



# **HOT ROLL LAMINATOR**

**MODEL HL-200/201**

## **OPERATING INSTRUCTIONS**

**CHEMINSTRUMENTS**

**510 COMMERCIAL DRIVE**

**FAIRFIELD, OHIO 45014**

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## PRODUCT DESCRIPTION

Congratulations on the purchase of your new ChemInstruments HL-200/201 Hot Roll Laminator. This is a state of the art laboratory laminator with balanced pneumatic pressure top roll and controlled heat.



**Warning: This equipment can cause injury if not used properly. It is the operator's responsibility to observe all safety rules and warnings.**

This unit has the following features:

- Model HL-200 includes hard coat anodized Teflon coated aluminum top roll.
- Model HL-201 includes chrome plated steel top roll.
- Programmable temperature heat controller.
- Single unwind stand.
- Safety features that include a laminator nip trip wire and an emergency stop button.
- Optional heat guard kit is available providing guards for the top and bottom laminating rolls as well as the end cap roll shaft and bearings.
- Optional gap adjusters for precise gap control during laminating.
- Optional separate brake unwind stand for additional unwind with brake tension control.
- Forward and reverse action of the drive roll
- Selectable speeds from 2 – 300 inches per minute (5 – 750 centimeters per minute) in either direction
- Continuous run and jog mode

## SPECIFICATIONS

|                            |  |
|----------------------------|--|
| <b>Electrical</b>          | 120 VAC, 50/60 Hz, 15 amps or 240 VAC, 50/60 Hz, 8 amps  |
| <b>Air Pressure</b>        | 40 – 100 PSI   |
| <b>Speed</b>               | 2 – 300 inches/minute (0.1 inch increments from 2-12, 0.5 inch increments from 12-300)<br>5 – 750 centimeters/minute (.25 centimeter increments from 5-30, 1.25 centimeter from 30-750)  |
| <b>Max opening at Nip</b>  | 2 inch (51 millimeter)   |
| <b>Physical Dimensions</b> | Width: 39 inches (99 centimeters)<br>Depth: 20 inches (51 centimeters)<br>Height: 30 inches (76 centimeters)<br>Weight: 160 pounds (73 kilograms) with an Aluminum Roll<br>Weight: 185 pounds (84 kilograms) with a Steel Roll |

## UNPACKING

ChemInstruments has made every effort to ensure that the HL-200/201 arrives at your location without damage. Carefully unpack the instrument and check for any damage that may have occurred during shipment. If any damage did occur during transit, notify the **carrier** immediately.

The ChemInstruments HL-200/201 consists of the following parts:

- The laminator frame, which includes the laminating station and attached control box.
- Optional equipment if ordered would include gap adjusters, brake unwind stand, heat guard kit, along with any customized alterations and/or additions.

Make sure all of these components are present before discarding the packaging material.



HL-200 with optional gap adjusters

## ASSEMBLY



**Warning:** Due to its weight and size, use two people to move the HL-200/201.



**Warning:** Before proceeding with using the HL-200/201, it is advisable to become familiar with the Key Components. These Key Components and a brief description of their function follow in the next section.

- Carefully remove the Hot Roll Laminator from the packaging and set it on a sturdy bench top.
- Check the physical dimensions listed previously for the space required for the instrument. As with any precision piece of laboratory equipment, it is preferable to locate the HL-200/201 in an area where temperature and humidity are controlled to standard conditions of  $72 \pm 2^{\circ}\text{F}$  and  $50 \pm 5\%$  relative humidity.
- The laminator should be located on a sturdy bench or cart capable of a 200 pound load.
- It is recommended that access be provided for both the front and back of the machine.
- Carefully remove the Kraft paper from the laminating rolls.
- Attach an incoming airline to the male inlet fixture on the side of the cabinet.
- Set the Air Pressure Regulator at 40 PSI for initial startup.



**Warning:** Make sure the power source matches the requirements of the Hot Roll Laminator machine. Damage will occur if this unit is plugged into the incorrect power supply.



**Warning:** Only connect this unit to a properly sized circuit to avoid overload problems.

- Plug the laminator into the appropriate AC circuit.
- Remove the wood blocks between the laminating rolls. This requires the air and electrical connections to have been made. Push the OPEN NIP button if the top Heat Laminating Roll is in the down position and resting on the wood blocks.
- If the optional Gap Adjusters are included, use these to create a gap by threading both lower half of the Gap Adjuster cylinders down the air cylinder shaft. Lock their position by threading the top half of the Gap Adjuster down until it contacts the bottom half of the Gap Adjuster.

- When the laminator is not in use, these Gap Adjusters will provide a mechanical stop to the downward travel of the top Heat Laminating Roll. This will prevent wear and damage to the rubber cover on the Drive Laminating Roll
- Check the Roll Unwind Bar to make sure it is seated properly in the support frame.
- If the optional Brake Unwind System is provided, check that the Pressure Plate is positioned with the slot over the Retaining Pin.

