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# User's Manual

## Rapid Digestors & Fume Removal Systems

### **Models**

2301200 Rapid Digestor-25  
2308000 Rapid Digestor-4  
2350025 25-Place Fume Removal System  
2354000 4-Place Fume Removal System

To receive important product updates,  
complete your product registration card  
online at [register.labconco.com](http://register.labconco.com)

**Please read the User's Manual before operating the equipment.**

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The warranty for Rapid Digestors and Fume Removal Systems will expire one year from date of installation or two years from date of shipment from Labconco, whichever is sooner. Warranty is non-transferable and only applies to the owner (organization) of record.

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Under no circumstances shall Labconco Corporation be liable for indirect, consequential, or special damages of any kind. This warranty is exclusive and in lieu of all other warranties whether oral, or implied.

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## **Limitation of Liability**

The disposal and/or emission of substances used in connection with this equipment may be governed by various federal, state, or local regulations. All users of this equipment are required to become familiar with any regulations that apply in the user's area concerning the dumping of waste materials in or upon water, land, or air and to comply with such regulations. Labconco Corporation is held harmless with respect to user's compliance with such regulations.

## **Contacting Labconco Corporation**

If you have questions that are not addressed in this manual, or if you need technical assistance, contact Labconco's Customer Service Department or Labconco's Product Service Department at 1-800-821-5525 or 1-816-333-8811, between the hours of 7:30 a.m. and 5:30 p.m., Central Standard Time.

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# Chapter 1:

## Introduction

Thank you for displaying confidence in us by selecting a Labconco Rapid Digester. Our design engineers, assemblers and inspectors have utilized their skills and years of experience to ensure that the new Labconco Rapid Digestors meets our high standards of quality and performance.



**This manual should be read carefully by all the end users in order to become familiar with the operation of the Rapid Digestors. Recommendations are made within the manual to help you obtain maximum performance and life from your product.**

**We have included sections on initial set up, operation, maintenance and troubleshooting to provide you with all the tools necessary to achieve maximum performance. If you have questions or concerns, do not hesitate to call us at 1-800-821-5525 for assistance.**

**WARNING: The disposal of substances used in connection with this equipment may be governed by various federal, state or local regulations. All users of this equipment are urged to become familiar with any regulations that apply in the user's area concerning the dumping of waste materials in or upon water, land or air and to comply with such regulations.**

## General Description

The Rapid Digestors are designed for wet digestions on material such as feeds, grains, soils, plant tissues, water effluent, organic wastes, and food products. These digestions are made prior to analysis for nitrogen, calcium, phosphorus, heavy metals, micro-nutrients, and other materials. The system consists of a control unit, a heating unit with digestion tubes, and a flask rack for transporting tubes. The flask rack is equipped with removable side panels providing increased heat transfer to the upper part of the digestion tubes.

The heating unit consists of individual heaters constructed of ceramic materials providing uniform and efficient heat transfer to the digestion tubes. The heaters are encased with an efficient insulating material on four sides and the bottom to prevent heat loss, assuring low energy consumption and safe casing temperatures. The close tolerance fit between the inner ceramic tube and the digestion solution provides for shorter digestion times and uniform digestion temperatures of the

sample solution. The heating unit is enclosed in a chemically etched aluminum casing, assuring easily cleaned surfaces with no paint to flake off and providing a good appearance throughout the unit's lifetime.

The control unit is of solid state design and regulates the temperature of the individual heaters uniformly and repeatedly. The large temperature set point dial assures accurate and repeatable temperature settings. The unique light display located on the heating unit assures accurate temperature setting and allows for visual observation of the Digester's operation.

The digestion tubes are thick-walled, rimmed, and made of borosilicate glass. Each tube is manufactured to close tolerances to assure efficient and uniform digestions. Digestion tubes are of the straight non-constricted type of approximately 250-ml capacity or with construction and an accurate volumetric mark placed at 250-ml volume.

