

# OPERATION MANUAL



**LAB-LINE**

LAB-LINE®

ULTRA-CLEAN® 100 OVENS

with

MICROPROCESSOR CONTROL, MECHANICAL CONVECTION

Models 3490M, 3490M-1, 3490M-3

3495M-1, 3495M-3

3499M-1, 3499M-3

With HEPA Filter:

3497M-1, 3497M-3

**LAB-LINE INSTRUMENTS, Inc.**

DESIGNERS AND MANUFACTURERS

15th and Bloomingdale Avenues  
Melrose Park, IL 60160-1491  
Call Toll Free: 1-800-LAB-LINE  
In Illinois: (708) 450-2600  
Telex: 6871028 LBLIN UW  
Fax: (708) 450-0943

We are pleased with your choice of LAB-LINE INSTRUMENTS for your equipment needs. For maximum value and ease of start-up, please proceed as follows:

1. Inspect the carton and contents for shipping damage. Notify the carrier immediately if damage is found.
2. Use the "ACCESSORY CHECK LIST" when unpacking to verify that the complete unit has been received. Do not discard packing material until everything is accounted for.
3. Read this Operation Manual thoroughly before deciding on an appropriate location for the unit. You must consider the availability of power, water and/or gas hook-ups, drains and other unit requirements, as well as user convenience.
4. Carefully follow directions in the "INSTALLATION" section of this manual.
5. Insist that each operator of the unit is familiar with the "OPERATION" section of this manual.
6. Fill out the WARRANTY REGISTRATION CARD and mail it in to Lab-Line Instruments, Inc. within seven business days after receiving the unit.
7. Keep this manual in a safe location for ready reference to the "OPERATION" and "MAINTENANCE" sections when needed.
8. If, after reading this manual, you have any difficulty with installation, operation or maintenance, please call:

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(708) 450-2600 (in Illinois)  
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Information for all Lab-Line Instruments, Inc.  
Microprocessor-Controlled Units

\*\*\*\*\*  
\* WARNING \*  
\*  
\* An auto-restart circuit, mounted on the microprocessor PCB, protects \*  
\* against sharp voltage fluctuations. The auto-restart circuit resets \*  
\* the microprocessor after a transient peak. Emergency back-up \*  
\* generators, heavily loaded equipment without zero-crossing switching \*  
\* and lightning storms can cause these voltage fluctuations. \*  
\*  
\* It is not possible to say absolutely that the equipment is safeguarded \*  
\* against all transient voltages or radio frequency interference. \*  
\* Lab-Line Instruments, therefore, expressly disclaims liability for any \*  
\* damage to the equipment or for loss sustained to purchaser from any \*  
\* failure due to transient voltages or radio frequency interference. \*  
\*  
\* For additional protection against transient voltages, use a line \*  
\* filter such as one manufactured by RKS Industries: Model SS-120-H \*  
\* for 120-volt units or Model SS-220-UH for 240-volt units. \*  
\*  
\* The purchaser is responsible for determining (through a qualified \*  
\* electrical contractor) if any line voltage suppression is necessary. \*  
\*  
\* In the event the available electrical outlet supplies power at less \*  
\* than 10% of the voltage required by unit's nameplate, erratic \*  
\* operation can occur. Proceed with determining the cause of low line \*  
\* voltage condition and remedy or select an outlet providing required \*  
\* nameplate voltage. \*  
\*\*\*\*\*

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# DESCRIPTION

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This advanced series of Ultra Clean<sup>®</sup> Class 100 ovens incorporates a microprocessor driven controller-programmer which can be conveniently and easily operated by the user from a front panel keyboard. The unit provides two ramp/dwell combinations which can be repeated up to 200 times or run continuously.

Mnemonics in the display area of the programmer-controller keep the user informed of the parameters which are being acted upon. An additional option allows the unit to be operated in either automatic or manual modes.

Mechanical air circulation provides optimum temperature uniformity and rapid recovery after door openings.

Two systems protect oven contents against overheating. An alarm setpoint programmed in the controller initiates a visual signal in the event the actual temperature exceeds the limit. In addition, a second system is an independent hydraulic thermostat set by the operator to a temperature slightly higher than the maximum operating temperature. This thermostat is a mechanical backup to protect contents in the unlikely event the controller experiences a failure. A red light on the control panel will warn the operator of the overtemperature condition.

# DANGER

DO NOT USE IN THE PRESENCE OF  
FLAMMABLE OR COMBUSTIBLE  
MATERIALS OR EXPLOSIVE GASES.  
DO NOT USE IN THE PRESENCE OF  
PRESSURIZED OR SEALED  
CONTAINERS.  
FIRE OR EXPLOSION MAY RESULT,  
CAUSING DEATH OR SEVERE INJURY.

# SPECIFICATIONS

TEMPERATURE RANGE: From slightly above ambient to 250°C.

POWER REQUIREMENTS: All models accept 50 Hz or 60 Hz current.

<u>Base Model*</u>	<u>Volts AC</u>	<u>Watts</u>	<u>Amps</u>	<u>Heaters</u>
3490M	120	1900	15.8	2
3490M-1	220/240	1900	7.9	2
3490M-3	208	2100	10.1	2
3495M-1	220/240	3100	12.9	2
3495M-3	208	3100	14.9	2
3499M-1	220/240	3100	12.9	2
3499M-3	208	3100	14.9	2

TEMPERATURE RANGE: Slightly above ambient to +250°C.

<u>TEMPERATURE CONTROL:</u> (typical)	<u>Model</u>	<u>at 100°C</u>	<u>at 200°C</u>
	3490M, -1, -3	+/- 0.1°C	+/- 0.2°C
	3495M-1, -3	+/- 0.1°C	+/- 0.2°C
	3499M-1, -3	+/- 0.1°C	+/- 0.2°C

<u>TEMPERATURE UNIFORMITY:</u> (per ASTM E-145 Test Procedure)	<u>Model</u>	<u>at 100°C</u>	<u>at 200°C</u>
	3490M, -1, -3	+/- 1.0°C	+/- 1.5°C
	3495M-1, -3	+/- 1.0°C	+/- 1.5°C
	3499M-1, -3	+/- 1.0°C	+/- 1.5°C

## DIMENSIONS:

3490M, -1, Interior: 13"W x 18"D x 19-1/2"H (33 x 46 x 50 cm)  
& -3 Exterior: 21-5/8"W x 24-1/4"D x 35"H (55 x 62 x 89 cm)  
Capacity: 2.6 cubic feet

3495M-1 Interior: 18"W x 18"D x 19-1/2"H (46 x 46 x 50 cm)  
& -3 Exterior: 26-5/8"W x 24-1/4"D x 35"H (68 x 62 x 89 cm)  
Capacity: 3.6 cubic feet

3499M-1 Interior: 23"W x 18"D x 19-1/2"H (58 x 46 x 50 cm)  
& -3 Exterior: 31-5/8"W x 24-1/4"D x 35"H (80 x 62 x 89 cm)  
Capacity: 4.6 cubic feet

WEIGHT (net): 3490M, -1, -3	180 lb (81.8 kg)
3495M-1, -3	220 lb (100 kg)
3499M-1, -3	234 lb (106.4 kg)

\*NOTE: Specifications are given here for base models. Units with the "C" suffix allow user to ramp in minutes and dwell in hours; units with the "D" suffix permit ramp in minutes and dwell in minutes.

