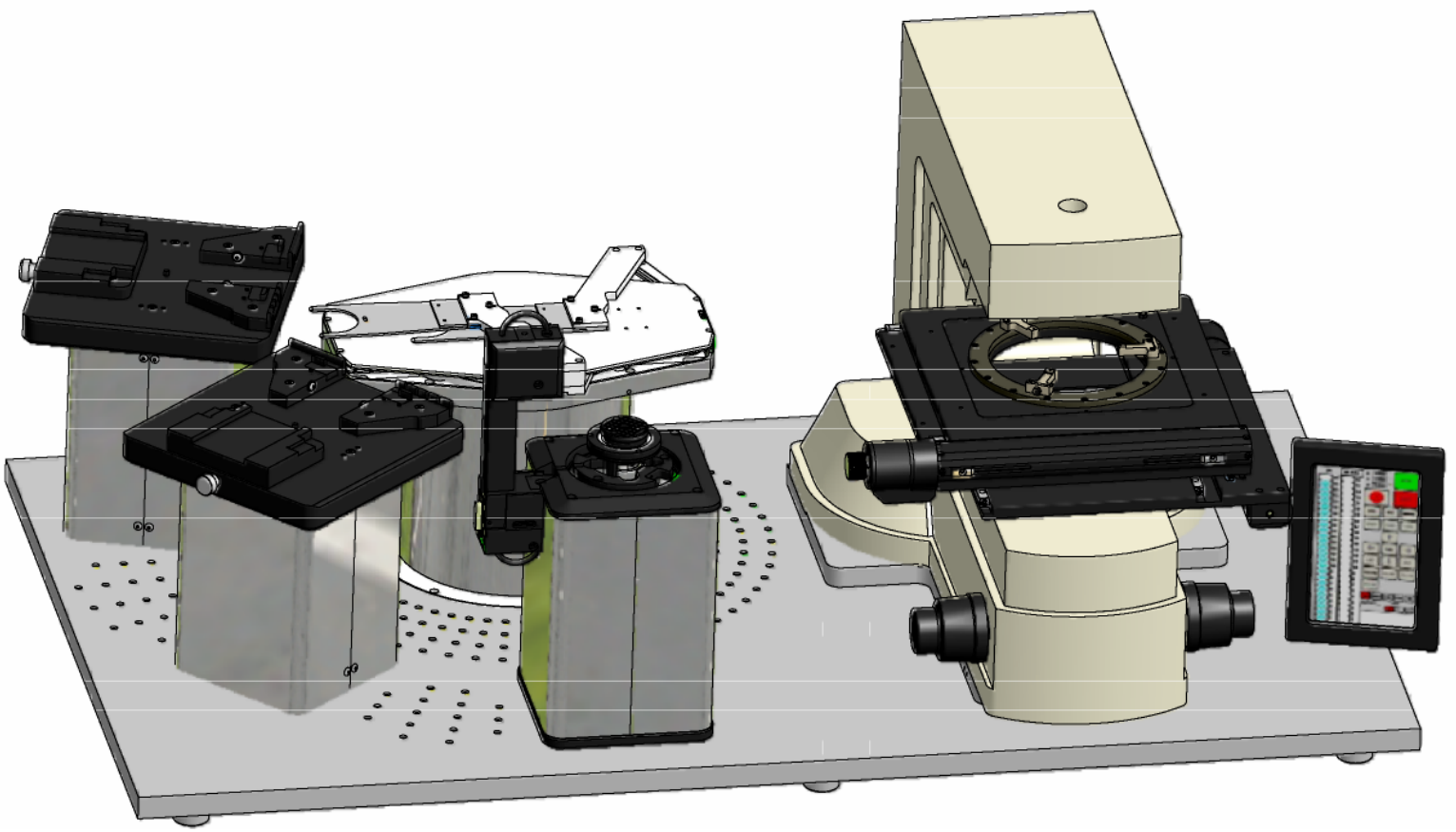
LEP Wafer Handler
Operation Manual



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Contents

1.0 Introduction

This manual will cover the setup, programming and operation of the LEP wafer handler system. The modular nature of the MAC controller and flexibility of the software allows for a wide range of configurations. Each option and configuration will be described in this manual.

The operating software is installed on a PC. The keypad console is an extension of the PC's main monitor with touch screen functionality.

2.0 Requirements

2.1 System

Input Voltage: 90-240Vac 50/60Hz 200W (Automatic International Voltage Selection)
Vacuum: 24 in. Hg

2.2 Tools

The following tools are required for complete assembly:
1.27mm, 1.5mm, 2mm, 2.5mm, 3mm, 4mm, 5mm, 6mm Hex Wrenches
Philips Head Screwdriver
Flat Head Screwdriver
Bubble Level

3.0 Hardware Installation

The basic wafer handler system consists of the following components. As the system is assembled, components should be leveled. All components have some type of leveling system and should be completed in the following order. A bubble level should be used for the leveling.

3.1 System Base Plate

The system should be leveled out by adjusting the six feet on the bottom on the bottom of the system base plate.

3.2 Cassette Towers

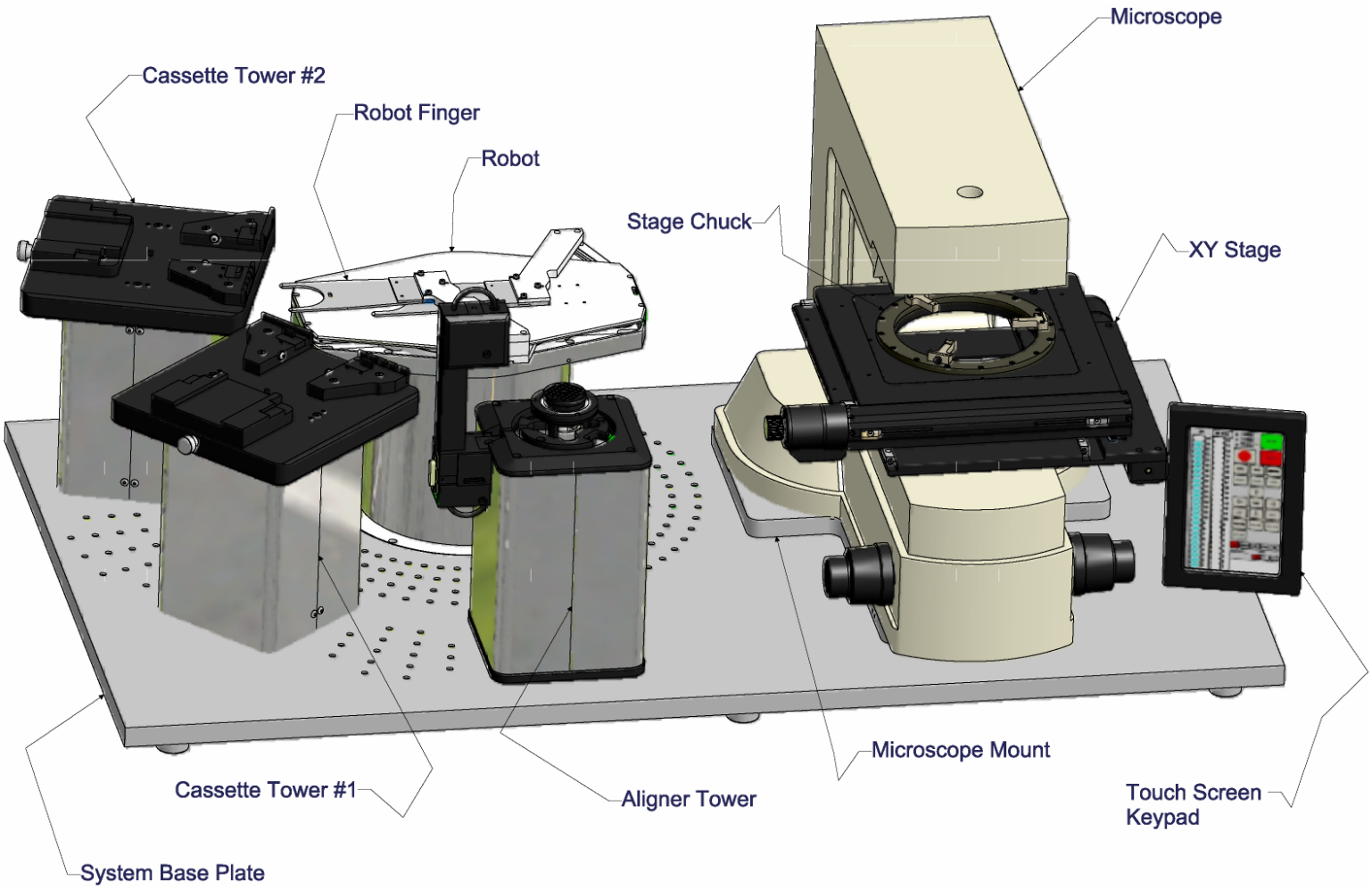
On the top side of the cassette towers there are (4) set screws, which are used to level the towers to the system base plate.

3.3 Aligner/Grip Tower

On the base of the aligner and grip towers there are also set screws which are used for leveling.

3.4 Robot Fingers

By adjusting the (3) setscrews and (3) mounting screws on each robot finger, the finger leveling should match the cassette towers with the arms extended.



3.5 Microscope Leveling

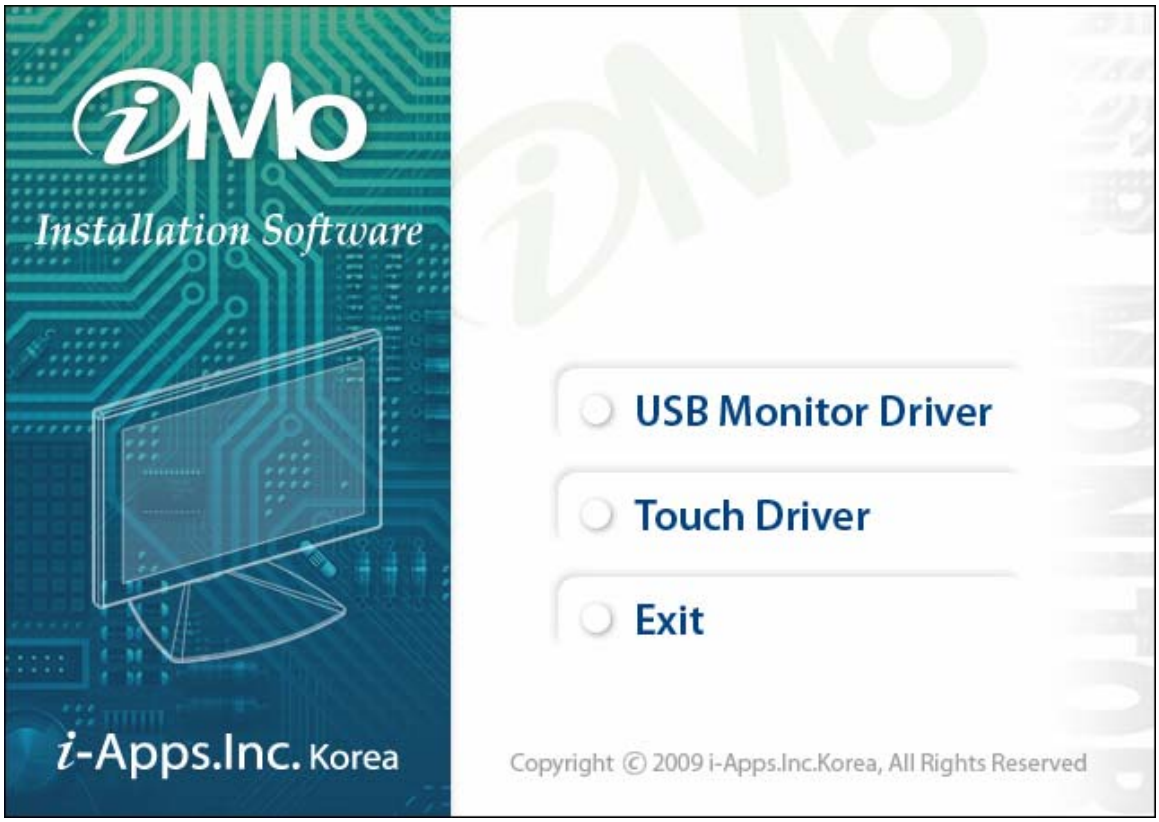
Move the stage to the load position. Using a small hex wrench, spin the (3) microscope mounting post. The stage should be leveled to match the robot fingers. Once leveling has been achieved, tighten up the three set screws on the sides of the microscope mounting plate to lock the plate down.

3.6 Stage Chuck Leveling

Level the stage chuck relative to the focal plane of the microscope. Using a 50X objective, move the stage left and right. Adjust the two rear set screws on the stage insert plate to achieve a less then 50um focusing deviation. Repeat for the front to back movement and the single set screw in the front of the stage insert plate. Once leveling has been achieved, lock the plate down with the (2) button head screws.

4.0 Software Installation

After the system has been mechanically setup, the software can be loaded to a PC. The touch screen keypad connects to a PC USB port. Two drivers are required for the monitor and touch screen functionality. See iMo Pivot Installation Manual.



The LEP dongle needs to insert into an available USB port on the computer. This dongle allows the software to be activated.

The LEP application software can now be installed by using the installation file.

LEPKbdSetup.msi

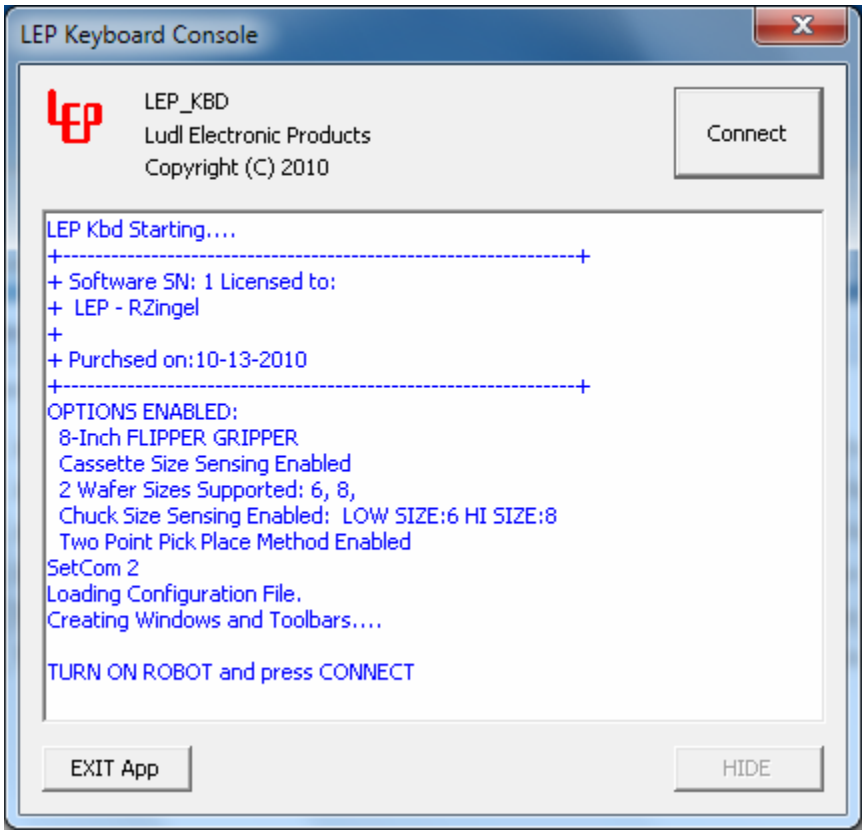
It's important that the computer log in account has full rights to the LEP Keyboard directory.

C:\LEPKbd

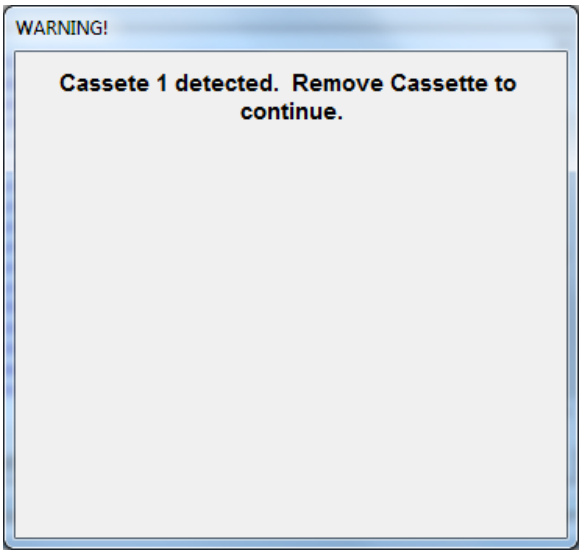
5.0 Starting the Application

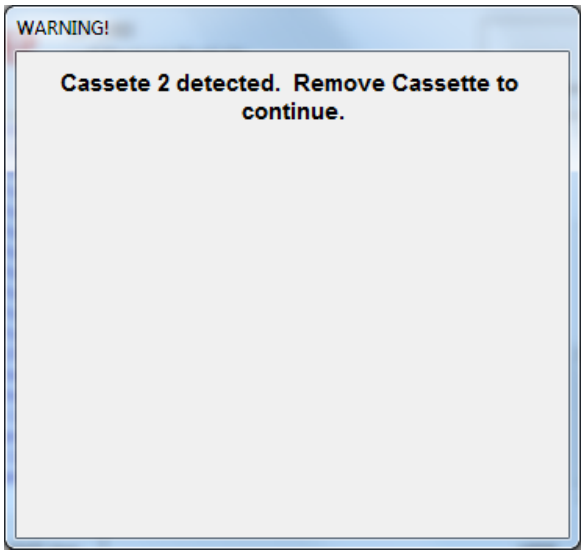
The software package is self-configuring. The system checks for specific MAC modules in the controller and determines from the predefined addresses and the module identification in what functions the application will enable. The following icon located in C:\LEPKbd should be used.

After the icon is clicked, the following Event Dialog box will be displayed. The user will be prompted to turn on the controller.



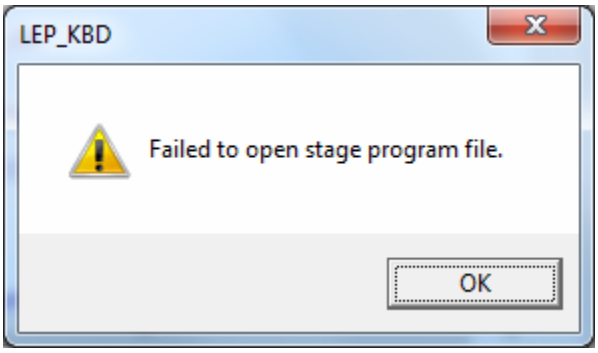
Click the ***Connect*** button. The software will verify the MAC controller has been turned on for at least 8 seconds. If cassettes are present in the system, you will be asked to remove them.





The system will then go through a calibration procedure. This procedure will zero out the robot and aligner, establishing a frame of reference for the system. The stage will be driven to each end limit and then centered. The stage center will be considered the 0,0 position.

The following message will appear if a stage recipe is not loaded. This is normal from a new start.



With a successful boot up, the event log file will display the following:

```
LEP Kbd Starting....
+-----------------------------------------------------------------+
+ Software SN: 1 Licensed to:
+  LEP - RZingel
+
+ Purchsed on:10-13-2010
+-----------------------------------------------------------------+
OPTIONS ENABLED:
  8-Inch FLIPPER GRIPPER
  Cassette Size Sensing Enabled
  2 Wafer Sizes Supported: 6, 8,
  Chuck Size Sensing Enabled:  LOW SIZE:6 HI SIZE:8
  Two Point Pick Place Method Enabled
SetCom 2
Loading Configuration File.
Creating Windows and Toolbars....

TURN ON ROBOT and press CONNECT
Initializing. Please Wait.....8..7..6..5..4..3..2..1..0.
..Opening COM PORT.................SUCCESS!!....
..Opening COM PORT for Flipper Gripper.................SUCCESS!!
ScanModules....
  Found 1
  Found 2
  Found 4
  Found 5
  Found 6
  Found 7
  Found 9
..DONE SCANNING....
Checking Vacuum.........
Checking Cassettes.....
Checking Stage.........
   Stage detected........  ENCODER MODE  OK
Checking Robot.........
   Robot detected........OK
    MAPPER DETECTED
Checking Aligner.......
Done!
```

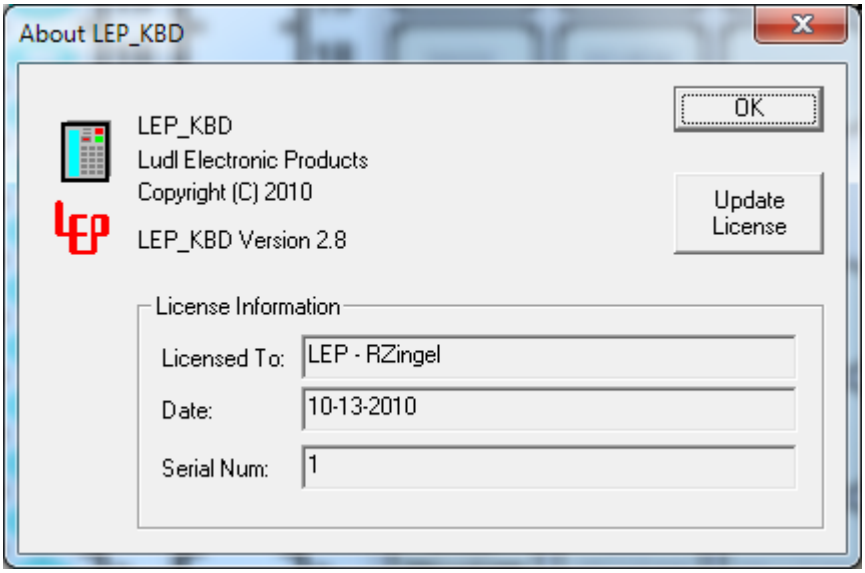
Any red text will indicate a problem with initialization.

