

**READ ALL PRECAUTIONS & INSTRUCTIONS CAREFULLY  
BEFORE OPERATING LAMINATOR**

Setup  
Instruction  
Operation  
Lamination  
Maintenance

**Hot Roll Digital Laminator  
Pressure Sensitive Roll Applicator**

**Model # HRD-443**

**Operation  
Manual**

## Glossary Of Symbols

## Part #

1.  Hand Crush/Force from Above Lab35
2.  General Danger Lab52
3.  Arm Entanglement Lab51
4.  Cutting of Fingers or Hand/Straight Blade Lab54
5.  Hand Entanglement/Chain Drive Lab36
6.  International/Hot Warning Lab100
7.  Electrical Hazard Lab 43
8.  CE European Electrical Lab06
9.  International Ground Lab79

**IMPORTANT:** Don't laminate one-of-a-kind documents unless you are sure of your laminating skills and can afford to damage or ruin the document.

Don't laminate valuable items such as stamps, baseball cards, autographs, or other collectibles because the value of such items can be destroyed by lamination. Collectors generally value these kinds of items only in their original state.

Remember that you cannot laminate thermal paper, such as typical fax paper, because it is activated by heat and will turn black. Also, remove paper clips and staples because they can damage the rubber rollers. Be careful about laminating anything that will be affected by heat. For example, the colors in crayon drawings may run together or be smeared, especially if the crayon layer is heavy. Light crayon drawings may not be affected, but test an expendable sample of any item that may not laminate well.

*IMPORTANT: Éviter de plastifier du papier thermosensible, comme le papier de télécopieur, puisqu'il noircira sous l'effet de la chaleur, et enlever les trombones et les agrafes qui risquent d'endommager les rouleaux de caoutchouc. Prendre certaines précautions avant de plastifier des articles susceptibles de réagir à la chaleur comme les dessins au pastel dont les couleurs baver et se mélanger, surtout si la couche de pastel est épaisse. Les pastels en couche mince peuvent ne pas réagir, mais, en cas de doute, il est préférable de faire un essai avec un échantillon perdu.*

*Ne pas plastifier les documents importants dont il n'existe qu'un seul exemplaire, à moins de bien maîtriser la technique de plastification.*

*Ne pas plastifier non plus les articles de collection comme les timbres, les cartes de baseball, les autographes ou autres, qui peuvent perdre leur valeur pour les collectionneurs s'ils ne sont plus dans leur état d'origine.*

*IMPORTANTE: Recuerde que no puede laminar papel térmico, tal como el papel de fax típico, ya que es activado por el calor y se tornará negro. Retire también cualquier sujetapapeles o grapa, puesto que pueden dañar los rodillos de goma. Evite laminar cosas sensibles al calor, por ejemplo, los colores de dibujos hechos en lápiz de pastel pueden no ser afectados, pero ensaye con alguna muestra descartable, en los ítemes que podrían no laminarse bien.*

*No lamine ningún documento único, a no ser que esté muy seguro de sus habilidades de laminador y pueda permitirse arruinar el documento.*

*No lamine artículos de valor, como estampillas, tarjetas de béisbol, autógrafos, u otros coleccionables, ya que su valor puede ser destruido por la laminación. En general, los coleccionistas valoran este tipo de artículo en su estado original.*

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# 1-1 INTRODUCTION

The Hot Roll Digital laminator is designed to provide quality lamination of a wide range of papers and materials up to 1/2-inch thick using film up to ten mil thick in either a hot or cold medium. Common hot applications include, but are not limited to maps, digital imaging, ink jet prints, packaging, posters, instructional aids, signs, presentation materials, photographs, copies (B&W or color), prints, flyers, promotional sheets and many other items.

The Hot Roll Digital features a built in release liner take-up mechanism to automate the application of transfer tape, and other pressure-sensitive adhesive (PSA) tapes or films. They conveniently & easily apply transfer tape to weeded vinyl, transfer-taped vinyl to sign blanks, and will apply clear PSA overlaminates to finished signs or promotional materials. The Hot Roll Digital Laminator is ideal for mounting applications and can accept substrates up to 1/2 inch thick .

An optional roll feed (for spooling banners, etc.) is available. The stand is standard with the Hot Roll Digital.

To assure the best performance from your new laminator, please follow the safety, installation, operation, and maintenance instructions in this manual. Read the manual before using the laminator, keep the manual with the machine, and periodically review the instructions. The manual also contains warranty and parts information.

Thank you for selecting the Hot Roll Digital laminator. We are committed to your satisfaction.

As you unpack your new laminator, please complete the following information. Always have this information ready when calling.

Dealer Where Purchased \_\_\_\_\_

Installation Date \_\_\_\_\_ Serial # \_\_\_\_\_

**WARNING:** High temperatures are present and care should be exercised in operating the laminator.

***MISE EN GARDE:*** *La machine à plastifier produit beaucoup de chaleur et on doit l'utiliser avec prudence.*

***ADVERTENCIA:*** *El plastificador produce temperaturas muy altas; tenga cuidado al utilizarlo.*

**WARNING:** The laminator should not be operated without the plexiglass safety shield.

***MISE EN GARDE:*** *Ne pas utiliser la machine à plastifier sans son écran protecteur en plexiglass.*

***ADVERTENCIA:*** *No utilice el plastificado sin tener el protector de plexiglass en su lugar.*

Ledco, Inc.  
4265 North Main Street  
Hemlock, NY 14466  
Phone: 800-937-9697 or 585-367-2392  
FAX : 585-367-2978

## 1-2 FEATURES & BENEFITS

Your new laminator has several standard features that set it apart from other models.

- **Variable speed.** The laminator operates at any speed up to 30 feet per minute. Thicker Hot films are generally applied better at mid-range to lower speeds, while 1.5 mil Hot film should be applied at mid-range to higher speeds. Pre-mask and other cold or PSA applications can be run as fast as the relative skill of the operator.
- **Precision Heat Controls.** Individual top and bottom heat controls, as used on our other Digital Laminators, allow for even, consistent heating of the laminating rollers throughout the entire temperature range.
- **A scrap rewind** with an adjustable clutch takes up the release liner found on many pressure-sensitive films.
- **Ease of cleaning.** The heated silicone rubber laminating rollers, and the silicon rubber pull rollers of the laminator should be cleaned regularly. The safety shield (see below) on the laminator swings away in seconds, making it easy to clean the laminating rollers.
- **Attached safety shield.** The polycarbonate shield is clear so operators can see their work. It does not conduct heat so they'll be protected from hot areas. It is fixed to the feed tray and the machine will not run if the feed tray and safety shield is not in place.
- **Lamination pressure.** The rubber rollers are spring-loaded and preset to ensure correct and even lamination pressure. The pressure is easy to adjust if required when performing routine maintenance.
- **Feed tray pressure strip.** This strip on the front of the feed tray holds images flat as they go into the laminator, making it easier to handle the lightweight papers sometimes used in digital imaging.
- **Supply roll tension controls.** Supply roll tension is easy to adjust by simply tightening or loosening the tension control knobs on the supply roll mandrels.
- **Ease of maintenance.** The Hot Roll Digital laminator is made to last. However, some items on a laminator do wear out. Even the high-quality silicone rubber used in the rollers will lose flexibility over time. Extensive use may wear out the rollers, or an operator may cut a roller by accident. Rollers and other key parts can be changed quickly without disassembling the frame. **Parts are available by calling the Ledco Service Dept. at 800-937-9697.**
- **Reverse.** The reverse switch can be invaluable to help avoid problems or clear misfeeds.
- **Right and left adjustable feed guides.**
- **Silicone rubber laminating rollers.** The rollers are flexible enough to provide a good edge seal and firm enough to offer a good surface seal. A high silicone content insures a much longer average roller life.
- **Very strong steel cores.** These prevent roller flexing and insure uniform pressure across the width of the laminate, giving you the best quality lamination available in a medium-duty commercial machine.
- **Controls to open and close the laminating rollers.** The controls make threading easier and allow even heating of laminating rollers during warm-up.
- **100% Made in the U.S.A.**

## 1-3 OPTIONS

- **Roll feed tray** When laminating a very long item such as a banner, it is just about impossible to feed it in perfectly straight by hand. By rolling it up on an empty laminating film roll core and putting that core on the roll feed assembly, laminating the longest item becomes relatively easy. The roll feed assembly is especially helpful for the owners of poster printers, plotters, banner makers, and other digital output devices.



## 1-4 SPECIFICATIONS

Max laminating width	44"
Speed	0-30FPM
Laminating/Pull roller diameter	3 1/8"
Supply roll core size	3"
Recommended film	up to 10mil
Max laminating thickness	1/2"
Max film roll diameter	12"
Dimensions	62"L 34"W 60"H
Shipping Dimensions	72"L 39"W 43"H
Weight/shipping weight	550/850lbs
Motor	1/4 HP D/C
Electrical (single phase)	208-240V single phase 50-60 cycles 30 amps
Electrical Connector	3 Phase 18 amps NEMA 6-30P (Single Phase)
Heaters	5500 watts

## 1-5 PRINCIPLES OF OPERATION

Hot Roll Digital laminators operate by pulling film with a thermally activated adhesive through a heated set of laminating rollers. Film from the supply rolls passes over heated rolls to activate a polyethylene adhesive layer on the film. It then passes through rubber rollers to apply pressure and bond the film to the item being laminated. The adhesive is pressed into the ink and fibers on the surface of the paper (see section 5-3).

The strength of the lamination bond can be checked by cutting a large "X" on the surface of (but not through) a laminated sample with a sharp blade. Use the tip of the blade to pry up one corner of the "X". Grab that corner and pull up the film. Ink and/or paper fibers coming up with the layer of film indicates a good adhesive bond.

If the film comes up too easily, with no ink or paper, the lamination was probably done at too low a temperature. Check the instructions that may have come with your laminating film and/or the lamination temperature chart in section 5-5.

Please note that when doing an X-test on glossy (coated) paper, a good X-test will pull up ink only. The film should not come up easily. When laminating material that is not glossy (uncoated), the paper is often more fibrous and a good X-test will yield ink and paper fibers coming up with the film.

The Hot Roll Digital features a built in release liner take-up mechanism to automate the application of transfer tape, and other pressure-sensitive adhesive (PSA) tapes or films. They conveniently & easily apply transfer tape to weeded vinyl, transfer-taped vinyl to sign blanks, and will apply clear PSA overlaminates to finished signs or promotional materials. Hot Roll Digital laminators are ideal for mounting applications and can accept substrates up to 1/2 inch thick .

Designed for sign and graphics applications, Hot Roll Digital machines are used in many settings, including sign shops, photo-finishing labs, reprographics shops and manufacturing plants.

Jobs such as applying vinyl to sign blanks or putting transfer tape on vinyl signage are very labor intensive. As the material gets wider and longer, the labor costs become disproportionately high. Bubbles and wrinkles are introduced, and waste increases. Some jobs require the additional time and mess of liquid application.

When signage is ruined during the taping or application process, the cost of re-cutting, re-weeding, and reapplying will usually take all the profit out of a job. Whether it's transfer tape, vinyl, sandblast or acid resist tape, pre-masks, adhesive film, clear polyester, or other pressure-sensitive material, a Hot Roll Digital laminator will put it down effortlessly with no bubbles or wrinkles.

Using a Hot Roll Digital laminator is much easier than doing the same work by hand. Fast and versatile, it requires little instruction for you to be up and running. Supply roll

tension is controlled with knobs. The laminating roller gap is adjusted with a single knob. Hot Roll Digital laminators are forgiving. They will apply most materials under a wide range of speeds and pressure or tension settings.

The Hot Roll Digital laminators are heavy-duty commercial laminators designed for the most rigorous and demanding jobs and workloads.

## 1-6 LAMINATING FILM

Most thermal (hot) laminating film consists of two layers: a base of polyester and an adhesive layer of polyethylene. The polyester layer forms the harder outer surface of the film and does not melt at laminating temperature. It provides rigidity and protection for your laminated items. The greater the polyester content, the higher the level of protection, rigidity and luster. The polyethylene layer melts at laminating temperature and bonds the film onto the subject material under the pressure of the laminating rollers. As an X-test demonstrates, the adhesive is pressed into the paper and fills irregularities in the surface.

The proportion of polyester and polyethylene in a film is usually described with numbers. For example, a “1-2” film consists of one mil of polyester and two mils of polyethylene. The first number refers to the base layer. The second number refers to the adhesive layer. A mil is 1/1000 of an inch.

Since polyester is the more costly of the two types of plastic generally used in laminating film, a “3-2” film will cost more than a “2-3” film. Both are 5-mil films but the “3-2” version will seem a little thicker on a piece of laminated material because it will be slightly stiffer. Thermal laminating films are available in many different base/adhesive combinations. Five mil film, for example, can be found in 1-4, 2-3, 3-2 and 4-1 combinations.

