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1.0 PREMEASUREMENT SETUP

The premeasurement setup includes setting the polarizer and analyzer angles of incidence, the turn-on and the warmup of the ellipsometer, and initial alignment of the sample stage.

1.1 Setting the Angle of Incidence

CAUTION

Do not grasp the 632.8 nm (red) laser when setting the polarizer arm. That may easily cause laser misalignment.

- a. Grasp the polarizer arm (but never the laser); and at the rear of the arm, loosen the clamp screw about one turn.
- b. Pull outward on spring-loaded locator pin next to the clamp screw, and move the arm to within 1/4-inch of the 70° angle of incidence.
- c. Release the locator pin, and move the arm slowly until the pin seats in the detent on the vertical plate. Tighten the clamp screw. (This accurately sets the angle of incidence.)
- d. Repeat steps a through c to set the analyzer arm angle of incidence, but do not apply pressure to the PD (photodetector) cover.

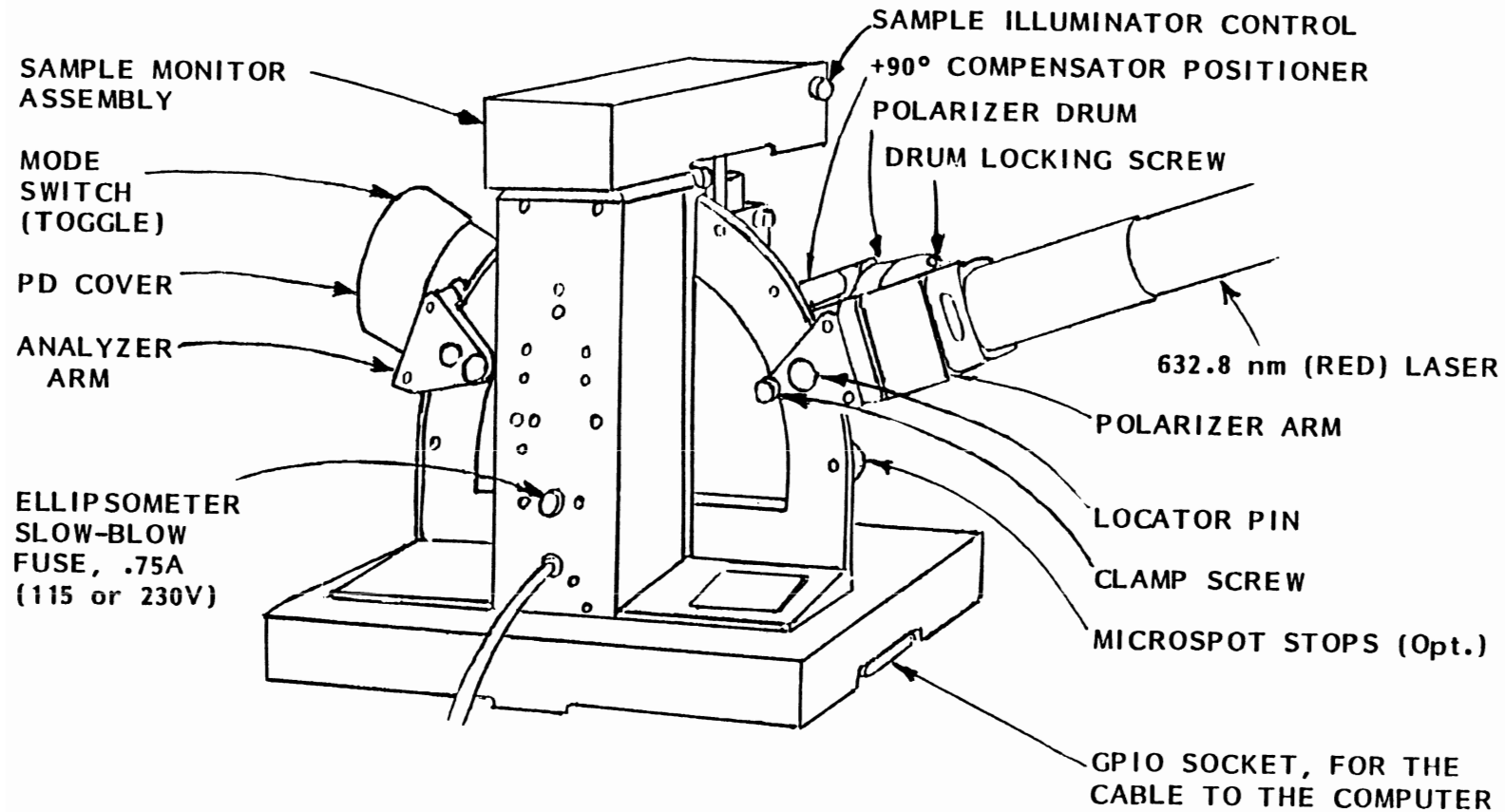
NOTE: Follow steps a to d also when setting the angle of incidence at any other detented angle.* The detented angles are 30°, 45° through 80° at 5° steps. There is also 90°, which is only for adjustments. See page 1-4 of the Description section about the beam size at each angle.

