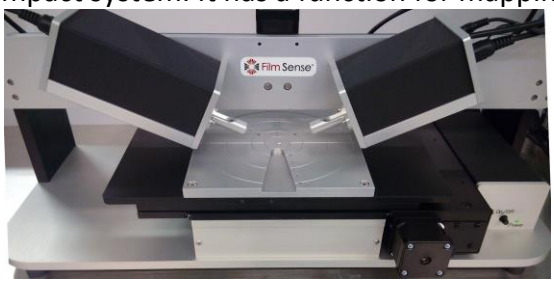
University of Minnesota Nano Fabrication Center
Standard Operating Procedure

Equipment Name:	Film-Sense		
Badger Name:	P2 Ellipsometer Film-Sense	**Revision Number:**	2
Model:	FS-1	**Revisionist**:	Tony Whipple
Location:	Bay 1	**Date:**	3/27/2020

1 Description

The Film Sense FS-1™ Multi-Wavelength Ellipsometer uses long-life LED's and a no-moving-parts ellipsometric detector to provide fast and reliable thin film measurements in an easy-to-use, compact system. It has a function for mapping surface thickness too.



2 Safety

a Watch the stage area, do NOT have items in front of this area due to the stage might move and hit it. DO NOT block or push on the stage.
b The system uses electrical power
c Do not edit the recipe and do not save the recipes.
d Do not edit any system parameters or machine settings.

3 Restrictions/Requirements

a Must be a qualified user.
b Need to have X.500 UMN account or get access to the guest industry account.

4 Required Facilities

a Power from outlet

5 Definitions

a Stage - is the part that thee wafers or sample sits on while being measured.

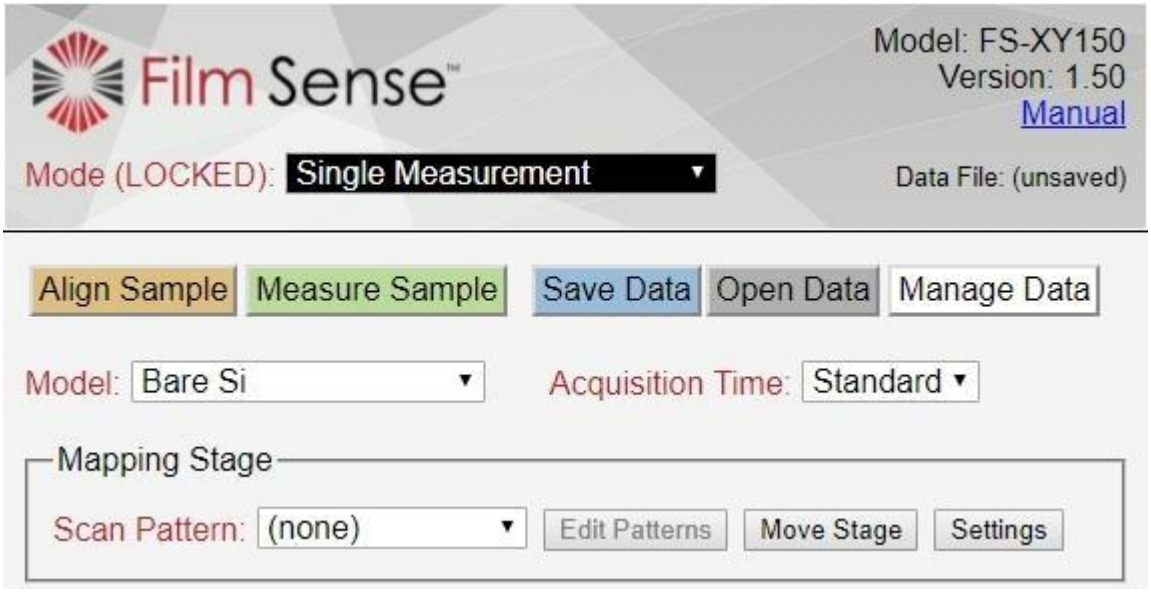
6 Operating Instructions

a LOGGING ON
1 Enable system and then log into the PC itself by using your X.500 account
2 Start up the software - click on the Film Sense icon 

to start.