TEMPERATURE RISE TIMES:	3490M, -1, -3	22 minutes
	3495M-1, -3	18 minutes
	3499M-1, -3	20.5 minutes

TEMPERATURE RECOVERY TIME OF LOAD:	3490M, -1, -3	8 minutes
	3495M-1, -3	4 minutes
	3499M-1, -3	7 minutes

## METHOD

Door open 90 degrees for 1 minute. Oven loaded with nine 4" wafer boats filled with wafers and evenly distributed in the oven. A thermocouple measured wafer temperature in the center wafer boat. Time recorded equals elapsed time for wafer temperature to reach 90% of setpoint (150°C).

NOTE: Performance measured under controlled laboratory conditions. Your oven's performance may be slightly different, depending on application.

MODELS 3497M-1, 3497M-3 (units with HEPA filters)

POWER REQUIREMENTS: All models accept 50 Hz or 60 Hz current.

<u>Model</u>	<u>Volts AC</u>	<u>Watts</u>	<u>Amps</u>	<u>Heaters</u>
3497M-1	220/240	3100	12.9	2
3497M-3	208	3100	14.9	2

TEMPERATURE RANGE: Slightly above ambient to +250°C.

TEMPERATURE ACCURACY: +/- 1% of readout over full range of oven temps.

TEMPERATURE CONTROL: +/- 0.2°C (at 90°C)

TEMPERATURE UNIFORMITY: +/- 1.5°C (at 90°C)

RISE TIME (ambient to 90°C): 11 minutes

RECOVERY TIME @ 90°C: 22 seconds  
(after 1 min., 90 degree door opening)

DIMENSIONS: Interior: 14"W x 18"D x 19-1/2"H (36 x 46 x 50 cm)  
Exterior: 26-5/8"W x 24-1/4"D x 35"H (68 x 62 x 89 cm)  
Capacity: 2.8 cubic feet

NET WEIGHT: 202 lb (91.8 kg)

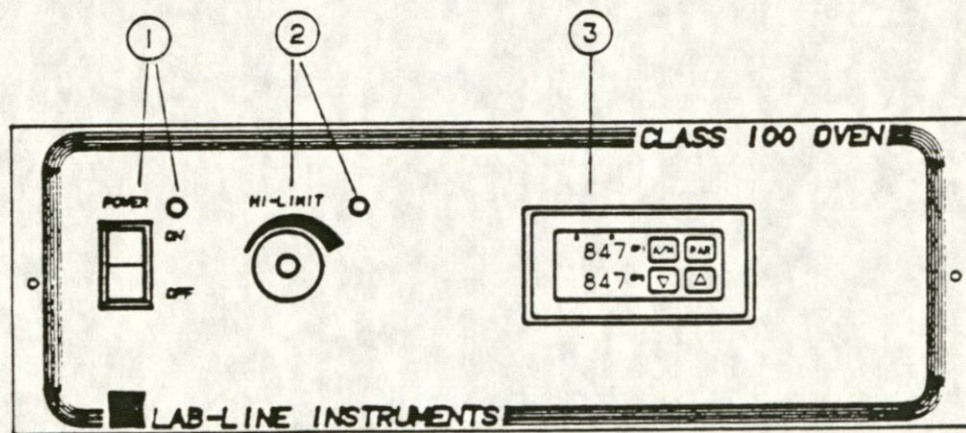


# FEATURES

## FRONT CONTROL PANEL

1. Power Switch. Turns all power to the unit "ON" or "OFF". When power is on, green lamp above switch is lit.
2. Hi-Limit Thermostat. Hydraulic type thermostat provides mechanical overtemperature back-up control, if the controller should fail. A red lamp above the thermostat signals that the temperature is exceeding the hi-limit setpoint established by the user.
3. Programmer-Controller with Display. Four-button operation controller allows user to set and control operating temperature and program ramp-to-setpoint procedures.

Figure 1: FRONT CONTROL PANEL



- |   |                          |
|---|--------------------------|
| 1. Power Switch with green lamp                 | 3. Programmer-Controller |
| 2. Hi-Limit Thermostat with red indicating lamp |                          |

# INSTALLATION

\*\*\*\*\*  
 \* OVEN MUST BE CLEANED AND BAKED OUT PRIOR TO USE IN CLEAN ROOMS \*  
 \*\*\*\*\*

1. LOCATION. Place the oven where it is to be operated, in an area away from drafts. Provide enough clearance to allow free air movement around the oven. Leave clearance at the rear for gas connection and adjustment of air vent. Position the unit with room for 90-degree door opening to the right. The oven must not be placed on a combustible surface.

2. STACKING.

\*\*\*\*\*  
 \* WARNING: These ovens should not be placed one on top of the other \*  
 \* because: 1. There is danger of the oven on top being accidentally \*  
 \* knocked over with possibility of serious injury and property damage. \*  
 \* 2. Heat from oven below can damage control panel components of oven \*  
 \* above with possible resulting electrical short and fire. TO ARRANGE \*  
 \* OVENS VERTICALLY, ORDER OPTIONAL SPACE SAVER STACKING RACK. \*  
 \*\*\*\*\*



3. LEVELING. The oven should be level, though its operation does not depend on this. Do not remove the oven's rubber feet, as they are necessary for proper ventilation. Removing the rubber feet may cause erratic temperature control and damage to the electronic components.

4. SHELF INSTALLATION. Install shelf guides in desired locations along the inside sides of the oven. Make sure the pair of guides for each shelf are at the same level. Each guide has two sets of tabs. Insert the top tabs first, then the bottom tabs. Slide shelves in place.

5. CLEANING. The following procedure is based on test information and a survey of methods currently used by microchip manufacturers.

- A. The person cleaning the oven prior to clean room use should wear disposable polyethylene gloves to prevent skin oils from contaminating the oven surfaces.
- B. Use a lint-free soft paper manufactured for clean room maintenance and reagent-grade isopropanol (denatured alcohol).
- C. Remove shelves, floor and inside side walls from oven and clean thoroughly. Clean interior chamber, including heaters, blower wheel and, very gently, the sensor tube.

D. Move the oven into the clean room and follow installation procedures, noting that it must be cleaned again before use.


6. BAKING OUT THE OVEN. After installing the shelves, bake the empty oven with a steady air exchange until particle count is reduced to an acceptable level.

For working temperatures about 200°C, bake 2 to 3 hours at 200°C.

7. ELECTRICAL POWER. Turn the power switch (on the left side of the front panel) to "OFF" -- the bottom half of the rocker pushed in. Plug the oven into an electrical outlet providing the power that is specified on the oven nameplate.

8. GAS CONNECTION. Inert gas, such as nitrogen, can be injected into the chamber to flush out impurities. The gas inlet, on the back of the oven is a 1/8-inch NPT pipe. Connect Tygon\* R-3603 tubing to this pipe and to the dual regulator on the gas source. Leave the gas turned off until the oven is being operated.

If the oven is to be operated without gas, keep the inlet capped. DO NOT USE THE PLASTIC SHIPPING CAP.

