Disco DAD 641 Dicing Saw SOP

Purpose and Scope

This document provides job breakdowns and reference information for the Disco DAD Dicing Saw operations.

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Reference Documents

Reference Documents	Specification No.
NanoFab User Guide	HTTPS://WWW.NANOFAB.UTAH.EDU/DOCUMENTS/2016/02/SMBB-USER-GUIDE.PDF/

Acronyms, Abbreviations and Definitions

Term	Description
SOP	Standard Operating Procedure

Equipment and Supplies

Description	
Dicing Blade	See User Notes

Safety

Safety alert symbol

The Safety Alert Symbol is used in conjunction with signal words to convey a personal injury hazard is present.

Signal words

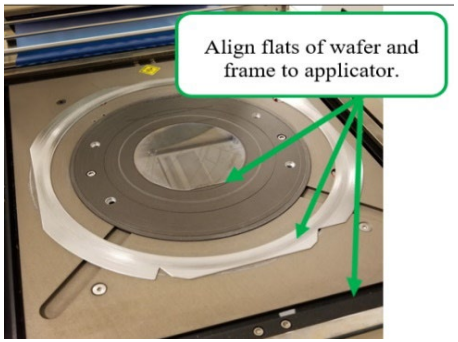
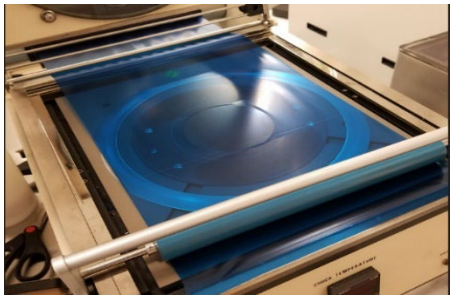
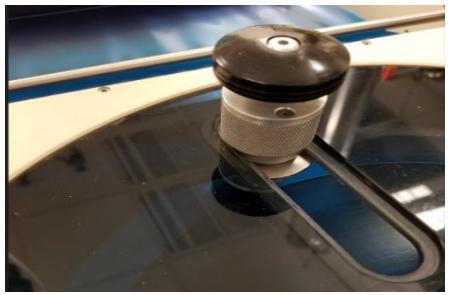
DANGER Indicates an imminently hazardous situation, which if not avoided, will result in death or serious injury. The Safety Alert Symbol should always be used.

WARNING Indicates a potentially hazardous situation, which if not avoided, may result in death or serious injury. If the safety alert symbol is NOT used in conjunction with this signal word, then the hazard conveyed is severe equipment or material damage.

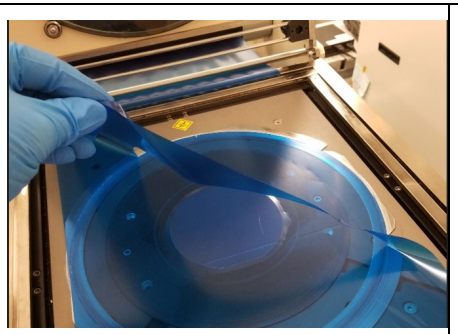
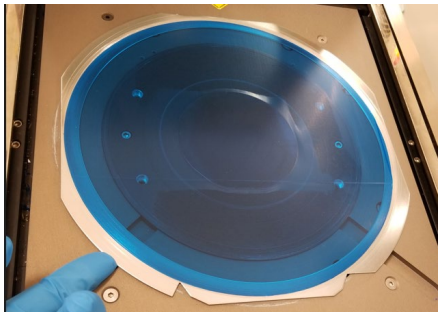
CAUTION Indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury. If the safety alert symbol is NOT used in conjunction with this signal word, then the hazard conveyed is minor equipment or material damage.

