



GAERTNER SCIENTIFIC CORPORATION
3650 Jarvis Ave.
Skokie, Illinois 60076 U.S.A.
tel: 1 847 673-5006
fax: 1 847 673-5009
e-mail: email@gaertnerscientific.com

(October 2002)

Procedure for Updating the Logic Board on Older (Pre-1990) Electronic Chassis to Make Compatible to Latest Burr-Brown ADC84KG A/D Converter Chip and to Ellipsometer Control by Windows™ PC

Preface:

The newest Gaertner ellipsometers interface and operate with the latest IBM compatible PC's running most any of the Microsoft Windows operating systems; including Windows 95, 98, NT, Me, XP and 2000. Slightly older (1990 to 1998) ellipsometers may require only a software upgrade to work with certain Windows operating systems, dependent upon the host computer. Yet even older Gaertner ellipsometers will require that modification be made to the logic board portion of the ellipsometer's electronic chassis before operation in any Windows computing environment can be considered. (In some cases, it may also be necessary to replace the A/D converter chip with a later 12-bit version.)

The procedure that follows will (in most cases) be sufficient to make the electronic chassis of older ellipsometers ready to run in the Windows PC environment once applicable Gaertner software and interface issues have been resolved.

1.0 REMOVAL OF ELECTRONIC CHASSIS FROM ELLIPSOMETER

- 1.1 In most instances, the configuration of your ellipsometer will resemble the one shown in **Figure 1** on the next page. If, however, you have a multi-wavelength ellipsometer or L26 FAB ellipsometer, there will be some differences in configuration not covered here, and you should then consult Gaertner's Service Dept. for further instruction. Otherwise, proceed as next indicated.

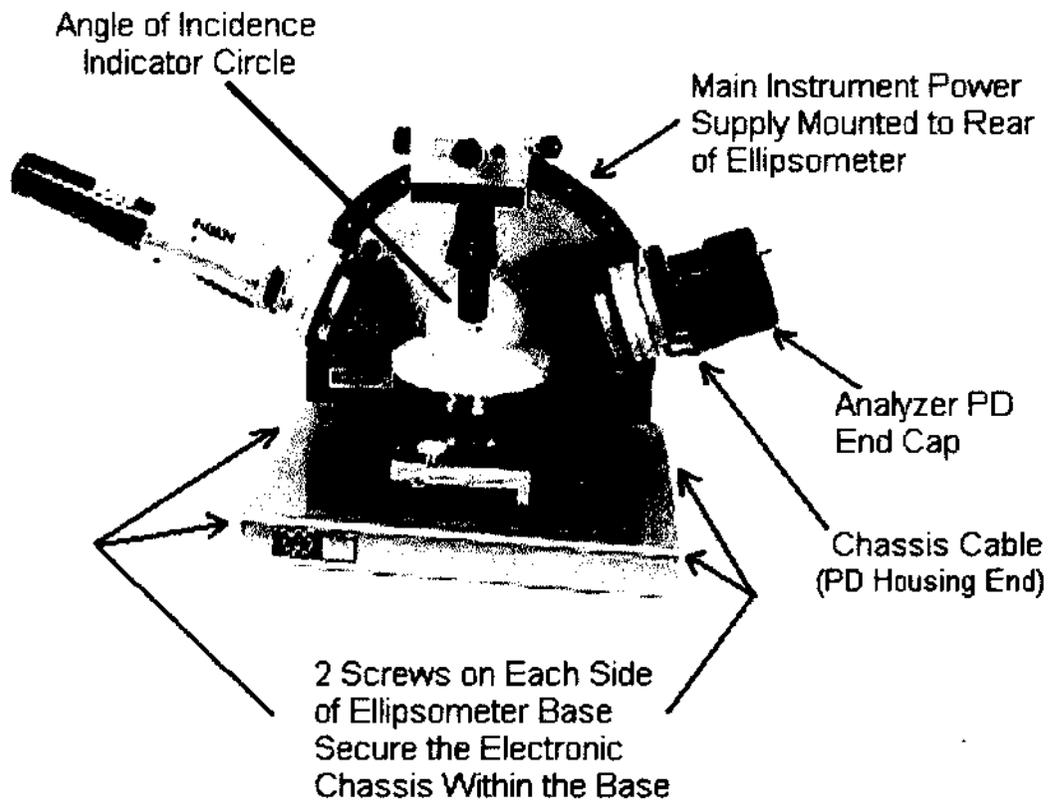


Figure 1.