The HL-200/201 laminator is now ready for use except for setting the temperature level for the heated roll.

## SAFETY FEATURES

The HL-200/201 hot roll laminator should be considered as any other piece of laboratory equipment. The safety features incorporated in this device are designed to help prevent injury. It remains the operator's responsibility to use this and all equipment with caution while following the manufacturer's instructions. Basic common sense and caution should be exercised at all times.

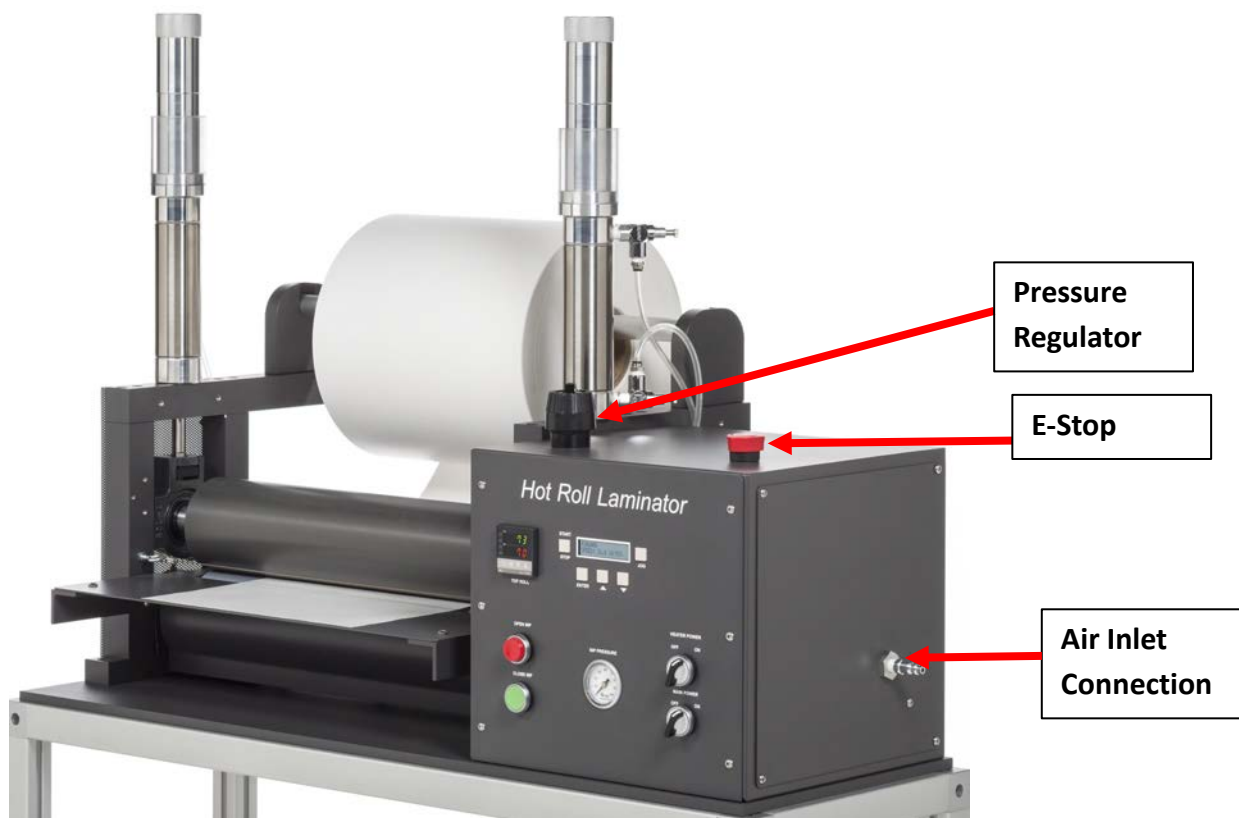
Please pay attention to and follow all warnings and cautions as you use this equipment. There are two basic safety features for this device.

1. **TRIP WIRE:** This safety wire is located in front of the top Heat Laminating Roll and nip point. When activated, the top roll will travel upward, opening the laminating nip and removing the pressure between the two laminating rolls. This trip wire is adjustable and should be tested regularly to insure proper operation. **DO NOT REMOVE THIS DEVICE.** It is considered a safety violation to hinder the operation of this device in any manner.
2. **E-STOP:** This device is located on the side of the control cabinet for ease of access. Besides disrupting all power to the equipment when activated, the top Heat Laminating Roll will travel upward opening the nip point of the two laminating rolls. This switch is not to be used as an "on/off" switch when operating the HL-200/201 laminator.

## KEY COMPONENTS

### CONTROL CABINET SIDE PANEL

- **PRESSURE REGULATOR** controls the air pressure distributed to the air pistons.
- **E-STOP** emergency stop disrupts all electrical and air supply, turn to release.
- **AIR INLET CONNECTION** is the connection for the air source.