## Detailed Operational Function

The Labconco Digester consists of the digestion unit, the control unit, and accessories (digestion tubes, flask rack, end plates, and retainer plate). The digestors can simultaneously handle up to 25 samples, each weighing up to 5 g for solid materials or approximately 25 ml for liquid samples.

## Digestion Unit

The digestion unit contains electrically heated ceramic cores retained in a pan insulated from the aluminum casing to reduce heat loss and to prevent the metal casing from becoming hot. The ceramic cores are precision molded to accommodate the digestion tubes and provide maximum direct contact with the tubes.

The center heating element with the 25-Place, or the rear left with the 4-Place, contains a RTD platinum sensor that is encased in ceramic to sense the temperature of the digester and signals the control unit providing uniform temperature control.



**CAUTION: The top surface of the digester is hot during operation and for a period of time after shutdown. To avoid the possibility of burns, do not touch the surface with bare hands.**

The exposed surfaces of the unit are made of aluminum finished by a chemically etched process to withstand corrosion. The light(s) located on the front of the digester indicates when the digester has reached set-point temperature, along with providing over and under temperature set-point indications. Flashing of the light(s) indicates proper temperature control.

## Control Unit

The solid state proportional controller regulates the temperature of the digester unit. The Rapid Digester-25 control unit is factory set to accept 208/240 volts, 50/60 Hz requiring 20 amp fusing and the 4-Place set to accept 115 volts, 50/60 Hz requiring 15 amp fusing. Temperatures from a few degrees above ambient to 450° C can be set on the set point indicator dial. Each controller is factory calibrated for proper temperature setting before leaving the factory and should not require re-calibration. A red indicator light on the front panel of the control unit is illuminated when unit is energized. Flashing of the light(s) located on the digester unit indicates the set-point temperature, when it has been reached, the temperature of the digester is proportionately controlled by the controller.

## Digestion Tubes and Flask Rack

Digestors are supplied without digestion tubes. The heavy rims allow the tubes to hang in the stand when the rack is lifted. The flask rack is constructed of aluminum alloy and holds the tubes during digestion as well as during cooling, dilution, washing, drying, and weighing of samples. Samples are weighed or volumetrically delivered into the tubes and the digestion mixture added. The tubes in the rack are then lowered into the digester unit. The samples are digested at the proper temperature for a predetermined amount of time. Digestion temperature and time is determined by the type of sample being digested. After digestion is complete, the flask rack containing digested samples must be removed from digester, cooled and diluted with water. The digestion is now complete and ready for appropriate determination.

## End Plates

The end plates are rectangular aluminum plates that attach to the open ends of the flask rack during digestion. Closing the open ends of the rack promotes proper refluxing to wash down the sides of the tubes for complete and efficient digestions. The end plates are removed during cooling, dilution and washing.

## Fume Removal System (Optional Equipment)

An optional fume removal system is available to provide removal of the corrosive fumes expelled during a digestion. The use of this system is highly recommended to prevent damage to conventional fume removal hoods.

The Labconco Fume Removal Systems are designed to remove corrosive fumes produced when performing Kjeldahl digestions utilizing either of the Labconco Rapid Digestors. Model 2350025 is used with the 25-Place Rapid Digester and Model 2354000 is used with the 4-Place Rapid Digester. Fumes from a digestion are removed from the digestion tubes through the exhaust manifold by a water jet

eductor, which empties into a convenient drain. The Labconco fume Removal System consists of the exhaust manifold, water jet eductor, stand for exhaust manifold, and drip pan. Model 2354000 fume removal system for the 4-place digester does not include jet eductor, stand, or drip pan.

### **Exhaust Manifold**

The manifold consists of the glass removal system contained in aluminum, stainless steel on the 4-place system housing. All aluminum parts are finished by a chemically etched process to withstand corrosion. The glass manifold has either four or twenty-five bulbs, depending on model number that fit directly into the digester tubes providing fume removal. The glass manifold pipes are interchangeable and can be replaced in case of breakage. High temperature acid resistant hose is provided for the connection from the glass manifold to the water jet eductor.