Job Breakdown 1 – Film Framing Substrate (1 of 2)

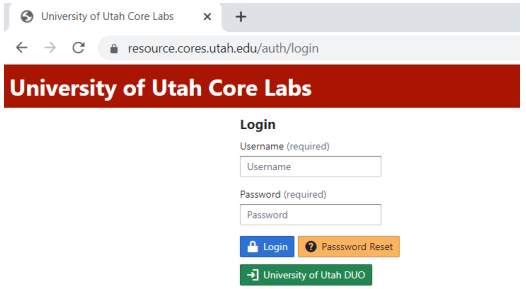
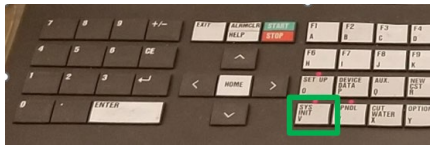
Follow this section to Film Frame a substrate.

1.	A. Place substrate face down in the tape applicator, aligning the substrate flat with the flat edge of the tape applicator. Use the scribed rings in the applicator as guides. *Note: The side that is face down will be the side that is facing up on the dicing saw. If your substrate doesn't have a flat, disregard any flat orientation in this document.* *B.* Center a tape frame around the substrate. Equally align the sides of the tape frame using the magnets to secure in place. Align the flat of the tape frame to be parallel to the applicator edge and the flat of the substrate if applicable.		☐
2.	A. Pull tape over the substrate and frame without touching them and affix the tape to the front and rear edges of the tape applicator. *NOTE: Make sure tape is not too wavy and it covers the film frame equally on both sides.* B. Lift up roller assembly pushing the roller slowly over the substrate and film frame. C. Return roller assembly into the lowered position and close hinged top.		☐
3.	A. Verify that the Film Frame is under the Circle Cutter by sighting the blade position above the centered Film Frame. Note: The cutter can be re-positioned by loosening its knurled knob on the handle. B. Push down lightly on knob and make just over one full turn going clockwise. Repeat the cutting a second time going in the counterclockwise direction. C. Use the push button cutter at the back of the cutter to cut the tape from the roll.		☐

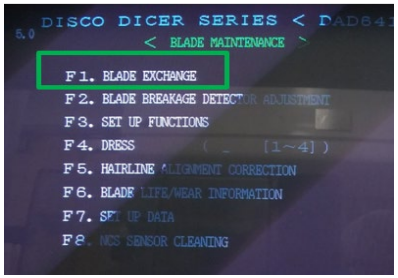
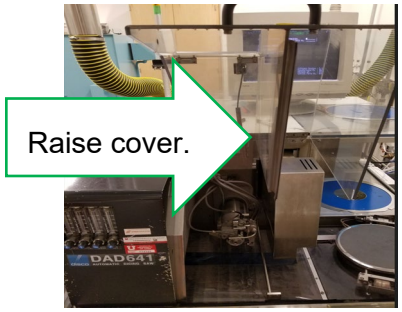
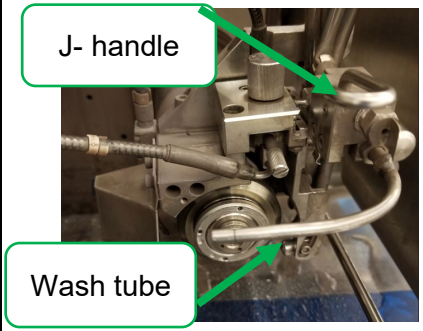
Job Breakdown 1 – Film Framing Substrate (2 of 2)

4.	A. Open hinged top and carefully. B. Lift up tape trimmings pulling radially outwards to prevent lifting up tape from Film Frame, in case there are spots where it hasn't been cut through. Note: It's best to start peeling from the back of the applicator and pull toward the front.		☐
5.	A. Slowly lift out the tape frame using the finger recesses. B. Lift at an angle to release the tape adhesive from the tape chuck without too much force to peel it from the tape frame.		☐