\*\*\*\*\*  
 \* WARNING: Inject only an inert gas into the oven. The use of any \*  
 \* other type gas may lead to fire or explosion and serious injury \*  
 \* or death and property damage. \*  
 \*\*\*\*\*

9. RECORDER CONNECTION. To record oven temperature as shown on the LED readout, plug a recording device into the 1/4-inch phone jack on the back of the oven. Output voltage is 2 mV per degree C; output impedance is 1 K-ohm. The recording device should have a minimum input impedance of 10 K-ohm and should be set for a minimum range of 0 to 500 mV to match the 0 to 250 C temperature range.

10. DOOR ADJUSTMENT. During shipping, the oven door may have been knocked out of line. The following procedure will correct door-to-body and door-to-gasket misalignment.

- A. Lay the unit on its back. If exhaust and purging ports are fitted, support the unit on 2' x 4's to protect these components.
- B. Remove the pivot bolt and flat washer from the top door hinge.
- C. Unlatch the door handle to release the door, then slide the door out and off the bottom hinge pivot bolt to gain access to hinge screws.

\*Tygon -- Reg. TM Norton Company.

- D. Slightly loosen hinge screws on top and bottom hinges, so that hinges require firm hand pressure to reposition. DO NOT REMOVE HINGE SCREWS. Complete removal of screws will make it extremely difficult to reassemble the hinge.
- E. Replace the door on the bottom hinge pin and fit the door in place. Loosen the bottom hinge pivot bolt with an open end wrench. Replace the top hinge pivot bolt and set it to be finger tight.
- F. Align the door to the body -- top, bottom and sides.
- G. Remove the top hinge pivot bolt again, noting the position of properly aligned hinges. Remove the door carefully without moving the hinges out of position.
- H. Tighten all hinge screws VERY securely.
- I. Replace door on bottom hinge pivot bolt. Replace the top pivot bolt and washer. Tighten top and bottom hinge pivot bolts very securely to maintain proper alignment.

11. LATCH ADJUSTMENT. Adjustment of the latch is required, if (A) the door is not sealing properly, (B) the door is too hard to open, or (C) door opens while oven is heating.

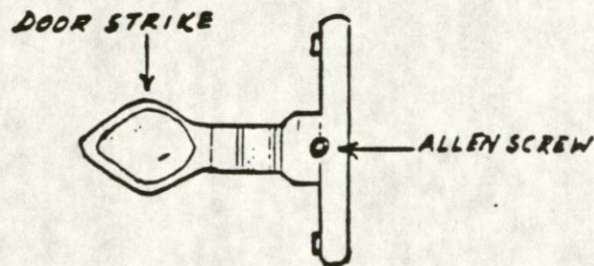
- A. NOT SEALING PROPERLY. Door does not fit snug against the gasket:
  - (1) Open the door. Use a 5/64" allen wrench to remove the allen screw from the door strike assembly.
  - (2) Rotate the catch mechanism clockwise to shorten length and thereby bring door closer to body of oven. The number of turns will have to be approximated.
  - (3) Reinsert and tighten the allen screw securely.
  - (4) Repeat this procedure as necessary to achieve a tight seal.
- B. DOOR TOO HARD TO OPEN.
  - (1) Open the door. Use 5/64" allen wrench to remove the allen screw from the door strike assembly.

- (2) Rotate catch mechanism counterclockwise to increase length and, thereby, position door a little farther away from the body of the oven. The number of turns will have to be approximated. Reinsert and tighten allen screw securely. Repeat if necessary to achieve satisfactory operation.

C. DOOR OPENS WHILE OVEN IS HEATING.

The door will have to be adjusted to close more easily, in order to allow for the expansion occurring during heating. Follow the procedure described in (B). Depending on operating temperature, the procedure may have to be repeated to assure proper door operation.

Figure 2  
DOOR STRIKE ASSEMBLY



# OPERATION



\*\*\*\*\*  
 \* DANGER: Do not use in the presence of flammable or combustible \*  
 \* materials or explosive gases. Do not use in the presence of \*  
 \* pressurized or sealed containers. Fire or explosion may result, \*  
 \* causing death or severe injury. \*  
 \*\*\*\*\*

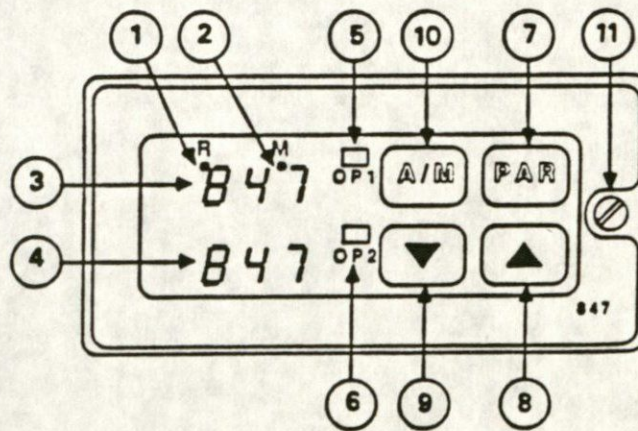


\*\*\*\*\*  
 \* WARNING: Do not heat any substance above a temperature which will \*  
 \* cause it to emit toxic fumes. Death or severe injury may result. \*  
 \*\*\*\*\*



\*\*\*\*\*  
 \* CAUTION: It is the user's responsibility to monitor oven action at \*  
 \* each step involved in setting operating temperature, safety limits \*  
 \* and alarm signals. Otherwise, oven failure may occur with possible \*  
 \* property damage and/or injury to personnel. \*  
 \*\*\*\*\*

Figure 3. PROGRAMMER-CONTROLLER



- 1. Ramp-to-Setpoint Light
- 2. Manual Mode Active Light
- 3. Upper Led Display
- 4. Lower Led Display
- 5. Output 1 Energized Light
- 6. Output 2 Energized Light

- 7. Parameter Scroll and Alarm Acknowledge Light
- 8. Increase Parameter Value
- 9. Decrease Parameter Value
- 10. Auto/Manual Operation
- 11. Jacking Screw

## DISPLAYS

The upper display on the panel shows:

1. The measured value when controller is in automatic or manual mode.
2. Parameter menomics when scanning the parameter list with PAR button.
3. If the controller is in the alarm status and the AL1 output has switched into the alarm state, the measured value will flash.

The lower display on the panel shows:

1. Temperature setpoint when in the automatic mode.
2. Parameter value when viewing the parameter list with the PAR button.

## OUTPUT LIGHTS

1. Ramp-to-Setpoint. This adjoins the letter, "R". See Fig. 3. This is a green LED dot which lights when the controller is ramping from the measured value to the new setpoint. When PAR button is pressed in order to check on the current setpoint during the ramping process, the dot will flash.

When the setpoint is reached, the lamp goes out.


2. Manual Mode. When controller is in the Manual Mode, the light just below the letter "M" in the upper display area will be illuminated.

## PUSH BUTTONS

1. PAR BUTTON. This button has two functions:
  - a. To advance to the next parameter. Depressing PAR button advances the program to each enabled parameter and displays the current value of that parameter.
  - b. To acknowledge an alarm.
2. UP/DOWN ARROWS. The Up and Down arrows are used solely to increase or decrease the value of the parameter displayed.

