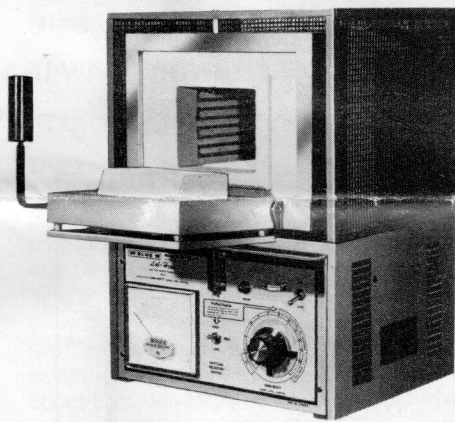


OPERATION and MAINTENANCE MANUAL



BLUE M

Lab-Heat

BOX TYPE

MUFFLE FURNACES

IMPORTANT
THIS MANUAL SHOULD BE
READ CAREFULLY BEFORE
UNIT IS PLACED IN OPER-
ATION.

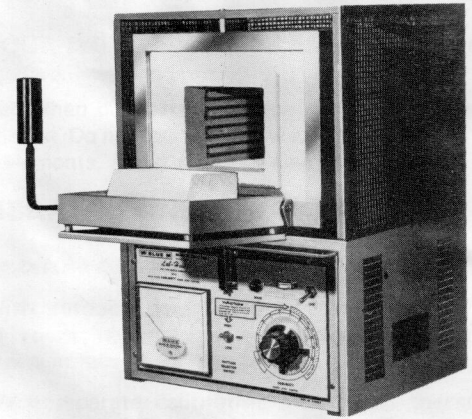


A UNIT OF GENERAL SIGNAL
BLUE ISLAND, ILLINOIS 60406

OPERATION AND MAINTENANCE MANUAL

BLUE M

Lab-Heat, Box Type, MUFFLE FURNACE



I. INSTALLATION

All standard Blue M Electric Company Lab-Heat Muffle Furnaces are shipped electrically complete. Positioning, connecting proper electrical service, and observing the following steps are the only requirements for placing furnace in operation.

A. Although the Vari-Watt Control on this unit is not a temperature responsive device, the furnace - once stabilized - will maintain a reasonably constant operating temperature. However, to do so, it is essential to provide a stable environment for unit operation.

