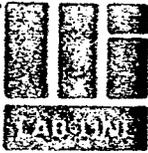


6640-01-121-2348

OPERATION MANUAL



LAB-LINE
IMPERIAL II
CO-2 INCUBATOR

Models

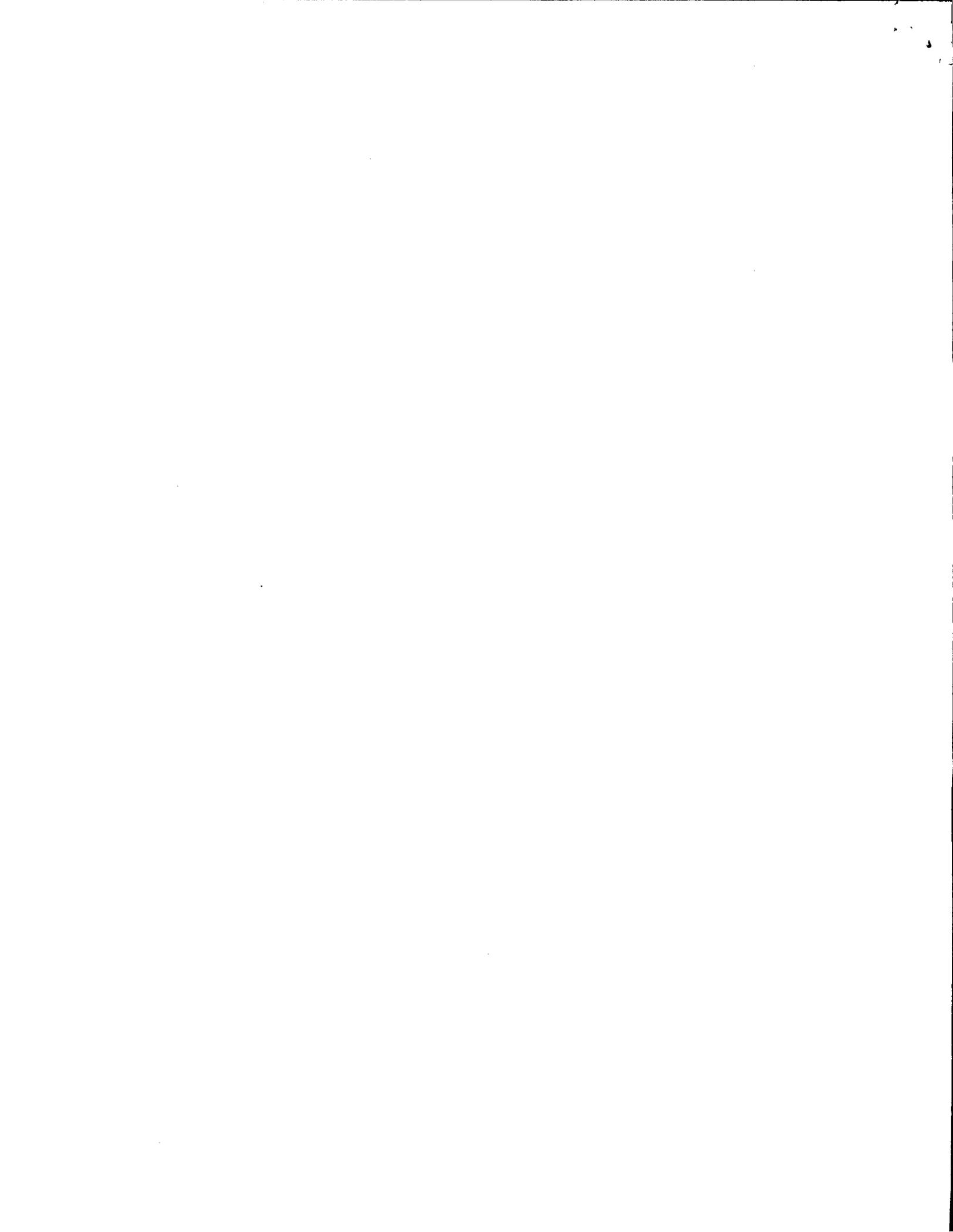
417	417-10	420	425
417-2	417-11	420-1	425-1

NSN: 6640-01-121-2348

LAB-LINE INSTRUMENTS, Inc.

Designers and Manufacturers
3000 N. Greenwood Avenue
Deerose Park, Illinois 60180
U.S.A.

Phone 312-450-2600 (in Illinois)
800-323-0257 (elsewhere)
Telex 08-710-28 LB-LIN-UW



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 the unit 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.
3. Read this operation manual thoroughly before deciding on an appropriate location for the unit. You must consider the availability of power and/or gas hook-ups, drains and other unit requirements as well as user convenience in operation.
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. Keep this manual in a safe location for ready reference to the "Operation" and "Maintenance" sections when needed.
7. If, after reading this manual, you have any difficulty installing, operating or maintaining this equipment, please call:

LAB-LINE CUSTOMER RELATIONS DEPARTMENT
800-323-0257 (outside Illinois)
312-450-2600 (inside Illinois)

8. Don't forget to fill out and mail in the warranty card to:

LAB-LINE INSTRUMENTS, INC.
Lab-Line Plaza, Melrose Park, IL 60160 U.S.A.

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CONTENTS

PAGES	TITLE
1-1	Model Description
2-1	Unit Specifications
3-1	Method of Installation.
3-2	Figure 1: AIR/CO-2 HOOKUPS
4-1	Operation Instructions
4-1	Figure 2: CONTROL PANEL
4-4	Figure 3: GAS RATIO NOMOGRAM
5-1	Maintenance Requirements
6-1	Replacement Parts List
7-1	Wiring Diagrams
	Figure 4: WIRING FOR 120V UNITS
	Figure 5: WIRING FOR 240V UNITS
Back Cover	Warranty

DESCRIPTION

The CO-2 Incubators covered by this manual provide for the control of CO-2 concentration and temperature to create a growth environment for tissue cultures, plants, cells, virus, etc. The incoming gas mixture passes through an aeration stone that can be immersed in the chamber water reservoir to raise relative humidity to as high as 98%.

Separate flowmeters are adjustable for air and CO-2 rates, and an access port on the control panel permits gas samples to be taken.

