# GCA AUTOSTEP 200 STEPPER INSTRUCTIONS

**General information:**

Our stepper, located in the class 100 area, is an i-line 5:1 reduction tool. The wavelength of i-line emission is 365 nm, and the stepper has a lens with a numerical aperture NA=0.4, giving a resolution of 0.5 μm and a depth of focus of ±1 μm. A 5" reticle is used, and the largest square area that can be exposed on the wafer is 14.85 mm on a side.

**OPERATING PROCEDURE:**

**IMPORTANT: The stepper is a very delicate and expensive piece of equipment. It sometimes malfunctions (especially at reticle loading). Follow the procedure given below, and if something doesn't seem correct, or it gives you an error message, then the machine has probably malfunctioned. DO NOT try to fix anything!! Contact Mike Thomas or Mark Richmond.**

1. Be sure that the proper reticle has been loaded into the reticle handling system. If you reticle has a barcode, type RMSDIR after you log in to display the loaded reticles. If your reticle does not have a barcode, check the board on the stepper to determine the floor number (1-10) of your reticle. Only Mike Thomas, Mark Richmond, and specially trained users can load reticles into the reticle handling system. Check with the TA if the reticle that you need is not in the system.
2. Enable the stepper in Coral.
3. Place your wafer onto the chuck with the wafer notch against the banking pin at the back of the chuck, and be sure that the wafer is snug against the banking pin at the left side of the chuck. Turn on the chuck vacuum switch. Carefully place the chuck back on the stage (**avoid hitting the microscope objectives**). Be sure that the chuck is seated properly. Turn on the θ-stage vacuum. Close the doors on the stepper enclosure.
4. Before exposing your first wafer you must log in by typing: **LOG IN [42,1]**, and when asked for the password type: ICFAB to log into the stepper. Check for files by typing **LISTF**. There should be only a few files, the job files used to expose your wafers.
5. Check the chuck size by typing the command **CHUCK**. Select the "Set Chuck size" option. If the chuck size is already 100, just hit return. If the chuck size is anything else, type **100** and hit return. Users are supposed to leave the system with chuck size 100, but sometimes do not.
6. To execute the exposure job, type **EXEC JOBNAME\PASS**. If you want to use μDFAS local alignment, the type **MAP JOBNAME\PASS.** The job name will be IC0 or one of the other jobs, depending on which layer is being processed. The computer then asks you a series of questions. The questions and your response are shown below. If the response already shows up on the screen, you can just hit return. If not, type what is in BOLD, then hit (return).
    Expose: **.24** (return)  Check for the nominal time on the white board
    Focus  (return)
    Reticle Bar code: [The barcode shows up here]  (return)
    Floor #: **{type your reticle position, 1-10}** (return) {Type a number only if there is no barcode}
    Alignment Mark Phase: **N** (return)
6. The system will load the requested mask. Wait for the display to show "START AWH". It can take a few seconds. Note: this is where most system errors occur. If the display does not

show "START AWH", the system has not loaded the reticle correctly, and you must contact Mike Thomas.

7. Now you start the exposure execution. Press the **MAN** button on the right side of the keyboard. Press the **MAN** button again.

8. If you are doing an alignment, the alignment marks should show in the two windows on the screen. If this is your first lithography step there are no marks on the wafer, and you can skip this step. Using the left/right/up/down, and +θ, –θ buttons on the right side of the keyboard you will move the alignment marks to match the marks on the screen. To toggle between the fast and slow speeds, press the **SPEED** button. To change the speed of the stage motion for both the fast and slow modes, press **O**. Be sure to be at low speed for the final alignment. If you don't see the marks, you probably didn't load the wafer properly against the banking pins. Start the alignment procedure with the right side alignment mark. Move the horizontal and vertical marks on the wafer inside the Cross Hair Pattern using the keyboard. Now, working with the left side alignment mark, move the horizontal alignment marks inside the horizontal Cross Hair Pattern using the "theta" control. If necessary, switch back and forth between x-y and theta adjustment several times as they interact with each other.

9. NOTE: There may be a slight offset in the x direction in the alignment between the marks on the left and right screen. If so, align the wafer in x and y using the marks on the right side, and use the marks on the left side only to adjust the rotation (theta). There is a limit range Theta motion (±1˚). If the alignment marks do not appear on the video screen then you must repeat the mechanical alignment of the wafer against the 2 pins on the chuck. Turn off the wafer vacuum and gently reseat it against the 2 pins. Turn the vacuum back on and check the video screen. If you still can't see the marks, turn off the theta stage vacuum and move the chuck slightly until you can see the marks.

10. When the x-y and theta alignments are correct, press the **EXPOSE** button. The system will now expose your wafer.

11. When the wafer is finished, the stage will move to the load position. Turn off the θ-stage vacuum and remove the chuck. Turn off the chuck vacuum and remove your wafer. If you have more wafers, carefully place the next wafer on the chuck and turn on the chuck vacuum. Replace the chuck and turn on the θ-stage vacuum. Press the **MAN** button to move this wafer into alignment position. Repeat steps 8-9 to expose the rest of your wafers.

12. When all of your wafers have been exposed, quit the program by pressing **CTRL-C** then **A**.

13. Send the reticle back to the elevator by typing: **RMSRET**.

14. Log out by typing: **LOG OUT**.

15. Disable the system in Coral.

Changing a reticle
**Note: Unless you have been trained by Prof. Snider or the lab staff, you are NOT AUTHORIZED to change reticles.**
To change a reticle, type the command RMSL. Wait until the turntable stops moving. If you touch the turntable, DO NOT touch the forks. Remove the reticle box from the stepper elevator and move it to a hood. Remove the old reticle, storing it properly, and put your new reticle in the box, making sure that the bar code goes in the proper orientation (marked on the box). Put the reticle box back in the stepper elevator. Press (return). The stepper will then do an inventory of the reticles.