

ModuLam 130



**Dry-film Lamination
Engine**



Think & Tinker, Ltd.

Table of Contents

Safety First	1
Characteristics	2
Control Panel	3
Functions and Operation	4
A. Indicator lamps	4
B. Preset functions	5
C. Temperature Control	6
D. Motor / Speed Control.....	6
Operation	7
Cold Lamination.....	7
A. Cold laminating when the ModuLam is first turned on	7
B. Cold laminating with a hot machine.....	7
Hot lamination.....	7
A. Hot laminating when the ModuLam is first turned on.....	7
B. Shutting down after hot lamination.....	8
Laminating Temperature and Speed.....	8
A. Adjusting laminating speed to compensate for changes in the thickness of the film or substrate..	8
B. If the combination of film and paper is thinner than 1 step or thicker than 4 steps, adjust the laminating temperature using the following chart.....	8
Change of step according to temperature	8
Tips for achieving perfect lamination.....	9
Appendix	10
Laminating Photoresist and Soldermask.....	10
Lamination Record and Setting Guide.....	14
Specifications	15

Safety First

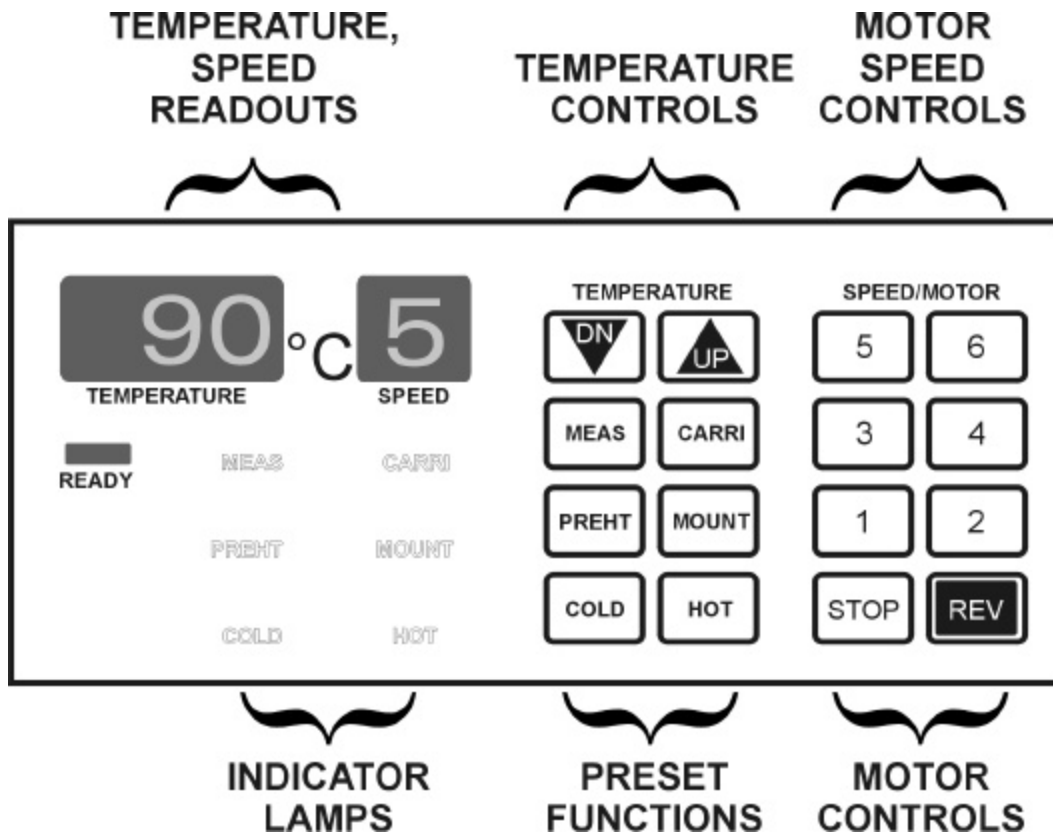
Before using your Composer laminator, there are a few precautions that should be observed.