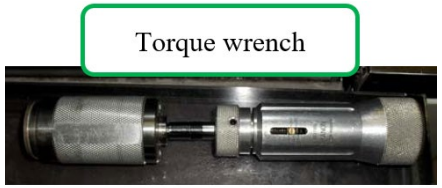
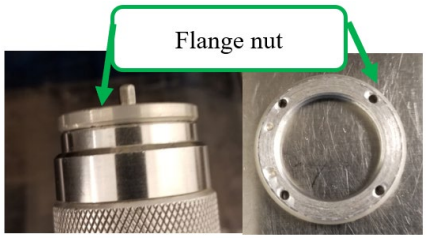
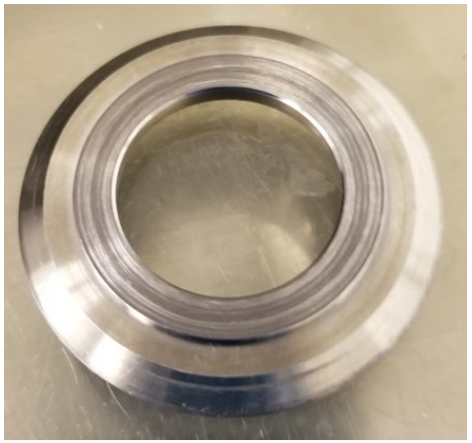
Job Breakdown 2 – Enable/Disable the Disco Dicing Saw (1 of 1)

1.	A. Login to HSC. B. Select the Disco DAD 641 Dicing saw. C. Select the desired block of time. a. Send “Unlock” to the tool for starting, b. Send “Lock” command if stopping.		☐
2.	A. Ensure splash cover is down. B. Open the door beneath the keyboard to access the start key to a. To start, turn the key to the right. b. To shut down, turn the key to the left.		☐
3.	If starting the system follow these steps, if not disregard. A. Slide keypad protector over keypad and out-of-the-way. B. Press **SYS INIT** key to initialize system.		☐

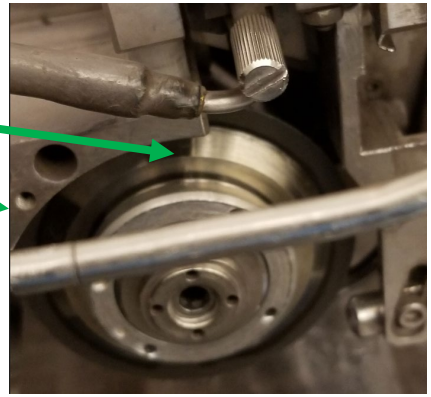
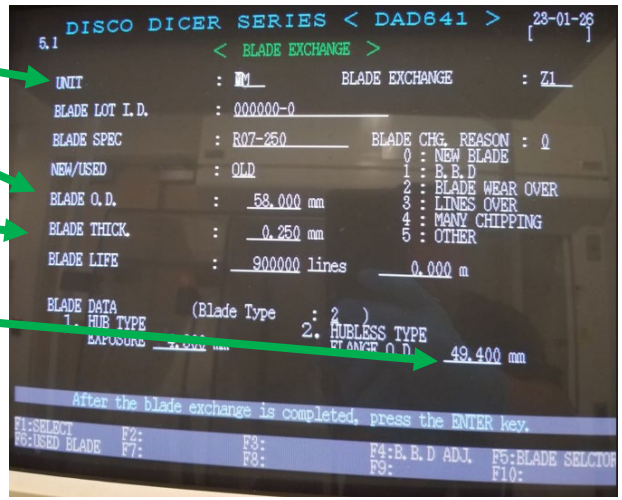
Job Breakdown 3 – Blade Exchange (1 of 3)

1.	A. From the Main Menu on the screen press F5 for Blade Maintenance. B. Go to the Blade Exchange Menu (F1) *Note: The CRT monitor on top of the tool sometimes needs to have the on/off button pushed after enabling to show the main menu screen. This can take a couple of iterations of pushing the on/off switch to get it to work.*		☐
2.	Carefully raise the Splash Cover all the way then let down gently: it should stay locked in up position; if not, try again.		☐
3.	Raise the wheel cover assembly out of the way to gain access to the spindle for blade replacement. *Note: Use the provided J-handle to lift the wheel cover assembly, not the wash tube.*		☐