6.0 Main Navigation Menu

Click on the LEP logo in the windows icon tray, located at the bottom right hand corner of the main screen. The main menu for the system will be displayed.

6.1 About

Clicking on the ***About*** will display the software version.



6.2 Wafer Size

The wafer size will load and save wafer size teach points.

6.3 Configuration

All system configurations can be accessed from this menu.

6.4 Edge Gripper

All edge gripper parameters can be accessed from this menu.

6.5 Program Joystick Key

The joystick buttons can programmed from this menu.

6.6 Recipe

Stage program recipe's can be loaded and saved from this menu.

6.7 Display Event Log

All system events will be stored and logged in this window. The events are all date and time stamped. This log can be used as a trouble shooting aid in the event of a failure.

6.8 System Console

This is an option only enabled for LEP personnel.

6.9 Robot Diagnostics

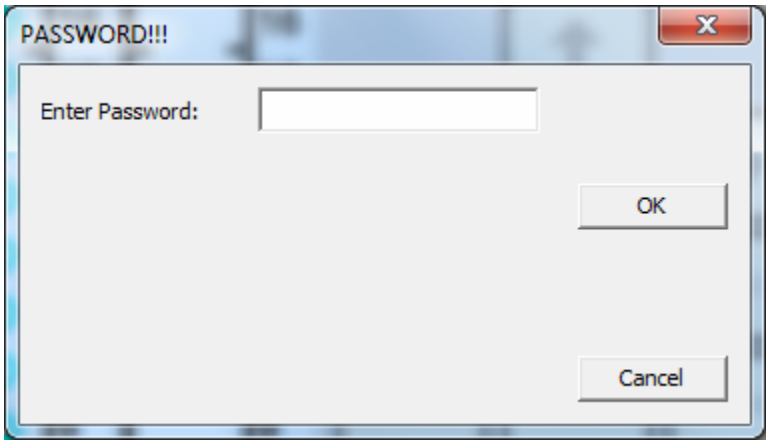
This menu allows the system diagnostics to be displayed. Each component functions can be broken down to aid in trouble shooting.

6.10 Reset Wafer Counter

The system will keep track of all successful wafer transfers. This menu item can only be reset when the administrative password has been entered.

6.11 System Log In

The system can be logged in under three basic levels: Operator, User, and Administrator.



The OPERATOR doesn't require a password. The operator will only have rights to start the application, load teach points and load stage recipes.

The USER has rights to operate the system, load teach points and load/create stage recipes. The password ***user*** should be entered in the password field.

The ADMINISTRATOR has the ability to change system configuration, teach new wafer points, create stage recipes and operate the system. The password ***admin*** should be used to log into the application as the administrator.

The passwords may be changed within the Application, Configuration menu.

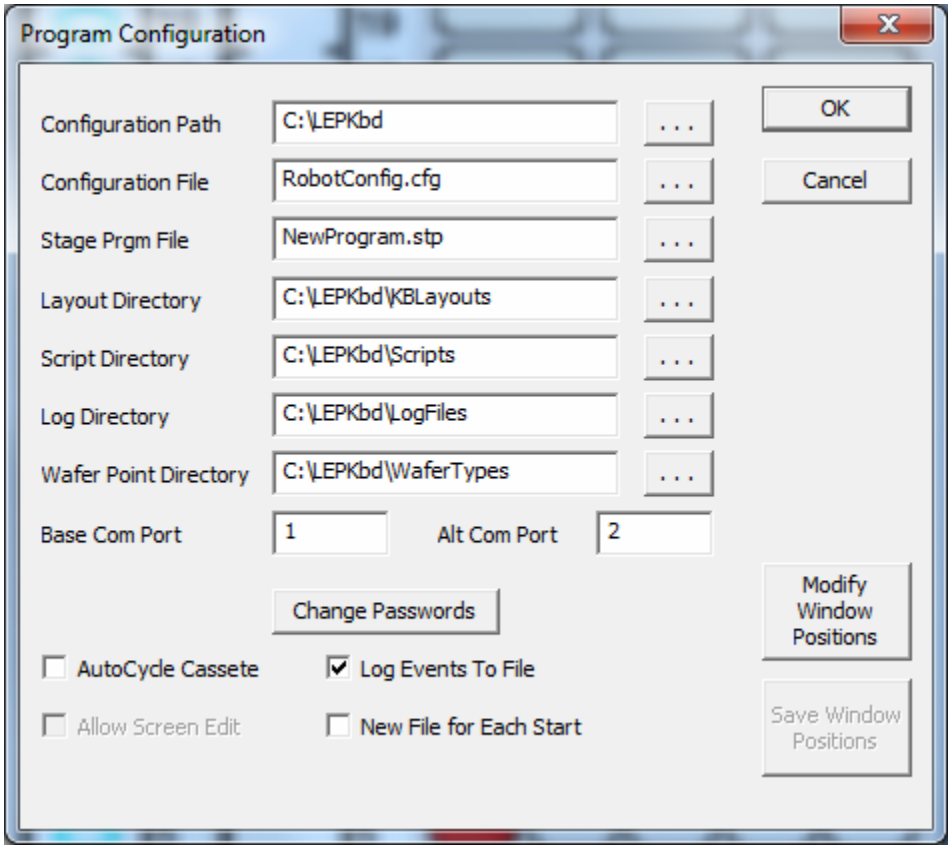
7.0 System Configuration

To make system changes to the system log into the application as the administrator.

7.1 Application Configuration

The following programs path should be set after the software installation.

Use the supplied null modem cable (p/n: 73A00019), which should connect from the host computer 9 pin com port to the MAC controller DB 25 RS232 port.



The Base Com Port should be set to the selected computers RS232 port. The com port should be set to the following, which is the controller default:

- 9600 Baud
- 8 Data
- 2 Stop Bits
- No Parity

The Alt Com Port is used for systems containing a Edge Gripper tower. A straight RS232 should be connected from the PC com port to MAC controller RS485/RS232 connector. The default settings should be used here as well.

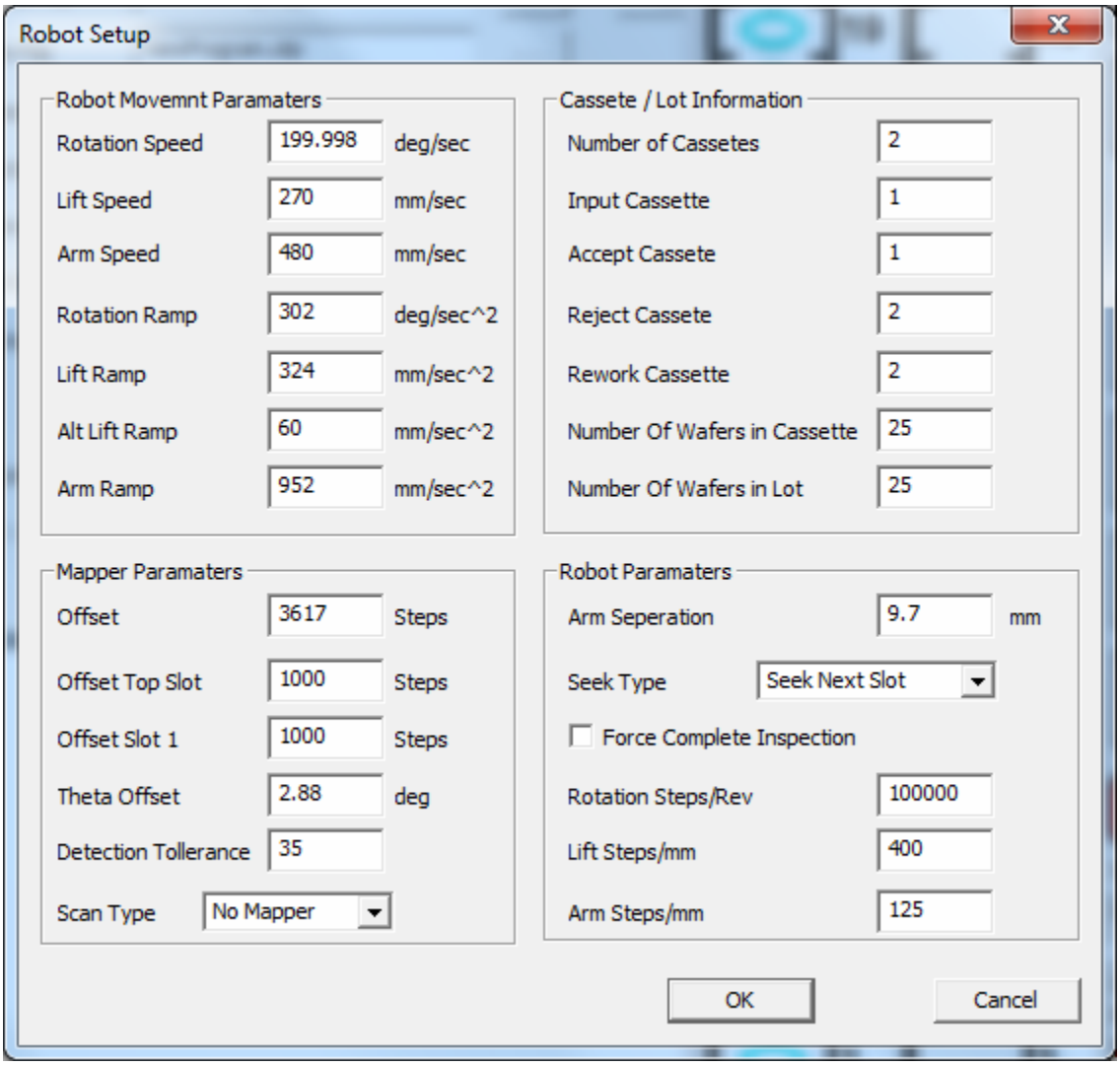
- 9600 Baud
- 8 Data
- 2 Stop Bits
- No Parity

To run the system is a continuous mode, check the ***AutoCycle Cassette*** box. This will operate the system without any human intervention.

The autocycle option should only be enabled after the system can successfully transfer a full cassette.

7.2 Robot Configuration

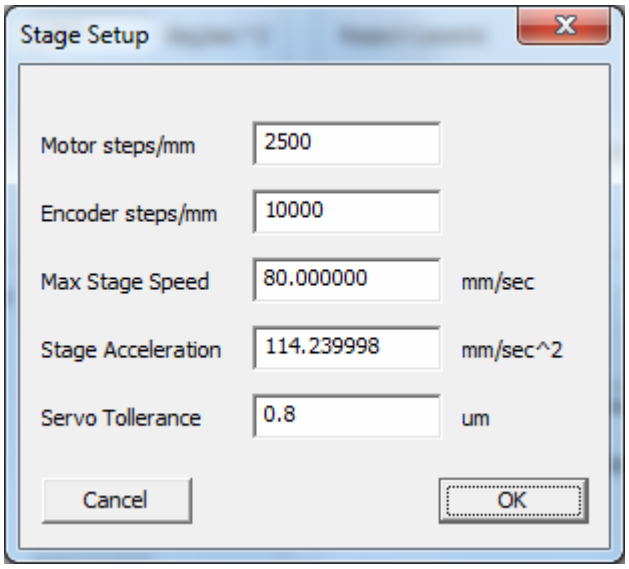
Clicking on the ***Configuration*** option, then ***Robot***, will bring up the following screen. This screen allows the robot parameters to be changed as desired.



The application is preloaded with safe defaults. They can be optimized depending upon the application, wafer size, and wafer material.

7.3 Stage Configuration

Clicking on the ***Configuration*** option, then ***Stage***, will open up the next screen. This screen allows the stage parameters to be changed.



The software has certain parameters that are hardware dependent which affects the operation of the stage. The parameters are the ratio of the number of motor steps per millimeter of travel for the X, Y axes. The ratio can easily be calculated based on the following formula:

$$STEPS/mm = \frac{MOTORSTEPS/REVOLUTION}{LEADSCREW\ PITCH}$$

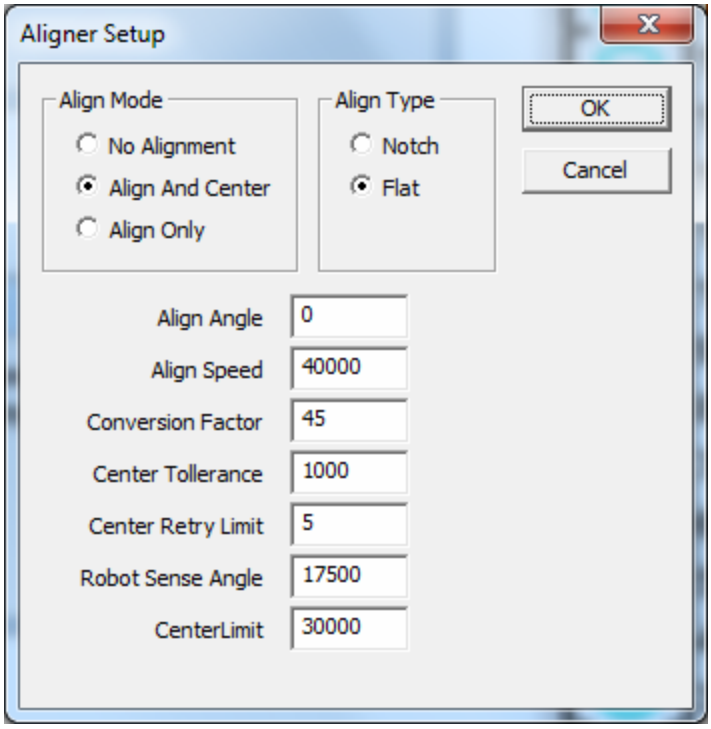
or more easily from the following table:

Leadscrew / **Motor**	**1 mm Pitch LeadScrew**	**2 mm Pitch LeadScrew**	**4 mm Pitch LeadScrew**
10,000 steps/rev	10,000	5,000	2,500
20,000 steps/rev	20,000	10,000	5,000

All stage positions are stored in the minimum stage units, not measurement units.

7.4 Aligner Configuration

The aligner configuration is also found in this same area. The align mode and type can be selected here.



Align Angle:
The align angle is the angle the flat/notch will be placed onto the stage. The value is written in steps.

Align Speed:
The angle speed is the speed at which the aligner will spin. The speed value is written in Hz.

Conversion Factor:
This the factor of the robot sense angle and center limit, which are hardware dependent. This value should not be altered unless directed by LEP personnel.

Center Tolerance:
Center tolerance determines the allowed eccentricity error of the pre-aligner.

Center Retry Limit:
Center retry limit is defined as the maximum number of attempts to satisfy the center tolerance condition.

Robot Sense Angle:
This is the angle at which the laser is placed on the aligner tower.

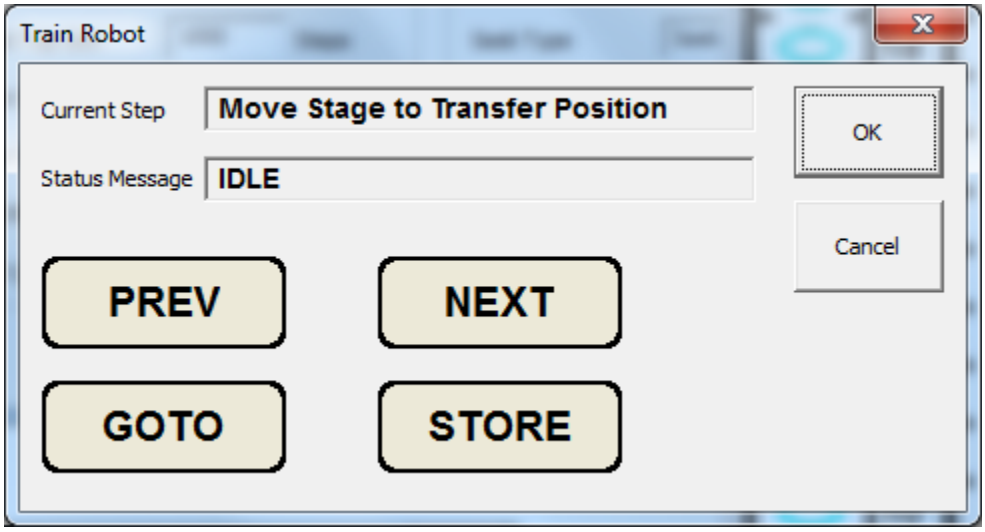
Center Limit:
This is the correction distance used by the robot for centering the wafer.

7.5 System Training

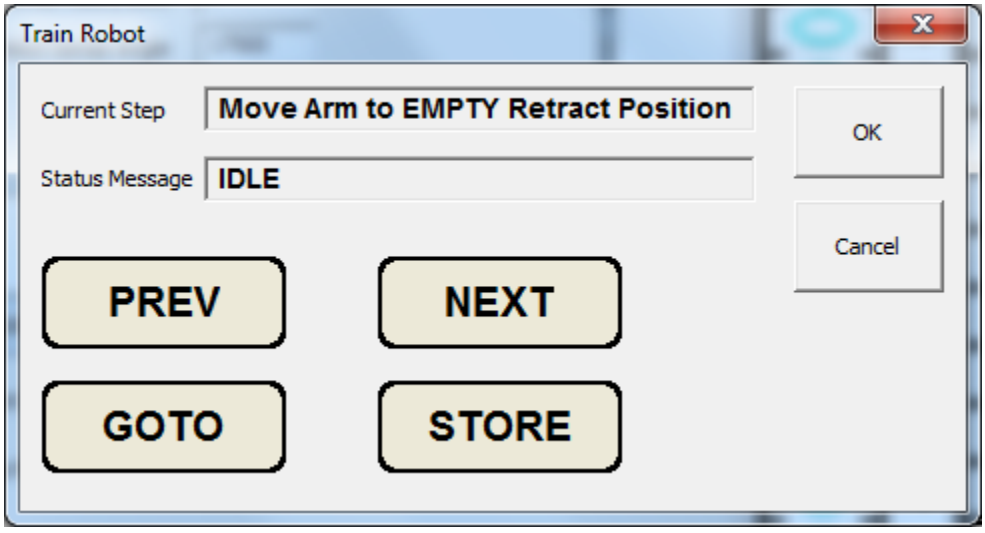
With all the configuration menus set up, the system can now be taught for specific reference positions. The ***PREV*** and ***NEXT*** buttons will move you the various teach points. The ***STORE*** button will store the taught position into a corresponding teach file. If a point has already been taught, the ***GOTO*** button can be used to verify that position.

The first training box will direct you to move the stage with the joystick to the load/unload position. This position is where the robot will hand off the wafer to the stage. The transfer position is generally near the left back corner of the stage travel, just off the limit switches.

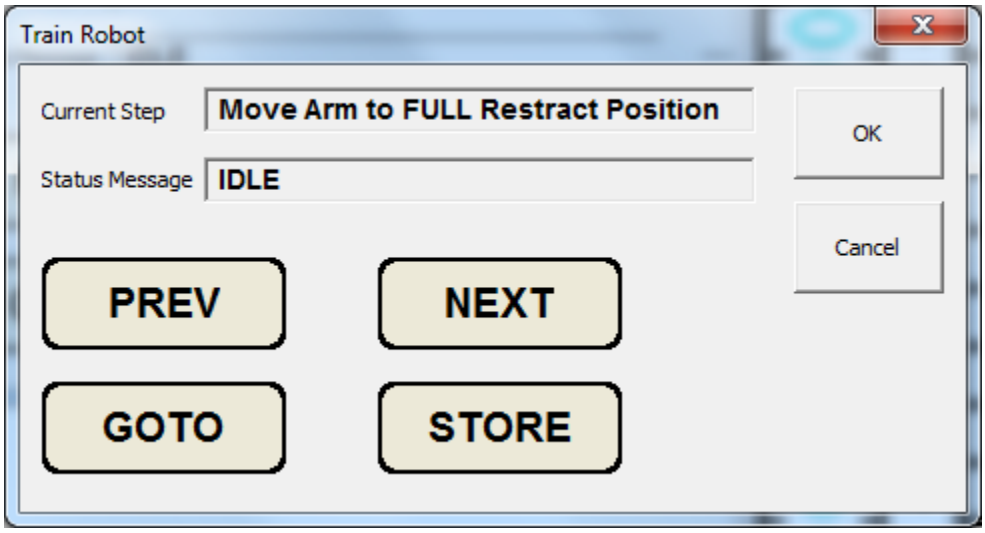
No teach positions may correspond to a limit position of any axis. This is deemed an error condition.



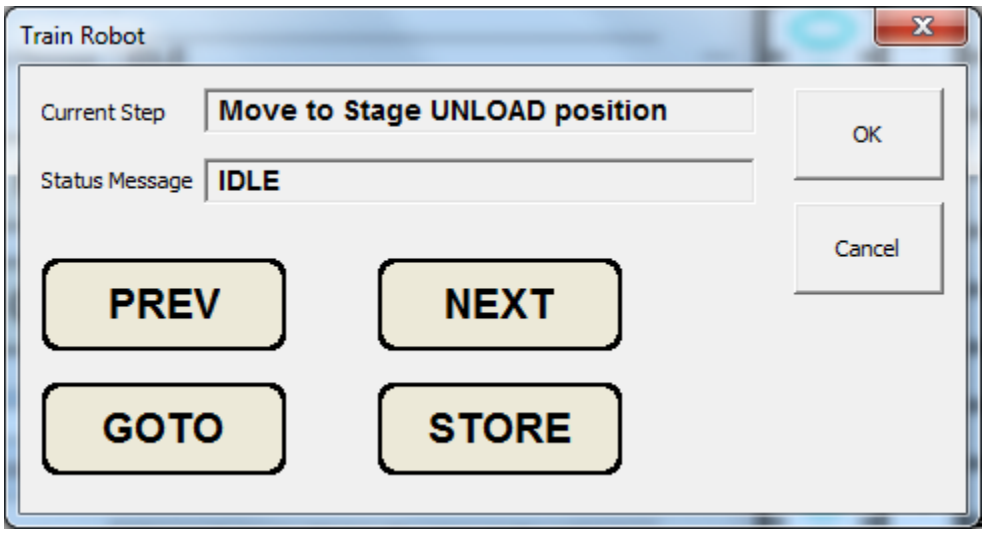
The next training box will direct you to move the robot arms to the empty retract position. This position is taught just where the arms are inside the robot envelope.