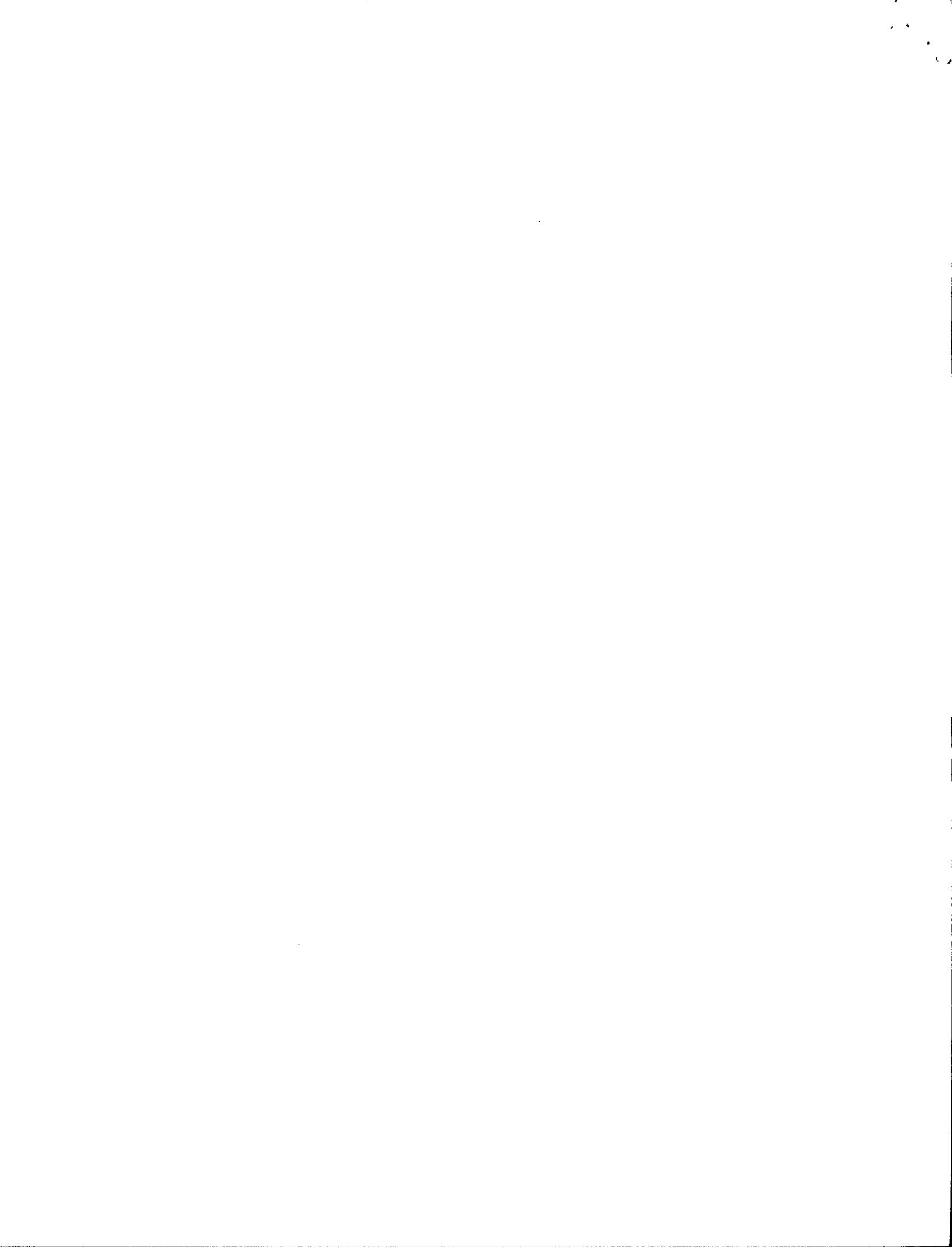
Two hydraulic thermostats - one for setpoint control and the other as an overtemperature limit - regulate temperature. If the control thermostat should fail, the limit thermostat will protect chamber contents.

Strip heaters on the outside of the chamber inner walls are positioned for uniform heat distribution, while high density fiberglass insulation minimizes heat loss. A fan in the chamber ceiling circulates chamber atmosphere to prevent temperature stratification.

The double door system has a tempered glass inner door for undisturbed viewing of the entire chamber, and a metal outer door for insulation and to block out unwanted light sources. Both doors have condensate troughs to keep standing water away from the door area.

The leakproof chamber is made of heavy-gauge stainless steel and the steel cabinet has a baked enamel finish for easy cleaning. Steel shelves are adjustable and removable.

The differences between models in this series are of size, the number of incubation chambers (one or two), and power requirements. Check the unit nameplate with your power source to be sure they agree.



SPECIFICATIONS

TEMPERATURE PARAMETERS

Range - from slightly above ambient to 65 degrees C
Control - to within +/- 0.5 degrees C

HUMIDITY RANGE

From ambient to 98% relative humidity

CARBON DIOXIDE RANGE

From 0 to 20% of the mixture

ELECTRICAL REQUIREMENTS

417	120 VAC, 50/60 Hz, 5 amps,	340 watts
417-2	240 VAC, 50/60 Hz, 3 amps,	340 watts
417-10	120 VAC, 50/60 Hz, 5 amps,	500 watts
417-11	240 VAC, 50/60 Hz, 3 amps,	500 watts
420	120 VAC, 50/60 Hz, 5 amps,	700 watts
420-1	240 VAC, 50/60 Hz, 3 amps,	700 watts
425	120 VAC, 50/60 Hz, 5 amps,	1000 watts
425-1	240 VAC, 50/60 Hz, 3 amps,	1000 watts

DIMENSIONS

Model	Chamber(s)	Overall Measurements	
417, 417-2	Single	20"W x 20"D x 38"H	(50.8 x 50.8 x 96.5cm)
417-10, 417-11	Single	24"W x 22"D x 38"H	(61.0 x 55.9 x 96.5cm)
420, 420-1	2 Stacked	20"W x 20"D x 76"H	(50.8 x 50.8 x 193.0cm)
425, 425-1	2 Adjacent	53"W x 24"D x 40"H	(134.6 x 61.0 x 101.6cm)

Model	Volume	Shelves*	Shelf Area*	Net Weight
417, 417-2	4.3 cu.ft.	6	12 sq.ft.	115 lb. (52.2kg)
417-10, 417-11	6.1 cu.ft.	6	18 sq.ft.	200 lb. (90.7kg)
420, 420-1	8.6 cu.ft.	12	24 sq.ft.	230 lb. (104.3kg)
425, 425-1	12.2 cu.ft.	12	24 sq.ft.	215 lb. (97.5kg)

* Additional shelves can be installed to double the shelf area.



INSTALLATION

1. LOCATION

Place the unit where it will be used, away from extraneous vibrations, drafts and wide variations in ambient temperature. Choose a spot near a power supply that matches the unit nameplate requirements.

Having a distilled or deionized water source and floor drain nearby is necessary if humidification will use the water inlet (see #3 below). Allow clearance for free air convection, CO-2 tank attachment and user convenience. Make sure the unit is level.

2. GAS HOOK-UP

Turn all flowmeters on the incubator fully counterclockwise to "OFF". Connect air and CO-2 supply lines to their respective fittings on the back of the unit. Use 3/8"OD copper tubing, flexible metal hose, etc. (meeting local codes), with filters to insure that the air and CO-2 are free of contaminants, for gas lines. Refer to Figure 1 on page 3-2.

Set the supply regulators at 10 psi. Check all connections for leaks.

NOTE: For dual chambers models each chamber has a separate set of air and gas fittings.