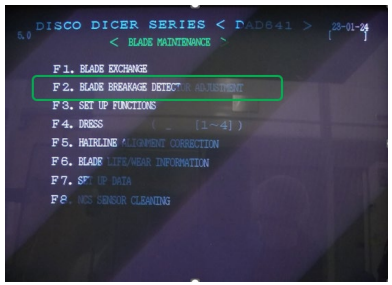
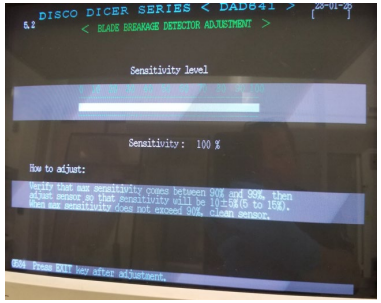
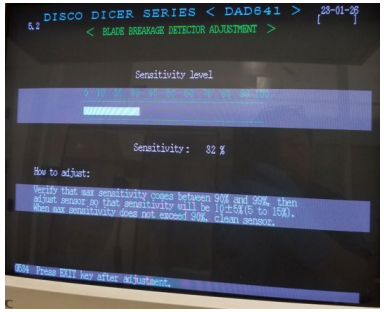
Job Breakdown 3 – Blade Exchange Continued (2 of 3)

4.	A. Using provided torque wrench to remove flange nut. B. Ensure you are holding onto the spindle with the center Allen key while rotating the spanner section. See Note below for more details. *Note: **The tool is left-handed: CW to loosen.** The torque wrench reversible tool-end has two "pin spanners," one wider than the other. Use the wider spanner to remove and install the flange nut. Do not disturb the inner, smaller spindle nut!*	 	☐
5.	Carefully, remove outer flange with thumb and middle-finger nails, grabbing it by the dovetail-turned protrusion on the outer flange. *Note: Do not drop outer flange, as any dent on the flange rim will weaken blade rigidity, resulting in excessive chipping and eventual broken blades. There is also a tool provided to grab the dovetail, however it tends to slip and most people do better using two finger method.*		☐

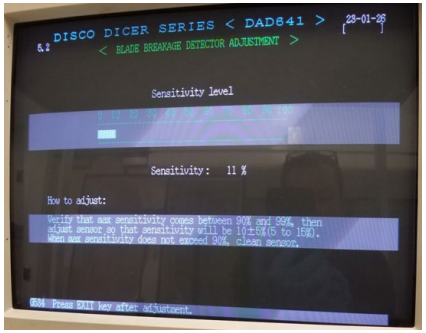
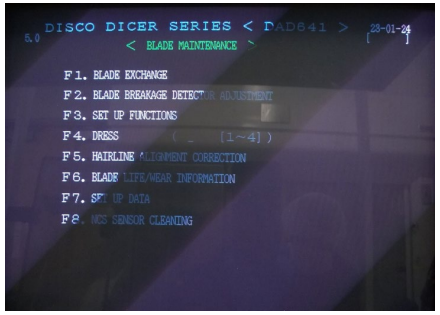
Job Breakdown 3 – Blade Exchange Continued (3 of 3)

6.	A. Place new blade on very gently, seating its inner circumference on the inner flange. B. Carefully replace outer flange C. Verify that the blade and flange are well seated by spinning the spindle by hand: no wobble should be detected. D. Tighten nut with torque wrench (set at 360 cNm) until "click" is felt and heard. *Note: The nut should be turned CCW relative to the shaft which is held by the Allen-key extension of the rear part of the wrench; alternatively, the rear part of the wrench may be turned CW relative to its front part. Leave BBD/wash-nozzle assembly in the up position for now.*		☐
7.	A. Select the appropriate UNIT (MM or Inch) with the **F1** key. B. Enter Blade O.D.(outside diameter, e.g. 58 mm). This number is the first dimension number (of 3) on the blade-cassette label. Press return C. Enter BLADE THICKNESS. D. Choose NEW/OLD Blade E. The BLADE TYPE: 2 and FLANGE O.D. 49.4 mmshould never change, but check, anyway, to make sure. F. Press **ENTER** and verify that the machine responds with a beep and "Data updated" at the bottom left of the screen. G. Press **EXIT** once to return to the < BLADE MAINTENANCE >screen.		☐

