Software Brochure/Manual - SEMI 200 - Semi-Automatic Probe Station

Ver 1.1

Menu

I. System Operation & Function Description

A. Homing Process：

After launching the application, it will connect to the control box through USB and perform homing process. The homing process moves Z/Y/X/T axis to the system defined zero position sequentially. In order to avoid possible wafer contact scenario, Z axis must move first down to negative limit and then up to system defined zero position. Y axis will then move toward user side's negative limit and away to system defined zero position. After that, X axis will move toward user left side's negative limit and right a little bit to system defined zero position. Finally, T axis will rotate counterclockwise to negative limit and clockwise to center position. The absolute position should be always larger than or equals to zero therefore the XY zero position is located in lower left corner for the reachable area.

The final action will move the chuck to Load Position for operator's wafer loading & vacuuming. When it's done, the system will be idle and ready for user operation.

B. Prober Semi：

Fig. 1 shows the main application's window. Operator could perform project file operation, sub-window operation, check software version and quit the whole software. The detailed functions are described as following.

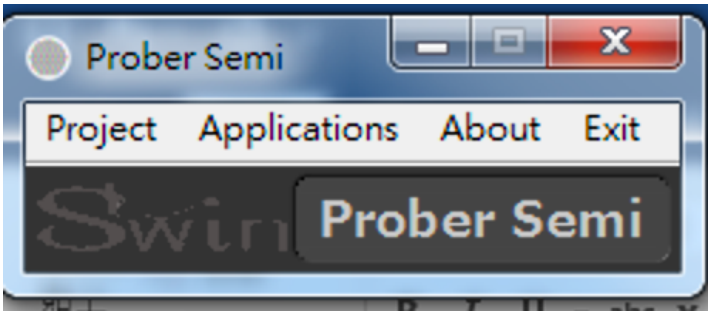


Fig. 1 Prober Semi

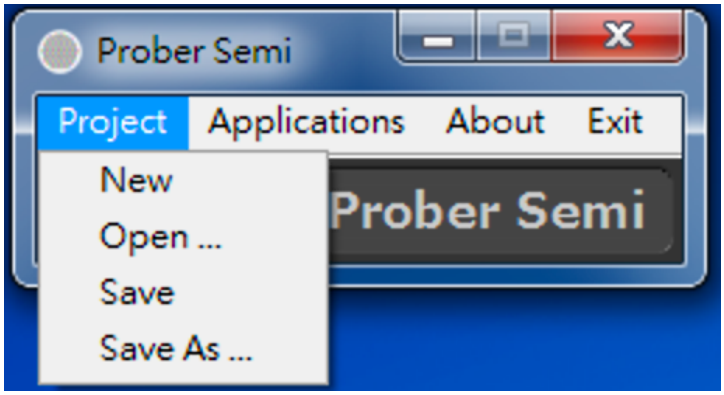


Fig. 2 Project

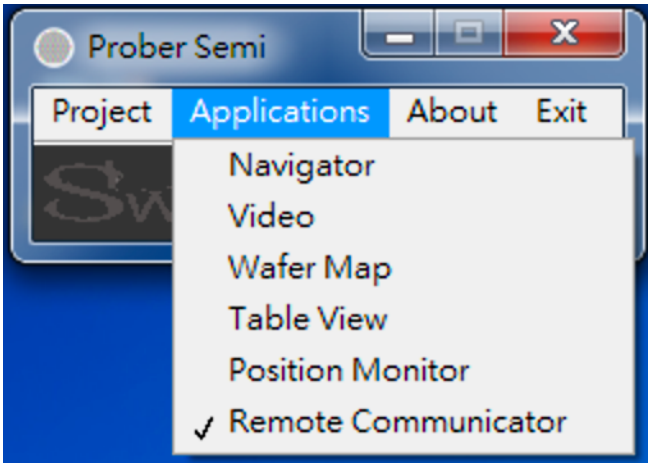


Fig. 3 Applications

C. Navigator：

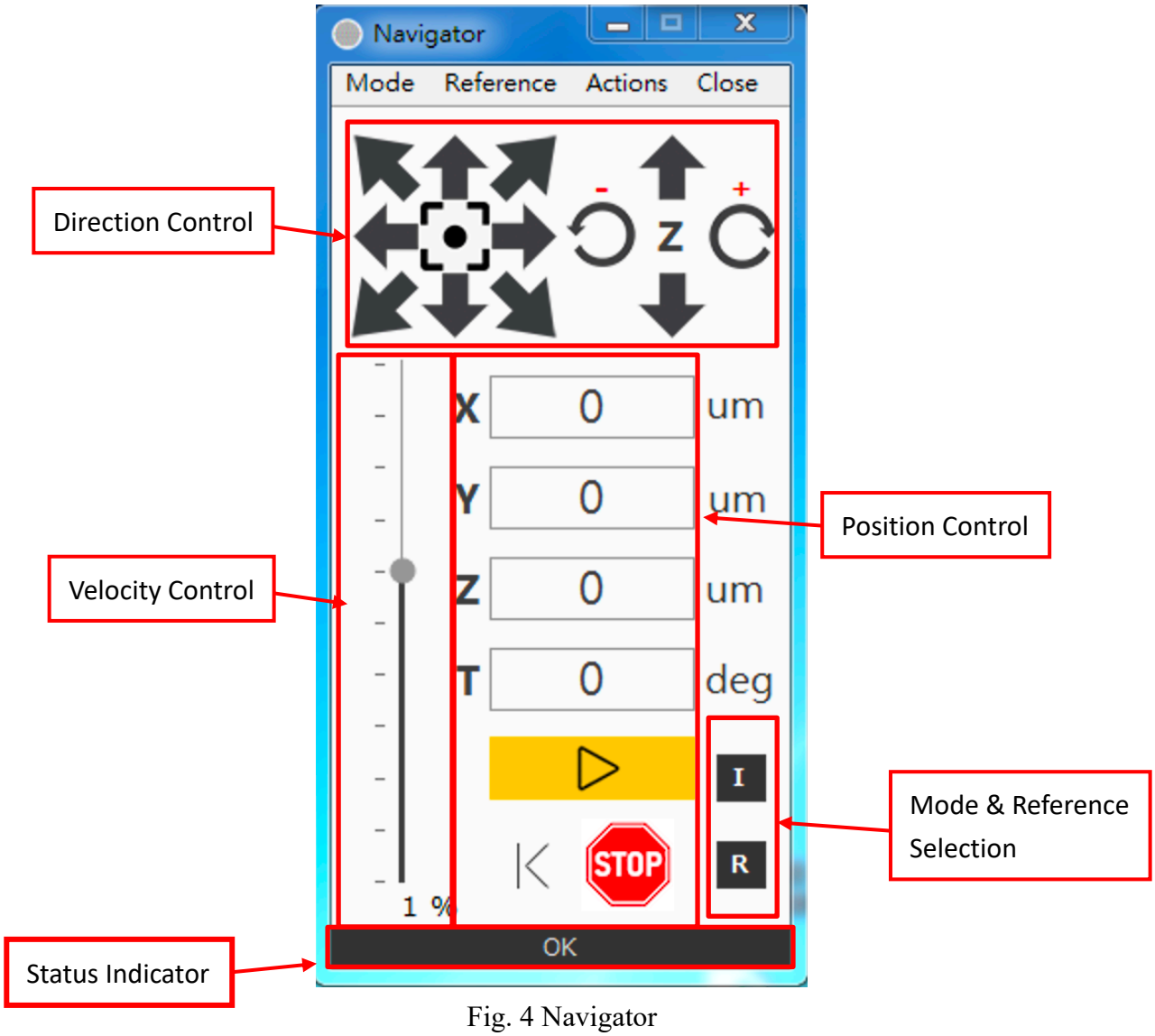


Fig. 4 Navigator

Direction Control:

Perform chuck movement and control the direction of moving direction of each axis. The center icon of XY moves the chuck to its defined center location.

Velocity Control:

Adjust moving velocity of the chuck. The selectable values are 100%, 50%, 25%, 5%, 1%, 0.5%, 0.25%, 0.1%, 0.05%, 0.01%, 0.005% respectively and relatives to each axis's highest motor velocity.

Position Control：

Control the move distance or position in um unit. When in Index Mode, the unit will change to defined index value. There are also a Start Moving, Abort Moving and Last

Position button when needed.

Status Indicator：

Indicate current prober status. The status maybe one of the following:
Ready to move, moving or error with error code.

Motion Mode & Reference Selection ：

Select Motion Mode & Reference. Click the button to switch between each mode. Operator could also perform switch from the menu. Different Motion Mode has its own position value and velocity set.：

Motion Mode：

- Jogging Mode：Press the arrow continuously to move the chuck toward desired direction with constant speed. Motion stop when release the mouse or reach the boundary.
- Step Mode：One click the arrow to perform one time movement to the desired position according to the Reference Selection.
- Index Mode：Similar to Step Mode but change the XY unit from um to index value.

Reference Selection：

- Relative：Motion move relative to the current position.
- Zero：Motion move relative to the zero position.
- Home：Motion move relative to the Home position.
- Center：Motion move relative to the Center position.

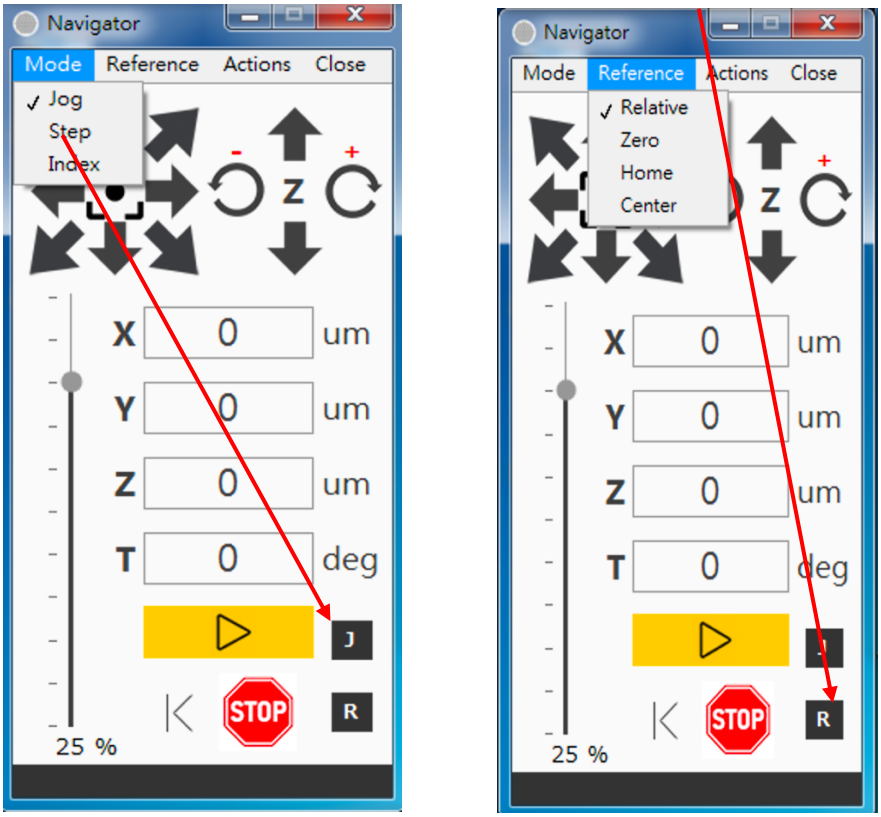


Fig. 5 Motion Mode & Reference Selection

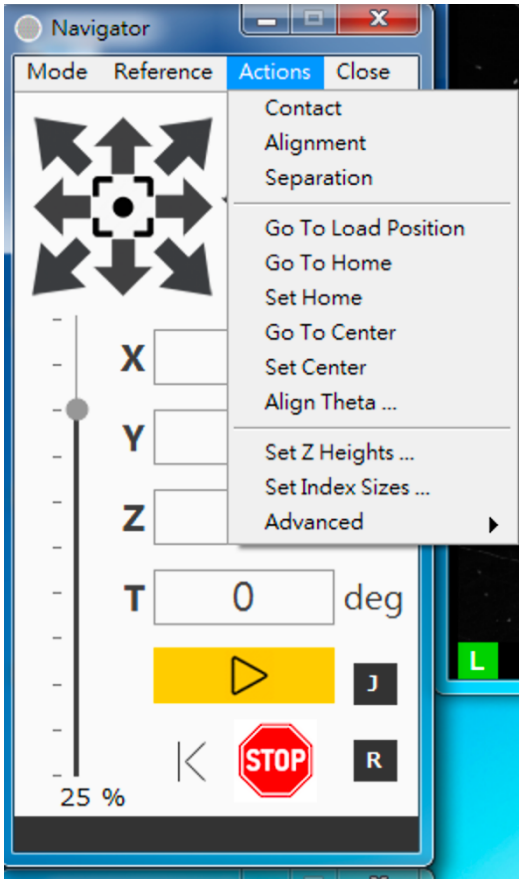


Fig. 6 Actions

Contact：
Move chuck Z axis to Contact position.

