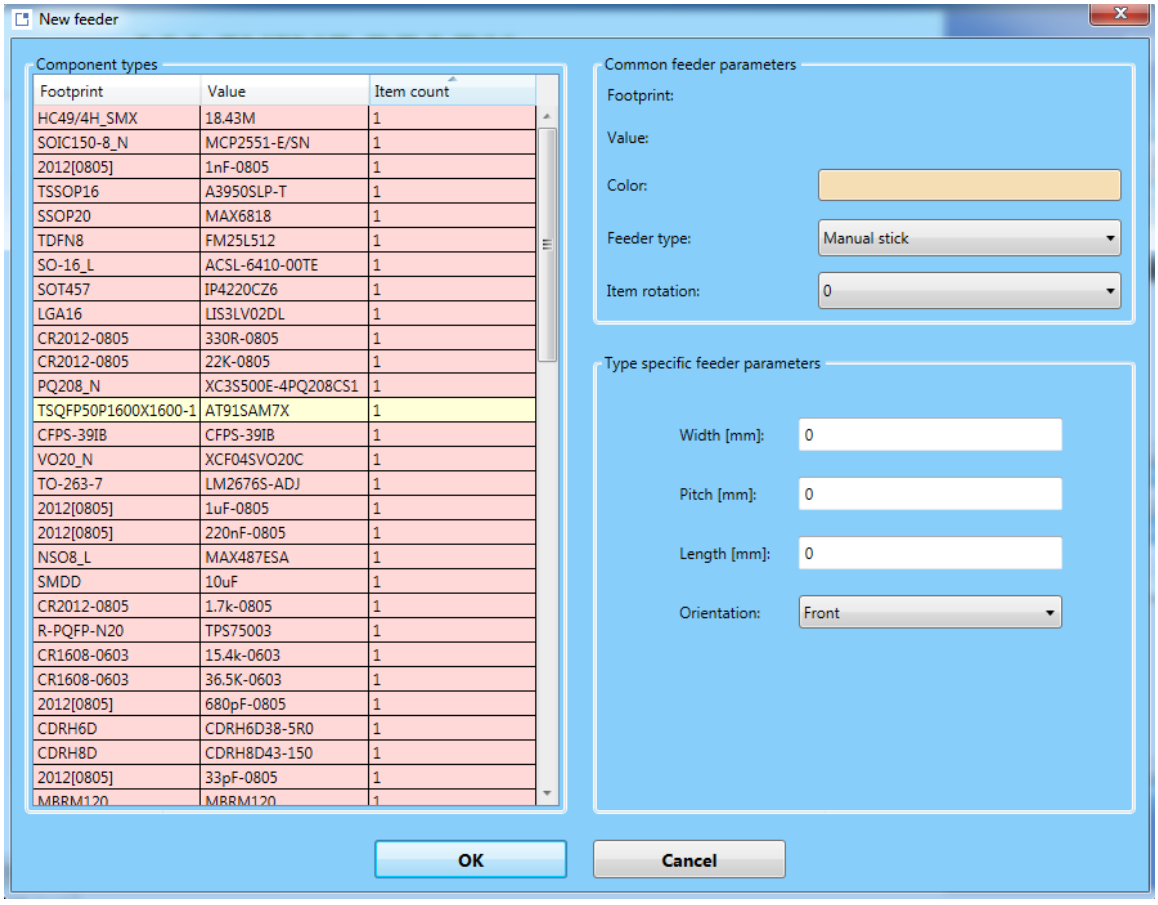


Accept	Accept changes and close dialog
Cancel	Cancel changes and close dialog
Fill all	Select all cells
Clear all	Deselect all cells

Empty cells will be omitted during placing process.

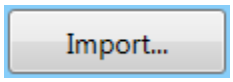
2.2.4.4.4. Stick feeder properties

Stick feeder properties dialog is used for setting up a new stick feeder:



Property	Value	Meaning
Footprint:	Component footprint	Info
Value:	Component value	Info
Color	Feeder color	Info
Feeder type:	Feeder type	Type of feeder
Item rotation:	0 90 180 270	Angle of component within feeder.
Width:	Feeder width	Feeder width in mm.
Pitch:	Feeder pitch	Feeder pitch between components in mm.
Length:	Feeder length	Feeder full length in mm.
Orientation:	Front Left Right	Feeder location on the machine.

2.2.4.4.5. Import feeders properties

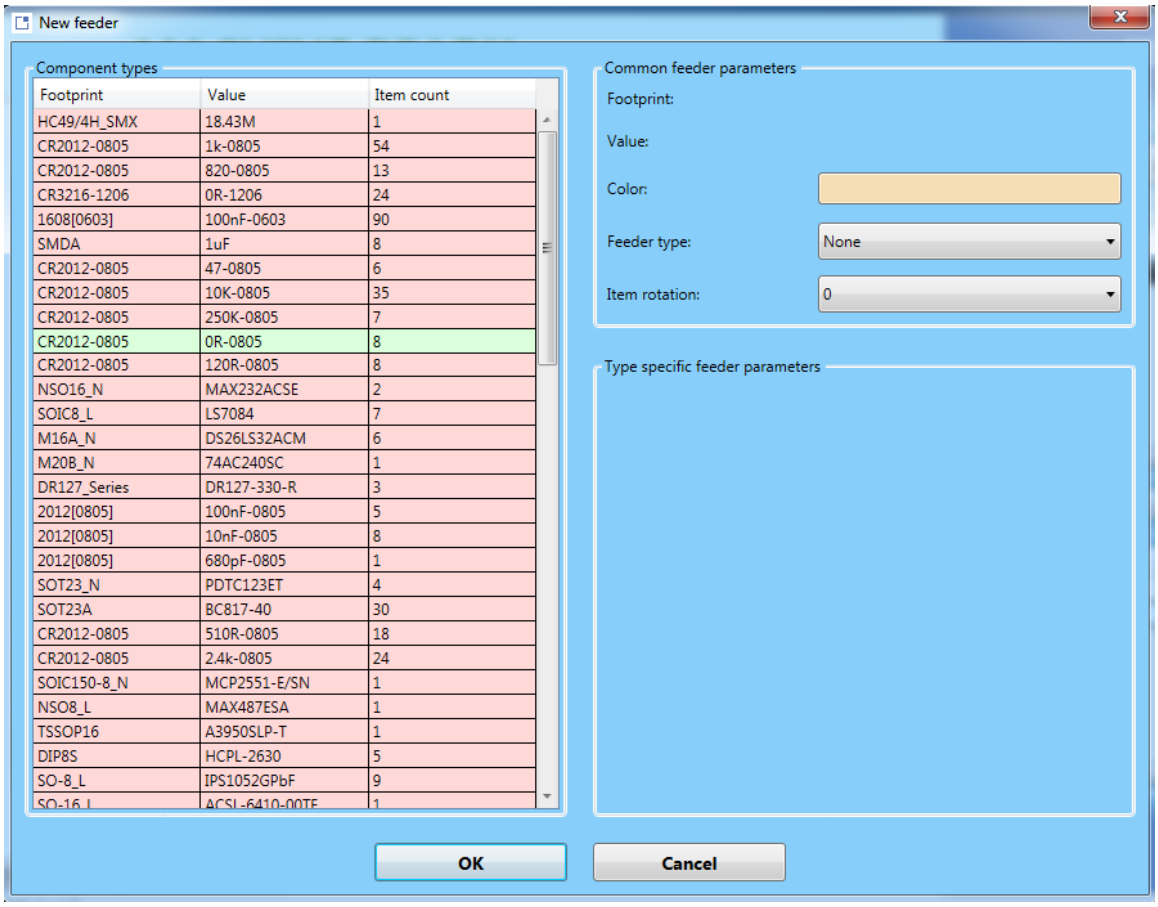
By clicking 

You can import feeders from another project.

Important: Feeder properties will be imported only if Footprint and Value are equal between two projects.

2.2.4.4.6. Add new feeder

In order to define a new feeder from pick and place data the following dialog is to be used:



Click on left list to select a component to add. After that set up feeder settings on the right.

2.2.4.5. Automat work

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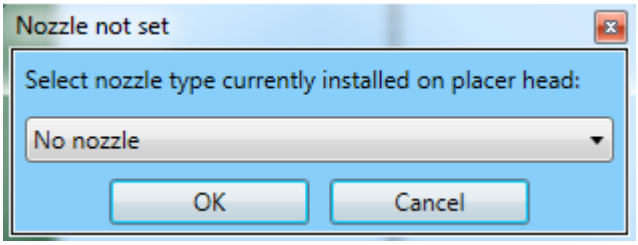
2.2.4.5.1. Start automatic process

To start working choose one of options:

New	Start working with new PCB.
Continue	Continue working with PCB that has not been finished yet.
Cancel	Cancel working procedure.

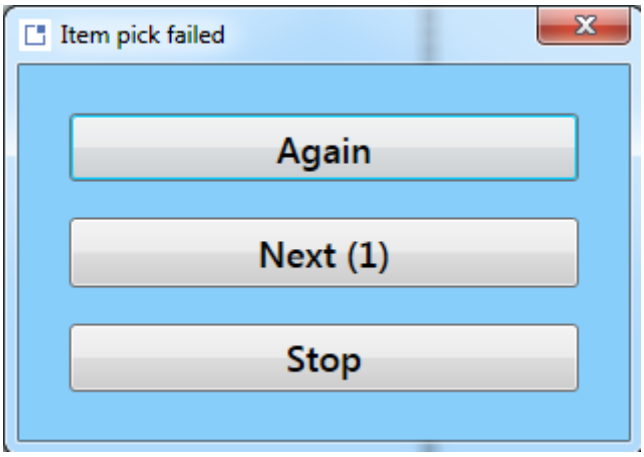
2.2.4.5.2. Nozzle not set

Please select a nozzle that is currently on the placing head. Choose the nozzle from list box:



2.2.4.5.3. Item pick failed

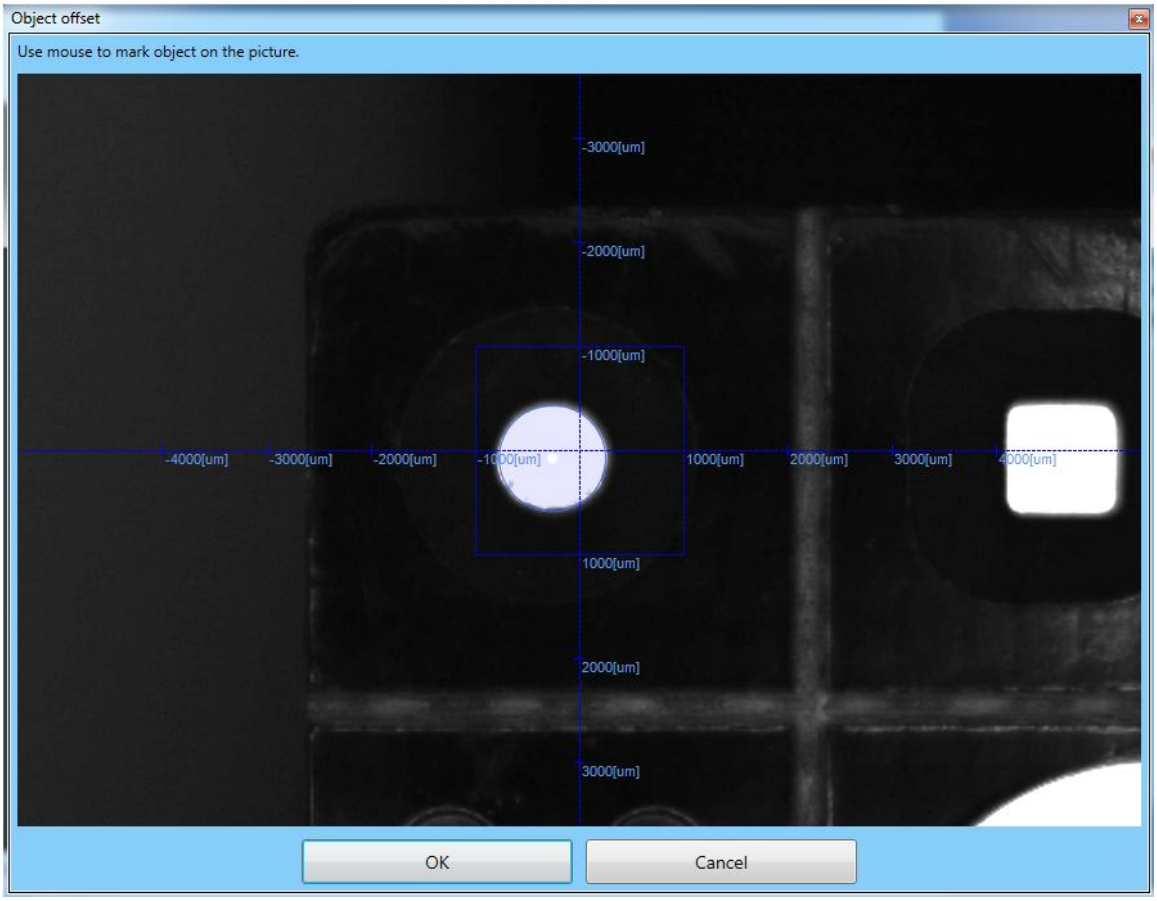
Do action after picking error. It may occur when there is no components in the feeder.



Again	Try picking up from the same position ones again.
Next (1)	Go to next pick position (next component on the feeder).
Stop	Stop the automat.