In the US laminating trade, the generally accepted practice is to describe two-sided lamination, or encapsulation, by the thickness of one layer of film. For example, “3-mil lamination” should refer to lamination with two layers of 3-mil film. If you are buying or selling laminating film or lamination services, please make sure both parties understand the film descriptions being used. There is a huge variety of thermal laminating films available to suit many different kinds of application. Here are some of the more commonly used “special” film types or film additives:

- film with low-melt adhesives, also known as co-polymer films; these often have better clarity and are less likely to curl or ripple
- matte films to eliminate glare or to accept printing or writing; many suppliers offer a variety of finishes including glossy, matte, satin (in between glossy and matte) velvet, and textured (crystal) finishes.
- film with UV inhibitors to protect colors in the laminated material from fading in sunlight. Note: All polyester films are inherently UV protectant.
- thermal film that has a pressure-sensitive adhesive and a release liner on its outer side; for example, a poster with this material laminated on the back could easily be mounted without fasteners or tape by removing the release liner to expose activated adhesive.

- “liner films” with a protective liner on the top outer surface...after a piece of material has been laminated, trimmed, packed, and shipped, the person using the material can remove the protective liner revealing a surface perfectly free of dust, scratches or abrasion
- opaque or colored films for the back side of a lamination; these can form a border for a laminated piece to add visual interest or a more “finished” look
- iridescent clear films for special visual effects
- permanently waterproof films for outdoor, underwater, or special applications; the most common thermal laminating films are made with water-based primers and will eventually de-laminate if continually exposed to water or weather; truly waterproof films are made with special primers

Rolls of film may be purchased in different widths. The size of the laminator is the only limitation to the width of the film rolls you can use. Make sure the upper and lower roll widths are the same, and are aligned with each other.

When installing film, always center the rolls of film on the supply roll mandrels.

Because it does not hold heat well, 1.5 mil film can be the most difficult gauge of film to use. A standard 1.5 mil film will run at about 310 °F, while a 3 mil film with the same adhesive type will run at 280 °F. Even when applied at 310 °F, the 1.5 mil film will not adhere as consistently as the 3 mil film applied at 280°F, or a 5 mil applied at 250°F. For many applications, 5 mil film does a much better job of protecting and enhancing items.

Ten mil film is suggested for those applications that need the most protection and rigidity. Seven mil films are also available.

Rolls of film are sometimes spliced. Most film suppliers will mark a splice with colored tape. This way, you can see the splice as a “dash” of color on either end of the roll. If you spot a spliced roll in advance, you can put it on the top supply roll mandrel in order to see the splice coming more easily and avoid putting material under the splice. Or you could put it on the bottom roll if you plan to be laminating items that will never be seen from the back side.

## 1-7 WARRANTY

This laminator is guaranteed against defects in material and workmanship for a period of two years after date of shipment. Defective parts will be replaced without cost within the warranty period, provided the laminator has not been abused, altered or operated contrary to instructions. Ledco, Inc. shall not be liable for any alternations or repairs except those made with its written consent.

This obligation under warranty shall not extend to the following:

- The adjustment or replacement of parts which are the normal responsibility of the owner. For example, rubber rollers, heat shoe coatings, scratched or chipped paint, loose fasteners (screws, nuts, etc.), or other items that show wear under normal use; i.e. "normal wear parts."
- Normal operating adjustments to heat, speed, tension, etc.
- Parts that are not manufactured by Ledco, Inc. If the individual manufacturer warrants these items, their warranty is, in turn, passed on to the original purchaser of the laminator. Ledco, Inc. does not incur any obligation or liability as a result of the warranties, which are the sole responsibility of the appropriate individual manufacturer.

Any laminator that proves defective during the warranty period may be returned to Ledco, Inc. unless it is decided that the necessary repairs can be made during a service call. Notice of the defect should be submitted in writing or by phone to Ledco before any steps are taken to repair or return the machine. Phone: 800-937-9697 or 585-367-2392 Fax: 585-367-2978

If the machine is returned, the following should accompany it.

- Customer name, address and phone number
- Written particulars regarding the malfunction
- Date of installation
- Serial number of the machine.

**K RETURNS MUST HAVE A RETURN AUTHORIZATION NUMBER  
ON THE OUTSIDE OF THE SHIPPING CONTAINER.**

Send all returned equipment freight **PREPAID** to:  
Ledco, Inc., 4265 North Main Street, Hemlock, NY 14466

If your machine needs servicing after the warranty has expired, please contact your dealer. Ledco, Inc. does offer technical support if your dealer is unable to assist.

This warranty is expressly in lieu of all other warranties expressed or implied. This includes the warranties of Merchantability and Fitness For Use and of all other obligation or liabilities of Ledco, Inc. Ledco neither assumes nor authorizes any other person to assume it for any other obligation or liability in connection with the sale of this laminator except as provided for above.

Further, this warranty will not apply to any machine or part thereof which has been damaged as a result of an accident or as a result of the abuse, misuse, or neglect of the machine. The warranty is also void if the laminator has been altered or repaired by any other than an authorized repair facility or dealer. If you have any questions about this warranty, contact:  
Ledco: Phone: 800-937-9697 or 585-367-2392 Fax: 585-367-2978

## 2-1 UNPACKING AND INVENTORY

The laminator arrives fully assembled, with the exception of the stand which requires assembly (instructions are included). Some parts such as feed trays may be packed off the machine to avoid shipping damage. Upon arrival, inspect the unit immediately and thoroughly using the packing list that accompanies the shipment. Please follow these steps to correct any problem with your shipment. Ledco, Inc. cannot accept any responsibility for damage or loss unless you notify us within ten days of receipt of shipment and follow these procedures:

**BREAKAGE OR DAMAGE:** It is imperative that any shipping damage is reported and a claim is filed with the delivering carrier immediately upon receipt of damaged shipment. The procedure for reporting damage depends on the method of shipment. **Please note damage on bill of lading. If possible take photos of the damage immediately.**

**FREIGHT, EXPRESS, or TRUCK DELIVERY:** According to the contract terms and conditions of the carrier, the responsibility of the shipper ends at the time and place of shipment. The carrier then assumes full responsibility for the shipment.

1. Notify Ledco **IMMEDIATELY**.
2. Hold damaged goods with container and packing for inspection by the examining agent. Ledco will arrange the inspection.
3. **DO NOT RETURN ANY GOODS TO LEDCO PRIOR TO AUTHORIZATION BY LEDCO.**
4. Submit a copy of the inspector's report to Ledco. Ledco will file the claim with the carrier. Ledco will replace your machinery if necessary. You will be credited for the damaged machinery when the claim is processed.

### **SHORTAGE:**

1. Check the packing list notations. The apparent shortage may have been marked as an intentional short-shipped (back-ordered) item.
2. Reinspect the container and packing material, particularly for smaller items.
3. Make certain that unauthorized personnel prior to complete unpacking did not remove the item and inventory.
4. Call us and send immediate written notification of the shortage.

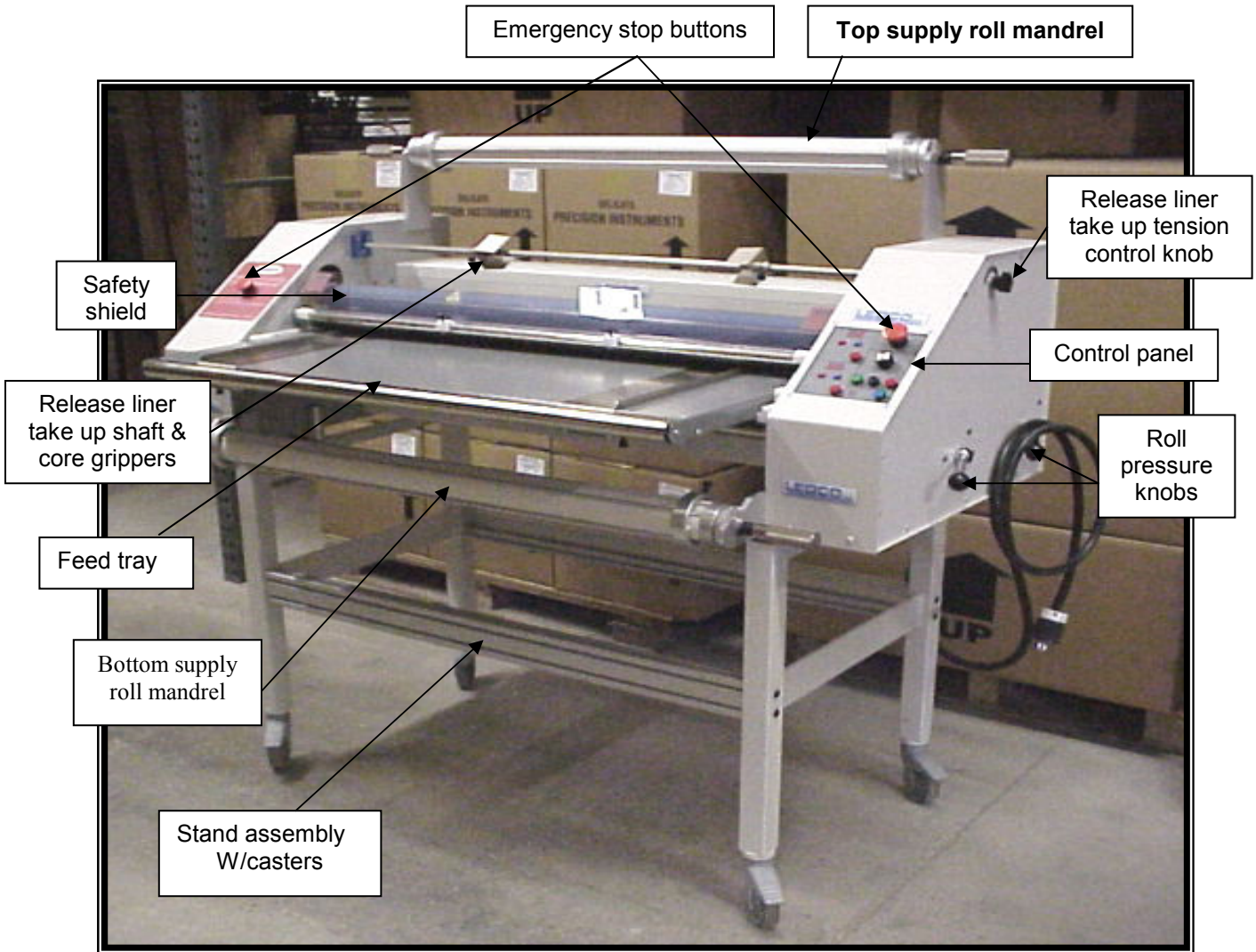
### **INCORRECT SHIPMENT:**

1. If the material you receive does not correspond with your order, notify Ledco immediately. Include the order number and item(s).
2. Hold item(s) until return instructions are received.