- 1.2 Turn-off the ellipsometer and unplug its line cord from the wall outlet. Move the polarizer and analyzer arms to 50° angle of incidence to ease handling and positioning of the ellipsometer. Be sure that the "locking" black thumb screw on the back of each arm is secured to eliminate the risk that an arm could suddenly pop-out of the detent position. Now, locate the main instrument power supply assembly at the rear of the ellipsometer. Remove each of the four corner screws that secure the rectangular metal plate to the back of the ellipsometer. Gently lower the power supply assembly and disconnect all plastic/rubber wire connectors to separate the instrument power supply assembly from the ellipsometer. Set the power supply assembly aside, out of the way.
- 1.3 For this step, it may help to position the ellipsometer about 6 to 10 inches in front of a strong support post or shelf. Remove two screws from each side of the ellipsometer base. (refer Figure 1) Carefully, raise the front of the ellipsometer up such that it pivots on the rear edge of its base. (Do not grab the arms, laser, sample table or overhanging monitor-microscope.) Now, if necessary, have a second person support the ellipsometer as it is tilted back, or rest the ellipsometer against the support



Figure 2.

post (or shelf) mentioned earlier. Do not allow the ellipsometer to fall back! The electronic chassis should now be visible as the rest of the ellipsometer is raised away from it. Look at Figure 2 on the previous page.

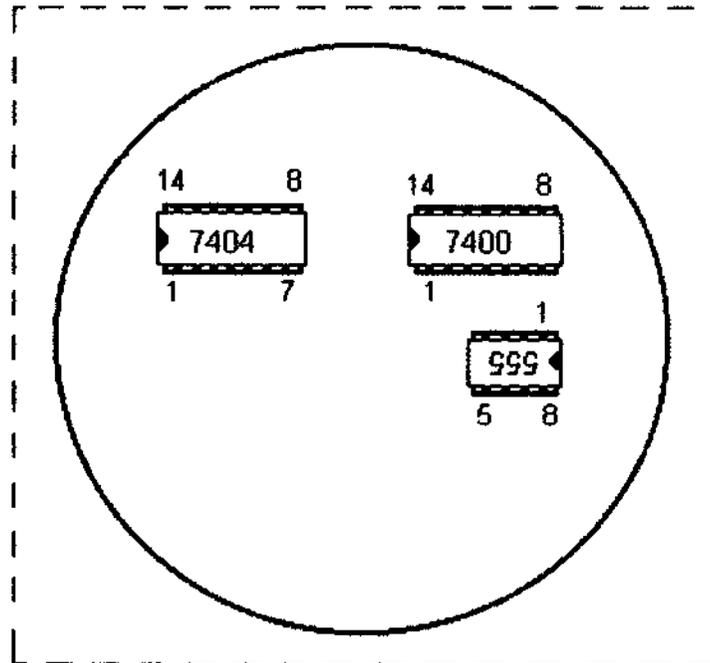
- 1.4 Toward the center rear of the electronic chassis is the connector board. For most electronic chassis, there will be a 24-pin (plastic) connector which permits disconnecting the chassis (ribbon) cable from the chassis. **If you have such a chassis, then proceed to step 1.6** to complete the removal of the electronic chassis. **If instead your chassis cable is “hard-wired” into the chassis, then proceed as follows.** Carefully lower the ellipsometer back down over the electronic chassis. Locate the 2 screws that are on either side of the mode (toggle) switch on the Analyzer PD End Cap (Figure 1). Loosen and remove these 2 screws. Around the rim of the End Cap, locate the 3 screws that are 120° apart. Loosen these 3 screws by about 3 turns each. Now pull the End Cap away from the analyzer to reveal the PD (photodetector) board and the terminal connector strip, labeled **A – X**.
- 1.5 Detach all connectors from the terminal connector strip. Now go to the Angle of Incidence Indicator Circle (Figure 1) and carefully loosen and remove the 2 screws which hold it in place on the “half-moon” (semi-circle). Lay the Indicator Circle aside. Free the chassis (ribbon) cable from any clamps or “hold-downs”, then carefully route and pull the chassis cable back through the opening exposed in the “half-moon” when the Indicator Circle was removed. Be careful not to damage the wires and terminal connector strip as you push them through the opening to the back of the ellipsometer. Raise the front of the ellipsometer again until it is tilted back far enough for you to reach the chassis cable and the other 2 cables (w/ plastic connectors) and pull them all through the hole at the rear of the ellipsometer base. The electronic chassis can now be pulled forward, out from under the ellipsometer. Proceed to **Section 2.0**.
- 1.6 At the connector board, carefully disconnect the chassis cable from the chassis. Pull the other 2 cables (w/ plastic connectors) through the hole at the rear of the ellipsometer base. Now pull the electronic chassis forward until it clears the ellipsometer.

