



# Micro Automation Wafer Dicing Saw

## Model 1006A

### Operation Manual





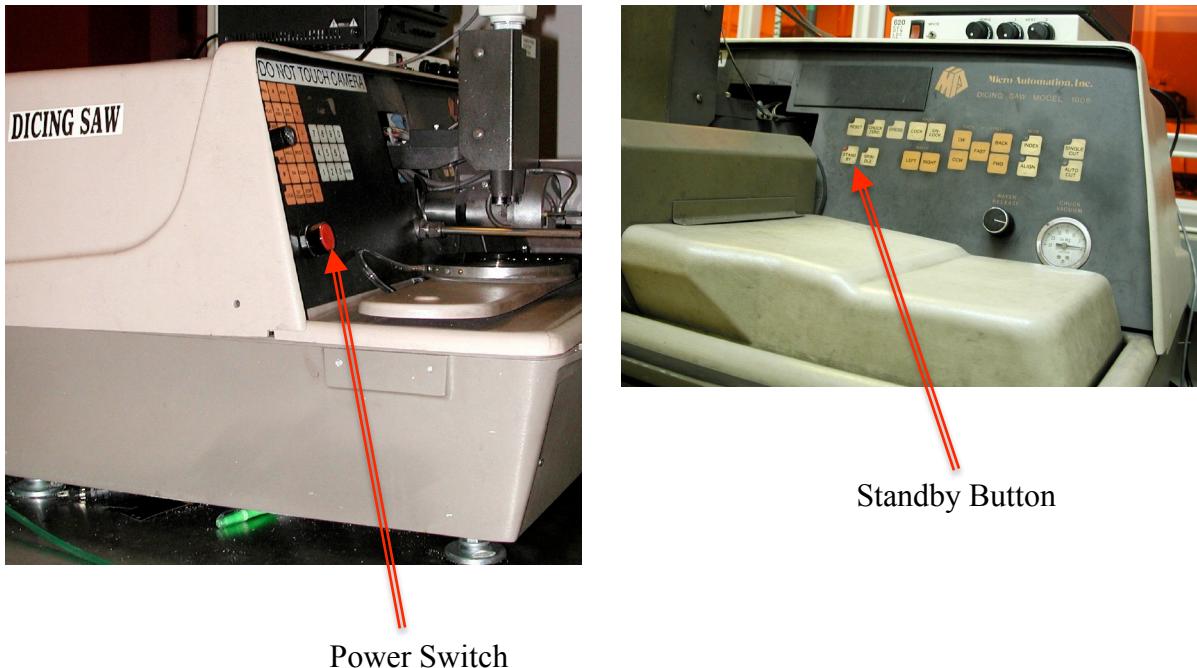
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## Table of Contents

Safety: .....	3
Preparing to use the Dicing Saw .....	7
Facility Checks.....	8
System Startup: .....	14
Programming system for Sawing:.....	19
Dicing a Substrate .....	28
After Sawing is Complete: .....	38
Appendix 1: Common Error codes .....	39
Appendix 2: Wafer Preparation .....	41
Appendix 3: Wafer Measurement .....	42
Appendix 4: Programming worksheet for round wafers.....	43
Appendix 5: Machine Modes .....	44
Appendix 6: Spindle Speed conversion Chart .....	45
Appendix 7: Blade Removal / Installation .....	46

## Safety:

- 1) Before operating this tool, users must be trained and certified by a Super user.
- 2) Never leave system unattended while cutting.
- 3) Use the Standby button if possible when a Urgent shutdown is required.
- 4) Use the ON / OFF button for Emergency shutdown.

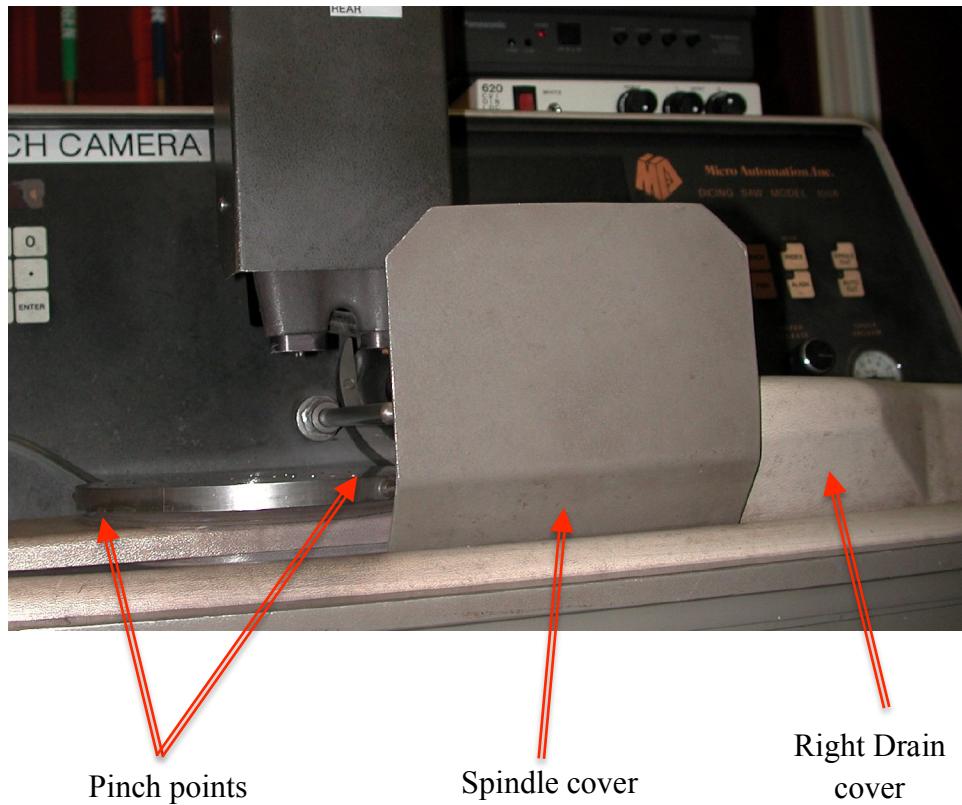


**Note: Use the Standby button to do an Emergency stop if possible**

**Note: Never Touch Spindle without AIR on to the system.**

**Doing so can damage the High Speed Bearings leading to very costly repairs.**

- 5) Make sure covers are in place and no foreign materials are on the chuck or surrounding area when activating Reset or Standby.
- 6) Never remove covers when the Spindle is active.



**Note: Motor drives are high torque and can bind / mash fingers or any material in their paths.**

7) Inspect Chuck Vacuum tubing.  
a) Tubing should have a smooth loop with no kinking.

Vacuum Tubing  
with Smooth  
Curve and no  
Kinks



8) Make sure drains are clear and there is no standing water before starting.

Left drain

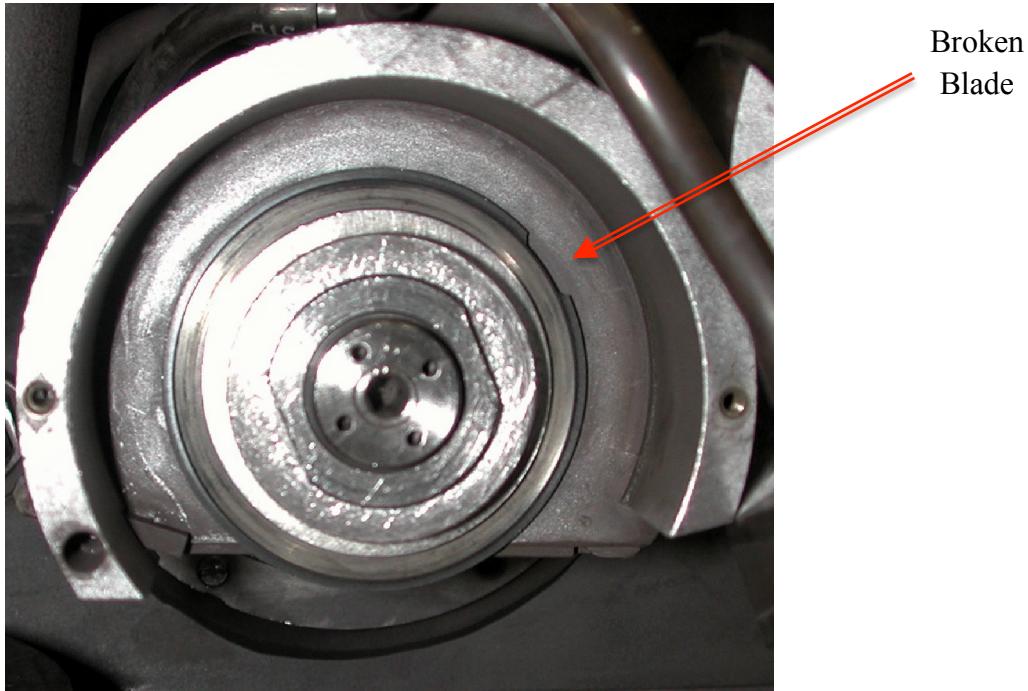


Right Drain with  
Cover removed



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- 9) Make sure an undamaged blade is installed before turning on the Spindle drive.
- 10) Never touch a blade that is mounted on the spindle.
- 11) Never attempt to use a broken blade.