With the measured value in the upper display and the temperature setpoint in the lower display, use the Up and Down buttons to change the setpoint value.

3. A/M BUTTON. Depressing the A/M button permits switching from automatic to manual operation and back again.

\*\*\*\*\*  
 \*  WARNING: Do not use manual operation unless the oven temperature \*  
 \* is closely monitored. Overheating and resulting damage to the \*  
 \* oven may occur. Do not exceed a temperature of 270°C. \*  
 \*\*\*\*\*

## PROGRAMMING

The programmer-controller will produce a fixed-format, 4-part program: Ramp, Dwell, Ramp and Dwell. The 4 parts are executed consecutively: when the first is finished, the second is begun automatically and continues in this manner until the last segment is completed. The program can be run between 1 and 200 times or continuously.

The Setpoint can be freely changed within the limits of the setpoint high and low limits.

The setpoint in a program increases or decreases at a linear ramping rate until a specified target level is reached. The target level can be either above or below the current measured value. The ramping rate is expressed in degrees Centigrade per minute.

In the following discussion, the underlined letters are mnemonics for parameters as they appear on the display screen.

1. r1 = Ramp 1. This is the rate at which the setpoint advances to the first target level; r1 always starts from the measured value. It is adjustable from 0.01 to 99.99 display units per minute.
2. L1 = Target Temperature No. 1. This is the first temperature level to which the controller is ramping at the rate indicated in the preceding. L1 is adjustable over the range of the input sensor. See WARNING note below.
3. d1 = Dwell Time No. 1. This is the length of time (in minutes) that the setpoint remains at L1 before advancing to the next ramp.
4. r2 = Ramp 2. This is the rate at which the controller will ramp from L1 to L2.
5. L2 = Target Temperature No. 2. This is the target setpoint temperature after d1 has timed out. See WARNING note below.
6. d2 = Dwell Time No. 2. The time (in minutes) that you wish setpoint to remain at the second target setpoint, L2.



\*\*\*\*\*  
 \* WARNING: Do not set a temperature level higher than 270°C, \*  
 \* otherwise damage to the oven may result. \*  
 \*\*\*\*\*

LOOP COUNTER = LC

The value that you assign here fixes the number of times that the program that you have entered will repeat itself.

The mnemonic, LC, appears on the display screen. The value may be changed from 1 to 200 repetitions or a selection, Cont, is offered for continuous running of a program.

When a program is running, the displayed value shows the number of loops remaining.



### HOLDING A PROGRAM = Hold

When the programmer is in Hold, timing is suspended and temporary adjustments of the parameters can be made. The time elapsed while the programmer is in Hold increases the total run time of the program. To enter the Hold parameter, follow this procedure:

1. Scroll down the parameter list with PAR until Prog displays. Push either the Up or Down buttons until Hold appears in the lower display.
2. Either press PAR or let the display time out to enter the Hold program state.

When the programmer is in the Hold state, the "R" lamp in the upper left hand corner of the display area will flash.

Changes made to parameters LC, r1, L1, d2, r2, L2 and d2 during Hold are valid only during the current loop of the program.

### HOLDBACK OPTION = Hb

Holdback is the allowable deviation between the programmed setpoint and the actual temperature during a program. If the deviation between the programmed setpoint and actual temperature exceeds Hb, the program is automatically placed in Hold (clock stops) until the deviation reduces to an acceptable level. The program then resumes operation and the clock resumes timing.

Hb is adjustable over the entire range of the input sensor and is always enabled. By stopping the programmer clock, the measured value has a chance to become equal to the programmed setpoint. In order that holdback not have an effect on the program, it is recommended that Hb be set to an extremely large value.

### ALARM INDICATIONS

There are two levels of alarm activation:

1. The lower display indicates HiAL, LoAL and/or d AL alternating with the setpoint indicating that the measured value has entered the alarm status.

If the actual temperature follows a ramping setpoint through an alarm area, the alarms are activated. Two types of activity are signaled:

- a. Full scale high and full scale low temperature alarms. If the alarm setpoints are non-latching, when the ramp moves into the "safe" area, the alarm condition will end.
- b. Deviation Alarm. The deviation alarm band parallels the current setpoint. If the measured value cannot track the setpoint in the area of the deviation alarm, an alarm status is created.

2. The upper display flashes the measured value. AL1 is configured to respond to at least one of the 3 alarm setpoints and AL1 has switched into an alarm state.

#### RESETTING A PROGRAM IN Idle

A program can be placed in Idle as follows:

1. Scroll down the parameter list with PAR until Prog is displayed.
2. Depress either Up or Down until Idle appears in the lower display.
3. Either press PAR or let the display time out to enter the Idle program state.

When the preceding has been executed, the state lamp "R" goes out to indicate that unit is now in Idle.

Changes made to all parameters in Idle are permanent. Contrast with Hold where changes made are temporary and only for current loop of the program.

#### POWER LOSS

In the event that power is lost during the running of a program, the values of all parameters are saved in non-volatile memory. As soon as power is restored, the clock resumes counting in the same program segment and the measured temperature is restored to run (pre power loss) values.

#### PROGRAM STATUS SIGNALS

1. State Lamp "R"

The LED below "R" in the upper left hand corner of display area indicates program status according to the following:

- a. Off = Idle
- b. ON = run
- c. Flashing = Hold or Hb

2. Program Segment

If the program is either in run, Hb or Hold, pressing PAR once will cause lower display to show the current segment of the program: r1, d1, r2, d2 or Hb along with the units.

3. Time Remaining

If the program is currently executing either d1 or d2, the value displayed below these mnemonics is the time remaining in the segment.

#### 4. Setpoints

While the program is in run, Hold or Hb, the setpoint appearing in the lower display is the current working setpoint.

#### HI-LIMIT CONTROL

Turn the Hi-Limit Control dial counterclockwise until the red Hi-Limit light goes on. Turn the Hi-Limit Control clockwise until the red Hi-Limit light goes out; continue turning the Hi-Limit Control dial clockwise an additional 5 degrees of rotation to set it.

This is a secondary, mechanical back-up to guard against overheating.

NOTE: The Hi-Limit Control must be reset each time a new maximum, operating temperature is set. The Hi-Limit Control must also be set higher than any level which might be entered into a program.

#### LOADING THE OVEN

Load the oven evenly and keep the load at least two inches from the side walls. Do not place a load on the floor of the oven where it might cover the air intake area.



\*\*\*\*\*  
\* CAUTION: Do not operate the unit, if any of the temperature controls \*  
\* become inoperative. Otherwise, a hazardous condition will develop \*  
\* which can result in injury or death and property damage. \*  
\*\*\*\*\*

#### TYPICAL PROGRAM

1. Press PAR until LC appears in upper display. Use Up/Down buttons to enter number of times you wish program to repeat.
2. Press PAR until r1 is in upper display. This is first ramp rate. Enter numerical value of rate as related to time at which you wish controller to advance in reaching new setpoint.
3. Press PAR until you reach L1. This is first target setpoint. Enter desired value.
4. Press PAR until you reach d1. This is length of time in minutes you wish process to remain at the first target setpoint. Enter desired value. NOTE: The adjustable range is from 1 to 9999 minutes. If set to 0, the dwell segment will be omitted and controller proceeds to next function.