1. To prevent the possibility of electrical shock, do not operate near sinks, bathtubs, etc.
2. Always check the electrical requirements printed on the bottom of your laminator before plugging into a wall outlet.
3. If an extension cord or "outlet expander" is used, check its power rating to insure that it is compatible with the requirements of the laminator.
4. Do not use the unit if the power cord or case is damaged in any way.
5. Do not allow the power cord to touch hot surfaces.
6. Turn the power off when the unit is not in use, unattended or not intended to be used.
7. Do not rest anything (including your hand) on top of the unit when it is in operation as it can get quite hot.
8. Do not operate machine around inflammable liquids.
9. Do not allow water to enter the machine. If a drink is spilled into the unit, unplug the power cord from the wall and allow the liquid to dry before using the laminator again.
10. Do not force substrates through the machine. You may damage the rollers and void your warranty.

Characteristics

Uniformity of lamination	Each Think & Tinker lamination engine is equipped with 6 Ceracon [®] internally heated rollers. The front two rollers are act as pre-heaters, raising the temperature of the laminating film to a temperature just below the melting point of the adhesive. They also serve to squeeze out any trapped air. The second pair of rollers is heated to the adhesion fusion temperature, laminating the film to the substrate uniformly, without voids or air pocket. The final pair of rollers are unheated and serve to tension the laminated material as it is cooling to insure a flat, stress free end product.
High performance	The custom microprocessor based lamination controller offers precise digital control of both the lamination temperature and the motor speed. Four pre-programmed combinations of speed and temperature reduce the task of setting up the laminator to pressing a button and waiting for the rollers to come up to operating temperature.
Safety	The laminator shell is constructed of heat resistant, non-flammable plastic, protecting the user from the hot lamination elements and any danger of electric shock.
Power saving	The digital lamination controller insures that only the right amount of heat is delivered to the lamination rollers, saving considerable energy over other pouch style laminators that use switch type thermostats. The use of a dc pulsed drive motor minimizes motor heating, resulting in further energy savings.
Soft-touch[®] control panel	All functions are controlled by depressing the desired Soft-touch [®] button. Signal lights and an audible alarm provide immediate feedback that the operating parameters have been changed. An over temperature alarm alerts the operator that the lamination temperature for the target film has been exceeded and the user should wait until the unit cools down.

Control Panel



Functions and Operation

Soft-touch[®] Control Panel

A. Indicator lamps

Specific lamps are illuminated to indicate the state of one or more of the operating parameters of the laminator.



Temperature Indicator – displays the target operating temperature. Also used to display the current fusion roll temperature when the MEASURE function is selected.



Roller Speed Indicator – displays the current “running speed” of the lamination rollers

COLD

Indicates that the current chosen pre-set function is COLD (room temperature) lamination. (temp. = RT , speed = 2)

MEAS

Indicates that the MEASURE (MEAS) function has been selected and the temperature indicator is displaying the current temperature of the fusion rollers.

PREHT

Indicates that the PRE-HEAT (PREHT) function has been selected. (temp. = 80°C, speed = 2)

HOT

Indicates that the HOT function has been selected. (temp. = 90°C, speed = 5)

MOUNT

Indicates that the MOUNTING (MOUNT) function is selected. (temp. = 130°C, speed = 1)

CARRI

Indicates that the MATTING (MOUNT) function is selected. (temp. = 110°C, speed = 2)

READY

Indicates the state of the rollers. Changes state according to the temperature of the rollers as follows:

OFF – the temperature of the fusion rollers is below the set point

BLINKING – the temperature of the fusion rollers is above the set point

ON – the temperature of the fusion rollers is at the set point (+/- 3°C)

B. Preset functions

A number of pre-programmed combinations of temperature and roller speed are accessible from the control panel. These should provide good starting points when laminating new materials and will shorten the learning curve as you familiarize yourself with ModuLam laminators.