Alignment：
Move chuck Z axis to Alignment position.

Separation：
Move chuck Z axis to Separation position.

Go To Load Position：
Move chuck XYZT axis to Load Position. Z axis will go down first and then XYT axis.

Go To Home：
Move chuck to user defined Home position. Z axis will go down first and then XY axis.

Set Home：
Set current position to Home position.

Go To Center：
Move chuck to user defined XY Center position. Z axis will go down first and then XY axis.

Set Center：
Set current position to Center position.

Chuck Vacuum Actuation:

Multizone Vacuum actuation controlled by software control

Align Theta：

Rotate the chuck by 2 points method as Fig. 7. Move the chuck to the first position and click P1 as Fig. 8. After that, move the chuck to the second position and click P2 as Fig. 9. The software will calculate an angle between the P1P2 and horizontal line. Click ALIGN to rotate the chuck according to the calculated value.

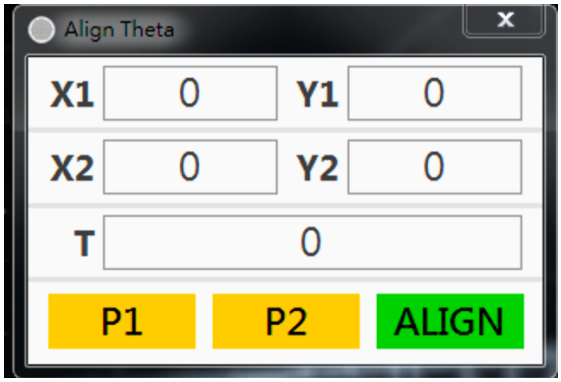


Fig. 7 Align Theta

Fig. 8 Click P1

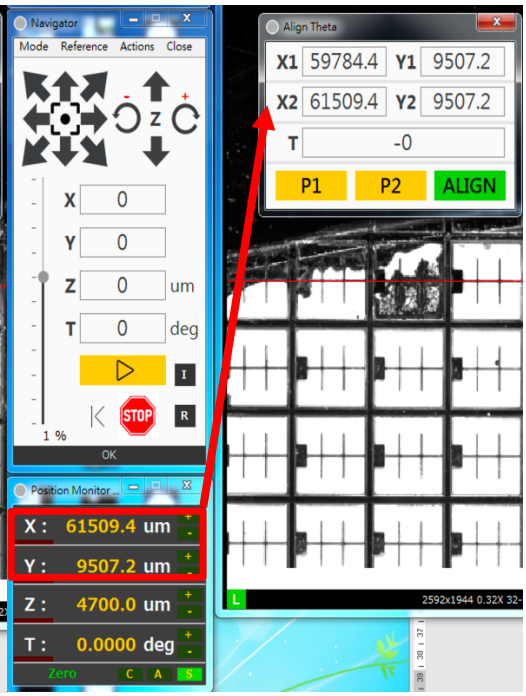


Fig. 9 Click P2

Set Z Heights：

Set Contact, Alignment and Separation height for Z axis. Click READ button to write current Z position into Contact field. The Contact position is absolute position. Align & Separation position are relative to Contact position and must be lower. Click APPLY to update all of the position in effect.

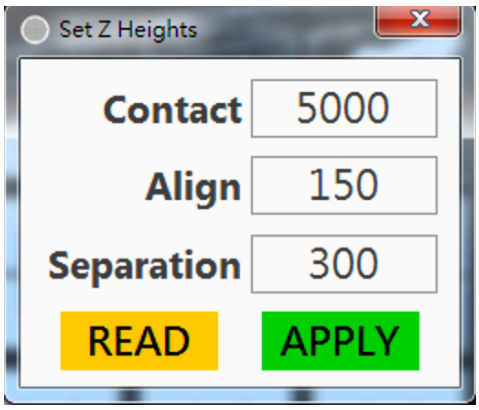


Fig. 10 Set Z Heights

Set Index Sizes：

Set XY index value. Index value is used in index mode motion. Operator first move the chuck to P1 position, click P1 button as Fig. 12. After that, move chuck to P2 position, click P2 button as Fig. 13. Click CALC button to calculate delta X & delta Y distance in X Idx & Y Idx field. Click APPLY button to update index value in effect.

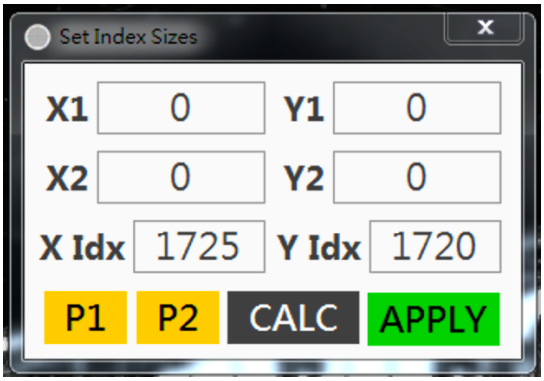


Fig. 11 Set Index Sizes

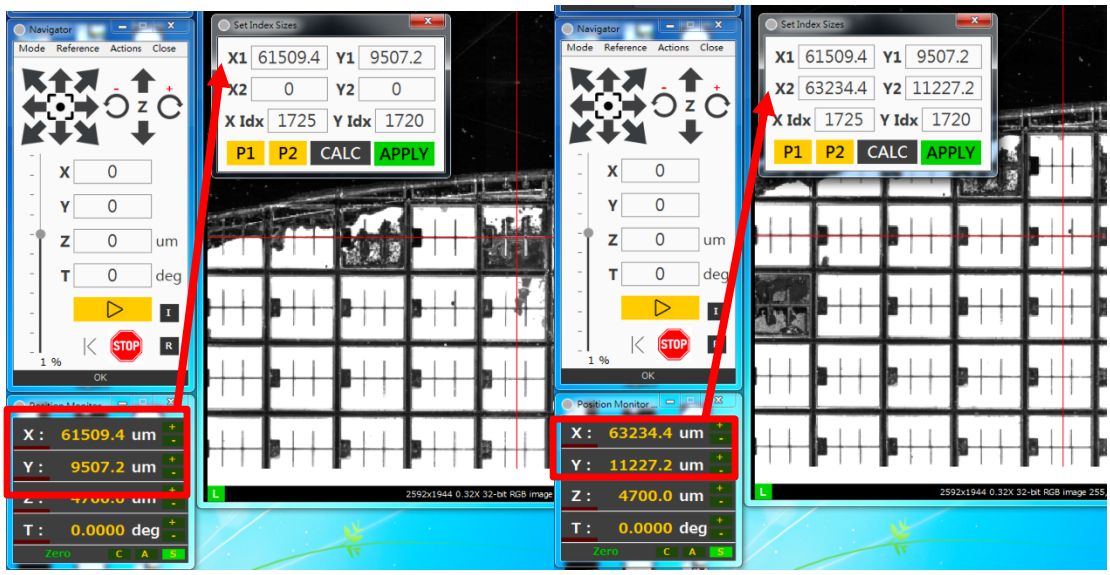


Fig. 12 Click P1 Fig. 13 Click P2

Advanced：

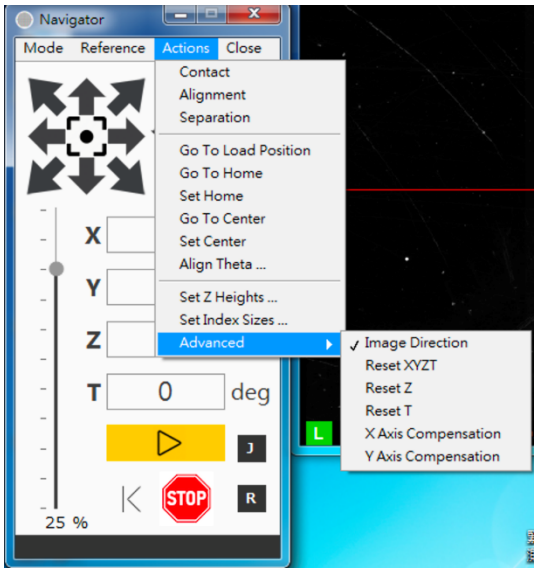


Fig. 14 Advanced Menu

Image Direction：

When selected, the XY moving direction is according by camera image. When unselected, XY moving direction is consistent with human common sense.

Reset XYZT：

Perform homing process for all axis when things go wrong and motion behave erroneous.

Reset Z：

Perform Z axis homing only.

Reset T：

Perform T axis homing only.

X Axis Compensation：

Perform compensation for X axis. Sometimes a tiny error exists between motor feedback and optical encoder. Whenever the operator could not move the chuck to the desired position, follow the instruction as Fig. 15 and perform axis compensation may solve the problem. Make sure to adopt a highly precise target when doing this.

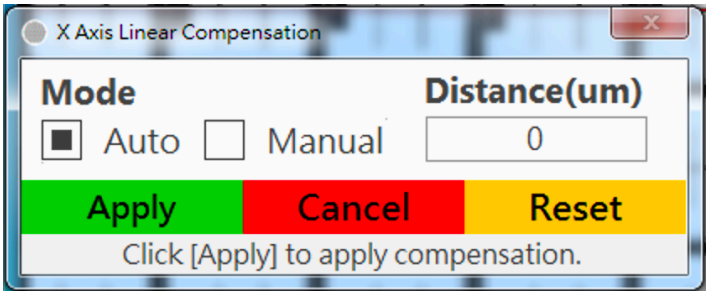


Fig. 15 X Axis Linear Compensation

Y Axis Compensation：

Perform compensation for Y axis. Same procedure as X axis compensation.

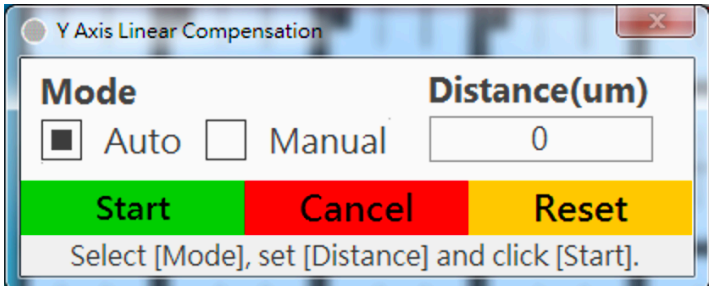


Fig. 16 Y Axis Linear Compensation

D. Position Monitor：

This application indicates current XYZT position according to the reference. It also has LEDs to indicate if an axis is moving, reaches boundary or contact/alignment/separation position. Operator could also launch multiple Position Monitor according to different reference.

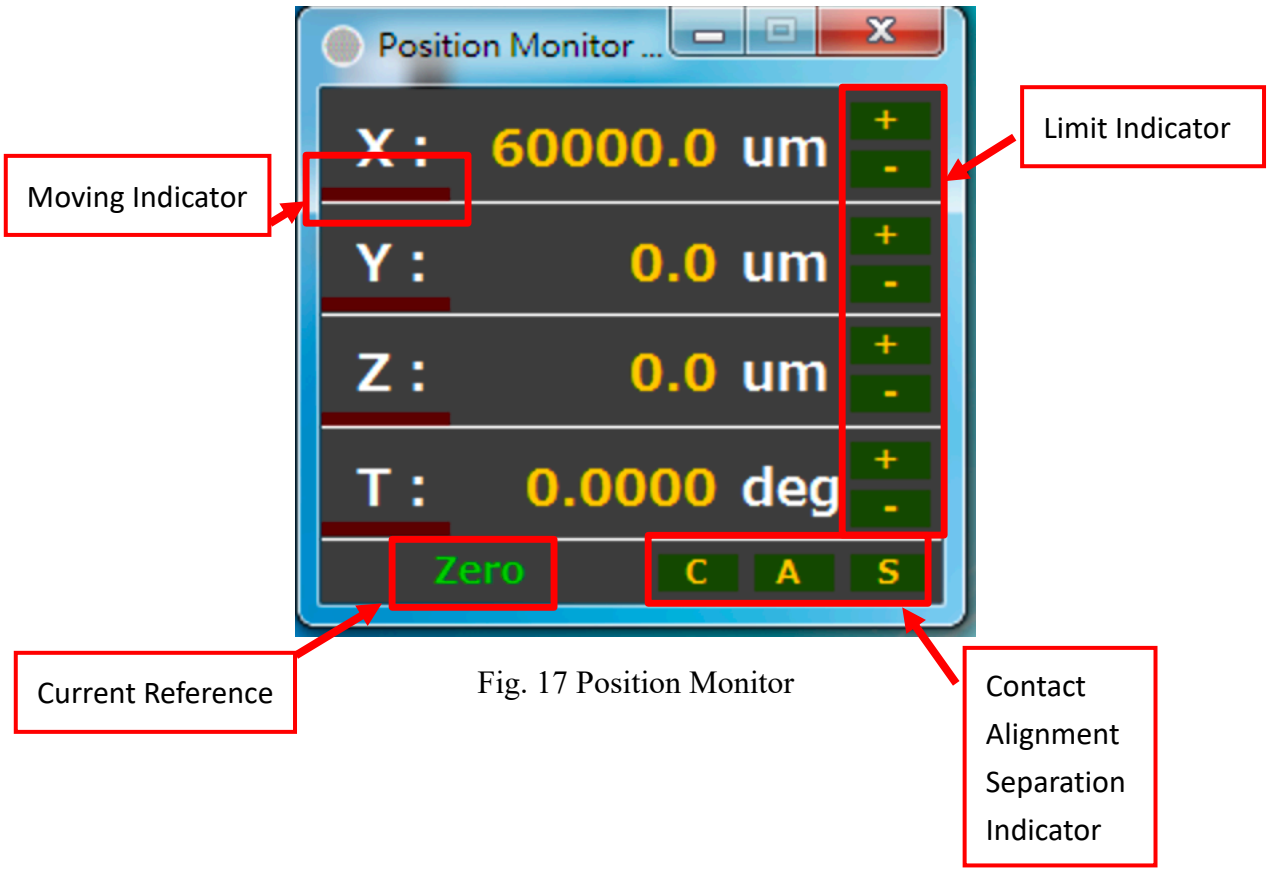


Fig. 17 Position Monitor

E. Video：

This application displays the actual current wafer image. Operator could also freeze the live image to perform inspection, vision measurement, color/grey image switching, white balance tuning and more as Fig. 18.