### **Water Jet Eductor (Not applicable to Model #2354000)**

The Water Jet Eductor is made of an acid resistant material to assure long life and trouble free operation. The movement of water through the eductor creates a vacuum that exhausts the fumes collected by the exhaust manifold. The amount of water flow required is usually in the range of 2-3 gallons/minute. The amount of vacuum required from the water eductor is controlled by the adjustment of the water flow rate.

### **Stand and Drip Pan (Not applicable to Model #2354000)**

The stand is designed to hold the exhaust manifold when not in use. The drip pan is placed under the stand to catch any acid drippings. Each is finished with an acid resistant coating to assure long life and good appearance.

### **Specifications**

#### 1. Water Requirements

Supply	tap water
Demand	2-3 gallons/minute
Connections for eductor	1/2" male (A1/2" x 3/8" nipple is provided for connection to a regular laboratory gooseneck faucet

### 2. Physical Specifications

Weight (exhaust manifold including Water Jet Eductor)	7.1 lbs. Model #2350025 (25 place system) 4 lbs. Model #2354000 (4 place system without Water Jet Eductor)
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### 3. Drain

Drain must be capable of handling 2-3 gallons/minute water flow.  
Eductor water outlet must enter into a sink or a laboratory drain and it is recommended that the eductor drain be located in a fume hood.  
Water Jet Eductor not included with Model #2354000.

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## Chapter 2: Specifications

### Rapid Digestor, 25-Place

#### 1. Electrical

Operating Voltage:	208-240V AC single phase
Current (Max.):	16 Amp at 230V AC
Fusing:	25 Amp fuses @208 or 240V AC operation
Frequency:	50 or 60 Hz

#### 2. Physical

Weight:	Digestion Unit:	78 lbs.
	Control Unit:	10.8 lbs.
Size:	Tubes:	9.2 lbs./set of 25
	Flask Rack:	3.6 lbs.
	End Plates:	1.4 lbs.
	Digestion Unit:	8" H x 19-1/4"W x 19" D
	Control Unit:	5-1/8"H x 8" W x 12-1/8"D
	Flask Rack:	6-1/2"H x 14-1/4"W x 14-1/4"D
	Flask Rack w/ handles:	6-1/2"H x 17-3/4"W x 14-1/4"D
	End Plate:	6-1/2"H x 14-9/16"W x 1"D
	Tubes:	11-15/16"L x 1.65 OD (Volumetric) 11-15/16"L x 1.65 OD (Straight)
Sample Size:		
		Up to 5 grams

**3. Features**

Digestion Tubes (Types):	250 ml straight 250 ml constricted with volumetric mark
Capacity (samples/digestion):	25
Temperature range:	Ambient to 450°C
Heat-up time to 410°C:	Approximately one hour
Temperature readout:	Set point dial with indication lamps

## **Rapid Digestor, 4-Place**

**1. Electrical**

Operating voltage:	115V AC
Current (Max.):	6 Amp @ 115V AC
Fusing:	8 Amp @ 115V AC
Frequency:	50 or 60 Hz

**2. Physical**

Weight (Shipping):	30 Lbs.
Size:	Digestion Unit: 6-3/8"H x 9"W x 11-1/4"D Control Unit 4-3/4"H x 6-3/4"W x 8-1/8"D Sample size: Up to 5 grams

**3. Features**

Digestion tube (types):	250 ml straight 250 ml constricted with volumetric mark
Capacity (samples/digestion):	4
Temperature range:	Ambient to 450°C
Heat-up time to 410°C:	Approximately 45 minutes
Temperature readout:	Set point dial with indication lamps

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## Chapter 3: Installation

### Unpacking and Installation of Rapid Digester

Use caution when unpacking the digester and accessories to avoid damage. Remove the digester unit from the carton first and carefully inspect all packing material to insure that no accessories or small parts are discarded by accident. If damage from shipping has occurred, the customer must file a claim with the carrier IMMEDIATELY! Do not return any item to Labconco Corporation without written authorization from the factory. Your local laboratory apparatus dealer can assist you and should be contacted if problems occur.