- e. Set the polarizer drum to 45°, and secure it by inserting the locking screw in the hole on the side of drum.

*See the Caution note at the top of Figure 2-1 about the arms with the optional Microspot optics at the 90° angle of incidence. Note the statement (with the asterisk) just above the caption about the fact that with the microspots, the arms cannot be set at 90° with the larger table.

CAUTION (For 90° Angle of Incidence)*

If the L116C has Microspot Optics, rotate the 150 mm table so that its lifting slot is under the analyzer Microspot. Move the table to the left and down so that neither Microspot Optic will contact the table when both of the arms are at 90°.



*The optional 200 mm dia. table cannot be moved out of the way of the optional Microspot Optics. Thus, the arms cannot be set at 90° with both of these options.

Figure 2-1 This is the rear and left view of the L116C Ellipsometer (with the standard table).

1.2 Turn-on and Warmup

- a. Connect the ellipsometer and the computer according to the Installation section.
- b. To turn on the ellipsometer and the 632.8 nm (red) laser, turn the key-operated power switch on the Sample Monitor Assembly fully clockwise, ON (Figure 2-2). The Emission Indicator should illuminate. A 15-minute minimum warmup of the 632.8 nm laser is recommended before performing ellipsometric measurements. Set the Mode (toggle) switch (Figure 2-1) to AS. The following describes the three Mode switch positions:
 - Manual (M) position: This is used during alignment and calibration
 - Autoset (AS) position: This is used during premeasurement setup (sample stage alignment)
 - Automatic (A) position: This is used for automatic measurement (with the drum rotating)
- c. Pull to open the beam attenuator, and proceed with the "Sample Table Vacuum and Allignment".

1.3 Sample Table Vacuum and Alignment

Vacuum At the center and rear of the table are small (#0-80x1/8" round head, stainless steel) plugs that can be removed when a vacuum pump is connected to the ellipsometer. Remove only the plugs that will be under the wafer, but not the plug under the edge of the wafer (see Figure 2-3).

Alignment Follow this procedure, beginning with step a (see Figure 2-4).

- a. With tweezers, air wand, etc. put a reference sample or single-layer, nonabsorbing wafer of a known film thickness on the table via the insertion slot. Turn on the vacuum pump if connected.
- b. Loosen the sample table clamp screw.
- c. Look into the Sample Monitor Assembly eyepiece, turn the illumination control for the desired illumination. Move the eyepiece in or out for the sharpest focus of the 90° crosshairs.
- d. Rotate either of the Sample Monitor Control knobs in Figure 2-2 so that it brings a reflected image of the two diagonal lines into view (if already not in view), as seen in the eyepiece.

(section 1.3 continued on page 2-6)