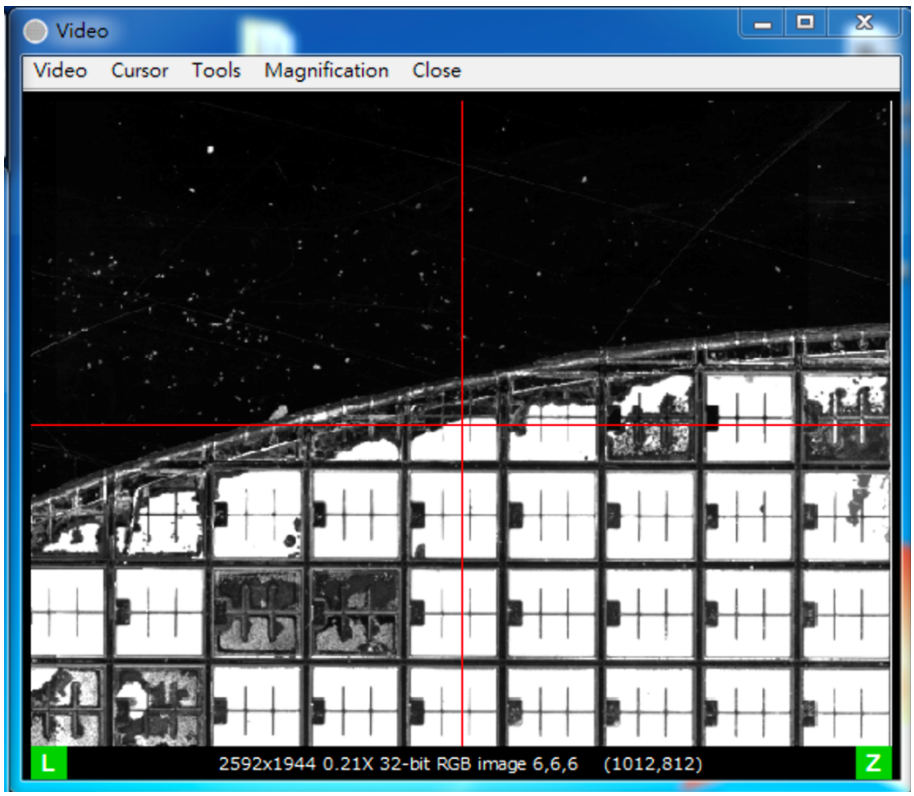


Fig. 18 Video

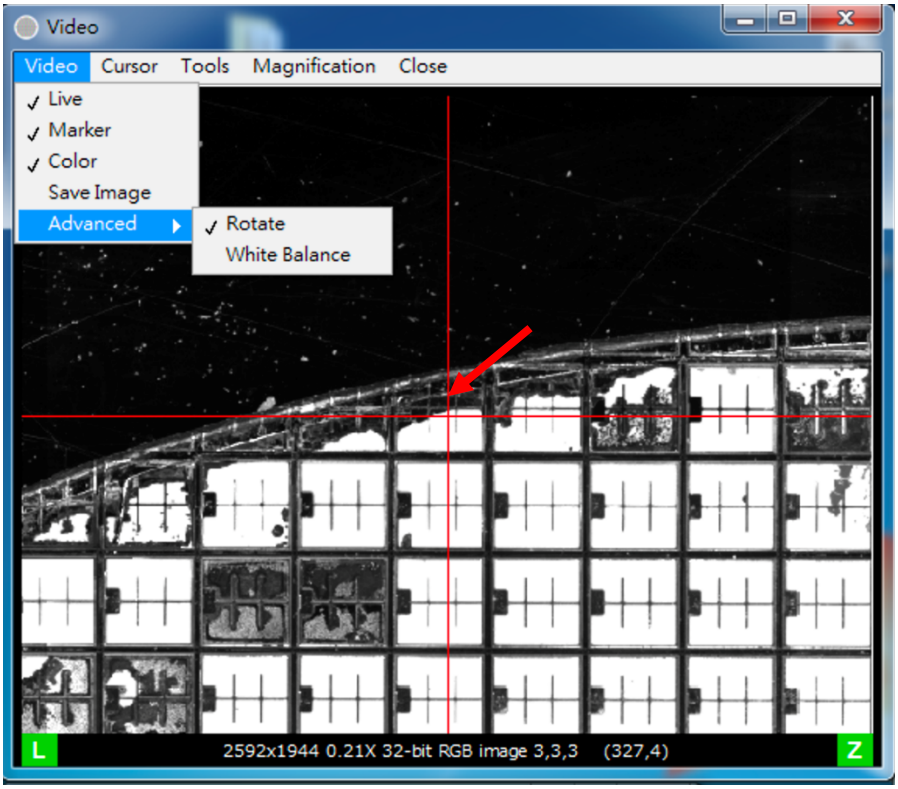


Fig. 19 Video Menu

Use Video Menu as Fig. 19 to perform different setting or action described as following：

- Live：Switch between live image or freeze image.
- Marker：Switch to display or hide the cross marker.
- Color：Switch between color or grey image for inspection.
- Save Image：Save current image into a file.
- Rotate：Rotate the raw image to meet the human common sense.
- White Balance：Tuning white balance effect for color image.

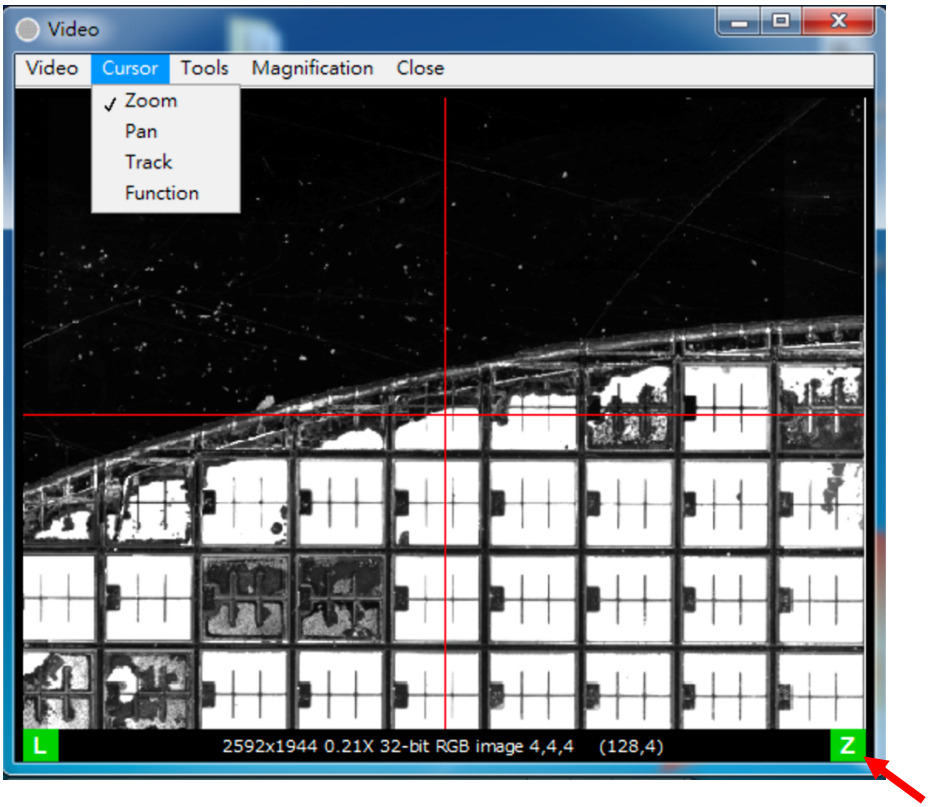


Fig. 20 Cursor Menu

Use Cursor menu to define different function with the mouse. Operator could also switch between these functions by click the lower right green button. The function is described as following：

- Zoom：Left click the mouse to zoom in/out the current image.
- Pan：Click and drag the mouse to move the field of view.
- Track：I.E. Click and Go. Click a desired position and chuck will move that position to the center of the view.
- Function：For vision measurement and calibration purpose. The cursor will change automatically with different scenario. For example, when performing distance measurement, it will be shown as Fig. 21. When performing template teaching for Pattern Match, it will be shown as Fig. 22.

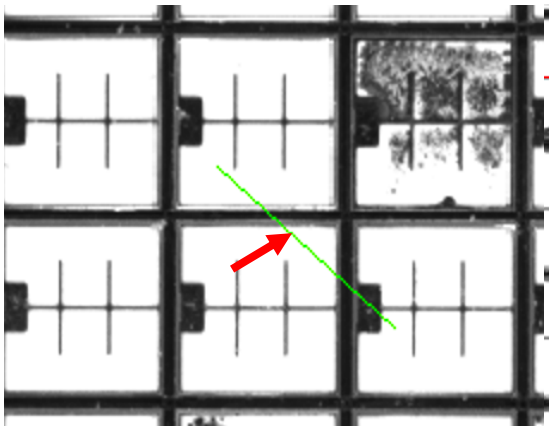


Fig. 21 Function_Measurement

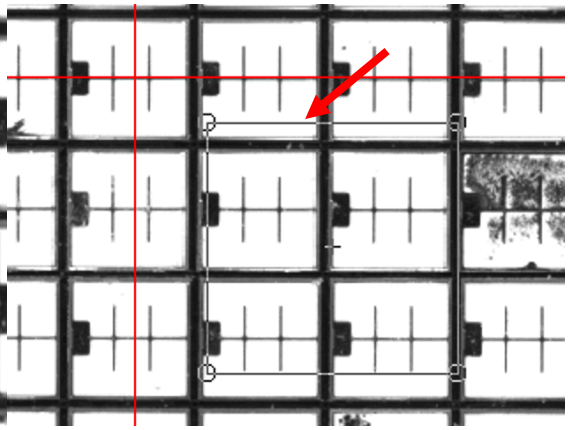


Fig. 22 Function_Pre Aligner

Use Tools menu to perform vision measurement and wafer alignment.：

- Measurement：Line distance measurement as Fig. 21 & Fig. 23；Clamp measurement as Fig. 24. Five options including H Max, H Min, V Max, V Min and H Max are supported；Circle measurement as Fig. 25.
- Pre Aligner：Two point method for rotate the chuck, same approach as “Align Theta” function in Navigator.
- Wafer Aligner：Teaching and parameter setting for aligning each wafer as Fig. 26. When the operator places a wafer on the chuck, it may not be perfectly in horizontal position. With Wafer Aligner feature, the prober could perform automatically horizontal zeroing with proper teaching and parameter setting.
- Chip Aligner：Teaching and parameter setting for aligning each chip location as Fig. 27. Owing to the process error during wafer manufacturing, each chip may not be located in the ideal position of the original design. With Chip Aligner feature, the prober could compensate this error for improve the probing quality.