Can be used for laminating materials that do not require heat (e.g. pressure sensitive adhesives). A speed = 0 and temperature = 0 (room temperature) are input into the controller when this function is selected.

Automatically selected when laminator is first turned on.



This function is configured for applying 40 micron to 80 micron, low temperature protective laminating film to copier bond or ink-jet media. (temp. = 90°C, speed = 5)



Configured for laminating card stock up to 2 mm thickness with protective films up to 100 microns thick. (temp. = 130°C, speed = 1)



This function is designed for laminating printed circuit substrates with dry-film photopolymers in a siliconized carrier. Can also be used for laminating photographs with matting film. (temp. = 110°C, speed = 2)



This is a stand-by function that can be selected when the machine will be idle for a period of time. The lower temperature extends the life of the rollers and reduces energy consumption. (temp. = 80°C, speed = 2)

C. Temperature Control



1. The se buttons are used to increase and decrease the temperature set-point. As might be expected, the UP arrow increases the temperature, the DOWN (DN) arrow lowers it. After changing the temperature, allow at least 10 minutes for the laminator to reach equilibrium.
2. The range that the temperature can be adjusted is from room temperature (RT) to 160°C in increments of 1°C. If the actual temperature exceeds 160°C (overshoot), a warning beep will sound and the heat will automatically be reduced.



- Press the MEASURE (MEAS) button to display the current temperature of the fusion rollers. The temperature will be displayed for 3 seconds before the displays reverts to the set-point.

D. Motor / Speed Control



The speed of the rollers can be adjusted in 6 increments using these buttons (1 being the slowest, 6 the fastest). It is a good idea to record both the temperature and the motor speed for each type of film that you use. The accuracy of the Think & Tinker lamination controller allows you to return to the same operating parameters with the touch of a couple of buttons.



This momentary switch is used to turn off the drive motor. The motor will restart as soon as the button is released. When the rollers are at operating temperature, it is not a good idea to keep this button depressed for long periods of time as damage to the silicone coating may result.



This momentary switch is used to reverse the rotation of the rollers. It is used to remove jammed substrates as well as neck ties that have been dragged into the laminator.

Operation

Cold Lamination

Cold lamination relies on pressure sensitive adhesives to bond the various laminates together. It is especially useful for laminating materials that would be damaged excessive heat.

A. Cold laminating when the ModuLam is first turned on

1. Turn on the power switch at the right rear of the machine.
2. COLD mode is automatically set. (temp. = 0, speed = 0). The COLD indicator is illuminated.
3. Set the speed to 2 or 3 manually and test your materials for secure void-free lamination. If small void exist or if the degree of adhesion is not adequate, try adding a bit of heat (30°C to 50°C) to see if the bond improves. Even heat sensitive materials can usually withstand such modest temperatures.

B. Cold laminating with a hot machine

1. Select COLD mode. Set the speed to 2 or 3.
2. If the temperature is above 60°C, the ready light (REDY) will blink indicating that the temperature of the fusion rollers is above the set point. Wait until the temperature has fallen to 30°C, before testing your materials.

Hot lamination

Hot lamination usually refers to the process of bonding materials together with the aid of a “hot-melt” adhesive. Many popular laminating films are co-extrusions of a polymer with a high melting point (Mylar or PET) and one with a relatively low one (polyethylene, or polypropylene) which acts as the adhesive.