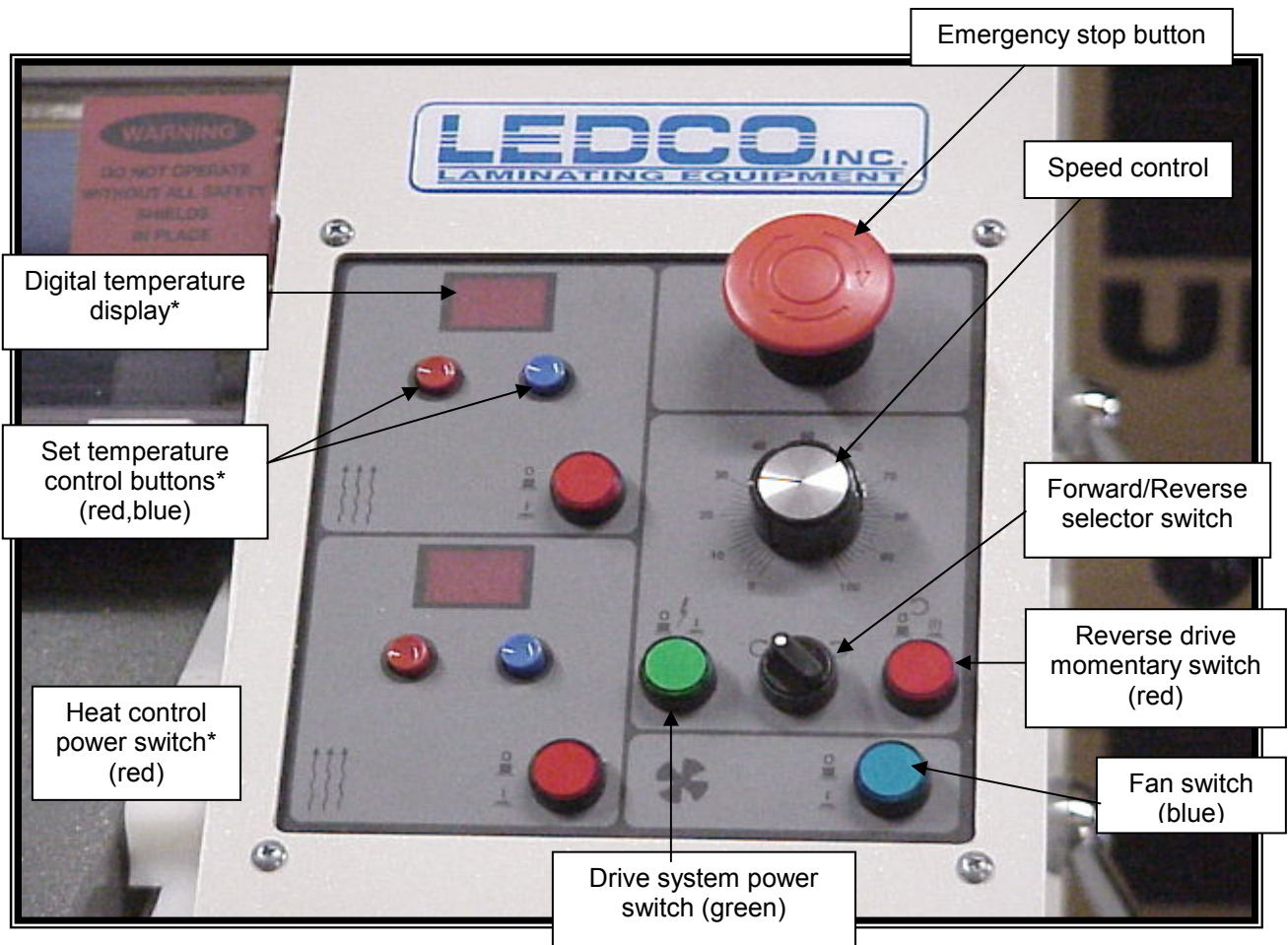
**RETURNS: DO NOT RETURN DAMAGED OR INCORRECT ITEMS UNTIL YOU HAVE RECEIVED SHIPPING INSTRUCTIONS AND AN AUTHORIZATION NUMBER FROM LEDCO.**

### 3-1 PRODUCT ILLUSTRATIONS & NAMES OF PARTS

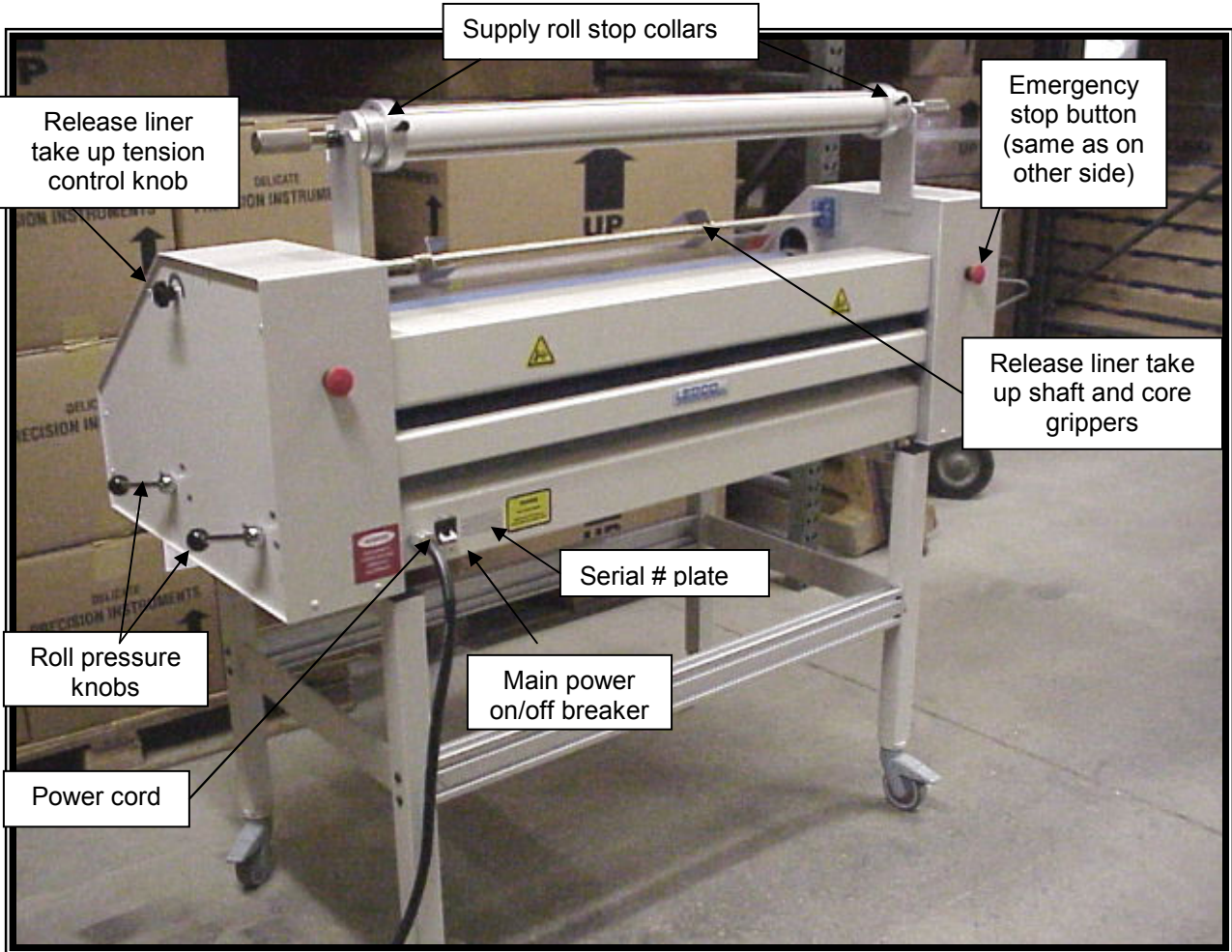
The photos below and on the following pages identify major components and operating controls. Refer to them as you study the installation, operating and maintenance procedures described in this manual.







\* Top & bottom heat controls are identical



## 4-1 SAFETY PRECAUTION

**DO NOT OPERATE THIS MACHINE UNTIL YOU HAVE READ AND FULLY UNDERSTOOD THE FOLLOWING SAFETY PRECAUTIONS.**

1. Never operate this machine without reminding yourself that a big laminator is a powerful and potentially dangerous tool. If misused, used carelessly, or used without observing the rules of safe operation, very serious injury can result.
2. Never operate this machine without all guards, housings, safety shields, stop switches or other safety devices in place and fully operational.
3. Never operate this machine unless you have been fully trained and have received and understood all operating instructions. Make sure you know how the machine works and how it is controlled.
4. Never operate this machine if it is not working properly or if you notice any abnormality in its performance.
5. Never tamper with, rewire, or bypass any control or safety device on this machine.
6. Always keep all parts of your body clear of the laminating rollers, pull rollers, and heated surfaces of the laminator when the power is on.
7. Remember that even after the machine has been turned off for some time, the laminator's heated parts, and adjoining parts, can remain hot enough to burn you.
8. Never attempt to clean the heated areas, laminating rollers, or pull rollers while the power is on.
9. Never remove the machine housing or attempt any kind of maintenance without disconnecting power to the unit.
10. Always be sure all persons are clear of the machine before advancing or reversing the pressure rollers, especially when multiple operators or observers are present.
11. Never wear loose clothing, ties, jewelry or any item, which could be caught in the rollers or machinery when operating the machine. Operators with long hair must put their hair up before running the machine.
12. Always keep your hands clear of any slitter mechanism or blade except when the power is off and you intend to adjust the mechanism or change a blade.
13. Because casters raise the center of gravity and the increase risk of tipping, use casters only when the machine needs to be moved. Use a minimum of two people. Move slowly, and avoid any obstructions. Remove the casters when the machine is in its proper position.

**NOTICE TO EMPLOYER: A copy of these safety precautions must be given to all operators, set-up personnel, maintenance people, and supervisors of this machine. A copy should also be hung on the machine readily accessible and visible to the operator. Additional copies are available upon request.**

**IMPORTANT: Where a language barrier or insufficient schooling would prevent a person from reading and understanding these safety precautions, you should either translate this information or have it read or interpreted to the person, and get assurance that it is understood.**

## 5-1 SET-UP & OPERATION

With the laminator on an unobstructed, level surface, perform the following checkout.

1. Remove all packing straps, rubber bands, tape, and plastic ties from the machine. Remove the protective paper from the safety shield.
2. Plug the machine into a proper 208-240V single phase 30 amp outlet.
3. Remove the feed tray from its packing. Engage the feed tray into the slots of the feed table mounting brackets located at mid level on the insides of both side panels and gently push the tray until it seats. Make sure safety shield is pushed all the way forward towards laminating rolls.
4. Turn on the master switch at the back of the machine. Check all four EMERGENCY STOP BUTTONS. They should be in the up position. If buttons are depressed, turn clockwise slightly until they pop up.
5. Adjust the heat controls.
  - To raise temperature:
    - Press red button once to display set point value screen
    - Press red button again to raise set point value
    - Hold red button to raise set point value rapidly
    - Wait five seconds for actual temperature to be displayed
  - To lower temperature:
    - Press red button once to access set point value screen
    - Press blue button to lower set point value
    - Hold blue button to decrease set point rapidly
    - Wait five seconds for actual temperature to be displayed
  - To switch from Fahrenheit to Celsius:
    - Hold blue button for five seconds
    - Use red button to toggle from degrees F to degrees C
    - Wait five second for actual temperature to display
    - **Be sure not to inadvertently switch from F to C during routine heat adjustments.**

6. The laminating and pull rollers are shipped in the open position. Turn the roll pressure control knobs (the large knobs on right side of the machine) clockwise to engage the rollers. Open and close the rollers several times. Notice that if you turn the knob counterclockwise as far as it will go the rollers are open. If you turn it clockwise you can hear and feel the rollers close and lock. Leave the rollers open if you are not going to thread the machine now.

Always leave the rollers open when you turn off the machine. Always make sure the rollers are open for shipping. Close the rollers when you are going to thread the machine.

7. Press the forward drive (green) button in. Gradually rotate the speed control knob clockwise and observe the lamination drive rollers to see that they are moving. The pull rollers and the laminating rollers should rotate toward the back to the laminator. To check reverse mode, rotate clockwise the forward/reverse selector switch to reverse, press the reverse button (red) in while the forward drive button is also on (and speed control knob set at between 10-15% on the dial) and the rollers will reverse toward the front of the machine while the button is being depressed.



**IMPORTANT: RETURN THE SPEED CONTROL KNOB TO ZERO**

7. Turn off the drive.

8. Turn the heat OFF and master switch OFF.

**SAFETY NOTE: This machine will not operate unless:**

- **It is plugged into an appropriate power source.**
- **All the emergency stop buttons are in the ON position.**
- **Master power switch/breaker on lower back panel is in the "ON" position.**
- **The feed tray and the safety shield are in their proper position.**

## 5-2 Threading the Laminator w/Thermal (hot) Film

1. Although this machine can be threaded cold, most operators feel it's easier to thread while it is warming up or already hot. Remove the supply roll mandrels and the feed tray. The supply roll mandrels are now ready to be loaded with film.

(There are four 3" diameter stop collars included with the machine. These components are designed to help you conveniently align your top and bottom rolls of film, and can be used to hold your film rolls in place if necessary.)



2. Slide a roll of film onto the top supply roll mandrel. Center the roll on the mandrel and place the mandrel in the top bracket. This is a job best done with two people, even if the roll of film is not very heavy. With a person holding each end of the mandrel, it is easy to put both hexagonal fittings into their respective brackets. Make sure they are both fully seated. Attempting to load the film on the laminator by yourself may result in a back strain or other injury.

**Make sure the dull side of the film is facing up and the shiny side is facing the heat rolls during the threading.**

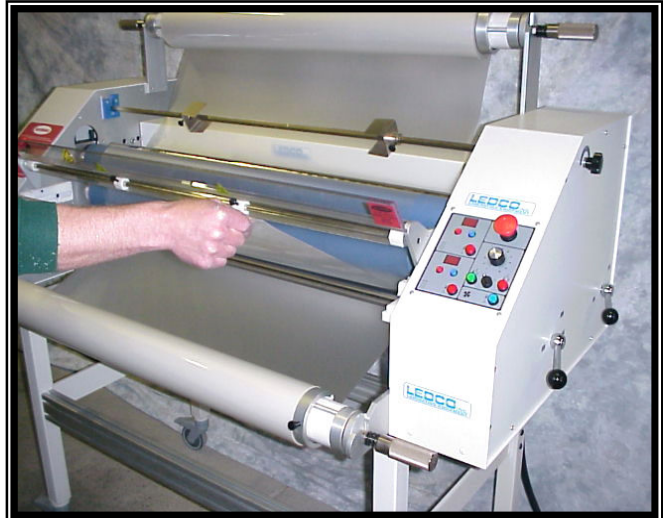


3. Review the threading diagram in section 5-3. **Remember, the shiny side of the film must always go against the heat rolls. The dull (adhesive) side must face away from the heat rolls.**

With the top roll of film centered on the mandrel and the shiny side facing down, pass the film under the idler, and then drape it over the top heat roll. You are now ready to load the bottom supply roll mandrel.