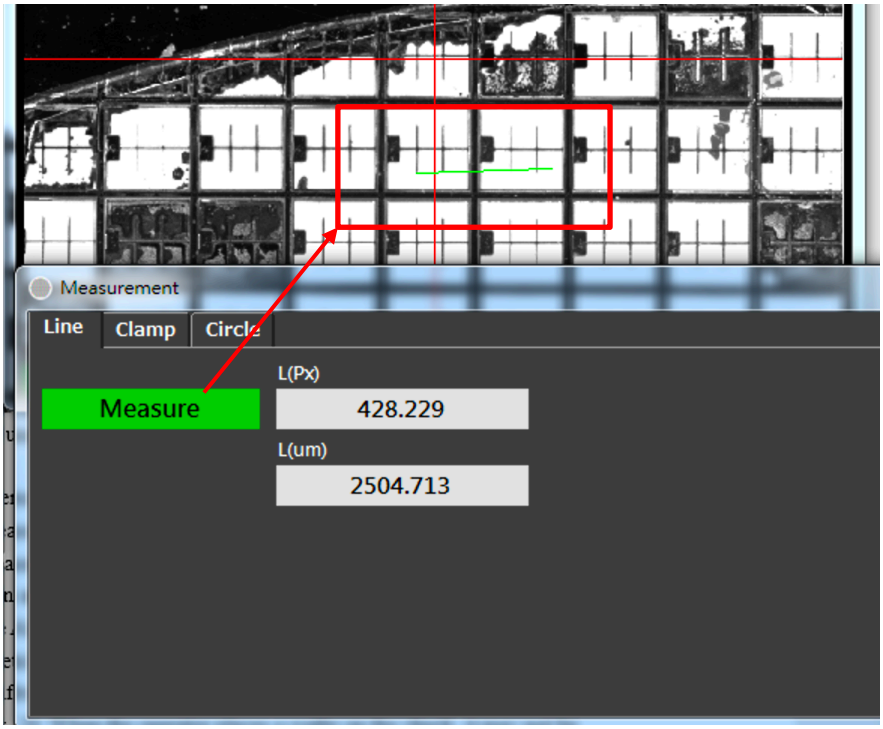


Fig. 23 Measure Line

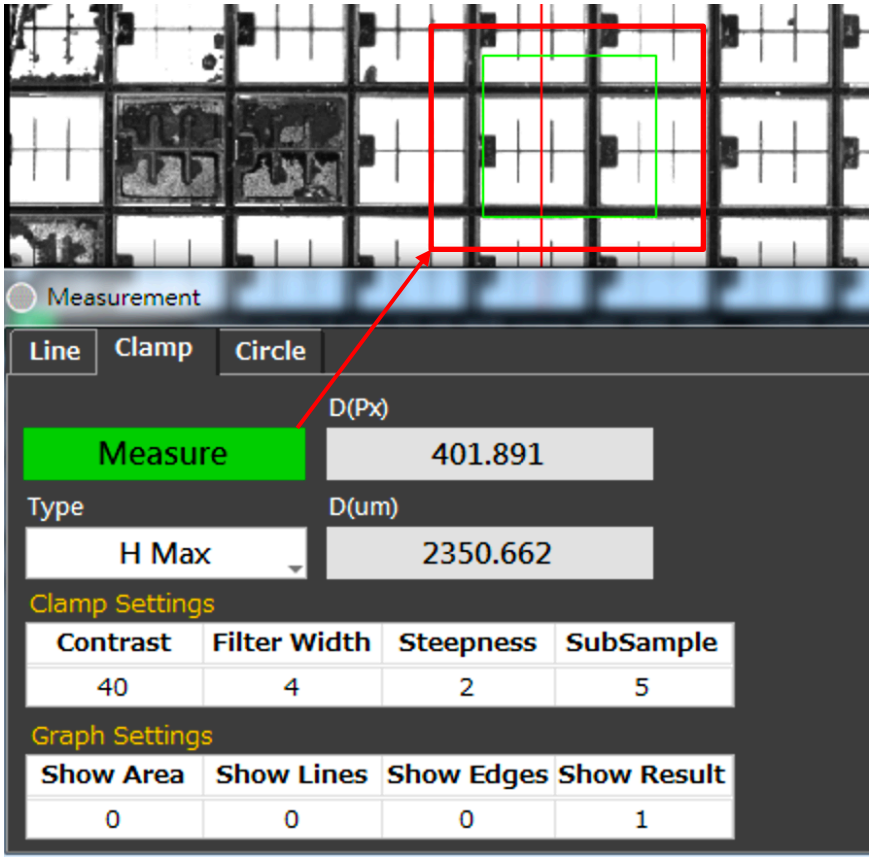


Fig. 24 Measure Clamp

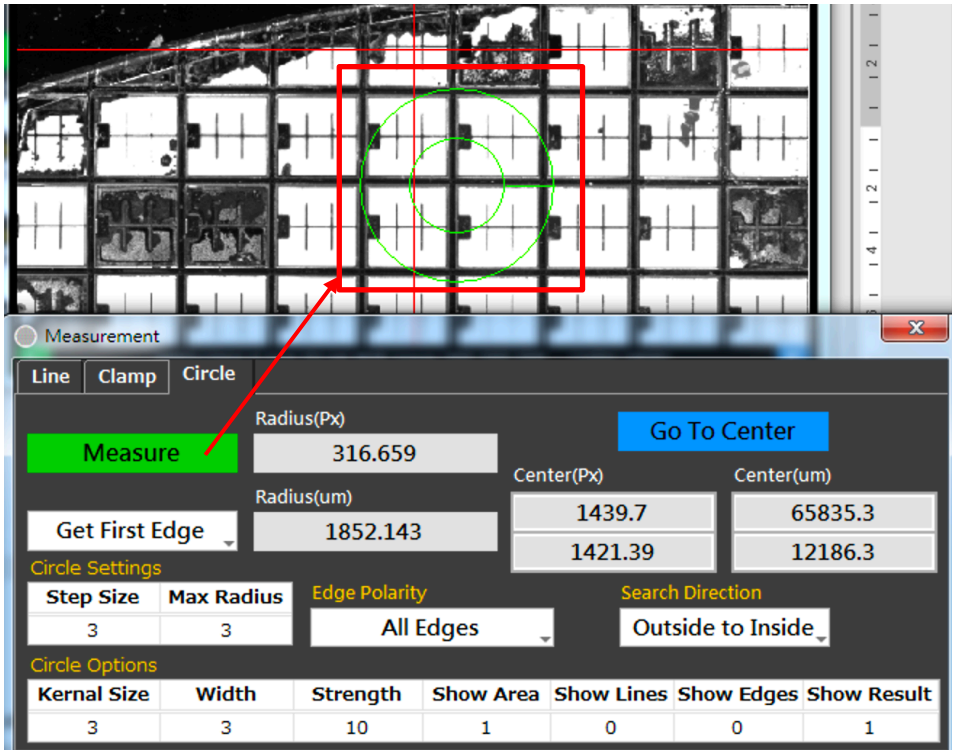


Fig.25 Measure Circle

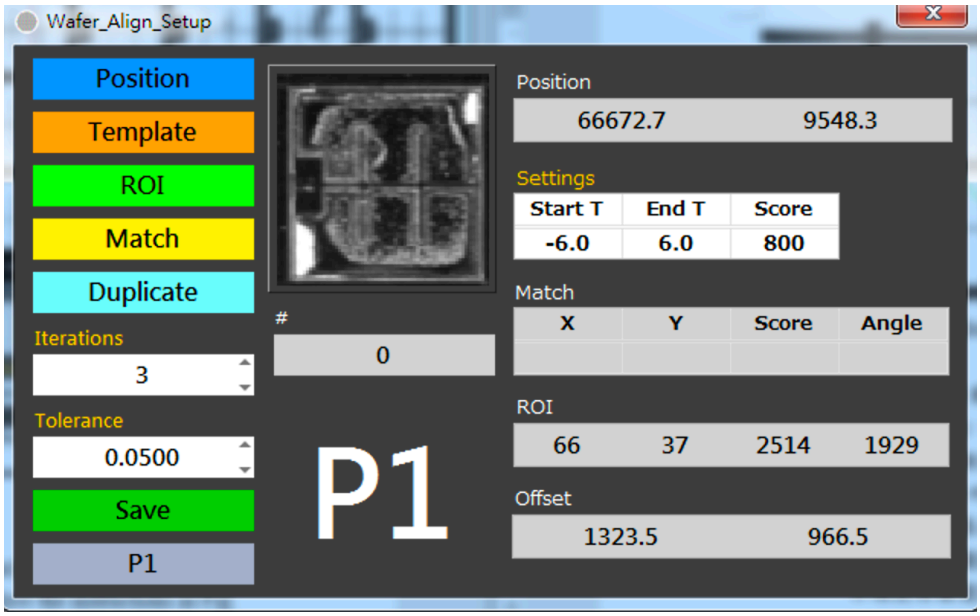


Fig.26 Wafer_Align

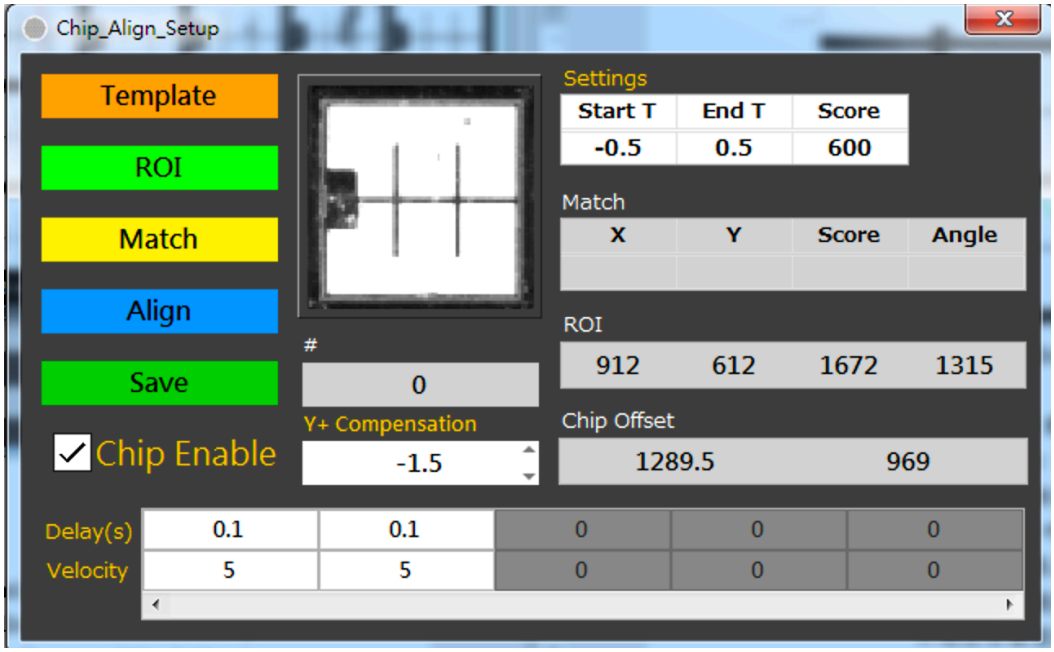


Fig.27 Chip_Align

Use Magnification menu to switch between different ratio and perform vision parameter calibration for correct click & Go movement as Fig. 28. Follow the instructions as Fig. 29 to perform vision calibration. Operator could also click the green letter button to make switch.：

- Low：Switch to low ratio lens.
- Medium：Switch to middle ratio lens.
- High：Switch to high ratio lens.
- LX：Perform Low Ratio X direction vision calibration.
- LY：Perform Low Ratio Y direction vision calibration.
- MX：Perform Middle Ratio X direction vision calibration.
- MY：Perform Middle Ratio Y direction vision calibration.
- HX：Perform High Ratio X direction vision calibration.
- HY：Perform High Ratio Y direction vision calibration.

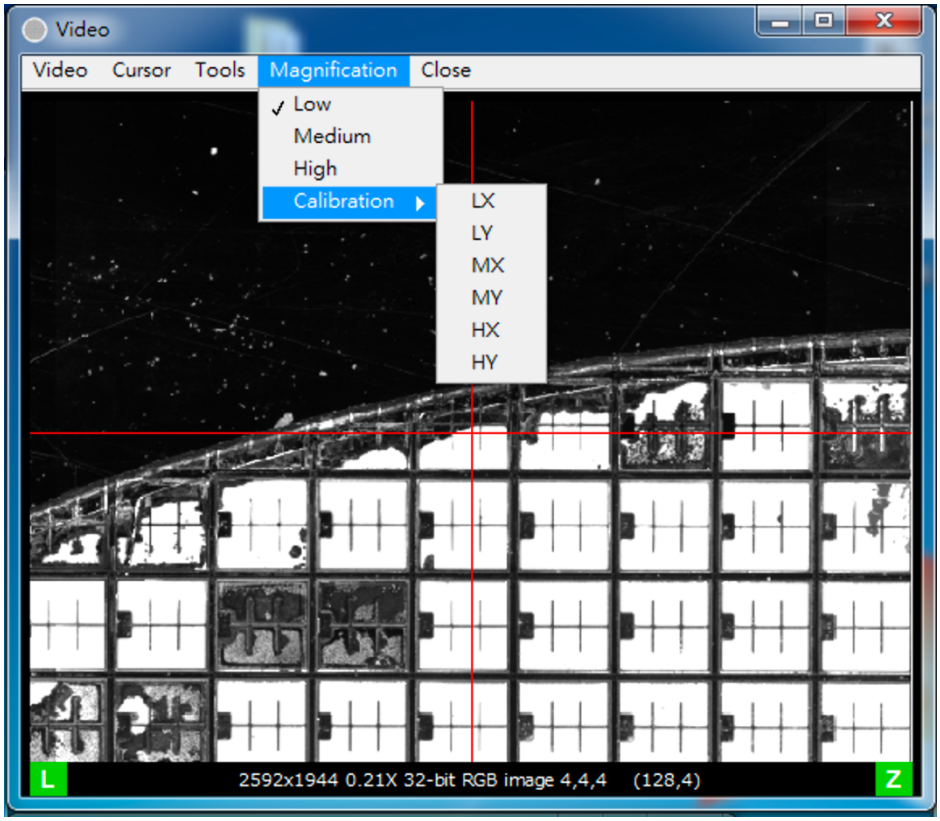


Fig. 28 Magnification

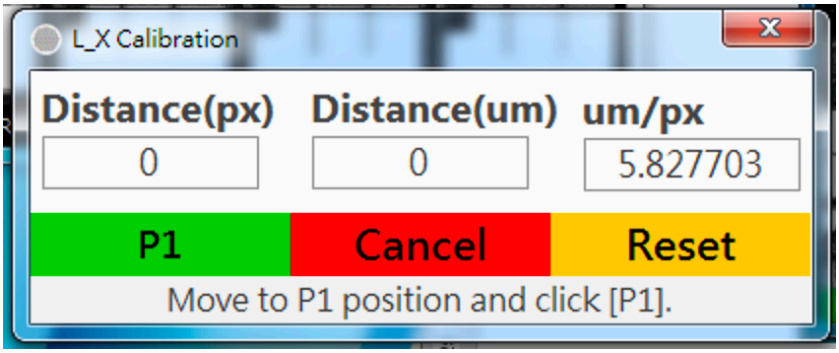


Fig. 29 M_X Calibration

F. Table View：

Use this application to record position and add annotation, move to recorded position with desired velocity and perform looping. Use File menu to open a new table, load previous saved table and save current table to a file as Fig. 31.