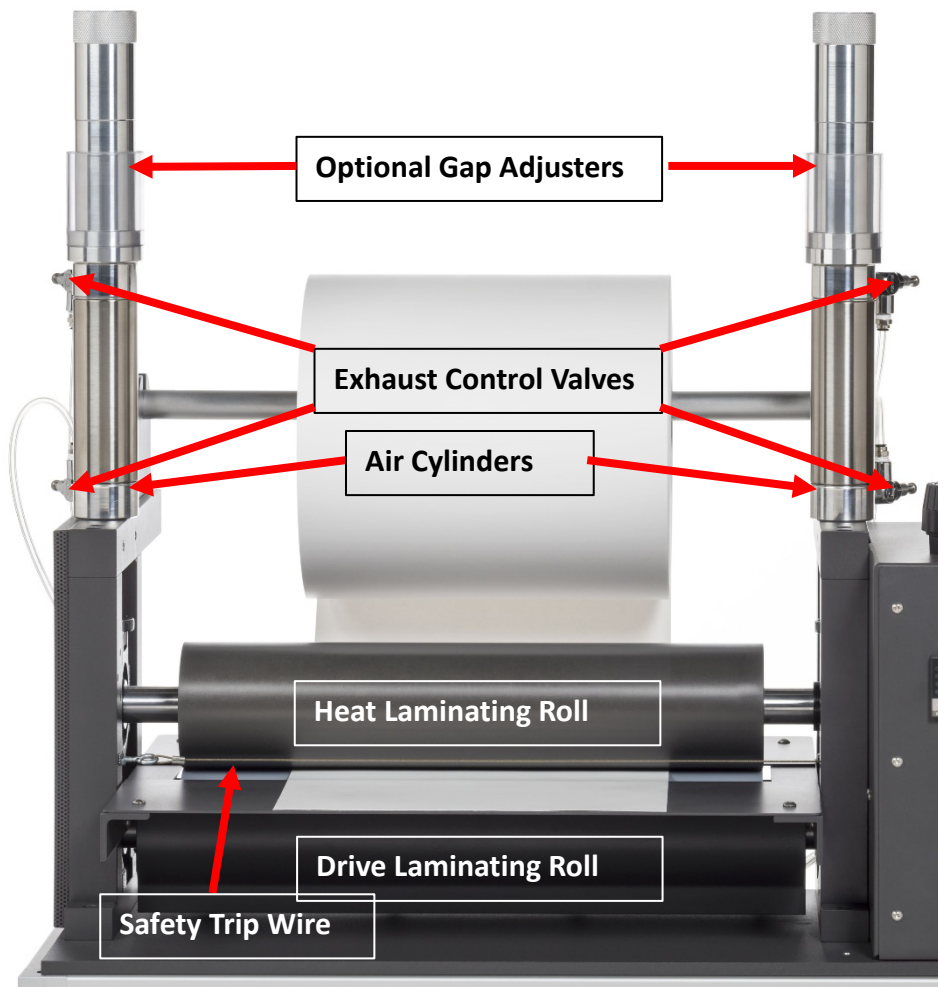




## LAMINATOR

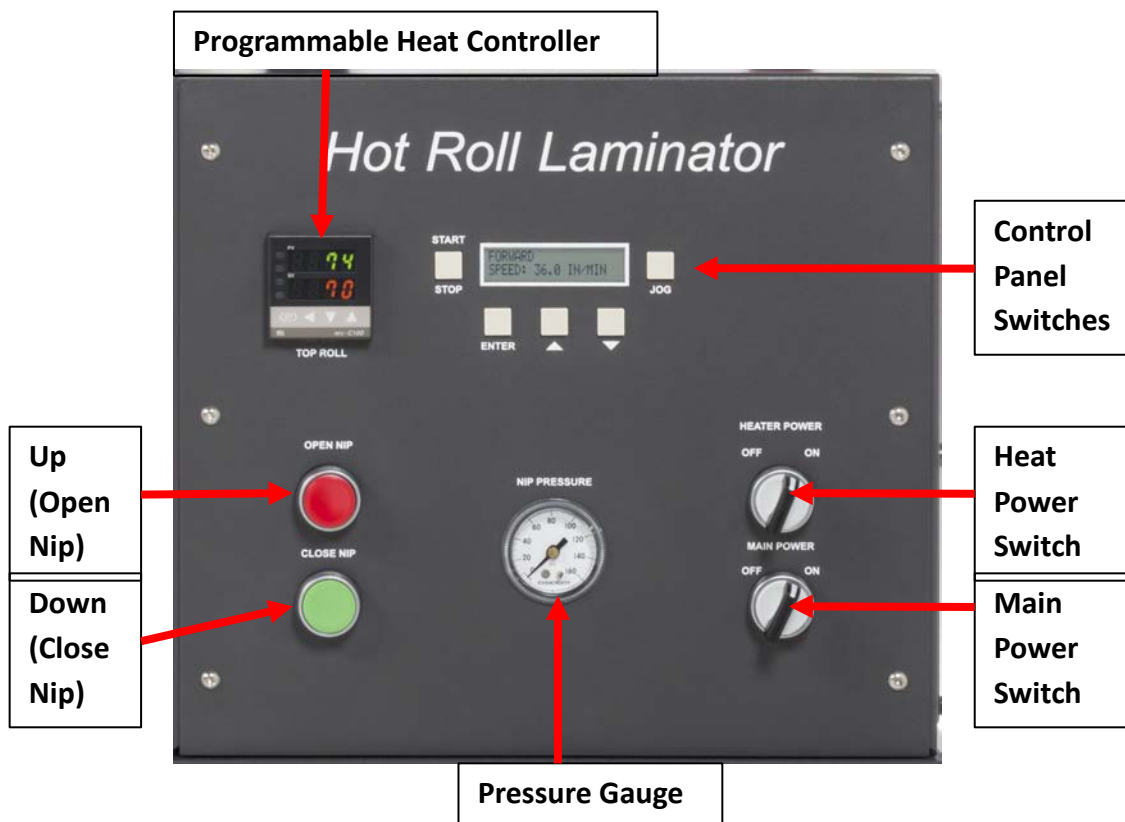
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- **EXHAUST CONTROL VALVES** control the rate of exhaust from the Air Cylinder that it is mounted to.
- **AIR CYLINDERS** are mounted vertically at each end of the top heat laminating roll. These pneumatic cylinders move the top heat laminating roll up and down according to the UP and DOWN switches.
- **HEATED LAMINATING ROLL** the top roll supplying the laminating pressure.
- **DRIVE LAMINATING ROLL** the bottom roll connected to the motor and supplying the drive to the laminator.
- **NIP** refers to the point of contact between the two laminating rolls.
- **SAFETY TRIP WIRE** will open the nip by raising the heat laminating roll. The heat laminating roll will stop moving also.



## CONTROL CABINET FRONT PANEL

- **PROGRAMMABLE HEAT CONTROLLER** allows you to set temperature and offset parameters.
- **OPEN NIP** moves top pressure roll to the up position.
- **CLOSE NIP** moves top pressure roll to the down position.
- **PRESSURE GAUGE** displays the air pressure being delivered to the air pistons after passing through the Pressure Regulator.
- **MAIN POWER SWITCH** turns on/off the AC power to the machine.
- **HEAT POWER SWITCH** turns on/off the heat controller.
- **CONTROL PANEL SWITCHES** – See Control Panel Operation in Section 5.0, Theory of Operation, for a description of the functions of these switches



## THEORY OF OPERATION



**Warning: Possibility of crushing or pinching. 1) Do not insert limbs in the nip area while rolls are rotating. 2) Do not lower the top roll while limbs are in the nip area.**

Laminated samples can be prepared with or without heat. Single sample sheets to be laminated are fed to the Nip from the Laminating Platforms to be laminated with material from the Unwind Stand. The top Heat Laminating Roll can be controlled to provide heat for heat activated adhesive material. Laminating pressure is controlled by the Air Regulator. Speed and direction of the laminating rolls is controlled by the control board. The travel speed of the top Heat Laminating Roll is controlled by the four Exhaust Control Valves.