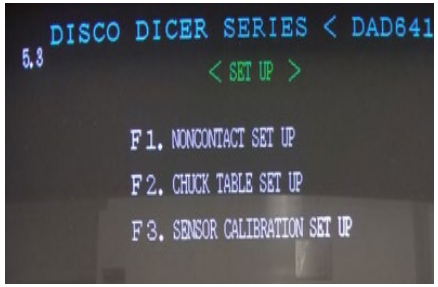
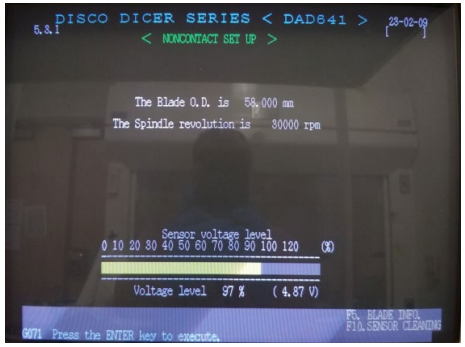
Job Breakdown 4 – Blade Breakage Detector (1 of 2)

1.	A. Go to the Blade Maintenance Screen. B. Select **F2** from the Blade Maintenance Screen.		☐
2.	With the blade breakage detector (BBD) raised, verify that the sensitivity meter reads above 90%; if not, detector needs to be cleaned, first; ask for help.		☐
3.	A. Carefully lower the BBD/wash-nozzle assembly with the J-shaped handle, watching the sensitivity meter so it doesn't go past zero. *Note: Refer to JB3-3 for reference.* B. Carefully adjust the Up/Down knob in the down direction until it reads about 30% before proceeding.		☐

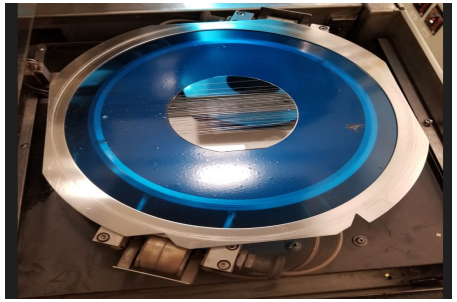
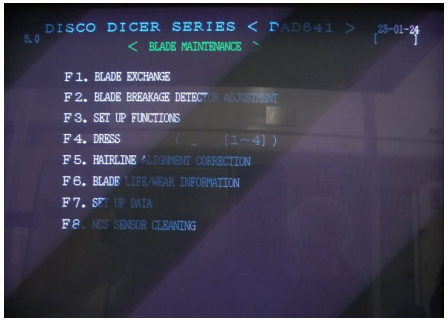
Job Breakdown 4 – Blade Breakage Continued (2 of 2)

4.	A. Complete the adjustment of the BBD knob, slowly rotate the blade and ensure the sensitivity meter reading is between 5% and 15% in all positions of the spindle. Note: A quality blade should run concentric enough not to fluctuate the reading by more than 2%. B. Hand-tighten clamp screw by turning knurled end CW until snug ensuring its stays at 10% +/- 1% C. Lower the Splash Cover by pushing up on the handle, then gently letting it down: Never force it down.		☐
5.	Exit back to Blade Maintenance Menu.		☐

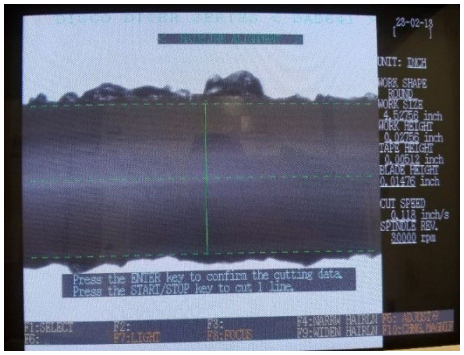
Job Breakdown 5 – Blade Set Up (1 of 1)