**Note: Blades are sharp and easily broken.**

- 12) Substrate should always have adhesive film on backside.
  - a) See Appendix if necessary.
- 13) Programming interlocks prevent system operation out of recommended parameters.
- 14) The system is noisy. Hearing protection is recommended.
- 15) Use proper UV eye protection during the adhesive film removal process.
- 16) Hardware interlocks stop operation when facilities drop below safe pressures or flows.
- 17) Never leave the system while cutting.
- 18) Never change blades with no or low Air supplied to the system.



## **Preparing to use the Dicing Saw**

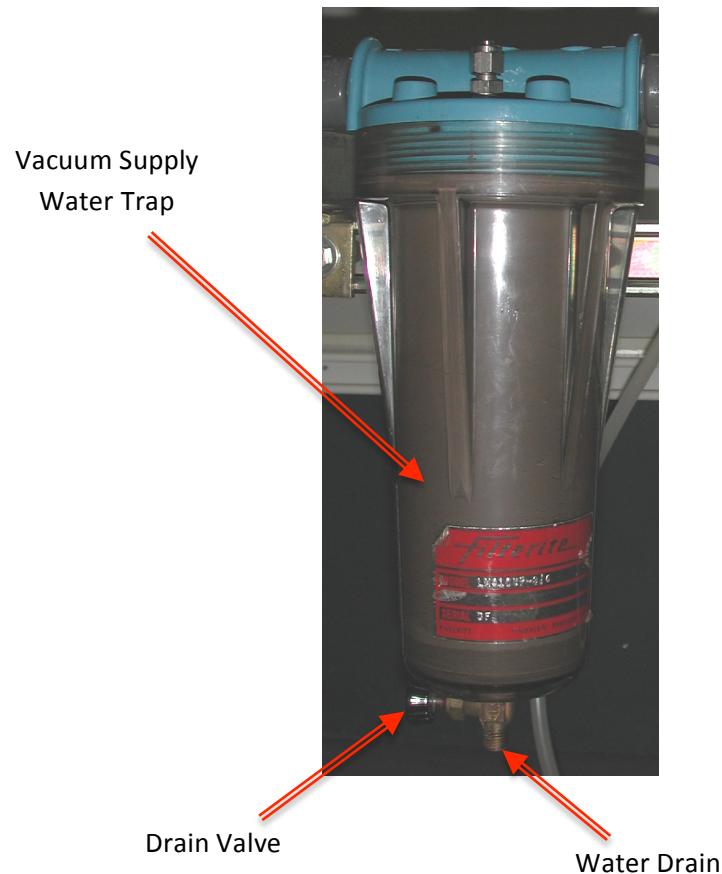
- 1) Fill out programming worksheet. See example in Dicing Saw Reference Manual Appendix.
- 2) Obtain proper cutting blade for the substrate.
- 3) Install backing material on wafer. Refer to Appendix in Reference Manual if necessary.
- 4) The Saw is quite noisy. Ear protection should be available in the Cleanroom entrance area.

**Note: Never Touch Spindle without AIR on to the system.**

**Doing so can damage the High Speed Bearings leading to very costly repairs.**

## Facility Checks

- 1) Check Log Book for any system notations.
- 2) If system is down in the book and no notification was sent please send a note to NCNC and notify Staff.
- 3) Make sure Vacuum Facility valve is shut off (see next page for location).
- 4) Make sure the drain bucket is below the Water Trap located underneath table on the left side.
- 5) Open the drain valve. Turn knob counterclockwise to open.
- 6) After water stops flowing close valve. Turn clockwise to close (hand-tighten only).
- 7) Check red tubing into water drain (system rear right side).



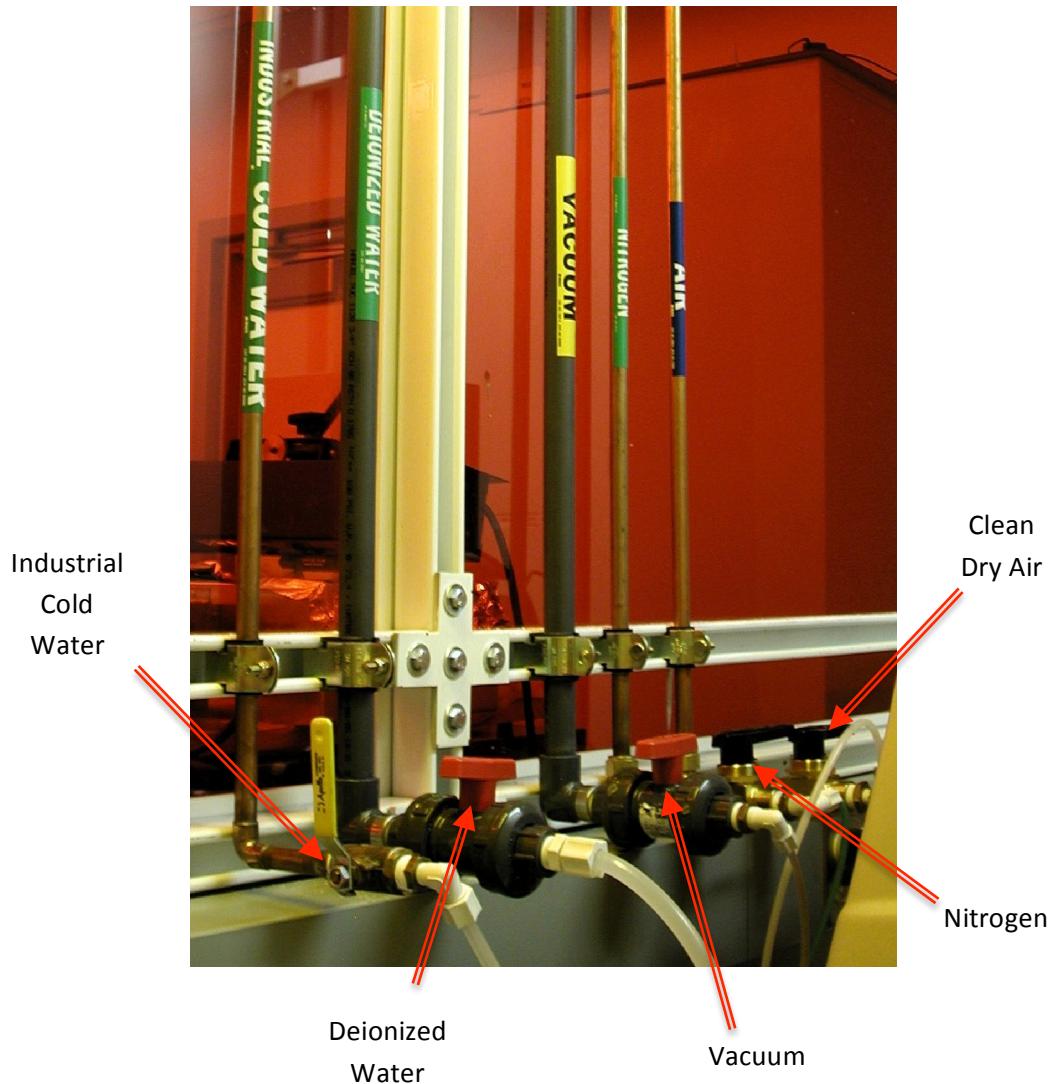


8) Hand valve Handle positions.

a) When opening or closing valves try to keep the assembly body from rotating side to side.



- 1) Using hand valves turn on facility supplies.
- 2) Open Water valves one at a time looking for water leaks.
- 3) There should be the sound of air flowing after the AIR valve is opened.