4. Load the bottom roll of film onto the mandrel in the same manner as the top roll. Remember, the **shiny side of the film must always go against the heat rolls. The dull (adhesive) side must face away from the heat rolls.** Make sure the two rolls of film are aligned with each other before going to the next step. Pass the web under the idler bar near the bottom heat roll. Use extreme care if the heat rolls are already heated up. Pull the bottom web up and drape it over the top web. When the machine is hot, the two webs will stick to each other. If threading while cold, use tape to hold the bottom web in place.



5. With both rolls threaded and installed in their respective brackets, unwind the top and bottom supply rolls about a half-turn each. This will provide enough slack in the web to allow the feed tray to slide on easily.



6. Slide the feed tray into position. Position the safety shield forward toward the heat rolls. Remember the drive will NOT engage without the feed table and the safety shield in their proper positions.



7. Make sure there is still enough slack in the web. Close the laminating rollers with the two large knobs on the right side of the unit. With the film draped over the two heat rolls, and melted or taped together, push one edge of the threading card between the heat rolls so that the film is firmly positioned against the heated laminating rollers. Make sure the rubber rollers are in the closed position. If a threading card is not available, any piece of card stock or poster board will work.



8. Push the forward drive switch. If the film and the card are in the nip (the point where the laminating rollers meet) the film and the threading card will start into the laminator and will pass through both sets of rubber rollers. When the threading card has cleared the back of the machine, turn OFF the drive switch.



**CAUTION:** The laminator is designed to be run with the operator directly facing the control panel and feed tray, not at an angle or from the side of the machine.

**For operator safety, the safety shield must be in position over the upper heat**



**roll when the machine is ON, or when the drive switch is in the forward position.**

## 5-3 Film Threading Diagram

For easy loading and threading of the laminator, please follow these two steps:

1. Place the film on the supply roll mandrel as shown in the drawings below and to the right. The position of the supply roll tension knob may vary.

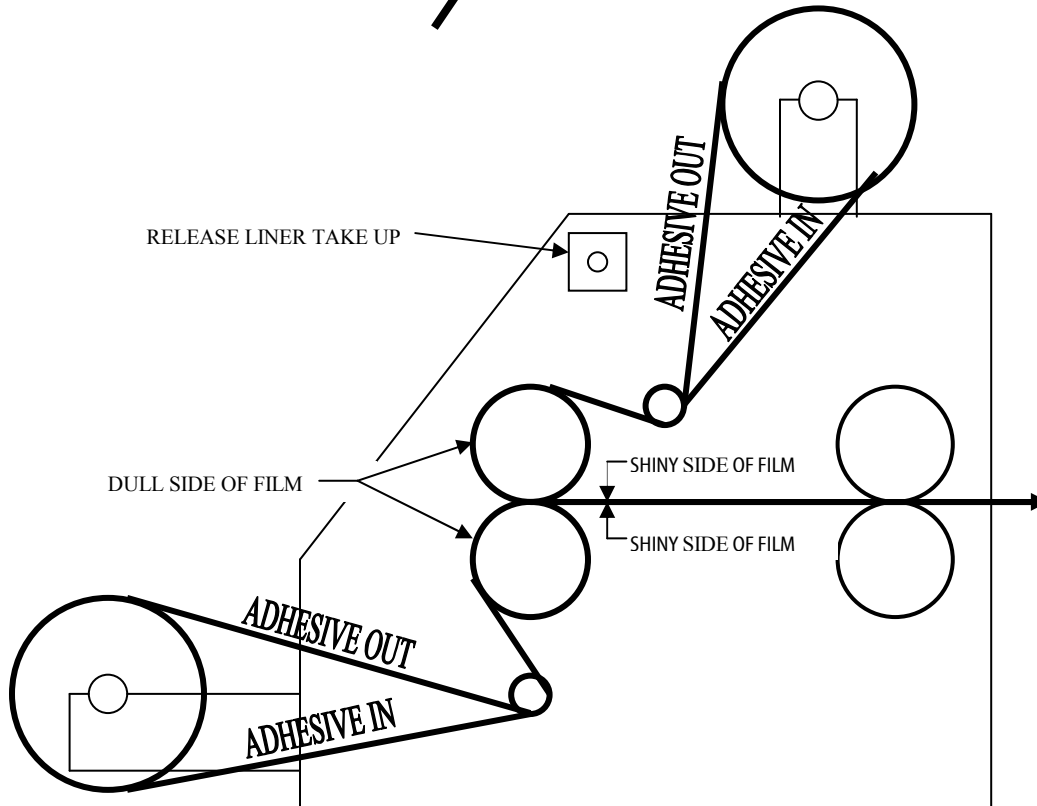
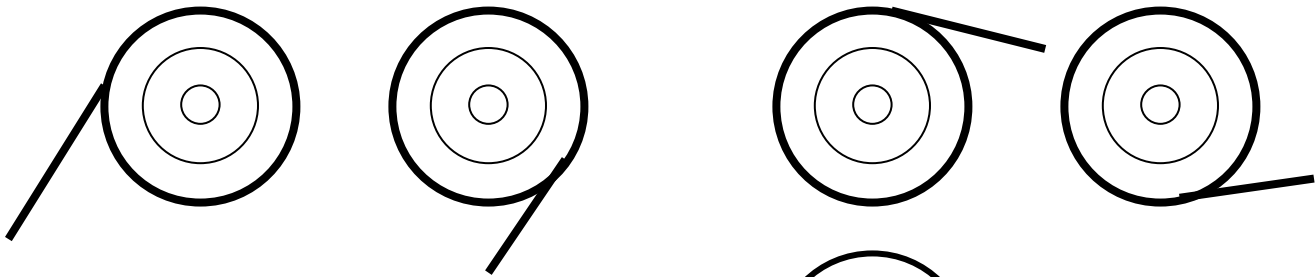
RIGHT SIDE VIEW OF  
TOP SUPPLY ROLL

adhesive out    adhesive in

2. Place the loaded supply roll mandrel on the mandrel on the machine as shown in the picture. The polyester side (usually the shiny side) of the film must go against the heat shoe. The polyethylene side (the dull side) of the film must face the operator.

RIGHT SIDE VIEW OF  
BOTTOM SUPPLY ROLL

adhesive out    adhesive in



**RIGHT SIDE VIEW OF LAMINATOR**

## 5-4 LAMINATING w/THERMAL (hot) FILM

1. If the machine is not already on and warmed up, first make sure the power cord is plugged in. Turn on the machine and set the temperature for whatever film is being used.
2. The laminator will be ready to operate in about 20 minutes.

**WARNING: Try not to let the temperature exceed 325° Fahrenheit while film is threaded and the laminator is not running. The film could disintegrate and require cleaning and rethreading of the machine. When it is necessary to laminate at temperatures in excess of 325° – such as for poster board when using 1.5 mil film or using heat activated mounting boards for simultaneous mounting and laminating – pull some excess film off the film supply rolls to provide slack so the film is not tight against the heat rolls while the machine is heating. This will keep the film from melting when the laminator is not advancing film.**



3. Position the feed guides if needed for precision feeding. You will get the best results by centering items in the web of film.
4. Check and balance the supply roll tension on both rolls. Start by loosening both knobs until there is no pressure on the springs. Tighten each knob until it just begins to press on its spring. For a preliminary adjustment, put three or four turns of tension on each knob.
5. Turn the fans on. Fans should be utilized when laminating with films 3, 5 mil or thicker.
6. Once the machine has come up to temperature, you are ready to make final adjustments of the supply roll tension. With the heat ON, the rollers CLOSED and LOCKED, push the FORWARD button.

Watch the film as it passes over the heat rolls. If there is some waviness in the film at the leading edge of both top and/or bottom heat rolls, supply roll tension is perfect. The leading edge would be the top of the top heat roll and the bottom of the bottom heat roll, the edges that first contact the film. If there is no waviness in the film at all, there is too much supply roll tension. Loosen both knobs a small amount and check again.

If the waviness or wrinkling extends into the laminating rollers, tension needs to be increased. Always keep the amount of tension the same on both rolls. Waviness that extends across 10 to 30 percent of the heat rolls indicates acceptable supply roll tension.

8. When starting the machine to begin lamination, let at least 6-8 inches of film go through the rollers before inserting the items to be laminated. This takes out slack in the film and removes the cooler strip of film that forms just in front of the nip when the laminator is not but film is not being advanced. This also removes any areas of film with excess adhesive that may have pooled just beneath the shoes.

Examine the film coming out the back of the machine. If bubbles or wrinkles appear in the film, this means there is not enough tension to draw the film tight and smooth over the heat shoes. Turn the tension control knobs clockwise to increase the tension.

If the film is stretching, and gets narrower as it goes across the shoes, supply roll tension is much too high, and the temperature setting may also be too high for that film.

Film that is 1.5-mil thickness requires very little tension.

REMEMBER TO TURN BOTH THE TOP AND BOTTOM TENSION CONTROL KNOBS THE SAME AMOUNT TO KEEP TENSION THE SAME ON TOP AND BOTTOM ROLLS. If the film curls up or down after it leaves the machine, read the above section on supply roll tension again and readjust the supply roll tension on both rolls.

If the tension appears balanced, but you notice waves or ripples toward the center of the web of film as it comes out the back, the temperature may be too high or the lamination speed may be too fast for that film. These waves in the film are called "heat wrinkles". These heat wrinkles are formed when the film has not cooled enough before coming out the back of the machine. For the best results, the film should be cooled below melt temperature while it is pulled tight and perfectly flat between the laminating rollers and the pull rollers. If the film exits the back of the machine while still at or above melt temperature, heat wrinkles can form. The major reason for fans on a laminator is to cool the film, not to cool the machine.

9. A unique feature of the laminator is the provision for driving both top and bottom pull rollers and laminating rollers. This feature provides an even distribution of heat on a continuous basis to the laminating rollers prior to startup, or when laminating production is temporarily halted.

10. The laminator is designed to operate with the operator directly facing the control panels and feed tray assembly.

## 5-5 RECOMMENDED TEMPERATURE SETTINGS

Your first source of information about recommended film application temperatures and operating characteristics should be your film suppliers. If you do not know the source of your film, or if the supplier cannot provide the information, please use the following table as an approximate guide.

**FILM MELT TEMPERATURE CHART (ALL FAHRENHEIT)**

FILM TYPE	FILM THICKNESS		
	1.5-1.8-mil	3 mil	5-10 mil
Monopolymer	310°-320°	280°-290°	270°-280°
Low-temp (copolymer)	300°-310°	220°-270°	220°-260°
Ultra-low temperature	230°-280°	180°-270°	180°-260°

Several important notes about this chart:

1. Your film vendor must have the primary responsibility for providing information about the film that you are using.
2. This chart is to serve as a general guide when better data is not available.
3. If your film vendor cannot provide this and other information about the film you are using, it may be difficult to achieve good results.
4. When laminating heavy posters or other thick items with 1.5 to 1.8 mil films, some additional heat may be required to get a permanent bond. Try to limit running in excess of 340-350 degrees to this application or when running heat activated mounting boards when simultaneously mounting and laminating.
5. While offset printed materials may be laminated at the lower ends of the above ranges, inkjet and other output from digital printers may require the upper end of the range in order to get a good bond.
6. See 1-6 LAMINATING FILM for more information.

### Cooling Fans:

The cooling fans are used during lamination with 3-mil, 5-mil, 7-mil, and 10-mil film. The fans cool the plastic as it leaves the laminating rollers and before it enters the pull rollers. As mentioned earlier, the fans prevent heat wrinkling and help insure lamination that is smooth and flat. The pull rollers on a laminator turn a little faster than the laminating rollers, insuring that the film is perfectly flat while it is being cooled.

**NOTE:** It is possible that variances from recommended temperature settings may be necessary due to material thickness, ambient temperature, humidity or the quality or thickness of the material being laminated.