1.	A. From the Blade Maintenance Menu select Set Up Functions (F3) Note: You can also press the **SET UP** key on the key pad. B. Select Non Contact Setup (F1)		☐
2.	A. Follow prompts on the screen during Non Contact Set Up. B. Ensure the results are > 90% once the sensors are being checked. Note: If the Splash Cover had been opened since the last initialization, machine will first take a moment to reinitialize, then prompt you to "Execute one more time"; press Enter again; Setup is started.		☐

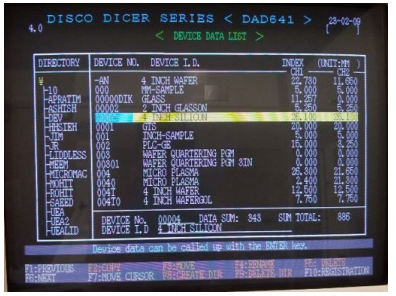
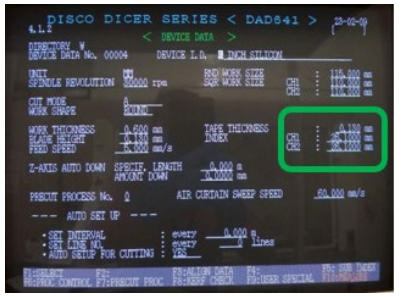
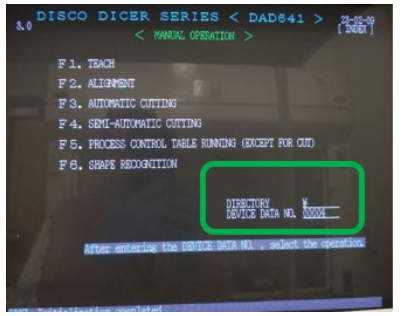
Job Breakdown 6 – Hairline Adjustment Correction (1 of 2)

1.	A. Place the framed substrate used for Hairline Adjustment Correction onto the chuck. *Note: This substrate is usually sitting off to the side of the vacuum chuck already framed for use by anyone using the dicing saw. If the substrate is fully used a new substrate can be mounted on a tape frame.* B. Align the flat and dicing cuts to the flat of the chuck housing. The cut will be made parallel to the keyboard.		☐
2.	A. Ensure fingers are out of the way of the substrate clamps on the chuck. B. Press CT Vac button		☐
3.	A. On the Blade Maintenance Menu press F5 Hairline Adjustment Correction.		☐

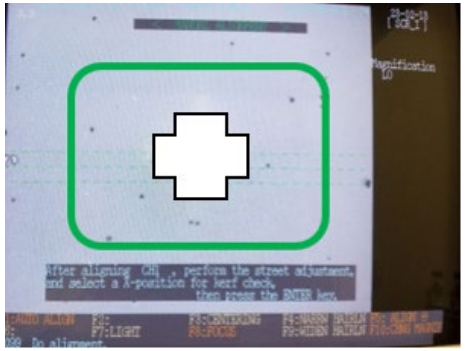
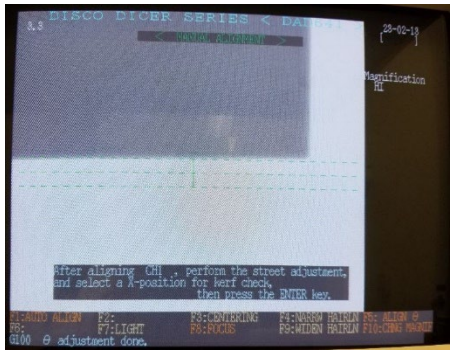
Job Breakdown 6 – Hairline Adjustment Correction Continued (2 of 2)

4.	A. Align hairlines by press **F8** to focus, then F8 to auto focus, then press exit. Note: Adjustments to lighting and focus will need to be made in order to see the substrate and previous cuts correctly. It's best to find the edge of a cut or the edge of the substrate to perform the focus and lighting intensity. Note: Use the Screen Index button to move one screen at a time until an edge can be found to perform focus and lighting. Index will move in increments found in the loaded recipe.		☐
5.	A. Press START/STOP to perform hairline cut. B. After cut is made, adjust hairlines with the cut, by y-jogging, and (F4) narrowing or (F9) widening hairlines. *Note: You may need to use the air gun to move the water from the streets to view it properly in the camera.* C. Press ENTER to complete Hairline Alignment.		☐