- Locate the digester unit under a suitable fume removal system to assure complete removal of fumes and vapors given off during the digestion.



**CAUTION: Acid fumes given off during digestion are very corrosive. Digestion unit must be placed in venting system that is totally resistant to acid fumes or damage will result to the removal system. It is highly recommended that Labconco's fume removal system, designed for acid removal from digestors, be used in conjunction with a laboratory fume hood.**

- Locate control unit outside hood away from any vapors or fumes. Damage to control unit will result if subjected to corrosive vapors or fumes.
- Connect power cord from control unit to digester unit. Connect small diameter gray sensor cord to the 2-prong receptacle provided.
- Connect main power cord from control unit to suitable electrical outlet. (208-240V AC 3-wire installation fused at 25 amps for the 25-Place digester or 115V AC for the 4-Place. Refer to electrical specifications pages 5 & 6).

- Adjust temperature set-point dial to approximately 300°C. Turn switch to ON position. Red pilot light on controller panel will be illuminated along with the red light(s) on the Digester's front panel.
- Allow approximately 40 minutes for unit to reach temperature setting. When unit reaches temperature, the light(s) on the digester unit will flash. When light(s) are on, one half of the time the temperature indicated on the temperature dial has been reached.
- Place digestion tubes in flask rack. System is now ready for operation.

## **Installation and Assembly of Fume Removal System**

Install eductor by one of the methods described in the detailed drawing in Chapter 10. The eductor assembly as provided is for connection to a regular laboratory gooseneck faucet – (method 1). Model #23540, fume removal system for Rapid Digester 4-place, is not provided with the Water Jet Eductor. Any non-metallic water aspirator pump such as Nalgene® 6140 or equivalent is suitable for use with the 4-place fume removal system. It is highly recommended that eductor and drain be located in a fume hood to remove the small amount of gases that do not dissolve in the water stream. It is also recommended that the digester and fume removal system be located in a fume hood to prevent accumulation of fumes in the laboratory during observation and dilution of the digested samples. Assemble glass manifold sections as shown in detailed drawing. Model #23540 comes completely assembled. Align manifold pipes into manifold by placing glass manifold assembly on flat surface. Adjust each manifold pipe section to assure a snug fit into the ground glass taper joint. Place stainless steel retainer clip around glass taper joints as shown in detail drawing. Insert assembled glass manifold into manifold housing. Attach rear brackets into place with screws that are provided. Glass manifold should be free to move slightly in housing. Refer to detailed drawing located in Chapter 10.

Connect manifold assembly to the water aspirator with the high temperature acid resistant hose provided. Expansion of the acid resistant hose may be necessary to facilitate installation of the hose to the glass manifold hose connection. The exhaust system is now ready for operation.

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## Chapter 4: Normal Operation