A. Hot laminating when the ModuLam is first turned on

1. Turn on the power switch at the right rear of the machine.
2. COLD mode is automatically set. Select one of the pre-set functions or manually enter the desired speed and temperature.
3. The unit is ready to use when the READY (REDY) indicator comes on.
4. If you are using laminating pouches, place the item to be laminated inside the pouch.
5. Gently feed into the front rollers.
6. The laminated ensemble will pass through the rollers and exit from the rear of the machine.
7. Examine the laminated specimen for voids and poor conformance. If the lamination is not satisfactory, experiment a little with the speed and temperature until the best results are achieved.
8. Generally speaking, once satisfactory lamination is achieved, the speed can be increased (if desired) if the laminating temperature is also raised. Play around with a few pouches until you find the combination of roller speed and temperature that gives you the best results. Record the operating parameters inside the back cover of this manual.

B. Shutting down after hot lamination

1. After laminating with the rollers at an elevated temperature, it is a good idea to let the rollers cool to below 60°C before turning off the power.
2. Press the COLD button. The temperature will gradually fall and the motor will keep turning. When the temperature falls to 60°C the motor will automatically turn off.
3. Turn off the power switch.
 - Selecting COLD mode and allowing the rollers to drop in temperature before turning off the machine will significantly increase the life of the rollers.

Laminating Temperature and Speed

When you are laminating a low temperature heat activated protective film onto a new substrate, a good starting point is the HOT pre-set function. With it's combination of temp = 90°C and speed = 5, the HOT function should give good enough results that you can easily adjust the speed and/or temperature to achieve excellent lamination every time. The following "adjustment schedules" should help you zero in on the best combination of speed and temperature for you particular application.

A. Adjusting laminating speed to compensate for changes in the thickness of the film or substrate.

1. With 80 micron **film** as the standard, a change in 20 microns of thickness corresponds to 1 unit step of speed. If you set up you lamination process based primarily on 80 micron film with a given substrate, switching film thickness will require that you **decrease** lamination speed by 1 step from the standard speed of 5 for every 20 microns increase in film thickness.
2. With 100 micron **paper** as the standard, a change in 25 microns of thickness corresponds to 1 unit step of speed. If you set up you lamination process based primarily on 100 micron paper, switching paper thickness will require that you **decrease** lamination speed by 1 step from the standard speed of 5 for every 25 microns increase in paper thickness.

B. If the combination of film and paper is thinner than 1 step or thicker than 4 steps, adjust the laminating temperature using the following chart.

Change of step according to temperature											
Temp(°C)	70	80	90	100	110	120	125	130	135	140	150
Step	-4	-2	standard	+1	+2	+3	+4	+5	+6	+7	+8

Confusing? Not really. Consider the following example:

EXAMPLE: If you want to laminate 125 micron film and 150 micron paper at a temperature of 100°C

- Temp: add 1 step to go from 90°C standard to 100°C (see table above) **+1**
- Paper: subtract 2 speed steps to compensate for a 50 micron increase in paper thickness above the 100 micron standard **-2**
- Film: subtract 2.25 steps for increasing the film thickness by 45 microns **-2.25**
- Total compensation is -3.75 steps. Round up to 4 steps and subtract from the standard speed (5) **to yield a final speed of 1**

Tips for achieving perfect lamination

1. Unless a siliconized carrier is used, do not use sheet film when laminating. It may become jammed or stuck to the rollers.
2. Using poor quality films or pouches can cause damage to the machine
3. If the pouch or substrate is not fed straight, lines or wrinkles may appear on the film.
4. Never force a carrier or pouch into the machine. If it will not feed, for any reason, press REVERSE and remove.
5. Never pull an item being laminated from the back of the machine. Allow the unit to feed at its own rate.
6. Laminating substrates thicker than 300 microns in a sealed pouch may result in poor sealing along the edges.
7. Always use a carrier when laminating with films less than 80 micron total (both sides) thickness.
8. If the laminated substrate is hazy or milky in appearance or exhibits poor adhesion, reduce the speed by 1 step and run the item back through the laminator.
9. If the laminated film looks burnt, curled, or crooked, increase the speed by 1 step.
10. If the temperature is too high or the speed is too low, film can become wrapped around the rollers and will not be seen exiting from the rear. If this happens, press REVERSE (REV) and gently pull the film from the front of the laminator. Remove the top cover and wipe adhesive off of the rollers AFTER THEY HAVE COOLED TO ROOM TEMPERATURE!!