Each of the items mentioned above can be found in various sections of this manual with a detail explanation of their function and method of operation.

## POWER UP

Turn on the main power switch located on the front panel of the control cabinet. The display will go through a power on self-test. It is also necessary to open the air supply valve.



**Warning: Operating temperature for this equipment is 0 to 70 Celsius. The equipment needs to be completely free of condensation, inside and out, before applying power.**

## OPERATION

### PRESSURE REGULATION

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Turning the Pressure Regulator knob, located on the top of the control cabinet, controls the pressure of the top roll at the nip. Turning the knob clockwise will increase the pressure and turning it counter clockwise will decrease the air pressure. The Pressure Gauge, located on the front of the control cabinet, will display the current air pressure on the top pressure roll.

### FLOW CONTROL VALVES

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The Flow Control Valves regulate the speed of the top pressure roll as it moves up and down. Adjusting the valves in the following manner will regulate this movement. It may also be necessary to adjust these valves to balance the movement of the air pistons in order for the top

pressure roll to travel evenly. If the speed of the two air pistons is not equal, one side of the top pressure roll will move faster than the other side.



**Warning! Always operate with the top rolls downward motion at a slow speed.**

The speed of the air pistons has been preset at the factory. These settings allow the top pressure roll to move downward at a safe, slow speed, and move upward rapidly. If it becomes necessary to adjust these valves, then use the following procedure.