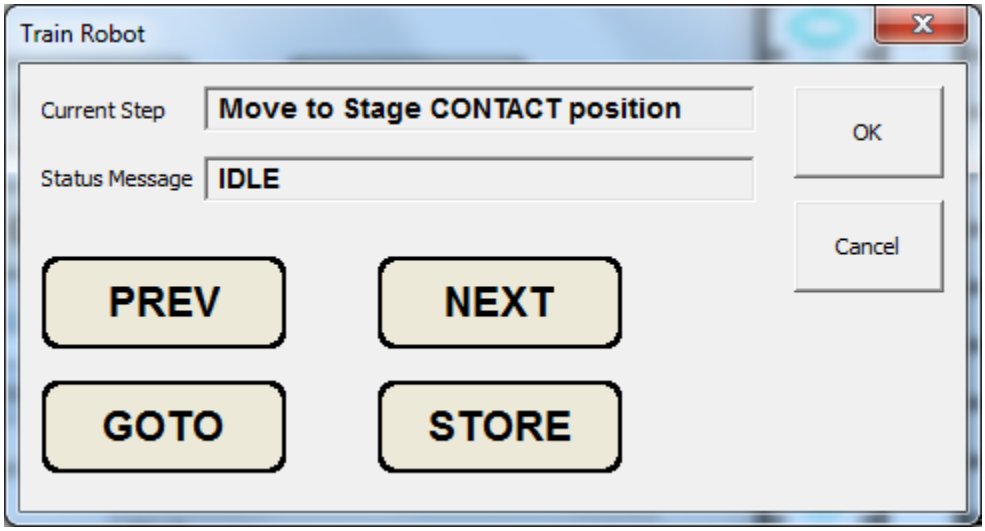
The next training box will direct you to move the robot arms to the full retract position. This position is where the arms are retracted inside the robot envelope, just off the rear limit switches.



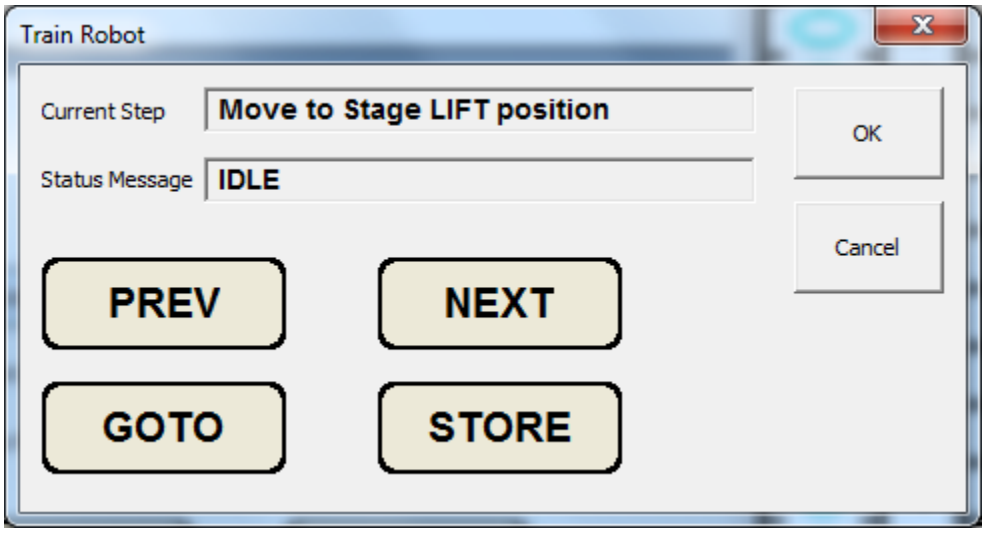
The next training box will direct you to move the robot arms to the stage unload position. This location corresponds to the robot arm position as it interfaces with the stage in the load position such that the arm is able to place the wafer centered on the stage vacuum chuck. A safe distance is ~2 mm below the wafer. All robot axis positions, such as, rotation, z height and arm travel are stored.



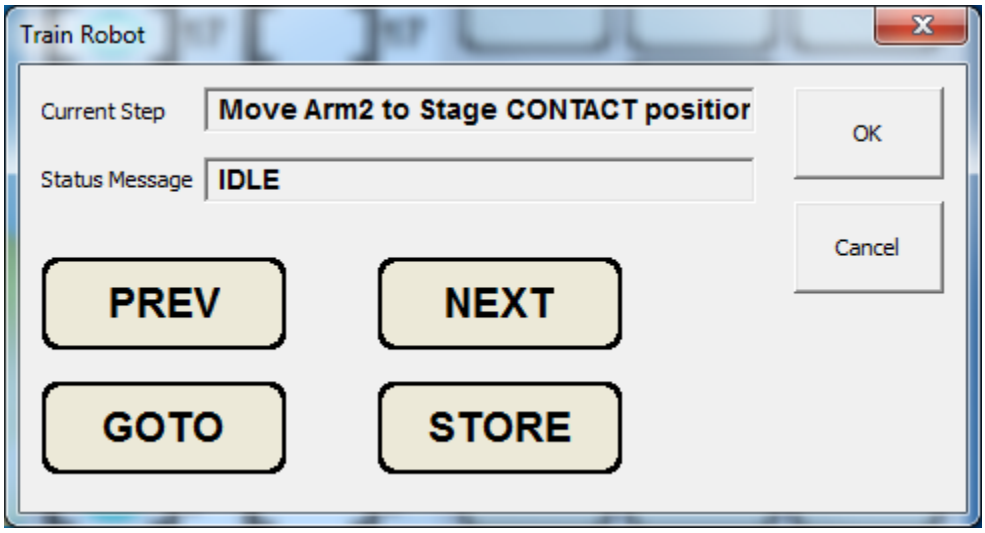
The next training box will direct you to move the robot arms to the stage contact position. This location corresponds to the Z position of the robot arm such that the top surface of the finger contacts the underside of the wafer. Just the robot z height is stored.



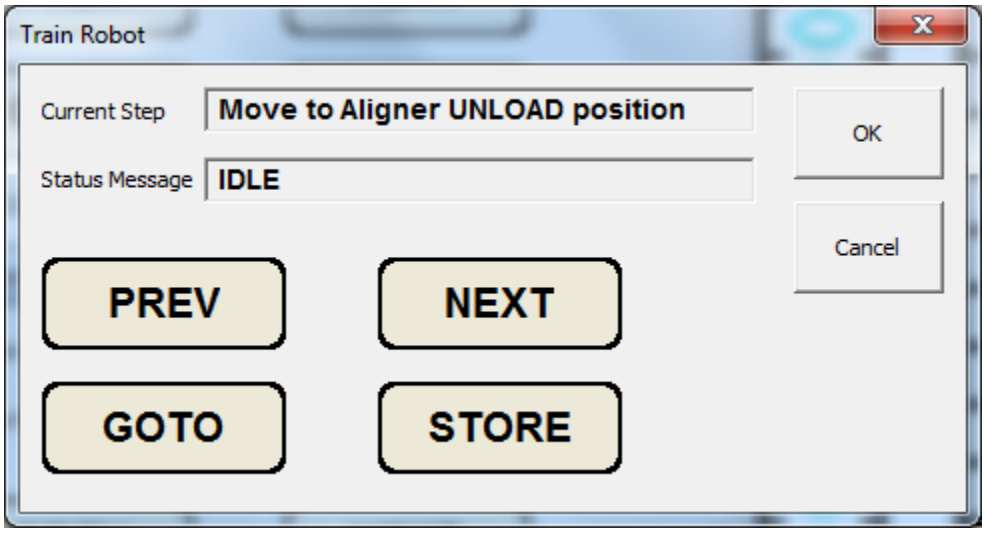
The next training box will direct you to move the robot arms to the stage lift position. This is the position where the wafer will come in and leave the stage chuck. A safe distance is ~2 mm above the wafer. Again, just the robot z height is stored.



The next training box will direct you to move robot Arm2 to the stage for the contact position. This is the position is the same as the Arm1 contact position. The finger distance from Arm2 to Arm1 is calculated and stored.

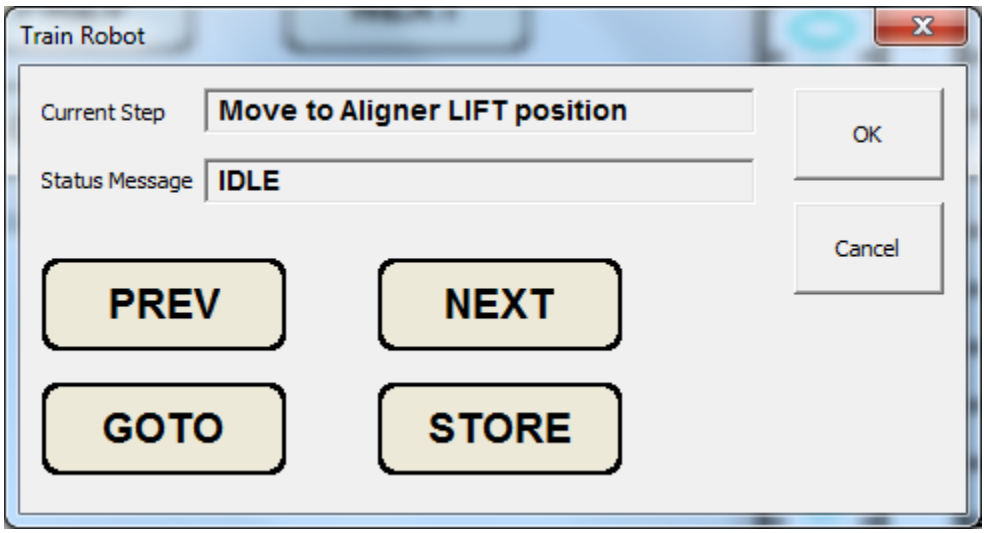


Much like the stage unload position, the aligner unload position is where the robot arms will end up after a wafer has been placed on the aligner. A safe distance of ~2 mm below the wafer should be used. All robot axis positions, such as, rotation, z height and arm travel are stored.

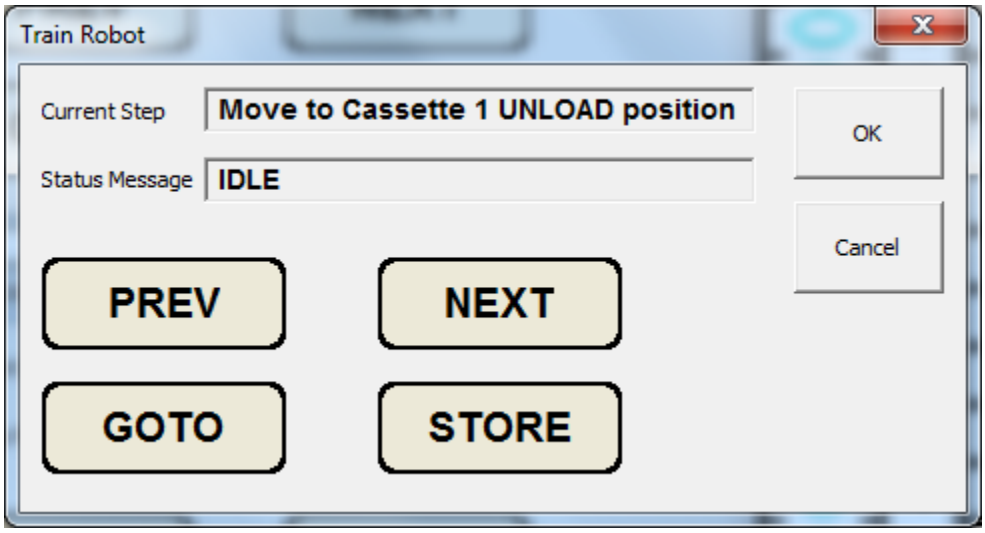


The aligner contact position is also the same. This is the position where the wafer and robot finger contact. Just the robot z height is stored.

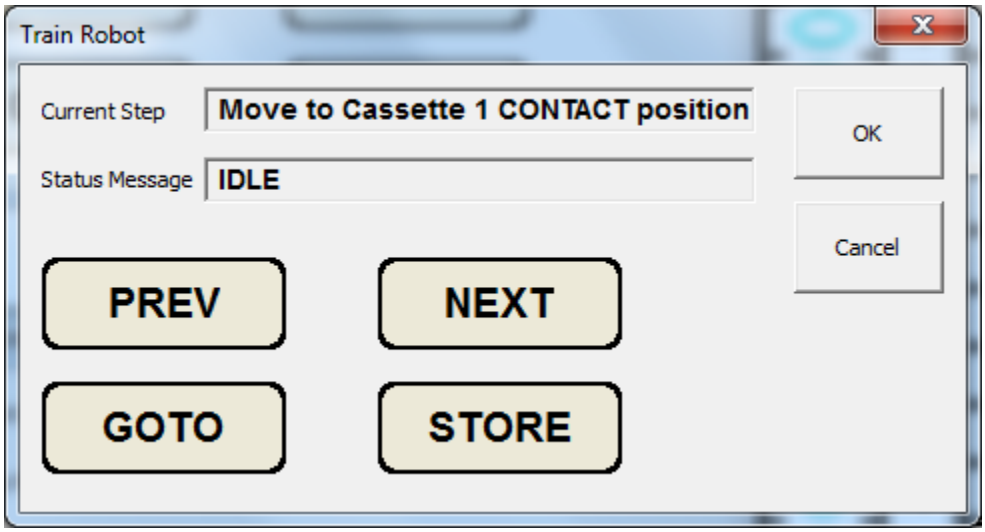
The next training box will direct you to move the robot arms to the aligner lift position. This is the position corresponds to the Z position of the finger, which is ~2mm above the top surface of the aligner chuck. Again, just the robot z height is stored.



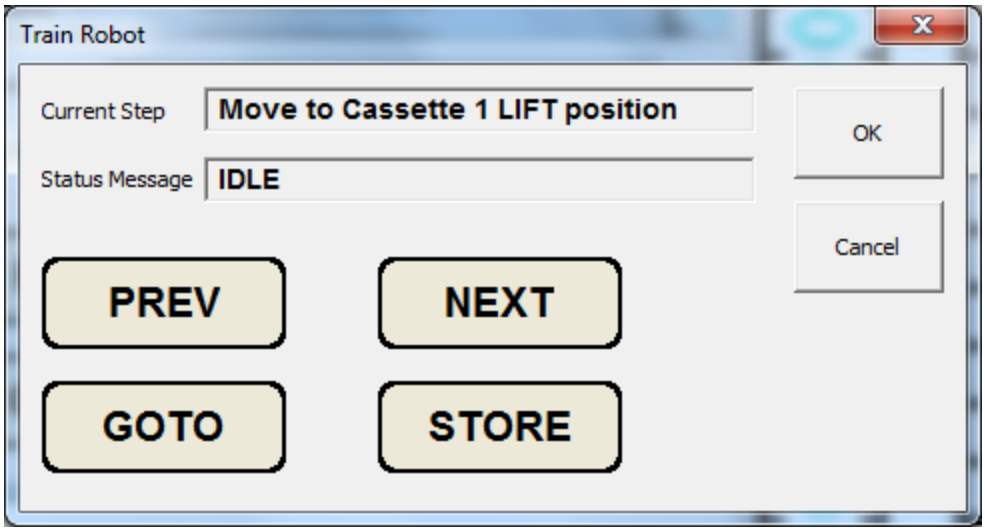
The cassette 1 unload position, is taught just under wafer (~2mm) located in the cassette in slot #1. All robot axis positions, such as, rotation, z height and arm travel are stored.



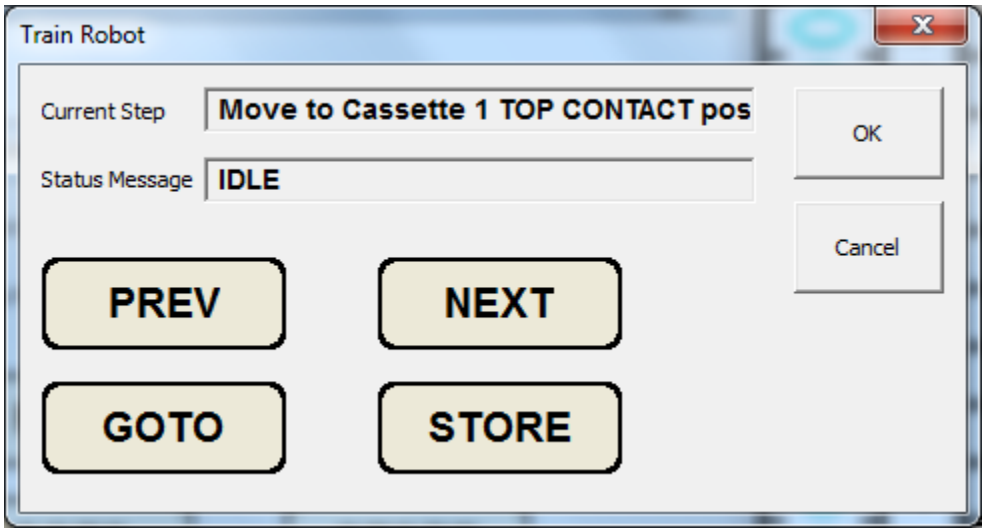
The cassette 1 contact position is the position where the wafer and robot finger meet. Just the robot z height is stored.



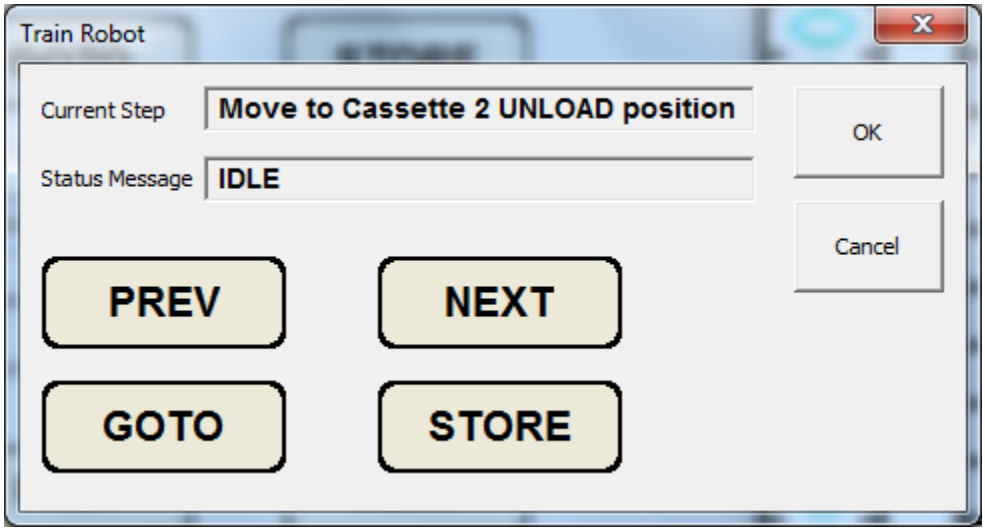
The cassette 1 lift position is where the wafer is lifted to the mid point of the cassette slot. Just the robot z height is stored.

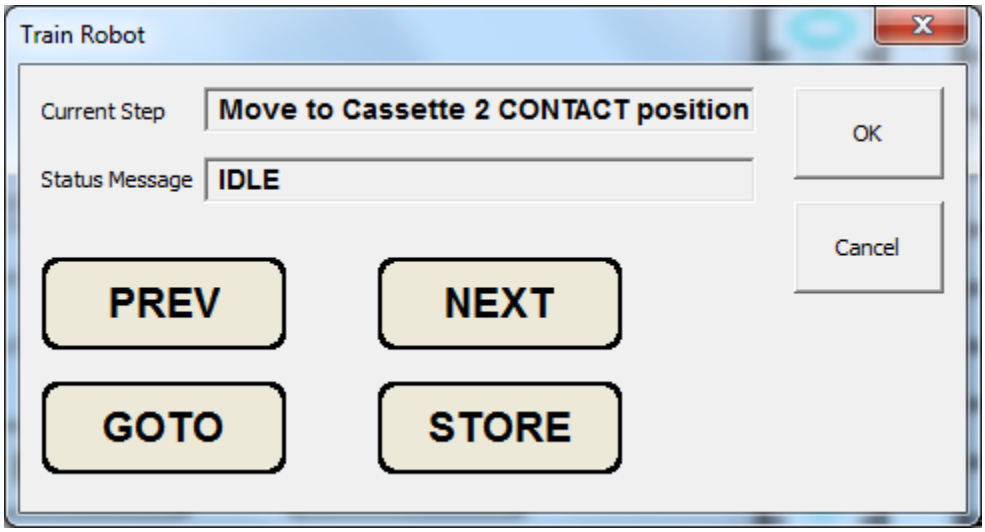


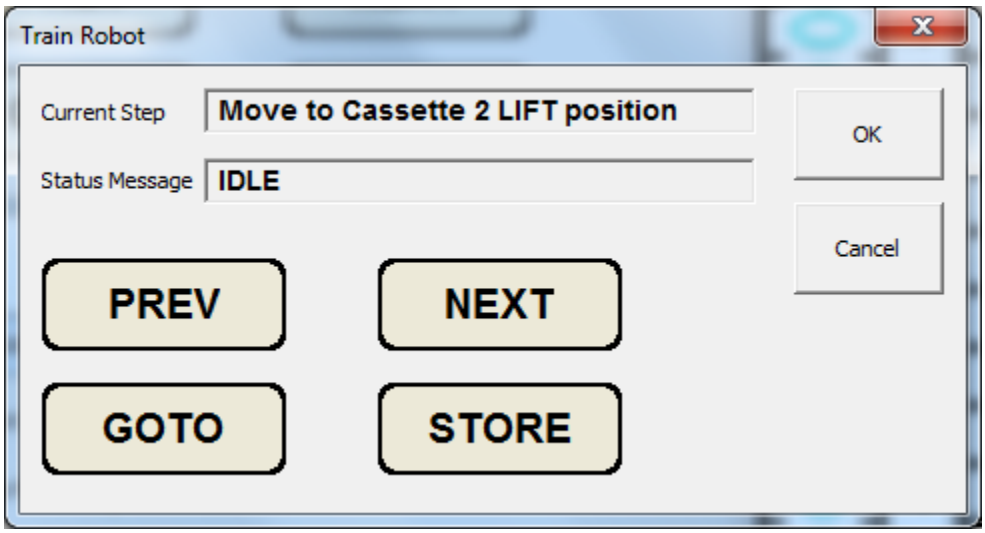
The last cassette 1 position is the top contact position. The robot should be driven to the 25th wafer and where the wafer and robot finger meet. Just the robot z height is stored.

