



## DPL-24 Operation:

- Turn on the power.
- Set the two temperature controllers for the top and bottom heaters (or use prior settings)
- Let the heaters reach the temperature settings.
- Set the timers for vacuum dwell and pressure dwell (or use prior settings)

At this point the DPL-24 is ready for repetitive laminating

- Prepare the materials for lamination. This is actually the only step where operator technique can make a difference. The film should not overlap the edges of the substrate, and it should be free from wrinkles. Take care to stick the film to the substrate at just a few points to avoid bubbles.
- Open the drawer and place the prepared materials on the platen. If the upper surface tends to get tacky, add a thin cover sheet of compatible material.
- Close the drawer and press the cycle start button.
- When the cycle is finished, open the drawer and remove the laminated material.

That's it, as far as the operator is concerned.

A more detailed description with a bitmap file showing the internal operating principles follows:

When the DPL-24 is turned on, two proportional controllers independently drive the top and bottom heaters to the heat the diaphragm and drawer platen to the temperatures set on the front panel. After a brief warmup time, the laminator is ready for use.

The drawer is pulled open to allow access to load the vulcanized rubber platen with materials ready for lamination. Products of differing thicknesses and geometries can be intermixed during a cycle if adequate 'hold-down' techniques are employed. The layered material is placed on the platen mounted in the sliding



drawer. When the drawer is closed, the platen is positioned in the vacuum chamber, and an O-ring seal on the drawer face contacts the opening in the vacuum / pressure vessel.

Before the beginning of the cycle there is a vacuum drawn above the diaphragm. Air at atmospheric pressure is in bottom of the vessel, pushing the diaphragm upwards. The diaphragm is up above the material on the drawer platen. The drawer platen is spring loaded upwards to allow the drawer to be opened and closed.

When the cycle starts, vacuum is drawn on both ports, above and below the diaphragm. Utilizing a high volume vacuum pump, an end point approaching one Torr is achieved. This vacuum is displayed on a digital gauge located on the front panel. A programmable timer adjustable from .1 seconds to 9990 hours determines the vacuum dwell time before continuing to the next step. It is important to note that this dwell time will allow air between the layers of material to be evacuated before the lamination pressure cycle begins, eliminating trapped bubbles. Because the vacuum is equal above and below the diaphragm, it does not move and does not contact the material in the drawer.

At the end of the Vacuum Dwell, positive air pressure at up to 10 PSI is applied to the port above the diaphragm to bring the pressure differential to nearly 25 PSI. The preheated silicone rubber diaphragm descends onto the workpiece. This action drives the spring-mounted drawer platen into contact with the lower heat platen. Isostatic pressure is transferred to the material by the diaphragm. The stretching effect that often occurs with roll type laminators is minimized. The flexible diaphragm conforms to the surface shape assuring positive contact between the layers, thereby eliminating voids. The pressure dwell time is controlled by another timer identical to the vacuum dwell timer.

At the end of the pressure dwell cycle, the top port is connected to the vacuum pump again, and the bottom port is vented to atmospheric pressure. This returns the diaphragm and drawer platen to their original positions and allows the drawer to be opened for unloading.