- The bottom valve controls the down speed and the top valve controls the up speed.
- Turn the thumbscrews clockwise to go slower and counter clockwise to go faster.
- After each adjustment move the top pressure roll up by pressing the RED OPEN button and down by pressing the GREEN CLOSE button at least one time to determine the affect and need for further adjustment.
- Always maintain an even balance between the left and right Flow Control Valves to avoid uneven movement of the top pressure roll when traveling up and down.

## CONTROL PANEL OPERATION

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The HL-200/201 instrument allows the user to change speed and direction of the drive roll while it is moving. The control panel has a circular menu system. See Table 1 for a listing of selectable parameters.

The following describes the button operation for the Control Panel:

1. **START/STOP:** Pressing this button while there is no motion will move the drive roll at the set speed and direction as long as the Nip is in the lowered position. Pressing this button while the rolls are moving will cause motion to stop.
2. **JOG:** While this button is pressed, the rolls will move at the set speed and direction programmed as long as the Nip is in the lowered position. As soon as this button is released, motion will stop.
3. **ENTER:** This button is used to change the parameter displayed on the top line of the display. The display has a circular menu system.
4. **UP ARROW, DOWN ARROW:** These buttons will alter the value of the parameter that is displayed on the top line of the display. The values can be changed either when the rolls are moving or stationary.

The procedure for changing parameter values is as follows:

1. Press the **ENTER** button to change the parameter displayed on the top line.
2. The parameter displayed on the top line of the display can be altered by using the **UP ARROW** and **DOWN ARROW**.
3. The values can be changed while the rollers are moving.

4. For example, to change speed, press the **ENTER** button until the speed is displayed on the top line of the display. Press the **UP ARROW** or **DOWN ARROW** until the desired speed is displayed.

**Table 1 - Parameters and Ranges**

|                  |   |
|------------------|---|
| <b>Speed</b>     | 2 – 300 inches/minute (0.1 inch increments from 2-12, 0.5 inch increment from 12-300)<br>5 – 750 centimeters/minute (0.25 centimeter increments from 5-30, 1.25 from 30-750)  |
| <b>Direction</b> | Forward or Reverse  |
| <b>Units</b>     | Inches or centimeters   |
| <b>Length</b>    | The displayed value is the measured length traveled since the last reset. This value is always incrementing even when the motor is reversed. If changing direction, then reset the length traveled by pressing the Up Arrow or the Down Arrow while the Length is displayed on the top line of the display. |

## **INSTRUMENT OPERATION**

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The following describes basic instrument operation:

1. Press the **GREEN CLOSE NIP** button to close the Nip.
2. Move the rolls by pressing the **START/STOP** button or the **JOG** button.
3. Change the speed or direction by following the procedure listed in Control Panel Operation.
4. Reset the displayed length by pressing the **UP ARROW** or **DOWN ARROW** while the Length is displayed on the top line of the display.
5. Press the **RED OPEN NIP** button to open the Nip.

## PROGRAMMABLE HEAT CONTROLLER

There is a separate manual supplied by the manufacturer of the Heat Controller. Please refer to this manual for specific instructions on operation.

One of the features of the Programmable Heat Controller is the ability to learn the fastest most efficient manner to reach the set temperature. This feature is called "Auto Tune". Before shipping, the HL-200/201 has been Auto Tuned to 250 ° F (122 ° C).

1. To activate the top Heat Laminating Roll heat, turn the Heat Power Switch on.
2. To change/set the temperature, press the **SET** button
3. The temperature setting under **SV** will start blinking.
4. Use the < arrow to select which number you would like to change.
5. Use the up and down buttons to select the correct number for temperature.
6. To record the new temperature setting, press the **SET** button.
7. When no entry has been made for a period of one (1) minute, the controller will return to normal operation with the last recorded set point.



**Warning:** After the heater switch is turned on, the internal temperature of the heated roll will rise quickly. For the roll temperature to stabilize, you should allow 45 minutes before performing laminations.

There are additional features that are described in the supplied manufacturer's manual. One of the notable features is the ability to set a temperature "Offset Bias". This feature allows you to program the controller to reflect the outside roll surface temperature of the Heated Laminating Roll as opposed to the internal temperature.



## LAMINATING PROCEDURE

There are many ways to use the HL-200/201 hot roll laminator. The following is a basic description of the principles of laminating. Your particular lamination may require steps in addition or different than the following.

1. Raise the top Heat Laminating Roll by pressing the OPEN NIP button.
2. Turn the Heat Power switch on and set the Programmable Heat Control to the desired temperature. Make sure you follow the manufacturer's manual instructions and wait 45 minutes before laminating.
3. Load any roll form material on the Unwind Stand.
4. Set the speed for the Drive Laminating Roll.
5. Thread the roll form material according to your need to either not preheat or preheat the web before entering the Nip. (To preheat the web, thread the web directly in contact with the top Heat Laminating Roll and inside of the Guide Roll. To not preheat the web thread the material around the Guide Roll before entering the Nip)
6. Place the sheet or other material to be laminated on the Laminating Platform at the entry point of the Nip.
7. Make sure that the adhesive side of your sample is in contact with the web and position it in the Nip of the laminating rolls.
8. Press the CLOSE NIP button to lower the top Heat Laminating Roll.
9. Press the START/STOP switch to start the laminator.
10. As the sample moves through the laminator it may be necessary to guide the laminated sheet away from the Bottom Drive Roll. Material has a tendency to follow the curve of the laminating roll.
11. When finished, press the START/STOP switch and press the OPEN NIP button to raise the top Heat Laminating Roll.