Please note the wide range of temperatures listed, especially for heavier films. This does not mean any film that thick can be run anywhere within the given range. There are “standard” or high-temperature and “low-melt” or low-temperature versions of all film thickness. Some low-melt films work at lower temperatures than others do. It is important you buy your film from a vendor who can tell you the following additional information about any film you choose:

- the thickness
- the clarity
- suggested melt-temperature range
- polyester/polyethylene content
- how well the adhesive will stick to the kinds of images you’ll be protecting and enhancing

Temperatures may exceed 310° when laminating poster board or other thick items with 1.5 mil film on a continuous basis, but when the machine is stopped, turn the heat off if the setting is in excess of 310°. **Never set the heat above 350° with film in the laminator. Temperatures over 300° are not needed except with 1.5 mil film or when processing heat activated mounting materials. Film that is 3 mil or thicker is generally run at 280° or less.**



## 5-6 Simultaneous Laminating and Mounting

There are several different ways to simultaneously mount and laminate. The one preferred by most experienced users, especially those in digital imaging, is to hot laminate while mounting with a pressure-sensitive adhesive at the same time. The advantages of pressure-sensitive mounting for digital imaging applications are covered Section 5-7

Section 5-7 of this manual also details how to coat your foam core or other mounting board with a layer of pressure-sensitive adhesive. OR you can buy board already coated with an adhesive and its release liner.

Cut a piece of your pre-coated substrate (mounting board) slightly larger than your image. Peel back about 4 inches of the release liner on the edge that will be put into the laminator first (leading edge).

Use that exposed adhesive to position and align your image on the board. Being careful to keep the leading edge of the image aligned and wrinkle-free, smooth it down onto the exposed adhesive. The image does not need to be trimmed to final size first, since finish trimming of board and image will be done together after laminating.

When the laminator is threaded and up to temperature, put the leading edge of the board with its image under the feed strip on the leading edge of the feed tray. The feed strip should lift easily to accommodate substrates up to 1/2 inch thick. The laminator should be set 10 or 20 degrees hotter than what you would use on that film for standard laminating. The fan should be turned off.

Keep the board in that position. Do not let it advance far enough to touch the heat rolls yet. Make sure the laminating rollers are closed and locked. The pull rollers should be closed but not locked. Start advancing the film. Once the film that was resting on the heat rolls has been advanced, push the board squarely into the nip.

Hold onto the release liner. Do not let the release liner go under the safety shield. The curl of the release liner will help keep the image off the board until it gets close to the laminating nip.

Laminating both sides of the item helps save the setup time that would be wasted in preparing the machine for one-sided lamination. Other problems with one-sided lamination are detailed in section 5-7.

Another advantage of laminating both sides of foam core and some other substrates is that it minimizes the curl that those substrates are subject to over time.

No adjustment of the laminating rollers is required. Because they are spring-loaded, they will open appropriately for any board up to 1/2" thick. When using 1/2" thick substrates, close laminating rollers, but do not lock them.

After the lamination is complete, trim the board and its now resident image to the finished dimensions.

Final finishing steps may include edge grippers for hanging, many types of framing, edging with plastic U-channel, or putting a leg on the back in the case of countertop displays.

Another very convenient way to simultaneously mount and hot laminate is to utilize pre-made mounting/laminating boards. These boards come in a variety of popular sizes and consist of a 3/16 foam board (pre-laminated on the back to reduce bowing) with an overlamine flap on top (available in various finishes). With the machine unthreaded and up to the appropriate temperature (consult recommended heat settings from your supplier), simply place and align your image in position on the board under the laminating flap, smooth the flap over the image. Make sure the laminating rollers are closed and locked. The pull rollers should be closed but not locked. With the motor drive on and the speed set at 10-15 percent on the dial, feed the leading edge of the board/image/overlamine squarely into the nip of the heated laminating rolls. The heated laminating rolls will grasp the board/image/overlamine and pull it through the nip applying the necessary heat and pressure to the overlamine flap and heat activated adhesive on the board to both laminate the image and securely mount it to the board. The laminated and mounted image then passes through the rear pull rolls and then exits the back of the machine. Let the board cool adequately before final finishing.

## **5-7 COLD APPLICATIONS**

### **Cold Mounting**

The Hot Roll Digital laminator is designed to be a cold laminator and mounting device as well as a hot laminator / mounter.

There are many different methods and sequences for laminating and mounting, but the most common procedure used with digital images is to first hot laminate and then cold mount. Cold adhesives adhere better and more reliably than dry mount (hot) adhesives when it comes to the various plastics, coated papers, and coated mounting boards often used in digital imaging.

The Hot Roll Digital laminator can be used to apply adhesive film to mounting boards. Boards can also be purchased pre-coated with pressure-sensitive adhesive and a release liner.

Most rolls of adhesive have a single release liner. This release liner goes against the top laminating heated roller of the machine. If this work is run after a hot laminating job, sometimes a little heat (100 – 110 degrees) may help the adhesive to flow. It is not necessary to allow the machine to cool to room temperature.



Cold laminators are one-sided laminators with very few exceptions. Most hot laminators encapsulate or coat both sides. When laminating only one side, you must not allow exposed adhesive to go into the machine. Make sure the material being coated is at least as wide as the roll of film. Overlap pieces or use scrap paper between pieces to keep adhesive off the rollers.

Thread the machine by putting a large piece of scrap paper or cardboard through the open rollers. Stick the adhesive to this threading card, close the rollers, and begin to laminate. Keep feeding scrap paper so that the adhesive does not start a wraparound on the rollers.

Adjust the unwind tension to remove any wrinkles from the material. Do not use any more tension than needed or you may stretch the material.

Begin to feed the mounting boards, butting each up against the one ahead. Cut the boards apart with a utility knife at the back end of each board.

Once your boards are coated, or if you buy them pre-coated, you are ready to mount any graphic. There are many methods for sizing and trimming, but most operators pick a board slightly bigger than the graphic and trim board and graphic together after mounting.

Peel back about two inches of the release liner on one end of the board. Use this exposed adhesive to position the laminated graphic on the board. Slide the positioned end of the board into the laminator, holding the graphic up with one hand. Pull off the release liner before it goes into the nip. Pick up the mounted item at the back of the machine. Trim away the unwanted portions of the graphic and the board at the same time.

For information on simultaneous laminating and mounting, see the previous section of this manual.

## 5-8 THREADING THE LAMINATOR FOR COLD LAMINATES UTILIZING THE RELEASE LINER TAKE-UP MECHANISM

### Cold Laminating

Cold laminating is less likely to be used than hot in most digital imaging applications for several reasons:

- Cold laminating does not allow true encapsulation
- It does not offer the same degree of permanent protection
- Cold films are several times as costly as hot films
- Items to be laminated on two sides must be run through the machine twice, so labor is at least doubled

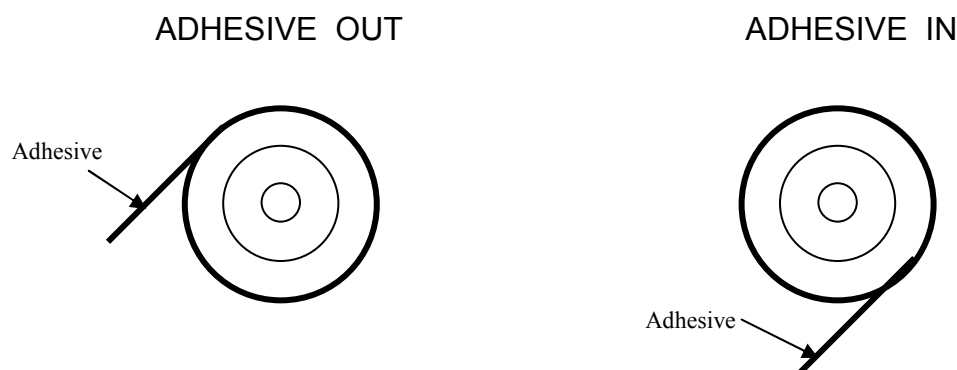
**SAFETY NOTICE:** Always disconnect power from source before threading laminator to prevent accidental injury to operator



### APPLICATION OF OVERLAMINATES:

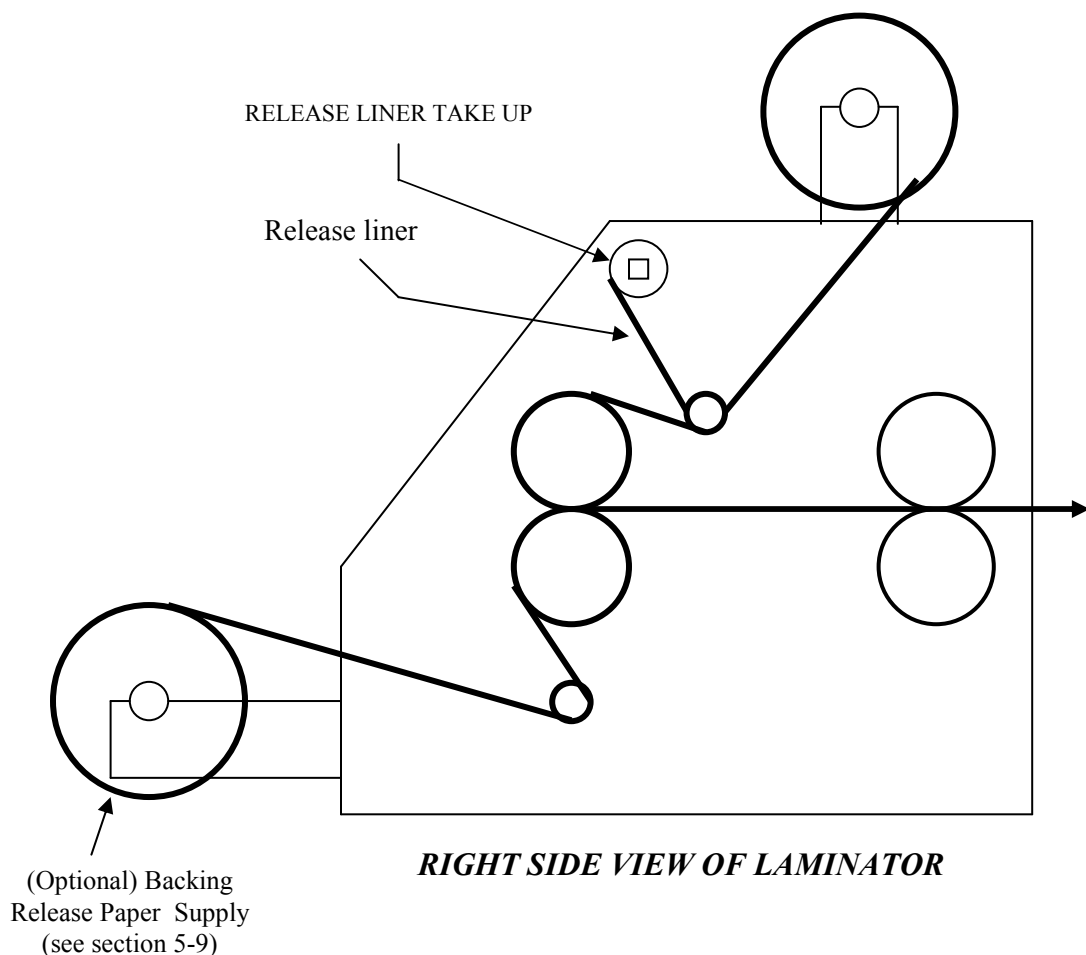
1. Remove the supply roll mandrel and the feed tray. The supply roll mandrel is now ready to accept loading of the PSA (pressure sensitive adhesive) material. Slide a roll of film onto the top supply roll mandrel, turning the roll slightly to slide the gripper inside the core. Center the roll. Make sure the adhesive side of the film is facing upwards.