2.0 SEPARATING ELECTRONIC CHASSIS FRAME FROM CHASSIS TRAY

- 2.1 Refer to Figure 2. Loosen and remove 2 small screws that secure the interface connector to the chassis tray. Loosen and remove the 2 screws on either end of the test jacks strip to separate it from the chassis tray. Remove four screws, two on each side of the chassis frame between the

edge of the frame and the DC power supplies. Now pull the chassis frame away from the chassis tray.

- 2.2 Locate the logic board at the center of the electronic chassis frame. The modifications to be made to the logic board will require access to the top and bottom surfaces of the logic board.



Pin Locations of Logic Board IC Chips

Figure 3.

3.0 UPDATING OF LOGIC BOARD PER FOLLOWING MODIFICATIONS

- 3.1 Figure 3 is a top surface view of the logic board showing the location/orientation of pins for the three IC chips on the board. Beginning with the 7400 IC, go to the printed circuit (trace) side of the logic board and cut at these two trace locations:

- A) 1/8 inch from pin 8, and...
- B) Trace from pin 10, 1/16 inch from 0.2 MF capacitor.

- 3.2 Disconnect 100 ohm resistor from pin 11 trace (of 7400 IC).

3.3 Use drill size #60 (0.039") for holes at the following locations on the logic board:

- A) At midpoint of trace between pin 1 of 555 IC and 0.2 MF capacitor (GND),
- B) At cut end of trace from pin 10 (of 7400 IC),
- C) At pin 8 just outside of 7400 IC end,
- D) At pin 10 just outside of 7400 IC side,
- E) Beyond trace from 0.2 MF capacitor to 100 ohm resistor at resistor end, and...
- F) At trace on other side of cut from pin 8 (of 7400 IC).

3.4 Make electrical connection of the following:

- A) Add new 0.005 MF capacitor from hole between 0.2 MF capacitor and pin 1 of 555 IC to hole at cut end of trace from pin 10 of 7400 IC, (holes drilled in steps 3.3A, 3.3B above)
- B) 100 ohm resistor end disconnected from pin 11 trace (step 3.2) to hole at pin 8 (step 3.3C),
- C) And place wire jumpers from:
 - a) Hole on trace at other side of pin 8 (step 3.3F) to hole at resistor end (step 3.3E), and
 - b) Pin 11 to pin 10 (step 3.2 to step 3.3D).

4.0 FINAL CHECKS AND CLOSING INSTRUCTIONS

- 4.1 Place the electronic chassis frame back onto the chassis tray but do not secure it with the screws yet. Take the electronic chassis back over to the ellipsometer. Carefully reconnect all cables and wires between the ellipsometer, electronic chassis, and the instrument power supply. Connect the interface between the ellipsometer and computer. Return the polarizer and analyzer arms to 70° angle of incidence, turn the key switch to power on the ellipsometer, and confirm that the laser light is being emitted. While waiting for the laser to warm-up, try the mode switch in "A" position to see if there is still motor response. If there are no outward signs of a problem, continue.
- 4.2 After the laser source has warmed-up for about 15 minutes, take a known sample, place it on the sample stage and perform the standard pre-measurement sample stage alignment procedure. Take a measurement

using the newest ellipsometer software (and interface) in your possession. The measurement should be accurate and repeatable within normal allowed specifications. If the measurement is inaccurate or unrepeatable check to make sure that all wires and cables have been connected properly. Also, this is a good opportunity to time the rotation speed of the analyzer drum. The optimum speed of operation for the analyzer drum is about 1½ to 2 rotations per second. If necessary, the motor speed can be adjusted at the trimpot that is adjacent to the brown test jack on the test jacks strip (Figure 2). (Clockwise turn of the pot increases speed.) If after these considerations you are still not getting good results, consult Gaertner's Service Dept. for a more in-depth analysis of the problem.

- 4.3 Once satisfactory performance of the electronic chassis has been established, turn-off power to the ellipsometer and unplug the line cord from the wall outlet. Disconnect all cables and wires so the process of re-assembly of components back into the ellipsometer can take place. First, secure the chassis frame back onto the chassis tray by replacing the four screws removed in step 2.1, and re-attach the interface connector and test jacks strip to the chassis tray. Take this opportunity to inspect the chassis hangers, two on each side of the chassis tray. They should be standing almost perpendicular to the edge(s) of the tray to allow for "easier" re-attachment into the base of the ellipsometer.
- 4.4 Now basically reverse the procedures you followed in Section 1.0 to re-mount the electronic chassis and instrument power supply back into the ellipsometer. Be careful not to pinch or otherwise damage cables in this process. You will also find it useful to have a penlight or a small flashlight available when you are trying to locate the screwholes on the chassis hangers as you peer through each of the four screwholes on the sides of the ellipsometer base.

FINISH