2.2.4.5.4. Manual reference point

User can manually select fiducial on the picture from top camera. It is useful function in case of PCB without dedicated reference points:



2.2.4.6. Project wizard

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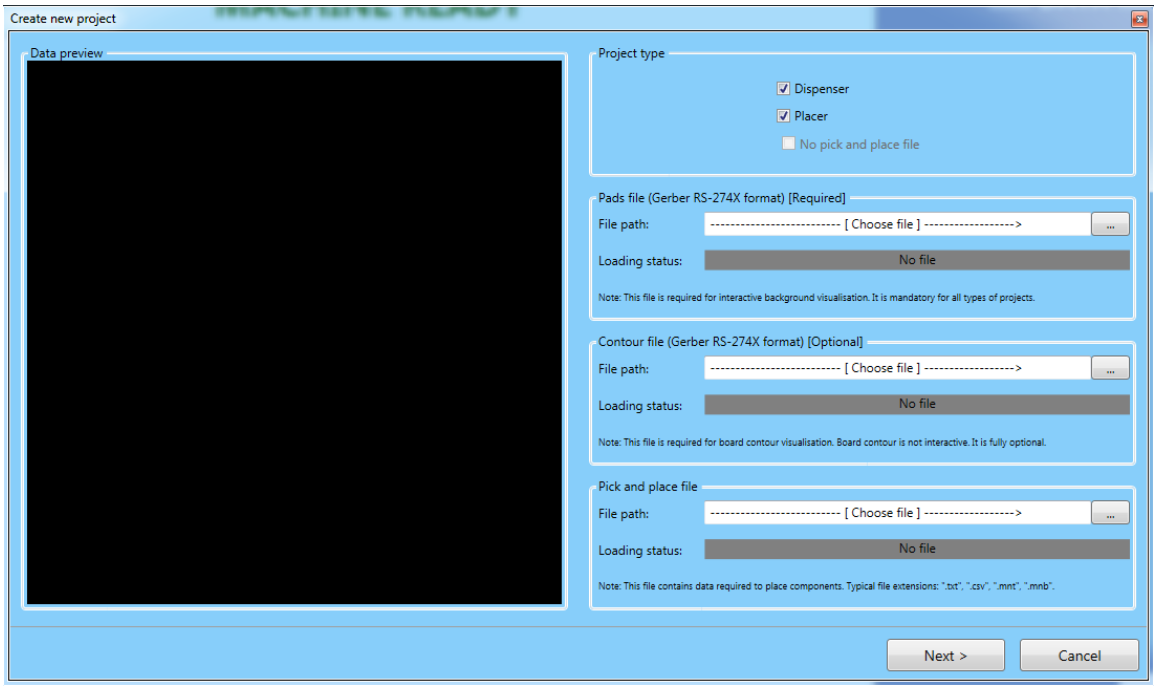
2.2.4.6.1. Select project type and CAD data



It is possible to create a project with the following settings:

- Dispenser
- Placer
- Dispenser + Placer

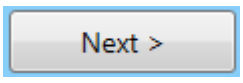
Select appropriate CAD data files for project:

I. Placer:

- Pads file - Gerber Top or Bottom layer
- Contour file - Gerber contour
- Pick and place file - Pick and place file (*.csv or *.txt) with place coordinates

II. Dispenser:

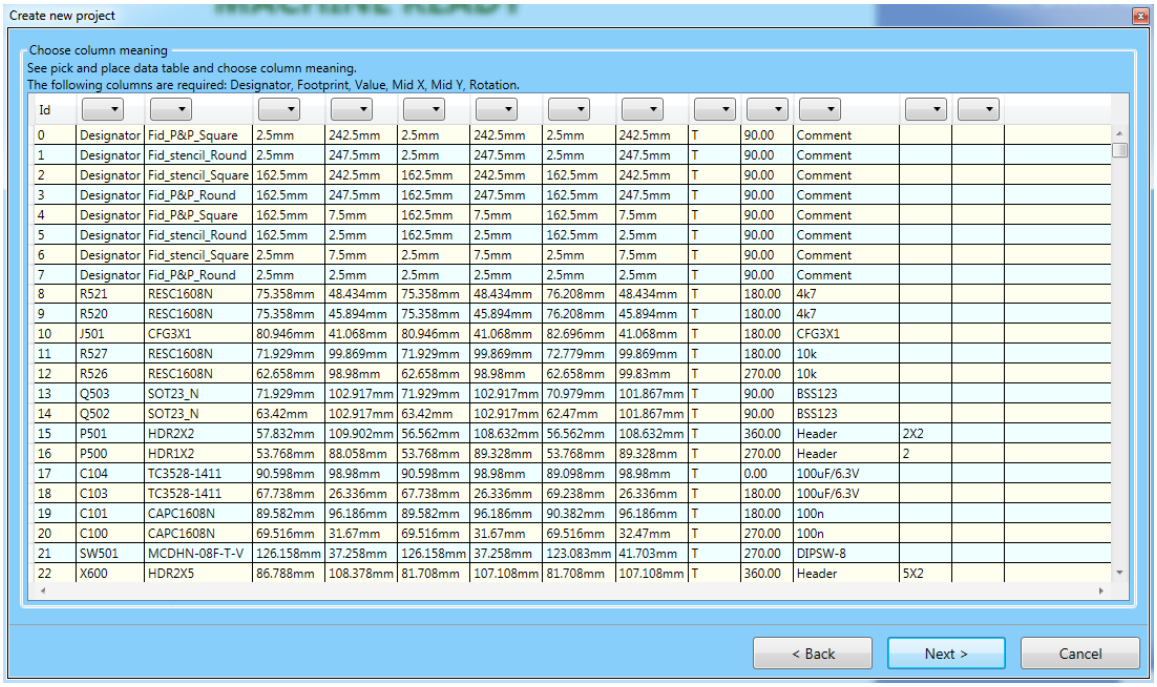
- Pads file - Gerber Top or Bottom paste
- Contour file - Gerber contour

After selecting files, click 

button.

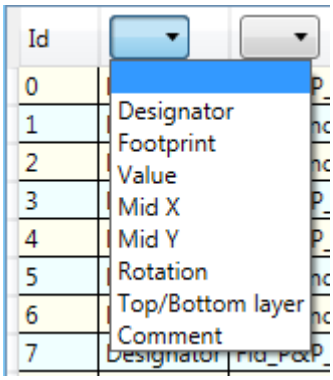
2.2.4.6.2. Pick And Place meaning

When pick and place files are not standard user has to indicate the meaning of the columns:

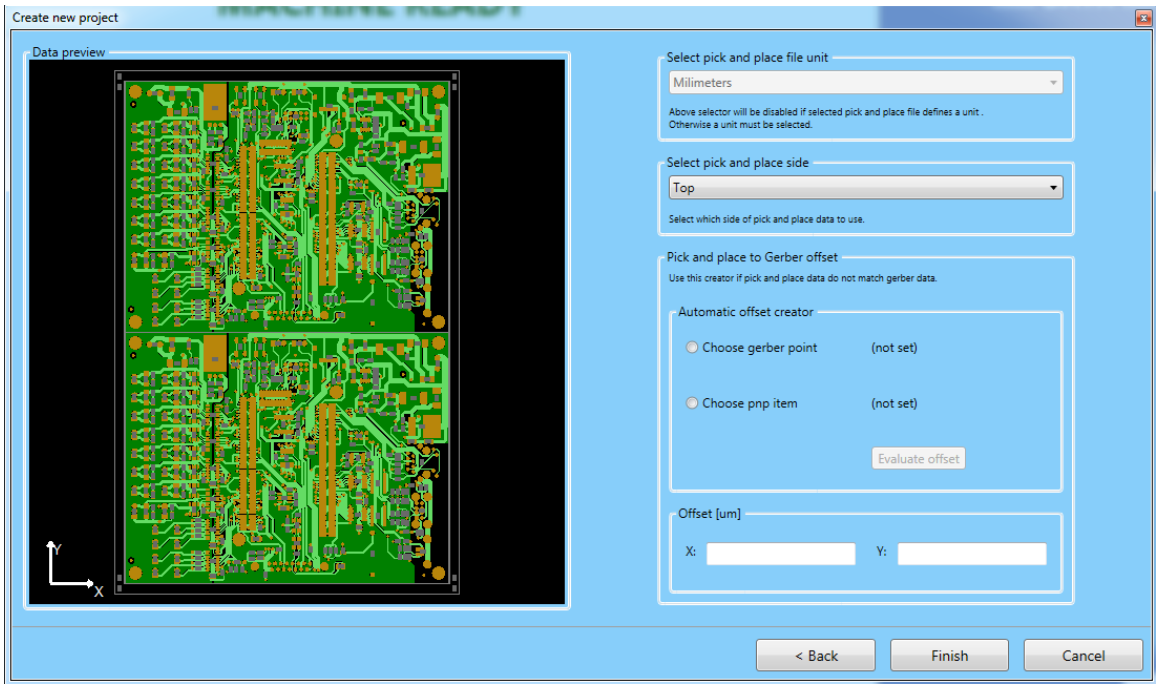


Id														
0	Designator	Fid_P&P_Square	2.5mm	242.5mm	2.5mm	242.5mm	2.5mm	242.5mm	T	90.00	Comment			
1	Designator	Fid_stencil_Round	2.5mm	247.5mm	2.5mm	247.5mm	2.5mm	247.5mm	T	90.00	Comment			
2	Designator	Fid_stencil_Square	162.5mm	242.5mm	162.5mm	242.5mm	162.5mm	242.5mm	T	90.00	Comment			
3	Designator	Fid_P&P_Round	162.5mm	247.5mm	162.5mm	247.5mm	162.5mm	247.5mm	T	90.00	Comment			
4	Designator	Fid_P&P_Square	162.5mm	7.5mm	162.5mm	7.5mm	162.5mm	7.5mm	T	90.00	Comment			
5	Designator	Fid_stencil_Round	162.5mm	2.5mm	162.5mm	2.5mm	162.5mm	2.5mm	T	90.00	Comment			
6	Designator	Fid_stencil_Square	2.5mm	7.5mm	2.5mm	7.5mm	2.5mm	7.5mm	T	90.00	Comment			
7	Designator	Fid_P&P_Round	2.5mm	2.5mm	2.5mm	2.5mm	2.5mm	2.5mm	T	90.00	Comment			
8	R521	RESC1608N	75.358mm	48.434mm	75.358mm	48.434mm	76.208mm	48.434mm	T	180.00	4k7			
9	R520	RESC1608N	75.358mm	45.894mm	75.358mm	45.894mm	76.208mm	45.894mm	T	180.00	4k7			
10	J501	CFG3X1	80.946mm	41.068mm	80.946mm	41.068mm	82.696mm	41.068mm	T	180.00	CFG3X1			
11	R527	RESC1608N	71.929mm	99.869mm	71.929mm	99.869mm	72.779mm	99.869mm	T	180.00	10k			
12	R526	RESC1608N	62.658mm	98.98mm	62.658mm	98.98mm	62.658mm	99.83mm	T	270.00	10k			
13	Q503	SOT23_N	71.929mm	102.917mm	71.929mm	102.917mm	70.979mm	101.867mm	T	90.00	BSS123			
14	Q502	SOT23_N	63.42mm	102.917mm	63.42mm	102.917mm	62.47mm	101.867mm	T	90.00	BSS123			
15	P501	HDR2X2	57.832mm	109.902mm	56.562mm	108.632mm	56.562mm	108.632mm	T	360.00	Header	2X2		
16	P500	HDR1X2	53.768mm	88.058mm	53.768mm	89.328mm	53.768mm	89.328mm	T	270.00	Header	2		
17	C104	TC3528-1411	90.598mm	98.98mm	90.598mm	98.98mm	89.098mm	98.98mm	T	0.00	100uF/6.3V			
18	C103	TC3528-1411	67.738mm	26.336mm	67.738mm	26.336mm	69.238mm	26.336mm	T	180.00	100uF/6.3V			
19	C101	CAPC1608N	89.582mm	96.186mm	89.582mm	96.186mm	90.382mm	96.186mm	T	180.00	100n			
20	C100	CAPC1608N	69.516mm	31.67mm	69.516mm	31.67mm	69.516mm	32.47mm	T	270.00	100n			
21	SW501	MCDHN-08F-T-V	126.158mm	37.258mm	126.158mm	37.258mm	123.083mm	41.703mm	T	270.00	DIPSW-8			
22	X600	HDR2X5	86.788mm	108.378mm	81.708mm	107.108mm	81.708mm	107.108mm	T	360.00	Header	5X2		

To do this click on the top of the column and choose appropriate meaning of it:



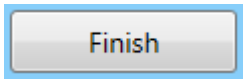
2.2.4.6.3. Pick And Place settings



Pick and place file unit - choose unit of pick and place file

PCB side - select PCB side (top/bottom)

Gerber offset - some CAD systems do not generate appropriate information about coordinates used in gerber files. In this case user has to correct this information using this wizard page

Click 

to finish creating project.

3. Quick guide

With this quick guide You can learn how to create placer and dispenser projects just with a few simple steps. Please take a look at:

- Placer project guide,
- Dispenser project guide.

3.1. Placer

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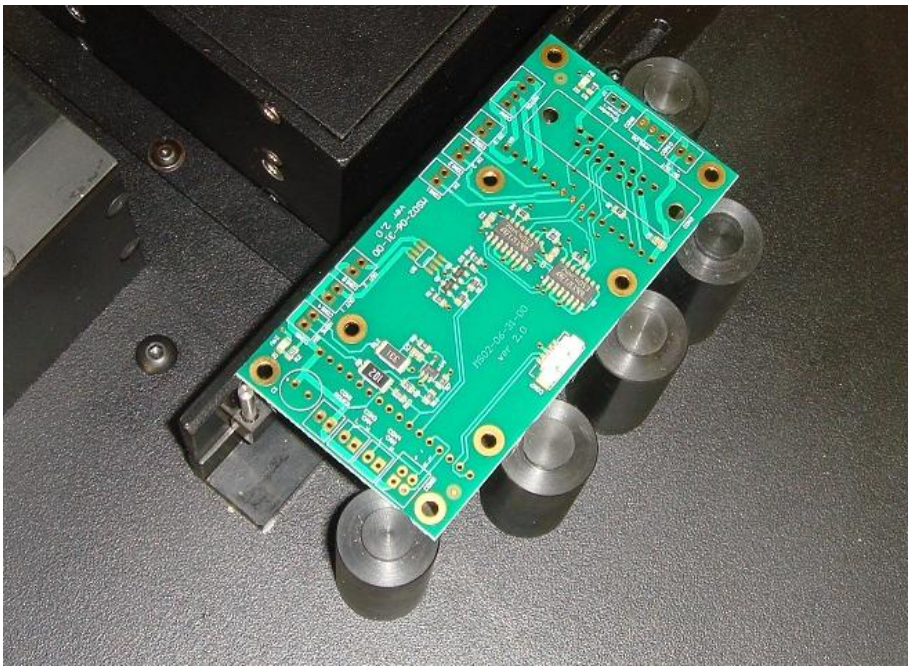
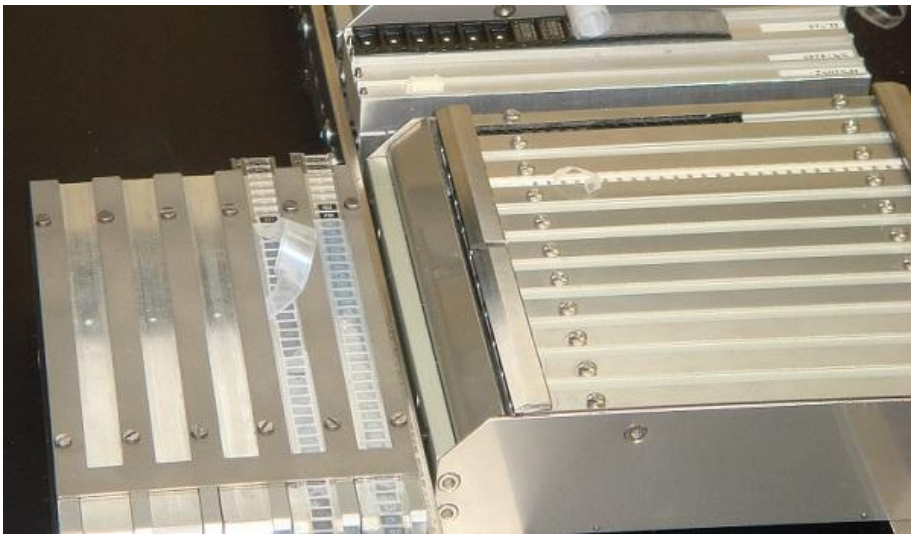
3.1.1. Prepare working area