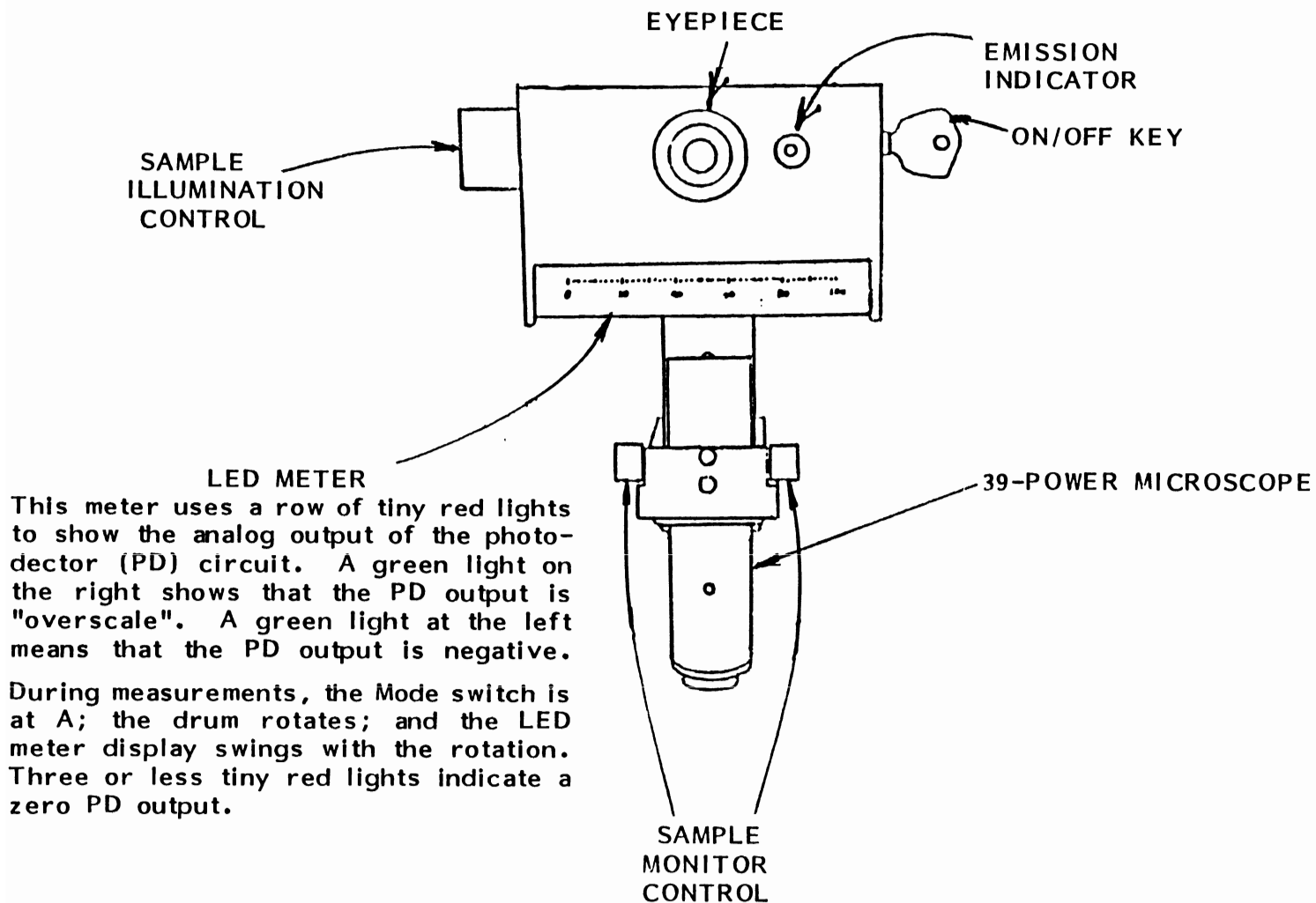


Figure 2-2 These are the ellipsometer controls and indicators on the Sample Monitor Assembly.