## EXHAUST CONTROL VALVES

The motion of the top Heat Laminating Roll is controlled by the exhaust of air from each of the two air cylinders. To regulated this exhaust there are 4 Exhaust Control Valves that are adjusted at the factory before shipping. Follow the procedure below to adjust the speed and/or even the motion of the top Heat Laminating Roll.

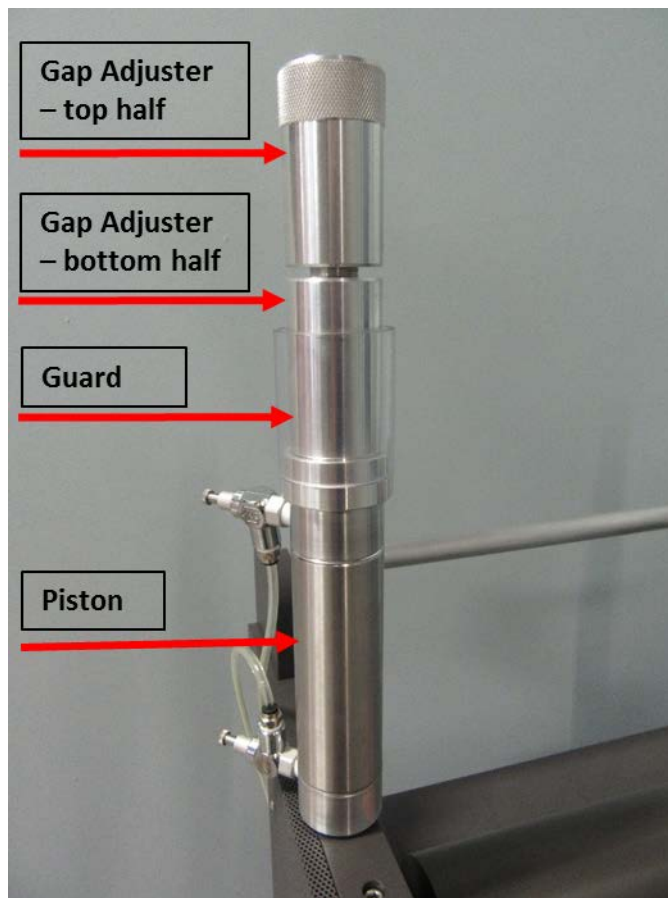
1. Set the Air Regulator between 40 and 60 PSI for the inlet air pressure.
2. Turn the Heat Power switch to off.
3. Cycle the top Heat Laminating Roll up and down while noting the speed and whether one end of the roll travels faster than the other end.
4. First adjust for the even travel of the roll by choosing one direction of movement.
5. If you are adjusting the upward movement you will be adjusting the Exhaust Control Valves mounted at the top of each of the Air Cylinders.
6. The adjustment is mostly a trial and error process. First adjust the valve on one cylinder, by either turning the valve knob in for faster movement or out for slower movement, then cycling the top Heat Laminating Roll to evaluate the movement.
7. Once you have the roll moving evenly in one direction, repeat the process for the opposite direction by adjusting the opposed Exhaust Control Valves at the opposite end of the Air Cylinders.
8. After adjusting the up and down movement of the top Heat Laminating Roll for even movement, you can slow or speed up the movement in either direction by adjusting the Exhaust Control Valves to release or retard the air flow exhaust accordingly.



## OPTIONAL EQUIPMENT

### GAP ADJUSTERS

The purpose of the Gap Adjusters is to provide the ability to set a constant gap between the laminating rolls by use of mechanical stops. The following procedure will describe how to use these Gap Adjusters.



1. Loosen the top half of both Gap Adjusters located at the top of each of the two Air Cylinders. The Gap Adjusters are threaded onto the piston shaft of the Air Cylinder.
2. Loosen the bottom half of both Gap Adjusters, making sure they have been retracted far enough for the top Heat Laminating Roll to be able to travel downward and contact the bottom Drive Laminating Roll

3. Push the **CLOSE NIP** button to confirm that the two Laminating Rolls contact each other at the Nip.
4. Raise the top Heat Laminating Roll by pressing the **OPEN NIP** button and determine the amount of gap you wish to create between the Laminating Rolls. If you have a “spacer” of the proper size, place this between the two Laminating Rolls at the Nip.
5. Press the **CLOSE NIP** button to lower the top Heat Laminating Roll.
6. While the top Heat Laminating Roll is resting on your gap spacer, thread the lower half of each Gap Adjuster down until it stops turning then lock it in place by doing the same with the top half of the Gap Adjuster.
7. Press the **OPEN NIP** button and remove your gap spacer, then lower the top Heat Laminating Roll and check the gap created by the Gap Adjusters for evenness and distance.
8. Adjust by repeating if necessary.