### Operation and General Kjeldahl Digestion Procedure for Nitrate Free Samples 1 – 2

#### General Digestion for feed, grain, etc.

1. Turn main power switch located on front of controller to ON position. Set temperature to 410°C using temperature set point dial on controller. Allow approximately one hour for unit to reach pre-set temperature (digestor at pre-set temperature when light(s) located on front of digestor is flashing).
2. Carefully insert the digestion tubes into the holes provided in the flask rack. The flask rack can be used for convenient handling and transportation of the digestion tubes.
3. Place weighed, well ground homogenous samples into digestion tubes and add 9g  $K_2SO_4$ , 0.42 g  $HgO$ , and 15 ml  $H_2SO_4$ .
4. After completing sample and reagent addition to the digestion tubes, carefully elevate the rack by grasping the handles provided and place in position on the digestor unit. As the rack is lifted, each tube will rest on its top rim. Carefully lower rack so that each tube enters its respective hole and bottoms in the base of the unit.
5. If optional fume removal system has been purchased, place system on top of the digestion tubes. Alignment is accomplished by a side to side, front to back motion. Adjust water flow to aspirator to the point where all fumes are removed.
6. Place end plates on flask rack. These plates completely close the ends of the flask rack and allow the temperature of the upper portion of the tube to elevate providing for proper refluxing and condensation of the  $H_2SO_4$  which washes the carbonized material back into the digestion solution. (A certain amount of foaming will occur at the beginning of the digestion. The refluxing of the acid washes any carbonized

material back into the digestion solution. If foaming is uncontrollable, reduce digestion temperature and/or sample size).

7. Digest sample at 410° for 45 minutes for complete recovery of all types of nitrogen containing samples. (Digestion time may be less for those samples not containing refractory nitrogen. Refer to Labconco's extracts).

Current Edition of: *Official Methods of Analysis of the Association of Official Analytical Chemists*, Washington, District of Columbia.

Methods utilizing copper as the catalyst and 20 minute digestions refer to reference section of this manual and request appropriate Labconco extracts.

8. After digestion is complete, remove flask rack containing tubes from digester and place on heat resistant pad. Avoid having the hot tubes come into contact with a cool or wet surface. (As a safety precaution, wear asbestos gloves and goggles when removing the rack and tubes from the digester).
9. Allow tubes to cool for 5-8 minutes. Dilute digest with approximately 100-ml water when tubes are cool enough to handle. Dilution must be made before a cake is formed from precipitated salts, but not before the digest is cool enough to contain the exothermic reaction. (The cooling period is very important since, in the determination procedure, caking of the salts will cause low recoveries of the nitrogen contained in the cake).
10. After dilution of the digested sample, the nitrogen content can be determined by Labconco's Rapid Distillation Apparatus, normal Kjeldahl distillation, specific ion electrode, steam distillation, or by manual or automated colorimetric determinations. The general method presented for the digestion of total Kjeldahl nitrogen is a basic method being used in many laboratories doing feeds and grain digestions.



**WARNING: Perchloric Acid is a very rapid oxidizer. It comes to a boil at relatively low temperatures, with the liquid contents totally evaporated in a short amount of time. The residue which remains after the liquid is dawn off becomes anhydrous and very unstable. For this reason, Labconco warns against the use of Perchloric Acid with this equipment as a reaction could result.**

## Operation of Fume Removal System

Place exhaust manifold on top of digestion tubes immediately after placing tubes in digestor. Alignment is accomplished by a side to side, front to back motion. It is not necessary to have a full rack of tubes in place, but there must be a tube in each corner and the center of the digestor for support of the exhaust manifold. Adjust water flow to eductor to maximum and allow water flow to be at a maximum until the large amount of fumes produced during first stages of digestion have subsided. (Usually 5-7 minutes, depending on moisture content and size of sample). Reduce water flow to the point where all fumes are removed.



**CAUTION: If maximum water flow to the eductor is allowed to continue throughout entire digestion, the removal of too much acid could take place, resulting in caking of sample contents contained in the digestion tubes and/or nitrogen loss. Remove only those fumes that have been expelled to the top of the digestion tubes. At the end of the digestion period, remove digestion tubes from digestor for cooling. Leave exhaust manifold in place on top of the tubes during removal and cooling period.**

Tilt exhaust manifold to the rear to allow drainage of acid from the manifold to the eductor after cooling period. Place exhaust manifold on stand allowing drip pan to collect all acid expelled from the manifold. Drip pan is to be placed directly under stand to catch acid drainage from manifold. This drainage can be held to a minimum if exhaust manifold is tilted to the rear to allow drainage of acid into the eductor. Stand and drip pan is not provided with Model #2354000.