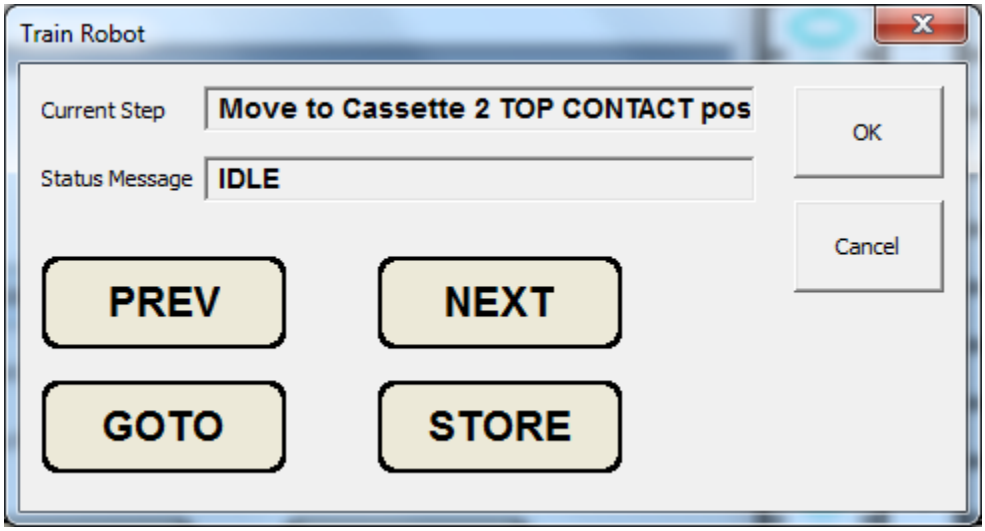


The same process for Cassette tower 1 is repeated for Cassette tower 2.





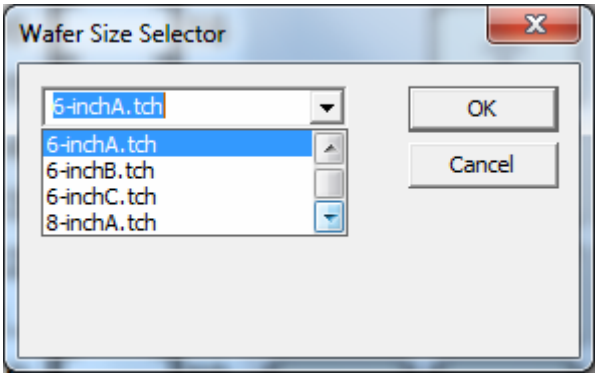




After all the position have successfully taught, the teach points will need to be saved into the appropriate teach files. The points should be saved using the main menu, then Wafer Size.

Each wafer size contains an A, B & C file type. Each file type can pertain to a particular wafer material type that may need to be handled differently. The A, B & C file type is primary used with an edge handling system

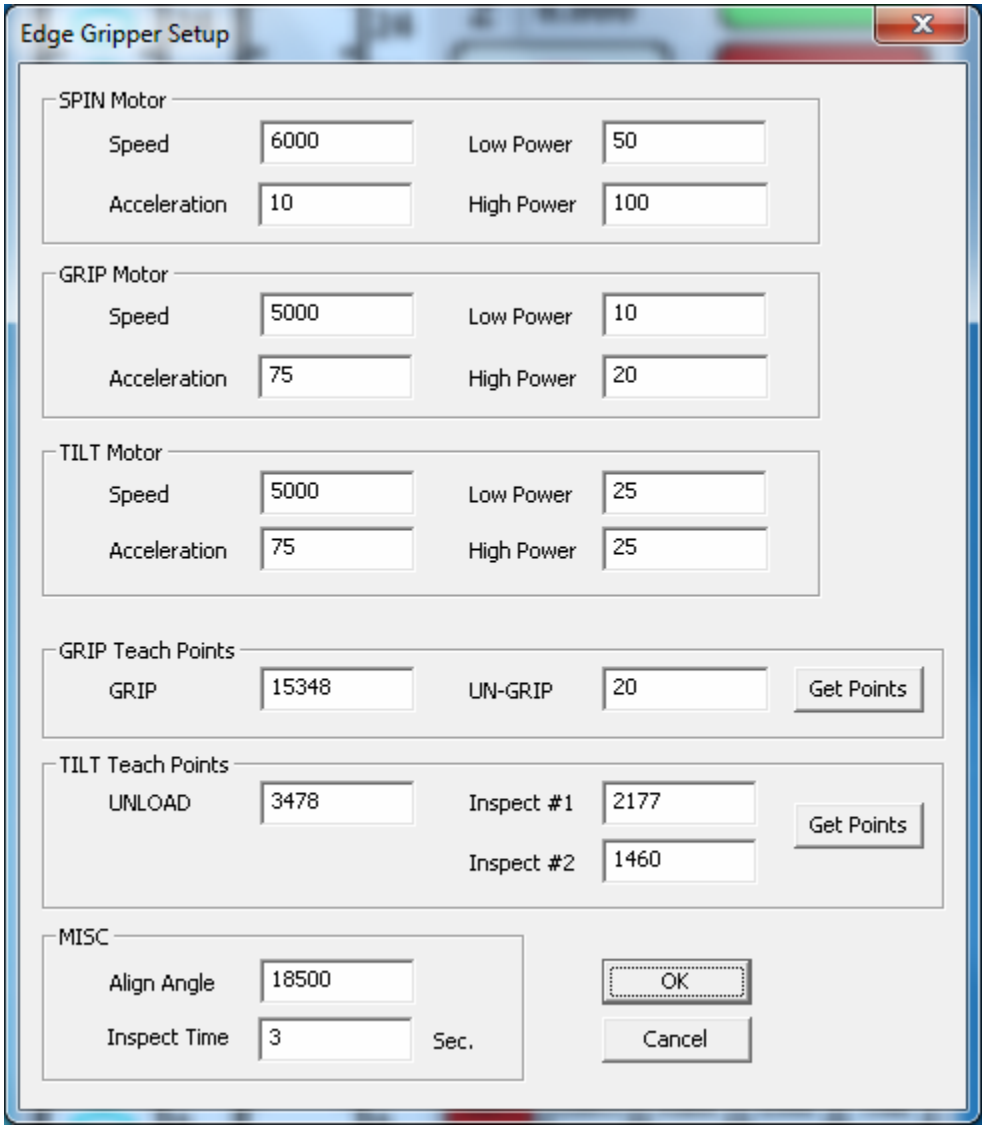
It is important for the system manager to keep track of the files and material types.



8.0 Edge Gripper

The edge gripping feature is used for wafers that can only be contact in a specific exclusion zone. The robot finger will move the wafer into the center of the edge tower. The wafer will get gripped, then spin for the flat/notch to be located. Once found, and then rotate to the flat/notch angle.

8.1 Edge Gripper Configuration



Spin Motor:
The spin motor are the (6) motors used to spin the wafer for alignment.

Grip Motor:
The grip motor is used grip and release the wafer.

Tilt Motor:
The tilt motor is used to tilt the wafer for macro front and back side inspection.

Grip Teach Points:
These values are taught positions where the wafer grip and un-gripped.

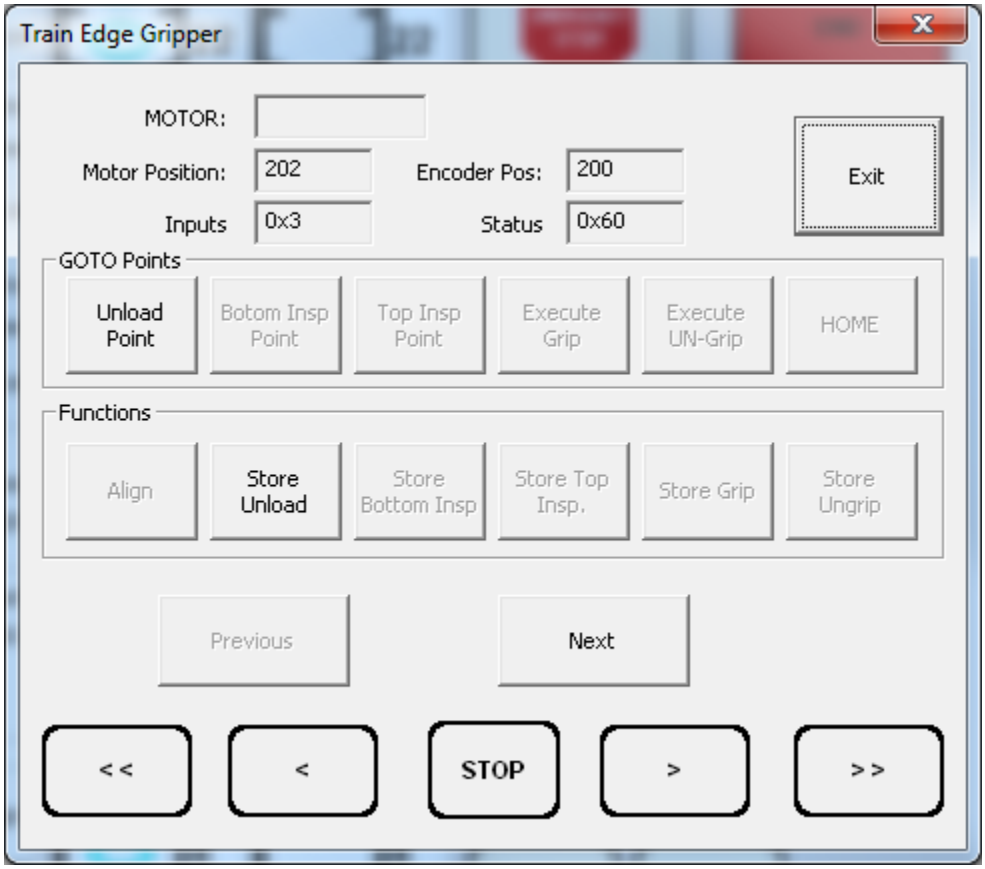
Tilt Teach Points:
These positions are taught as well. The unload position corresponds to position where the wafer will come in contact with the edge gripping wheels. Inspect #1 & Inspect #2 are the points that correspond to the inspection angles for the front and back side inspection.

Miscellaneous:
The align angle is the angle the flat/notch will be placed onto the stage. The macro inspection time can also be adjusted as desired.

8.2 Edge Gripper Training

Much like the system training, the edge gripper needs specific reference positions taught. The ***PREV*** and ***NEXT*** buttons will move you the various teach points. The ***STORE*** button will store the taught position into a corresponding teach file. If a point has already been taught, the ***GOTO*** buttons can be used to verify each position.

No teach positions may correspond to a limit position of any axis. This is deemed an error condition.



Align:
This function will spin the (6) motors and test laser for wafer flat/notch alignment. (There is no stored position for this function.)

Store Unload:
This position corresponds to the tilt angle of the tower. The angle should be set so the robot finger and wafer are on the same plane.

Store Bottom Insp:
This position corresponds to the tilt angle for the back side inspection.

Store Top Insp:
This position corresponds to the tilt angle for the front side inspection.

Store Bottom Insp:
This position corresponds to the tilt angle for the back side inspection.

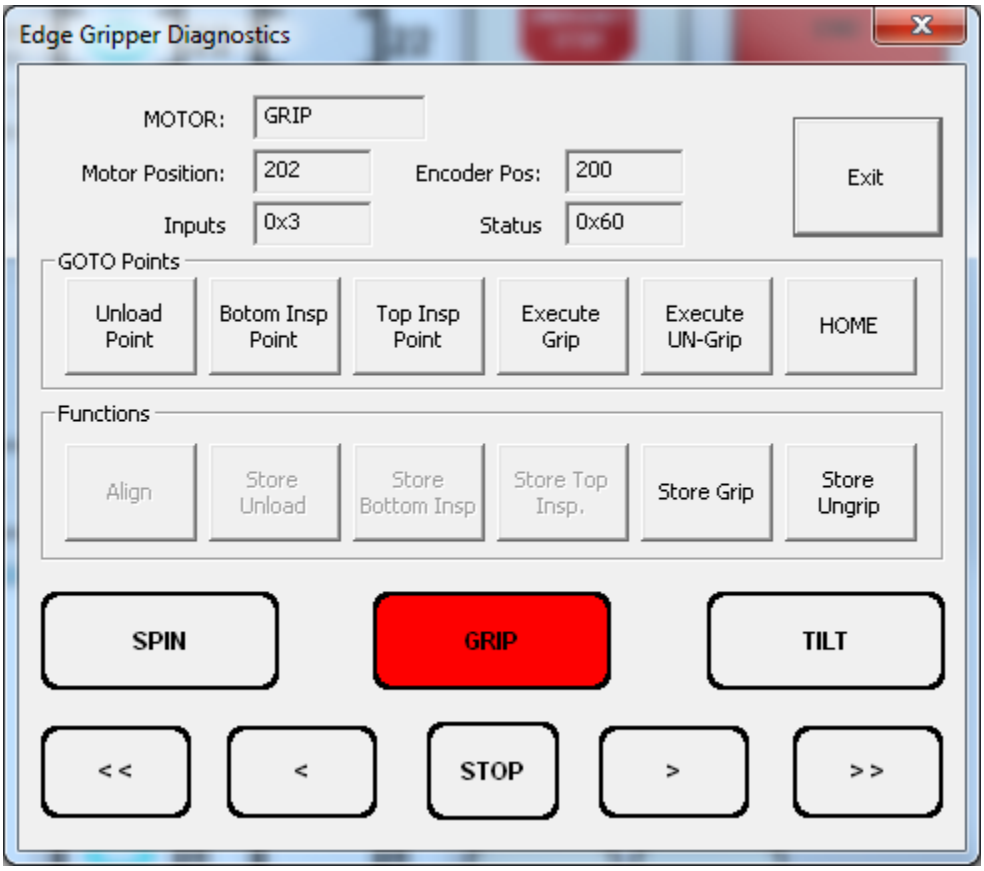
Store Grip:
This position corresponds to where the wafer is gripped with the (6) wheels. This is where the A, B & C file types should be used.

Store Ungrip:
This position corresponds to where the (6) wheels are fully open just off the limit switches.

<< < STOP > >>:
The arrows at the bottom of the menu are used to move the motors. The double << are for large moves, where as the < is used for fine movements. The ***STOP*** button will store any motors from moving.

8.3 Edge Gripper Diagnostics

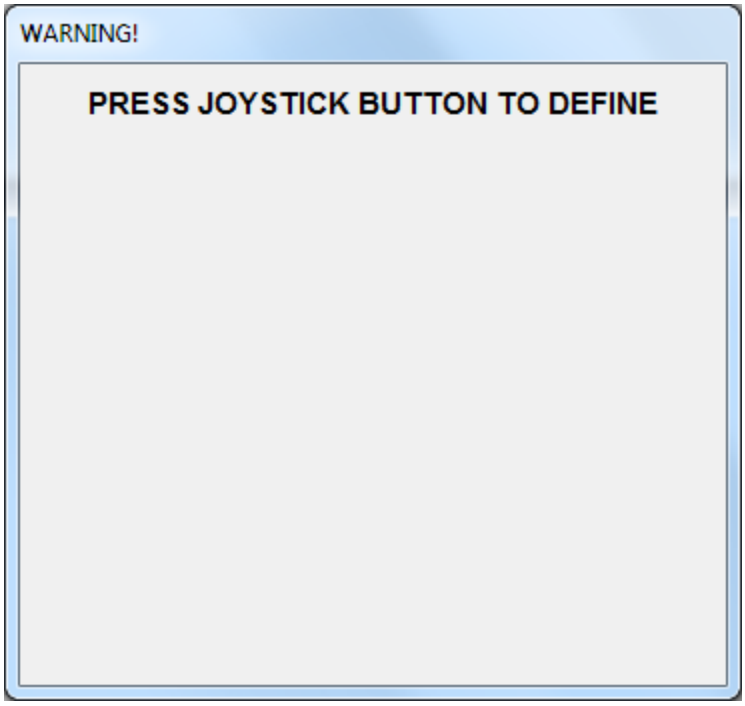
The Edge Gripper Diagnostic window is similar to the Train Edge Gripper window and can be used for system trouble shooting or aid in system setup.



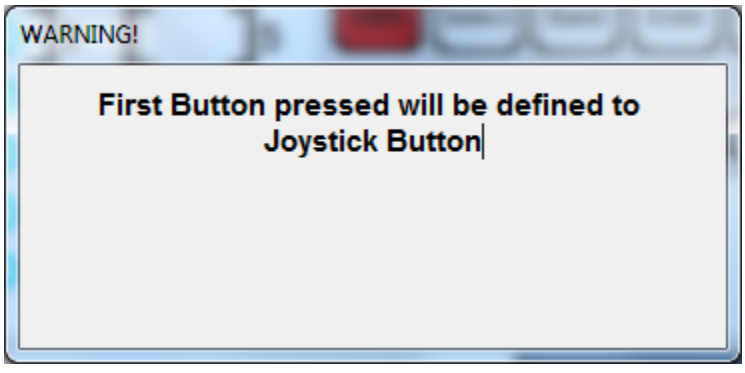
9.0 Joystick Button Programming

The joystick buttons can be programmed to act as quick keys for the operator. The joystick buttons can mimic any button from the main touch screen. Typically, the #2 joystick button is programmed as the ***START*** or ***ACCEPT*** and the #1 joystick button is programmed as the ***PAUSE***.

The first menu prompt will ask you to select the joystick button.



The next menu prompt will ask you to select the button from main touch screen.



10.0 Robot Diagnostics

In the event the system has a problem, the Robot Diagnostics window can be used for system trouble shooting or aid in system setup.

10.1 Position / Status Display

Each positional value and motor status for the robot and stage will be displayed in the first two columns. The CW and CCW will indicate if any of the axes have a limit switch activated. These marker dots correspond to the CW and CCW limit switch LED's on the front of each MAC controller module. The JOY buttons will enable or disable the joystick operation from any robot and stage axes.

If 99W042 and 99W043 universal cassette towers with wafer size detection is installed in the system the wafer cassette size will be displayed for both cassette tower #1 and tower #2.

10.2 Module Info

All modules present in the controller will be displayed in the Module Info window.

10.3 Vacuum /Sense Control

The vacuum/sense panel can be used to turn vacuum on and off for every station in the system. Clicking the button will turn vacuum on, the vacuum sensor will then display if a wafer is present or not.

If 99W040 and 99W041 universal cassette towers are installed in the system the cassette 1, 2 or 3 switches will be activated. Cassette 1 corresponds to Cassette Tower 1, the marker dots indicates a cassette can be present in any of the 3" – 8" cassette positions.