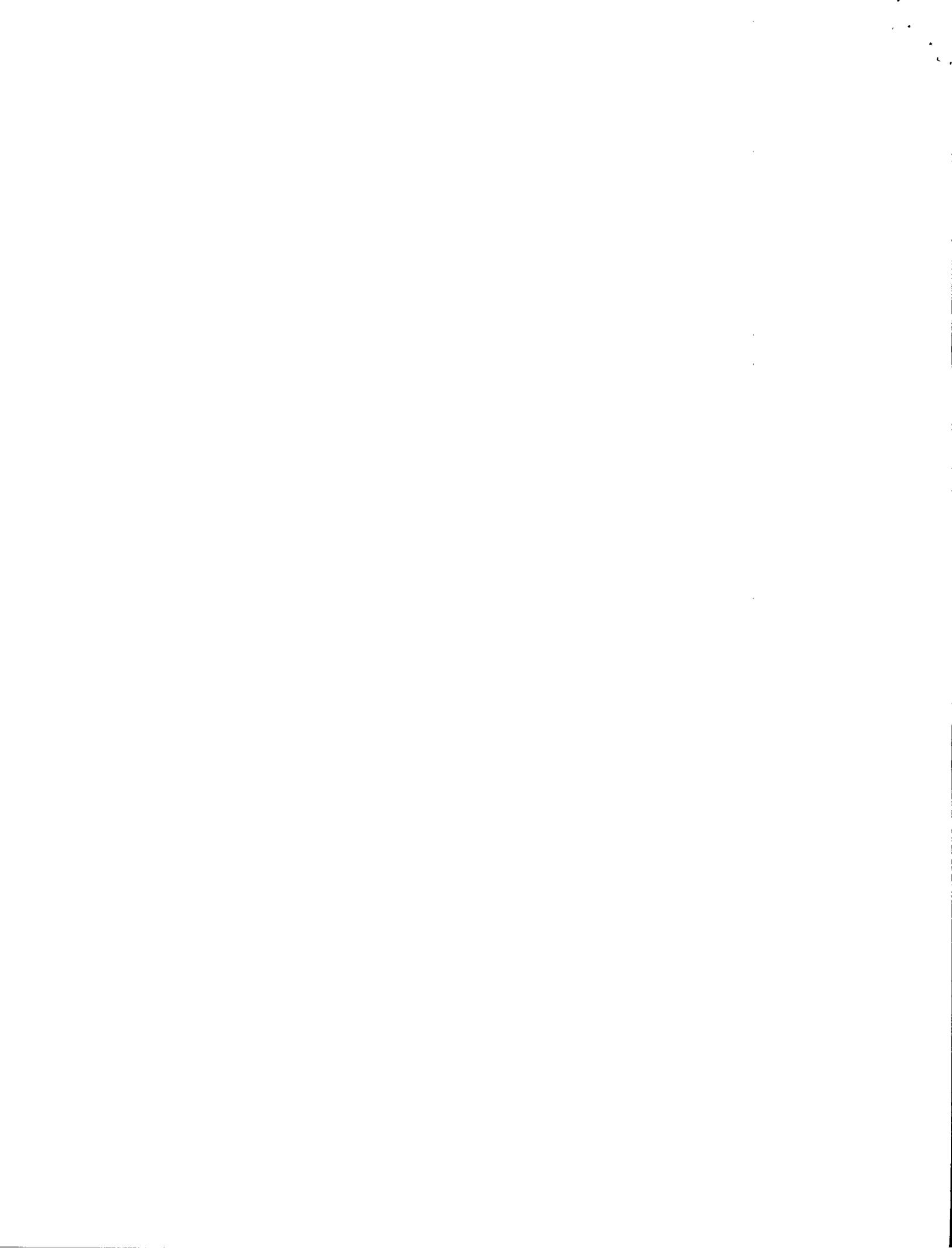
3. HUMIDIFICATION

To raise the humidity in a chamber to above ambient, add water either by (1) placing a pan of water in the bottom of the chamber or (2) connecting a water source to the water inlet on the back of the unit. In either case, only DISTILLED or DEIONIZED water should be used.

The water inlet is a 1/8" NPT female pipe leading to the reservoir. Dual chamber units have one for each chamber. If this fitting is not used as a water inlet, keep it plugged.

Attach the water level regulator (Lab-Line part 730-236-00) to the water inlet. The regulator has two pipes. The horizontal pipe is the inlet, and the vertical pipe at the bottom is a drain. Connect a hose from the inlet to a water supply valve. Connect a hose from the drain pipe to a floor drain.

Check water connections for leaks. Keep the water valve turned off when the incubator is not being operated.



4. WATER TROUGH DRAIN

Use a 1/4" hose to connect the drip trough fitting below the outer door to a floor drain or pan.

5. THERMOMETER

Place a dial thermometer (with a range of at least +20 to +70 degrees C) on a center shelf so it can be read through the glass inner door.

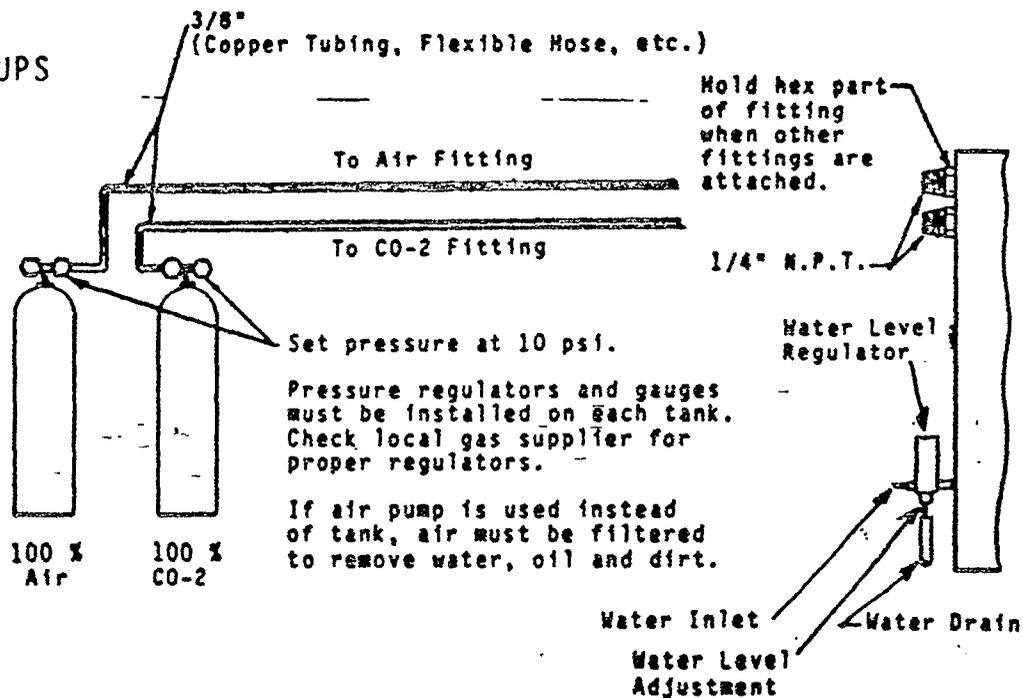
6. ELECTRICAL CONNECTION

The unit is supplied with a three-wire line cord. It should be plugged into an outlet designed for three-prong plugs. For an outlet designed to accept two-prong plugs (ungrounded), the best recommendation is to have a qualified electrician replace it with a new grounded outlet. When using a code-approved adapter, the ground lead from the adapter **MUST** be attached to a known good ground.