Left click to select the highlight position as Fig. 30. Click triangle to move to the target position. Click up/down arrow to move to the previous/next position. Click stop button to stop the current movement or looping. Click plus right arrow to insert current position to the table below the highlight position. Click minus left arrow to delete the highlight position. Click repeat button to enable looping.

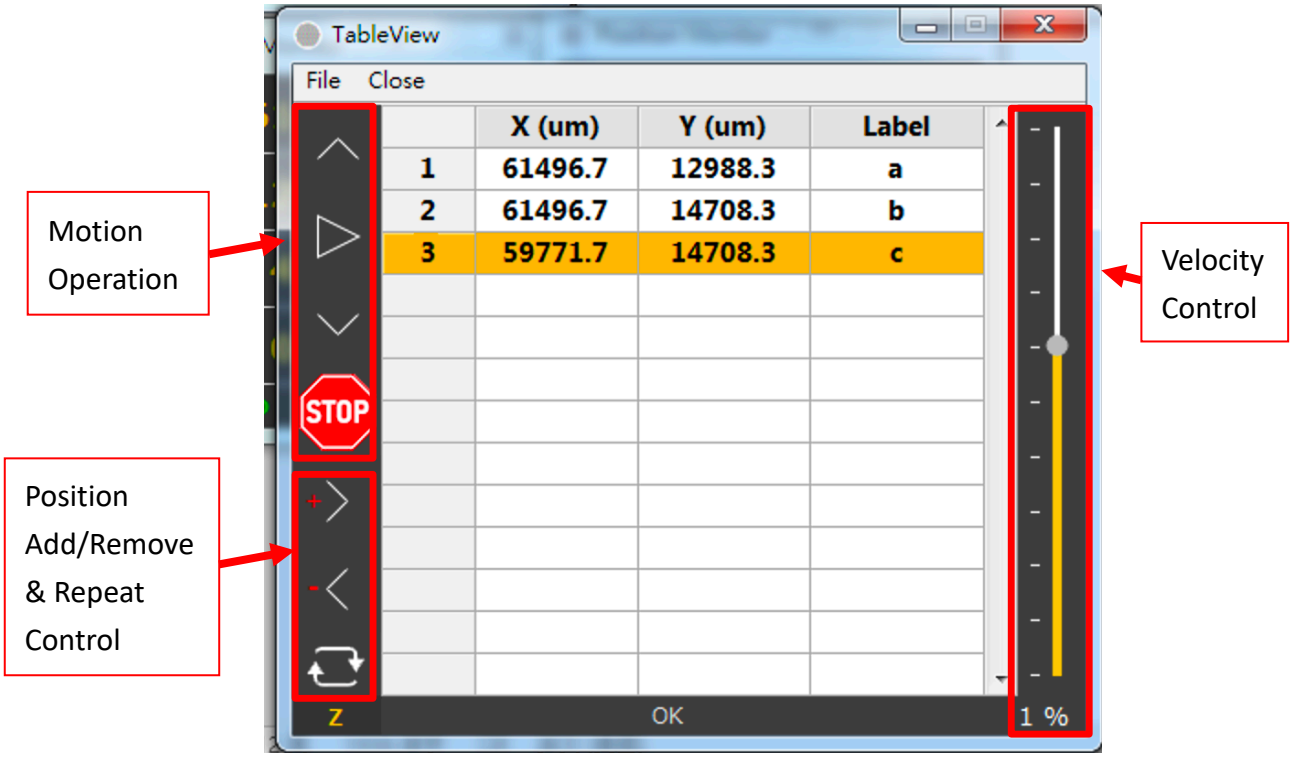


Fig. 30 Table View

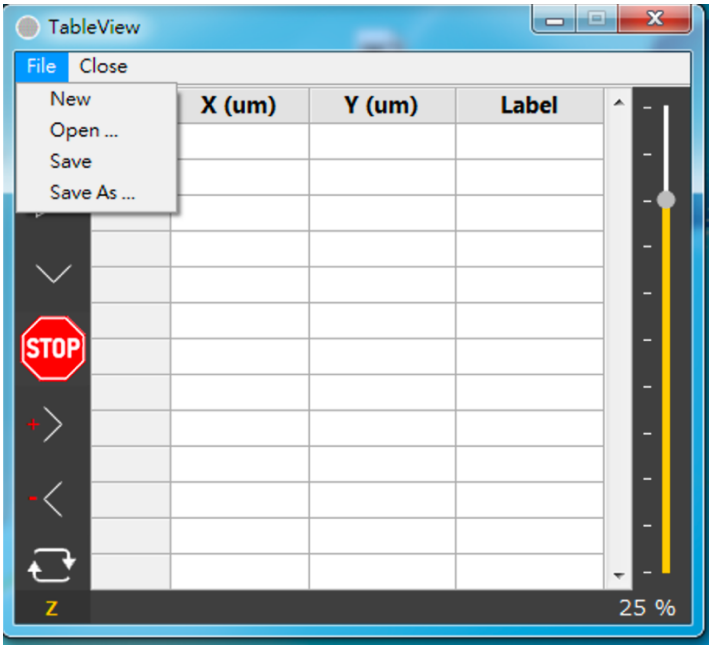


Fig. 31 TableView File

G. Wafer Map :

Use Wafer Map application to define a meaningful coordinate set which matches the current wafer under probe. By properly set the wafer parameter, operator could move the chuck to the desired die, assign pre-defined bin status and more as Fig. 32.

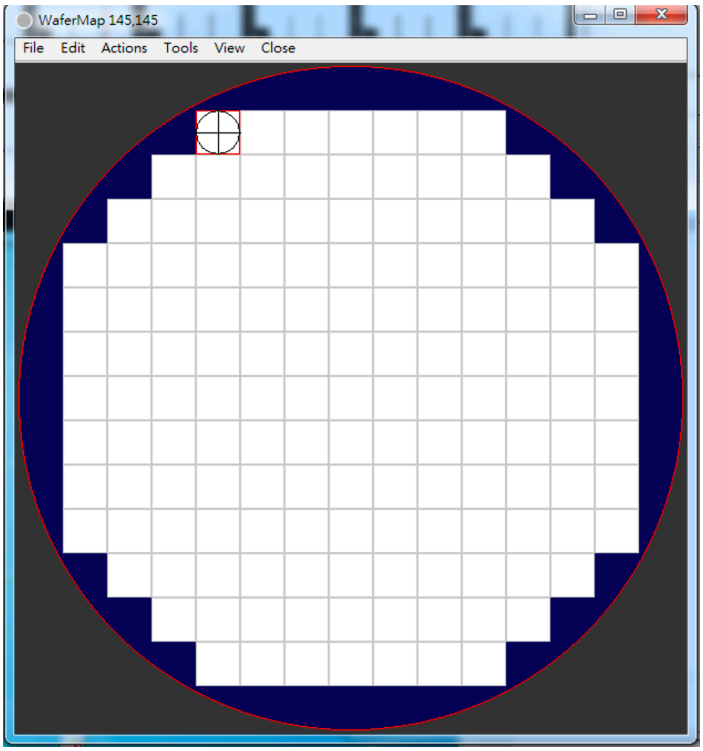


Fig. 32 WaferMap

File：

Operator could start a new wafermap, set current wafermap parameter, open previous saved wafermap file and save current wafermap to a file.

The setup window is in Fig. 34.

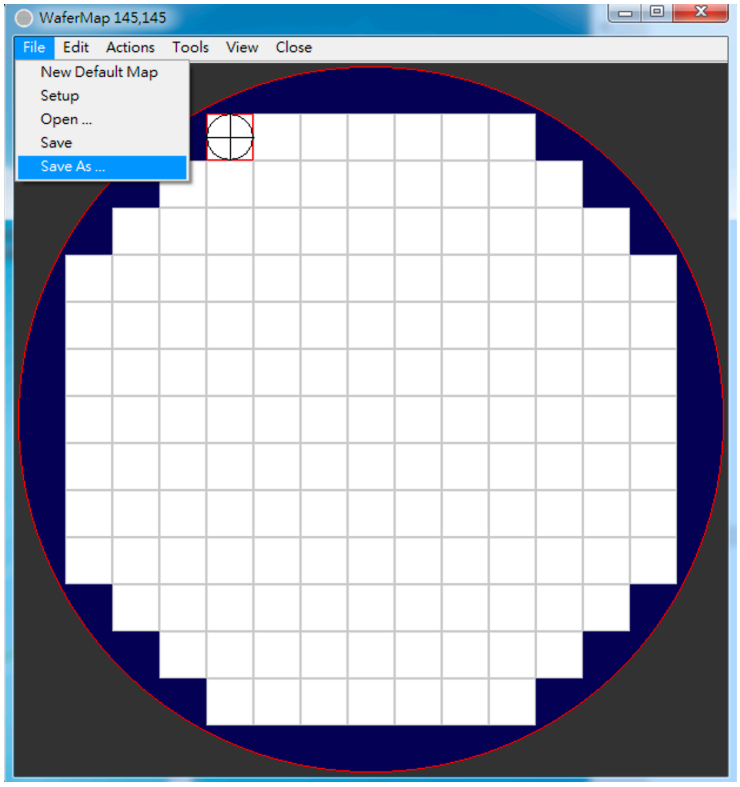


Fig. 33 Wafer Map File

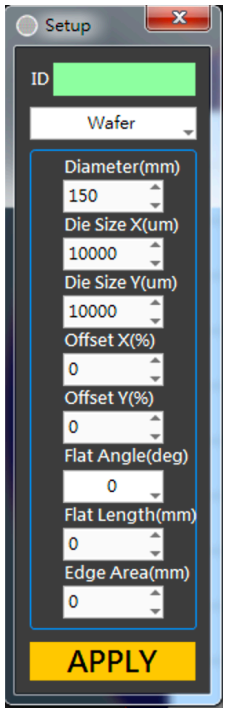


Fig. 34 Wafer Map Setup

Edit Map：

Click a die to toggle between valid/invalid status. Operator could only probe a valid die which is set to probe. When a menu is activated, it's corresponding description is shown on the window title as Fig. 36.