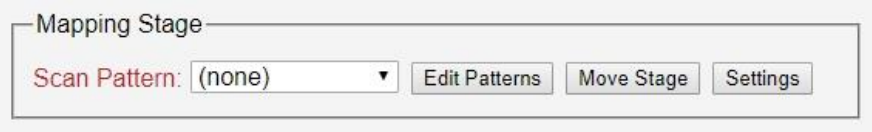
b SETUP PROCEDURE *Selecting the correct testing method or model*

1 The system should start up into the normal main screen.

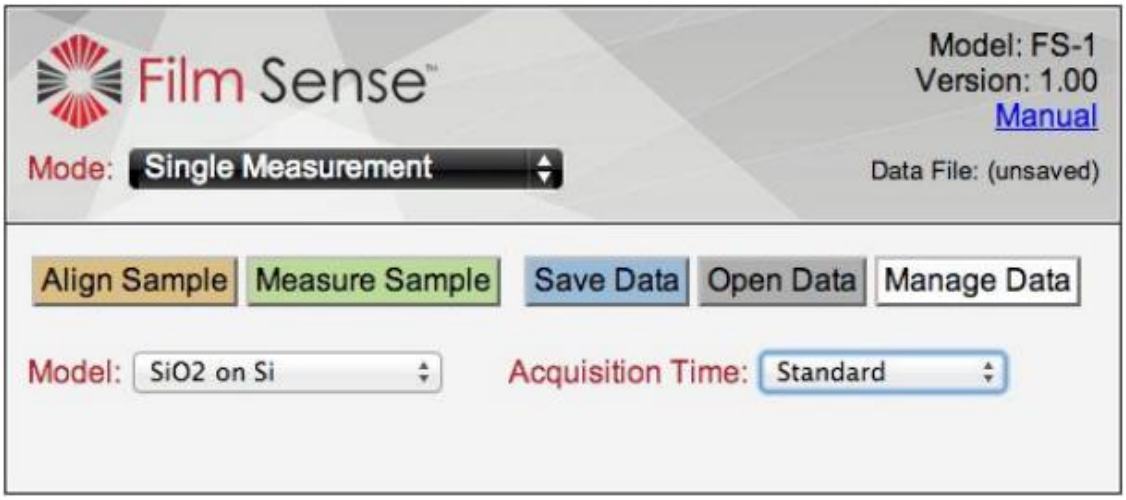


c MOVE STAGE *Best location from wafer placement*

To be able to load the wafer you might need to move the stage forward.



In Mapping Stage look for and click on the Move Stage button. See Appendix 1.

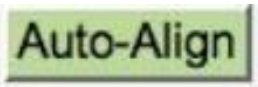


Select recipe by right side of the window on the Model line this will display a recipe menu.

d ALIGN SAMPLE *Best signal from wafer*

1 To have the system find the correct height of the wafer you need to align sample For the maximum signal – this is done within software. From within the Single Measurement mode select the left box labeled **Align Sample** then **Auto-Align** box. The Z-axis can be manually moved (by software) **NEVER** touch or push the stage. This is done by pressing on the left or right arrows on the keyboard.

Fig 2. Align sample box



and the Auto-Align box.

2 Make sure the wafer is under the laser light if not more wafer or move stage.
3 Intensity values vary for each sample, a bare wafer measures about 9 or 10 level.
4 The stage control can be accessed by clicking on the Move Stage tab. Exit the screens when done by pressing the back button. 

d STARTING MEASURING *Film Thickness by single measurement mode*

1. The wafer should be in place from doing the alignment step.

2. Load the desired recipe by pressing the area to the right of Model: 

to select your film to measure.