The first step to take before the placing process is initiated is to configure the working area of the machine:

I. Remove the bottom camera lens hood if installed
II. Install the PCB in the middle of the working area of the machine. Use the PCB holders to keep it firmly. The picture below shows how it should be done:



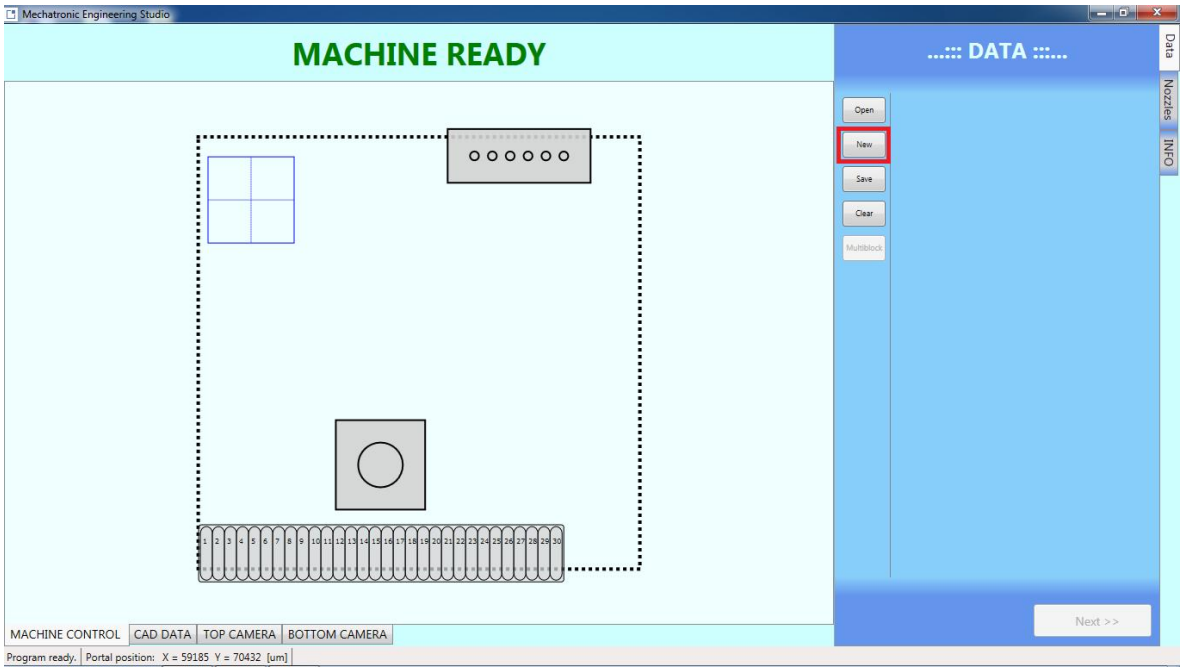
III. Install needed components in feeders



The feeders must be configured before being used. How to do it is described in this quick guide later on.

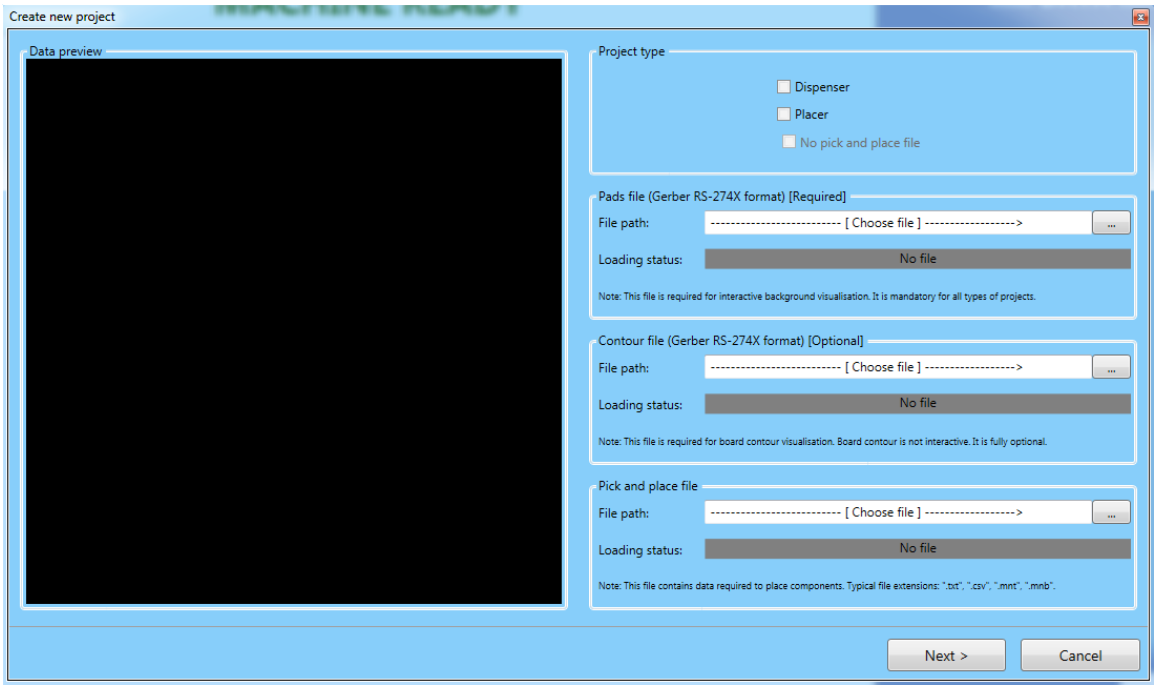
3.1.2. Create new project

To start a new Pick and Place project click on “New” button. It will open a new project wizard.

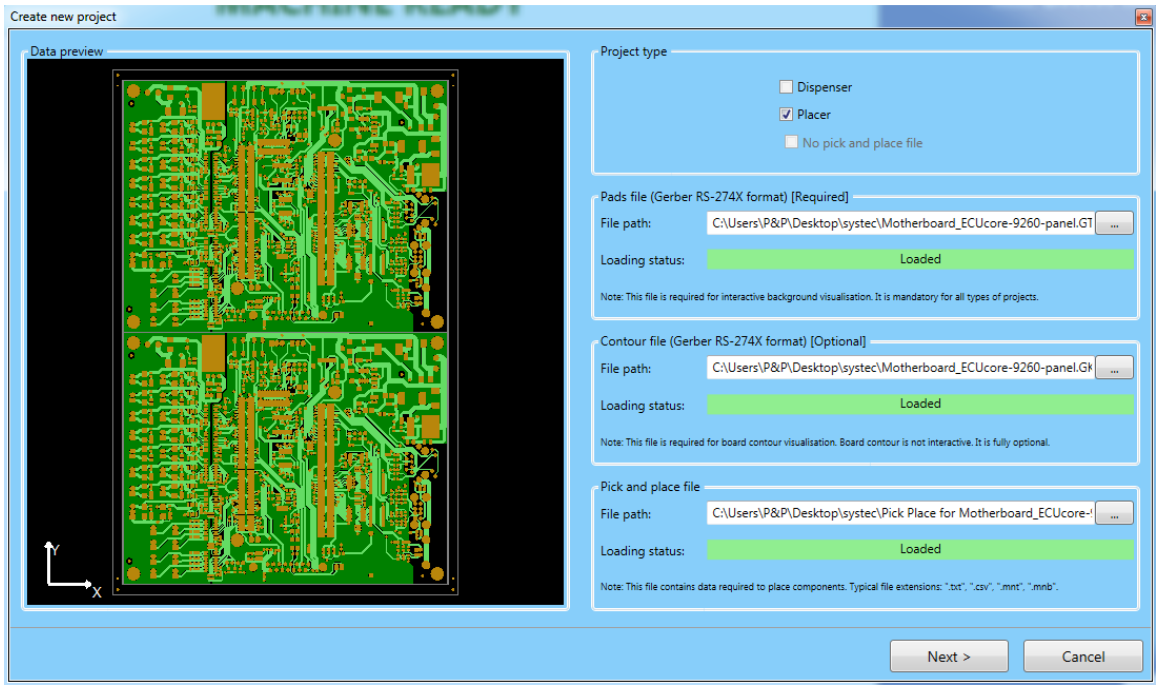


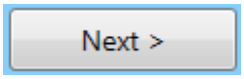
3.1.2.1. Select project type and CAD data

Select appropriate project type and choose CAD data files for the project.



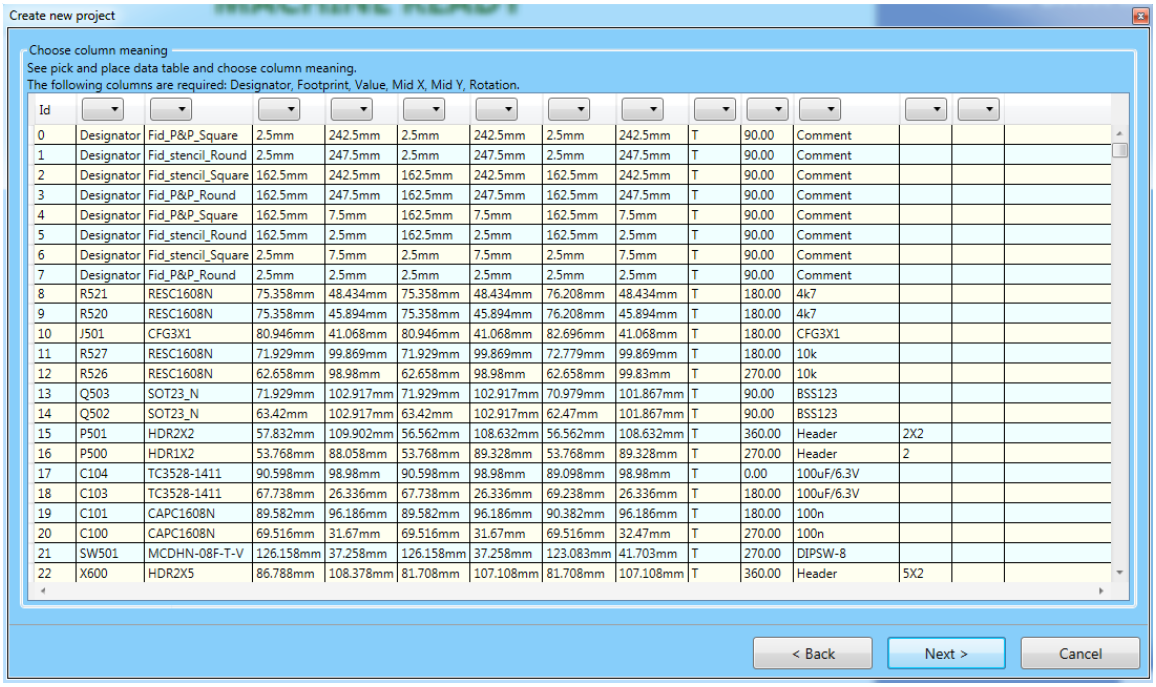
Pads file:	Gerber Top or Bottom layer.
Contour file:	Gerber contour.
Pick and place file:	Pick and place file (*.csv or *.txt) with place coordinates.



Then click  button to continue.

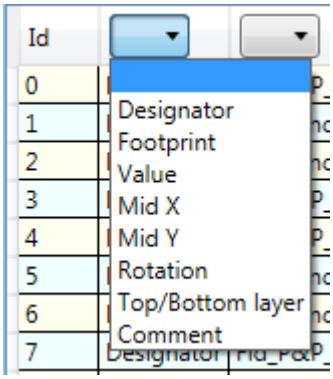
3.1.2.2. Select Pick and Place data

Now we have to choose the meaning of columns from the Pick and Place file:

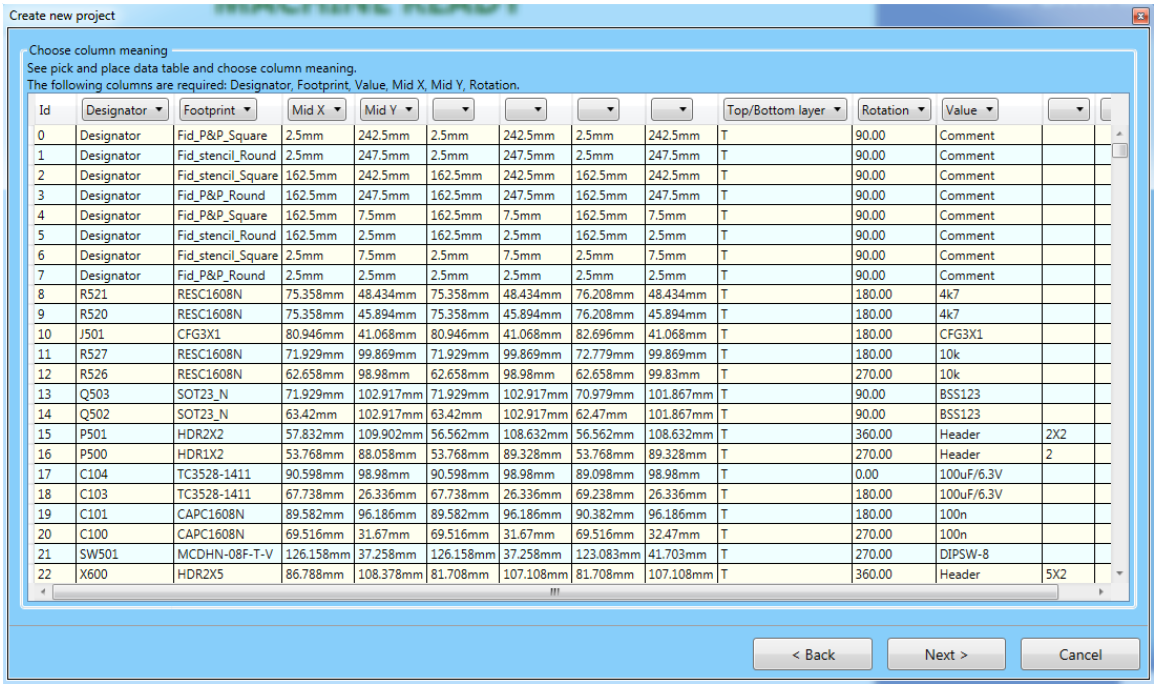


Id														
0	Designator	Fid_P&P_Square	2.5mm	242.5mm	2.5mm	242.5mm	2.5mm	242.5mm	T	90.00	Comment			
1	Designator	Fid_stencil_Round	2.5mm	247.5mm	2.5mm	247.5mm	2.5mm	247.5mm	T	90.00	Comment			
2	Designator	Fid_stencil_Square	162.5mm	242.5mm	162.5mm	242.5mm	162.5mm	242.5mm	T	90.00	Comment			
3	Designator	Fid_P&P_Round	162.5mm	247.5mm	162.5mm	247.5mm	162.5mm	247.5mm	T	90.00	Comment			
4	Designator	Fid_P&P_Square	162.5mm	7.5mm	162.5mm	7.5mm	162.5mm	7.5mm	T	90.00	Comment			
5	Designator	Fid_stencil_Round	162.5mm	2.5mm	162.5mm	2.5mm	162.5mm	2.5mm	T	90.00	Comment			
6	Designator	Fid_stencil_Square	2.5mm	7.5mm	2.5mm	7.5mm	2.5mm	7.5mm	T	90.00	Comment			
7	Designator	Fid_P&P_Round	2.5mm	2.5mm	2.5mm	2.5mm	2.5mm	2.5mm	T	90.00	Comment			
8	R521	RESC1608N	75.358mm	48.434mm	75.358mm	48.434mm	76.208mm	48.434mm	T	180.00	4k7			
9	R520	RESC1608N	75.358mm	45.894mm	75.358mm	45.894mm	76.208mm	45.894mm	T	180.00	4k7			
10	J501	CFG3X1	80.946mm	41.068mm	80.946mm	41.068mm	82.696mm	41.068mm	T	180.00	CFG3X1			
11	R527	RESC1608N	71.929mm	99.869mm	71.929mm	99.869mm	72.779mm	99.869mm	T	180.00	10k			
12	R526	RESC1608N	62.658mm	98.98mm	62.658mm	98.98mm	62.658mm	99.83mm	T	270.00	10k			
13	Q503	SOT23_N	71.929mm	102.917mm	71.929mm	102.917mm	70.979mm	101.867mm	T	90.00	BSS123			
14	Q502	SOT23_N	63.42mm	102.917mm	63.42mm	102.917mm	62.47mm	101.867mm	T	90.00	BSS123			
15	P501	HDR2X2	57.832mm	109.902mm	56.562mm	108.632mm	56.562mm	108.632mm	T	360.00	Header	2X2		
16	P500	HDR1X2	53.768mm	88.058mm	53.768mm	89.328mm	53.768mm	89.328mm	T	270.00	Header	2		
17	C104	TC3528-1411	90.598mm	98.98mm	90.598mm	98.98mm	89.098mm	98.98mm	T	0.00	100uF/6.3V			
18	C103	TC3528-1411	67.738mm	26.336mm	67.738mm	26.336mm	69.238mm	26.336mm	T	180.00	100uF/6.3V			
19	C101	CAPC1608N	89.582mm	96.186mm	89.582mm	96.186mm	90.382mm	96.186mm	T	180.00	100n			
20	C100	CAPC1608N	69.516mm	31.67mm	69.516mm	31.67mm	69.516mm	32.47mm	T	270.00	100n			
21	SW501	MCDHN-08F-T-V	126.158mm	37.258mm	126.158mm	37.258mm	123.083mm	41.703mm	T	270.00	DIPSW-8			
22	X600	HDR2X5	86.788mm	108.378mm	81.708mm	107.108mm	81.708mm	107.108mm	T	360.00	Header	5X2		

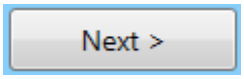
Click the column title to open menu with some options:



Select all needed columns as shown below:



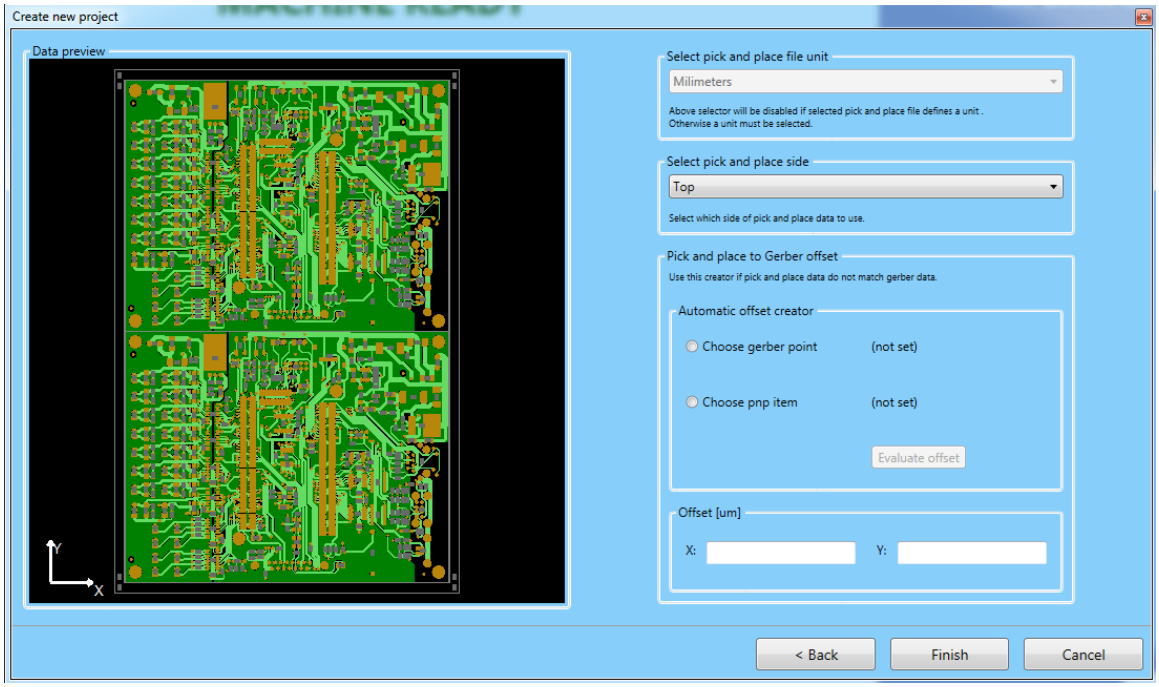
Id	Designator	Footprint	Mid X	Mid Y					Top/Bottom layer	Rotation	Value		
0	Designator	Fid_P&P_Square	2.5mm	242.5mm	2.5mm	242.5mm	2.5mm	242.5mm	T	90.00	Comment		
1	Designator	Fid_stencil_Round	2.5mm	247.5mm	2.5mm	247.5mm	2.5mm	247.5mm	T	90.00	Comment		
2	Designator	Fid_stencil_Square	162.5mm	242.5mm	162.5mm	242.5mm	162.5mm	242.5mm	T	90.00	Comment		
3	Designator	Fid_P&P_Round	162.5mm	247.5mm	162.5mm	247.5mm	162.5mm	247.5mm	T	90.00	Comment		
4	Designator	Fid_P&P_Square	162.5mm	7.5mm	162.5mm	7.5mm	162.5mm	7.5mm	T	90.00	Comment		
5	Designator	Fid_stencil_Round	162.5mm	2.5mm	162.5mm	2.5mm	162.5mm	2.5mm	T	90.00	Comment		
6	Designator	Fid_stencil_Square	2.5mm	7.5mm	2.5mm	7.5mm	2.5mm	7.5mm	T	90.00	Comment		
7	Designator	Fid_P&P_Round	2.5mm	2.5mm	2.5mm	2.5mm	2.5mm	2.5mm	T	90.00	Comment		
8	R521	RESC1608N	75.358mm	48.434mm	75.358mm	48.434mm	76.208mm	48.434mm	T	180.00	4k7		
9	R520	RESC1608N	75.358mm	45.894mm	75.358mm	45.894mm	76.208mm	45.894mm	T	180.00	4k7		
10	J501	CFG3X1	80.946mm	41.068mm	80.946mm	41.068mm	82.696mm	41.068mm	T	180.00	CFG3X1		
11	R527	RESC1608N	71.929mm	99.869mm	71.929mm	99.869mm	72.779mm	99.869mm	T	180.00	10k		
12	R526	RESC1608N	62.658mm	98.98mm	62.658mm	98.98mm	62.658mm	99.83mm	T	270.00	10k		
13	Q503	SOT23_N	71.929mm	102.917mm	71.929mm	102.917mm	70.979mm	101.867mm	T	90.00	BSS123		
14	Q502	SOT23_N	63.42mm	102.917mm	63.42mm	102.917mm	62.47mm	101.867mm	T	90.00	BSS123		
15	P501	HDR2X2	57.832mm	109.902mm	56.562mm	108.632mm	56.562mm	108.632mm	T	360.00	Header	2X2	
16	P500	HDR1X2	53.768mm	88.058mm	53.768mm	89.328mm	53.768mm	89.328mm	T	270.00	Header	2	
17	C104	TC3528-1411	90.598mm	98.98mm	90.598mm	98.98mm	89.098mm	98.98mm	T	0.00	100uF/6.3V		
18	C103	TC3528-1411	67.738mm	26.336mm	67.738mm	26.336mm	69.238mm	26.336mm	T	180.00	100uF/6.3V		
19	C101	CAPC1608N	89.582mm	96.186mm	89.582mm	96.186mm	90.382mm	96.186mm	T	180.00	100n		
20	C100	CAPC1608N	69.516mm	31.67mm	69.516mm	31.67mm	69.516mm	32.47mm	T	270.00	100n		
21	SW501	MCDHN-08F-T-V	126.158mm	37.258mm	126.158mm	37.258mm	123.083mm	41.703mm	T	270.00	DIPSW-8		
22	X600	HDR2X5	86.788mm	108.378mm	81.708mm	107.108mm	81.708mm	107.108mm	T	360.00	Header	5X2	

Then click 

button to continue.

3.1.2.3. Set Pick and Place settings

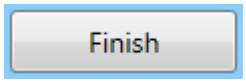
For compatibility with all Pick and Place files we have to choose data settings:



Pick and place file unit - choose unit of pick and place file

PCB side - select PCB side (top/bottom)

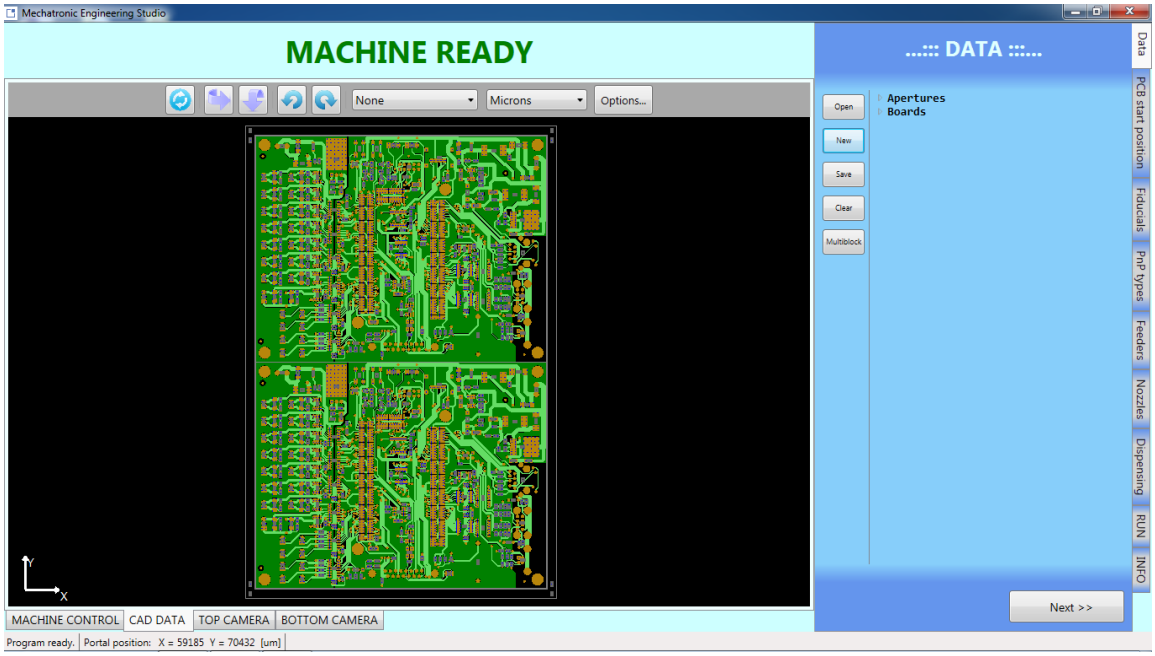
Gerber offset - some CAD systems do not generate appropriate information about coordinates used in gerber files. In this case user has to correct this information using this wizard page

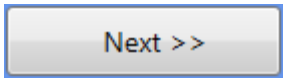
Click 

to finish creating project.

3.1.3. CAD data

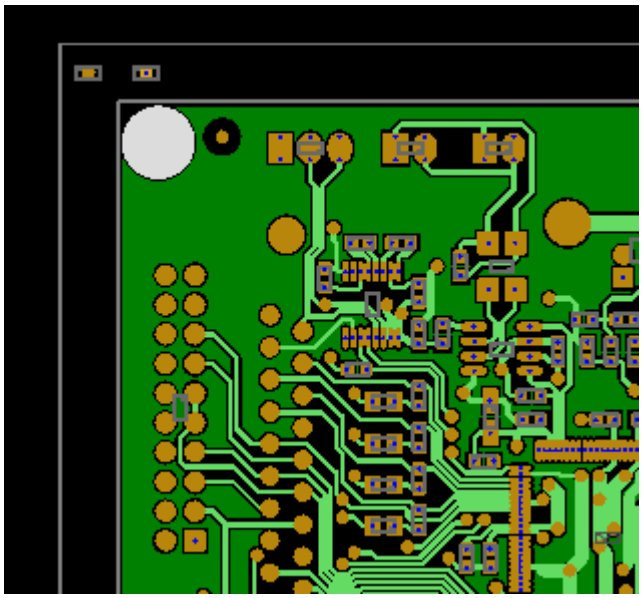
Now the visualization of gerber and pick and place files can be seen:

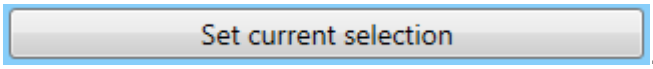


Click  to continue.