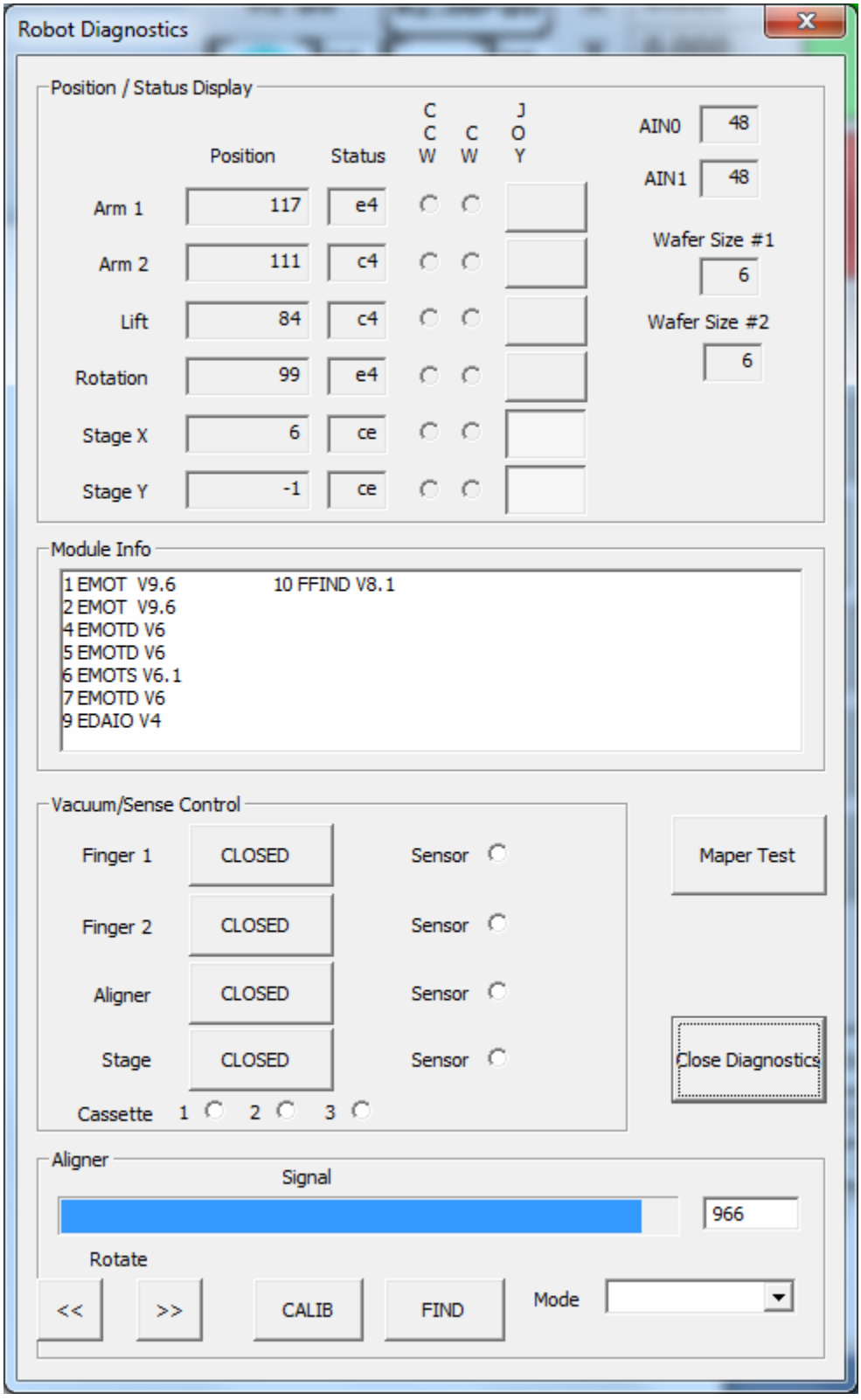
10.4 Aligner

The aligner signal will display the signal strength of the laser used to detect the flat or notch on a wafer. An unobstructed laser will display a high value. The scale will range from 0 to 1000.

The two rotate buttons can be used to rotate the aligner motor in either direction.

The ***CALIB*** button is used to calibrate the laser.

The ***FIND*** button can be used to find the notch or flat of a wafer. The Mode pull down menu is used to select the flat or notch.


Robot Diagnostics
Position / Status Display
Position
Status
CCW
CW
JOY
Arm 1
117
e4
Arm 2
111
c4
Lift
84
c4
Rotation
99
e4
Stage X
6
ce
Stage Y
-1
ce
AIN0
48
AIN1
48
Wafer Size #1
6
Wafer Size #2
6
Module Info
1 EMOT V9.6
2 EMOT V9.6
4 EMOTD V6
5 EMOTD V6
6 EMOTS V6.1
7 EMOTD V6
9 EDAIO V4
10 FFIND V8.1
Vacuum/Sense Control
Finger 1
CLOSED
Sensor
Finger 2
CLOSED
Sensor
Aligner
CLOSED
Sensor
Stage
CLOSED
Sensor
Cassette
1
2
3
Maper Test
Close Diagnostics
Aligner
Signal
966
Rotate
<<
>>
CALIB
FIND
Mode

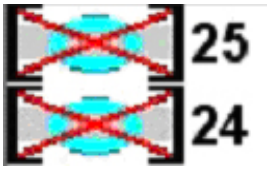
10.5 Mapper Testing

Clicking on the ***Mapper Test*** button will open up the following window. To Map a cassette tower select MAP CASSETTE 1, 2 or 3. The robot will used the cassette teach positions to rotate the robot to the correct tower and scan the cassette.

The slot locations will display the following:

Wafer Present: 

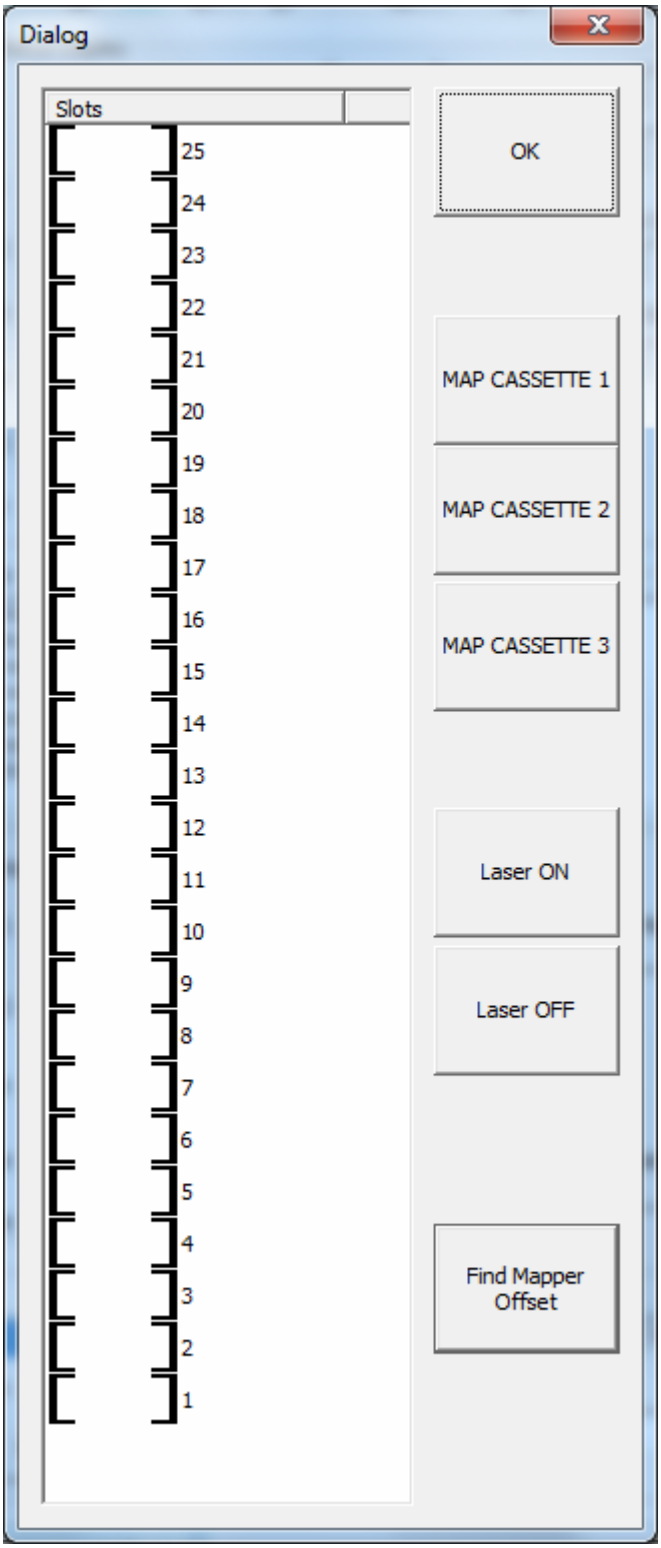
Empty Slot: 

Cross Slot: 

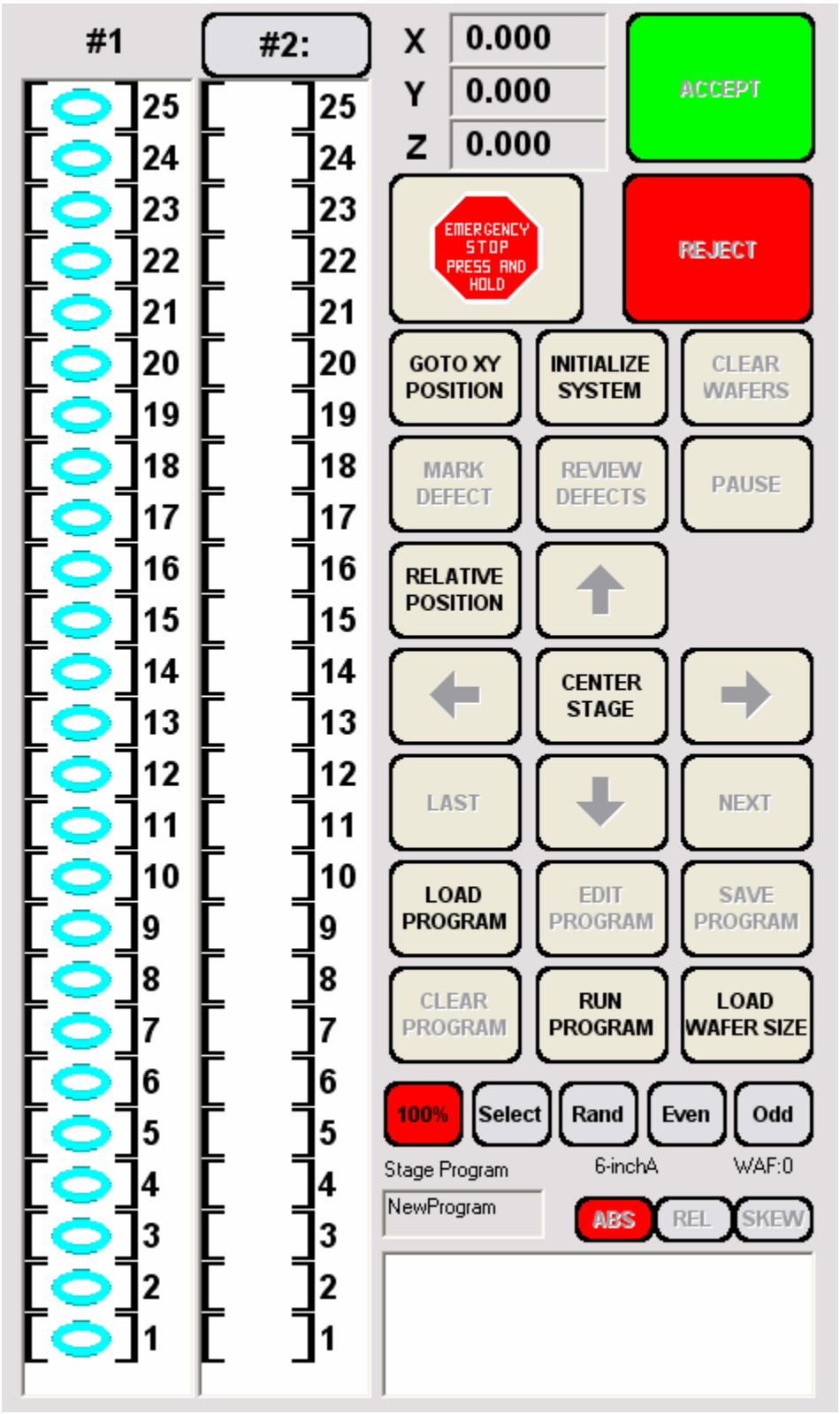
The ***Laser ON*** and ***OFF*** buttons can be used to turn the mapper laser on and off.

The ***Find Mapper Offset*** button is used to find the value from the first wafer taught contact position and where the mapper laser beam is physically located. This value is then stored in the Robot Configuration, Mapper Parameters, Offset field.

System must be properly taught with reference positions to use mapper testing functions.



11.0 Main Screen Layout

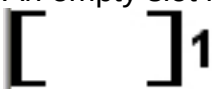


11.1 Button Definitions

#1:
The #1 cassette status column indicates the input wafer cassette station. Typically, this is the first cassette tower closest to the operator. The five wafer selection buttons can be used to select the wafers.

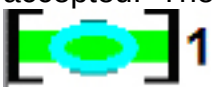
The blue circle indicates a particular wafer being selected.

An empty slot indicates not to select that particular wafer slot.

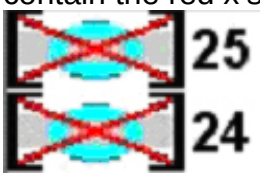


A blue circle with a blue bar indicates a wafer in process.

A blue circle with a green bar indicates a wafer has been processed and has been accepted. The wafer has been placed back into the input cassette.



Red x's indicates cross slotted wafers. Both slots where the cross slot has occurred will contain the red x's.

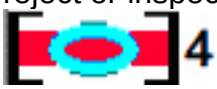


This function can only be used when a wafer mapper is installed in the system.

#2:
The #2 cassette status column indicates the reject or inspect wafer cassette station.

Clicking the button will allow you to toggle through the available positions, such as cassette tower 1, 2 or 3.

A blue circle with red bar indicates a wafer has been rejected and been placed into the reject or inspection cassette.



Microscope Coordinate System

X: This shows stage X position.
Y: This shows stage Y position.
Z: This shows microscope Z position.

A z-axis motor needs to be installed.

START or ACCEPT:
This button starts the wafer processing. After the wafer has been inspected, the ACCEPT will place the wafer back into the #1 cassette station.

STOP or REJECT:
This button will reject the wafer. The wafer will be placed into defined reject cassette station.

EMERGENCY STOP:
This button requires the user to press and hold the emergency button for 1 second before the system is halted. This is done, so the button isn't inadvertently clicked. A manual unload of any wafer in the system will be required.

GOTO XY POSITION:
This button allows the operator to enter a coordinate for stage position. The current coordinate will be displayed as the default entry value. The coordinates are either REL, ABS or SKEW depending upon the current position display mode.

INITIALIZE SYSTEM:
The ***INITIALIZE SYSTEM*** button will reset the system after a failure has occurred. It will only be displayed after the ***EMERGENCY STOP*** button has been activated, after an error and after the ***STOP*** button has been clicked.

CLEAR WAFERS:
This button will stop the current program and end an inspection cycle. What ever process is currently in process will be completed. The wafers will then be return to the input cassette.

MARK DEFECT:
During a stage program, specific points can be marked and saved for later review.

REVIEW DEFECTS:
After a stage program has been completed, the ***REVIEW*** button can be used to review any marked points made by the ***MARK DEFECT*** button.

PAUSE:
The ***PAUSE*** button will immediately halt the stage if it is in motion and pause the current stage program. To continue with the stage program, re-hit the ***PAUSE*** button.

RELATIVE POSITION:
This button will switch between the absolute and relative positional display. When entering the relative mode, the microscope coordinate display will show the position relative to the point at which the button was pressed. At the bottom of the screen the ABS and REL indicators will show which mode the position display is in. Clicking the button again will switch the mode back to ABS.

UP/DOWN ARROWS:
In a stage program, the stage will move back and forward in the Y-axis a single increment distance.

LEFT/RIGHT ARROWS:
Similar to the ***UP/DOWN*** buttons, the ***LEFT/RIGHT*** buttons will move the stage a single increment either left or right in the X-axis.

CENTER STAGE:
The ***CENTER STAGE*** button will move to the stage 0,0 position. The coordinates are to the center for the X and Y travel of the stage.

NEXT:
The ***NEXT*** button will move the stage to the next programmed position. The sequence will follow the exact sequence of the normal program.

LAST:
Similar to the ***NEXT*** button, the ***LAST*** button will move the stage to the previous programmed position.

LOAD PROGRAM:
The ***LOAD PROGRAM*** button will load a stage program recipe.

EDIT PROGRAM:
The ***EDIT PROGRAM*** button allows the user or administrator to edit a currently loaded stage program recipe.

SAVE PROGRAM:
The ***SAVE PROGRAM*** button allows the user or administrator to save stage program recipe.

CLEAR PROGRAM:
The ***CLEAR PROGRAM*** button clears any currently loaded stage program recipe from memory. The following window will be displayed.

RUN PROGRAM:
The ***RUN PROGRAM*** button will allow a stage program recipe to be executed from the main screen. This will also allow the recipe to be re-run after it has been completed.

LOAD WAFER SIZE:
The ***RUN PROGRAM*** button will allow a stage program recipe to be executed from the main screen. This will also allow the recipe to be re-run after it has been completed.

Wafer Selection

100%:
All wafers will be selected and inspected.

Select:
Using the touch screen or mouse, the user can select and inspect any wafers.

Rand:
The wafers will be selected randomly for inspection,

Even:
All even wafers will be selected for inspection.

Odd:
All odd wafers will be selected for inspection.

STAGE PROGRAM:
This window will show the currently loaded stage program recipe.

LOADED TEACH FILE:
Next to the stage program window is the loaded teach file. This displays the currently loaded wafer size and type.

WAF:
The WAF displays a running total of wafer transfers.

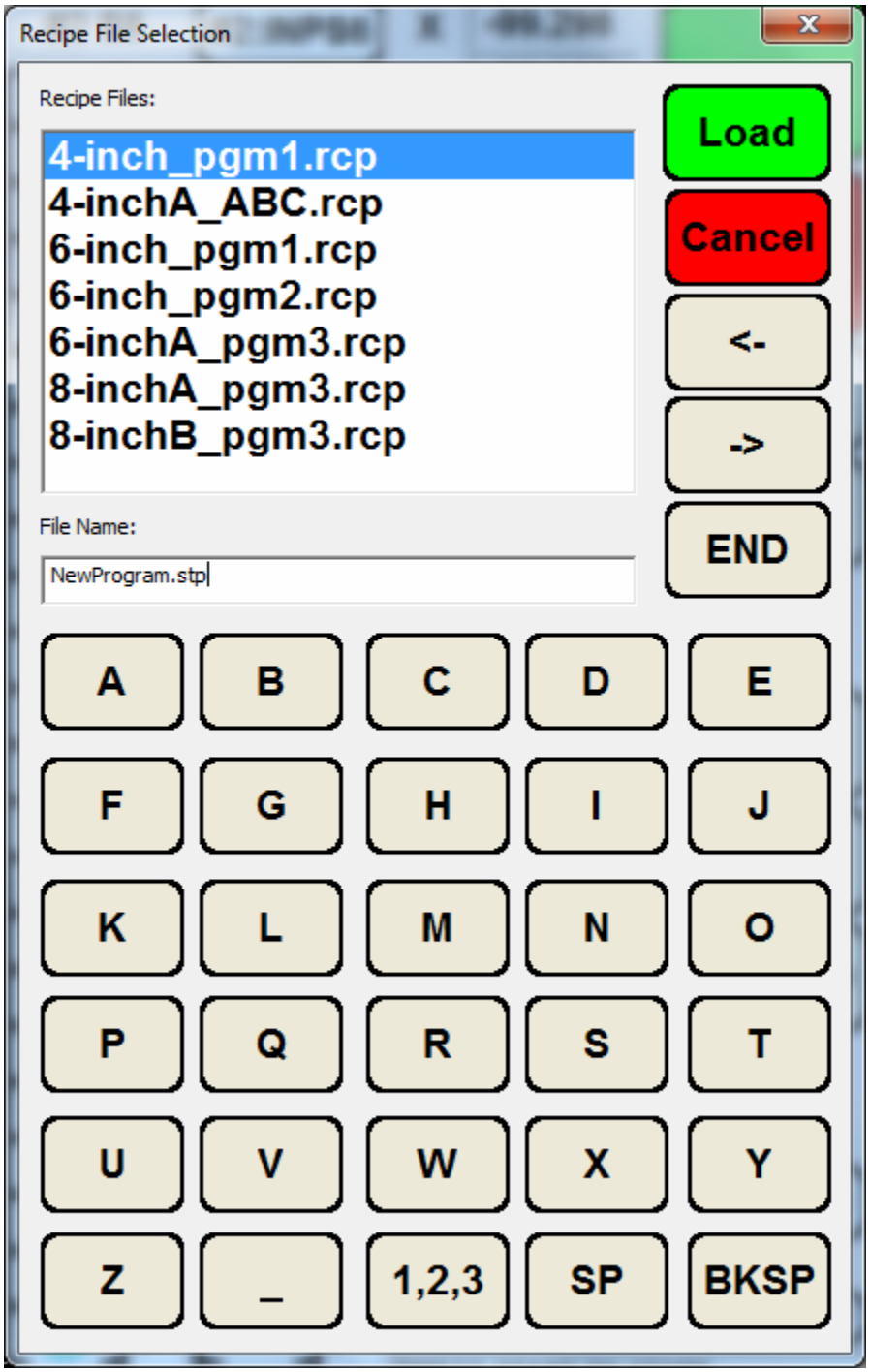
ABS:
The ***ABS*** button will display the stage coordinate system as an absolute value. The stage center will be 0,0 with four quadrants. The microscope coordinate position display will change to reflect the respective display mode. A red button indicates the current coordinate system in use.

REL:
The ***REL*** button shows the coordinate system from any particular point. When pressed the position display will be set 0,0.

SKEW:
The system is in SKEW mode, all coordinates are in specimen coordinates. Care should be taken that no points are programmed in normal mode if the deskew feature is to be used.

12.0 Loading a Stage Program Recipe

From the main screen, click the ***LOAD PROGRAM*** button. This will automatically clear any previous recipe file in memory.



13.0 Creating a Stage Program Recipe

The recipe programming provides a flexible and friendly means for programming simple or complex stage patterns. From the main screen, click the ***CLEAR PROGRAM*** button to clear any existing program from memory. Next, click the ***EDIT PROGRAM*** button. This will open up the main stage program recipe window.

Control and setup of the stage recipe is achieved by using a combination of menus and buttons.

The joystick will be enabled and allow the creator to drive the stage to specific points. After the desired point is reach, the ***STORE*** button should be clicked to save that location.