3. Select the number of measuring points by selecting the scan pattern 1, 5, or more. This can be skipped and measurements can be made at the current position.

WARNING:

DO NOT have anything in front of stage area ever. While it is measuring the stage moves and it will crash into anything in front of it. Keep system safe, have table in front of stage clear.

4 Press the **Measure Sample** button 

and then watch the system run. The resulting thickness from each measured point will be displayed. The stage will move around while each point is being measured. After it is done the results will be displayed. If several points were selected an wafer map will be displayed.

Fig. 2. Notice the data results .

5 It best to know the layers and the expected thickness. Do not trust the values given but make sure they make sense and agree with what is expected.

6 Remove the wafer, the stage might need to be moved to get access to the wafer.

7 You can capture the image from the screen or get other data from results.

8 Save the data by selecting the Save Data button and selecting the folder called Default and enter a File name then click the OK box. The File should be able to be found at the **C:\Users\ your x.500 name \ Downloads** directory.

9 Before leaving have the stage move to the center or back position to keep it safe.

10 Close the X.500 account on the system, and log out of enabling system.

WARNING:

DO NOT EVER try to move the **Z-axis** or push on the **stage** of the system.
DO NOT PRESS **ABORT** unless there is a problem with the system.
DO NOT EVER **EDIT** any of the film recipes.
DO NOT use this PC for normal web surfing, this is for thin film measuring only.
Remember to log off the system when done and disable it too.
Film you want to measure is not found on the list? Ask and MNC staff will try to add it to the list. Exploring new types of films contact trainer for more info on the system capabilities.

7 Problems and Solutions

1. The software does not start up correctly.
   Check to see that the unit itself has power to it.

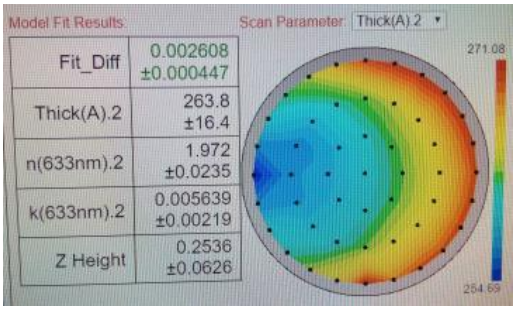
   If not push in the power button. 

   This should always be on.

   Check that the address on the browser task bar line to make sure it is correct.

   Make sure this is what the browser is pointing at: 

2. The wafer map of thickness is complete, how do I get the image from the software? Select the Save Data button.



3. The system will not let me log in. Contact Matt Lowe for account access or Becky Von Dissen if you do not have a UMN X.500 account. They can give you info to get access.

4. The auto alignment is not working not signal value. You might need to move the stage or move wafer. See example values below.

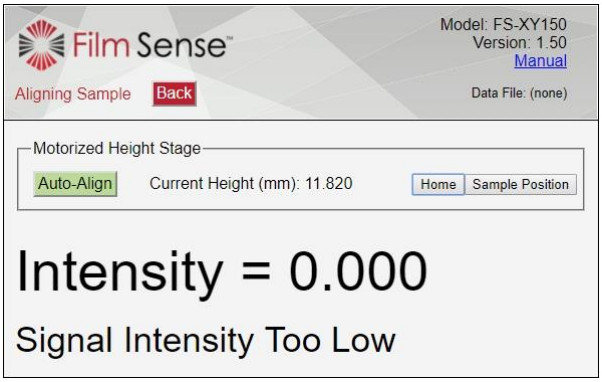
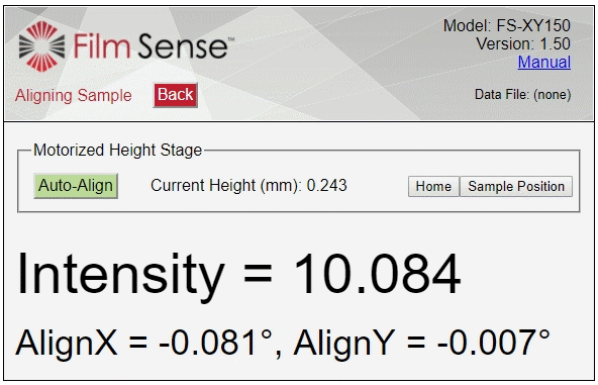