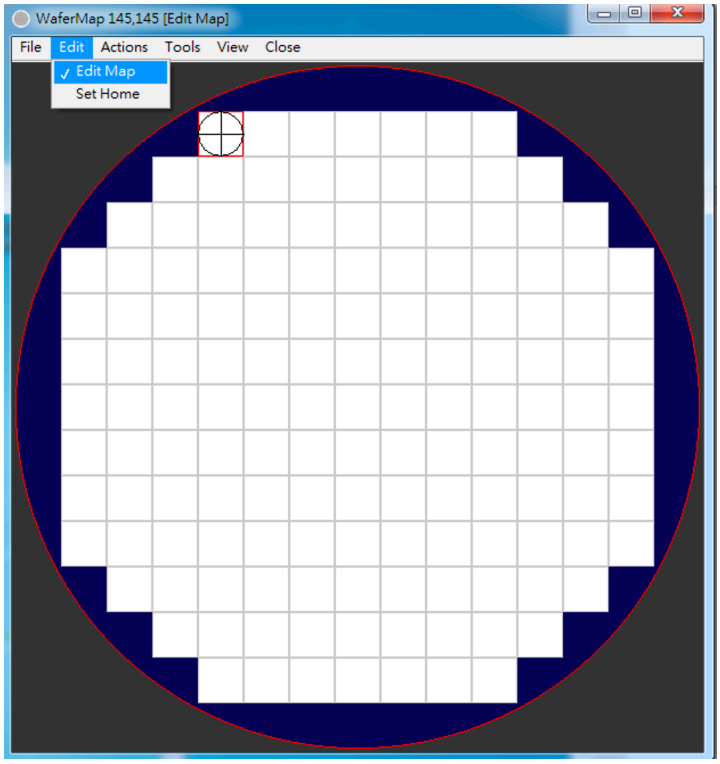


Fig. 35 Wafer Map Edit

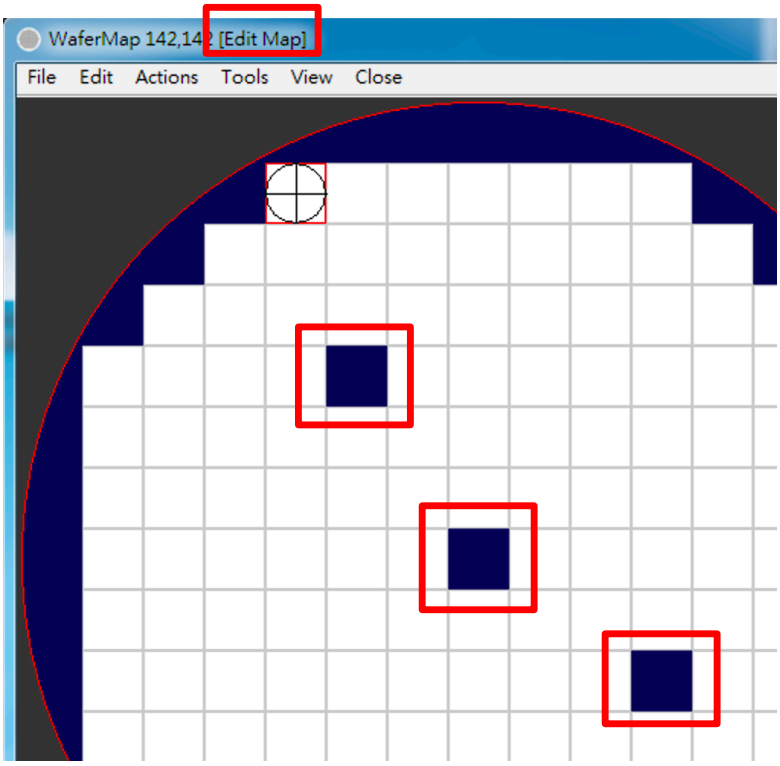


Fig. 36 Edit Map

Set Home：

Set Home Die by mouse click. The selected Home Die will be depicted as Fig. 37. Home Die & Home position are linked together. Therefore when going to Home Die the chuck is actually moving to the Home position defined by operator.

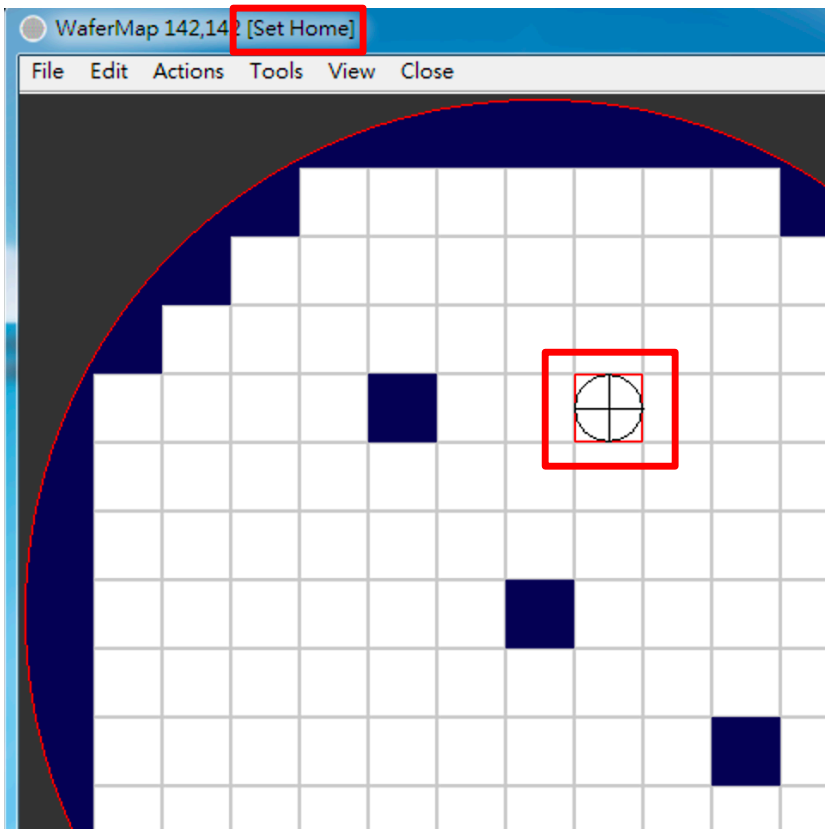


Fig. 37 Set Home

Actions：

Use this menu to perform various actions for the wafermap and the chuck as Fig. 38：

- Go Home：Move chuck to Home position.
- Go To Die：Move chuck to the selected die center by mouse click as Fig. 39. It will also perform position fine tuning with Chip Align enabled.
- Go Previous Die：Move chuck to the previous probe die.
- Go Next Die：Move chuck to the next probe die.
- Demo：Starting/Stopping demo mode by iterating through each probe die.

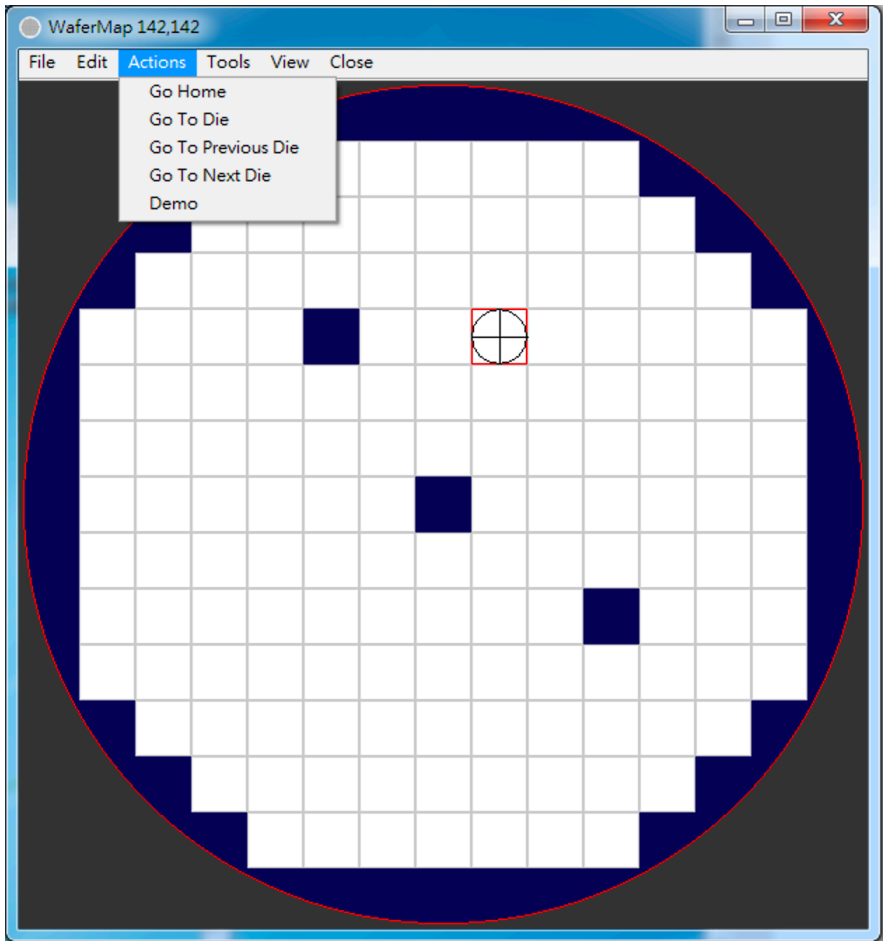


Fig. 38 Actions

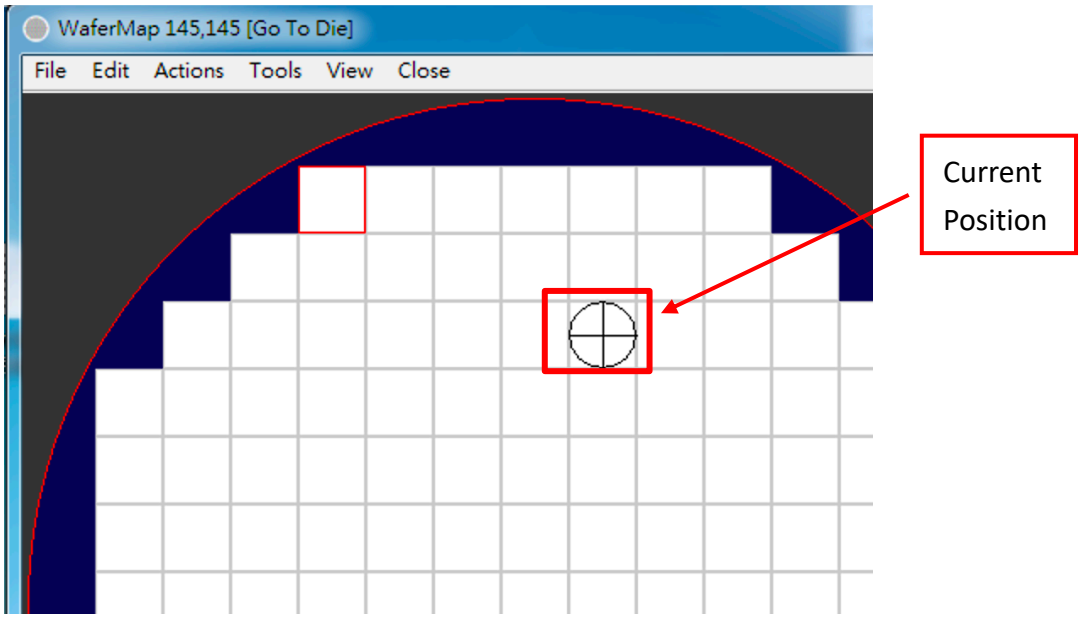


Fig. 39 Go To Die

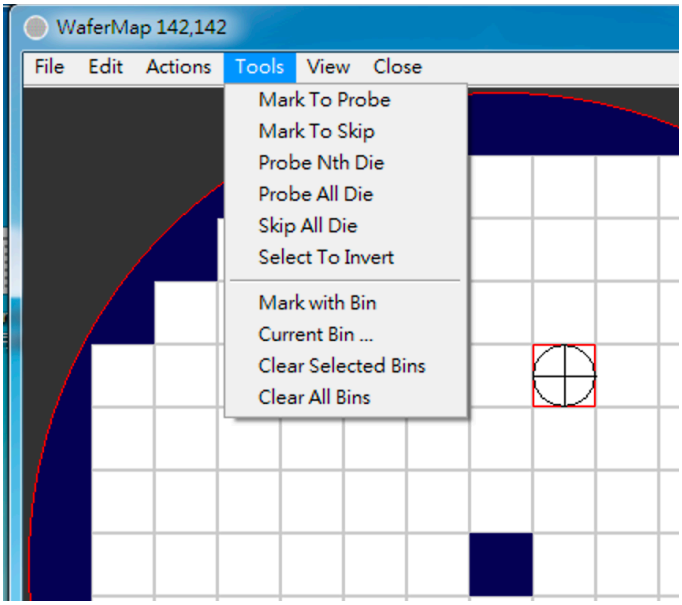


Fig. 40 Wafer Map Tools

Mark To Probe：

Mark the select die as a valid probe die by mouse click. A valid probe die could be probed and therefore binned according to the test result.

Mark To Skip：

Mark the select die as a skip probe die by mouse click. A skip probe die indicates a valid die but requires the prober to skip when performing wafermap probing.

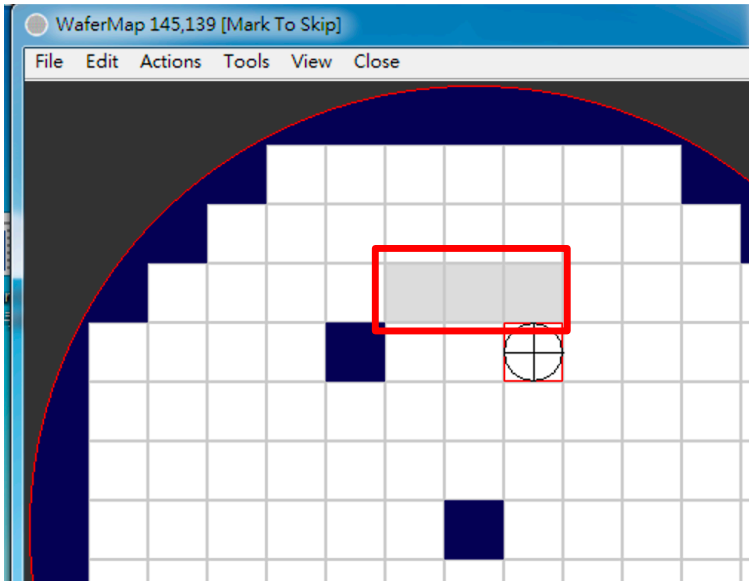


Fig. 41 Mark To Skip

Probe Nth Die：

Popup a window as Fig. 42. Set Every Nth Die number to probe every nth die in the waftermap and skip in between. When Every Nth Die set to 2 the effect is as Fig. 43. This feature is useful when the operator does not want to probe all the dies for time saving purpose.

