GENERAL PROCESS AND OPERATION SPECIFICATION

Clustex

I.   SCOPE
   a. The purpose of this document is to describe requirements and basic operating instructions for the Clustex tool. This deposition tool is intended for up to 4" substrates and can be deposited on by up to three magnetron sputtering heads.

II.   SAFETY
   a. Be sure that you are trained and signed off to use this equipment per AggieFab policy.
   b. Refer to Safety Features in Clustex Operating Instructions manual.
   c. Operating personnel need to be aware of the hazards that they may be exposed to while operating the tool.
      i.   Electrical Hazards: high voltages can exist at the tool, power rack, pumps and other areas.
      ii. Toxic Substance Hazards: wafers may be coated with toxic materials. Exercise caution when handling processed materials.
      iii. Process Gases: Nitrogen, Argon, and Oxygen.
      iv. Strong Magnetic Fields: Magnetrons can cause disruptions in pacemakers and other electrical implants.
   d. If you are unsure about any procedure or indication while operating this equipment, contact a staff member or trainer for assistance.

III. APPLICABLE DOCUMENTS, MATERIALS AND REQUIREMENTS
   a. For more information about the detailed operation of this tool refer to the Clustex operation specification or electronic manual.
   b. Appendix A: Currently Installed Targets
   c. Appendix B: Recipe Creation and Editing
   d. Appendix C: Home Screen Monitor

IV.   OPERATION
   a. Log into your account:
      i.   Click "User" on the top left of the window
      ii. Select your account and type in your password
   b. Select the "Overview" tab to ensure there are no active alarms
      i.   Active alarms will be colored red. Noticeable places to check are: three pumps, water flow for magnetrons, and the detail window.
   c. Create/edit your recipe
      i.   Select the "Recipe" tab
      ii. To create a new recipe:
         1. Select the "Category" to store your recipe in
         2. Click the "new" button under "Recipes"
         3. Use previous recipes as macros to simplify the recipe and copy steps from existing recipes to keep the same format.
         4. The general process should be process start → plasma start → substrate movement → plasma finish → process end

        iii. To edit an existing recipe (NOTE: Do not edit pre-existing recipes unless it is your own.):
1. Select "Category" and "Recipe" you want to edit.
2. Select the step you wish to edit
3. Click the "toolbox" button above the list of recipe steps
4. To review your entire recipe, select the "tree view" option above the list of steps. This will show you every step, even within the macros you use.

        iv. NOTE: The software does NOT verify the logic of a recipe. An improper recipe can still be saved and run.

        v. Save the recipe you created/edited

d. Run your recipe
    i. Under "Recipe" at the bottom of the window, select "On"
    ii. Choose the Category and Recipe you want to run
    iii. Click "Ok"
    iv. Ensure the "Reflected Power" is ~0 W and the "Bias Voltage" > 5V on the "Process" screen
    v. To view the steps of the recipe being run:
1. Select "Tools" in the upper left of the window
2. Click Layers and a window of the recipe will appear

    vi. If an error or warning appears, the recipe will be put on "Break"
1. Press "Error Reset" to acknowledge the warning
2. Press "On" under Recipe at the bottom of the window to continue the recipe after the error has been solved. If error cannot be solved, stop the recipe and attempt to fix the issue within the recipe.

    vii. The recipe name and step will be displayed in the top right of the screen. When completed this will display "Recipe Completed"

e. Logout when finished with the tool:
    i. Click "User" in the menu bar
    ii. Select "Change User"
    iii. Choose "logout" as the user and enter "logout" for the password

V. **SIGNATURES AND REVISION HISTORY**
   a. Author of this document: Mitchell Roselius
   b. Author Title or Role: Student Technician
   c. Date: 24 October 2019
   d. Revision: A

Approvals:

Technical Manager Signature: _____

Date: _____

Revision History:

Revision	Author	Date
Original Issue	Mitchell Roselius	24 October 2019
Rev A		
Rev B		
Rev C		
Rev D		
Rev E		

Appendix A – Currently Installed Targets

Magnetron #	Generator	Target Mat'l	Date Installed/changed	# of Spares	Cost from Lesker 2" dia, 0.125"
1	1RF	N/A - Ion Etch	^04/15		
2	1RF	SiO2	2/14/2017		$97
3	1RF	W	1/15/2016		$209
4	1RF	VO2	6/18/2016		RFQ
5	1RF	Nb2O5	11/29/2015	1	$228
6	2RF	Si	7/29/2015	1 (new)	$169
7	2RF	TiN?	3/6/2015	1 (new)	$506
8	2RF	Al2O3	7/29/2015		$424
9	2RF	Ir	9/15/2016		Price on Request
10	2RF	NbO2	No date entered	1	$228
11	3RF	HfO2	2/29/15		$646
12	3RF	Ta2O5	2/8/2015		$451
13	3RF	TiO2	6/27/2016		$382
14	3RF	Ru	11/20/2015		Price on Request
15	3RF	Zr	4/29/2016		$94
16	3RF	Hf	No date entered	1	$373
17	4DC	Ti	9/12/2016		$85
18	4DC	Ta	? 2016		$218
19	4DC	Pt	4/29/2016		Price on Request
20	1RF	Cr	7/29/2015		$138