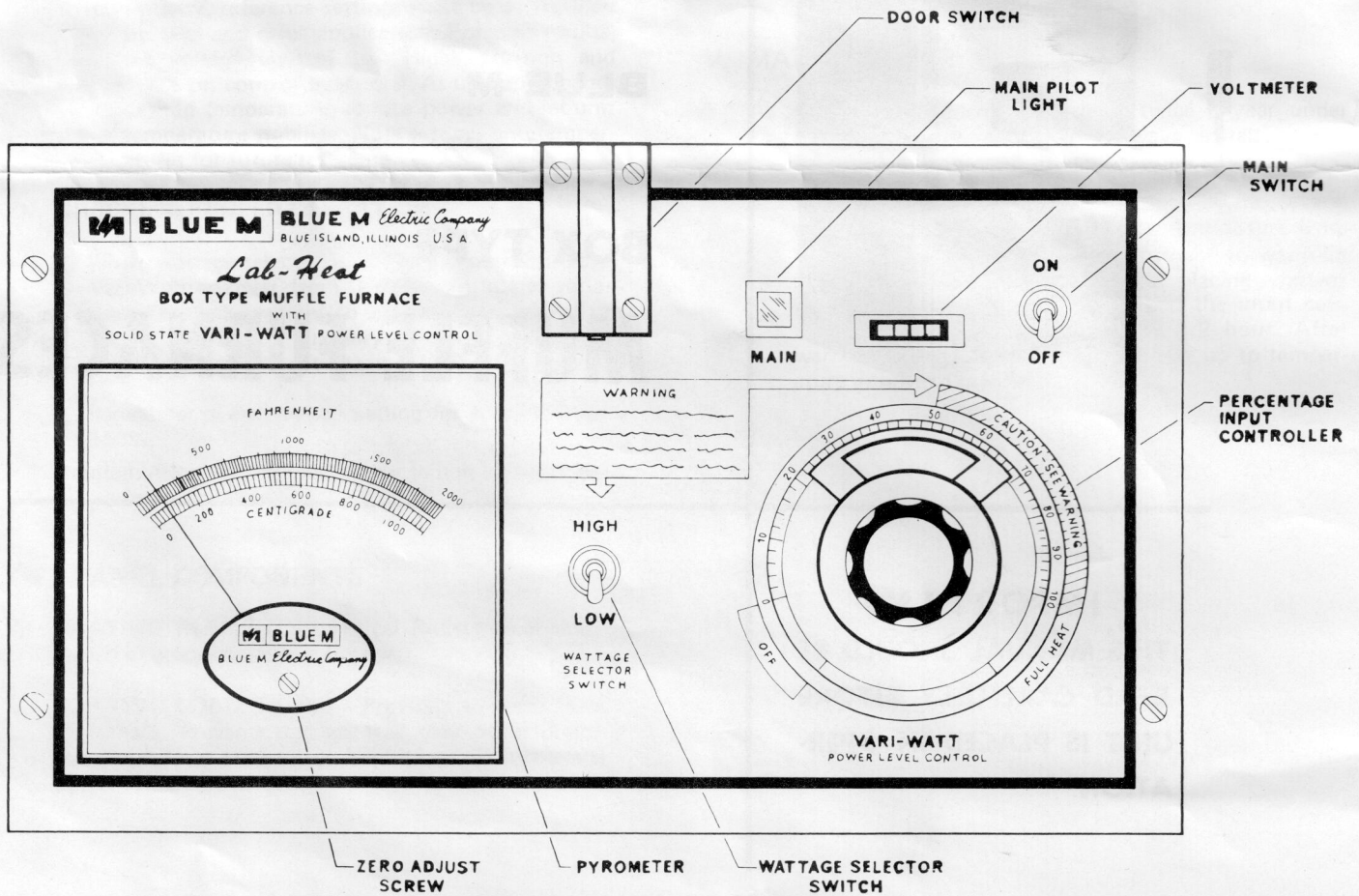


Figure 1

- B. Carefully unpack furnace.
- C. Remove heat shield package (4 pieces) packed separately alongside of furnace in box. Insert studs on heat shield sides into base of unit in holes provided. Install top heat shield over side heat shields. These side and top heat shields are interlocked; install screw in top heat shield to hold in place.
- D. Open furnace door and carefully remove all protective packaging material from interior.
- E. Visually inspect heating elements and thermocouple. Thermocouple should protrude straight into furnace.
- F. Install four (4) adhesive backed plastic feet. Remove protective cover and place on each corner of unit bottom.
- G. Install counter-weighted door handle on door with two (2) screws provided.
- H. Sufficient clearance should be allowed around entire furnace perimeter to facilitate air circulation and safety. Approximately 6" to 12".
- I. Connect furnace to source of power. (Voltage and current requirements specified on name plate.)
- J. Be certain that furnace is grounded in accordance with applicable electrical codes.
- K. Fused protection should not exceed 125% of furnace rating.

II. VARI-WATT POWER LEVEL CONTROL

A. INTRODUCTION

The Vari-Watt power level control is a solid-state power control system for "M" series furnaces. **Please note that this device is not a temperature sensitive controller.** It controls power applied to the heating elements only. Constant monitoring is necessary when raising furnace to desired set point. **Caution:** Failure to closely monitor temperature and adjust controls accordingly will result in overheating the load and/or destroying the unit. "High" selector switch setting and control potentiometer setting above 50% will allow operating temperature to exceed its maximum rating of 2000 °F. in one to three hours.

B. DESCRIPTION OF CONTROL COMPONENTS

1. Wattage Selector Switch - Switches resistance in or out of circuit to limit voltage available to heating elements. Switch has two settings: "High" and "Low".

POWER SETTING	EFFECTIVE ZERO ON DIAL FACE FOR EACH RANGE SETTING	RESISTANCE OF WATTAGE SELECTOR SWITCH	
		0%	100%
HIGH	0%	75K	0
LOW	50%	55K	27K

Figure 2

2. Vari-Watt adjustment - Provides smooth transition between maximum and minimum voltages available; 0-100% in "High", 0-50% in "Low".