If a plug must be installed, use only the three-prong grounded type, rated for the unit load requirements and matching the power outlet. Make sure the green ground wire is secured to the plug ground terminal. Refer to the wiring diagram if necessary.

Turn the Power Switch to "OFF" and insert the plug into the outlet.

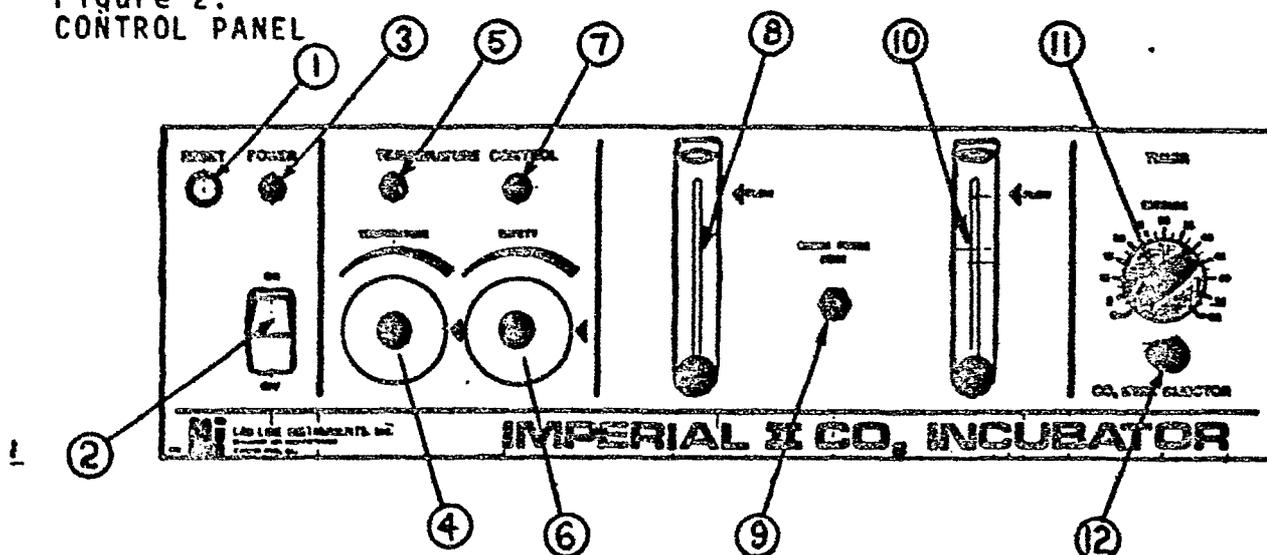
Figure 1:
AIR/CO-2 HOOK-UPS





OPERATION

Figure 2:
CONTROL PANEL



1. Circuit Breaker
2. Power Switch
3. Power Lamp
4. Control Knob
5. Control Lamp
6. Overtemperature Knob

7. Overtemperature Lamp
8. Air Flowmeter
9. Sample Access Port
10. CO-2 Flowmeter
11. Kwik-Inject Timer
12. Injection Button

1. POWERING UP

Push the Power Switch(es) to "ON". The Power Lamp(s) will be lit when power is "ON". Dual chamber models have two separate Power Switches and Power Lamps. The chambers can be used independently or together.

2. SETTING THE CONTROL THERMOSTAT(S)

- A. Turn the Overtemperature Knob fully clockwise, then turn the Control Knob clockwise to approximate the desired temperature (the setpoint). Note that the dial is for reference purposes only, and does not indicate a direct temperature reading.
- B. Allow time for chamber temperature to stabilize before proceeding. The Control Lamp is lit when heaters are energized, and not lit when heaters are not energized (between heating cycles). Allow several heating cycles to pass.
- C. Open the outer door and read the thermometer through the glass, then adjust the Control Knob closer to setpoint. Turn the knob clockwise to raise the temperature, counterclockwise to lower it.
- D. Repeat steps B and C above as needed until setpoint is maintained.



3. SETTING THE OVERTEMPERATURE THERMOSTAT(S)

- A. When the Control Lamp is lit, turn the Overtemperature Knob counterclockwise until the Control Lamp goes out and the Overtemperature Lamp is lit.
- B. Turn the Overtemperature Knob back clockwise slowly, just until the Control Lamp is again lit. Then turn it another 5 degrees of rotation clockwise to set the Overtemperature thermostat slightly higher than the Control thermostat.

NOTE: The Overtemperature setting must be changed each time the Control setting (setpoint) is changed.

4. LOADING THE INCUBATOR

Load the chamber, spacing the items as far apart as possible (for maximum air circulation).

5. AIR/GAS RATIO

Set the flowmeters to obtain the required air and CO-2 flow. Using the lowest possible CO-2 flow rate will help to conserve gas.

Use one of the following formulae or the nomogram on page 4-4 of this manual to find the desired air-to-gas ratio:

R = % CO-2 in the chamber atmosphere
 A = Air flow in liters/minute
 C = CO-2 flow in liters/minute

Equation 1 (to be used if air & CO-2 flow rates are known):

$$R = \frac{C}{A + C} \times 100$$

Equation 2 (to be used if air flow rate and % CO-2 are known):

$$C = \frac{RA}{100 - R} \text{ liters/min}$$

Equation 3 (to be used if CO-2 flow rate and % CO-2 are known):

$$A = \frac{100C - RC}{R} \text{ liters/min}$$



Example 1: If a CO-2 percentage of 15% is desired at a flow rate of 0.4 liters/min of CO-2, use Equation 3.

$$A = \frac{100 (0.4) - 15 (0.4)}{15} = \frac{40 - 6}{15}$$

$$= 2.26 \text{ liters/min of air}$$

Example 2: If flow rates are set at 0.1 liters/min of CO-2 and 3 liters/min of air, use Equation 1 to find CO-2 percentage:

$$R = \frac{0.1}{3.0 + 0.1} \times 100 = 3.2\% \text{ CO-2 in chamber atmosphere}$$

6. KWIK-INJECT SYSTEM

The Kwik-Inject system permits bypassing the flowmeter to inject gas directly from the supply into the chamber. A timer on the control panel limits injection time - - from 0 to 60 seconds. To determine the proper time, consult the equation below for the incubator model:

MODEL	TANK PRESSURE	TIME (T)
417, 417-2, 420, 420-1	10 psi	$T = 0.914 \times \% \text{ CO-2}$
417-10, 417-11	10 psi	$T = 1.28 \times \% \text{ CO-2}$
425, 425-1	10 psi	$T = 2.56 \times \% \text{ CO-2}$