5. Repeat procedure above with regard to r2, L2 and d2 which are the second ramp rate, second target temperature and second dwell time, respectively.
6. Scroll down the parameter list with PAR until Prog appears. Press either Up or Down until the program state parameter run appears in the lower display.

Either press PAR or let the display time out to enter the run program state.

If the unit is in run, the parameters LC, r1, L1, d1, r2, L2 and d2 cannot be adjusted.

If a dwell segment is selected for viewing during run, the time remaining will be displayed.

Viewing LC (loop count) during run will provide the number of loops remaining including the current number.

#### THE RUN STATE

If program is in run, parameters LC, r1, L1, d1, r2, L2 and d2 cannot be changed. Any other accessible parameter can be changed.

If the dwell segment is displayed during run and the programmer is in that segment, what is viewed is the time remaining for the segment not the total dwell time. In the same manner, a display of LC in a multiple loop program will provide in the lower display the number of loops remaining.

#### SELF TUNING OPTION

Two types of self tuning are available:

1. Tune from Ambient

A self-tune procedure from ambient is performed, if the actual temperature is not near the control setpoint. This can apply to a "normal" heat-up condition or tuning a load which operates mainly in cooling, i.e. the setpoint is well below setpoint.

2. Tune from Setpoint

A self-tune procedure from setpoint is performed, if the actual temperature is near the control setpoint.

Two different parameters can be used to initiate tuning. Both perform a tune from ambient or tune from setpoint, whichever meets conditions.

### 3. Tune on Demand

tunE. This parameter has two possible settings. It is used as a request to perform a tune operation at any time and, also, as an indication of the tuning status.

OFF. As a signal, the unit is not currently self tuning. This means that tuning was never initiated or that the unit successfully or unsuccessfully ended a tuning operation.

In addition, when entered as a command, it ends a tuning operation in progress.

on. As a signal, this shows that the controller is currently in a tuning operation.

### 4. Tune on Start-Up

t Su = tune on start-up. This parameter has two possible settings. It is used both as a request to perform tuning on start-up and, also, as a signal of a successful tuning operation.

no. As a display, this shows that a successful tune operation was concluded on start-up and that when power is applied to the unit in the future, no tuning will be initiated.

YES. When seen as a display, this signals that no successful tuning has ever been initiated on start-up and that when power is next applied to the unit, self-tuning will be initiated.

As a command, select YES in order to start a tune operation when power is next applied.

## OFFSET ADJUSTMENT

The procedure for the adjustment of offset is identical to that for changing any parameter. Scroll to the Ofst parameter with the PAR button and adjust the parameter with the Up and Down buttons.

The value of Ofst is added algebraically to the measured temperature. For example, an offset value of -2.00 applied to a measured temperature of 200 results in a display of 198.

SENSOR BREAK

1. Overrange condition

A broken thermocouple or input circuit is signaled by the mnemonic Sn b, sensor break.

The actual chamber temperature rises rapidly before the sensor break signal occurs. The open input circuit is detected by an overrange input signal exceeding the maximum of the linearization table.

The controller then enters the open-loop mode and outputs the sensor break power selected by the SnbP parameter. This should always be set for 0%.

2. Underrange condition

A condition in which input falls below the minimum of the linearization table results in a display of the mnemonic u r, (underrange). Examples of such situations include: incorrect thermocouple, reversed connection, etc.

The controller then enters the open-loop mode and outputs the sensor break power selected by the SnbP parameter. This should always be set for 0%.

PROCEDURE IN THE EVENT OF MALFUNCTION

Before beginning any investigation of a fault, the electrical supplies to all equipment involved should be switched off and isolated. There are no user-serviceable parts inside the controller. Contact your local dealer for assistance or Lab-Line as mentioned in the Maintenance section of this manual.



\*\*\*\*\*  
 \* WARNING: The unit's controller as delivered has been configured at \*  
 \* the factory for optimum operating performance. Because controller \*  
 \* functions are user selectable, it is the user's responsibility to \*  
 \* verify that any changes made conform to the operating limitations and \*  
 \* parameters of the oven. Personal injury, property loss and equipment \*  
 \* damage can result from an improperly configured controller. \*  
 \*\*\*\*\*

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# MAINTENANCE

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\*\*\*\*\*  
 \* Make no attempt to service or repair a Lab-Line product \*  
 \* under warranty before consulting your Lab-Line dealer. \*  
 \* After the warranty period, such consultation is still \*  
 \* advised, especially when the repair may be technically \*  
 \* sophisticated or difficult. \*  
 \* \*  
 \* If assistance is needed beyond what the distributor can \*  
 \* provide, please call the Lab-Line Customer Relations \*  
 \* Department at 708-450-2600 (inside Illinois) or at \*  
 \* 1-800-LAB-LINE (outside Illinois). \*  
 \* \*  
 \* No merchandise, however, should be returned directly to \*  
 \* Lab-Line without prior approval. \*  
 \*\*\*\*\*

\*\*\*\*\*  
 \* It is recommended that the following maintenance procedures \*  
 \* and replacement of parts be done by qualified personnel only. \*  
 \*\*\*\*\*

## A. ROUTINE CLEANING

The Ultra-Clean 100 Oven should be cleaned with lint-free wipes and reagent-grade isopropanol and thoroughly vacuumed.

## B. DOOR GASKET REPAIR

Remove oven from clean-room area.

If the door gasket is nicked or has a small tear, the gasket may be repaired with RTV Sealant 3145 (part #120-053-00). Form the sealant to the proper shape in the case of a nick. Use the sealant to reattach a small torn piece to the rest of the gasket. Allow 12 hours for the sealant to dry fully. Bake the gasket for several hours until the RTV has hardened completely. Then return oven to the clean-room area.

### C. COMPLETE GASKET REPLACEMENT

1. Unplug oven from outlet before servicing.
2. Remove shelves, floor and side walls.
3. Lay the oven on its back side. Be sure to support the oven back 2" above the surface to protect the vent port. Loosen all the Phillips screws from the trim strips holding the gasket.
4. Pull the gasket out from under the trim strips.
5. Starting at the seam on the hinge side, slide the double lip under the trim strip and work the gasket around the door opening. Smooth out any bows in the gasket and trim off any excess.
6. Tighten screws holding trim strips.
7. Clean oven's inner body; replace floor, side walls and shelves.

### D. FILTER REPLACEMENT

1. Disconnect unit from electrical outlet.
2. In the event unit has been in use, be certain that it has cooled before doing any work in the interior.
3. Filter cover is on the right hand side of interior of cabinet.
4. Remove shelves.
5. Locate and remove 2 screws on front of filter cover -- one at top and the other at the bottom.
6. Note flange of filter cover which is secured to back wall by 2 nuts. Remove nuts and washers.
7. Remove filter cover assembly from cabinet.
8. Replace existing filter with new one.
9. Reverse procedure to reassemble.

### E. PARTS REPLACEMENT/GENERAL

In the event that access is required to replace heaters, RTD sensor or safety thermostat, extreme care is necessary when removing teflon bladder.

After completing repairs, it is recommended that bladder and sealant (Dow Corning Sealant #736) be replaced.