Image values for no wafer or missing it



Value of a normal bare Si wafer

5. The system was shutdown, what can be done? Check the equipment page online. Contact MNC staff person.

8 Appendix

Images

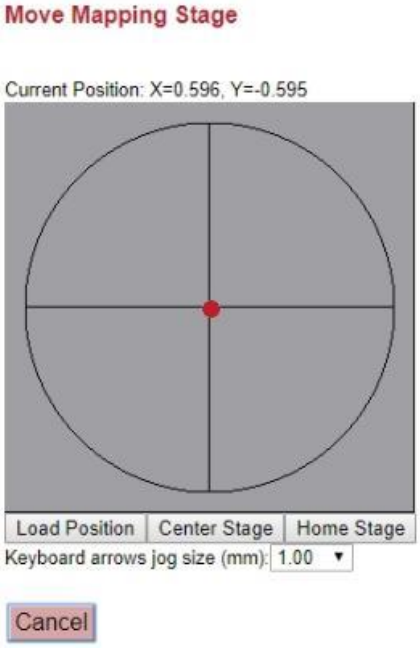


Fig 1.This is the display that is shown when the stage movement control is working. Just click anywhere on the image and the stage will move to that position.

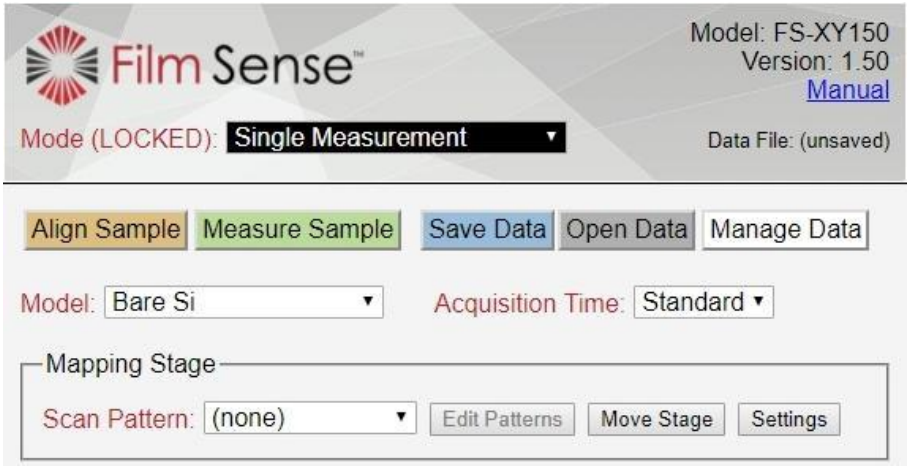


Fig. 2 The main operating screen that the software starts at.

List of Process recipes:

Standard processing recipes:

Common issues to be aware of with the system.

Make sure have the wafer back side clean so that it sits level and does not get the stage dirty.

Log in to get things working. You must enable the system and then also log in to the computer be using your X.500 account.

The measurement depends on the surface condition of the substrate and many other factors so to confirm a questionable thickness value. Try using other measuring systems.

Common film models that are already in the system: (if there is one you need contact MNC.)

Bare wafer – measures the thin native oxide (SiO2) on the surface
Basic films SiO2, SiN, Resist ? Several ranges-?
ALD films: Al2O3, HfO2, TiO2, ZnO, SiO2,
PEALD films: Al2O3, AlN, HfO2, HfN, TiO2, TiN, SiN, Al, and Ni
HD PECVD: SiO2, SiN, amorphous, DLC, SiC

Expanded functions – The system can do if it is needed, contact Tony Whipple to learn more.