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## Chapter 5: Routine Maintenance

Periodic cleaning of the surface is necessary to avoid stains from acid spills. This is best accomplished with a detergent and water solution when the unit is cool. (Disconnect unit from electrical source).

It is necessary to keep the cores of the ceramic heaters clear of any foreign material to assure free insertion of the digestion tubes.

### Maintenance for Fume Removal System

Periodic cleaning of the exhaust manifold is necessary for efficient operation of the system. The glass manifold can be disassembled and washed with detergent and water solution when cool. The manifold can also be washed by immersion and rinsing each bulb with water. Adjust eductor to maximum water flow to drain water wash from manifold. Inspect each bulb contained on the manifold pipes for obstructed vent hole. If obstructed, remove foreign material before reassemble. Rinse drip pan with water after each use.

#### **Service (Model # 23500-25 only)**

##### Replacement of glass manifold

1. Remove four screws from rear side of manifold housing.
2. Remove the two rear manifold brackets that retain the old manifold.  
Remove old manifold by slipping manifold glass pipes from front bracket.
3. Assemble glass manifold as in installation and assembly in Chapter 3.
4. Install new glass manifold in housing and reassemble in reverse order.

##### Replacement of Glass Manifold Sections

1. Follow steps 1 and 2 under “Replacement of Glass Manifold” above.
2. Remove retaining clip from section of manifold that requires replacement.
3. Replacement manifold section and reassemble in reverse order.

## Chapter 6: Troubleshooting

Symptom	Probable Cause	Corrective Measure
Main pilot light does not illuminate	ON-OFF switch in off position	Turn switch to ON position
	Main power fuse blown or circuit breaker tripped	Replace fuse or reset circuit breaker
	25 Amp fuse on control unit blown (8 Amp on Rapid Digestor 4-Place)	Check continuity of fuse with ohmmeter. Replace fuse if blown. If fuse continues to blow, locate cause.
	ON-OFF switch defective	Replace switch. Refer to Service Section for replacement procedure.
No heat applied to unit. Main pilot light illuminated	Sensor defective	Check continuity of sensor by placing ohmmeter across pins 1 & 2 of female sensor receptacle. If resistance measurements show sensor to be open, replace sensor by following Service Section on Sensor Replacement.
Indicator lamp not illuminated	Bulb defective	Check continuity of bulb with ohmmeter and replace if defective following Service Section-Indicator Lamp Replacement.
	Defective resistor	Check continuity of resistor for the row of heaters behind indicator lamp not illuminated using ohmmeter.
	Defective ceramic heater	Check continuity of each heater contained in the row behind indicator lamp that is not illuminated. Replace defective heater following Ceramic Heater Replacement section.

<b>Symptom</b>	<b>Probable Cause</b>	<b>Corrective Measure</b>
Uneven heat applied to unit (not applicable to Rapid Digestor 4-Place)	Strip heater defective	Check continuity of each strip heater and replace defective heater following Strip Heater Replacement section.

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## Chapter 7: Service

Refer to appropriate wiring diagrams or layout drawing for clarification.

### Main Power Switch Replacement

- Disconnect main line cord from power receptacle.
- Remove the #10-24 machine screws from sides of control unit and remove inner panel exposing switch.
- Remove wires from old switch and replace switch.
- Rewire new switch referring to wiring diagram located in Chapter 10.
- Reassemble control unit.
- Reconnect main power supply.

### Strip Heater Replacement (Not applicable to Rapid Digestor 4-Place)

- Disconnect main line cord from power receptacle.
- Remove screws from sides of digester and raise inner panel forward exposing indicator lamp housings.
- Disconnect spade terminals to indicator lamp freeing the inner panel for complete removal.
- Remove the six screws from bottom of digester freeing heater containment pan.
- Tilt heater containment pan to expose wiring.
- Trace wiring to defective heater and disconnect heater wiring.
- Remove heater, replace and rewire.
- Reassemble in reverse order starting with number 3.
- Reconnect main power supply.