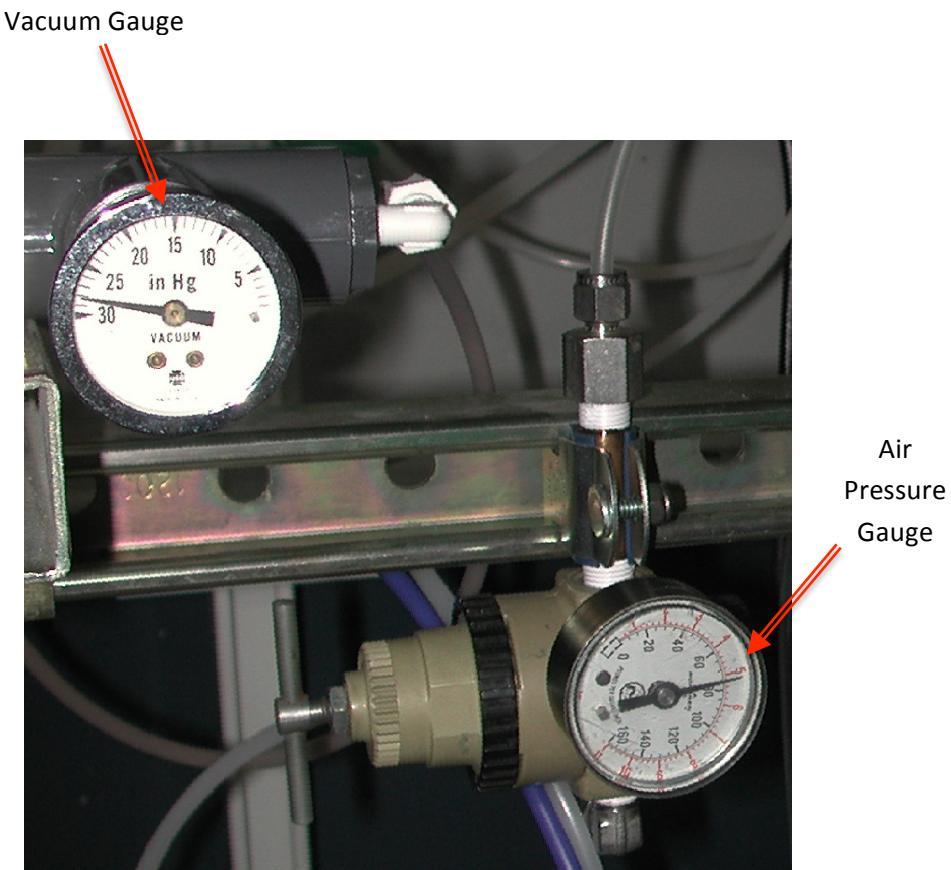
**Note: Open valves slowly.**



- 4) Vacuum and Air pressure gauges are located under the middle of the table.
- 5) Vacuum should read between 20 and 27 in Hg.

**Note: If Vacuum is below 20 make sure the Vacuum Water Trap Hand Valve is completely closed.**

- 6) Air pressure should be greater than 66 on the gauge.
- 7) If the pressures are out of range stop. Make a system down label and Update status in system Log Book. Notify the staff preferably using E-mail.





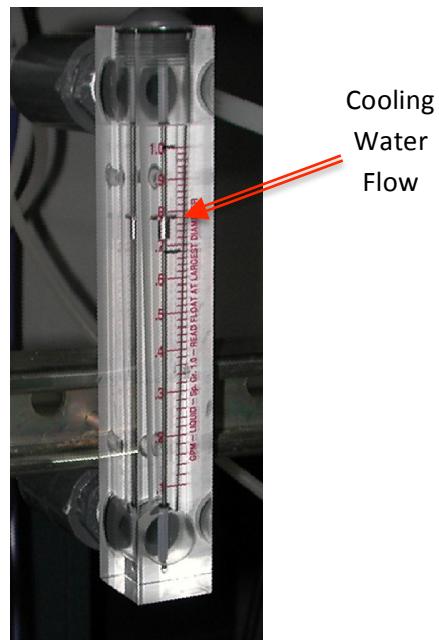
- 8) The Industrial Cold Water pressure should be 50 PSI or greater.
- 9) If the pressure is low or drops low after the Spindle is started, record the readings in the logbook and contact staff before attempting to use the system.



**Note: Check Water pressure again after starting the Spindle.**



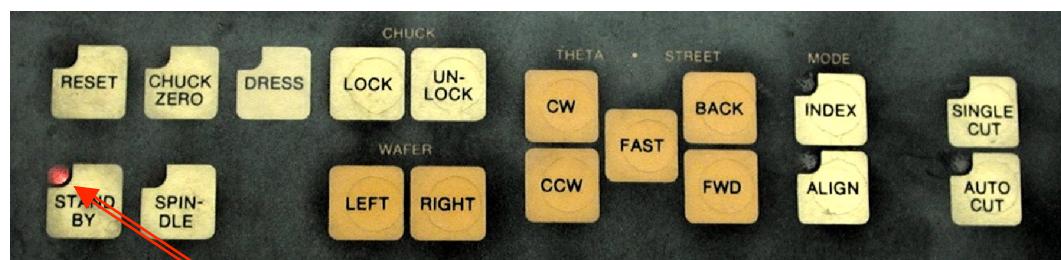
- 10) The Cooling water should only flow when the system power is on and the Spindle is turned on.
- 11) The Flow is read at the top of the indicator and should be greater than 0.8 GPM.
- 12) If the flow is low after the Spindle is started record the flow and pressure readings in the logbook. Put the system down, and contact the Staff.



## System Startup:

- 1) Push in the Power On Button.
- 2) After a machine Power Up the Dice, Metric, Local and Standby LED's should be on and steady.
- 3) Flashing lamp indicates activation that is not complete.

Steady  
Red Led  
indicates  
Success



STANDBY Lamp indicates  
default condition after  
Power On



**Note: If any Sequence fails during a Startup: Stop, Record failure in Log Book and contact Staff.**

- 4) Make sure drains are clear and there is no standing water before starting
- 5) Clean and Dry Chuck if necessary
- 6) Make sure the Chuck and Spindle areas have no foreign materials or kinked hosing.

**Note: If any of the hosing is kinked or binding contact Staff before attempting a repair.**

- 7) Press RESET Button
- 8) Pressing RESET immediately sends the saw to the home positions.
- 9) The Led should turn and remain steady.

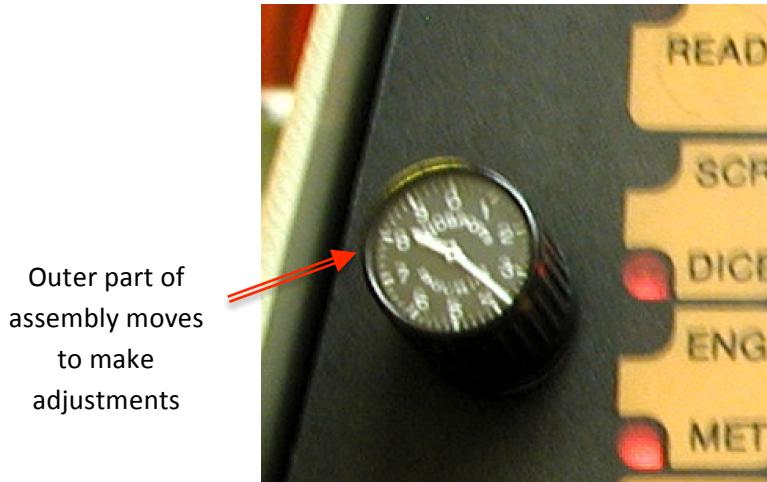


- 10) Check Spindle for presence of a Blade that is in good condition.
- 11) Install a known good Blade use the Instructions in the Reference manual if necessary.

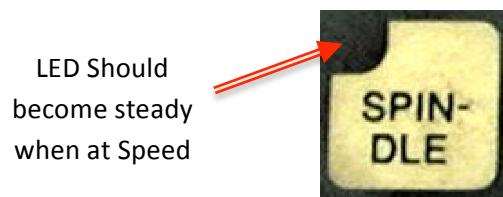
**Note: Before installing a Blade insure that the Air pressure is good.**



- 12) Adjust Spindle Speed control for desired speed.
  - a) See Appendix for approximate speed vs. setting.
  - b) Moving Outer (Knob) will change counter.

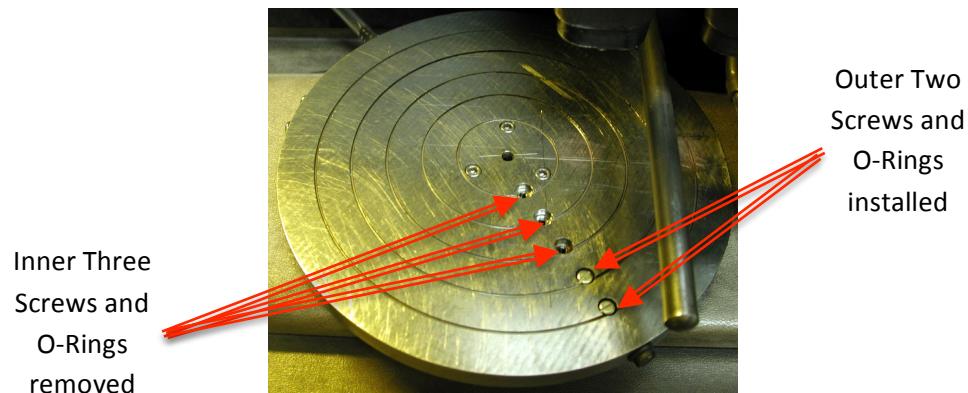


- 13) Press SPINDLE Button
  - a) Spindle should blink while coming up to speed.



- 14) Check water flow to the Spindle.
  - a) The Flow read at the top of the indicator should be greater than 0.8 GPM.
  - b) If the flow is low after the Spindle is started record the flow and pressure readings in the logbook. Contact staff before attempting to use the system.