## BRAKE UNWIND STAND

In order to properly laminate many materials, it is necessary to have appropriate back tension on the sample material as it is fed into the Nip. With the optional Brake Unwind System you can mechanically create a back tension that will help eliminate wrinkles in material as it is laminated. Follow the procedure below to use the Brake Unwind System while laminating.

1. Load the roll sample material onto the Brake Unwind spindle making sure the spring loaded gripper blades are engaging the inside surface of the web core.
2. Make sure that the brake plate on the unwind spindle has the open slot positioned over the stop pin on the mount.
3. To increase or decrease the back tension of this unwind roll, simply tighten or loosen the large pressure nut. This action will increase or decrease the tension on the brake plate, thus regulating unwind web tension



## PNEUMATIC FOOT CONTROL

This control is used to switch either the Drive Laminating Roll on and off or to move the top Heat Laminating Roll up and down. Use the following procedure to do either function.



**Warning: Extreme caution should be taken when using this feature to assure that only the sample is near the NIP when lowering the top Heat Laminating Roll.**

1. Activate the foot control by pressing on the switch plate
2. Releasing the switch plate will have the opposite control effect.
3. If you are wired to raise and lower the top Heat Laminating Roll, then the action of the switch plate will lower the top Heat Laminating Roll and release of the switch plate will raise the top Heat Laminating Roll.
4. If the foot switch is wired to the drive motor control, then the action of the switch plate will start the Drive Laminating Roll and release of the switch plate will stop the Drive Laminating Roll.

# MAINTENANCE

## TROUBLESHOOTING

The troubleshooting chart describes some problems that may occur over time. After determining the problem, follow one of the following maintenance procedures.

**UNPLUG THE MACHINE BEFORE ATTEMPTING MAINTENANCE PROCEDURES!**

**ELECTRIC SHOCK MAY OCCUR IF THE MACHINE IS PLUGGED IN!**

**Table 2 – Troubleshooting Chart**

| <b>Problem</b>  | <b>Possible Cause</b>                    | <b>Procedure</b>   |
|---|--|--|
| Bottom Drive Roll does not turn                                 | Check to make sure E-Stop is released    | Turn E-Stop quarter turn counter clockwise   |
|   | Fuse blown                               | Check incoming power fuse. Replace with the appropriate time delay fuse  |
|   | No power to motor                        | Check connections to power source  |
|   | Motor shaft coupling loose.              | Perform procedure labeled Tightening the Drive Coupling  |
| Top laminating roll does not turn with bottom roll and material | Contact between rolls is absent          | Make sure the top roll is in the down position<br>Increase the pressure to assure contact between the top and bottom rolls |
|   | Gap adjusters set too high               |  |
| Top laminating roll does not rise when switched to up position  | No air pressure                          | Check air connections and air regulator for proper connection and setting  |
|   | Exhaust airflow is being restricted      | Check Flow Control Vales for proper operation  |
| Top roll moves unevenly when it is being raised and lowered     | Air pressure is being exhausted unevenly | Check Flow Control Valves  |

**Table 3 – Troubleshooting Chart continued**

| <b>Problem</b>               | <b>Possible Cause</b>                      | <b>Procedure</b>  |
|------------------------------|--|---|
| Lamination has air bubbles   | Air trapped between layers being laminated | Check for proper air pressure<br>Make sure material is in the center of the rolls<br>Make sure you have proper back tension on laminate<br>Keep laminates apart till contact in the nip |
| Air system leaks             | Tubing leak at connection                  | Perform procedure labeled <b>Repairing Air Connections</b>  |
| Pressure roll will not lower | Pressure regulator is set to low           | Adjust pressure regulator to a minimum of 40 PSI  |
|                              | Flow control valves are closed             | See Flow Control Valve section  |
| No Air Pressure              | Air supply not connected                   | Connect machine to compressed air line and make sure control valve is opened  |

## MAINTENANCE PROCEDURES

Maintaining the HL-200/201 will provide many years of trouble free service. The following is a list of actions that should be taken as needed.

- On an annual basis, it is advisable to lubricate the air piston shafts with lithium grease.
- Clean the rolls.



**WARNING: Always unplug the unit before opening the control cabinet. Electric shock may occur.**

- When idle, keep the rolls separate by moving the pressure roll to the up position. This helps prevent flat spots from developing on the rolls.
- If the laminator is not to be used for an extended period of time, cover the rolls to protect them from damage.
- Before turning the air off of the optional air pistons, place a soft protective material between rolls.
- If the laminator is equipped with the optional gap adjusters, they can be set to hold the pressure roll in the up position when the air is turned off.