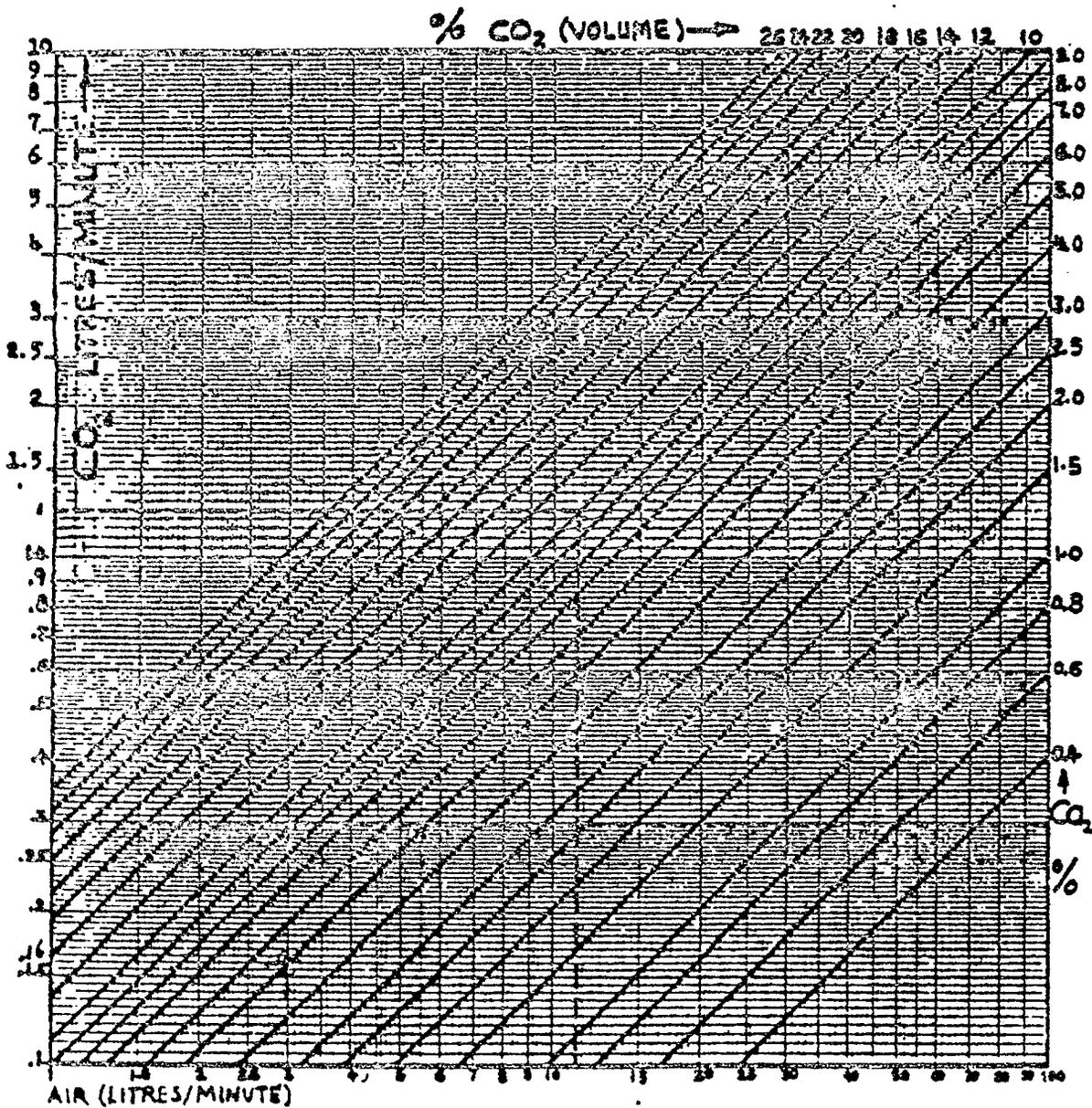
Set the timer to the calculated time and push the button below the timer when rapid CO-2 injection is desired.

7. HUMIDITY ADJUSTMENT

Chamber humidity can be raised by adding water to the chamber, either in a pan or from the water inlet (see the Installation Section for details). Maximum humidity results when the aeration stone at the end of the air/CO-2 tube is totally submerged in the water. Partially submerging it or completely removing it from the water will lower the humidity. For minimum humidity, the chamber should be dry.

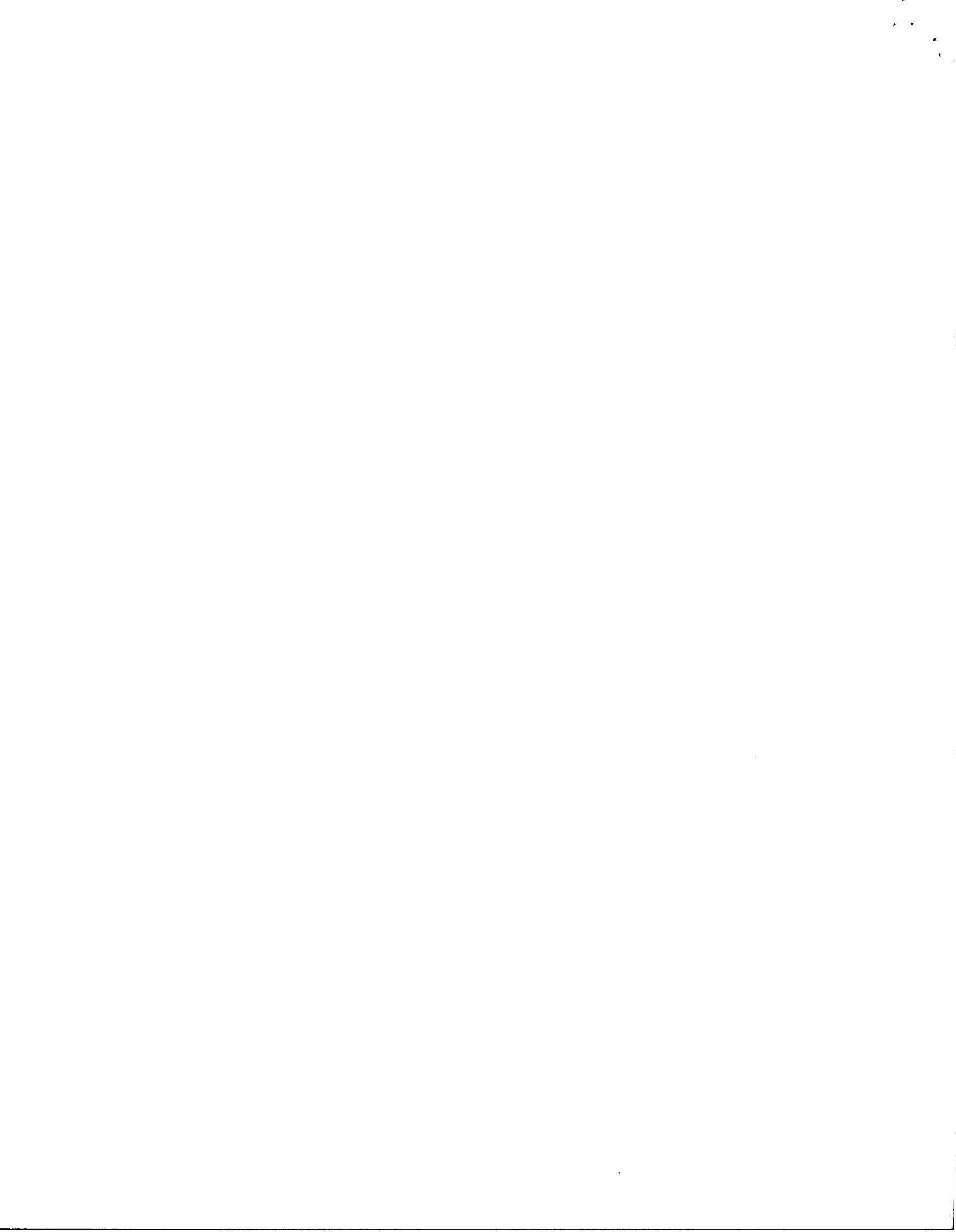


Figure 3:
AIR/CO-2 RATIO NOMOGRAM



This chart shows the CO-2 flow rate (liters/minute) required for a specific air/CO-2 ratio. Draw a vertical line from the point representing the air flow rate on the horizontal axis until it intersects with the desired CO-2 flow rate.