Appendix

Laminating Photoresist and Soldermask

The Modulam Hot Roll laminator is available with an optional foot switch and lamination carrier that make the application of dry-film photopolymers and pressure sensitive adhesives straight forward and very reliable.

Materials / equipment needed:

- [Modulam laminator](#) (with footswitch)
- lamination carrier ([TC10-0912](#))
- TackyCard® roller cleaner
- dry-film photoresist or soldermask

- copperclad
- abrasive cleanser / copper brightener (scrub cleanser)
- abrasive scrub brush
- rubber gloves, safety glasses, and an old shirt or smock
- plastic cutting board (or 12" x 24" sheet of plastic)
- Scotch® tape

Procedure

1. Place your laminator on a table (or any other stable horizontal surface) such that there is enough room behind the unit to accommodate the longest substrate (including carrier) that you intend to laminate. Make sure the tabletop is clean and ready to use.
2. **Before heating up your machine, clean the rollers using the TackyCard®. This will insure that debris on the fusion rollers does not damage the photoresist during lamination.**
3. Inspect the unit to ensure that the heat adjustment knob is set properly for your application. Most dry-film photopolymers (e.g. Think & Tinker photoresist and soldermask) work best if the lamination temperature is approx. 110°C (± 5°).

If you are not sure what the proper temperature is, start at the minimum setting and work your way up until satisfactory lamination is achieved. It takes a lot longer for the laminator to cool down than to heat up, so start with a **lower temperature setting** and gradually increase it until the desired results are achieved. Always allow at least 10 minutes after changing the temperature setting before attempting to laminate your board.

4. Use the board as a template to cut out a piece of dry-film just large enough to totally cover the copper surface (cut two pieces for a double sided board).
5. Prepare the copperclad for lamination by carefully [cleaning both sides](#).
6. Very slightly wet one side of the board using fine-spray plant mister. Remember. You want the board *moist*, not dripping wet. If the water beads up from the surface, the board is not clean and you should return to step 4.



Attach two pieces of Scotch[®] tape on opposite sides of one corner of the photopolymer. Using a quick pull, break the dull, matte release liner away from the adhesive side of the photopolymer (photoresist or soldermask).

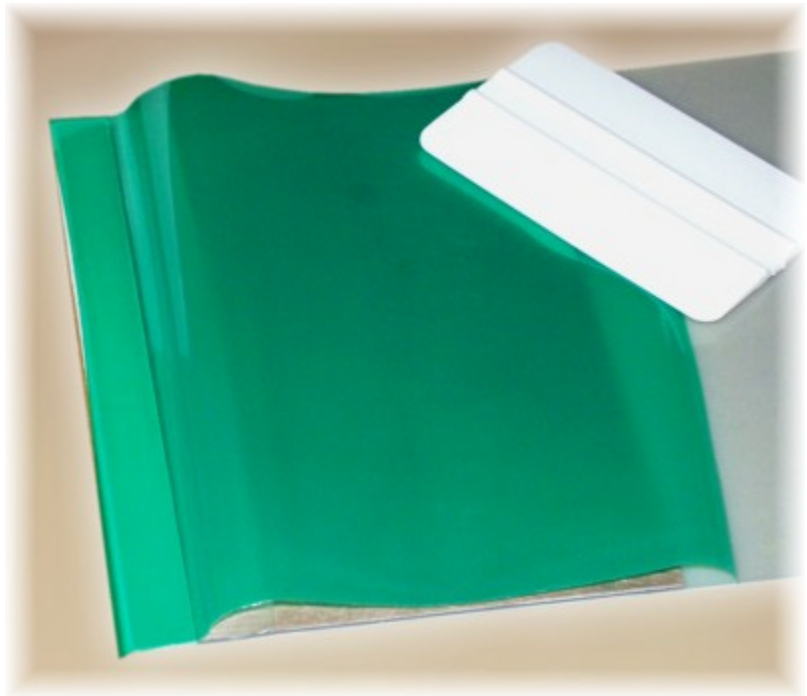
Peel back 1" of the release liner along one edge to expose the adhesive side of the photopolymer.