3.1.4. Set PCB start position

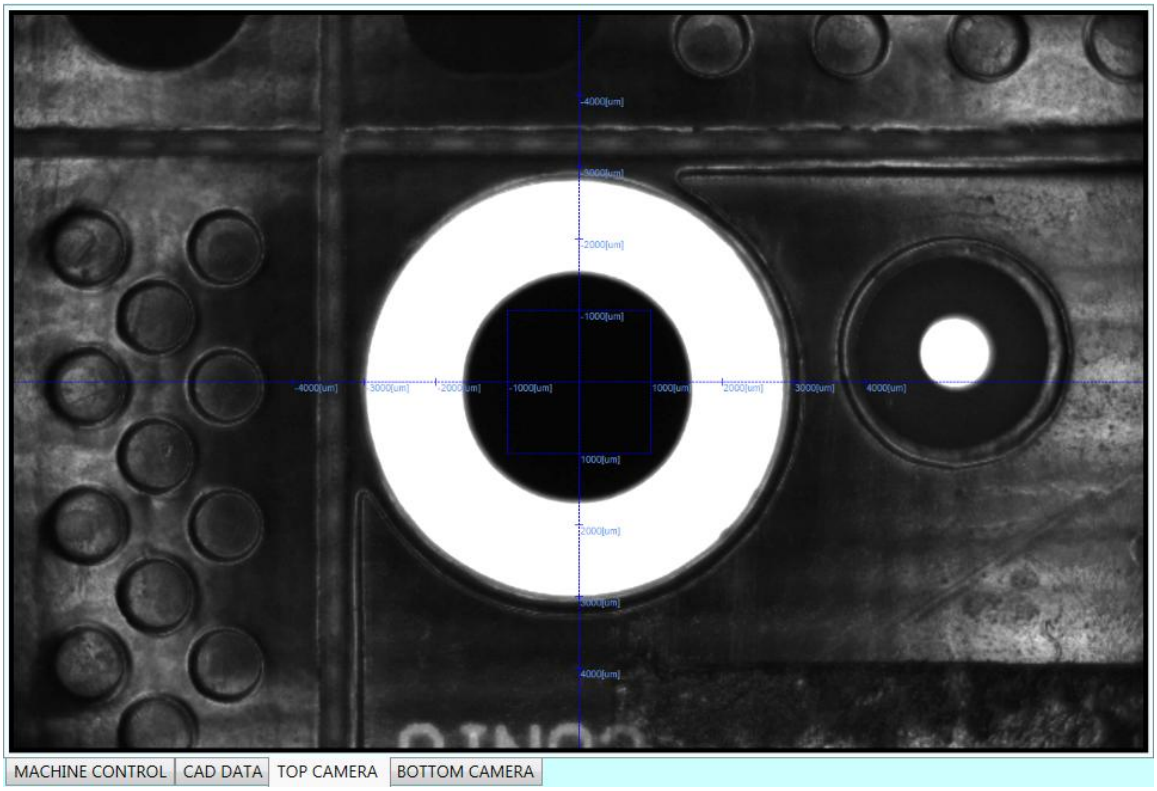
Select virtual position on CAD DATA, use Ctrl + left mouse button combination.

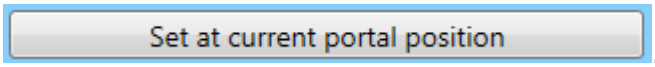


After that click 

.

Now move the machine arm close to the PCB (drag the arm on MACHINE CONTROL view). Afterwards, choose TOP CAMERA view and move to the point on PCB that is pointed by virtual position:

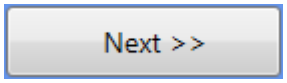


Afterwards, click 

.

Tip: If something goes wrong click 

button and set PCB position again.

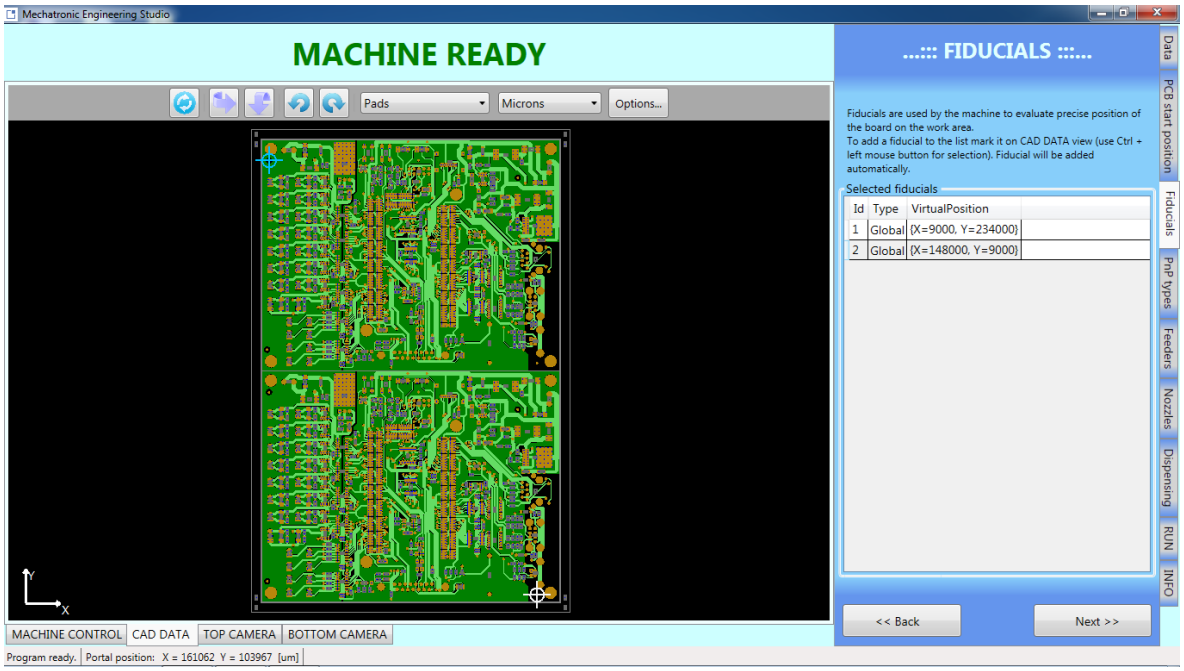
Click 

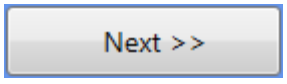
to continue.

3.1.5. Set fiducials

Two fiducials are required to perform placing process correctly. To add a fiducial to the list mark it on CAD DATA view (use Ctrl + left mouse button for selection). Fiducial will be added automatically.

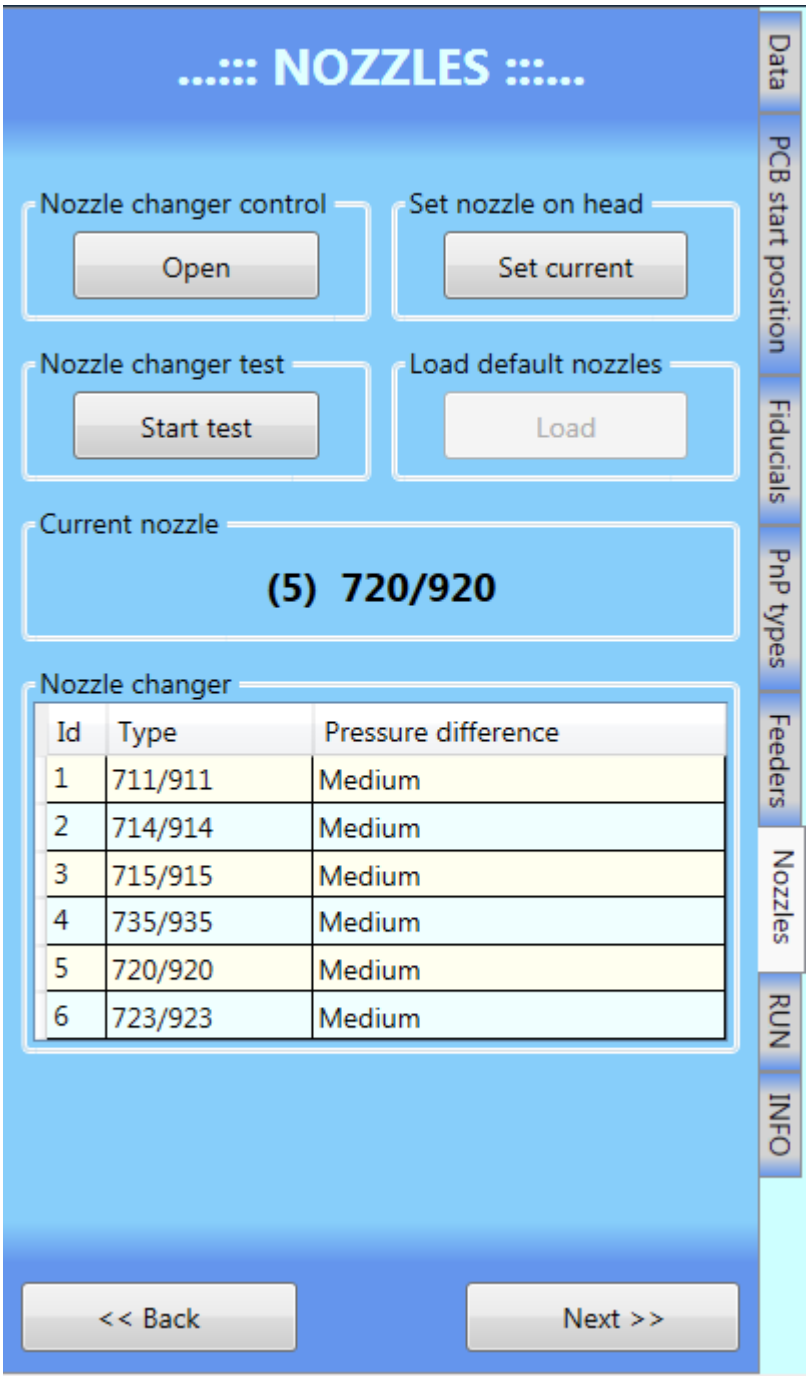
As a result, the selected fiducials should be shown on a list and marked on CAD DATA:

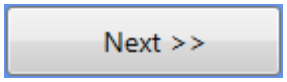


Click  to continue.

3.1.6. Set nozzles

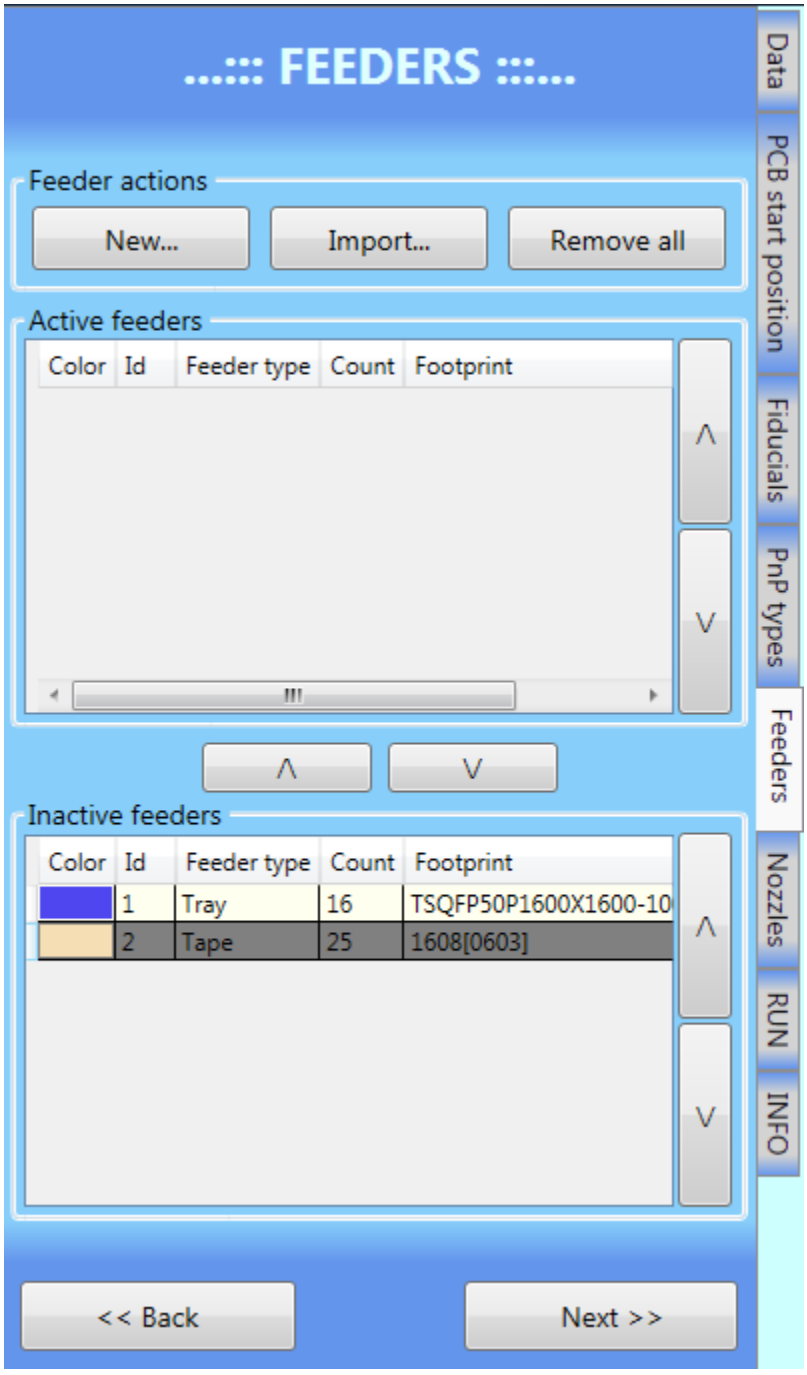
Here are settings of Nozzle Changer. We can leave default settings at this stage.



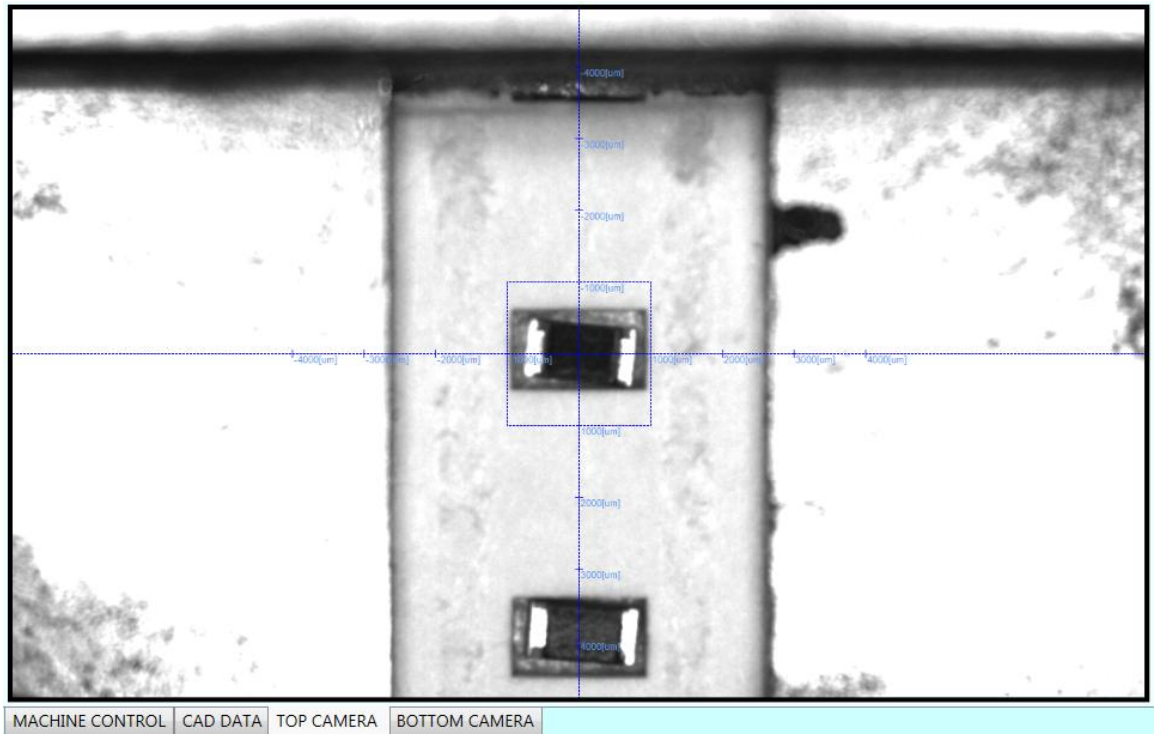
Click  to continue.