# REPLACEMENT PARTS

<u>DESCRIPTION</u>	<u>PART NUMBER</u>
Bladder, Teflon	720-457-00
Blower Wheel	160-125-00
Circuit Breaker, 1 A	330-158-00
Cordset	
3490M	470-122-00
3490M-1, 3495M-1, 3499M-1, 3497M-1	470-236-00
3490M-3, 3495M-3, 3499M-3, 3497M-3	470-237-00
Door Handle	600-002-00
Fan Blade, Heat Relief	160-124-00
Fan Motor, 120 V	370-251-00
208V, 240V	370-261-00
Filter, HEPA (3497M-1, 3497M-3)	525-036-00
Filter, Inline (3497M-1, 3497M-3)	525-034-00
Fuses	
3490M-1, 3490M-3	330-298-00
All Other Models	330-299-00
Fuse Holder	330-297-00
Gasket (Order length by model number)	530-180-00
Heaters	
3490M, 3490M-1	340-244-00
3490M-3	340-230-00
3495M-1, 3499M-1, 3497M-1	340-231-00
3495M-3, 3499M-3, 3497M-3	340-232-00
Motor Blower	370-264-00
Pilot Light Lens	
Green	360-238-00
Red	360-234-00
Pilot Light Base, Hi-Limit (Red)	
All Models	360-233-01

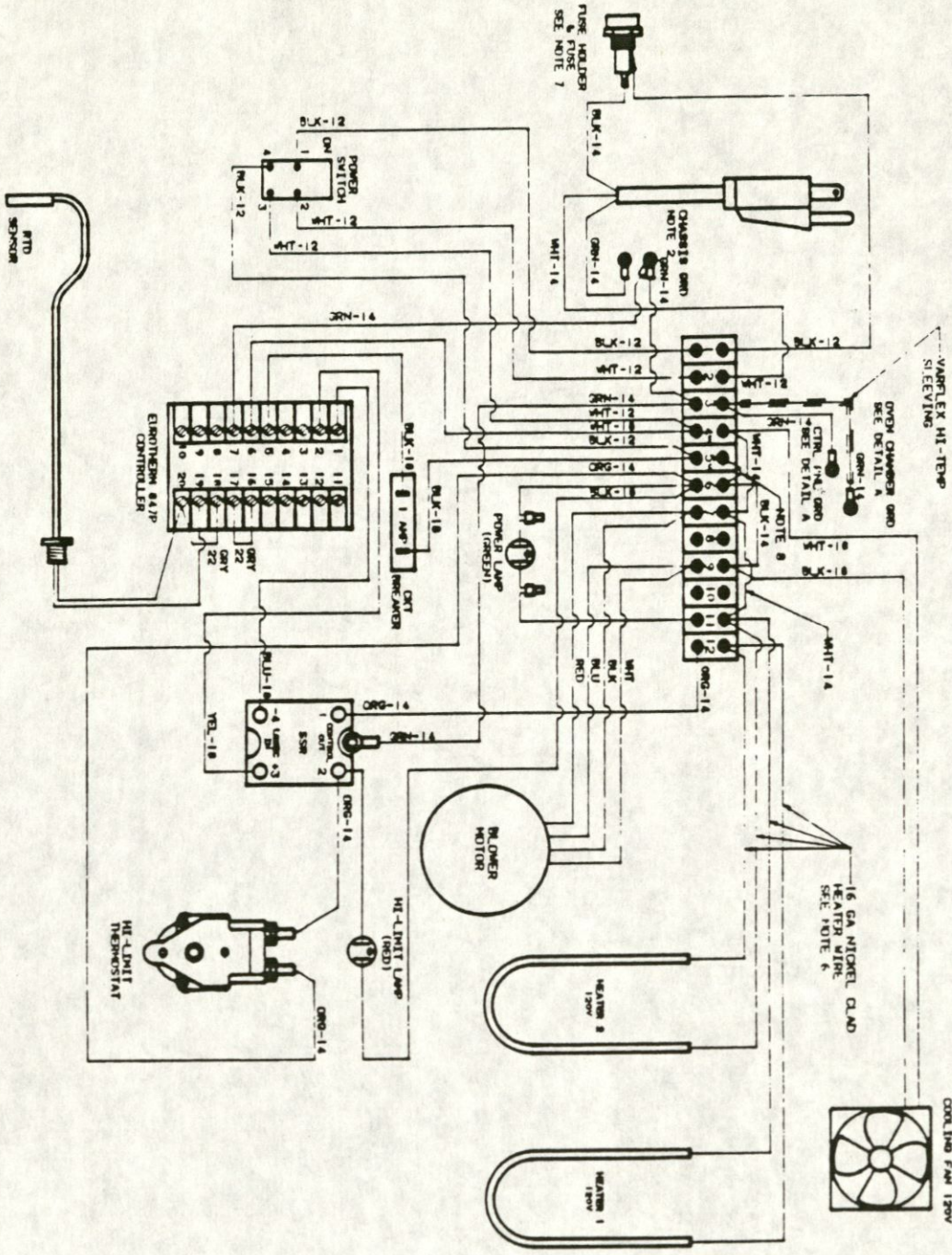
12/7/93

DESCRIPTIONPART NUMBER

Pilot Light Base, Power (Green)	
All Models	360-249-01
Rubber Feet (4)	790-078-00
Sealant (Dow Corning 736)	120-080-00
Shelves*	
3490M, -1, -3	587-843-00
3495M-1 & -3	587-844-00
3499M-1 & -3	587-845-00
3497M-1 & -3	588-806-00
Shelf Support Bracket	171-346-00
Solid State Relay	400-233-00
Switch, Power	440-226-00
Temperature Controller	485-194-00
Thermostat, Hi-Limit	920-300-00
Thermostat Knob	560-225-00
Wiring Diagrams	
Control Panel Assembly	
120 V	228-460-00
208 V	228-461-00
240 V	228-459-00

\*Shelves for 3490M units can be ordered with brackets as: 3490M-8  
 \*Shelves for 3495M units can be ordered with brackets as: 3495M-8  
 \*Shelves for 3499M units can be ordered with brackets as: 3499M-8  
 \*Shelves for 3497M units can be ordered with brackets as: 3497M-8