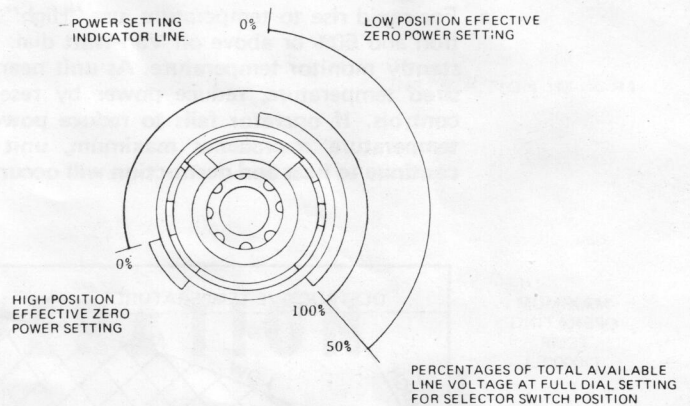


Figure 3

3. SCR Power Circuit - Functions as a high power adjustable resistance. As the Vari-Watt adjuster is rotated clockwise toward larger numbers on dial face, effective resistance of the SCR circuit decreases, causing current flow through the heating elements to increase. **This device will not regulate furnace temperature automatically.**
4. Vari-Watt Dial Reference Numbers - Reference numbers should be recorded for various temperatures. Whenever a stabilized temperature is achieved, record temperature, dial setting, power indicator reading, and wattage selector switch position. This will allow stabilized temperatures to be duplicated. Variations in line voltage, ambient temperature, and type of load and load size may cause slight variations in stabilized temperature.
5. Temperature Indicator - Displays actual operating temperature in °F. and °C.
6. Percent Power Indicator (Voltmeter) - Shows approximate power input to heating elements as a percentage of maximum capacity.

C. OPERATION

Please note: When furnace has been off for several days, firebrick lining will absorb moisture from the air. Allow furnace to warm slowly by placing wattage selector switch in "Low" and input controller at 50% for one-half hour. After initial warm-up, unit can run to operating temperature.

1. Turn unit on.
2. Set wattage selector switch to desired position. Set Vari-Watt adjuster. Use the following to determine which wattage selector position to use.

- a. For rapid rise to temperature, use "High" position and 50% or above on Vari-Watt dial. Constantly monitor temperature. As unit nears desired temperature, reduce power by resetting controls. If operator fails to reduce power as temperature approaches maximum, unit will continue to heat and destruction will occur.

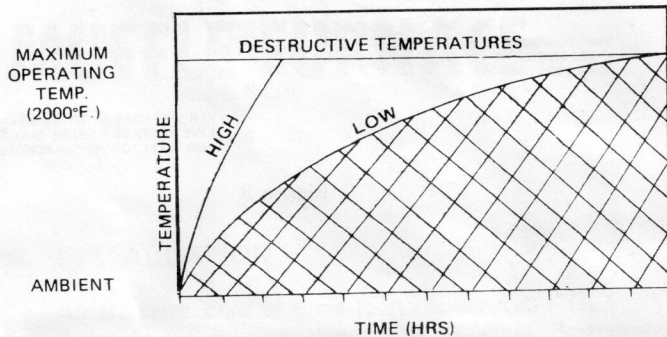


Figure 4

- b. For safe run-up to temperature, use "Low" wattage selector position. At this setting, run-up time is lengthy (6-10 hours). Readjust settings after proper temperature is reached.
- c. Initially, reference settings must be determined by trial and error application. For best results, set voltage control to "High" position and 100% on control knob dial. As unit approaches desired temperature, reduce power and let unit temperature stabilize. Note settings and temperatures for future reference.

D. CHECKING PROPER OPERATION

1. When wattage selector is in "High" position, vary Vari-Watt adjuster from 0-100%. Voltmeter variations must correspond to adjuster markings. If in doubt, connect an auxiliary voltmeter across element leads and observe readings.
2. Repeat for "Low" switch setting for a variation of 0-50%.

Caution: Always disconnect power to unit before opening wiring compartment.

III. OFF-PANEL COMPONENTS

- A. HEATING ELEMENTS - Helical Resistance Wire installed in grooved ceramic supports.
- B. CERAMIC LOAD TRAYS - Provided to cover floor of furnace. Prevents damage that may occur if product load rests on furnace bottom or (if furnished) bottom heating element.

- C. THERMOCOUPLE - Feeds millivolt input into pyrometer in direct proportion to furnace temperature.
- D. DOOR SWITCH - Shuts off furnace whenever door is opened.

Caution: When door is opened, bare heating elements are exposed. Do not touch or allow anything to touch exposed elements. Avoid shock or element burnout.

IV. CALIBRATION INSTRUCTIONS

- A. Be certain furnace is at room temperature.
- B. With furnace door open, set indicating pyrometer at room temperature by manipulating zero adjust screw in face of pyrometer.
- C. Place separate calibrating instrument thermocouple immediately adjacent to furnace thermocouple.
- D. Close door and turn on furnace. Heat up to 538°C (1000°F).
- E. Allow to stabilize at temperature for at least one (1) hour.
- F. If an error of larger than 2% of setpoint is observed, replace thermocouple. If error still exists, replace pyrometer.

V. MAINTENANCE

- A. Replace thermocouple at least twice a year under normal furnace operation. Always install a new thermocouple when replacing heating elements.
- B. When furnace has not been operated for several days, the firebrick lining may absorb moisture from the air. It is advisable to allow furnace to warm-up slowly. This is accomplished by placing wattage selector switch in low position and the input controller at 50% for approximately 1/2 hour. After warm-up period, furnace may be run up to temperature in normal manner.



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