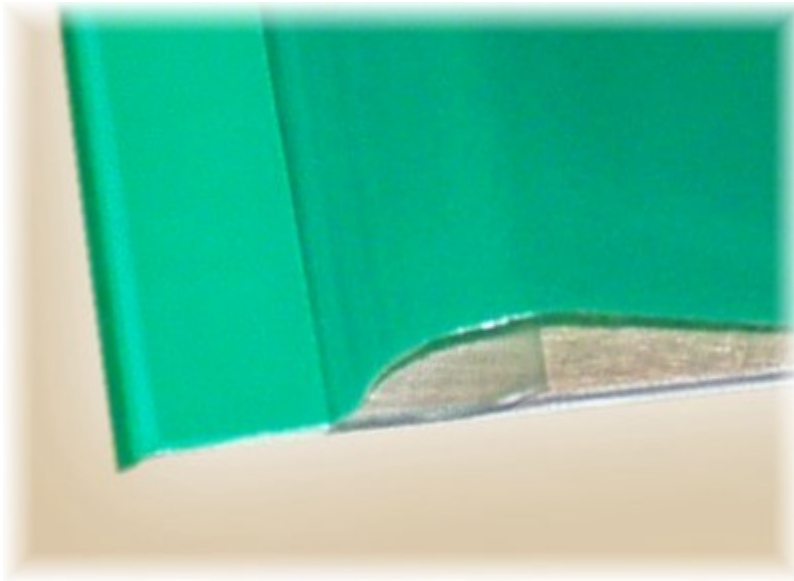
Luckily the cover sheet sticks to the photopolymer far better than the peel sheet so it is just about guaranteed that pulling the pieces of tape apart will strip the peel sheet as desired. If the shiny Mylar cover peels away instead, move to another corner and try again.

Do not remove the entire liner at this time. Peeling the sheets apart generates a fair amount of static electricity. This will, almost certainly, attract any piece of dust in your entire facility and deposit it at the worst possible spot in your circuit pattern.

Using a soft squeegee, adhere the entire edge of exposed adhesive to the raised lip of the lamination carrier.

If you are not using a carrier, adhere the film to the leading edge of the copperclad substrate you are coating. Please note that you may not be able to use this pre-laminated section of the film for circuit imaging as a result of wrinkles and/or trapped air bubbles.



