

## SOP for ABI Flood Source/Mask Aligner

Version: 22 April 2013

### General Use Precautions:

- **Emergency Stop**—If something goes horribly wrong with the mask aligner, a large red button (above the right control panel) can be hit to stop the pneumatic system and minimize damage to the equipment. **NOTE: The Emergency Stop will not turn off the Mercury Flood Source power supply. In the unlikely event of a “catastrophic failure” of the mercury lamp, turn the flood source power supply off using the double toggle on the front of the unit.**
- **Auto Exposure Setting**—In most applications, the **Auto Exposure** toggle switch (on the left control panel) should be left in the **ON** position. When in this setting, the flood source shutter will automatically open for the designated time when the **LIGHT SOURCE** toggle switch (on the right control panel) is flipped to **EXPOSE**. During normal operation, the four colored buttons on the left control panel should not need to be used with this setting.
- **Eye Protection**—UV protective goggles must be worn while using the mercury flood source. They are stored in the top plastic drawer below the table.

### General Use Procedure:

1. **Turn on the Hg lamp power supply** (below the table and to the left) by flipping the double-toggle to the UP position. Press and hold the starter rocker switch (at left) until the lamp has ignited. A high pitch whine will be audible. Allow approximately 10 minutes for lamp warm-up.
2. **Turn on the mask aligner** by flipping the rocker switch at the lower right of the base to the on position. The vacuum pump will turn on. **Open the green ball valve** to the left of the instrument to supply positive pressure for the pneumatic system.
3. Check that the system pressure is 50 psi and that the system vacuum is 27 in.Hg. The system pressure and vacuum gauges are above the right control panel.
4. Flip the **NITROGEN FLOW** toggle on the right control panel to the **ON** position. The gauge should indicate ~2.5 in.H<sub>2</sub>O. If necessary, adjust the flow by turning the knob below the gauge.
5. Lower the Substrate Chuck by turning the vertical, height adjustment knob (upper or lower half) **Clockwise**. The top of the gasket should be about level with the mask frame.
6. Place the substrate on the substrate chuck and flip the **SUB VAC** toggle switch to **ON**. The **SUB VAC** gauge should indicate ~27 in.Hg.
7. Place the mask on the mask frame and push the **MASK VAC** button switch to **ON**. The **MASK VAC** gauge should indicate ~27 in.Hg.
8. Adjust the substrate relative to the mask by altering the position of the substrate chuck. The horizontal knob below and to the right of the mask frame controls the X position of the chuck. Likewise, the horizontal knob below and in front controls the Y position. The horizontal knob below and to the left of the mask frame will rotate the substrate chuck.
9. Raise the substrate chuck by turning the **UPPER HALF** of the height adjustment knob **Counter-Clockwise**. It is important that, while raising the substrate chuck, one presses the **Chuck Leveling** button at the base of the mask frame support. The height adjustment knob will slip when the chuck cannot be raised further. When the maximum height is reached, loosen the set screw on the lower half of the knob, rotate the dial to **0** and re-tighten the set screw. Now, lower the substrate chuck by **20 μm** by turning the **LOWER HALF** of the height knob **Clockwise** to **20** on the dial. **NOTE: For thicker substrates, align the mask and substrate (outlined in step**

**10) if necessary and then raise the stage by turning the knob an additional 1/4 turn; skip to step 12.**

10. If necessary, repeat **step 7** for more precise chuck-to-substrate alignment while using the **ALIGNMENT SYSTEM** microscope. Flip the corresponding toggle switch to **ALIGN** to position the scope over the substrate chuck. **NOTE: Take care that the microscope lens does not impact the Mask Frame by raising the microscope using the macro-focus knob before flipping the toggle switch to ALIGN.** To change the microscope's X and Y positions, use the two buttons on the positioning handle to free their respective brakes. When finished, flip the **ALIGNMENT SYSTEM** toggle back to the **HOME** position.
11. Apply contact vacuum between the mask and substrate by flipping the **CONTACT VAC** toggle switch to the **ON** position. The **CONTACT VAC** gauge should indicate ~3 in.Hg. If necessary, adjust the vacuum by turning the knob below the gauge. If applying contact vacuum breaks the mask vacuum, turn the contact vacuum **OFF**, lower the substrate chuck using the **LOWER HALF** of the chuck height adjustment knob, and repeat **steps 9-11** until successful.
12. Set the **Exposure Time** on the timer box on the left control panel. Exposure time depends on the photoresist material and thickness.
13. Expose the substrate by flipping the **LIGHT SOURCE** toggle (on the right control panel) to the **EXPOSE** position. When the exposure is complete, flip the toggle back to the **HOME** position.
14. If necessary, break the contact vacuum by flipping the **CONTACT VAC** toggle to the **OFF** position. If no more substrates will be exposed, skip to **step 16**.
15. To expose another substrate using the same mask, raise the **Mask Frame** by flipping its corresponding toggle switch to the **UP** position. Break the substrate vacuum by flipping the **SUB VAC** toggle to the **OFF** position. Remove the exposed substrate and replace it with an unexposed substrate. Reapply substrate vacuum and lower the **Mask Frame**. If necessary, align the new substrate relative to the mask using the aforementioned chuck X, Y, and rotational position adjusters. If necessary, reapply contact vacuum by flipping the **CONTACT VAC** toggle to the **ON** position. Repeat **steps 13 & 14**.
16. Break the mask vacuum by pulling the **MASK VAC** button switch to the **OFF** position. Remove the mask.
17. Break the substrate vacuum by flipping the **SUB VAC** toggle to the **OFF** position. Remove the substrate.
18. If necessary, post-development substrates can be inspected using the **ALIGNMENT SYSTEM** microscope. Again, **take care that the microscope lens does not impact the Mask Frame by raising the microscope using the macro-focus knob before flipping the corresponding toggle switch to ALIGN.**
19. Turn off the **NITROGEN FLOW** by flipping its corresponding toggle to the **OFF** position.
20. Turn the mask aligner pneumatic system off using the rocker switch below the base (lower right). Close the green ball valve to the left of the instrument.
21. If no-one else is scheduled to use the flood source/mask aligner later in the day, turn off the flood source power supply using the double-toggle on the front of the unit; **otherwise, leave the unit on, as frequent ignition of the mercury lamp will shorten its life.**