12/7/93

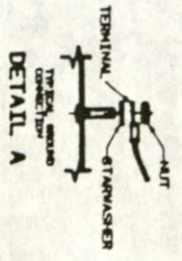


VAPLEX HI-TEMP SIEVING

COOLING FAN 120V

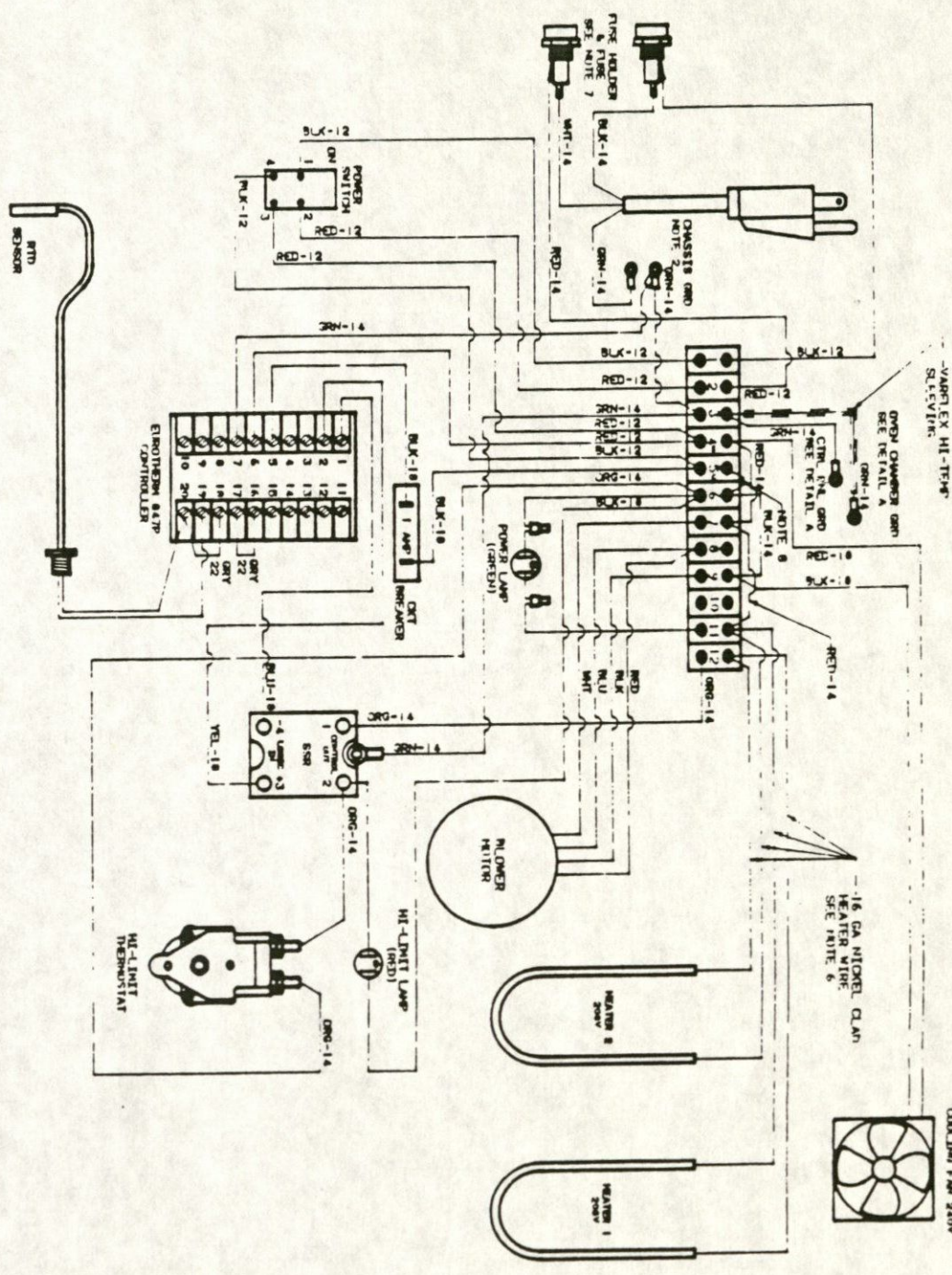
NOTES

1. CHASSIS GROUND. ATTACH EACH GROUND WIRE AS SHOWN IN DETAIL A. MASK BEFORE PAINTING OR SCRAP PAINT FROM INSIDE OF CHASSIS AT LOCATION OF GROUND.
2. LINE GROUND BROWN LEAD (GREEN) MUST BE MOUNTED TO A SEPARATE SCREW AND NOT SQUARE ITS MOUNTING SPACE WITH OTHER MOUNTING WIRES. SEE DETAIL "A".
3. EACH GROUND WIRE MUST BE SECURED WITH A SEPARATE NUT. SEE DETAIL "A".
4. WIRING MUST BE SECURED WITH CABLE TIES AND CLAMPS AS NECESSARY TO PREVENT CONTACT WITH MOVING PARTS.
5. WHEREVER WIRES PASS OVER A SHARP BEND OR CORNER THEY MUST BE PROTECTED FROM ABRASION BY GRUBSCREWS OR CHANNEL BRASS.
6. USE HI-TEMP 16 GA NICKEL CLAD HEATER WIRE & NICKEL CLAD RING TERMINALS AT ALL HEATER CONNECTIONS.
7. FUSE HOLDER CONNECTIONS. SOLDER CONNECTIONS AT FUSE HOLDER MUST BE CAREFULLY MADE. ALL WIRE STRANDS SHOULD BE EVENLY COATED WITH SOLDER AND THE CONNECTION SHOULD BE BRIGHT IN APPEARANCE.
8. 450-158-00 LAMP.
9. ROUTE RTD WIRES AWAY FROM HEATER WIRING OR ANY OTHER AC WIRING.



REV	DESCRIPTION	DATE	BY
1	ISSUED FOR CONSTRUCTION	11/15/61	J. W. BENTLEY
2	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY
3	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY
4	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY
5	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY
6	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY
7	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY
8	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY
9	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY
10	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY
11	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY
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28	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY
29	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY
30	REVISED TO SHOW CHANGES	11/15/61	J. W. BENTLEY