3.1.7. Set feeders

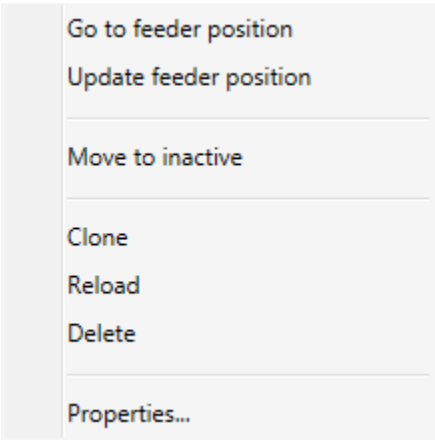
Here is the information about created feeders. As can be seen all the feeders are on the inactive feeders list. That means they have to be configured before using.



Show the center of first component on the feeder on TOP CAMERA view:

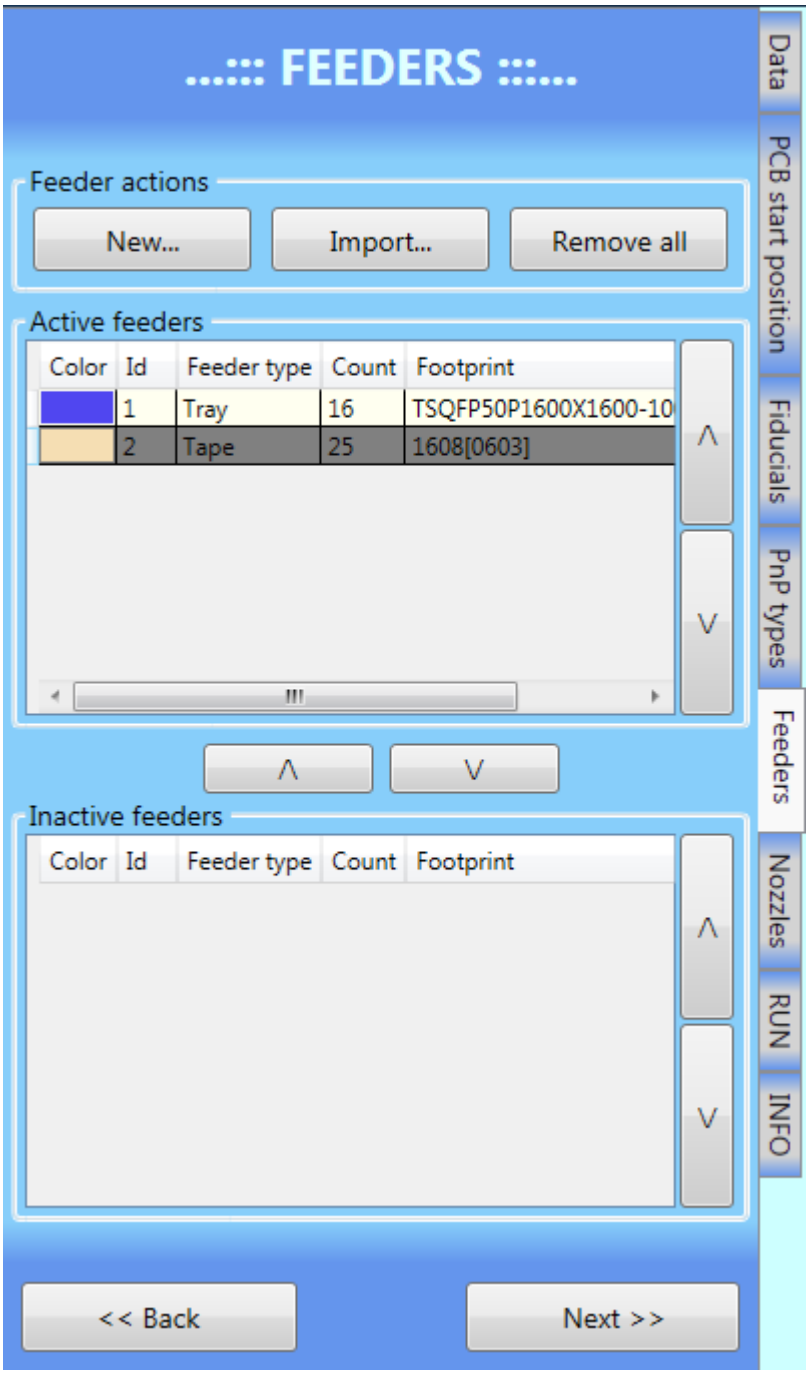


Next right click on the feeder from the list. You should see menu like below:

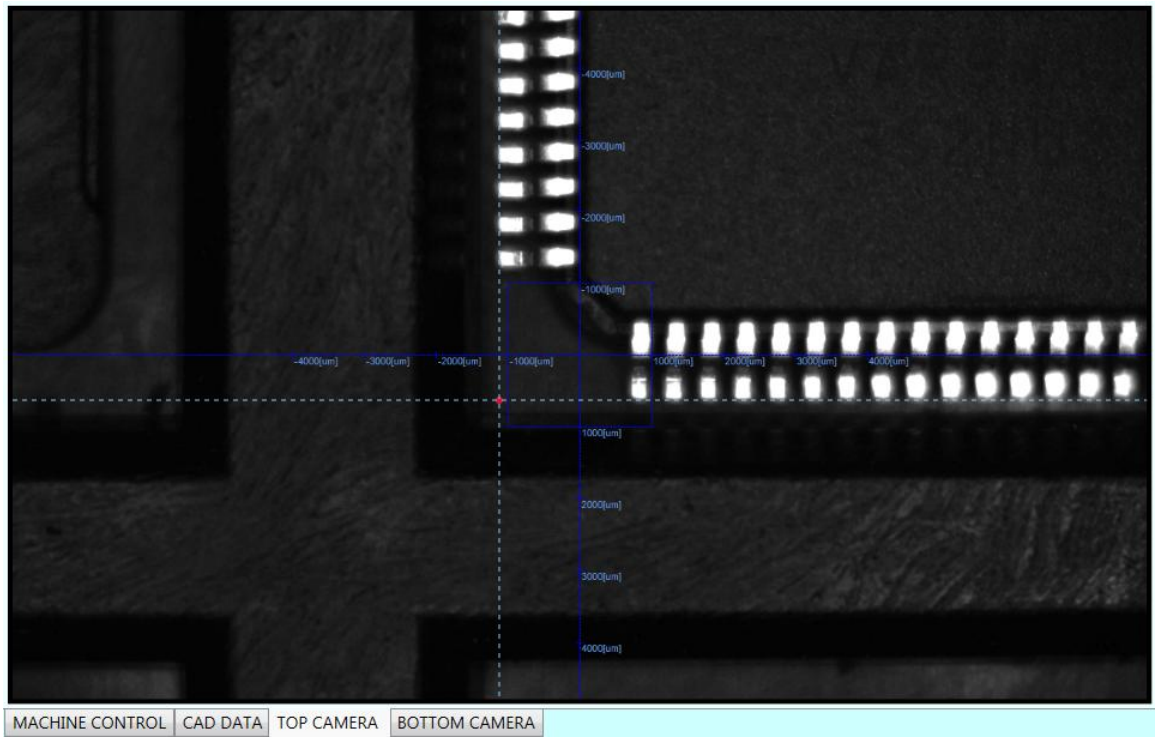


Then choose "Update feeder position". Feeder position will be updated. Please do this operation with all feeder. After that You can move feeders to Active feeders list. To do that select all feeders and click  button.

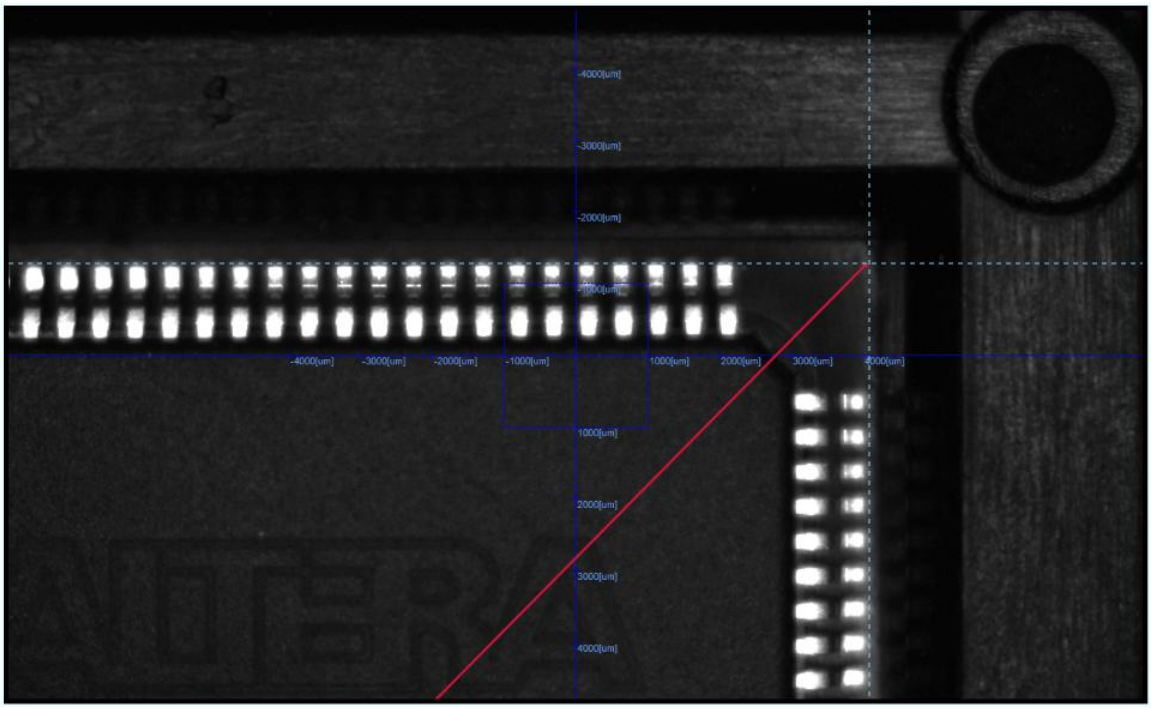
Components from the Active Feeders list will be placed by the machine.



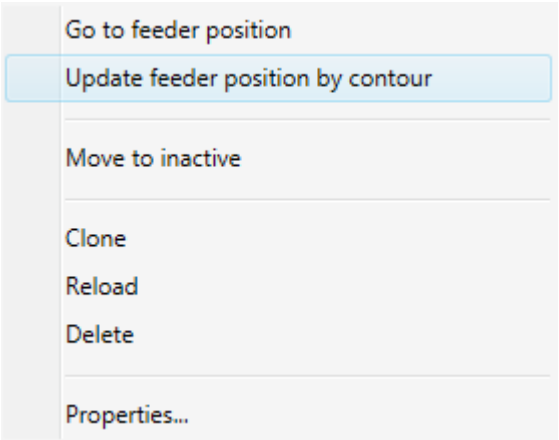
Tip: You can also change feeder position pointing at two corners of a component. Move arm close to first corner of component. Press Ctrl + left mouse button to mark first corner:

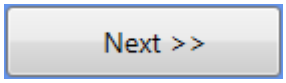


Move arm close to second corner of component. Press Ctrl + left mouse button to mark second corner:



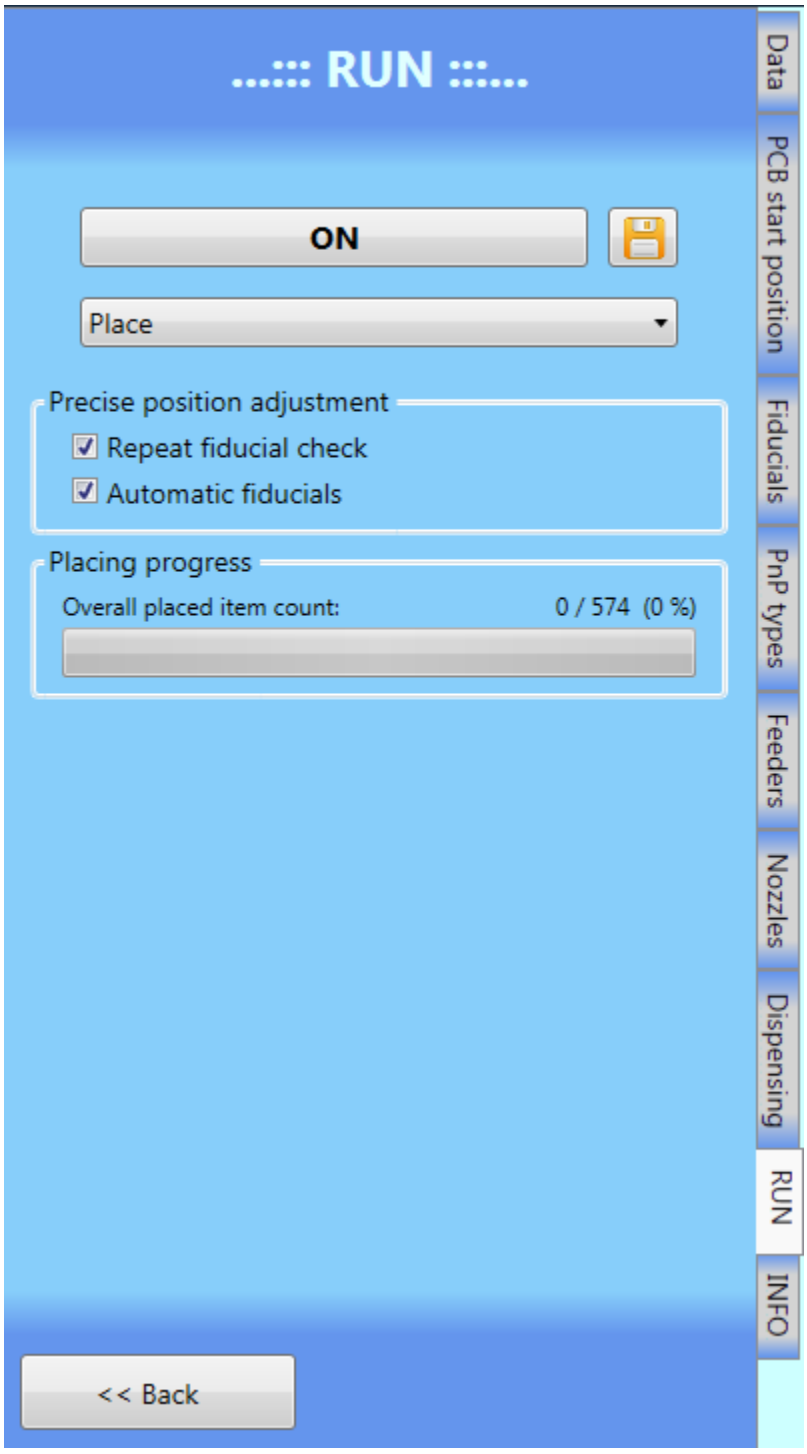
Next right click on feeder in feeder list and choose “Update feeder position by contour”:

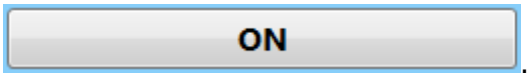


Click  to continue.