To obtain the air flow rate, with CO-2 flow rate (liters/min) and CO-2 percentage known, reverse the above procedure.



MAINTENANCE

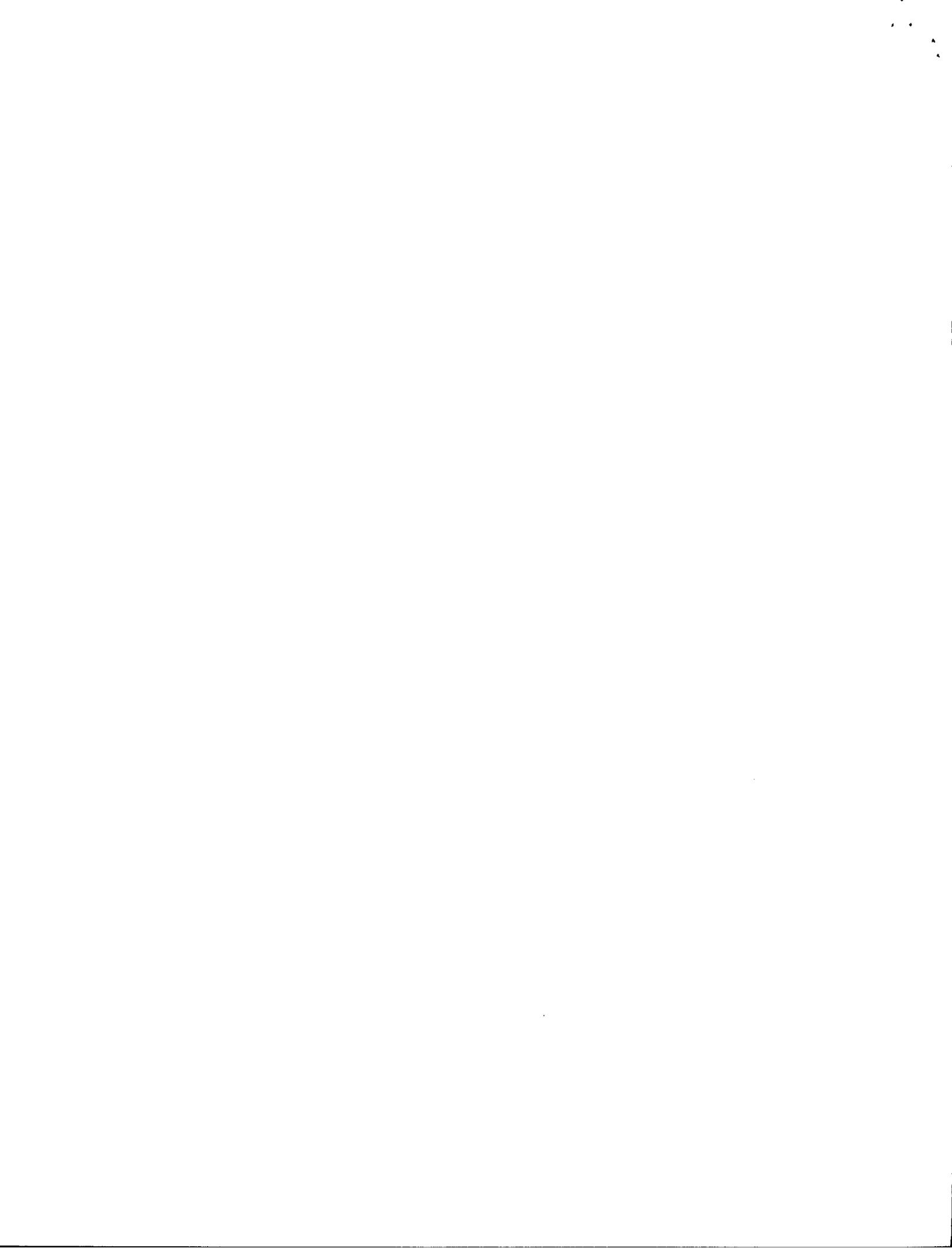
 * Make no attempt to service or repair a Lab-Line product *
 * under warranty before consulting your Lab-Line dealer. *
 * After the warranty period, such consultation is still *
 * advised, especially when the repair may be technically *
 * sophisticated or difficult. *
 * *
 * If assistance is needed beyond what the distributor *
 * can provide, please call Lab-Line Customer Relations *
 * Department at 312-450-2600 (inside Illinois) or at *
 * 800-323-0257 (elsewhere). *
 * *
 * No merchandise, however, should be returned *
 * to Lab-Line without prior approval. *

1. ROUTINE CLEANING

Disconnect the plug from its outlet before cleaning. Drain water from the water compartment and clean all chamber components with a solution of water and mild soap. Rinse thoroughly and dry. DO NOT use chlorine-based solutions or cleansers, harsh abrasives or scouring pads with metallic content. To remove built-up scale deposits, use a dilute acetic acid solution and a synthetic scrubber.