## Indicator Lamp Replacement

- Disconnect main line cord from power receptacle.
- Remove lens cap from defective bulb.
- Remove defective bulb from housing and replace.
- Reinstall lens cap.
- Reconnect main power supply.

## Resistor Replacement

- Follow steps 1-5 under “Strip Heater Replacement”.
- Remove defective resistor from buss bar and terminal strip.
- Install new resistor, retighten screws and reassemble in reverse order.
- Reconnect main power supply.

## Ceramic Heater Replacement

- Follow steps 1-5 under “Strip Heater Replacement”.
- Remove defective heater from heater containment pan.
- Install new heater by threading wires through hole in the bottom of the insulator board. Feed wires through hole and lower heater in place.



**CAUTION: Do not bend wires or allow wires to fold up between bottom of heater casing and insulator board. Heater life will be greatly reduced if heater is not installed correctly.**

- Reconnect heater wires and reassemble in reverse order.
- Reconnect main power supply.

## Sensor Replacement

- Follow steps 1-5 under “Strip Heater Replacement.”
- Disconnect sensor leads attached to 2-pin connector located on left side of digester. (2-pin connector located on rear of Rapid Digester 4-Place.)
- Remove heater containing the sensor. (Refer to layout sketches in Chapter 10). Heater-sensor assembly containing defective sensor may be used as heater only by breaking sensor flush with bottom of heater.

- Install new heater sensor assembly by carefully threading wires through holes in the bottom of the insulator board. Feed wires through holes and lower heater in place.



**CAUTION: Do not bend wires or allow wires to fold up between bottom of heater casing and insulator board. Heater and sensor life will be greatly reduced if heater is not installed correctly.**

- Reconnect heater wires and solder sensor wires to the 2-pin connector.
- Reconnect main power supply.

## Parts and Service

- If a problem should arise, please contact your local laboratory apparatus dealer through whom you purchased the Labconco products. Please include Labconco catalog and serial numbers on all phone or letter inquiries to obtain prompt action on your particular unit. Consult nameplates to obtain this information. If contacting Labconco directly, please furnish the name of the dealer from whom you purchased the equipment.

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## Chapter 8: References

*Official Methods of Analysis of the Association of Official Analytical Chemists*, 19th Edition, Washington, D.C., 2012.

Hambleton, L.G. and Noel, R. J., *Journal of the Association of Analytical Chemists*, 58; 143-145, 1975.

Noel, R.J. , and Hambleton, L.G., *Journal of the Association of Analytical Chemists*, 59: 134-140, 1976.

*Semi-Automated Method for Total Protein Nitrogen in Feeds* - Applications Wall, L.L., Sr., Gehrke, C.W., and Smith, R.A., University of Missouri, Columbia, Experiment Station Chemical Laboratories, Columbia, Missouri.