- 15) Prepare Wafer Chuck for CHUCK ZERO.
  - a) Clean and dry Wafer Chuck.
  - b) Remove or install Vacuum hole plug Screws to apply maximum vacuum over 100mm.



- 16) Clean and Install the Gauge Block (disk).
- 17) Place and center Gauge Block on the Chuck.



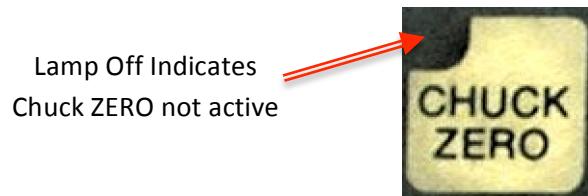
**Note: If Chuck and Gauge Block are not completely clean and dry the Chuck Zero will not be correct. Incorrect Zeroing can lead to damage of a substrate, Broken Blades and possible system damage.**



- 18) Press the LOCK Button.
  - a) Vacuum on the Front panel gauge should go to a reading of 17 or greater.



- 19) Press the CHUCK ZERO Button.
  - a) The lamp flashes during the sequence.
  - b) The lamp stays steady after sequence is complete.



- 20) Press the UNLOCK Button.
  - a) Remove Chuck Zero Block.
  - b) While button is pressed low pressure air is supplied to the chuck.
  - c) The Chuck Zero Block should float slightly while holding down the button.



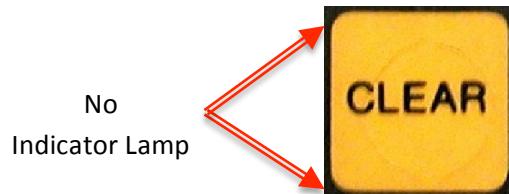
- 21) If all these steps completed with no problems the system is now ready to Program and Saw substrates.

## **Programming system for Sawing:**

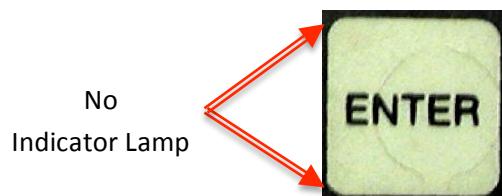
- 1) Before starting to Program you should have the worksheet completed.
- 2) It is recommended a Test cut be performed first to verify blade and system performance.
  - a) Determine any changes needed and Edit the program before doing the final cut.
- 3) The following program variables are in Metric units by system default.

**Note: To prevent damage to the system or substrate make sure the thickness entry is correct for each item being cut.**

- 4) Use press CLEAR Button to clear existing values in a parameter or remove Numeric Keypad errors.



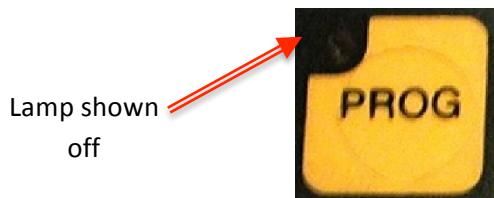
- 5) After using the Numeric Keypad use the ENTER Button to save to memory.





6) Press the PROG Button

- a) Once in the Program mode you must enter a complete program (with values for all parameters) to exit.
- b) The lamp should toggle on to indicate programming mode.
- c) The saw cannot be operated when in the programming mode.



- d) When programming if you hear a beep or see a flashing error code press the CLEAR Button and try entering a different number or parameter.
- e) If you see the mistake before hitting the ENTER Button press the CLEAR Button and try again.

### Programming Error codes

Code	Definition	Cause / Corrective Action
E003	Number is out of range	An attempt was made to enter a numerical value larger than the limits for that parameter.
E004	The dimension entered for height is greater than the dimension for wafer thickness.	Press CLEAR. Enter correct dimensions.
E005	Dimension entered for index is greater than the dimension entered for wafer size. This implies that the dies are larger than the wafer.	Press CLEAR. Enter correct dimensions.

- f) Once in the Program mode you must enter a complete program with all parameters to exit.
- g) The lamp should toggle on to indicate programming mode.

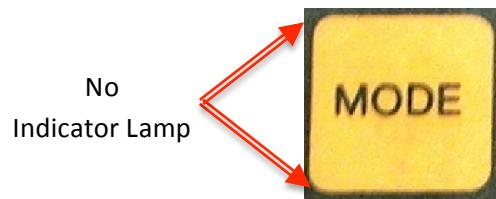


7) Press MODE Button to select wafer type and how the system cuts.

- Enter a number on the Numeric keypad and pressing ENTER.
- For descriptions of other Modes see Appendix.

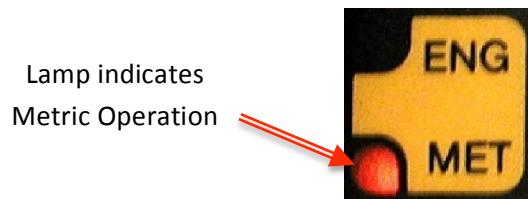
10 Round Wafers. Alignment required for each pass.

30 Rectangular substrates. Alignment required for each pass.



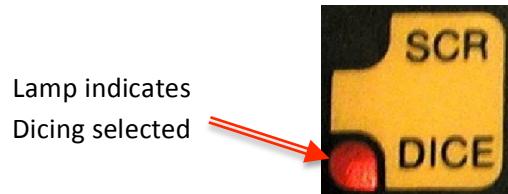
8) Only Press Button ENG / MET to change to English

- The machine default is Metric.
- The button toggles between English or Metric measurement.
- In ENG, the units are set in mils (1 mil = 0.001 inches).
- In MET, the units are millimeters.



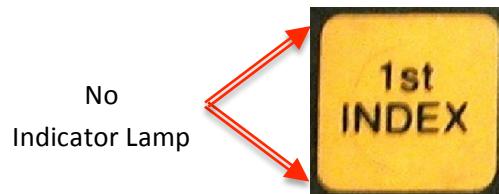
9) Press SCR / DICE to select Scribing

- The system default is DICE (most users).
- Pressing the Button toggles between Scribing and Dicing.
- The lamp indicates the selected operation.



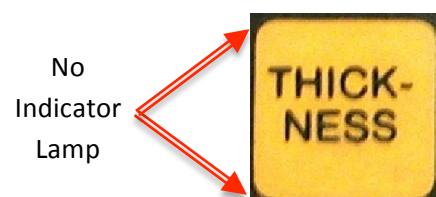
10) Press 1st INDEX Button

- Using the Keypad enter best guess for street spacing for pass 1 (value between 0.003 and 101.6 mm).
- This can be refined later when you ALIGN.
- Press ENTER Button to save data in memory



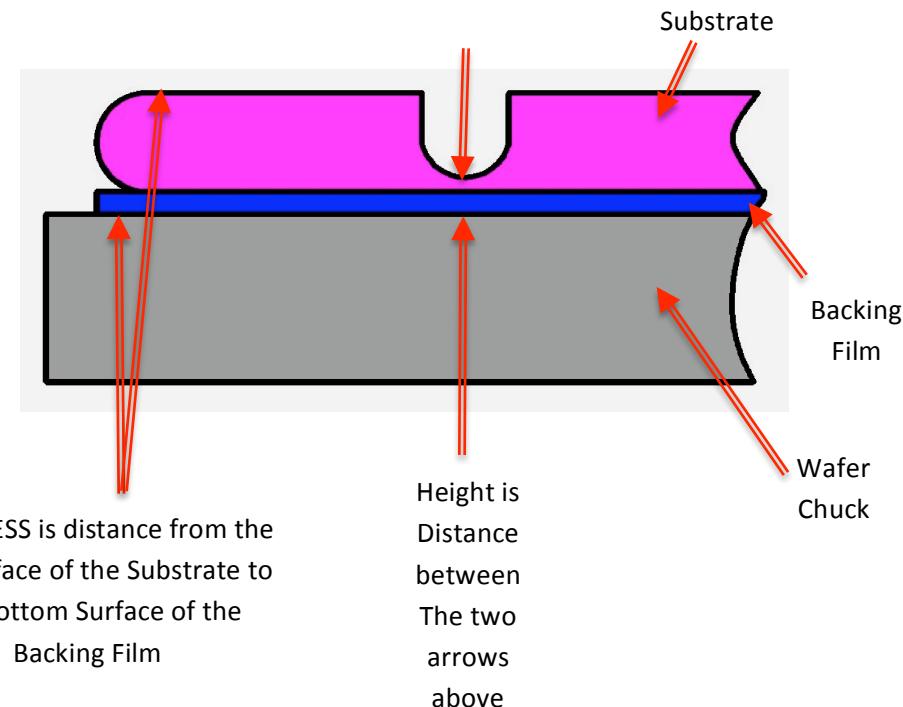
11) Press THICKNESS Button

- The thickness is the total (maximum thickness) substrate + backing film.
- Using the Numeric Keypad enter exact thickness of substrate + the backing film (value between 0.006 and 13 mm).
- Press ENTER Button to save to memory

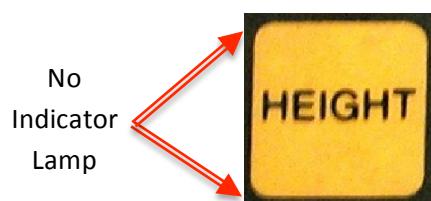


12) Press HEIGHT Button

- HEIGHT = THICKNESS – depth of cut (Amount of substrate including backing material left after a cut).