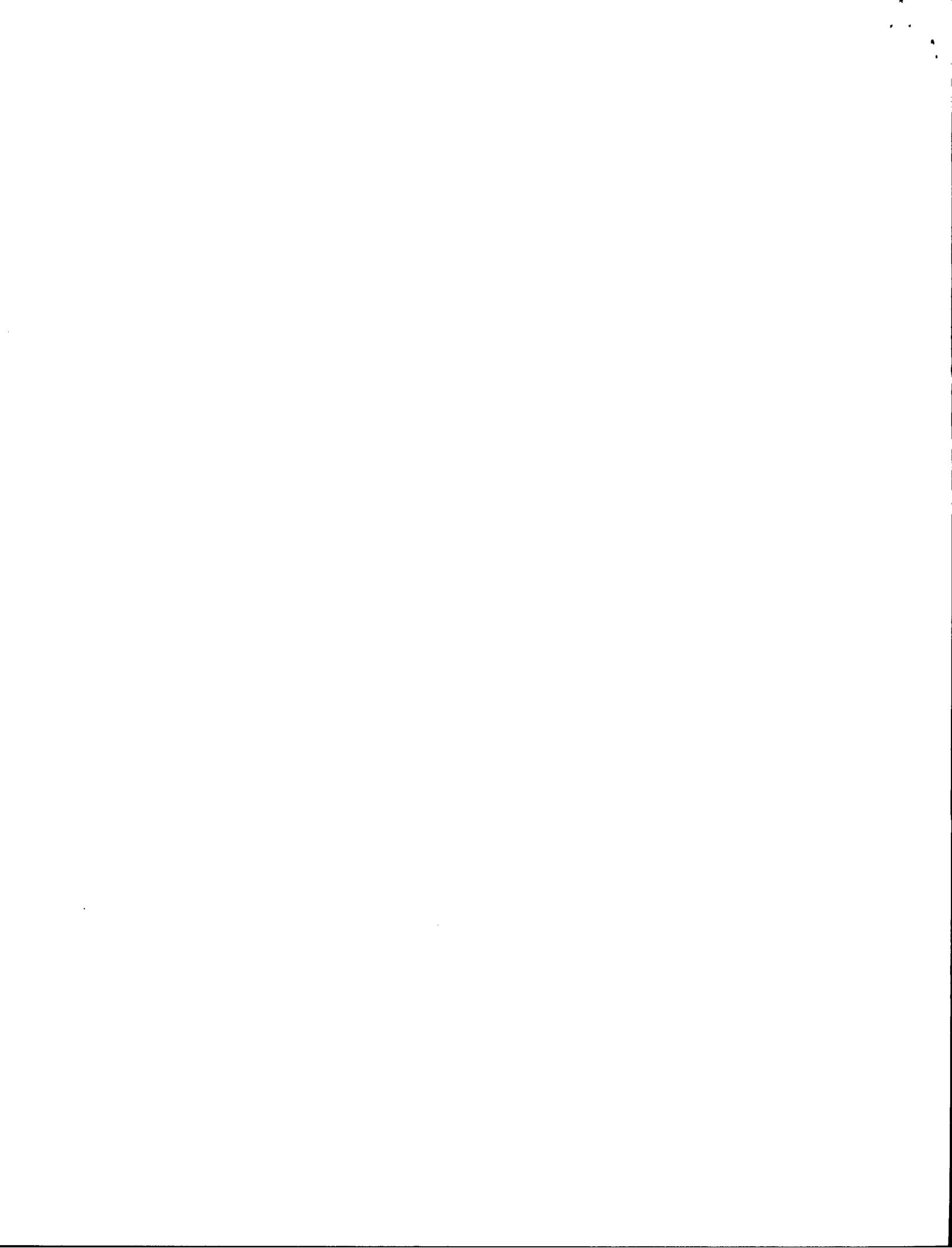
- 2. AERATION STONE CLEANING

The air/CO₂ mixture enters the chamber through an aeration stone that is submerged in water (for humidification) at the bottom of the chamber. When it eventually becomes clogged with particles, remove the stone and clean it with a nonmetallic scrubber in a dilute acetic acid solution. DO NOT use a chlorine-based product to clean the stone. Using distilled or deionized water for humidification will reduce the frequency of clogging and the need for cleaning.



REPLACEMENT PARTS

DESCRIPTION	PART NUMBER
Aeration Stone	750-005-00
Blower Wheel	160-010-00
Blower Motor	370-185-01
Buzzer for 425, 425-1	145-010-00
Circuit Breaker, 5 amp	330-118-00
Circuit Breaker for 417-11	330-125-00
Cordset	470-105-00
Feet, Leveling	790-157-00
Flowmeters	
Air (5 liters/min)	660-044-00
CO-2 (0.5 liters/min)	660-043-00
Fuse, 10 A for 425-1	330-067-00
Fuse Holder for 425-1	330-223-00
Gasket, Door (7½ foot length)	530-069-00
Gasket, Motor	530-073-00
Heaters	
For 417, 417-2, 420, 420-1:	
(75 watt, two per chamber)	340-109-00
(100 watt, two per chamber)	340-152-00
For 417-10, 417-11, 425, 425-1:	
(100 watt, four per chamber)	340-152-00
Pilot Lamps	
For 417, 417-10, 420, 425	360-036-00
For 417-2, 417-11, 420-1, 425-1	360-112-00
Regulator, Water Level	730-236-00
Solenoid Valve	796-876-00
Switch, Power	440-089-00
Thermometer	910-005-00
Thermostat (Control, Overttemperature)	920-126-00
Timer, Auto Reset	796-884-00
Transformer	
For 417-2, 417-11, 420-1	460-140-00
For 425-1	460-053-00
Wiring Diagrams	
For 417, 417-10, 420	3-227-465-00
For 417-2, 417-11, 420-1	3-226-908-01
For 425	4-227-410-00
For 425-1	4-226-875-04
Electrical Schematics	
For 417, 417-2, 417-10, 417-11, 420, 420-1	226-876-00
For 425	227-410-01
For 425-1	226-410-01