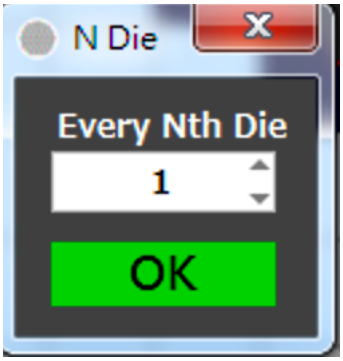


Fig. 42 Probe Nth Die

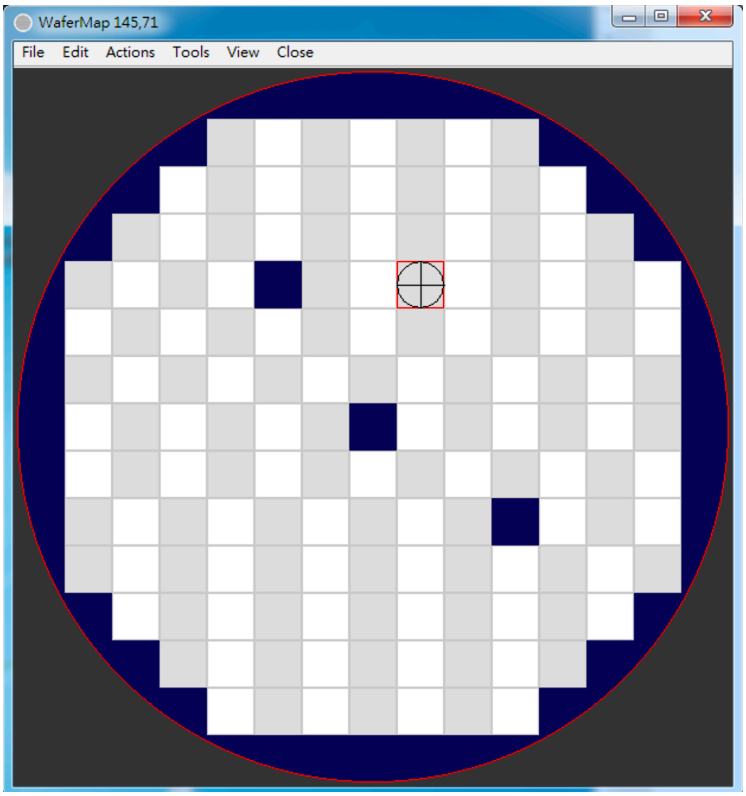


Fig. 43 Skip Nth Die

Probe All Die：

Set all valid die as probe die.

Skip All Die：

Set all valid die as skip die.

Select To Invert：

Use mouse to draw a rectangle inside wafermap to reverse the probe/skip status of valid die.

Mark With Bin：

Assign a Bin Number to selected die by mouse click.

Fig. 44 Mark With Bin

Current Bin：

Popup a window for selecting current bin as Fig. 45. Enter desired Bin Number and click SET. Used with “Mark With Bin” operation.

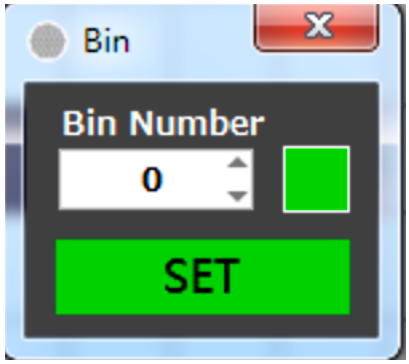


Fig. 45 Current Bin

Clear Selected Bins：

Delete selected die’s bin information by mouse click.

Clear All Bins：

Erase all the bin information on each die.

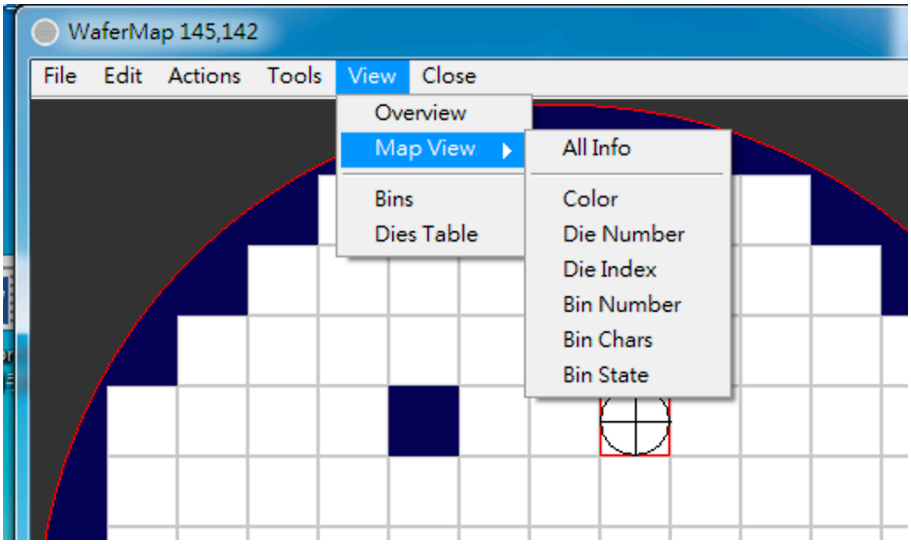


Fig. 46 Wafer Map View

Overview：

Activate to popup wafermap overview window as Fig. 47. Operator could zoom in from 200% to 1000% by click the magnifier icon and drag the reversed color rectangular to the interested position as Fig. 48.

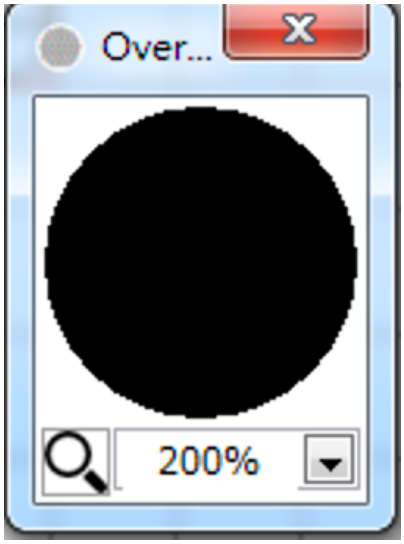


Fig. 47 Overview

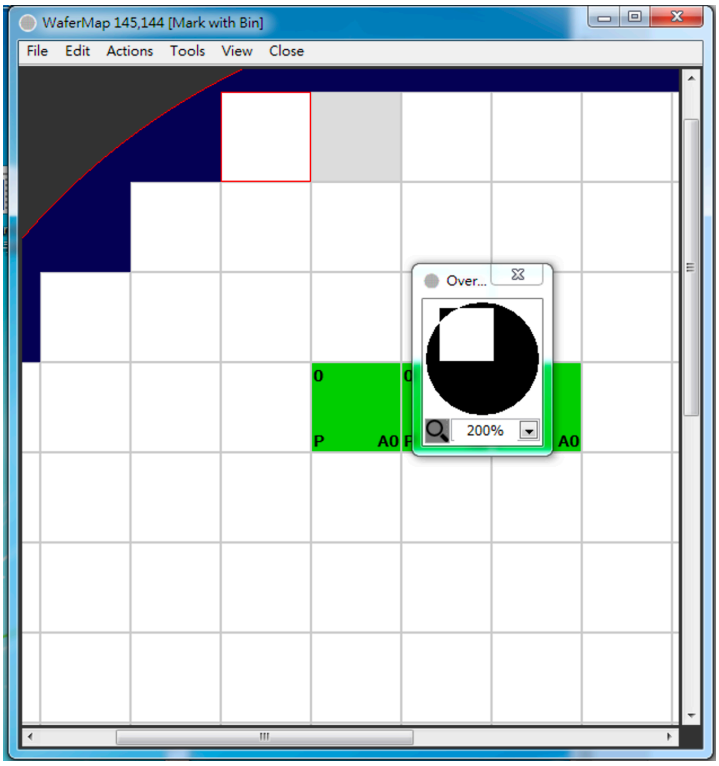


Fig. 48 Overview Activated

All Info：

Indicate all information including Bin Color, Die Number, Die Index, Bin Number, Bin Chars and Bin State. Please note the more information selected to show the more time the software needs to process.

Color：

Indicate bin color on binned die as Fig. 49. Only binned die has bin information, therefore has color.

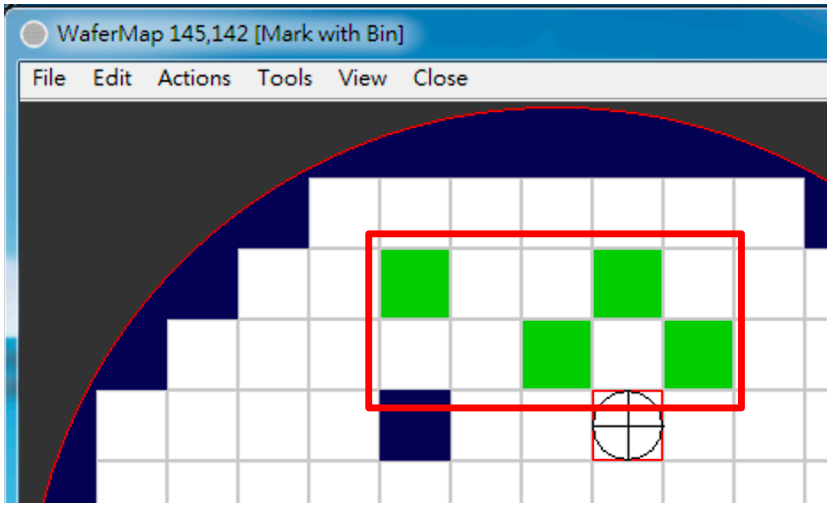


Fig. 49 Color

Die Number：

Indicate each probe die’s number as Fig. 51. Only selected probe die has die number.

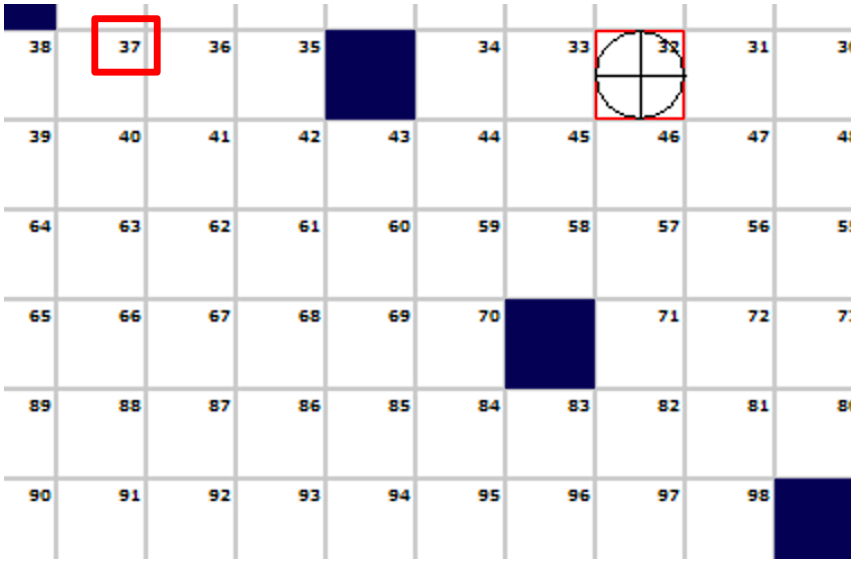


Fig. 50 Die Number

Die Index：

Indicate each die’s row & column index as Fig. 51.

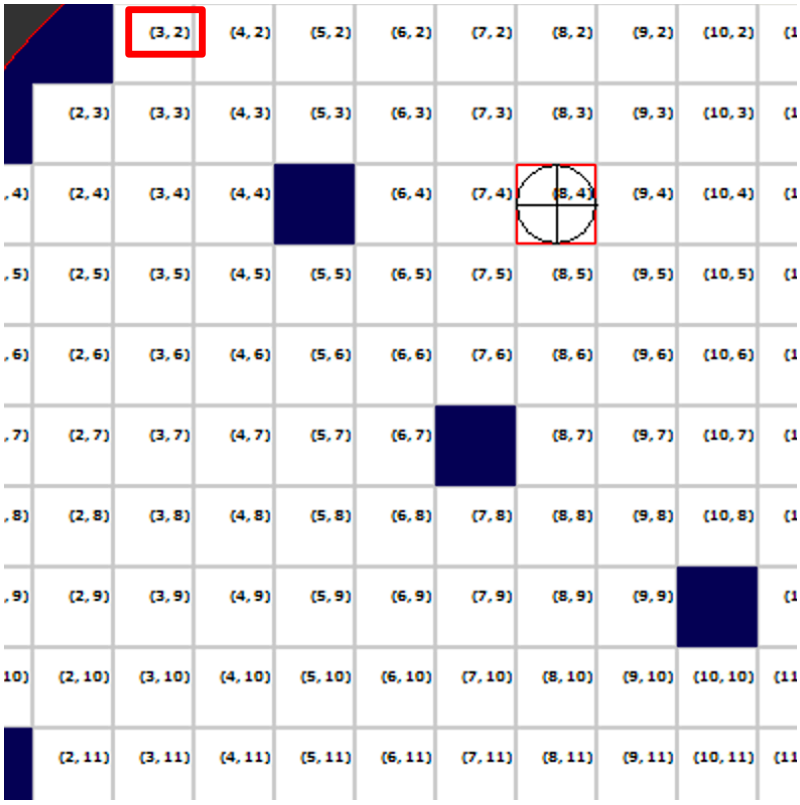


Fig. 51 Die Index

Bin Number：

Indicate Bin Number on the WaferMap as Fig. 52. The number shown are defined by the operator by “Mark With Bin”.