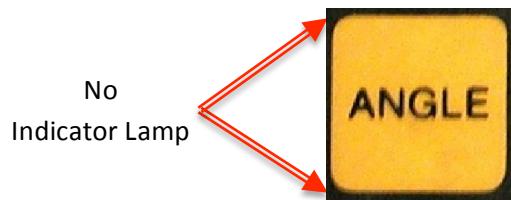


- Use Numeric Keypad to enter Height value (value between 0.006 and 13mm).
- Press ENTER Button to save to memory.



13) Pressing ANGLE Button

- a) Programs the angle the chuck will turn (Theta Axis) between 1st and 2nd index.
- b) Using Numeric Keypad enter the Angle of Chuck rotation (value between 1° and 121°).
- c) Press ENTER Button to save in memory.

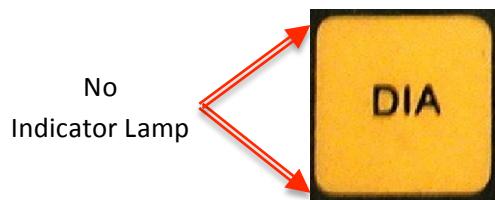


14) For Round Substrates (MODE 10) Press DIA Button to enter Wafer diameter

- a. DIA = wafer diameter.

**Note: If you are using Mode 10 to cut a rectangle you will need to increase the DIA.**

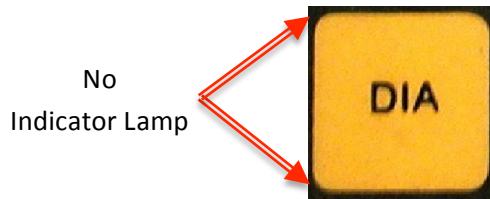
- b. Using Numeric Keypad enter Wafer diameter (0.006 and 152 mm).
- c. Expect an error if the 1<sup>st</sup> INDEX value is too large for the DIA.
- d. If this occurs you will need to CLEAR the 1<sup>st</sup> INDEX value and enter a smaller value.
- e. Press ENTER to save value.





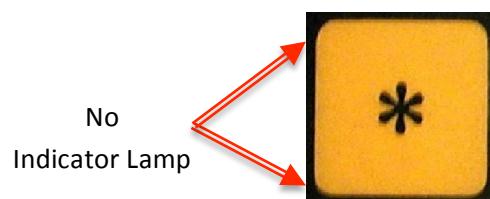
15) For Rectangular substrates (MODE 20) press DIA button

- Enter Substrates Width (right to left cutting stroke on 1<sup>st</sup> pass) dimension using Numeric Keypad (value 0.006 and 152mm).
- Press ENTER Button to save value to memory.



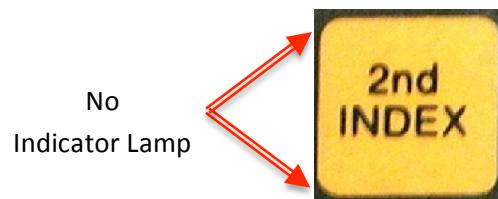
- Press \* (Asterisk) to enter Substrate Length dimension (length of 2<sup>nd</sup> pass cut)

  - Using Numeric Keypad enter length of Substrate (value between 0.006 and 152 mm).
  - Press ENTER button to save value to memory.

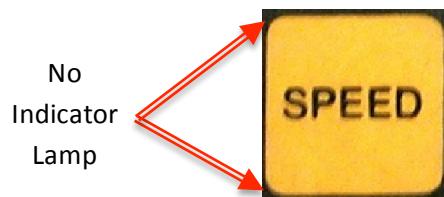


16) Press 2<sup>nd</sup> INDEX Button

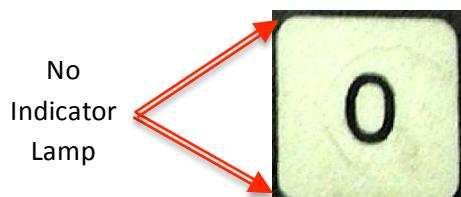
- Using the Keypad enter best guess for street spacing for cut pass 2 (value between 0.003 and 102mm).
- Note: 2<sup>nd</sup> INDEX occurs after the Theta rotation that was programmed in ANGLE.
- This can be refined later when you ALIGN.
- Press ENTER Button to save data in memory



- 17) Press SPEED Button to enter cutting speed
  - a) This is the X-Axis travel (cutting) speed.
  - b) This will depend on the material being cut.
  - c) Using Numeric Keypad enter Speed of Cuck movement (value between 1.27 and 508 mm per second).
  - d) Press ENTER button to save value to memory.



- 18) For Progressive-depth cuts Press 0 key
  - a) This will only function with some Modes. See Appendix or Micro-Automation manual for MODE descriptions.
  - b) Press Enter after (value between 0.025 and 0.381 mm) has been entered using the Numeric Keypad



- 19) Press the PROG Button to exit programming mode
  - a) The lamp should toggle off to indicate programming mode complete.

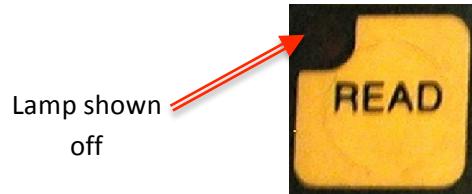




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20) Press the READ Button to enable programmed values display.

- While in READ you can press the following Buttons: MODE, 1<sup>st</sup> INDEX, HEIGHT, ANGLE, DIA, 2<sup>nd</sup> INDEX, THICK-NESS, SPEED and \*.
- Press the parameter button you want to check.
- If you are in Rectangular cutting Mode DIA will display the width and \* will display the height.



- When you have finished reading the programmed values press the READ button to exit.

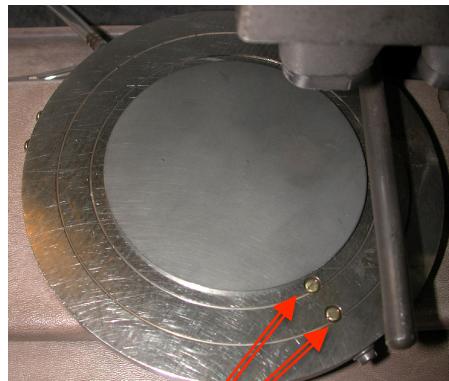


## Dicing a Substrate

- 1) If you have completed the previous sections you are now ready to Dice.

**Note: It is always good practice to do a Test cut when starting your session. This especially true if any of the following conditions exist. A new blade has been installed, there is an unknown blade on the system or you are following someone else.**

- 2) If you change Substrates make sure you have programmed the correct thickness and Height for each substrate.
- 3) Configure the Vacuum Chuck to match your substrate Diameter.
- 4) Remove screws starting from the center.
- 5) No empty screw holes should be visible when Substrate is on the Wafer Chuck and centered.
- 6) Screws and O-Rings should be stored in the Container on or near the system. If there are no screws or good O-Rings left contact Dan Haskell.



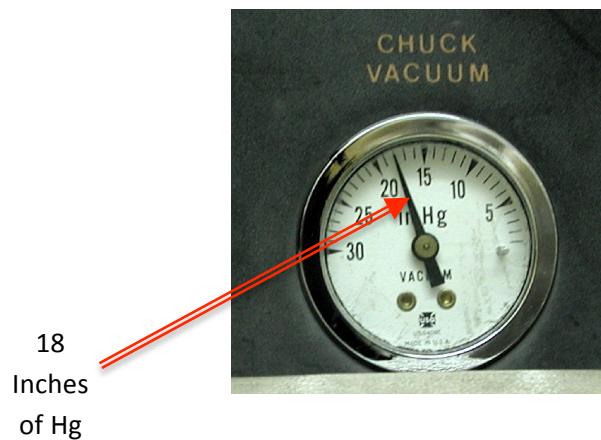
Visible Screw Holes  
should always have a  
Screw and O-Ring  
Installed



**Note: Use the Standby button when doing an Emergency stop if possible.  
Otherwise use the Power ON / OFF Button.**

**Note: If the Wafer Chuck is not completely clean and dry the Dicing may not be successful.**

- 7) Place Substrate on the Wafer Chuck using the Vacuum Grooves as a guide when centering.
- 8) Press LOCK Button to clamp wafer to Chuck
  - a) Turns on Chuck Vacuum.
  - b) The Vacuum Gauge on the Right side of the control panel should read above 17 Inches of Hg.
  - c) Never attempt any Dicing if the Vacuum behind the Substrate is not greater than 17.
  - d) If Vacuum test fails press UNLOCK Button and check Chuck surface and the back of the Substrate (Film). Film should be clean and no bubbles.