Job Breakdown 7 – Automatic Cutting (1 of 3)

1.	***Note: Keep fingers out of the way of the clamps.*** A. Mount the sample to be cut and press CT/VAC button. B. From the Main Menu press (F4) for Device Data List. C. Select your desired recipe or one to edit.		☐
2.	Check the recipe to ensure the parameters are correct or edit accordingly. *Note: Typically, the CH1 and CH2 parameters are changed to match the user's device size. These changes must be saved after editing. Once the changes are saved the recipe will be held in the memory when you exit out back to the Main Menu.*		☐
3.	A. Go to the Main Menu and select (F3) Manual Operation B. From the Manual Operation Screen select (F3) Automatic Cutting. *Note: The recipe is held in the memory that was just edited.* C. Press F4 for manual alignment		☐

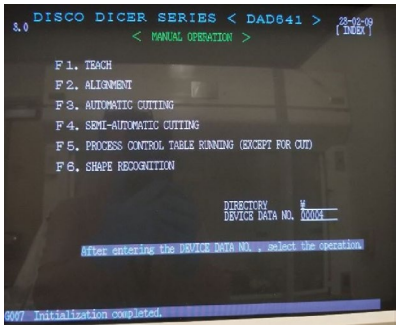
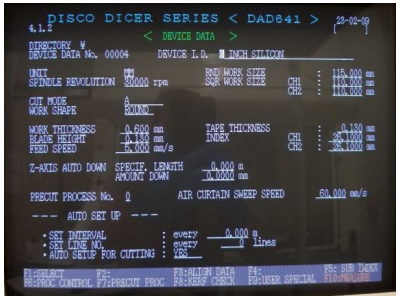
Job Breakdown 7 – Automatic Cutting Continued (2 of 3)

4.	A. Use the Light and Focus Keys to find a street or alignment image to focus. Note: The (F7 Light) and (F8 Focus) settings will be different for each sample. The (F10 Change Magnification) switches from low and high magnification. It's usually best to start with low magnification and do a rough alignment. Then use the high magnification to do the final alignment. The light and focus settings will be different for each magnification. B. Use the arrow keys to jog to the alignment features on the far-left side of your device. C. Follow the screen prompts and menus. D. Use the hairlines on the screen and adjust using the jog keys to line up with the alignment mark in the horizontal position. E. Press (F5) θ key which should move to the far right of the substrate. F. Jog and align the hairlines on the screen as you did in Step C and again press the (F5) θ key. This will align and go back the left side of the substrate, which should now be aligned in lo magnification.		☐
5.	A. Press F10 to enter high magnification and repeat previous JB7 Step 4 (C through E) to align CH1 using high magnification. The end alignment must be done in high magnification. B. Confirm you have good CH1 alignment. The hairline should be centered on the alignment marks, the blade will cut along the center line of the hairline image. if not repeat the previous alignment steps. C. Press enter when CH1 alignment is complete. Note: The alignment can be checked by consecutively pressing the (F5) θ key to go back and forth across the CH1 alignment. The hairline marks should stay horizontally aligned to your feature on both sides of the wafer. Always end back to the left side of the wafer before proceeding.		☐

Job Breakdown 7 – Automatic Cutting Continued (3 of 3)