VAPLEX HI-TEMP SIEVING  
 WIRING DIAGRAM 120V  
 AS NOTED  
 22-460-00  
 11/15/61



JANEX HI-TEMP  
SLICATOR

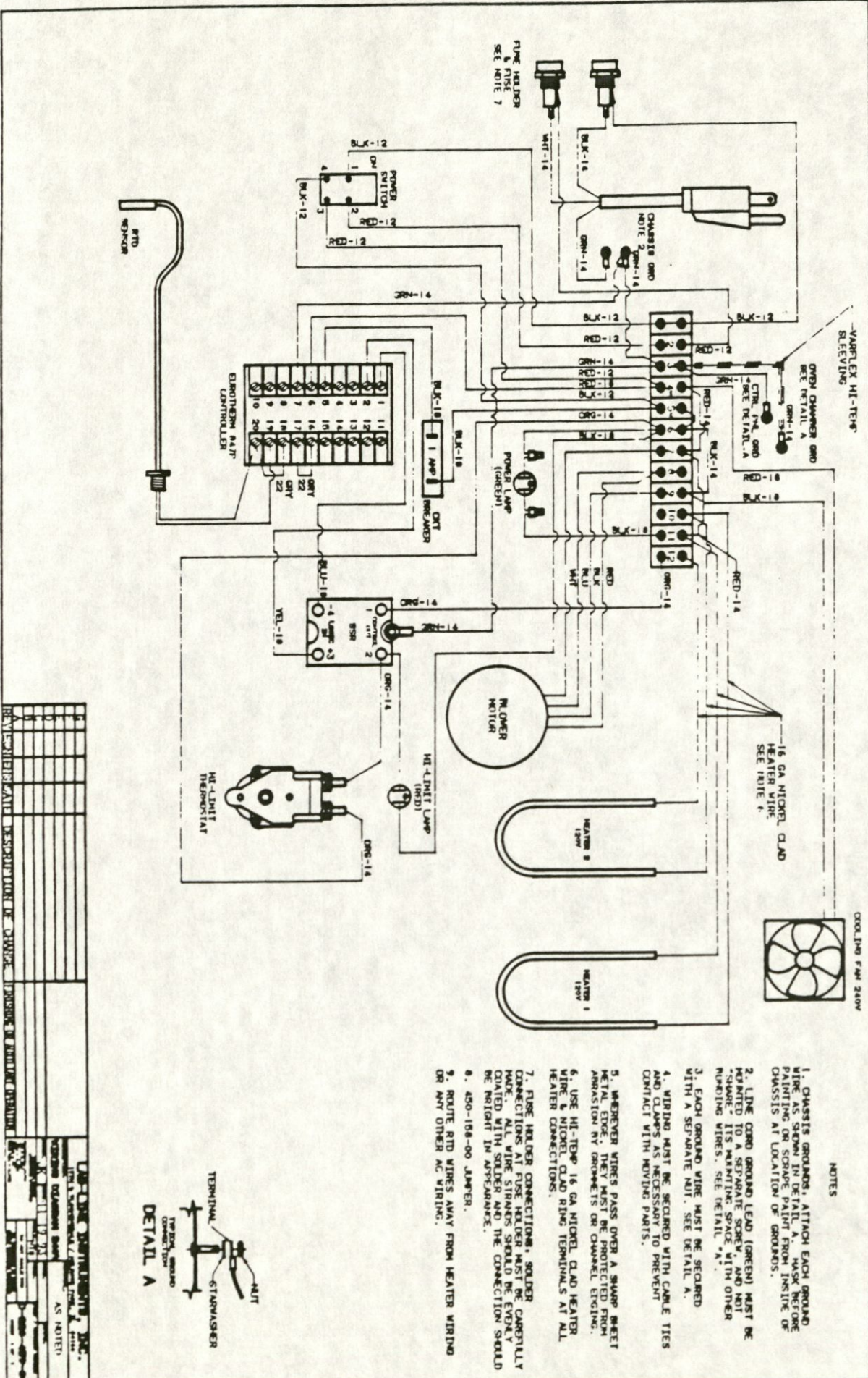
COOL UNIT FAN 240V

NOTES

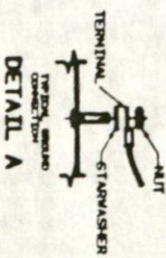
1. CHASSIS GROUND, ATTACH EACH GROUND WIRE AS SHOWN IN DETAIL A. USE SOLDER, PAINTING OR SPRAY PAINT FROM INSIDE OF CHASSIS AT LOCATION OF GROUND.
2. LINE GROUND LEAD (GREEN) MUST BE MOUNTED TO A SEPARATE SCREW AND NOT ROBBING WIRES. SEE DETAIL "A".
3. EACH GROUND WIRE MUST BE SECURED WITH A SEPARATE NUT. SEE DETAIL "A".
4. WIRING MUST BE SECURED WITH CABLE TIES AND CLAMPS AS NECESSARY TO PREVENT CONTACT WITH MOVING PARTS.
5. WHENEVER WIRES PASS OVER A SHARP SHEET METAL EDGE, THEY MUST BE PROTECTED FROM ABRASION BY GROOVES OR CHANNEL ENCLIPS.
6. USE HI-TEMP 16 GA NICKEL CLAD HEATER WIRE & NICKEL CLAD RING TERMINALS AT ALL HEATER CONNECTIONS.
7. FUSE HOLDER CONNECTIONS, SOLDER CONNECTIONS AT FUSE HOLDER MUST BE CAREFULLY MADE. ALL WIRE STRANDS SHOULD BE EVENLY COATED WITH SOLDER AND THE CONNECTION SHOULD BE INSIGHT IN APPROPRIATE.
8. 450-156-00 JUMPER.
9. ROUTE RTD WIRES AWAY FROM HEATER WIRING OR ANY OTHER AC WIRING.



REV	DESCRIPTION	DATE	BY
1	AS REVISED		
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# ACCESSORY CHECK LIST

The following loose parts and accessories are packed with this unit. Before discarding any packing materials, please be sure that nothing has been overlooked.

MODEL NUMBERS: 3490M, 3490M-1, 3490M-3  
3495M-1, 3495M-3, 3499M-1, 3499M-3  
3497M-1, 3497M-3

INSPECTOR \_\_\_\_\_

DATE \_\_\_\_\_

PACKED BY \_\_\_\_\_

CHECKED	ITEM	PART NUMBER	QUANTITY
_____	Instruction Manual	9-057-059-00	1
_____	Warranty Card	--	1
_____	Shelves 3490M, -1, -3	587-843-00	4
_____	3495M-1, -3	587-844-00	4
_____	3499M-1, -3	587-845-00	4
_____	3497M-1, -3	588-806-00	4
_____	Blue Caution Card (240V only)	--	1
_____			
_____			

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# WARRANTY

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LAB-LINE INSTRUMENTS, Inc., for itself and all of its subsidiaries ("Lab-Line"), does hereby warrant for a period of 15 months from the date of receipt by the User, under normal and proper usage, all of its products (except P.A.C.E. anaerobic chambers) against defects in workmanship and material, and will repair or replace any defective part(s) without charge when same is shipped prepaid to the authorized Lab-Line distributor from which the product was originally purchased. P.A.C.E. anaerobic chambers are warranted for a period of 12 months, except the vinyl front panel and rubber sleeves/ gloves which are warranted for 30 days, from the date of receipt by the User.

Should the nature of any defect require that the product or any constituent portion thereof be returned by such authorized distributor to Lab-Line's factory at Melrose Park, Illinois, prepaid, for service, a condition precedent to any return shall be the procurement by such dealer of written authorization from Lab-Line assigning a Return Goods Number to the product or part requiring service.

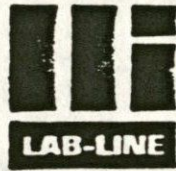
Parts and accessories manufactured by others are warranted only to the extent of the regular warranty of the manufacturer or supplier of such materials and only insofar as Lab-Line is able to transfer the benefits of warranty coverage, if any, to the User. Any adequately warranted defective part or accessory manufactured or supplied by others may be exchanged through an authorized Lab-Line dealer for a replacement part, and no charge in respect thereof shall be assessed if the defective part is shipped prepaid and received at Lab-Line's factory within 30 days from the date any replacement part is obtained by the User.

This warranty supersedes and is given in lieu of all implied warranties, and is void if the User does not provide the unit with continuous ample electrical power at constant voltage, consistent with the specifications of the product.

With respect to all Explosion-Proof and Flammable Material Storage (FMS) Refrigerators and Freezers, storage by User of any materials in the product which may cause deterioration of any components of the product shall be deemed to constitute abnormal and improper usage for the purposes of this warranty.

TO OBTAIN THE BENEFITS CONFERRED BY THIS WARRANTY, USER MUST RETURN THE WARRANTY CARD TO LAB-LINE WITHIN SEVEN (7) BUSINESS DAYS AFTER RECEIPT OF THE PRODUCT.

LAB-LINE INSTRUMENTS, Inc.  
(and all of its subsidiaries)



**FIRST IN INSTRUMENTS**  
**SERVING SCIENCE, INDUSTRY, RESEARCH AND EDUCATION**  
**SINCE 1908**