**WARNING: Do not adjust any of the potentiometers or dipswitches on either of the circuit boards under any circumstances.**

## **TIGHTENING THE DRIVE BELT**

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**Warning: Before working on this equipment and all electrical equipment, make sure you have disconnected the electrical power and air source.**

Should you need to replace or adjust the drive belt, please follow the procedure below.

1. Remove the six screws holding the faceplate.
2. Remove the four screws holding the side panel.
3. Carefully pull these two panels away from the control box.
4. Make sure not to pull any wires or air hoses loose.
5. Loosen the four (4) motor mount screws.
6. Pull the motor to tighten the belt.
7. Tighten the motor mount screws.
8. Reinstall the front and side panels.

## **REPAIRING AIR CONNECTIONS**

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In the even that an air leak develops the following procedure will guide you through repair.



**Warning: Before opening the cabinet to search for air leaks, disconnect the power cord.**

1. Find the source of the leak, and then disconnect the air supply from the unit. The tubing is very flexible and is pushed onto a small barb at each connection.
2. Cut the tubing off the barb.

3. Cut off any bad section of the tubing.
4. Push the tubing back onto the barb.
5. If there is not enough good tubing to reconnect, trace the tubing to the next fitting connection and replace the entire section of tubing.

## SAFETY TRIP WIRE ADJUSTMENT

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If the pressure roller will not lower when the green CLOSE NIP button is pressed, the safety trip wire may need adjustment. To adjust the safety trip wire, follow this procedure.



**Warning: When working on the HL-200/201, it is always best to disconnect the power and air supply. Before disconnecting the air supply, secure the top roll in the up position with blocks of wood or the optional Gap Adjusters.**

1. Push or pull the wire to verify that there are two audible "clicks;" one as the wire is pushed and the other as it is released.
2. If you do not detect the click of the switch when the trip wire is pulled or pushed, loosen the eyebolt on the left side of the safety trip wire by loosening the set nut, and then turning the eyebolt counter-clockwise.
3. Tighten or loosen the eyebolt until there is a "click" when the trip wire is pulled or pushed.
4. Hold the eyebolt securely and tighten the set nut on the eyebolt.

## CLEANING

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From time to time the rolls may need to be cleaned. The laminating platforms can be moved to allow easier access to the rolls. To do this, loosen the black plastic thumbscrews, slide the platform, and then re-tighten the thumbscrews.



**Warning: Always clean rolls with the power off and the heated roll cold to the touch. Do not clean the rolls while they are moving. Always clean the pressure roll while it is in the "up" position.**



**WARNING: Do not use toluene to clean the rubber surface of the rolls. Toluene will damage the rubber surface.**

- Mineral spirits and a soft cloth may be used to clean both of the rolls.
- Do not scrape the pressure roll with any objects.



## REPLACEMENT PARTS

| <b>Part Number</b>            | <b>Description</b>   |
|-------------------------------|--|
| R-HL BELT                     | Replacement Drive Belt for the HL series                         |
| R-HL BOTTOM BEARINGS          | Set of 2 Bottom Bearings for HL-100/101                          |
| R-HL DRIVE GEAR SET           | Replacement Gear set for the HL-100/101 both gears and bushings  |
| R-HL GUARD                    | Replacement HL Guard Set, includes: side, top and 2 x bottom     |
| R-HL HEATING ELEMENT 120      | Replacement HL Heating element for 120V                          |
| R-HL HEATING ELEMENT 240      | Replacement HL Heating element for 240V                          |
| R-HL-200 MOTOR                | Replacement Motor for the HL-200/201                             |
| R-HL-200 MOTOR DRIVE          | Replacement Motor Drive for the HL-200/201                       |
| R-HL REGULATOR AND GAUGE      | Replacement Regulator and Gauge with fittings for HLs            |
| R-HL SLIP RING NEW STYLE      | Replacement Slip Ring New Style, internal brushes                |
| R-HL THERMALLY CON. TOP ROLL  | HL Top Roll with Thermally Conductive Rubber, no heating element |
| R-HL/HLC/HLCL FUSE HOLDER     | Replacement Fuse Holder for the HL/HLC/HLCL                      |
| R-HL/HLC/HLCL HEATING CONTROL | Replacement Heating Controller for HL/HLC/HLCL                   |
| R-HL/HLC/HLCL RELAY           | Replacement Relay for the HL/HLC and HLCL series                 |
| R-HL-100 TOP ROLL             | Replacement Top Roll for HL-100, Teflon covered aluminum         |
| R-HL-100/101 BOTTOM ROLL      | Replacement Bottom Roll for HL's (80 durometer rubber)           |
| R-HL-101 TOP ROLL             | Replacement Top Roll for HL-101 ( Chrome Steel Roll)             |
| R-HL UMCII CONTROL            | Replacement UMCII Control  |