6.	Press the index button and ensure the cross hairs land on the desired targets. Note: These parameters come from the data in the recipe. Lift-off processes may have considerably more error between alignment streets.		☐
7.	Machine will rotate table to CH2 as defined in the recipe (usually 90 degrees). Repeat the alignment using the F5 key for CH2. Minimal changes should be necessary if good alignment was achieved in CH1.		
8.	Jog the sample to view alignment marks or streets and ensure that CH2 is aligned. Use the hairlines on the screen to align to the streets. Pressing the (F5) θ key will move to the far right of the substrate and pressing (F5) again will return to the original position. Note: Visually check the Ch2 alignment by pressing the “index” button which will allow the channel to index in the parameters for the chosen recipe.		☐
9.	Following Manual Alignment, start cutting by pressing **START/STOP** key. Note: Pause the cutting by pressing **START/STOP** key again. The machine will stop after it finishes the current cut. The machine will stop under the microscope for your inspection. You may jog only the *x* and *y* stages without disturbing the program. Cutting is resumed with a press of the **START/STOP** key. If cutting is noisy, suspect imminent blade breakage and press the red **Z EM** key, your best emergency response in most situations. The big EMO button should only be used as a last resort.		☐

Job Breakdown 8 – Semi Auto Cutting (1 of X)

1.	A. Follow steps 1-5 from JB7. B. Select F4 Semi-automatic cutting.		☐
2.	Check the recipe to ensure the parameters are correct or edit accordingly. *Note: Typically, the CH1 and CH2 parameters are changed to match the user's device size. These changes must be saved after editing. Once the changes are saved the recipe will be held in the memory when you exit out back to the Main Menu.*		☐

Job Reference 1 – User Notes (1 of 1)

Auto Cutting - This is for cutting automatically in one to four, precisely angled, directions (channels), possibly with Sub-Indexing. **This option is not used on the Disco DAD 641**

Without Sub-Indexing - Designed to cut in two orthogonal directions (CH1& CH2) in sequence, with a constant INDEX(specified in selected Device Data) for each channel. Without Sub-Indexing, the number of cuts are automatically figured out by the machine to cover the entire substrate, assumed centered and with dimensions specified in selected Device Data.

Semi-Automatic Cutting - For making cuts in only one direction (one channel). Advantage over Auto Cutting: number of cuts and position of first cut may be specified and *altered* with a single alignment.

Index Key - Toggles "index stepping" on/off. This will cause the front-rear-pointing (*y*) Jog keys to move the *y*-stage by CH1Index value (set in selected Device Data) and the left-right-pointing (*x*) Jog keys to move the *x*-stage by the CH2 Index value; this will be reversed when aligning for CH2. This mode is best for moving from one street on the substrate to the next, for inspection purposes. Also, with index- stepping on, pressing the "CW □" Jog key (with CW arrow drawn on it) switches to CH2 alignment; pressing the other (CCW) □ Jog key returns it to CH1.

SCR Index - Toggles "screen-stepping" mode on/off. This mode is programmed to move the table in approximately one screen (0.400-mm) per step, in both the *x* and *y* directions. This mode is best for moving short distances. It also affects the □ Jog keys: each brief press rotates the chuck through 2-degrees.

Jog keys - With neither mode selected ("[]" on screen), each brief press of a translation Jog key moves its corresponding stage by approximately 2 microns. Pressing and holding any Jog key in this mode, moves its corresponding stage smoothly at three consecutively higher speeds: very slow for the first two seconds the key is held down; an intermediate speed for the next two seconds; very fast (10-mm/s in the *y* direction, 45-mm/s in the *x*) thereafter. This key mode is the best for both micro-adjustments and covering large distances. Its effect on the θ Jog keys is similar.

Dicing blades can be purchased from Staff Members.

Best blade for glass = 58 X 0.250 X 40 or 57 X 0.250 X 40

Best blade for silicon = 52 X 0.90 X 40

Use black arrow key to stop dimming of screen.

Blue Tape thickness = 130 um

UV Tape thickness = 160 um

Always leave 100 um gap above table.

Revision History

Rev	Author	Date	Description of Change
E	Jim Pierce	12/20/2023	Remove contact and other information.
D	Jim Pierce	10/10/2023	Add Dicing Request Form and other updates.
C	Jim Pierce	05/15/2023	Adding detail and clarifications in several places.
B	Jim Pierce	01 Jan 2023	Complete re-write.
A	Sam Bell	19 Apr 2010	Initial Release