#### RIGHT SIDE VIEW OF TOP SUPPLY ROLL

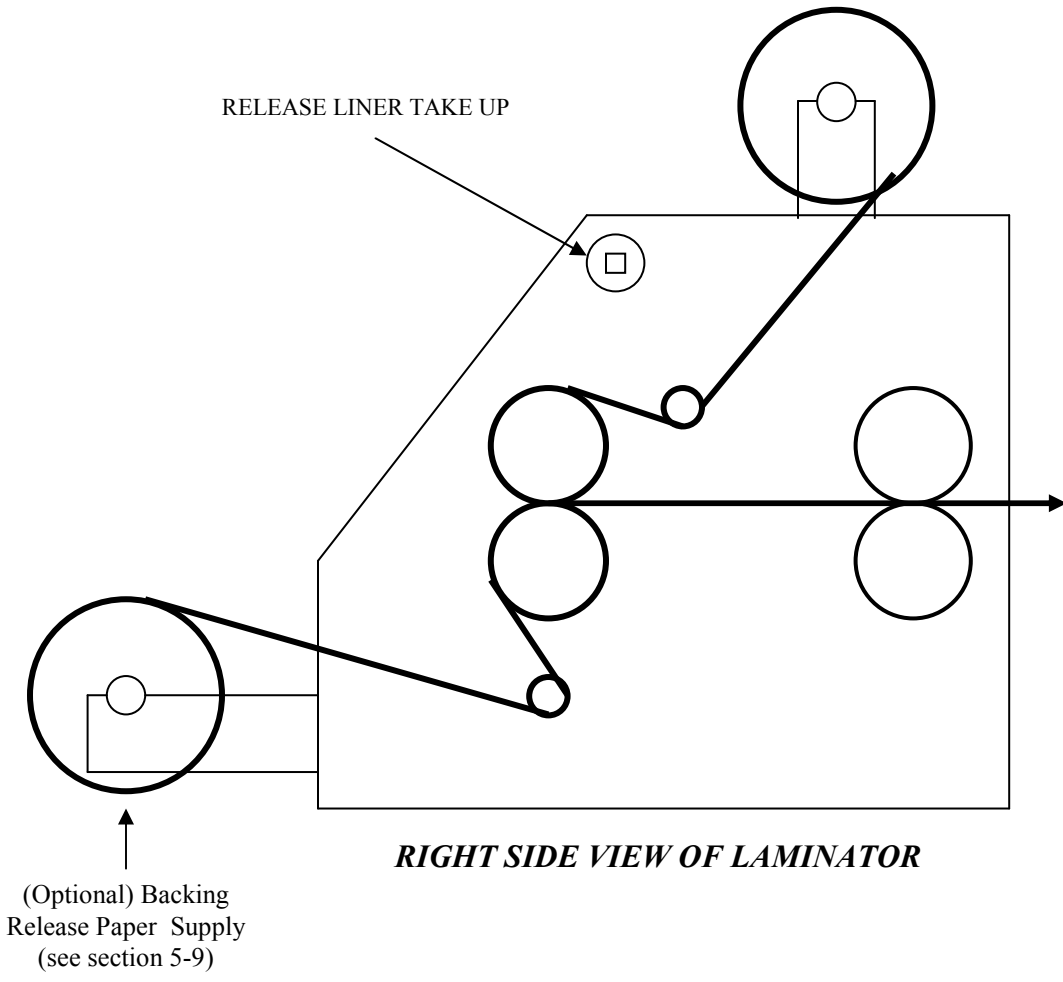


2. Center the roll on the mandrel and place the mandrel in the top brackets. This is a job best done with two people, even if the roll of film is not very heavy. With a person holding each end of the mandrel, it is easy to put both notch fittings into their respective brackets. Make sure they are both fully seated. Attempting to load the PSA material on the laminator by yourself may result in a back strain or other injury.

3. For easier threading use a scrap paper leader or release paper from the bottom supply roll, preferably the same width or wider than the PSA you are applying. Open laminating and pull rollers and slide the paper through, leaving just enough paper to tack onto the leading edge of your PSA material.



## THREADING AND APPLICATION OF PSA FILM & VINYL WHERE RELEASE LINER IS BEING REMOVED BY THE RELEASE LINER TAKE-UP MECHANISM



**THREADING AND APPLICATION OF PREMASKS,  
TRANSFER TAPES, PRESSURE SENSITIVE  
ADHESIVES OR OVERLAMINATES  
WITHOUT RELEASE LINERS**

4. Make sure when using a PSA with a liner, that the film has been threaded underneath the top idler bar (see threading diagram). Separate the liner from the adhesive part of the film at (from under) the (upper) idler roll and tape the liner to a 3" scrap cardboard core mounted on your release liner take-up using the core chucks to secure in place.

5. Close the rollers and lower the safety shield. Slide the feed table in place.

6. Reconnect power to the laminator.

7. Place the forward/reverse switch in the forward position. Turn the speed control to the zero position. Turn the drive switch ON. Carefully monitor the unwind of the laminate as it comes off the supply roll, over the laminating roll and into the nip.

Continue to monitor the laminate as it travels through the front (laminating) rollers all the way through the rear (pull) rollers. Adjust supply roll tension as needed to eliminate wrinkling of the laminate as it passes over the laminating roll. Similarly adjust the release liner take-up tension (via the release liner tension control knob located on the upper right housing denoted by the "INCREASE / DECREASE" decal) to adequately pull the release liner off the laminate and cleanly roll it up onto the release liner take-up core. Run off about 6-8 inches of laminate then turn off the drive switch and return the speed control to zero.

NOTE: If a wraparound occurs place the drive switch in the OFF position and turn the speed control to zero. Place the forward/reverse switch in the reverse position. Turn the drive switch on, depress the red momentary reverse drive button and slowly increase the speed. The operator will need to alternately reverse, pull, reverse, pull, reverse, pull until the film is free of the wraparound. Use the reverse jog sparingly as too much reverse can create a "reverse wraparound".

**CAUTION: The laminator is designed to be run with the operator directly facing the control panel and feed tray, not at an angle or from the side of the machine. For operator safety, THE SAFETY SHIELD MUST BE IN POSITION WHEN THE MACHINE IS ON, or WHEN THE DRIVE SWITCH IS IN THE FORWARD POSITION.**

**MISE EN GARGE: La machine a plastifier est concue pour que l'utilisateur se place directement en face du plateau d'alimentation et des commandes. De plus, pour assurer la securite de l'utilisateur, l'ecran protecteur doit etre releve de facon a recouvrir le sabor chauffant superieur lorsque la machine est sous tension (on) ou que l'interrupteur-moteur est en position de marche avant (forward).**

**ADVERTENCIA: El plastificador está disenado para funcionar con el operador estando directamente en frente del panel de mando y la bandeja de alimentacion, y no a un angulo, o desde un costado de la maquina. Para mayor seguridad del operador, el protector de seguridad debe estar en su lugar cuando la maquina está a encendida, o cuando el interruptor de mando está hacia adelante.**

## **5-9 COLD APPLICATION NOTES**

### **LAMINATION:**

With the Hot Roll Digital laminator now properly threaded with film, it is ready for continuous and/or interrupted lamination duty.

The quality of the finished lamination depends on several factors, such as: film quality, substrate, items to be laminated, lamination pressure, and correct feeding technique. To assure the highest quality lamination possible, some degree of experimentation is required. The following are some helpful hints:

- To remove wrinkles during initial threading and set up, **TURN OFF THE MACHINE**, open the laminating rollers. Gently pull the film and backing release paper at the exit point until all wrinkles are removed. Close the laminating rollers as film is being pulled taut over the rollers. This will conserve more material than trying to run the wrinkles out with the laminator.
- When using release paper to prevent adhesive buildup on the rollers be sure to closely match the widths of paper and film.
- When using smaller (widthwise) substrates it becomes most practical to set up and laminate these subjects as near the center of the roll as possible.
- Films for protecting images printed on vinyl should be made of vinyl themselves so that the flexibility of the vinyl substrate is not impaired. Polyester films are not recommended over vinyl because of their stiffness.
- When laminating only one side, you must not allow exposed adhesive to go into the machine. Make sure the material being coated is at least as wide as the roll of film. If material being laminated is narrower than the film, be sure to run release paper off of the bottom supply roll (see threading diagrams). When not using release paper be sure to overlap sheets of scrap paper under the film, leaving no exposed adhesive. Eliminating exposed adhesive will decrease chances of creating a wraparound.

### **SUPPLY ROLL TENSION:**

A small amount of tension is needed for most jobs. Too little tension and too much tension can both cause wrinkling. The right amount of tension is the least amount that will do the job.

Most tapes and pressure sensitive films do not require a great deal of roll pressure. Roll pressure is set at the factory and rarely needs adjustment. Balance of roll pressure across the rollers is more important than the actual PSI for most applications. Low-tack products such as transfer tape (also called pre-mask or application tape) do not require high pressure as much as they require a certain amount of time between the laminating rollers (also called dwell time).

Many transfer tapes will not stick well if applied at top speed. Your tape suppliers can provide high-tack transfer tapes that are much more suitable for use in the laminators. The common transfer tapes are very low-tack so that they will be forgiving enough to allow application by hand with a squeegee.

High-tack films, vinyl and tapes can be applied at higher speeds because they do not require as much dwell time.

## **2. APPLICATION OF TRANSFER TAPE SIGNAGE TO A SUBSTRATE:**

The Hot Roll Digital laminator will accept rigid substrates up to ½ inch thick. This allows the versatility that you need to accomplish various mounting applications where use of a thicker substrate is required, such as applying vinyl to sign blanks.

The rollers should be in the closed, not locked, position for any substrates over 3/16 inch thick. Substrates less than and up to 3/16 can be run with the rolls in the down and locked position.

The vinyl signage should be placed on the substrate (sign board), release liner side down and aligned the way it is to appear on the substrate. Create a “hinge” by taping the leading edge of your transfer taped signage to the substrate. Peel back two inches of your release liner and slide the positioned end of the board into the laminator, holding the taped graphic up with one hand. Using your free hand, gently pull away the release liner as the machine pulls the substrate through.

With the vinyl adhesive exposed it is imperative that the operator keep the vinyl suspended above the substrate until the point of application (nip rollers). If the graphic were to touch before being laminated, there is a greater risk of trapping air bubbles or wrinkles.

Slowly start the laminator and pull the release liner off the signage as the machine pulls the substrate through. Remove the liner slowly. The release liner will come off easiest if it is pulled away at or near a 90 degree angle from the signage. Slowly remove the separated release liner from the graphic, keeping the vinyl suspended until the point of application. Hold up the taped signage with one hand and be ready to pull away the release liner with the other. Slowly start the laminator and pull the release liner off the signage as the machine pulls the substrate through.

If the signage is held straight up (90 degree angle to the feed tray) from the point where it curls under the safety shield, the release liner can easily be separated from the signage at this point. The safety shield serves as a kind of guide for removing the release liner in this application. Holding the signage straight up against the bottom of the safety shield as the machine pulls the material into the rollers also keeps the vinyl adhesive off the substrate until it reaches the rollers, insuring a bubble-free application.

### 3. COLD MOUNTING:

The Hot Roll Digital laminator can be used to apply adhesive to mounting boards such as foam core. Substrates can also be purchased pre-coated with pressure-sensitive adhesive and a release liner. Cold adhesives adhere better and are more reliable than dry mount (hot) adhesives when it comes to the various plastics, coated papers, and coated mounting boards often used in digital imaging.

Most rolls of adhesive have a single release liner. When threading the laminator the release liner should be facing the top roller. When laminating only one side, you must **NOT** allow exposed adhesive to go into the machine. Make sure the material being coated is at least as wide as the roll of film. Overlap the pieces or use scrap paper underneath them in order to prevent the adhesive from coming in contact with the rollers.

Close the rollers to the appropriate setting. The rollers should be in the closed, not locked, position for any substrates over 3/16 inch thick. Substrates less than and up to 3/16 can be run with the rolls in the down and locked position.

Thread the machine by putting a large piece of scrap paper or cardboard through the open rollers. Stick the adhesive to this threading card, close the rollers, and begin to laminate. Keep feeding scrap paper so that the adhesive does not start a wraparound on the rollers.

Adjust the unwind tension to remove any wrinkles from the material. Do not use any more tension than needed or you may stretch the material.

Begin to feed the mounting boards, butting each up against the one ahead. Cut the boards apart with a utility knife at the back end. Once your boards are coated you are ready to mount any graphic. There are many methods for sizing and trimming, but most operators pick a board slightly bigger than the graphic and trim board and graphic together after mounting.

Peel back about two inches of the release liner on one end of the board. Create a "hinge" by using this exposed adhesive to position the graphic on the board. Slide the positioned end of the board into the laminator, holding the graphic up with one hand. Pull off the release liner before it goes into the nip. Pick up the mounted item at the back of the machine. Trim away the unwanted portions of the graphic and the board at the same time.



Cold films are better for certain applications, such as overlaminating vinyl. Films for protecting images printed on vinyl should be made of vinyl themselves so that the flexibility of the vinyl substrate is not impaired. Polyester films are not recommended over vinyl because of the stiffness.

NOTE: If a very flexible, conforming substrate is not required for the application, an image is better printed on paper than on vinyl. When appropriate it is much more convenient and labor effective to mount and/or laminate utilizing pre-made boards and laminates as highlighted in section 5-6 earlier.

When cold laminating, the threading process is similar to that described above for mounting adhesives. One difference is that outside surface of the film goes against the top laminating roller, while the adhesive side of the film should be facing the operator. The release liner should be taped to an empty core on the release liner take-up attachment.

When laminating only one side, you must not allow exposed adhesive to go into the machine. Make sure the material being coated is at least as wide as the roll of film. Overlap pieces or use scrap paper between pieces to keep adhesive off the rollers.

Thread the machine by putting a large piece of scrap paper or cardboard through the open rollers. Stick the adhesive to this threading card, close the rollers, and begin to laminate. Keep feeding scrap paper so that the adhesive does not start a wraparound on the rollers.