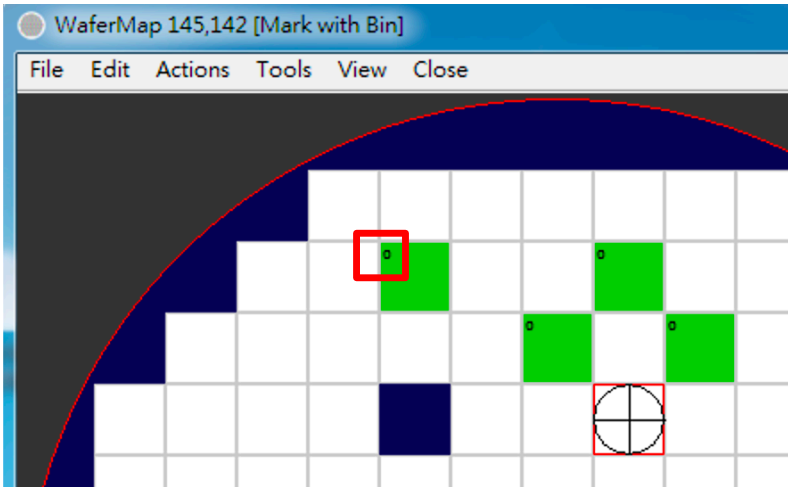


Fig. 52 Bin Number

Bin Chars：

Indicate Bin Chars on the WaferMap as Fig. 53. The characters shown are defined according to current Bin Number & Bin Table.

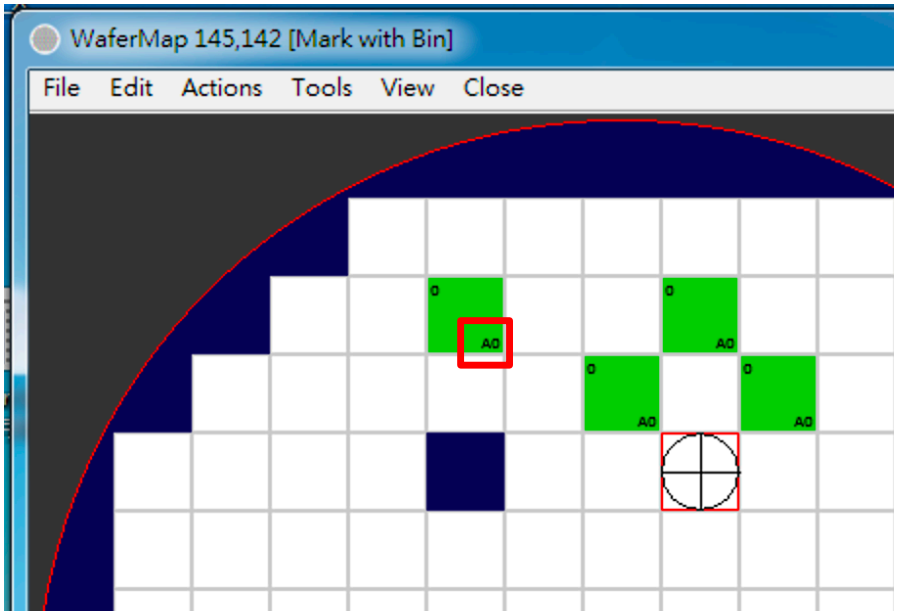


Fig. 53 Bin Chars

Bin State：

Indicate Bin State on the WaferMap as Fig. 54. P denotes pass and F denotes fail.

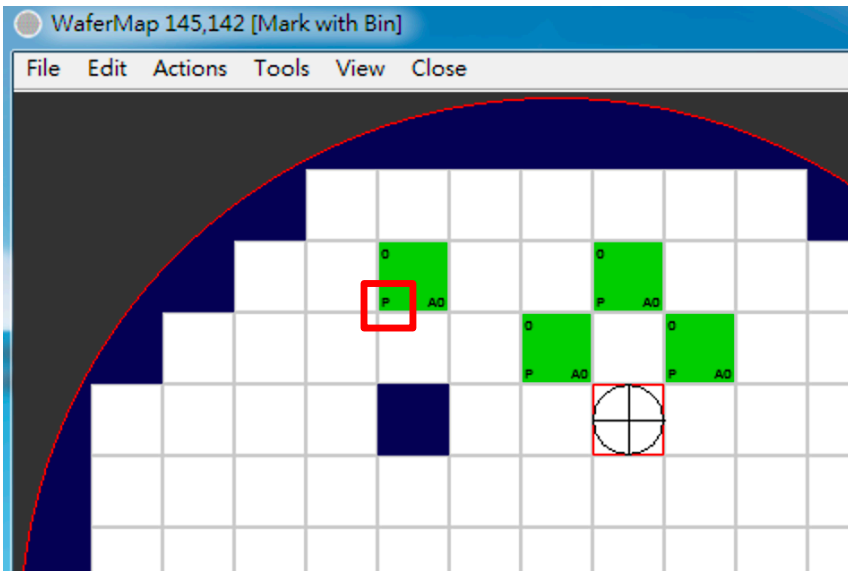


Fig. 54 Bin State

Bins：

Depicted as Fig. 55. This window displays the current bin table including Bin Character, Bin Color, Bin Status according to Bin Number.

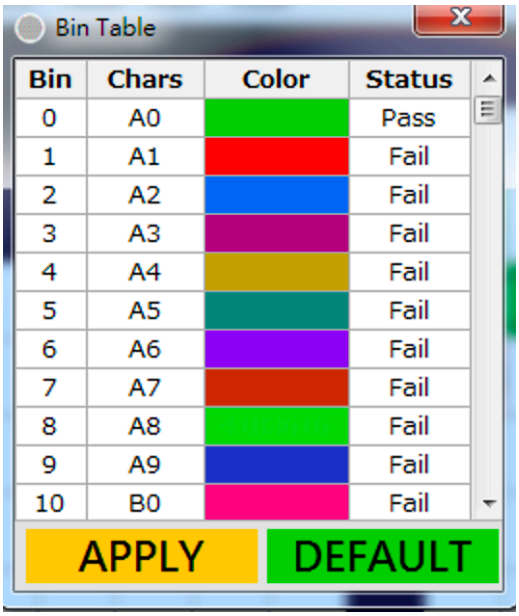
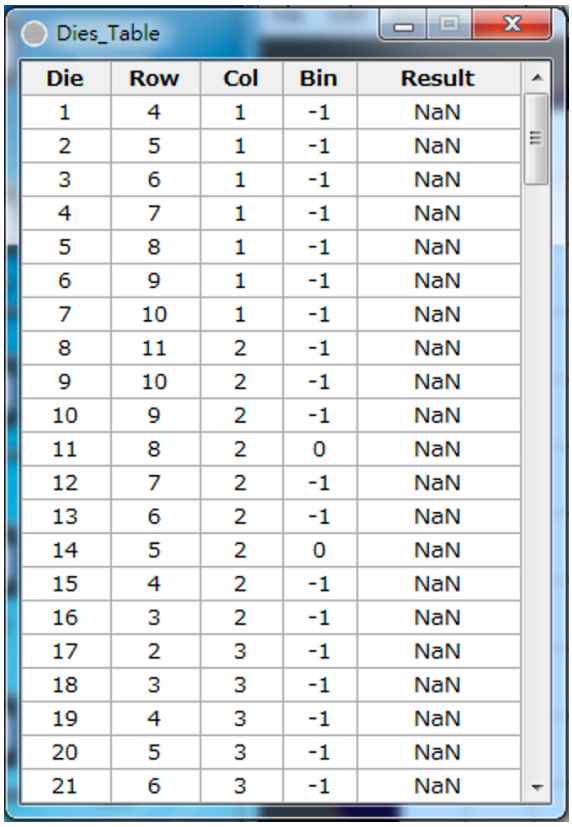


Fig. 55 Bin

Dies Table：

Depicted as Fig. 56. This window displays the current die table including Row, Column, Bin Number, Result according to Die Number.



Die	Row	Col	Bin	Result
1	4	1	-1	NaN
2	5	1	-1	NaN
3	6	1	-1	NaN
4	7	1	-1	NaN
5	8	1	-1	NaN
6	9	1	-1	NaN
7	10	1	-1	NaN
8	11	2	-1	NaN
9	10	2	-1	NaN
10	9	2	-1	NaN
11	8	2	0	NaN
12	7	2	-1	NaN
13	6	2	-1	NaN
14	5	2	0	NaN
15	4	2	-1	NaN
16	3	2	-1	NaN
17	2	3	-1	NaN
18	3	3	-1	NaN
19	4	3	-1	NaN
20	5	3	-1	NaN
21	6	3	-1	NaN

Fig. 56 Dies Table

H. Remote Communicator：

Remote command test window for external control & integration. The software support external command control through TCP/IP for further integration with Tester.
This window lists supported commands for test purpose, depicted as Fig. 57.
Operator could execute selected command and edit the script for batch operation.

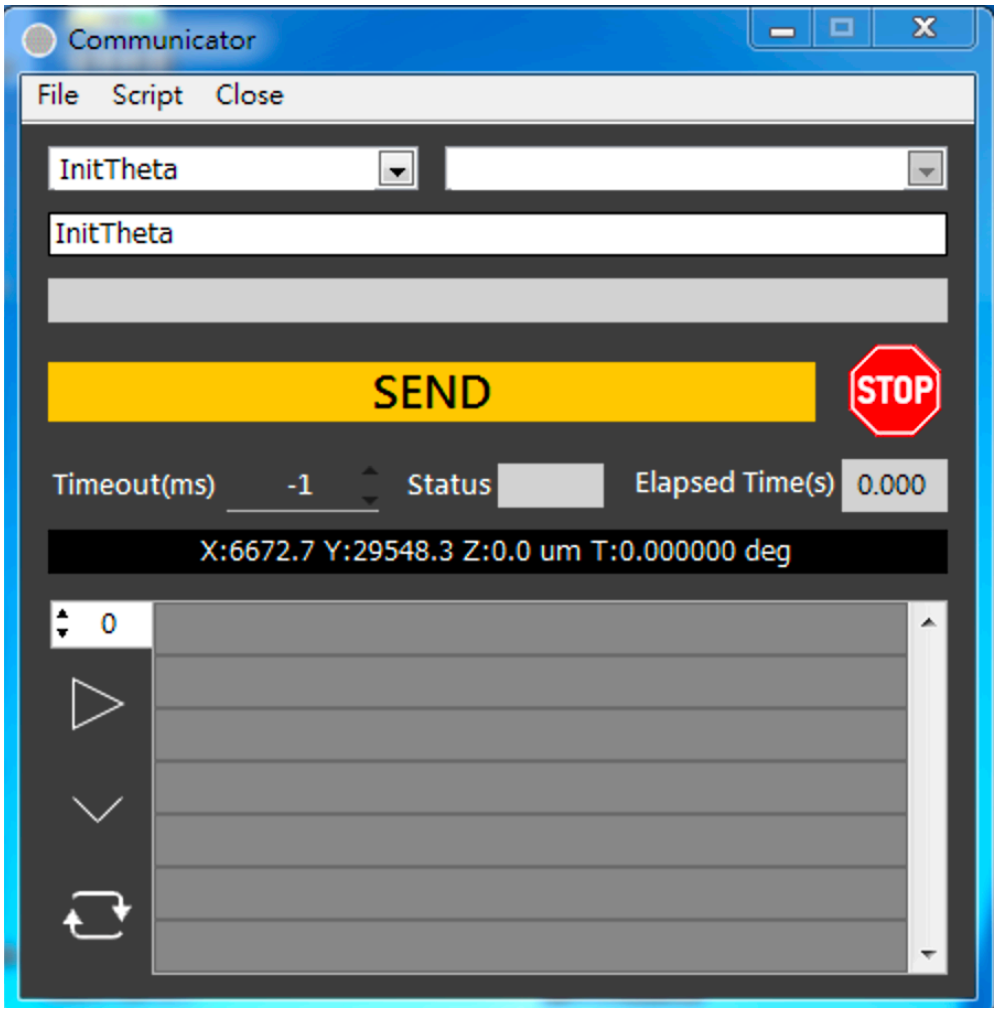


Fig. 57 Remote Communicator