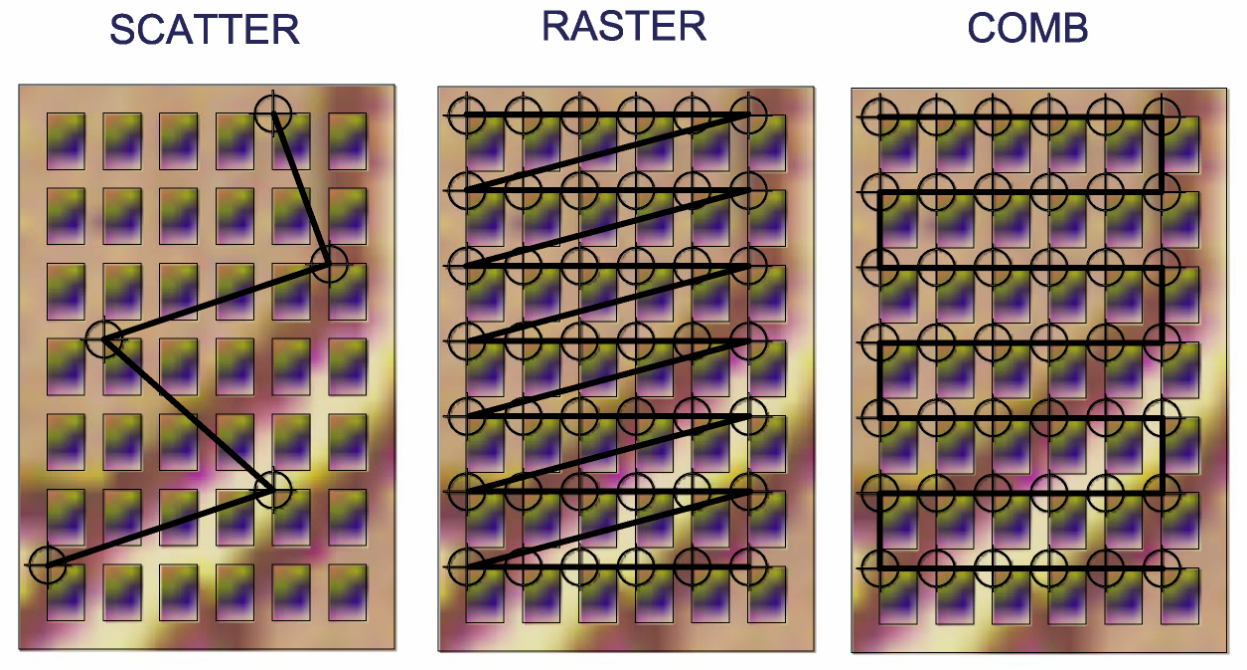
If the text has been modified directly in the Command Line, the ***ENTER*** button needs to be clicked for the line to be executed.

13.1 Teach Command Window

The Teach Command window at the bottom of the main screen will display simple step by step instructions.

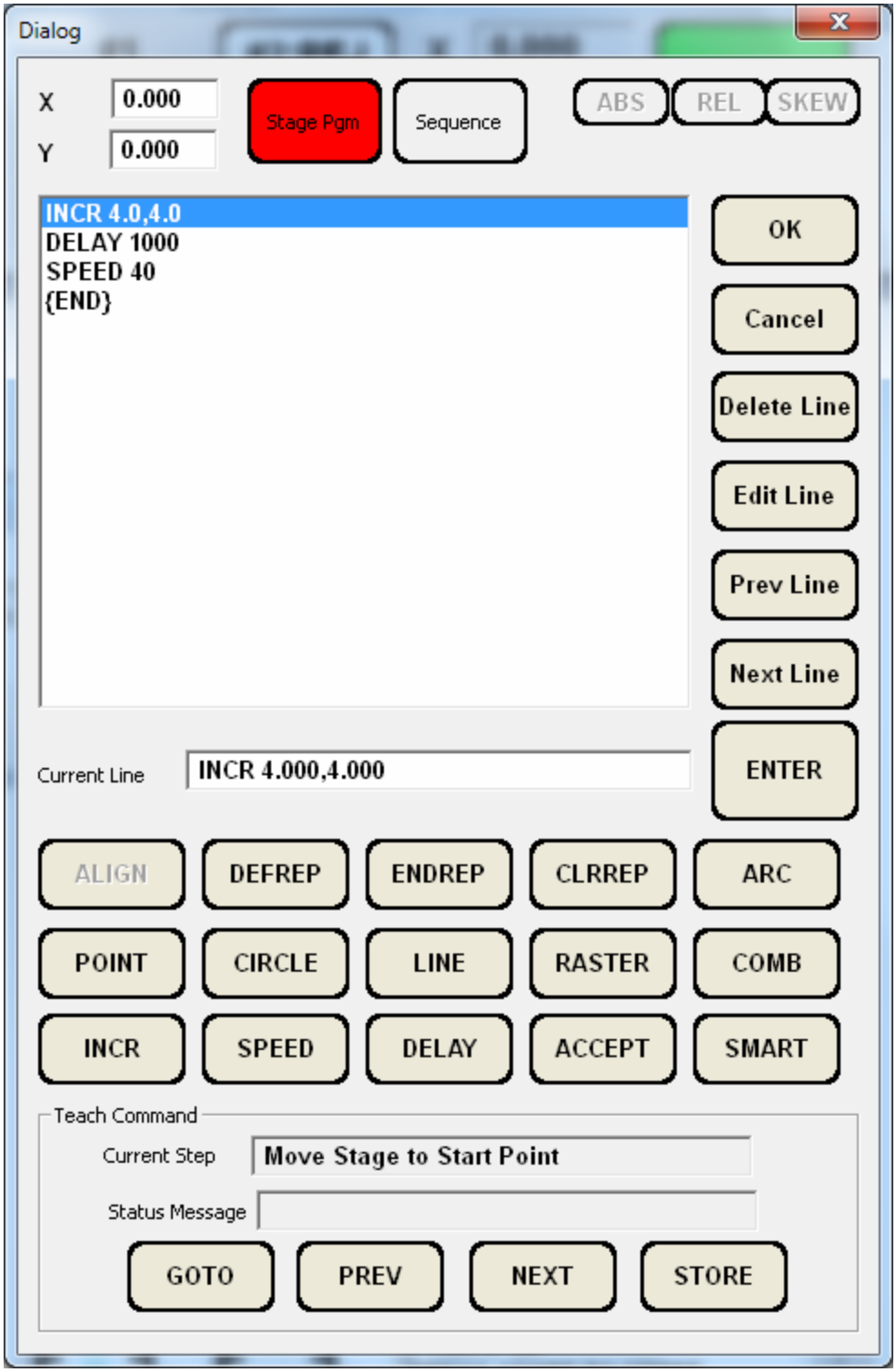
13.2 Scanning Modes

The program level is defined by either a SCATTER, RASTER, or COMB POINT. The RASTER and COMB modes are similar in that they both will move the stage to cover a rectangular area. They differ only in the sequence of the scanning. The SCATTERED POINT mode allows the user to set up individual points for scanning. The program will sequentially move through this point program.



The repeat pattern is a sub-program mode that is executed at each program position. The repeat patterns have the same modes as the program level except

that the positions must be stored relative to a program position. In a program execution the repeat pattern is executed in its entirety before continuing to the next program point.



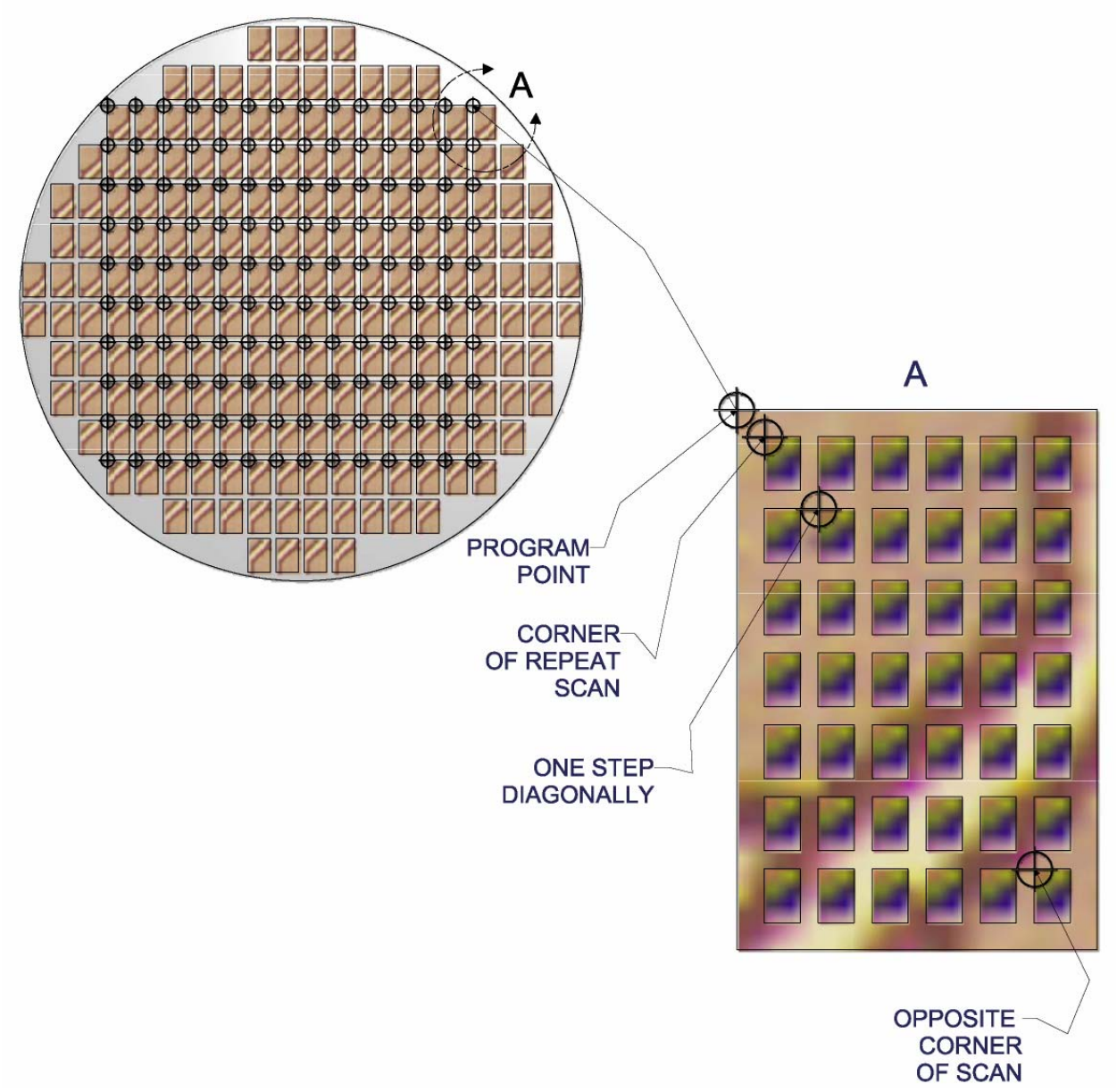
13.3 Button Definitions (Stage Pgm)

X and Y:
This displays the stage coordinates in the ABS or Absolute mode.

Stage Pgm:
This displays the stage recipe. All stage programs will be written in this window.

Sequence Pgm:
This displays the system recipe. Various functions can be programmed into a recipe which are different then the standard system configuration.

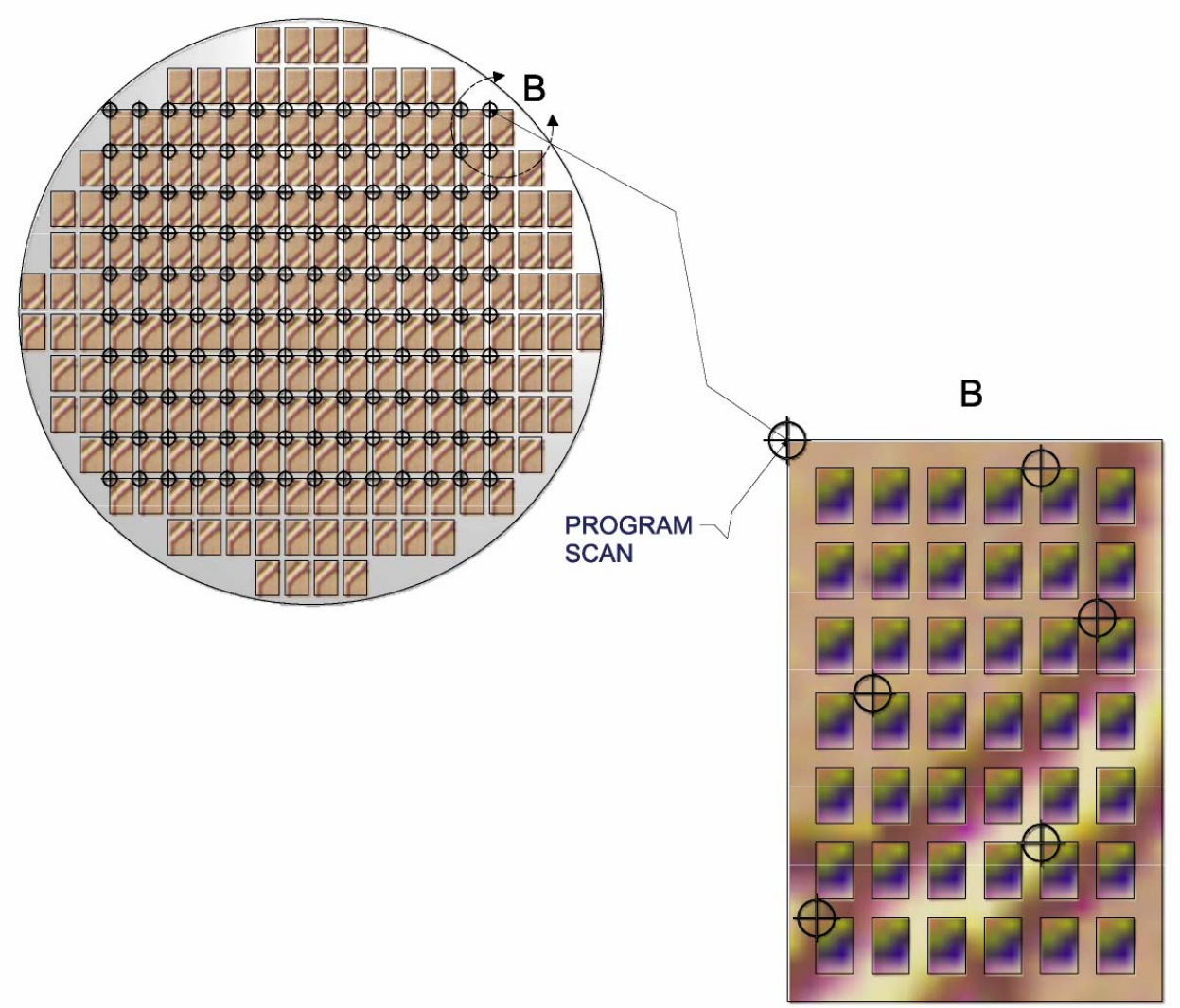
DEFREP or Define Repeat Pattern:
This function can be used to repeat scanning patterns at multiple points. The DEFREP should be inserted in the recipe file before it is to be use.



Example:

DEFREP {X,Y}
DEFREP -90.000,90.000
DELAY 3000
RASTER 1.000,-1.000,5.000,-5.000,10.000,-15.000,.500
ENDREP
RASTER -90.000,90.000,-80.000,80.000,80.000,-80.000,2.000

This program will perform a raster scan inside a raster scan. The internal scan will have relative points to the program scan point. Between each internal scan there will be a 3 second delay.



Example:

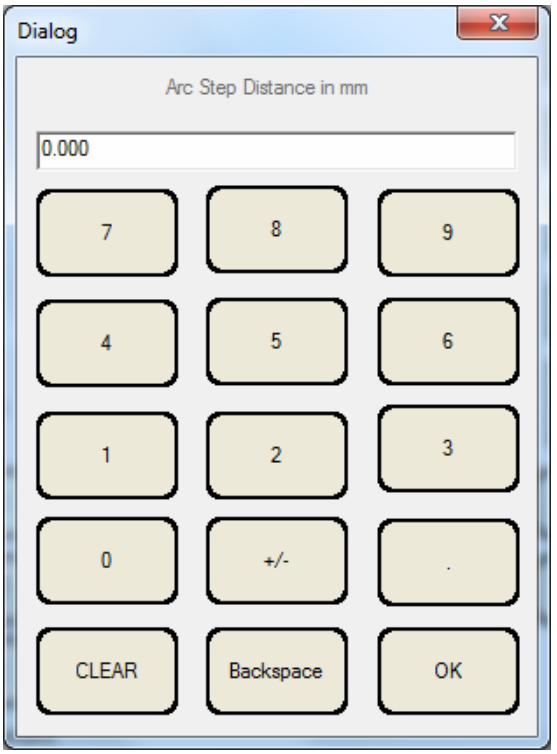
DEFREP {X,Y}
DEFREP -90.000,90.000
DELAY 3000
POINT 8.000,-1.000
POINT 9.000,-3.000
POINT 2.000,-3.000
ENDREP
RASTER -90.000,90.000,-80.000,80.000,80.000, -80.000,2.000

This program will perform a scatter point scan inside a raster scan. Between each internal scatter point there will be a 3 second delay.

ENDREP or End Repeat Pattern:
This function will end the repeat pattern.

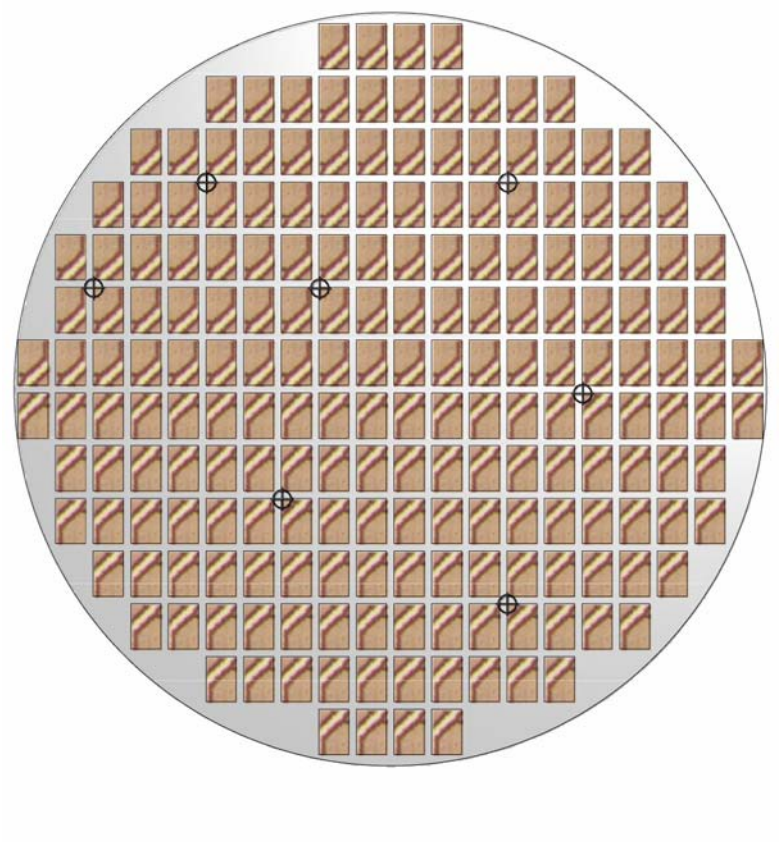
CLRREP or Clear Repeat Pattern:
This function will clear any repeat pattern in the sequence.

ARC:
This function will create an arc scan. Three points will be stored with this command. Starting point, ending point and any mid point on the arc, the ***STORE*** button should used after each point has been reached. The final step is to enter the Arc Step distance in mm.



Example:
ARC {Xs,Ys},{Xe,Ye},{X_{3rd},Y_{3rd}},{Distance}
ARC -100.000,0.000,0.000,100.000,70.700,70.700,2.000
The stage will move every 2mm on a 200mm arc path from the start point to the end point.

POINT:
This function will create and store an XY point.



Example:
POINT{X,Y}
POINT 56.230,-45.231
The stage will move that specific coordinate.

CIRCLE:
Much like the ARC command, this function will create a circle scan. Three points will be stored with this command. Starting point, ending point and any 3rd point, the STORE button should used after each point has been reached. The final step is to enter the Circle Step distance in mm. The circle command will always start at the 12:00 o'clock position.