Adjust the release line take-up tension so that the release liner is pulled away from the film just after it goes under the idler bar.

Adjust the supply roll unwind tension to remove any wrinkles from the material. Do not use any more tension than needed or you may stretch the material.

Begin to feed the images, overlapping them or running scrap paper between them. Be careful not to allow exposed adhesive to go into the rollers to avoid wraparounds.

The roll feed option can be used in two ways with cold overlaminating. A roll of printed material (one long image or many images) can be put on the roll feed mandrel for lamination in one non-stop process. Or a roll of inexpensive "release" paper can be run under the whole process to keep exposed adhesive out of the nip while laminating a series of pieces.

For those customers who need cold lamination exclusively, Ledco manufactures the Econocraft line of pressure-sensitive machines 25 to 50 inches wide. They can handle substrates up to an inch thick and as wide as the particular machine.

## 5-10 PREVENTING AND SOLVING PROBLEMS WHEN USING HOT LAMINATES

Please read this section before you have a problem.

**PROBLEM:** Wrinkling of the material as it goes into the laminating rollers. This problem usually occurs when laminating an item that has been folded, rolled, bent or wrinkled.

**SOLUTION:** Make sure the leading edge of the item being laminated is laying flat and is inserted parallel to the laminating rollers.

It is sometimes essential to smooth out an item as it passes over the feed table and through the rollers to ensure an even lamination without wrinkles. Smooth from the center of the item, back toward the trailing edges. Once the item starts to feed, you may also pull back and to the sides on the corners of the trailing edge.

If material has been rolled up, take the curl out of it on a table edge before laminating. If some curl remains, it may be helpful to insert the item with the curl down so the leading edge is pressed against the feed tray until just before the nip.

**PROBLEM:** Wrinkling of the film around the material being laminated.

**SOLUTION:** This is normal and inevitable on any laminator, especially with thicker material. These wrinkles will be trimmed away with the scrap, so they do not affect appearance. Because the rollers are being held apart by the paper or cardboard, they cannot pull equally on the plastic around the paper. This creates wrinkles that tend to look like the bow waves of a boat, radiating out through the clear part of the web from the sheet of material.

**PROBLEM:** When two pieces of material are laminated side by side, the plastic adheres to one piece but not the other.

**SOLUTION:** To get maximum efficiency from the film rolls, you can feed several items into the laminator side by side. However, wrinkling can occur if these items are of unequal thickness, because the laminating rollers are lifted off the thinner items by the thicker items. When laminating items side by side, it is important to arrange them so that the thickness is the same.

**PROBLEM:** Wrinkling of the plastic on a laminated piece of material.

**SOLUTIONS:** Make sure you have enough supply roll tension to take the wrinkles out of the film before it gets past the heat rolls. (see supply roll tension, section 5-4) Make sure the film is threaded properly (see threading the laminator, section 5-3). The most frequent operator error is threading the film under the bottom stabilizer bar instead of under the bottom idler bar. The threaded film should not touch the bottom stabilizer bar. When the bottom web of film is threaded around the stabilizer bar instead of the idler bar, the film will tend to wrinkle and often will not adhere. The top side of the item will not be affected.

**PROBLEM:** Film gets wrapped around the pull rollers.

**SOLUTION:** While threading the film cold, the loose ends of the unlaminated web are particularly susceptible to “wrap-around”. To minimize this, pull the threading card after it emerges from the pull rollers until the film clears the back of the machine. Use caution when first starting to laminate, being careful that the thin, unlaminated web does not get caught in pull rollers or laminating rollers.

If “wrap-around” does occur while the laminator is cold, you can easily correct it by reversing the direction of the rubber rolls, permitting the laminator to release the film from the rolls.

**PROBLEM:** Film gets wrapped around the laminating rollers while the machine is hot.

**SOLUTION:** Leaving the heat on so that the adhesive does not harden, follow the following steps.

**WARNING:** Be very careful not to touch the heated rollers when the machine is hot.

**MISE EN GARDE:** *Ne pas toucher les sabots chauffants lorsque la machine est chaude.*

**ADVERTENCIA:** *No toque las zapatas calefactoras cuando la máquina está caliente.*

1. Remove the feed tray.
2. Cut the film on the top and bottom, just in front of the idler bars.
3. Loosen the film from the heat shoes and grip the two loose ends, holding them together.
4. Turn the drive switch to the reverse position.
5. Turn on the drive at a very low speed and depress the red, reverse drive momentary button, and allow the laminator to back out the film that is wrapped around the rolls. Pull the film off the roller.

**WARNING:** Keeping the machine in reverse may cause a reverse wrap-around if the film is not getting pulled off the roller. You may need to pull on the film with a lot of force while stopping and starting the drive.

**MISE EN GARDE:** *Si l'on appuie trop longtemps sur l'interrupteur de marche arrière, le film risque de s'enrouler dans l'autre sens. Appuyer par à-coups sur l'interrupteur et vérifier le résultat chaque fois.*

**ADVERTENCIA:** *Apretar mucho tiempo el interruptor de marcha atrás puede causar bobinado inverso. Apriételo brevemente, luego suéltelo y observe el resultado. Apriételo nuevamente si se requiere más marcha atrás. Pare si nota que el plástico hala hacia atrás, volviendo sobre los rodillos.*

**WARNING:** Do not try to cut the plastic off the roller with a knife or other sharp instrument. You will end up cutting the rubber rollers and turn an inconvenience into a major repair bill not covered by warranty.

**MISE EN GARGE:** *Ne jamais tenter de dégager un film enroulé en le coupant avec une lame tranchante. Vous entaillerez le caoutchouc des rouleaux, ce qui occasionnera des frais majeurs de réparation qui ne sont pas couverts par la garantie.*

**ADVERTENCIA:** *No intente separar el plástico del rodillo cortando con un cuchillo u otro instrumento filoso. Terminará cortando los rodillos de goma y convertirá una incomodidad en una cuenta de reparaciones mayor, que no esta cubierta por la garantía.*

If this method does not work, let the machine fully cool. Remove. Carefully cut the wrap-around off the roller with a small pair of scissors, working the point and the cutting edges away from the rubber to avoid damaging the roller. Then clean the rollers per the instructions in section 7-2.

**PROBLEM:** Not noticing that the rolls of film are almost used up (one roll of film always runs out before the other.)

**WARNING:** If the film is run through the laminator without being matched to an opposing film, the adhesive exposed to the rubber rollers will stick to the laminating rollers and create a world-class wraparound. This type of wraparound is difficult to clear because the film adheres to the roller and to itself for the entire length of the accumulated film on the roller. It's best to clear this right away, before the adhesive hardens. Follow the steps above to clear.

**MISE EN GARDE:** *S'il n'y a qu'un film dans la machine, le coté adhésif, qui se trouvera contre le rouleau de plastification, y adhérerá, ce qui provoquera un enroulement "monstre: très difficile à défaire puisque le film adhère d'abord au rouleau, puis à lui-meme a mesure qu'il s'enroule. Il faut agir rapidement avant que la colle durcisse. Procéder de la facon indiquée ci-dessus pour régler le problème.*

**ADVERTENCIA:** *Si el plástico de uno de los rollos de abastecimiento pasa por el plastificador sin ser igualado por una película de plástico del rollo opuesto, el adhesivo expuesto a los rodillos de goma adherirá a los rodillos de laminación y causará un bucle monumental. Este tipo de bucle es muy difícil de deshacer porque el plástico adhiere tanto al rodillo como a sí mismo, a lo largo de toda la longitud de la película de plástico acumulada sobre el rodillo. Es mejor deshacerlo inmediatamente, antes de que endurezca el adhesivo. Siga los pasos indicados más arriba para lograrlo.*

**SOLUTION:** To avoid this problem, stop the laminator before either roll runs out, cut the webs of film, and remove the two near-empty rolls of film and then rethread new rolls. When putting film on a laminator, always use two rolls of matched length and width.

Experienced users may leave the pieces of film remaining over the shoes and in the rollers to help thread the new film. When the machine is warm, the ends of the new rolls can be easily tacked to the already threaded pieces because the adhesive layer facing outwards will be sticky. Be careful not to burn yourself on the heat rollers.

**PROBLEM:** Film is not properly adhered or starts to come off sometime after lamination.

**SOLUTION:** Check the media and ink combination bond compatibility ( perform “X” test as described in section 1-5). If the ink and paper combination is not receptive to heat lamination or unless there is something wrong with the film, this problem comes from film being run at too low a temperature. Check the heat setting on the laminator. (see recommended temperature settings, section 5-5). If the film is not sticking to the item, it is likely that more heat is required.

If you are using 1.5 mil film, which has a very thin adhesive layer, be sure to consult your film suppliers suggested temperature settings. Thinner films (like a 1.5 ml or 1.7 ml ) generally require around 300 degrees to adequately get that thin layer of adhesive to “kick over” and adhere properly.

If you are running thicker films, you may have the problem if you try to go too fast. In this case, the thicker film may not have enough time on the heat rollers to reach its adhesive melt temperature. Thicker films may be run at low speeds with no problem.

When laminating posters or other thicker material with 1.5 mil film, the paper itself can absorb enough of the heat from the film to drop the adhesive below its melt temperature. The film may start to come off immediately or it may start to fall off after a few days. The solution here is to run the work at a higher temperature. About 320° to 340 °F will usually do the job.

Sometimes you may see film detach from an item along one edge (the edge that was put in first). This happens when the material is put all the way into the nip before the machine is started. The way to prevent this is to let a few inches of film go through before putting in sheets to be laminated. This serves other purposes, besides ensuring the front edge of the piece will be properly sealed. It gives the machine a chance to take up the slack that develops in the film whenever the machine is stopped, and it prevents the following problem as well:

**PROBLEM:** A laminated item comes out with a large “oily” spot on or near the leading edge.

**SOLUTION:** It’s not oil that causes this effect, but excess adhesive. When a machine is left heated but idle for a few minutes or longer, the adhesive from the film over the heat rollers can form droplets if material is put in immediately. This excess adhesive saturates an area of paper, creating what looks like an oily spot. The solution, as mentioned above, is just to let a few inches of film go through before feeding in your work.

Anytime you are laminating unfamiliar or costly items, it is a good idea to start with an expendable sample or test piece. Laminating a test piece first gives you an indication of the results you'll get and also takes care of any pooled adhesive.

**PROBLEM:** A milky, hazy line about an inch wide appears periodically across the width of the web immediately after initial warm-up. (Section 5-4, step 3).

**SOLUTION:** The rollers may not be adequately heated, be sure to let the machine heat up thoroughly.

**PROBLEM:** The laminated material seems to have a pitted surface or irregular surface that does not match the texture of the paper being coated.

**SOLUTION:** This is usually caused by adhesive build-up or dirt on the rubber rollers, but may be caused by any matter stuck to the rollers, such as a piece of paper. Inspect the rubber rollers and if they need cleaning refer to section 7-2.

Cuts or other damage to the rubber rollers, especially the laminating rollers, can also cause irregularities in the surface of the film. If the rolls have excessive cuts or damage, they should be replaced. Replacement rolls (and all other components) are available from the **Ledco Service Dept. (Call 800-937-9697)**

**PROBLEM:** The film shrinks as it passed over the heated rollers (known as "necking: in the laminating trade).

**SOLUTION:** Reduce the heat and/or the supply roll tension. The film is not shrinking so much as it is being stretched by excess heat and tension, causing the web to get narrower as it is pulled over the heat rollers.

**PROBLEM:** No power is getting to the laminator.

**SOLUTION:** Make sure there is power at the electrical outlet being used, and make sure both ends of the power cord are firmly engaged. There are fuses inside the laminator, but dead outlets and loose power cord connections are the most common causes of this problem.

**PROBLEM:** Wavy or rippled sections in the laminate, especially toward the center of the web.

**SOLUTION:** These "heat wrinkles" are caused by excess temperature and/or speed for the film being used. Slightly speed up the motor and/or use a lower temperature appropriate for that particular film.

**PROBLEM:** General haziness or cloudiness in the film after lamination.

**SOLUTION:** Increase the temperature. That cloudiness is a function of incomplete adhesion. On a variable speed machine loaded with thicker film, it may be that the film is being run too fast and is not getting enough time on the heat rollers.

**PROBLEM:** Bubbles in the center of the web and/or film not sticking to the center of an item.

**SOLUTION:** This problem can be caused by excessive laminating roll pressure. Putting too much pressure on the laminating rollers actually decreases pressure in the center of the web.

The other likely cause of this symptom is worn rollers. For example, if hundreds of thousands of 18-inch wide sheets are laminated on a 38-inch machine, the center of the rollers can get worn down more than the ends of the rollers. In this situation, the laminating rollers should be replaced. The rollers worn in this way are not suitable for use as pull rollers.