3.1.8. Start placing

This is the final step in setting up the machine. Choose “Place” option from listbox:



To start placing please click 

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4. Machine maintenance

Please follow the rules defined in this chapter to keep the machine in good condition.

4.1. Placer maintenance

Please apply the following rules to keep the placer in good condition:

I. **Keep the nozzles clean.** A nozzle is a very accurate device and must be kept clean. If it is broken then must be replaced.

II. **Keep the working area clean.** During the placing process it may happen that some components will not be recognized by the machine. These components are dropped down close to back left corner of the machine. Please clean it regularly.

III. **Keep the bottom camera lens clean.** The bottom camera lens must be kept clean to ensure the correct component inspection process. Please do not touch the lens with fingers! If it is dirty please use a soft micro-fiber cloth. Persistent dirt should be removed with lens cleaning fluid. Do it carefully. If the machine is not used for a longer period please cover the bottom camera lens with the hood attached.

4.2. Dispenser maintenance

Please apply these rules to keep the dispenser in good condition:

I. **Use only good quality paste.**

II. **Do not leave soldering paste in the dispenser valve for time period longer than two hours.** It is necessary to use a dedicated substance to clean the dispenser head. This substance is safe for the dispenser valve and can be leave in it for a long time.

III. **Use only 1/4" needle, and change it after day work.** Never install longer needles. It may destroy the dispenser head.

5. Pxx Hardware

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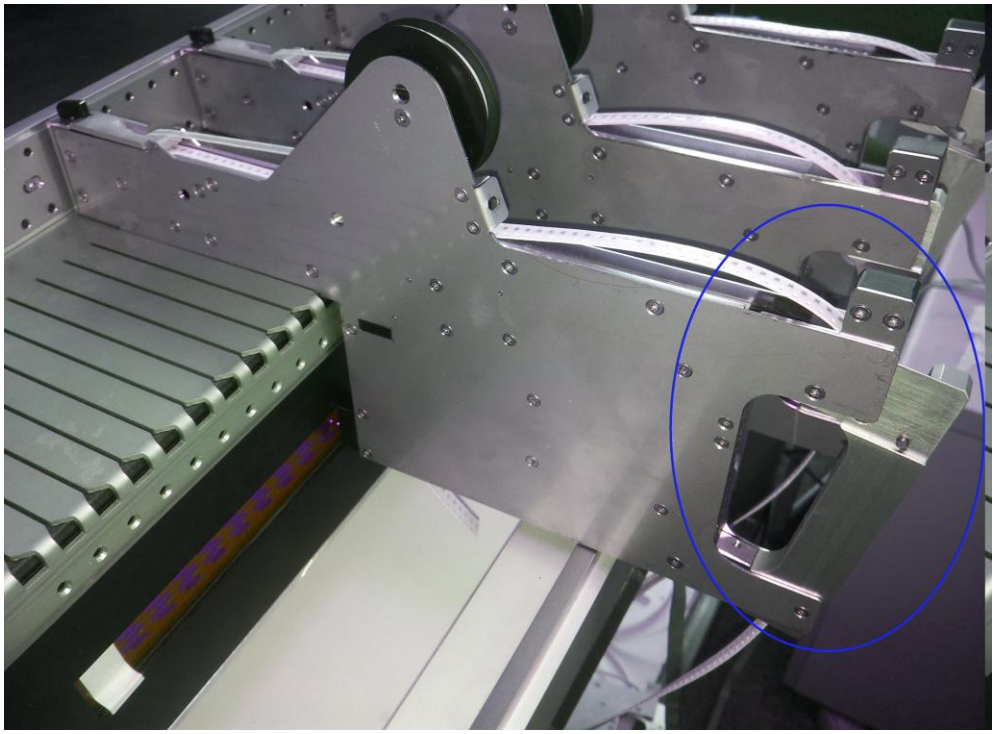
5.1. Automatic feeder setup

Follow the steps described here in order to correctly and safely use automatic feeders.

5.1.1. Feeder installation procedure

In odrer to safely install feeder to a slot, the following two steps have to be proceed:

I. Insert the feeder into the feeders frame. Make sure the safety handle is open:



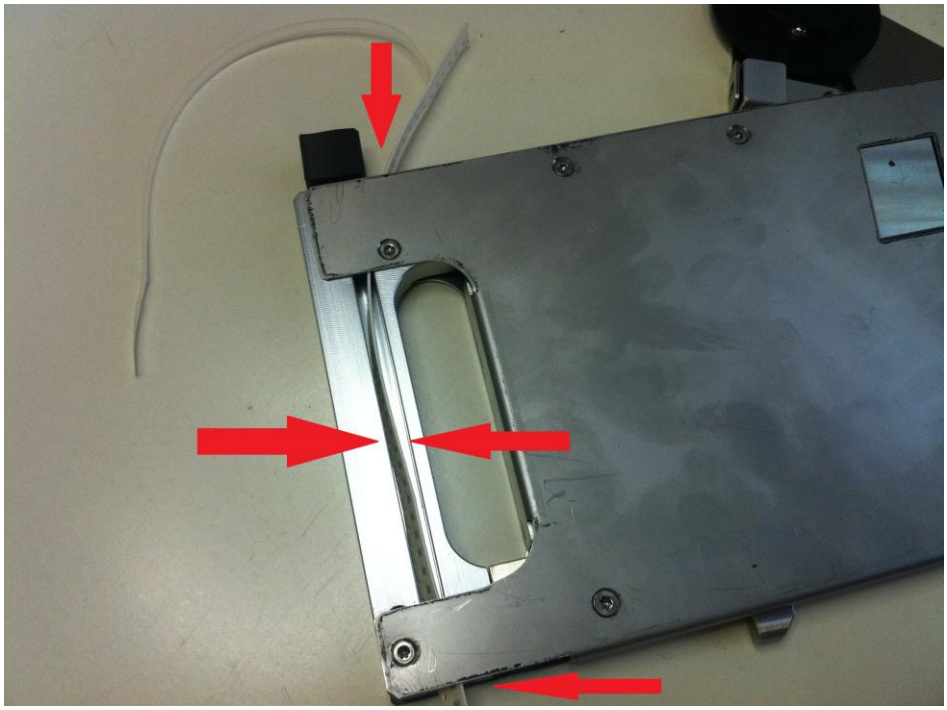
II. Close the safety handle, after that software will show unassigned feeder on the particular slot.

To uninstall the feeder, first open the safety handle and then pull the feeder out of its slot.

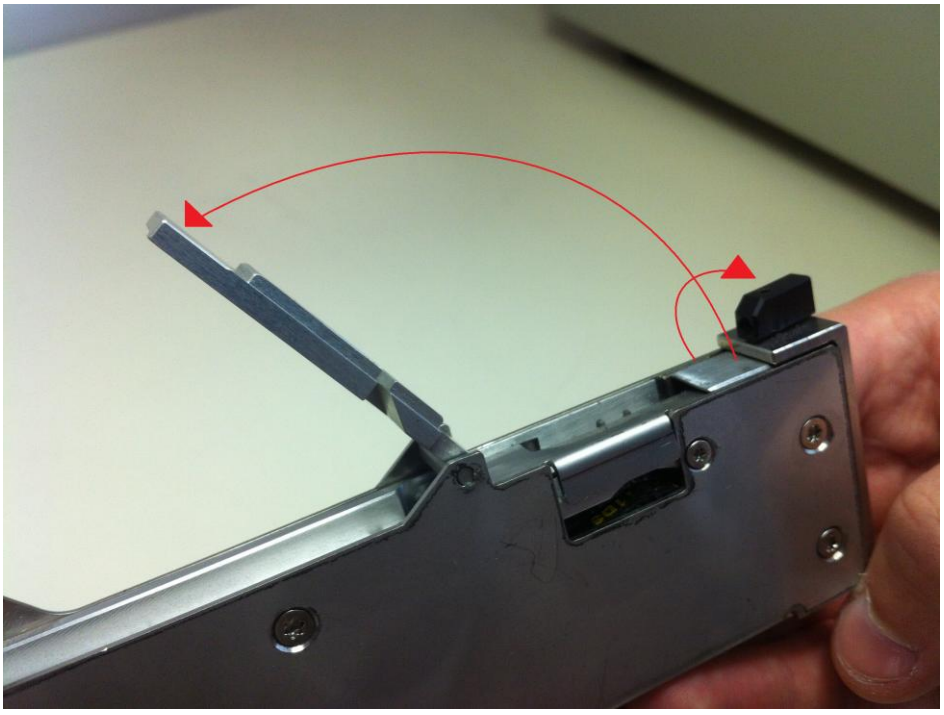
5.1.2. Feeder tape installation

Tape can be installed into the feeder by following these steps:

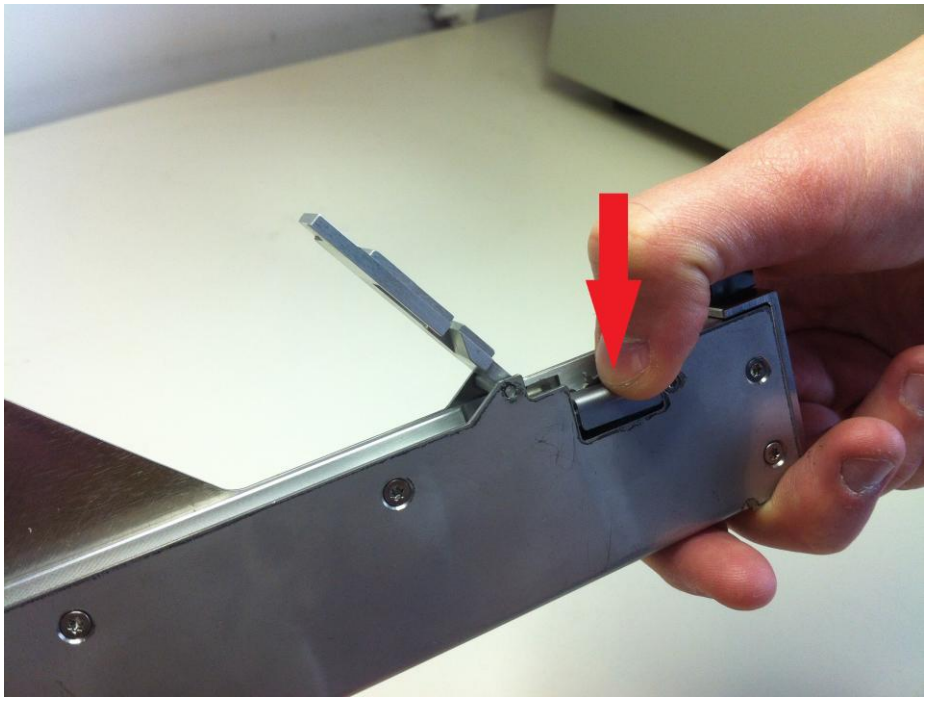
I. Insert the tape into the back handle:



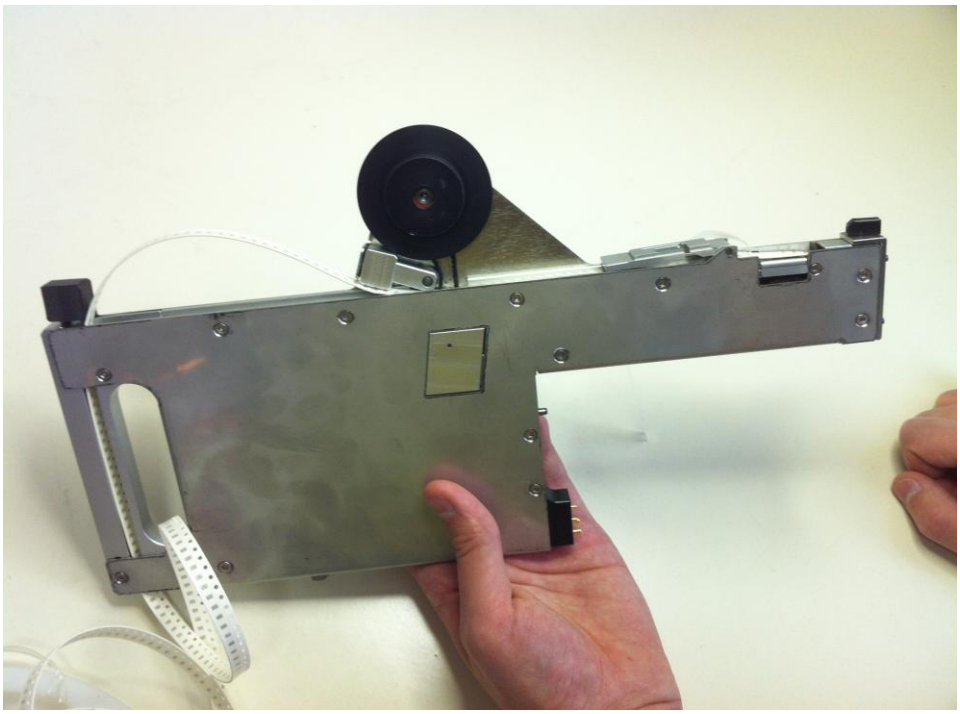
II. Unlock and open front safety frame:



III. Press the part shown on the picture. Clicking sound should be heard, it indicates that the feeder is unlocked

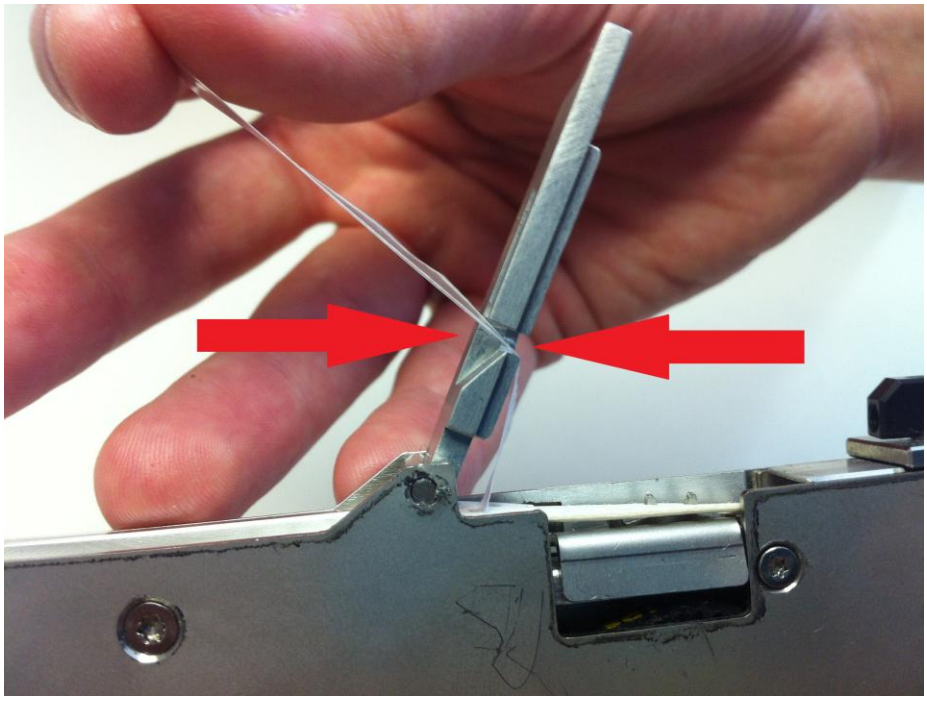


IV. Lead the tape through the feeders corpus.

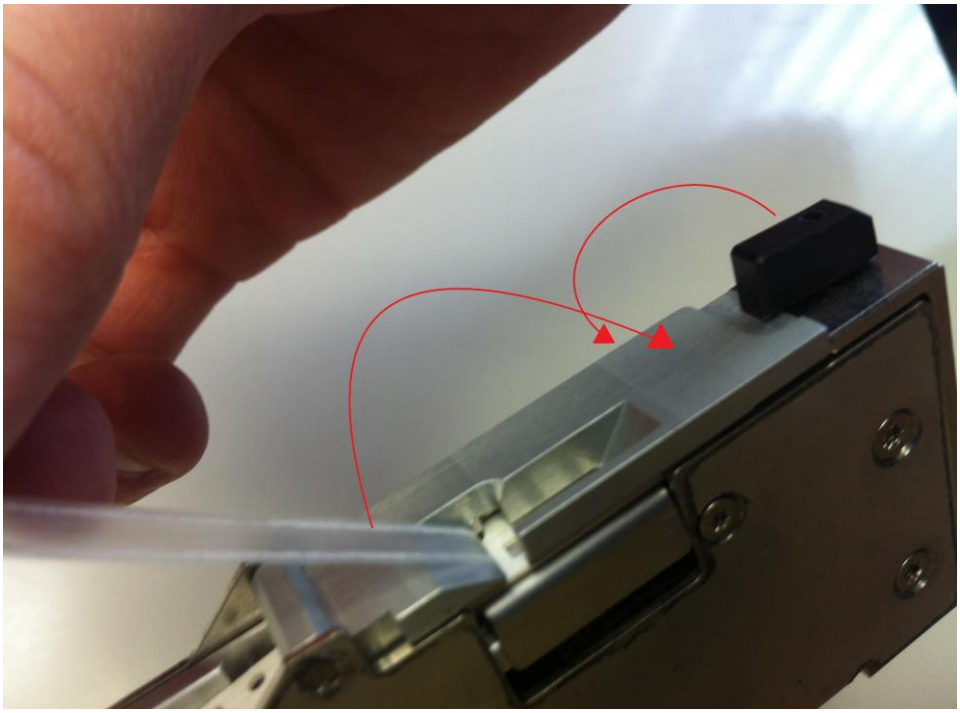


V. Place the end of the tape on the sprocket (Sprockets teeth shuld fit into tape holes)

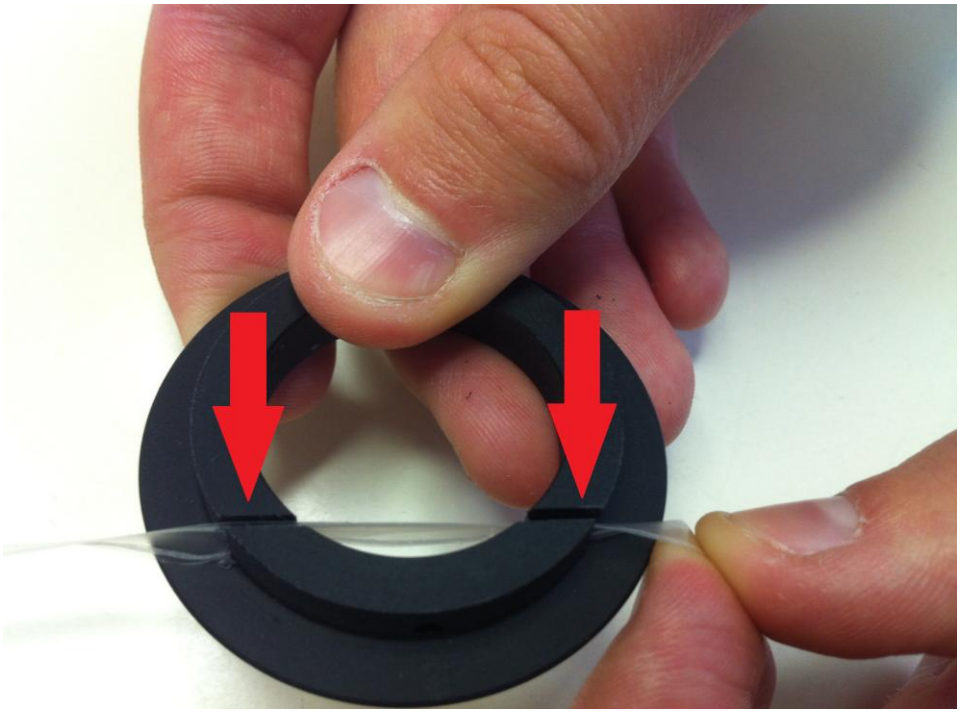
VI. Lead the safety tape thourgh the front safety frame.



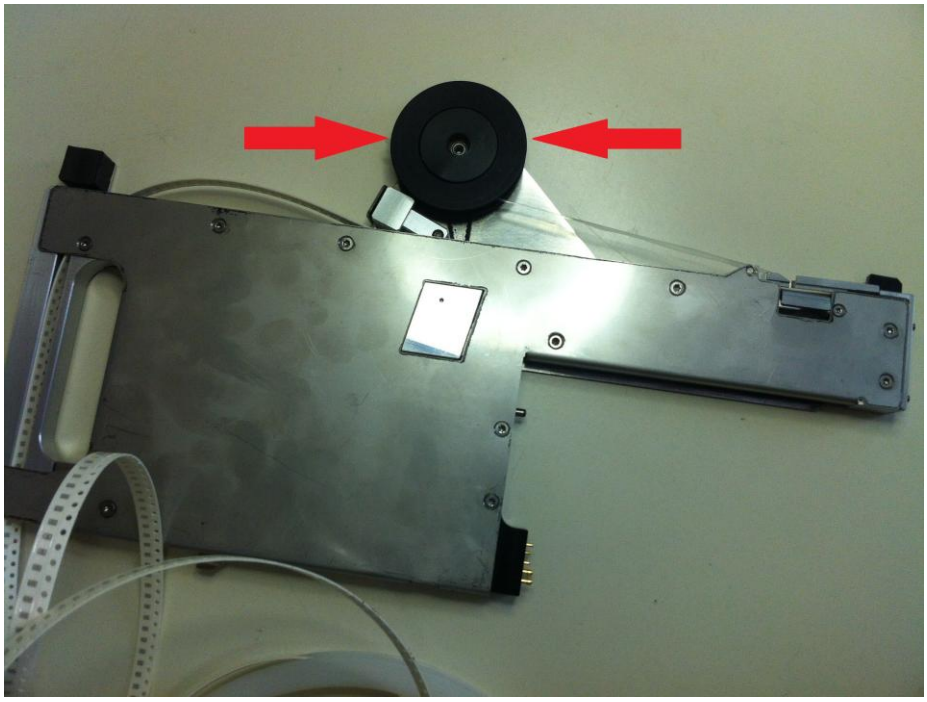
VII. Close the front safety frame and lock it by rotating the black lever.



VIII. Insert the protective tape into the groves.



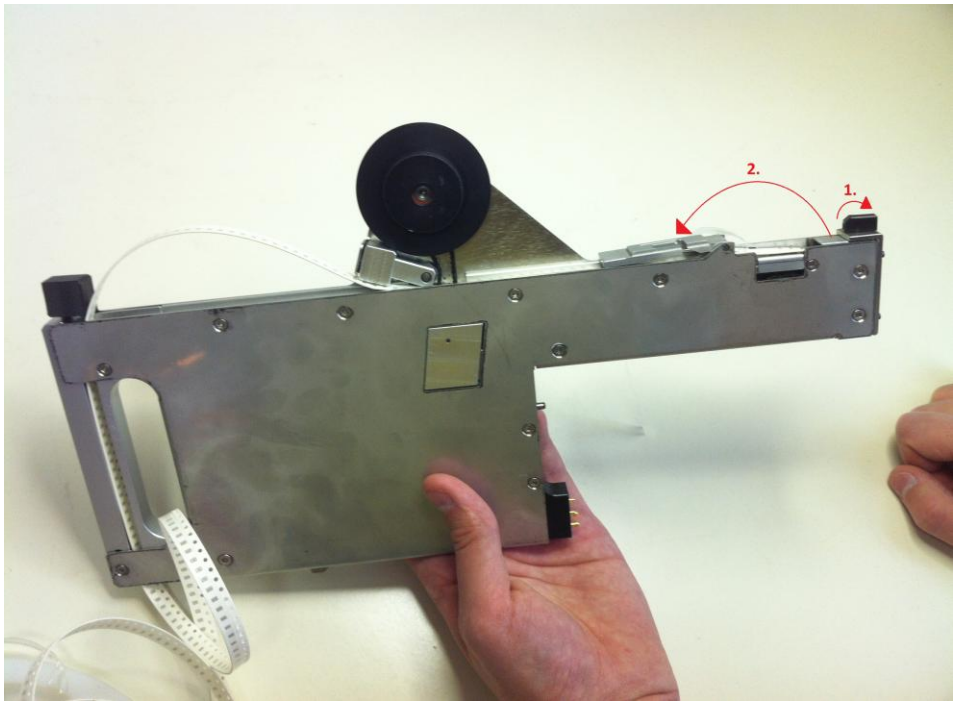
IX. Place the roll on the shaft and tighten the protective tape.



5.1.3. Feeder tape uninstallation

To remove the tape from the feeder tke following steps:

I. Pull out the feeder from the machine.
II. Unlock and open the front safety frame:



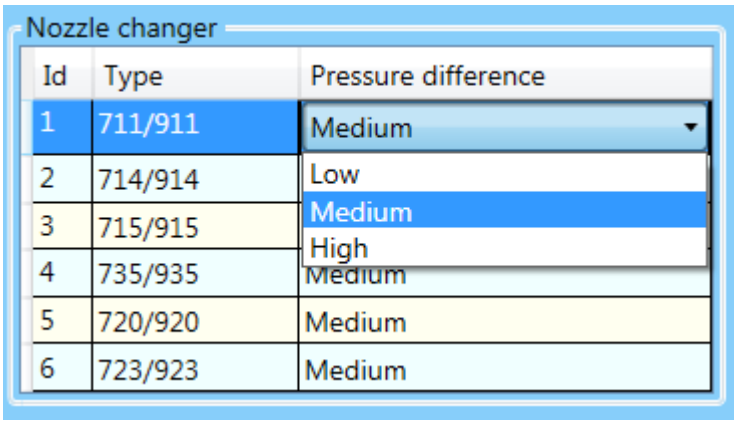
III. If components tape is present, cut the tape:

IV. Cut the tape, if there are any components. Cut the protective tape.
V. Remove the roll from the shaft and remove the protective tape from it. Carefully pull out an empty tape.

6. FAQ

The machine picks up a component. After picking a component pick error window appears - "Can't pick component. Are You sure that feeder isn't empty?". The feeder is not empty, there is a component on the nozzle. Why does this message appear?

- Component present on pinola is recognized by pressure difference before and after picking. If something goes wrong with nozzle the difference may be too small. You can change difference threshold on nozzle changer menu to Low.



- Verify if component is picked up without any problem by another nozzle.
- If feeder is defined as Tray or Tape feeder it should have correct height from component top surface to the nozzle. Please delete feeder and define it ones again as Stick feeder.

What are 'height' and 'force' parameters in feeder properties and what are they for?

'Height' parameter is a physical hight of component. It can be defined manually or leaved (0.000). If it is not set (equal to 0) machine will measure component and remember its height. It is important for taking good quality photo of component on bottom camera.
'Force' parameter determines additional force used for place procedure.

The machine picks an element (IC and resistor), positions it on the component camera, but instead by putting it on the PCB, it drops the element close to the automatic nozzle changer. What could be the reason for that?

The machine drops components close to the nozzle changer if they are not recognized during inspection. Please check if the protection cover is removed from the bottom camera lens (a round black cover on the lens). If not please remove it. On the user interface of the application please switch to the Chip View tab during Pick & Place process. A device under inspection should be seen on the screen.

What is the difference between 'virtual PCB start position' and 'real PCB start position'?

Please read complete information about 'virtual PCB start position' and 'real PCB start position' here.

We have connected the machine to power supply grid, but it does not seem to work - the monitor remains dark.

In order to start the machine up please press the Power ON button and wait for 5 seconds (the green button on the bottom of the machine). The machine will start to work. The reason for this intentional delay is the protection procedure initiated to check the internal power suppliers of the machine. It is a correct behavior. After the Windows 7 system is running please launch the Mechatronic Engineering Studio application by double-clicking its desktop icon and follow the instructions of the application user interface.

I tried to import feeders data (same components at the same place, with the same feeder), using 'import' button in feeders tab. But I have not been able to do it. The program says: "could not import any feeders". How can I do this?

When feeders are imported from one project to another one it is important to take care about Footprint and Value of components. It should match.