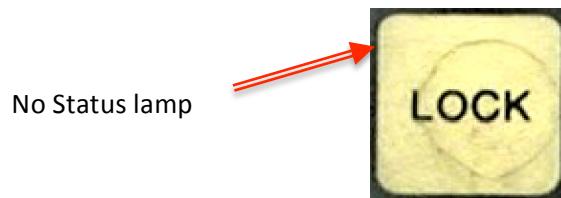
9) Press UNLOCK Button to remove or reposition Substrate if necessary.

- Turns off Chuck Vacuum.
- While button is pressed low pressure air is supplied to the chuck.

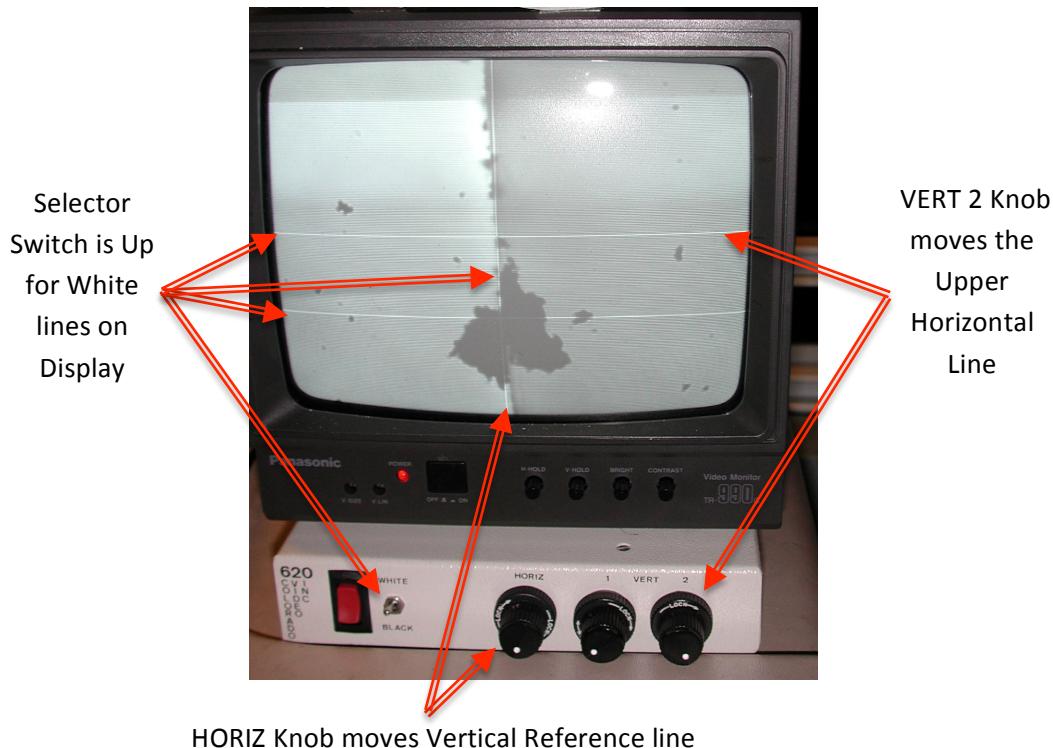


10) If you pressed UNLOCK press LOCK Button after moving the substrate.

- The Vacuum Gauge on the Right side of the control panel should read above 17 Inches of Hg.
- If Vacuum test fails press UNLOCK Button and check Chuck surface and try again.
- If Vacuum test keeps failing try the CHUCK ZERO fixture. If the Vacuum test still fails put the system down and notify the staff. If the Vacuum is good with the fixture then there is a problem with the Substrate / Film.



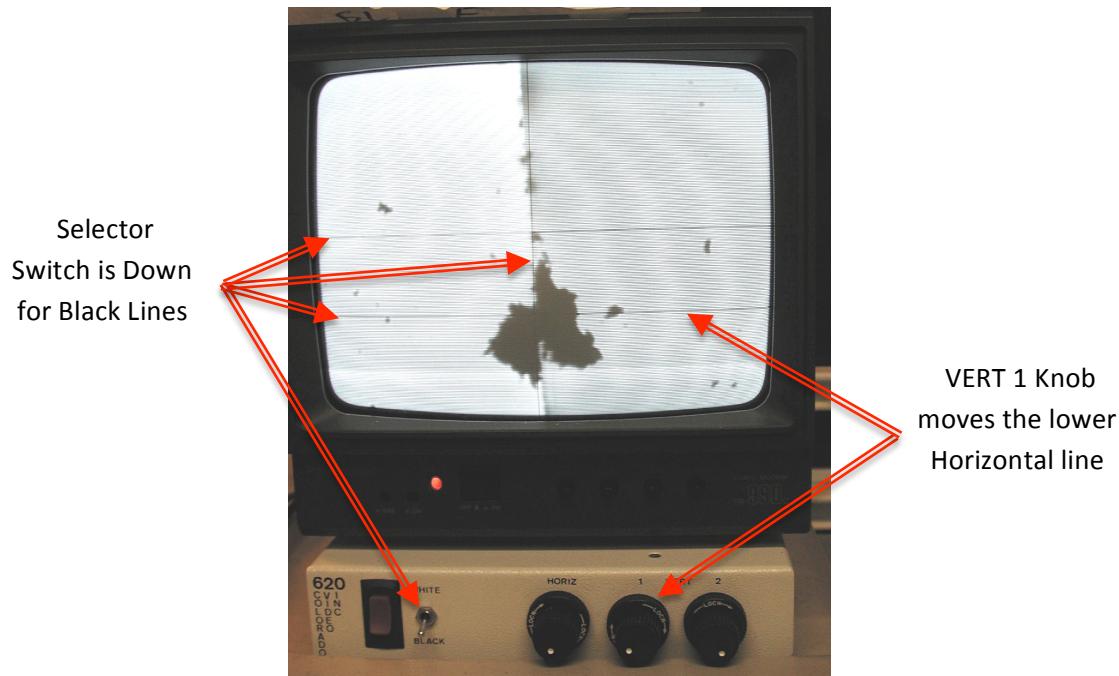
- 11) Turn on Video Monitor and configure for use
  - a) If the Monitor does not come on check the Outlet Strip on the right side of the table.
  - b) To display White Reference lines move the toggle selector switch up.
  - c) Use the VERT 2 Control Knob to position the upper Horizontal reference line on the Display.
  - d) Use the HORIZ Control Knob to position the Vertical reference line if desired.
  - e) The Vertical line controlled by the HORIZ helps to identify the left and right side views of the substrate.



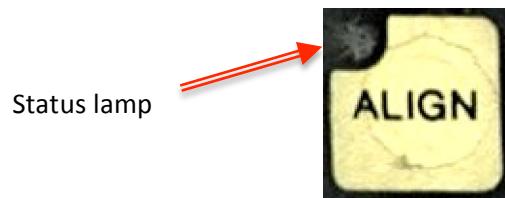
**Note: The upper and lower Horizontal Display lines show where the Blade will cut.**

**After the first (test) cut the lines can be moved to match the amount of material the Blade is removing. This will assist with the Alignment of the following cuts.**

- f) Use VERT 1 Control Knob to position the lower Horizontal reference line on the Display.
- g) Move Switch down to BLACK for Black alignment lines.



- 12) If Vacuum Gauge reads above 17 inches of Hg press ALIGN Button.
  - a) Pressing the ALIGN button moves the chuck into position under the optical alignment system and enables the Street and Theta switches.
  - b) If ALIGN is pressed while the saw is cutting, it finishes the cut it is making, Stops cutting, and returns to the align position. The ALIGN switch toggles with INDEX.

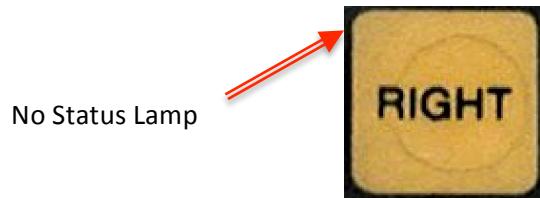




13) Press the following buttons to position the Substrate under the Microscope.

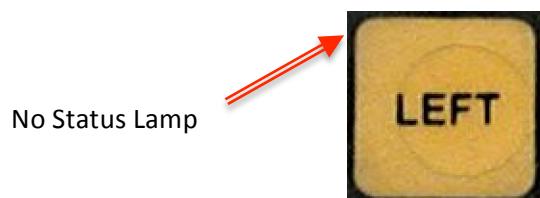
a) RIGHT Button

- i) Moves the chuck (x axis) to the right.
- ii) Either INDEX or ALIGN must be on for RIGHT to function.