For problems not listed here, contact your Ledco Dealer. If the Dealer doesn't know the answer, please ask the dealer to contact Ledco and get back to you.

You are also welcome to contact us directly with any problem at 800-937-9697 or 585-367-2392. Because of the potential volume of support calls, we do encourage the use of the dealer network as much as possible.

## **5-11 PREVENTING AND SOLVING PROBLEMS WHEN USING COLD LAMINATES**

Please read this section before you have a problem.

**PROBLEM:** Laminated images are curling up or down.

**SOLUTION:** Excessive supply roll tension causes the laminated image to curl up. This curl can be strong enough to prevent the item from hanging straight. It can even pull a mounted image off the substrate.

**PROBLEM:** Laminated images are exhibiting opposite corner curl.

**SOLUTION:** See the above solution and reduce supply roll tension. Opposite corner curl comes from stretching the film too much.

**PROBLEM:** No power is getting to the laminator.

**SOLUTION:** Make sure there is power at the electrical outlet being used, and make sure both ends of the power cord are firmly engaged. The fuses are located inside the right housing, but dead outlets and loose power cord connections are the most common causes of this problem.

**PROBLEM:** Tenting of the film on the image.

**SOLUTION:** This has nothing to do with the film or the laminator. It's caused by various contaminants on the surface of the image. Use cotton gloves or a tack rag as appropriate to clean your image just before it is laminated. If your system

is not in a fairly clean environment close off the area and filter the air or... move the system.

Supply roll tensioning systems dependent on friction between the cardboard film core and the supply roll mandrel and/or tension collars can also create dust in the environment.

**PROBLEM:** The laminated material seems to have a pitted surface or irregular surface that does not match the texture of the paper being coated.

**SOLUTION:** Check the surface of any/all items to be laminated and be sure they are free of any dust and/or debris. This can also be caused by adhesive build-up or dirt on the rubber rollers, but may be caused by debris stuck to the rollers, such as a piece of paper. Inspect the rubber rollers and if they need cleaning refer to section 7-2. Irregularities in the surface of the film can also be caused by cuts or other damage to the rubber rollers.

**PROBLEM:** Bubbles or wrinkles in the laminate, accompanied by movement of the supply roll from side to side (applies to laminators which use a clutch for supply roll tension).

**SOLUTION:** Cause of the problem is insufficient supply roll tension caused by the film core slipping on the supply roll mandrel. Increasing the clutch tension doesn't help, because the roll is turning with the mandrel. Depending on the design of the laminator, the supply roll lock mechanism has failed or the supply roll was put into the film core backwards.

**PROBLEM:** A defect in the lamination which repeats at the same interval each time.

**SOLUTION:** Look at the laminating roller on the side where the defect is appearing. This problem is usually caused by a cut or gouge in the roller, or by something stuck to the roller. A piece of paper, a small bit of wood or metal, or a hunk of adhesive are frequently the culprits.

Clean the rollers of the laminator each time you change film (see section 7-2), and at least once a day. Carefully educate your operators how to treat the laminator. Make sure they are trained to keep knives and other sharp objects away from the rollers.

**PROBLEM:** Film gets wrapped around the laminating rollers.

**SOLUTION:** This mess is most often caused by violating the most inflexible law of laminating: Do not allow exposed adhesive to go into the laminating rollers. Adhesive may stick to the rollers, or it may build up on the rollers to cause a wrap-around later.



When laminating one-side, keep your items wider than the film and keep them overlapping each other. The operator should run a web of paper under the web of film whenever the item being laminated is narrower than the film. The operator should run sheets of scrap paper or plastic under the web of film as he/she set up. Adjust the machine, and do your laminating. There should be an unbroken stream of material under the adhesive as it goes into the nip.

If adhesive does get on the rollers, clean it off before continuing to work. **UNPLUG THE MACHINE FIRST !! Refer to Section 7-2 for proper cleaning procedures.** NEVER try to clean the rollers while they are turning. Clean one section of the rollers at a time while the laminator is turned off.

**PROBLEM:** Wrinkling of one side of the web or skewing of images as they are laminated indicates that perhaps the pressure on one side of the laminating or pull rollers is greater than on the other.

**SOLUTION:** Skewed, wrinkled images are most often generated by skewed trimming or skewed feeding. If the leading edge of an image is not trimmed at right angles, the nip will catch one side before the other. Unless the paper is fairly heavy and stiff, the item will most likely be ruined. The same thing will happen if the operator feeds an item in with the leading edge not parallel to the nip.

If trimming or feeding are not problems, check to make sure the roll tension is balance. Make sure the rollers are closed. If the substrate being laminated is under 3/16 inch thick, make sure they are in the closed and locked position. Consult your laminator vendor if the problem persists.

**PROBLEM:** Myriad small bubbles of air caught between the image and the film, known as silvering.

**SOLUTION:** Silvering is often seen when laminating with cold films. With many cold films, this silvering will go away in a day or two as the adhesive penetrates and pushes the air through the back of the sheet.

## 6-1 INSTRUCTIONS FOR OPTIONS

### 6-2 ROLL FEED

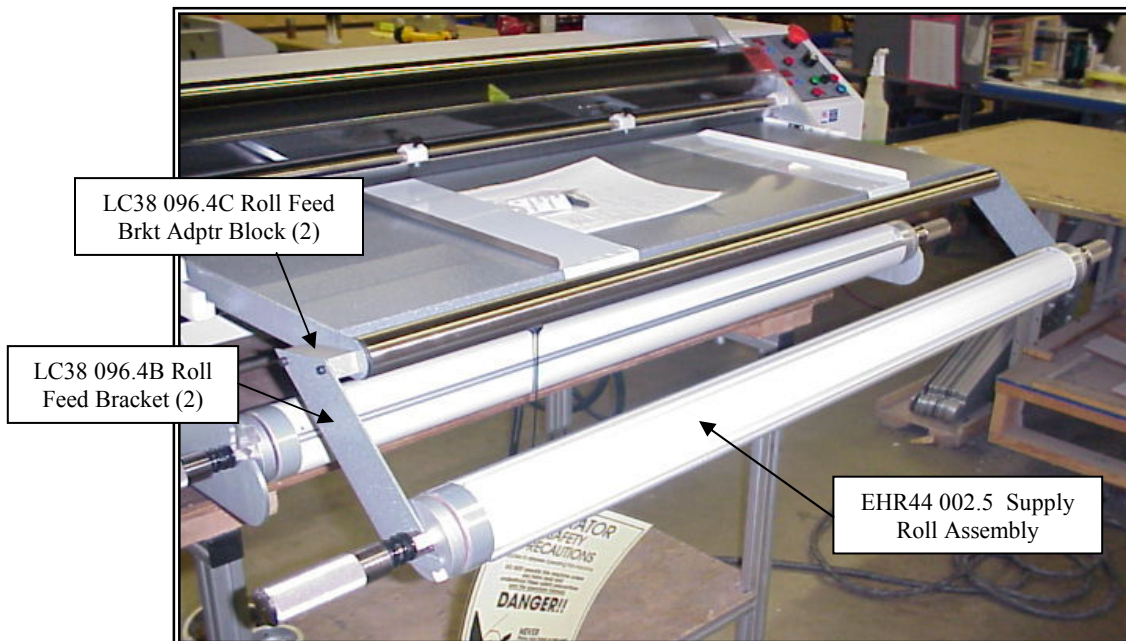
When laminating very long items such as banners it is just about impossible to feed it in perfectly straight by hand. With the roll feed mandrel, laminating the longest item becomes relatively easy. The roll feed mandrel is especially helpful for the owners of poster printers, plotters, banner makers and other digital output devices.

#### To laminate with the roll feed:

1. Roll up the item on an empty laminating film roll core making sure it's not telescoped. This insures it is rolled up perfectly straight.
2. Place the core on the roll feed mandrel. It doesn't matter if the image is face up or not, since both sides of the item will get the same lamination. Adjust for moderate amounts of unwind tension with the tension knob.
3. Feed the leading edge of the item under the feed assembly idler bar into the nip rollers just as if you were feeding an individual sheet. If you have enough blank paper ahead of the image portion of the item, cut the leading edge to a blunt point. This makes it easier to feed the item in without wrinkling.

An optional technique is to feed a sheet of scrap paper into the nip as a leader. Stop the leader when there is about two or three inches remaining outside the safety shield. Place the banner edge on the edge of the leader and tape it securely. Then start to laminate.

### Hot Roll Digital Laminator Roll Feed Option Parts Views



## 7-1 CLEANING & MAINTENANCE

**DANGER:** Always use extreme caution when performing maintenance on your machine! Always make sure the machine is unplugged and that there is NO power to the machine when working on or cleaning any part of the unit.

Use extreme caution to avoid Hot Surfaces, which may remain hot for a period of time even if there is NO POWER to your machine.

Use extreme caution to avoid pinch points at the nip of rubber rollers.

NEVER have rubber rollers turning while performing maintenance to your machine.

NEVER wear loose clothing, ties or jewelry (which may become entangled in gears or rubber rollers) while performing maintenance on your machine.

**MISE EN GARDE:** *La prudence est de mise lorsque l'on effectue l'entretien de cette machine.*

*S'assurer que le cordon d'alimentation est débranché et que la machine est mise hors tension avant de toucher à des pièces internes.*

*Prendre garde aux surfaces chaudes. Ces surfaces demeurent chaudes longtemps après que le courant a été coupé.*

*Tenir les doigts et les objets loin des rouleaux de caoutchouc. Ne jamais faire tourner les rouleaux pendant l'entretien de la machine.*

*Ne jamais porter de vêtements amples, de cravate ou de bijoux, etc. (ces articles peuvent être happés par les engrenages ou les rouleaux de caoutchouc).*

**ADVERTENCIA:** *sea extremadamente cuidadoso siempre que realice tareas de mantenimiento en su maquina.*

*Asegúrese siempre que la máquina está desenchufada y que no hay NINGUNA energía aplicada a la misma mientras esté trabajando con partes internas de la máquina.*

*Sea extremadamente cuidadoso en evitar superficies calientes, que pueden permanecer calientes durante cierto tiempo, aún después de estar cortada la corriente.*

*Tenga sumo cuidado en evitar puntos de constricción en las pasadas de los rodillos de goma. Nunca tenga los rodillos de goma en movimiento mientras realiza trabajos de mantenimiento en su máquina.*

*Nunca vista ropa suelta, corbata o joyas (que pueden ser atrapadas por engranajes o rodillos de goma) mientras está realizando trabajos de mantenimiento en la máquina.*

## 7-2 CLEANING THE RUBBER ROLLERS

Both the laminating rollers and the pull rollers need regular cleaning. Collectively these are referred to as the rubber rollers.

To clean the laminating rollers:

1. Remove the film from the laminator and allow the machine to cool to room temperature.
2. Turn off the master power switch and unplug the machine.
3. Clean the rubber rollers with a mildly abrasive cleaning pad such as a white Scotch Brite (Trademark of 3M) pad which may be purchased in the household section of your grocery store (the green pads are too abrasive). Use **Cool Clean** to clean the rollers (available through your LEDCO dealer). Rub firmly but do not scrub the rollers vigorously as this might mar the surface. Do not use sharp metal objects or steel wool as these will also mar the rollers.

**WARNING: Never clean the rollers while they are turning. While turning, the rollers may catch your fingers and cause injury, or they may catch your cleaning materials and damage the laminator. Unplug the power cord while cleaning the rollers or performing other maintenance on the machine. Turn the rollers by hand.**

**MISE EN GARGE: Ne jamais nettoyer les rouleaux pendant qu'ils tournent afin d'éviter de se blesser et d'empêcher que le produit de nettoyage n'endommage l'intérieur de la machine. Débrancher le cordon d'alimentation avant le nettoyage ou tout autre travail d'entretien. Nettoyer d'abord la partie apparente des rouleaux, puis, à l'aide de la commande de marche arrière, les faire tourner de façon à pouvoir en nettoyer toute la surface.**

**AVERTENCIA: Nunca limpie los rodillos de goma mientras estén girando. Al estar girando, los rodillos pueden atrapar sus dedos y lastimarlos, o pueden atrapar sus artículos para limpieza y danar el plastificador. Desenchufe el cordón eléctrico mientras está limpiando los rodillos, o realizando otras tareas de mantenimiento en la máquina. Gire los rodillos por mano.**

The pull rollers should also be cleaned in the same manner. Turn off the machine and turn the rollers by hand. Access the pull rollers from the back of the machine in between the pull roll guard and back motor cover.

## 7-3 LUBRICATION

**Drive Chain** Drive chain and sprockets on all models should receive a light coat of gear lube or heavy grease (preferably lithium grease) after each 1000 hours of operation.

*Wiring diagram for Hot Roll Digital laminator will soon be available upon request*