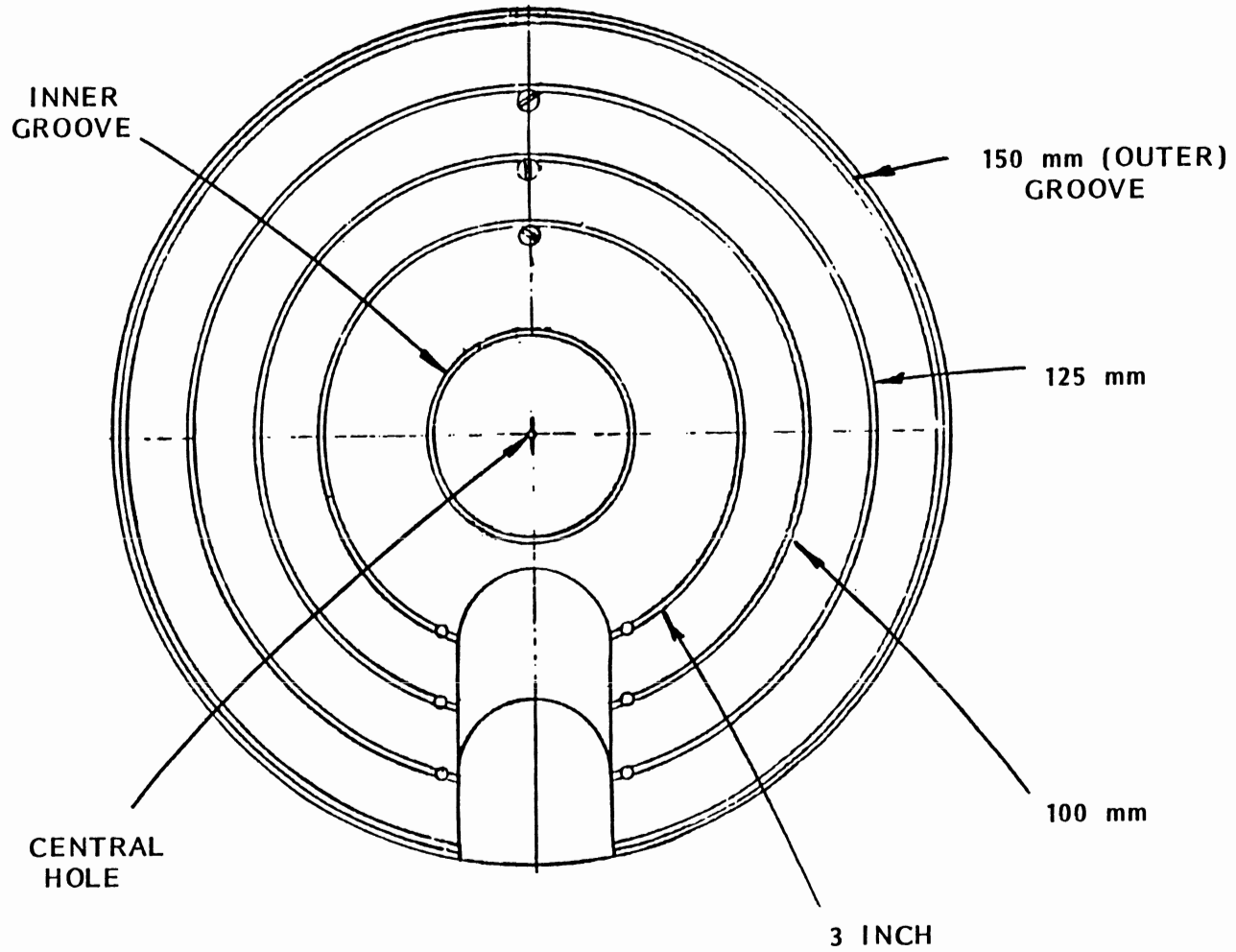


Figure 2-3 This is a top view of the 150 mm (almost 6 inches) diameter sample table. See Figure 6-1 in the Optional Components section for the top view of the optional 200 mm diameter table.

1.3 Sample Table Vacuum and Alignment (continued)

- e. Observe the intersection of the two wide diagonal lines and the intersection of the narrow lines. Slowly rotate as needed the X and Y plane tilt adjustment controls to center the diagonals precisely on the crosshairs intersection. This makes corrections for the sample surface out-of-flatness condition.

NOTE: The width/height of the intersection of the diagonals is four arc minutes. This may be used as a reference in determining the approximate tilt adjustment needed.

- f. Using the adjustment wheel under the rear of the table, raise or lower the table to obtain the maximum reading on the LED meter. A clockwise rotation of the wheel raises the table.
- g. If the reading from step e overshoots the LED meter upper limit, turn the analyzer drum to lower the gain. Then readjust the table slightly for a maximum reading. Repeat the adjustment of the drum and table vertically as needed for a maximum reading within the range of the LED meter.
- h. Return to steps c through g as often as needed until each adjustment is correct.
- i. Tighten the sample table clamp screw.
- j. See the standard single-point program instructions (such as STD) in the Standard Programs sections for the loading instructions, and use the Film program or subprogram. Proceed to make a measurement.
- k. Compare the thickness data measurement with previously acquired sample thickness data. The compared data should be within $\pm 3\text{\AA}$ ($\pm 0.3\text{ nm}$).