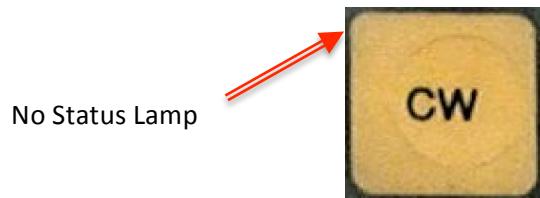
b) LEFT Button

- i) Moves the chuck (x axis) to the left.
- ii) Either INDEX or ALIGN must be on for LEFT to function.



c) CW Button

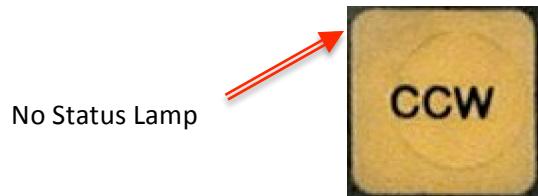
- i) Turns the chuck clockwise.
- ii) In ALIGN mode, the spindle will rotate as long as the button is pressed.
- iii) In INDEX mode, the chuck rotates to the programmed angle.





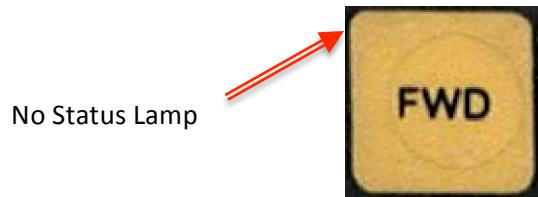
d) CCW Button

- i) Same as CW except the chuck rotates counterclockwise.



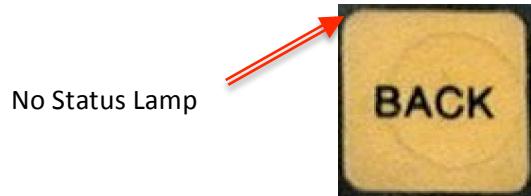
e) FWD Button

- i) Moves the Spindle forward (toward the operator).
- ii) In ALIGN mode the spindle moves as long as FWD is pressed. In INDEX the spindle moves, in steps the distance programmed as 1<sup>st</sup> or 2<sup>nd</sup> index.



f) BACK Button

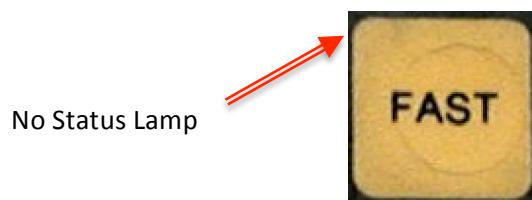
- i) Moves the Spindle backward (away from the operator).
- ii) In ALIGN mode the spindle moves as long as FWD is pressed. In INDEX the spindle moves, in steps the distance programmed as 1<sup>st</sup> or 2<sup>nd</sup> index.





g) FAST Button

- i) Speeds up the movement of Street and Theta controls the next time one of these is pressed.
- ii) After a Street or Theta control is released the FAST is no longer active.
- iii) The FAST function changes depending on whether the saw is in ALIGN or INDEX.
- iv) When in ALIGN, FAST causes the Y Axis or Theta rotation to move faster until the button is released.
- v) When in INDEX, FAST causes the Y Axis to step the programmed 1<sup>st</sup> or 2<sup>nd</sup> index distances as long as FWD or BACK is pressed, or until the edge of the wafer is reached.
- vi) When in INDEX, FAST causes the chuck to rotate the programmed angle whenever CW or CCW is pressed.



14) SINGLE CUT Button

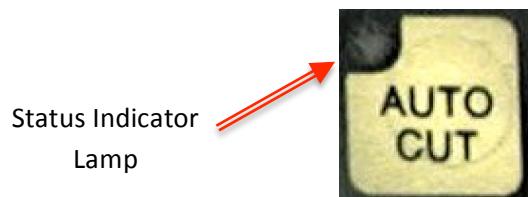
- a) Enabled only in ALIGN or INDEX mode.
- b) When enabled the saw will make one cut and return and the cut under the optics.





## 15) AUTO CUT

- a) Starts the automatic cutting sequence as programmed.
- b) If AUTO CUT is pressed while in the INDEX mode the saw will start to cut one street back from its last position.
- c) If AUTO CUT is pressed while the saw is in ALIGN mode, the saw will start to cut at the front of the wafer.



## 16) INDEX

- a) Pressing INDEX moves the chuck into position under the optics.
- b) If INDEX is pressed while the saw is cutting, it will finish the cut, then position the last cut under the optics.



## 17) Press UNLOCK Button to remove Substrate.

- a) Turns off Chuck Vacuum.
- b) While button is pressed low pressure air is supplied to the chuck.





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- 18) If more Dicing is required Check Program to see if changes are required.

**Note: If the Standby button was pressed CHUCK ZERO will need to be repeated.**

- 19) If no program changes were required repeat this section.

**Note: Clean and Dry the Wafer Chuck before installing the next Substrate to be cut.**

- 20) If this is the last Dicing operation go to the next section.



## After Sawing is Complete:

1. Press STANDBY and wait for the Blade to stop spinning.
2. Remove the cutting blade if you are done cutting and do not want to leave your blade in the system.

**Note: If you are leaving a Blade in the system leave a note with contact information.**

3. Dry off the system using wipes and the N2 blowgun.
4. Press Power Button and release.
  - a. Lights should go off.
5. Using Hand Valves turn off Facilities.
6. Update Log Book entries



## Appendix 1: Common Error codes

- 1) Error codes starting with an E typically refer to Operator errors and can be cleared by pressing CLEAR and returning to proper operation.
- 2) If an error code starts with an F “stop and contact the staff”.

<b>Code</b>	<b>Definition</b>	<b>Cause / Corrective Action</b>
E001	Saw is in STANDBY	RESET must be pressed before attempting to turn on spindle or otherwise operating the saw.
E002	Operator tried to operate the machine while in PROGRAM (or in READ)	See if PROG or READ lamps are lit. Press switch to extinguish lamps.
E003	Number is out of range	An attempt was made to enter a numerical parameter outside the design capability of the equipment or a Programmed value. Press CLEAR and program an acceptable number.
E004	The dimension entered for height is greater than the dimension for wafer thickness.	Press CLEAR. Enter correct dimensions.
E005	Dimension entered for index is greater than the dimension entered for wafer size. This implies that the dies are larger than the wafer.	Press CLEAR. Enter correct dimensions.
E006	The programmed wafer thickness dimension is too large for the saw to perform a chuck zero.	Press CLEAR. Enter correct thickness.
E007	A theta angle greater than $60.5^\circ$ was programmed while the saw was in hex mode (Mode 20, 21 or 22).	Press CLEAR. Program an angle less than $60.5^\circ$ .
E101	More than one switch pressed at one time.	Press CLEAR. If E101 is displayed there may be a shorted switch or connector. Notify Dan Haskell.
E102	An attempt has been made to operate the saw without the chuck locked.	Press CHUCK LOCK and proceed. If condition persists, Notify Dan Haskell.



<b>Code</b>	<b>Definition</b>	<b>Cause / Corrective Action</b>
E103	An attempt has been made to operate the machine with one or more parameters missing.	Make sure all parameters have been programmed into the saw. Check the asterisk (*) entry if in the 30 or 31 rectangular modes. Check the decimal (.) if in 60, 61, 70 or 71 progressive depth of cut modes.
E104	Chuck zero is required.	Place the 0.109 inch gauge block on the chuck and perform a chuck zero. Chuck zero is required after STANDBY or RESET.
E105	Chuck zero was attempted before the spindle was up to speed.	Wait until the spindle is up to speed.
E106	A switch was pressed while spindle was coming up to speed.	Wait until spindle is up to speed.
E108	Program storage is full.	E108 indicates that all memory spaces are full. If it is still desired to store the program it is necessary to erase or write over an existing program to make room for the new one.
E109	An attempt was made to retrieve a program that does not exist from storage.	Check program ID number requested.
E110	There is already a program stored in the memory location requested, and if you continue, you will alter a program in the memory.	E110 is a warning that an existing program is about to be altered.
E111	An attempt was made to turn on the spindle while the machine was in a service mode.	Spindle will not run while in a service mode. Select the proper mode.
E113	The chuck was not unlocked after a chuck zero operation.	Press UNLOCK and remove the gauge block.