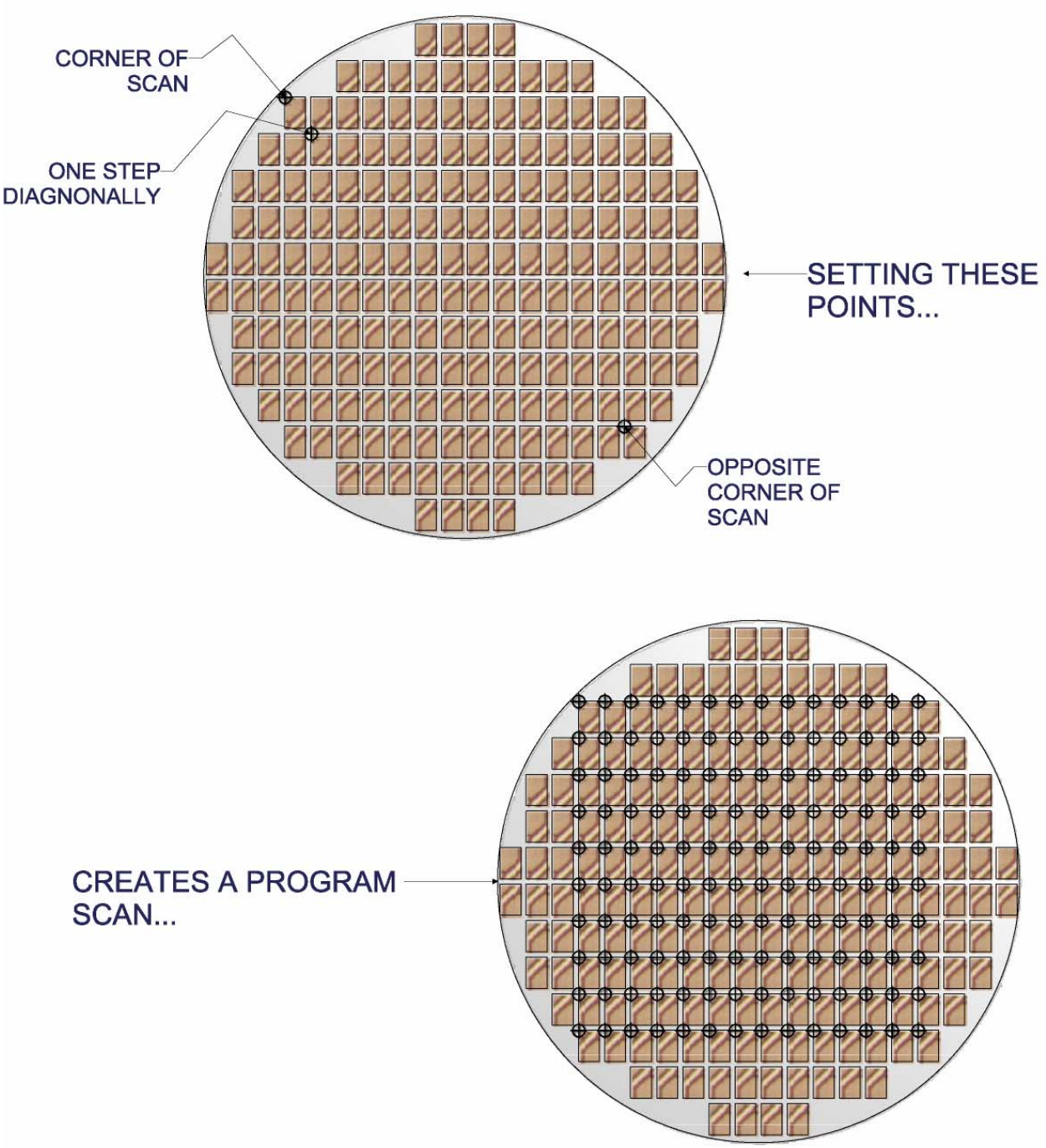
Example:
CIRCLE {Xs,Ys},{Xe,Ye},{X_{3rd},Y_{3rd}},{Distance}
CIRCLE -100.000,0.000,100.000,0.000,100.000,0.000,2.000
The stage will move every 2mm on a 200mm circle path from the start point to the end point.

LINE:
This function will create a line scan. Two points will be stored with this command, starting and ending points. The final step is to enter the line step distance in mm.

Example:
LINE {Xs,Ys},{Xe,Ye},{Distance}
LINE -40.000,20.000,40.000,20.000,1.000
The stage will move every 1mm from the start point to the end point.

RASTER:
This function will create a raster scan. The three step process involves teaching the corner of the rectangular area, the diagonal corner of the next rectangle, and the opposite corner of the scan area.

Example:
RASTER {Xs,Ys},{Xi,Yi},{Xe,Ye}
RASTER -70.000,70.000,-60.000,60.000,60.000,-60.000
The stage will move to every rectangle pattern in a left to right movement always starting from the left side.

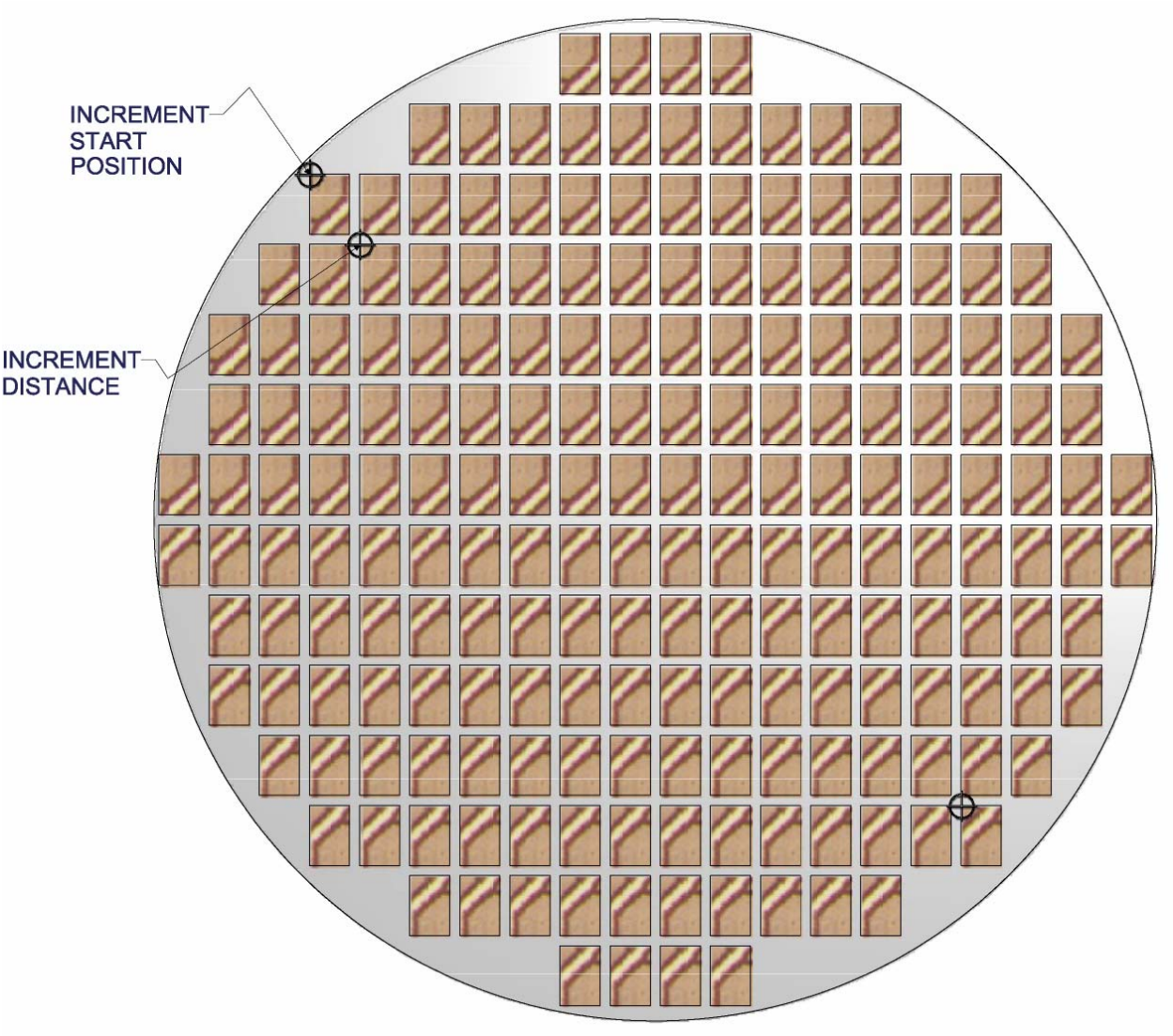


COMB:
The COMB scan function is exactly identical to the RASTER scan, but with scanning direction.

Example:
COMB {Xs,Ys},{Xi,Yi},{Xe,Ye}
COMB -70.000,70.000,-60.000,60.000,60.000,-60.000
The stage will move to every rectangle pattern starting from a left to right movement, then right to left and so on till the end of the scan area

INC or INCREMENT:

This function will create increment scan. Two diagonal points will be stored with this command, starting at base point and increment distance point. The STORE button should used after point has been reached.



Example:
INC {Distance}
INC 1
The incremental distance will equate to a 1mm move.

SPEED:
The stage speed can be changed at any point during the scanning process by inserting a new speed command.

Example:
SPEED {Speed}
SPEED 40
Speed 40 will set the stage speed to 40 mm/sec.

DELAY:
Delays can also be added between each point to give the operator enough time to view the point.

Example:
DELAY {Time}
DELAY 1000
Delay 1000 would equate to 1 sec or 1000ms.

ACCEPT:
Adding an accept function into the stage recipe will allow the wafer to be accepted without having the operator to click the ***ACCEPT*** button.

Example:
ACCEPT {Time}
ACCEPT 5
This command will wait 5 seconds before the wafer is auto accepted. In those 5 seconds, the operator can hit the reject button.

SMART:
The smart command allows marked defects to be compiled to an internal list for an entire cassette. As defects are marked, they will be added to the list. If the smart command is added to the beginning of the stage recipe, all the marked defects will be executed first. The smart command has a tolerance, so defects marked within the tolerance will be ignored.

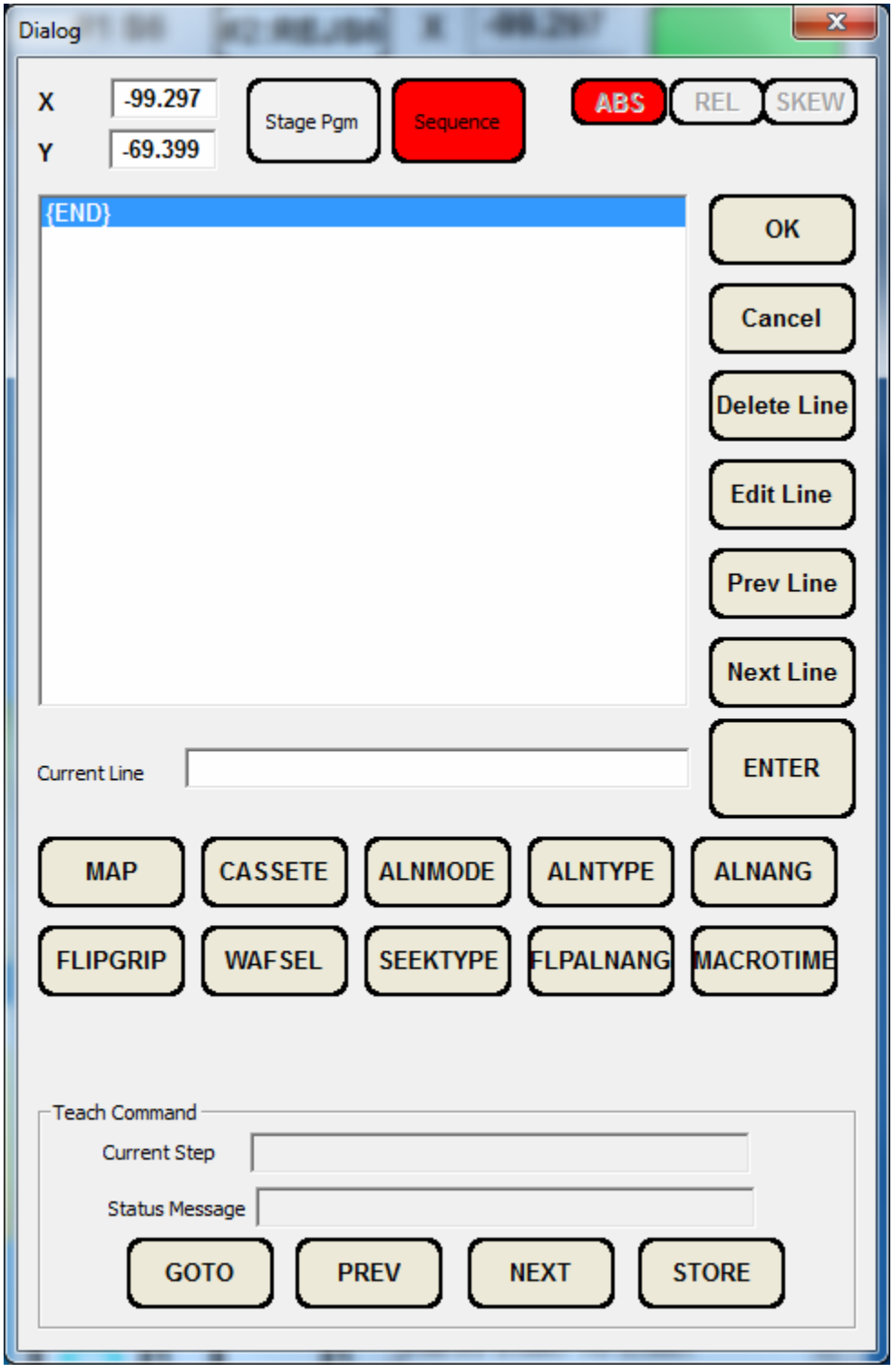
Example:
SMART {Tolerance}
SMART 1
The stage will drive to each marked defect within a 1mm tolerance.

Common Recipe

```
INC 4.000,4.000
DELAY 1000
SPEED 40
DEFREP -90.000,90.000
DELAY 3000
POINT 8.000,-1.000
POINT 9.000,-3.000
POINT 2.000,-3.000
ENDREP
RASTER -90.000,90.000,-80.000,80.000,80.000, -80.000,2.000
{END}
```

This program will perform a raster scan of the defined area on a wafer. At each raster program point, (3) scatter points will be looked at. There will be a 3 seconds delay between each scatter point and a 1 second delay between each raster program point.

13.4 Button Definitions (Sequence Pgm)



MAP:
Cassette mapping can be altered by the following options:

0 – None
1 – Single Scan
2 – Double Scan

Example:
MAP {Option}
MAP 0
Mapping will be disabled for this recipe.

CASSETE:
The cassette tower definition can be change from that standard configuration per a stage recipe.

Tower # – Input Cassette
Tower # – Accept Cassette
Tower # – Reject Cassette
Tower # – Rework Cassette

Example:
CASSETE {Input Tower #},{Accept Tower #},{Reject Tower #},{Rework Tower #}
CASSETE 2,2,1,1
The cassette tower definitions have been changed for this recipe, so cassette tower 2 is now the input and accept tower and cassette tower 1 is defined as the reject and rework.

ALMODE or ALIGNER MODE:
The aligner mode can be altered by the following options:

0 – None
1 – Align & Center
2 – Align

Example:
ALMODE {Option}
ALMODE 2
The wafer will be aligned to the flat or notch, but the centering is disabled for the recipe.

ALTYPE or ALIGN TYPE:
The align type can be altered by the following options:

0 – Flat
1 – Notch

Example:
ALTYPE {Option}
ALTYPE 1
The wafer will now align to a notch.

ALNANG or ALIGN ANGLE:
The align angle can be changed from normal orientation.

Example:
ALNANG {Angle}
ALNANG 37500
If the wafer is normally placed with the flat/notch facing the 6 O'clock position, this option will rotate the flat/notch to the 12 O'clock position.

FLIPGRIP:
Various options can be altered with respect to the operation of the edge gripping tower.

0 – Align
1 – Point 1
2 – Point 2
3 – Point 1 & 2

Example:
FLIPGRIP {Option}
FLIPGRIP 2
The edge gripping tower inspection functions deviate from the original configuration. Here only Point 2 will be activated.

WAFSEL or WAFER SELECT:
Selection wafers can also be programmed into the stage recipe. The following options are available:

0 – All
1 – Select * The individual wafer slots should be included in the syntax.
2 – Even
3 – Odd
4 – Random

Example:
WAFSEL {Option}
WAFSEL 4
The wafers will randomly select from the input cassette.
WAFSEL 1,1,5,8,10,12,13,14,20,25
Wafers 1, 5, 8, 10, 12, 13, 14, 20, 15 will be selected from the input cassette.

SEEKTYPE:
The wafer seeking can also be altered from the standard configuration:

0 – None
1 – Next Wafer
2 – Selected Wafer

Example:
SEEKTYPE {Option}
SEEKTYPE 1
This will automatically seek the next wafer from the input cassette.

FLPALNANG or FLIP ALIGN ANGLE:
This is the angle at the tower will be tilted. This can be adjusted so the wafer can be removed from the backside position.

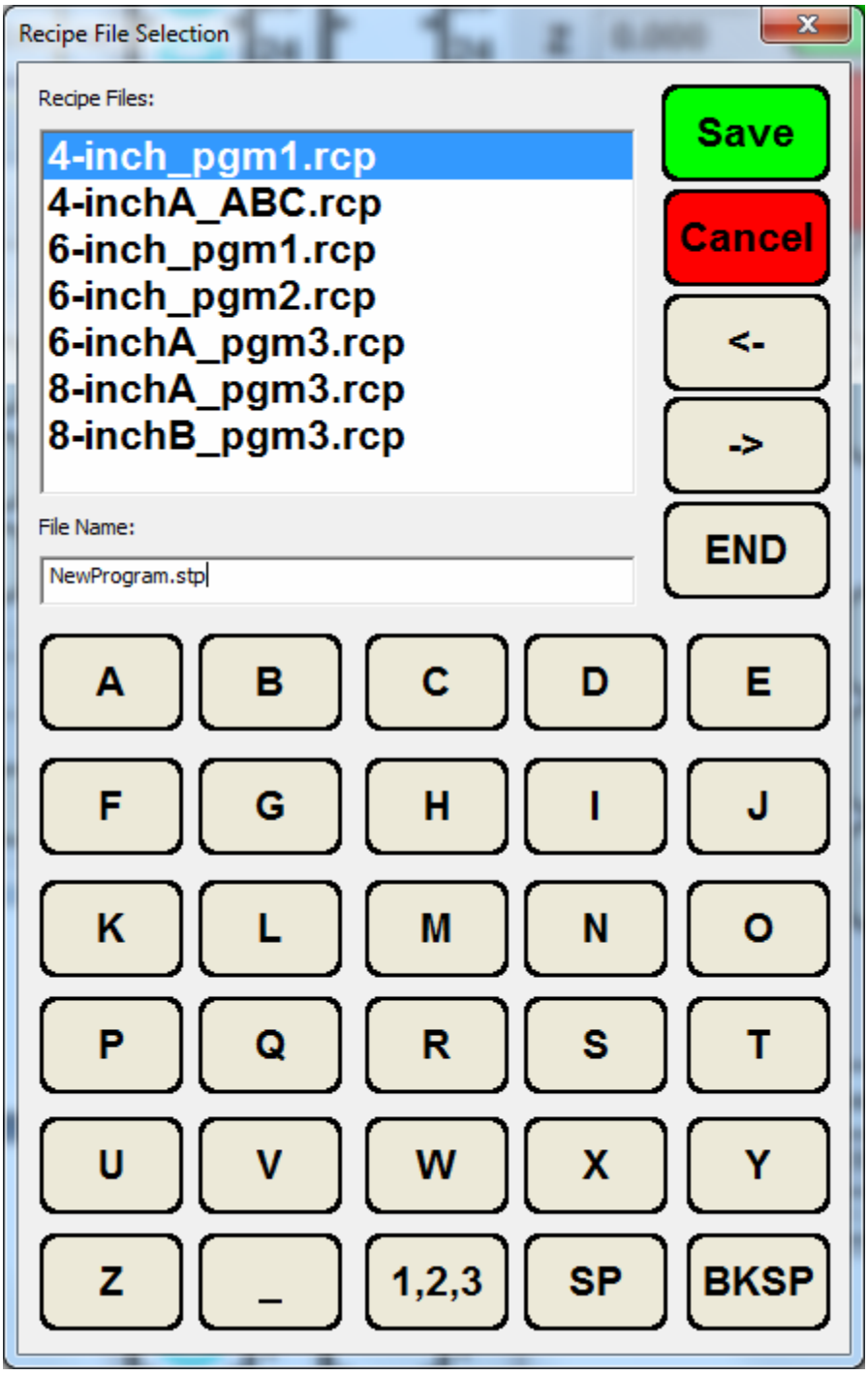
Example:
FLPALNANG {Angle}
FLPALNANG 2305
Inside of picking the wafer from the bottom surface, the tower can be tilted so the wafer picked from the top surface.

MICROTIME:
A specific inspection time can be force for the wafer. The inspection time is in milliseconds.

Example:
MICROTIME {Time}
MICROTIME 50
Each wafer inspection time will be completed in 50ms.

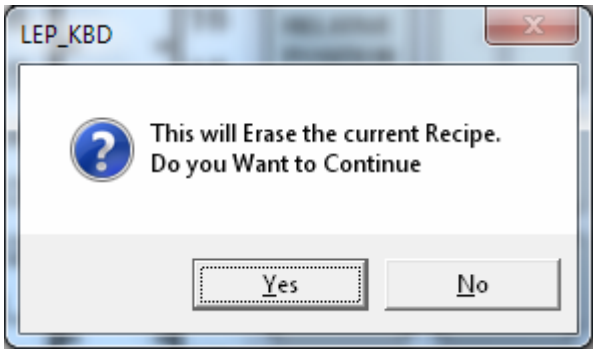
14.0 Saving a Stage Recipe Program

Once a stage recipe has been written, it needs to be saved. From the main screen, click the ***SAVE PROGRAM*** button. The following window will be displayed.



15.0 Clearing a Stage Recipe Program from Memory

To clear a stage recipe, click the ***CLEAR PROGRAM*** button on the main screen. This will automatically clear any previous recipe file in memory. The following dialog box will be displayed before the current stage recipe is cleared from memory.