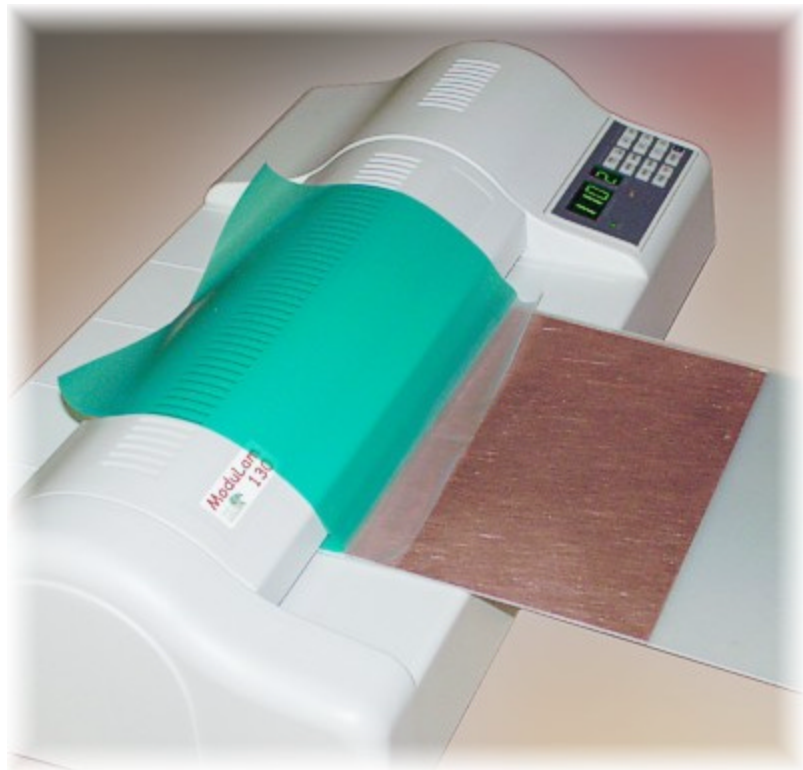


Fold the stripped release liner under the film.

Feed the carrier (or copperclad) into the laminator and let about 1/2" pass between the rollers.

If you are using a Modulam laminator, step on the footswitch to stop the feed motor.

Fold the photopolymer film back over the top of the laminator and position the copperclad substrate up against the raised lip of the carrier.





Grab the loose corners of the release liner and pull hands apart to apply a slight tension.

Release pressure on the footswitch to restart the feed motor.

As the carrier/substrate feeds into the laminator, pull the release liner away from the film just fast enough to keep it from passing into the machine. This will apply a mild tension to the film and prevent any wrinkling or air entrapment.

After the release liner has pulled totally away from the film, let the carrier/substrate continue through the laminator until it passes out the other side. Use an X-Acto knife to separate the substrate from the carrier by cutting along the inner edge of the raised lip. If you are making a double-sided PCB, flip the substrate over and repeat the above process on the other side. Remember to peel off the shiny Mylar film from the photopolymer on the raised lip of the carrier. This will insure that your next application of film will adequately adhere.



You should remove the photopolymer from the raised lip of the carrier every 4 or 5 uses to prevent excessive buildup.

Specifications

ModuLam 130	
Height (mm)	140
Width (mm)	580
Depth (mm)	295
Max. laminating width (mm)	330 (13")
Max. laminating speed (cm/min)	105
Max. operating temp.	140°C
Warm-up time	approx. 3 min
Control system	microprocessor
Drive system	pulsed DC motor
Net wt.	14.1 kg
Shipping wt.	16.7 kg
Electrical	800 Watts 115/220 VAC, 50/60 Hz.

Equipment Warranty

Think & Tinker, Ltd. of Palmer. Lake, CO, USA warrants the original purchaser of this equipment to be free from defects in material and workmanship under normal use and service. Our obligation under this warranty shall be limited to the repair or exchange of any part or parts which may prove defective under normal use and service within one year from the date of shipment and which our examination shall disclose to our satisfaction to be thus defective. When necessary, purchaser shall properly pack and return the unit to the nearest Think and Tinker Authorized Service Center, freight and insurance prepaid. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING THE WARRANTIES OF THE MERCHANTABILITY AND FITNESS FOR USE AND OF ALL OTHER OBLIGATIONS OR LIABILITIES ON OUR PART, AND WE NEITHER ASSUME NOR AUTHORIZE ANY OTHER PERSON TO ASSUME FOR US, ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF THIS MACHINE OR ANY PART THEREOF WHICH HAS BEEN SUBJECT TO ACCIDENT, NEGLIGENCE, ALTERATION, ABUSE, OR MISUSE. WE MAKE NO WARRANTY WHATSOEVER IN RESPECT TO ACCESSORIES OR PARTS NOT SUPPLIED BY US. THE TERM "ORIGINAL PURCHASER" AS USED IN THIS WARRANTY SHALL BE DEEMED TO MEAN THE PERSON OR COMPANY WHO FIRST PUTS THE THINK & TINKER EQUIPMENT INTO SERVICE.

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