K & S Dicing Saw Instructions

This machine is to be used by authorized personnel only. For training contact the MFC Engineer in office # 201E phone 621-9849. Enter all necessary information in the Log Book for each use.

For any questions or comments on the saw please contact Grek Richmond at grek@ece.arizona.edu

Important Notice: Before working on the saw you need to be wearing gloves and safety goggles.

I. Turning on the Saw

1) Turn on the DI water; this is the first/lowest blue valve on the clean room wall next to the saw.
2) Switch on the vacuum pump. The switch is found on the floor behind the saw.
3) Bring the CDA pressure to 80psi. The gauge for this is on the front of the saw which should be resting at 40psi (if the saw was properly shut down last time). To get the CDA to 80psi turn the knob on the top left corner of the machine until the gauge pressure reaches 80psi.
4) Now pull out the big red power plug on the front of the machine.

Now the screen should flash a few patterns a couple of times, run through a systems check and lastly go directly to the main title screen.

5) Notice the little red button under the plastic case next to the main keyboard, it needs to be pushed once every time the saw is turned on and off, push it.
6) You will be given an option to confirm the systems configuration, to do this press <enter>.
7) Now you should come to the edit menu where it should say SPNDL “off”. At this point the saw needs to re-teach itself the height between the blade and the chuck.
   a. To teach the height press <Teach>; then select option <b>.
   b. Pick a spot on the chuck for the spindle using the arrow keys
   c. Press <enter> and the blade will find its height from the chuck.
   d. At this point it may be a good time to begin mounting your wafer as this tends to take some time, roughly 10mins.

8) Once it has completed the height configuration it will ask for a new blade or an old blade. This is not the time to reinstall a new or old blade! You are simply telling the machine whether or not the blade you are using is old or
new. For example, press <s/enter> (shift enter) to tell it that it has a new blade in it already.
9) Get back to the edit menu by pressing <manual><display><display>. You can always press <manual><display><display> to return to the edit menu. Now in the edit menu the blinking cursor will tell you where you are. Use the arrow keys to move back and forth between the different options. When the option that you want is highlighted by the cursor press <enter> to select it.

II. Mounting Wafers

1) Measure the thickness of the wafer.
   A. Begin by zeroing the stylus: bring it down to the granite surface.
   B. Then give the gauge one good full turn so that it is brought back to zero, called “zeroing the gauge”.
   C. Now pull the stylus up and slide the wafer underneath and gently let the stylus down on the wafer. Be careful to note how many times the gauge needle passes zero. For every time it passes zero add 20 mils*.
   D. Take a few readings on the thickness of the wafer and use the max to enter into the program when that step comes.
   E. When finished measuring, raise the stylus up from the granite surface so that it won’t get damaged if someone bumps the table or machine.
*Note: Mil is NOT short hand for millimeters. 1 mil = 0.001 inches!

2) Take two mounting rings, blue and grey, and place the round outer edge of the grey ring flat on the table.
3) Pull off some tape and lay that over the grey ring.
4) Place the blue ring over the top of the grey ring and sticky paper and make sure that you get a smooth seal. This can be tricky so it make take some time to get this nice and smooth.
5) Cut off all the loose tape hanging around outside of the rings, this can get in the way of the saw.
6) If there is no straight edge on the side of the wafer or no clear markings to indicate where a straight edge is for vertical and horizontal references, you may need to scribe one on the wafer so that you have a vertical and horizontal reference point when you go to cut. Use a ruler and a razor for this.
7) Lay the polished side of the wafer down on the table and place the sticky side of the ring on top of the wafer making sure that the wafer sticks to the paper.
8) Now the wafer is mounted and ready to be cut. Clean up any loose supplies.

III. Creating/Editing a Cutting Program

At this point you should go to the Directory, <manual><display><display> will get you to the edit window, then move the cursor over to DIRECTORY and press <enter>, and you will have several options to choose from:
   ASSIGN/DELETE/DUPLICATE/...
By selecting ASSIGN you can then pick your program and then confirm.
Once you have confirmed your program you now have the option to EDIT/SAVE/DIRECTORY/INS-BLOCK/DEL-BLOCK

**A block is just a page with an angle assigned to it.
INS-BLOCK will insert a block.
DEL-BLOCK will delete a block.

1) Press <enter> on EDIT, this will bring you to a series of statistics to enter.
   a. Thickness- Enter the thickness of the wafer that you measured plus the
      thickness of the sticky paper which is 3mils thick.
   b. Blade exposure – No need to change this.
   c. Height rate – No need to change this.
   d. Spindle Speed – Should be at 30.00000
   e. Angle – typically starts at zero and could be changed to what ever
      angle is desired for the block.
   f. Cut Depth- This must be set so that it goes .5mils below the wafer, actually cutting the tape.
   g. Start Cut – Set to -1.0000 inches. This is in reference to where the
      blade will begin cutting. Where ever you mark it to start cutting it will
      go back the -1.0000 inches and truly begin from there. Sort of an error
      checking feature.
   h. Cut Length – Depends on the size of the wafer and where the saw
      actually starts cutting. Be careful not to go too far and/or come up
      short.
   i. Index- This is the distance between the cuts and the tricky part of
      using the saw. You must measure the distance carefully between the
      cuts,**
   j. Cut Count – The number of cuts to be made on the silicon wafer.
   k. X-Entry Speed- This is the speed the saw blade is spinning before it
      begins to actually cut. Set to 0.25
   l. X-Cutting Speed- this is the speed that the blade is going while it is
      actually cutting the wafer. Set to 0.5.
   m. Z-Speed – How fast the blade will lower or raise up and down before
      cutting. Set to 0.0625.