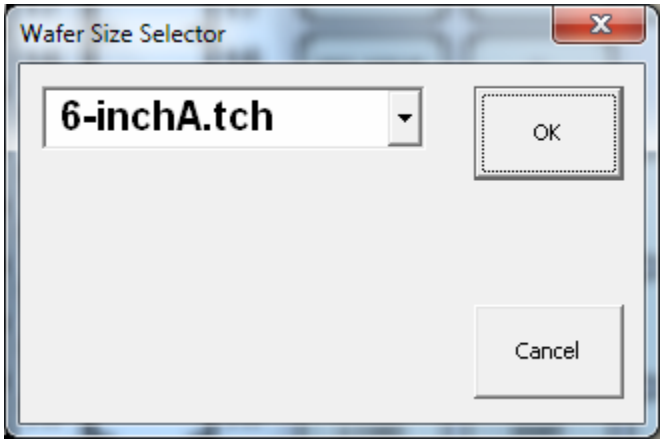


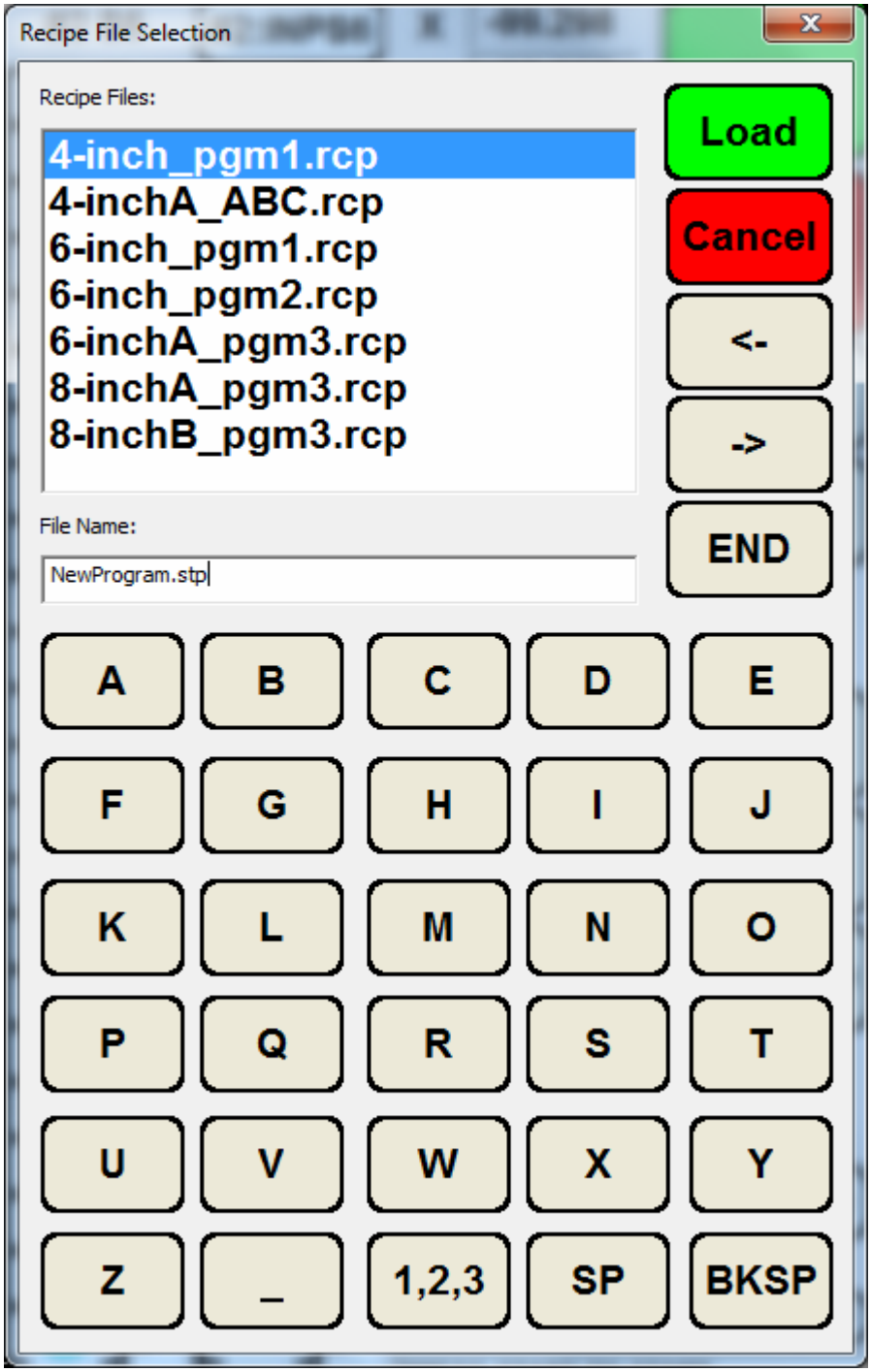
16.0 Running a Stage Recipe Program

After a stage recipe has been created, it can be executed by using the ***RUN PROGRAM*** button on the main screen. During normal operation, once a wafer is placed on the stage chuck, the stage recipe will automatically run. After the stage recipe has been completed it can be re-run for the same wafer by clicking the ***RUN PROGRAM*** button again.

17.0 User Operation

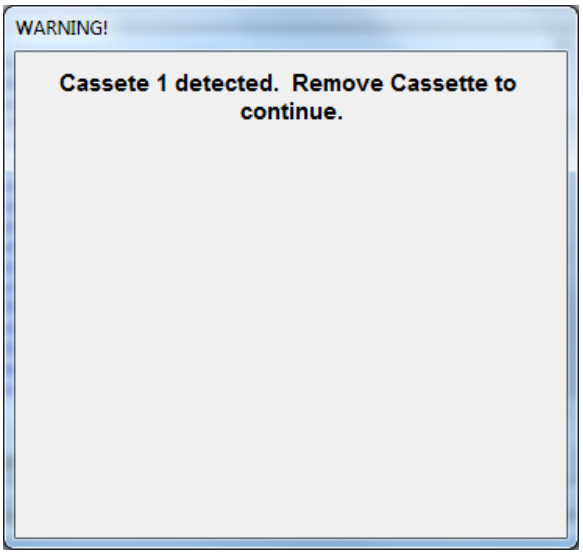
As the operator enters the main screen the wafer size and type should be loaded by clicking on the ***LOAD WAFER SIZE*** button. Once the wafer size teach points have been loaded into the controller, the stage recipe should be loaded into working memory. Click on the ***LOAD PROGRAM*** button for the following window to be displayed. Select the appropriate recipe file and click the ***Load*** button.

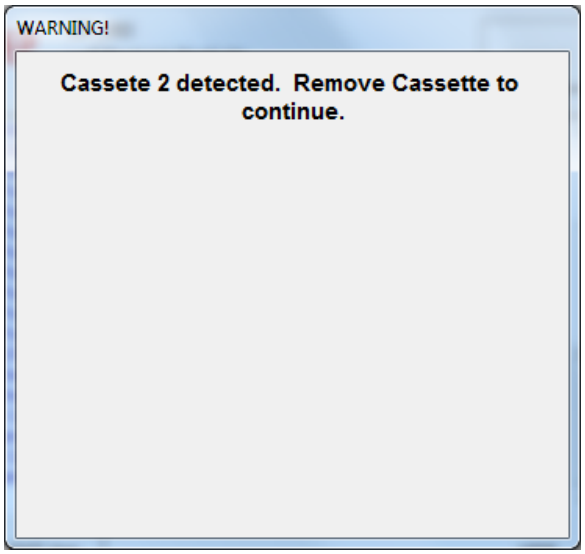




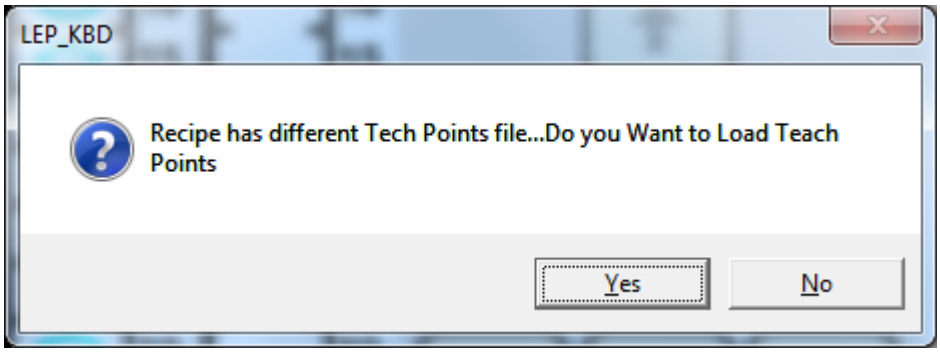
Place the IN and OUT cassette onto the cassette towers.

If cassettes are already present in the system, the following prompts will be displayed.





If universal cassette towers with size detection are installed, the system will know if the wrong cassettes are present. The software will compare the recipe file to the activated cassette wafer switch.



After the appropriate recipe file has been loaded and the correct wafers are placed on the towers, the ***START*** button can be clicked for the wafer inspection process to begin.

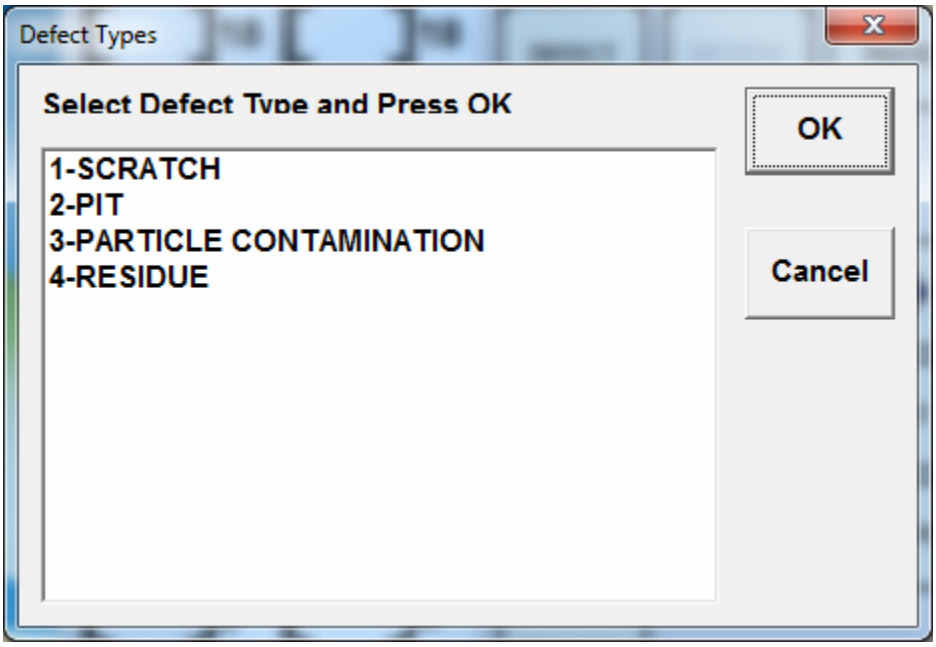
During the inspection process the ***ACCEPT*** or ***REJECT*** button can be clicked at any time to end the process on any wafer loaded onto the stage.

The ***PAUSE*** button can also be used to stop a recipe during mid operation. The joystick will be active, so manual movement can be done.

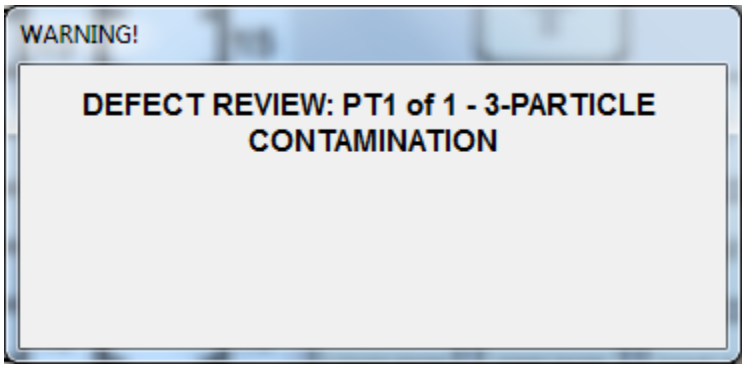
To end a session, the ***CLEAR WAFERS*** button can be used.

17.1 Defect and Reviewing

After a recipe has been created and is running, the operator can halt the program by hitting the ***PUASE*** button. At this time, the joystick and arrow keys are active, allowing the stage to be driven around for further inspections. If a defect is found, it can be marked by selecting the ***DEFECT*** button. The following screen will allow you to mark the type of defect and the location.



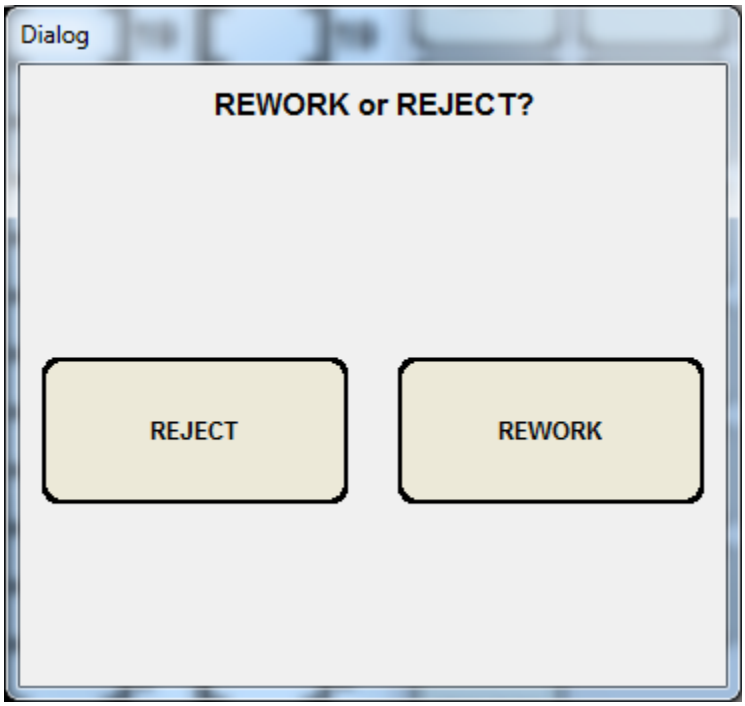
At the end of the stage program, those marked defects can then be reviewed by hitting the ***REVIEW*** button. The left and right arrow keys can used to scroll through the defects.



At anytime, the operator can accept or reject the wafer. Hitting the ***ACCEPT*** button will transfer the wafer back to the input cassette and marking the wafer in the touch screen with a green bar.

The ***REJECT*** button will display the next screen, which will allow you to reject or rework the wafer. The rejected wafer will place the wafer into the defined reject cassette and the rework will placed the wafer the defined rework cassette.

In a two cassette tower system, the reject and rework maybe defined as the same cassette tower.

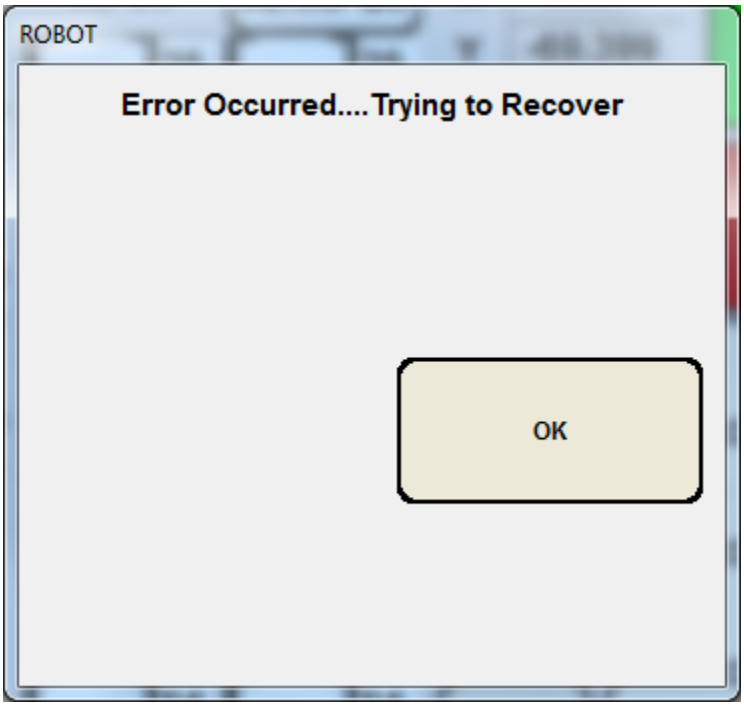


18.0 Error Messages

All error's and events to the system will be stored in a log file. They can be viewed from the system event window. All events are date and time stamped. Red text indicates an error.

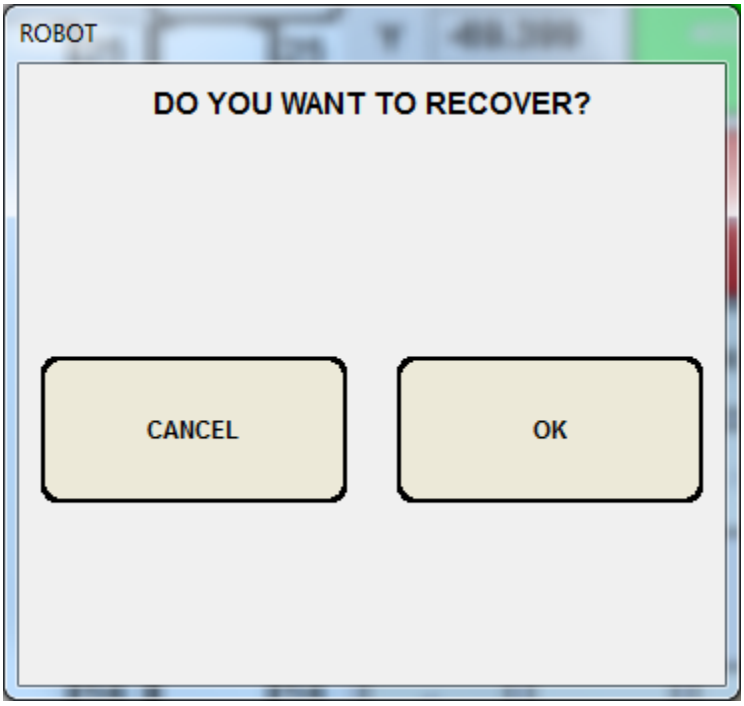
18.1 Vacuum Errors

The most common type of error is a vacuum error. A vacuum error can occur at any station with an improper transfer from the robot to the station. A vacuum error would display the following window:

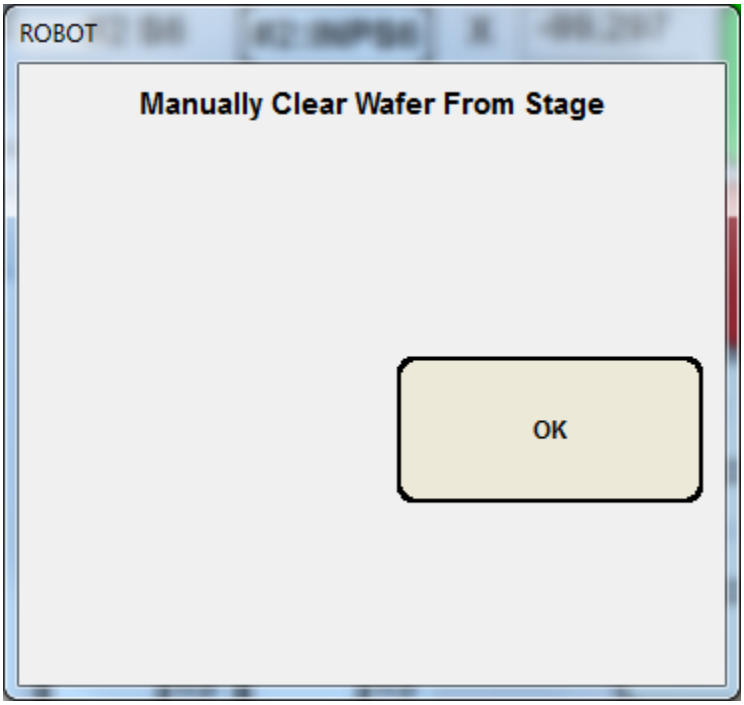


Clicking ***OK*** the system will try and recover from the error.

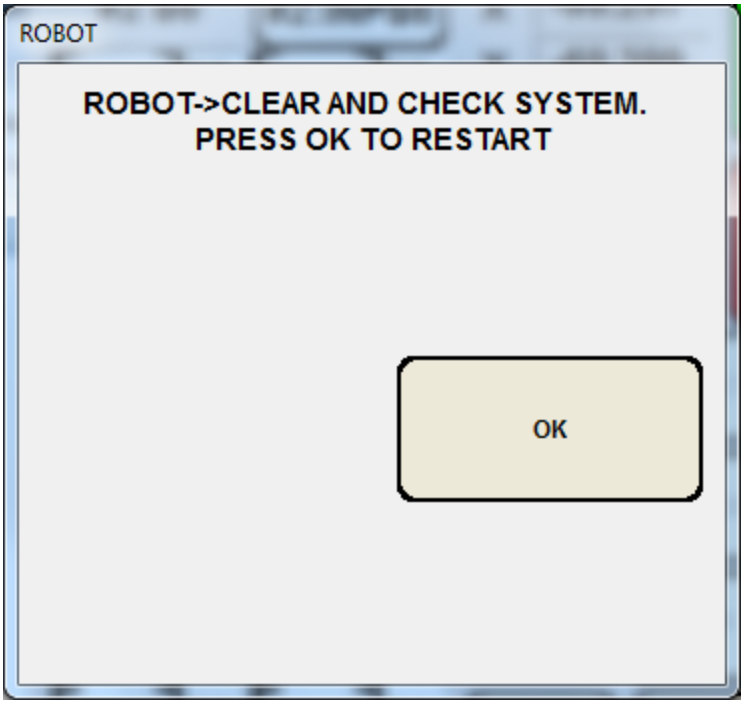
CANCEL will cancel the recovery and force a manual system unload.



OK will place the wafers back into the input cassette where the wafer was picked up from.



It is important not to remove the cassette from the tower at this time. If the cassette sense switches are toggled, the software will interpret that as a new cassette being placed on the tower.



NOTES

NOTES

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