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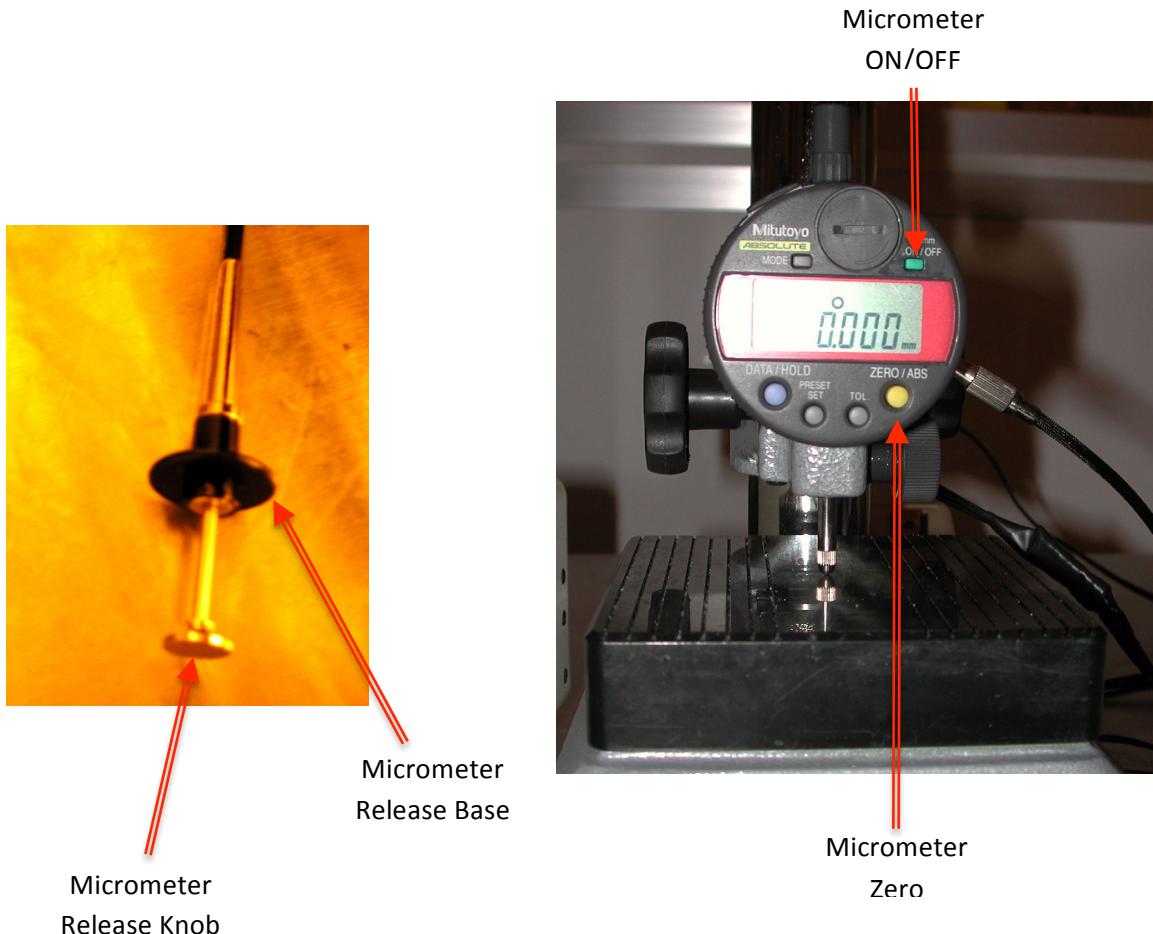
## **Appendix 2: Wafer Preparation**

1. Install backing material to substrate.

**Note: Page Under Construction see Superuser.**

## Appendix 3: Wafer Measurement

1. Clean off area on Micrometer fixture Base where sample will be placed (you will need to raise the Micrometer plunger grasping the Release Knob and Base).
2. Turn on Micrometer.
3. Zero readout.
4. Using Release Knob raise Micrometer plunger and place sample on Base.
5. **Gently Lower Plunger to Measure** then record the Thickness of the substrate preferably with film installed.
6. Always raise the Micrometer plunger before moving the sample being measured.





## Appendix 4: Programming worksheet for round wafers

Project	Material	Date

Blade	
Spindle Speed Setting	
ENG/MET	
SCR/DICE	
1 <sup>st</sup> INDEX	
THICKNESS	
HEIGHT	
ANGLE	
DIA	
2 <sup>nd</sup> INDEX	
Speed	

Notes:

Project	Material	Date

Blade	
Spindle Speed Setting	
ENG/MET	
SCR/DICE	
1 <sup>st</sup> INDEX	
THICKNESS	
HEIGHT	
ANGLE	
DIA	
2 <sup>nd</sup> INDEX	
Speed	

Notes:



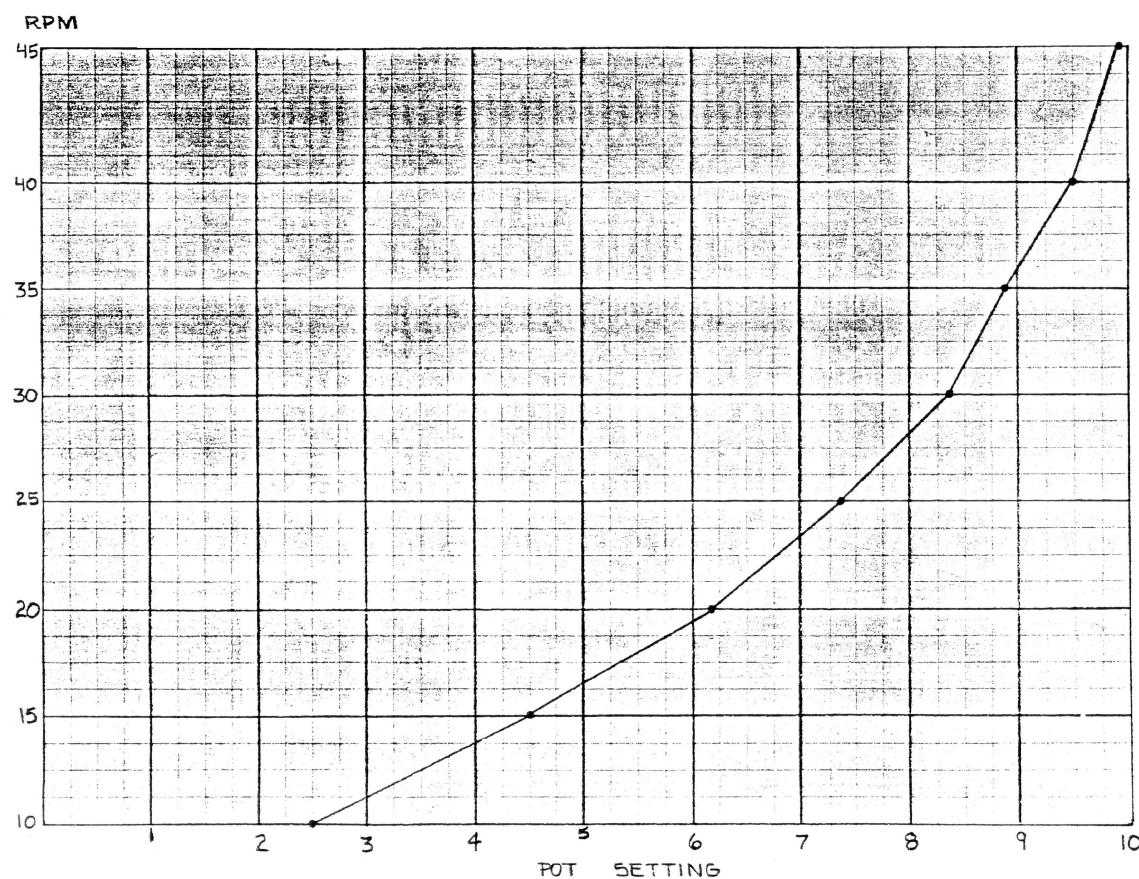
## Appendix 5: Machine Modes

- 10 Round Wafers. Alignment required for each pass.
- 11 Round wafers. No alignment required for Pass 2.
- 20 Round wafers, hex die. Alignment required for each pass. Triple alignment, for patterned wafers.
- 21 Round wafers, hex die. No Alignment required for any pass. (Blank wafers.)
- 22 Round wafers, hex die. No Alignment required for Pass 1 or Pass 2. Pass 3 alignment is made to an intersection of Pass 1 and Pass 2 cuts. (Blank wafers.)
- 30 Rectangular substrates. Alignment required for each pass. (Patterned wafers)
- 31 Rectangular substrates. No Alignment required for Pass 2. (Wafers with no pattern.)
- 60 Same as mode 10 except for progressive depth cuts.
- 61 Same as mode 11 except for progressive depth cuts. (Blank wafers)
- 70 Same as mode 30 except for progressive depth cuts.
- 71 Same as mode 31 except progressive depth cuts. (Blank wafers)



## Appendix 6: Spindle Speed conversion Chart

- 1) Potentiometer setting value X Axis expected speed Y Axis.
- 2) Approximate Revolutions Per Minute (RPM) chart value x 1000.





## **Appendix 7: Blade Removal / Installation**

**Note: Under Construction see staff for assistance.**