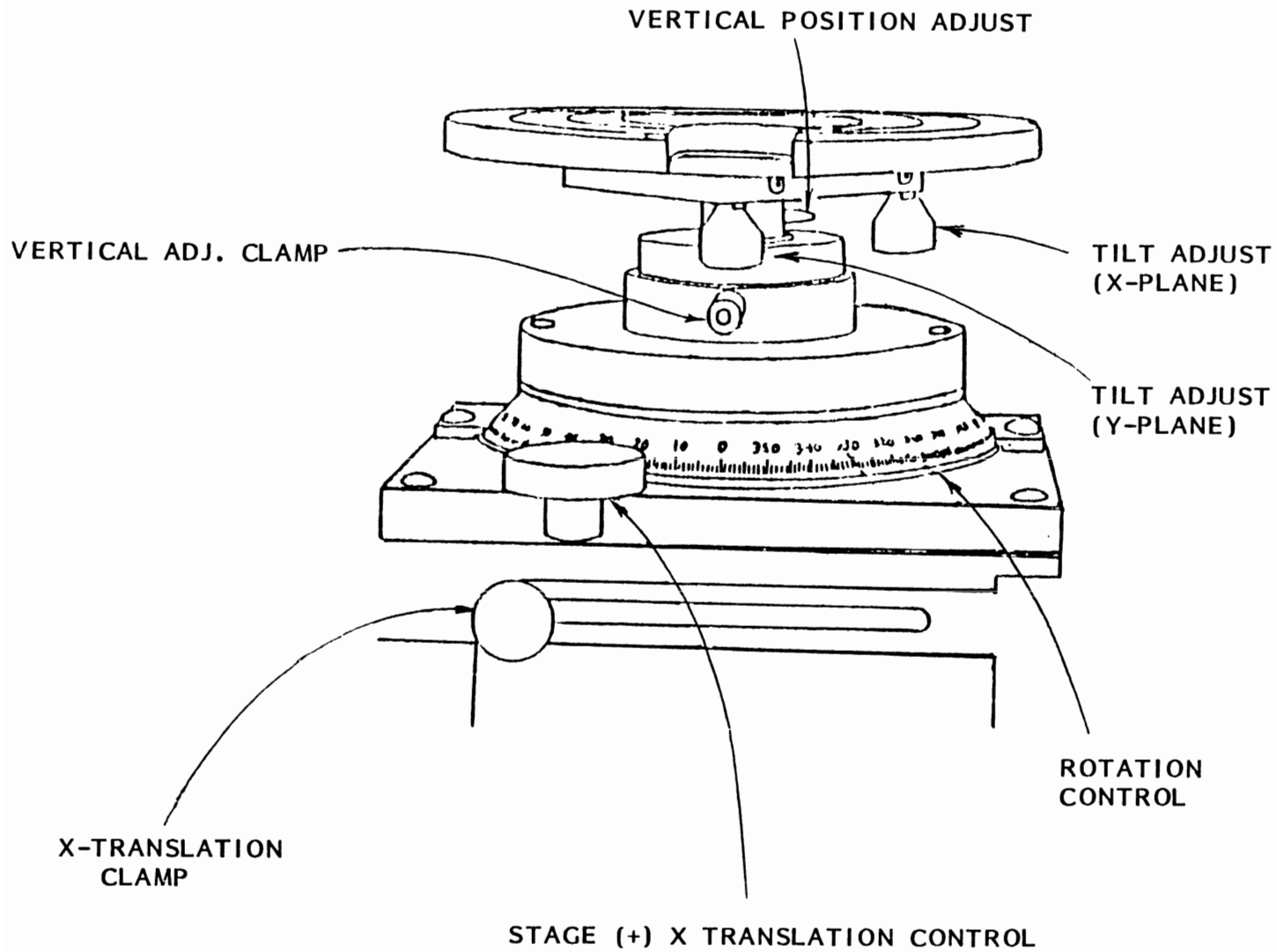


Figure 2-4 This is the L116C Sample Stage and Table.

2.0 MEASUREMENT PROCEDURE

Place the sample wafer on the sample table, load the program software into the computer, and initiate the measurements. Once the measurements are started, you press the keys as the screen and instructions request, then measurements are automatic.

Some measurements can be made after a 15-minute ellipsometer warmup, the stability of the laser improves after a few hours, which is better for important measurements. If the ellipsometer is in use several times a day, the laser should operate continuously.

WARNING

To avoid the hazard of laser beam dispersion, the beam attenuator must be closed while you adjust the polarizer or analyzer arm, or when the two arms are not at the same angle of incidence.

2.1 Standard and Optional Single-Point Measurement Programs

Valid measurements are dependent upon the selection of a program applicable to the sample being measured, and correct interaction by the user with the computer. The standard programs supplied with the ellipsometer are in the Standard Programs section. The optional programs available by special order are identified in the Optional Programs section.

Ideally, the table need not be vertically readjusted between measurements on a series of samples, if all samples in a given lot are plane-parallel, about equal in sample thickness, and no dust particles or other foreign matter are deposited on the surface of the table.