**NOTE: Finding the correct index can be a bit complicated. In order to do this we
recommend that you first save your work. Then go to the screen where you would
actually cut the wafer, press <auto><enter> to get there. Mount the substrate, see step 1
of part IV. You now need to do the alignment by picking three points, see step 2 below.
Then you will need to know where exactly you wish to begin the first cut and set the y-
axis to zero at that point. To do this press <shift><>, then press the up arrow key to zero
the y axis. Now you can move the screen up to the position where you want the second
cut to be. At this point the y-axis will be showing the distance you have moved up on the
wafer and that should be your index. You may also want to use this same technique to
get the street length, so that you may place the cut directly in the middle of the street.
***NOTE: The saw is not perfectly calibrated and will begin cutting 0.0036 inches above where you want it to cut!!! You may need to adjust your index to correct for this.

2) Use the arrow keys to move down to the next block. Typically there will be two blocks, the first one will be set to 0.000000 degrees and the second one will be set at 90.00000 degrees.
3) Edit the above a-m accordingly.
4) Continue pressing the down arrow key until you exit the last block. You should come to a screen where you can edit the way the saw cuts, either DICE or Scribe. Dice will cut right to left and then move up the index and back over and then begin cutting right to left again. Scribe will start cutting right to left and then move up the index and cut back left to right then move up the index and continue cutting in that pattern.
5) Be sure to save your settings before you cut.
6) Then hit <auto> and then <enter>.
7) Now place the mounted wafer, “substrate”, on the saw and make sure it is lined up. Hold that steady and press <enter>. The vacuum should kick on and secure your substrate in place.

IV. Wafer Alignment

1) Enter substrate “mounted wafer” and press <enter>. Be sure to hold on to the wafer as the vacuum starts up. For information about mounting the wafers see part II.

Now you will automatically come to a different screen where you must now locate the edge of the wafer. You should be seeing a close up camera view of the wafer.

You now have to tell the saw where a straight line is by selecting three points along the edge of the wafer.

2) Once you have located an edge press <enter>.

The camera will automatically move itself and you will need to find the edge once again. You will then select your edge again by pressing <enter>. Complete this option as many times as is necessary to determine a straight cutting line.

3) Once you have selected the desired number of points press <s/enter>, (shift and enter at the same time) to complete this operation.
4) Now you must tell the machine where the zero is for the x & y by pressing <shift><.>. This will tell the saw where to actually begin cutting your straight line from.
NOTE: before you zero y or x make sure that you are well within the -1.0000 inch Start Cut value: see Step 6) g) above.

5) You will zero the x & y by pressing the up arrow key for the y and the right arrow key for the x. Should you make a mistake you can always recover the previous default values by pressing the down arrow key for y and the left arrow key for x.
6) Now you will have to repeat the above operations for all the blocks within your program.
7) Once you have completed aligning and zeroing all blocks press <s/enter> and the saw will finally be cutting!

V. Shutting down the Saw
1) Rinse the wafer with water and then dry it off with CDA.
2) Begin shutting down the saw by making sure that you work is saved.
3) Then unplug the main red power switch.
4) Turn off the pump (black switch on the floor behind the saw).
5) Turn off the water, the lowest blue valve on the clean room wall.
6) Return the CDA pressure to 40psi.

VI. Blade Removal and Installation

There are two types of blades for the saw; one is used for cutting metal and silicon, while the other, known as the “Silicon blade”, is used for cutting everything else. The blade used for cutting metal is known as the “copper” blade and will be marked H253JN-T3. The Silicon blade will be marked H255 RM – T3.

Tools needed: Find the red handled hex nut wrench and place that through the black donut shaped gripping device.

1) Remove the hood of the saw.
2) Unscrew and remove the special washers with the special red handled hex nut wrench.
3) Gently pull the blade out (BE VERY CAREFUL).
4) The writing must be facing out when you are placing the new blade on the saw.
5) Screw the hex nuts back on, again being very careful with the blade.
6) Place the hood back on the saw.

VII. Trouble Shooting

When it fails to do the above step and go to the title screen you will get an error message. For example, you may get a z-axis problem. When this is the case you need to make sure that the little black flag on the back of the machine is well outside the sensor. Then turn the saw off using the main red power switch on the
front of the saw, wait 5 minutes, and then turn it back on again. Should the saw still not go directly to the title page turn it off and then turn it back on again. It may take a few tries before it starts working properly. If the saw still won’t come on, you need to call either Rob Georgio cell: 602-690-6580 or Wade at ADVOTECH: 480-736-0406. Chances are they will want you to take off the side panel and mess around with the rack of electronics. If these guys fail to get the saw to work properly, inform the lab engineer, lab mechanic, lab manager then seek the nearest baseball bat and/or gun and do your worst on the saw.