Appendix B – Recipe Creation and Editing

Buttons

⬜	Generates a new category and a new recipe. After generation, you must assign a suitable name to the category or to the recipe.
📋 📋	Copy and insert a line in a recipe.
✕	Delete an entry in a category or in a recipe.
➡ ➡ ➡	Delete, add or insert a line in a recipe.
↕ ↕	Sorts the list in alphabetical order forward or backward.
➡ ➡	Moves a line in a recipe upward or downward.
🛠	Opens a user dialog for creating a recipe. The sub-menus open corresponding toolboxes: • control objects, • direct sequential control • date/time control • conditional commands, • PC commands

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💾	Saving a recipe: After a recipe is created, all changes are saved directly and automatically. The changes are saved to the file "Recipe.mdb" (Microsoft Access) on the "Steps" page. Saving done by pressing this button causes the recipe to also be saved in the database on the "ComStep" page.
"table view and "tree view"	Representation of the operating steps selectively in tabular form or in the form of a directory tree, similar to that of "Microsoft Explorer".
🛠	"Debug-mode" - if this function is activated, the program steps through its sequence. After each operating step is processed, the recipe stops (BREAK) and the user must then activate it again by pressing the Recipe [ON] button in the main command bar.

Appendix C – Home Screen Monitor
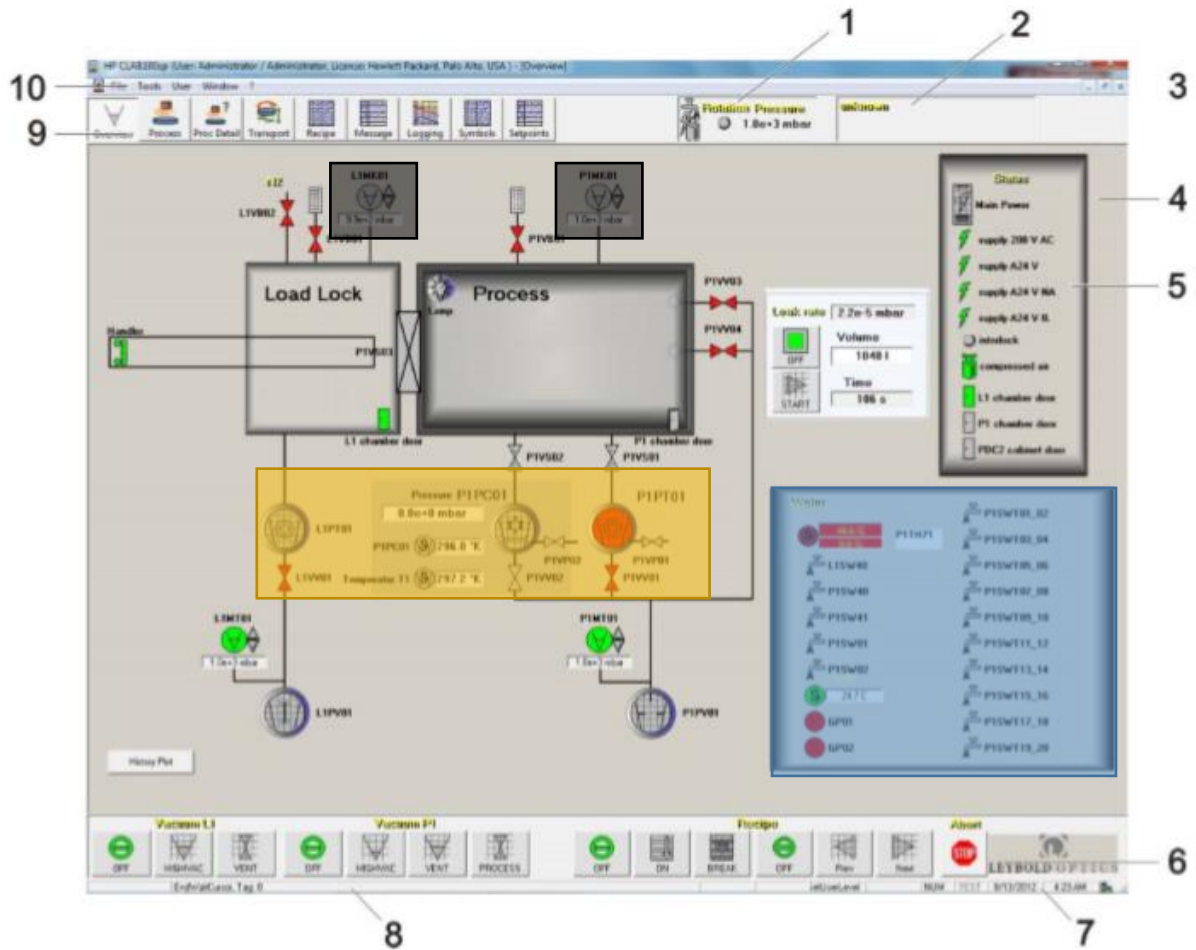
Typical screen display

1 State field
2 Display of recipe status
3 Closing the visualization window
4 Visualization window
5 Detail window

6 main command bar
7 Date and time
8 Status bar
9 main menu bar
10 menu bar

Blue – Water flow for magnetrons

Yellow – Load lock roughing pump, process chamber cryo pump, process chamber turbo pump

Black – Pressure gauges for load lock and process chamber