WIRING

Figure 4:
WIRING FOR 120V UNITS

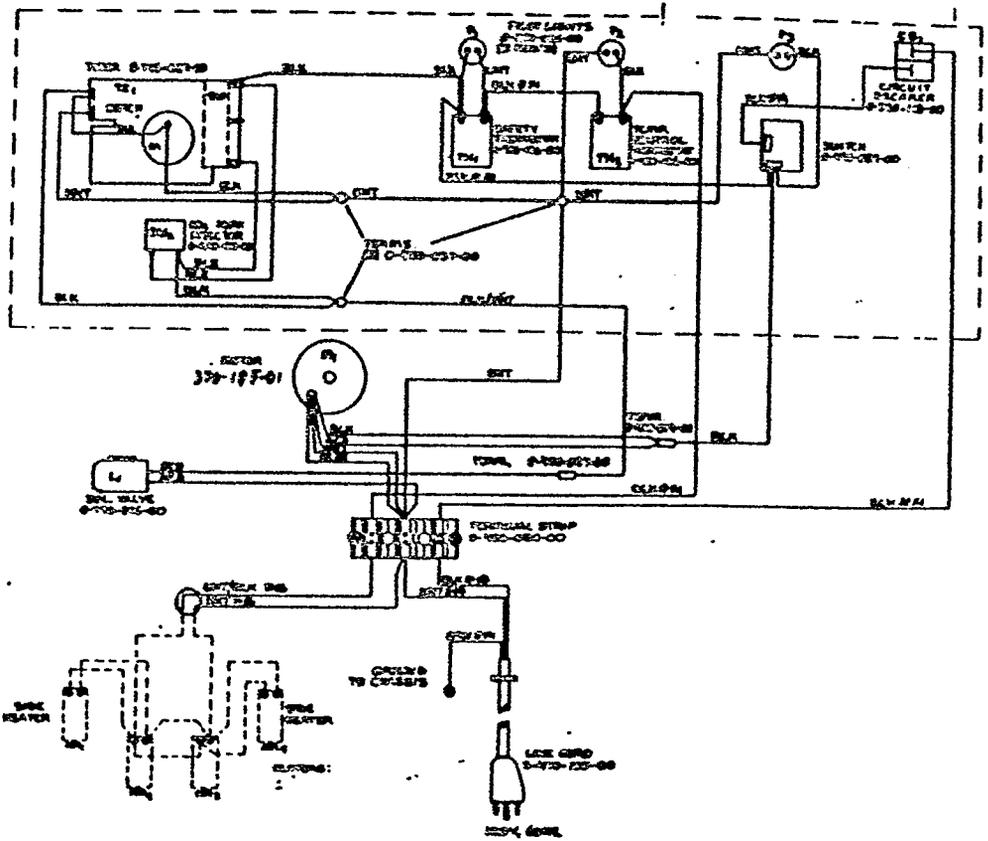
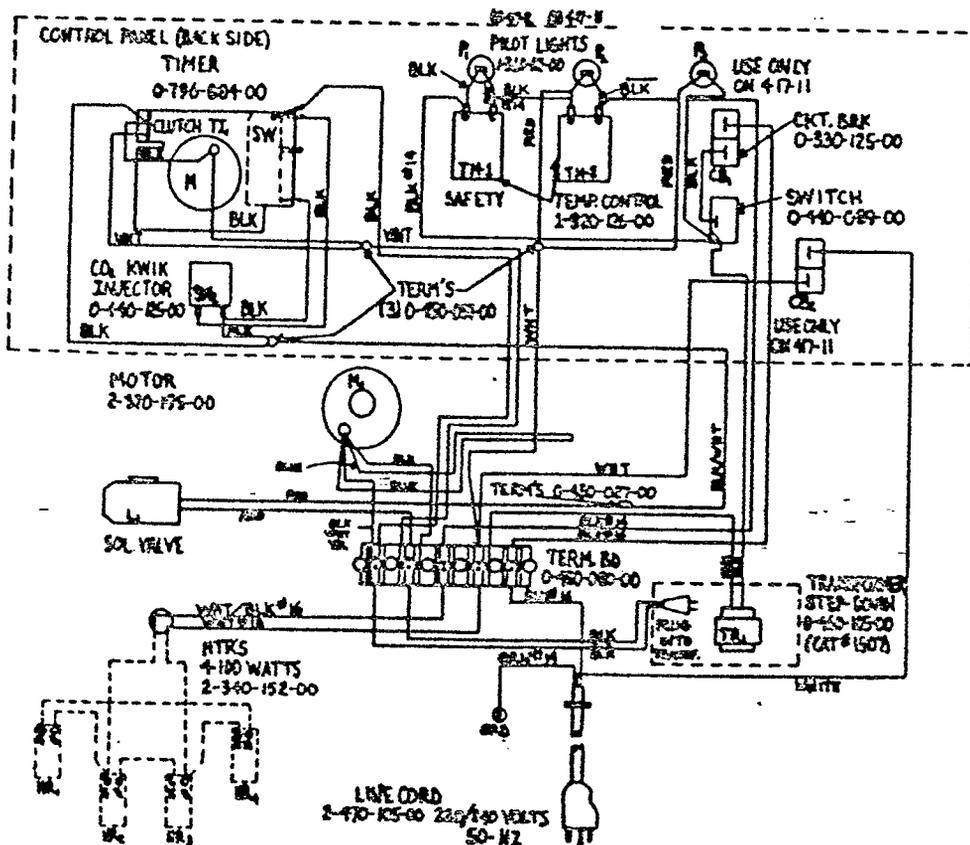
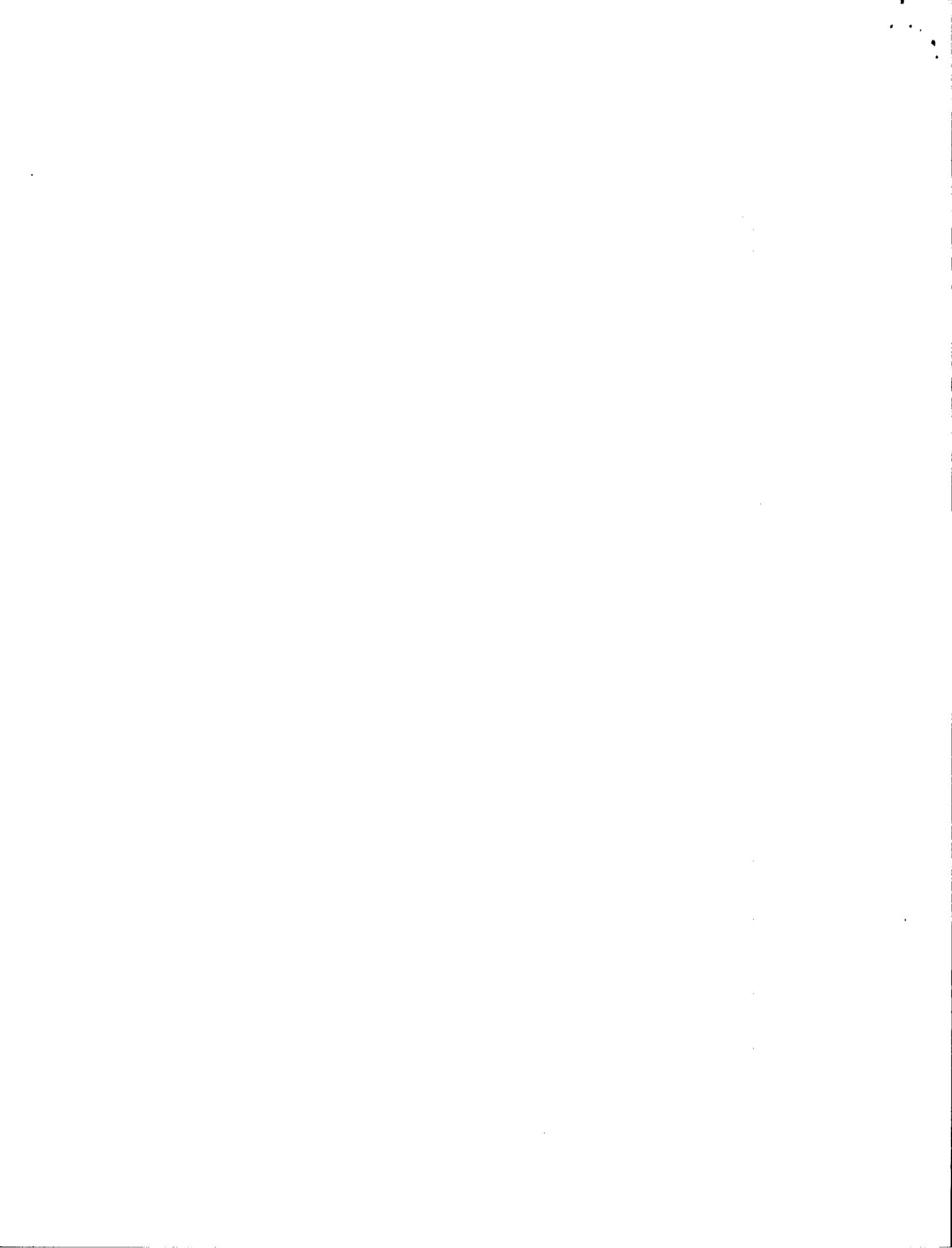


Figure 5:
WIRING FOR 240V UNITS





WARRANTY

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)