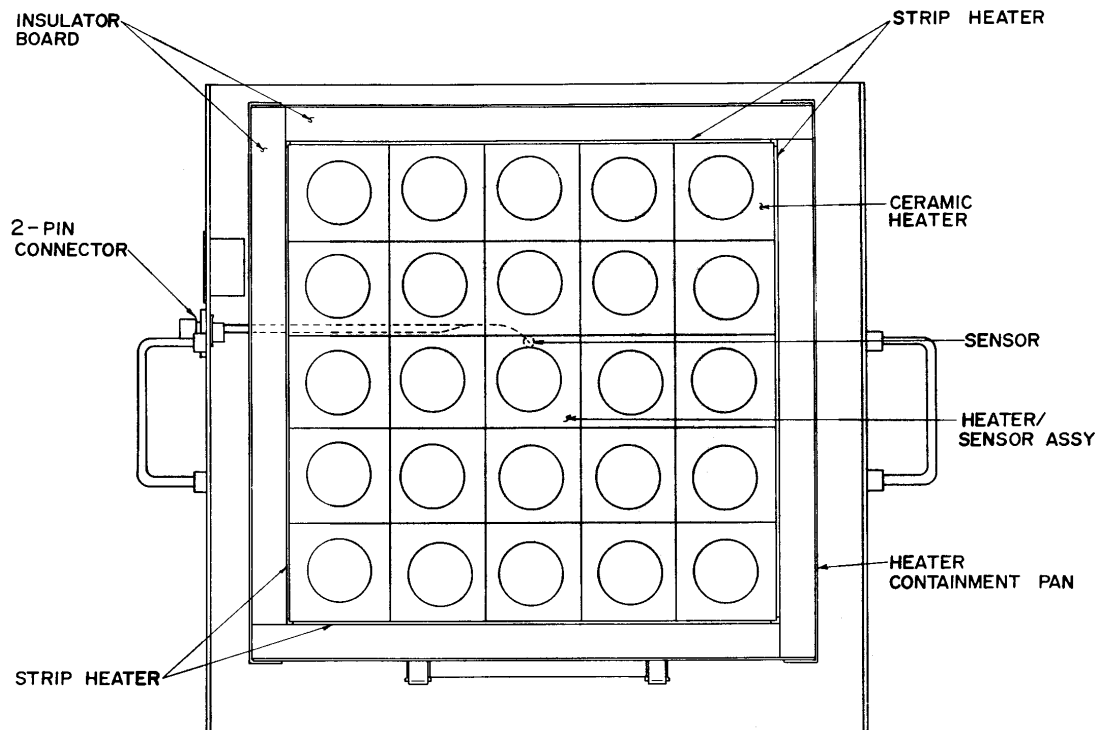
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## Chapter 9: Replacement Parts

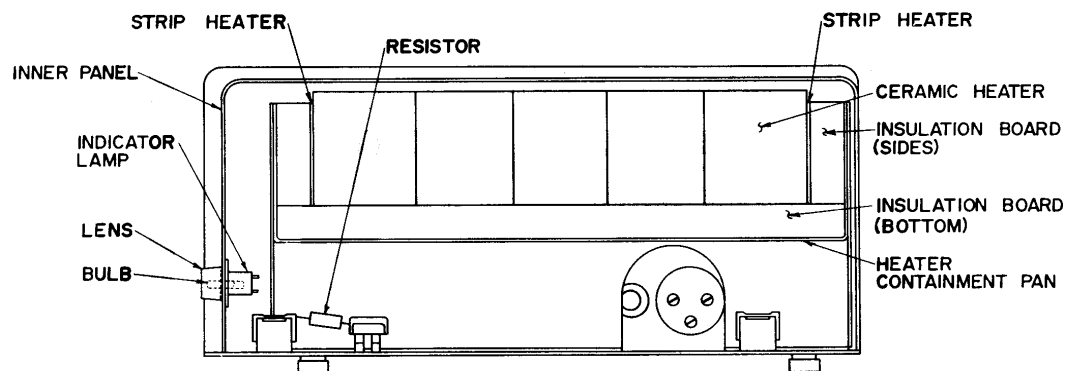
### Rapid Digestor 25-Place

#### 25-Place Digestor

<u>Catalog No.</u>	<u>Description</u>
1276100	Lens Cap, Red
1276200	Indicator Lamp
2303400	Heater Assembly with sensor cemented in place
1324900	Resistor, 2 ohm 20 W
1345900	Strip, Heater
2302000	Assembly, Heater
2303025	Tube Digestion, 250 ml volumetric (Pkg. of 25)
2304025	Tube, Digestion with NO volumetric marking. (Pkg. of 25)
2305100	Flask Rack



**DIGESTOR**  
TOP VIEW OF UNIT  
(TOP CUTAWAY)

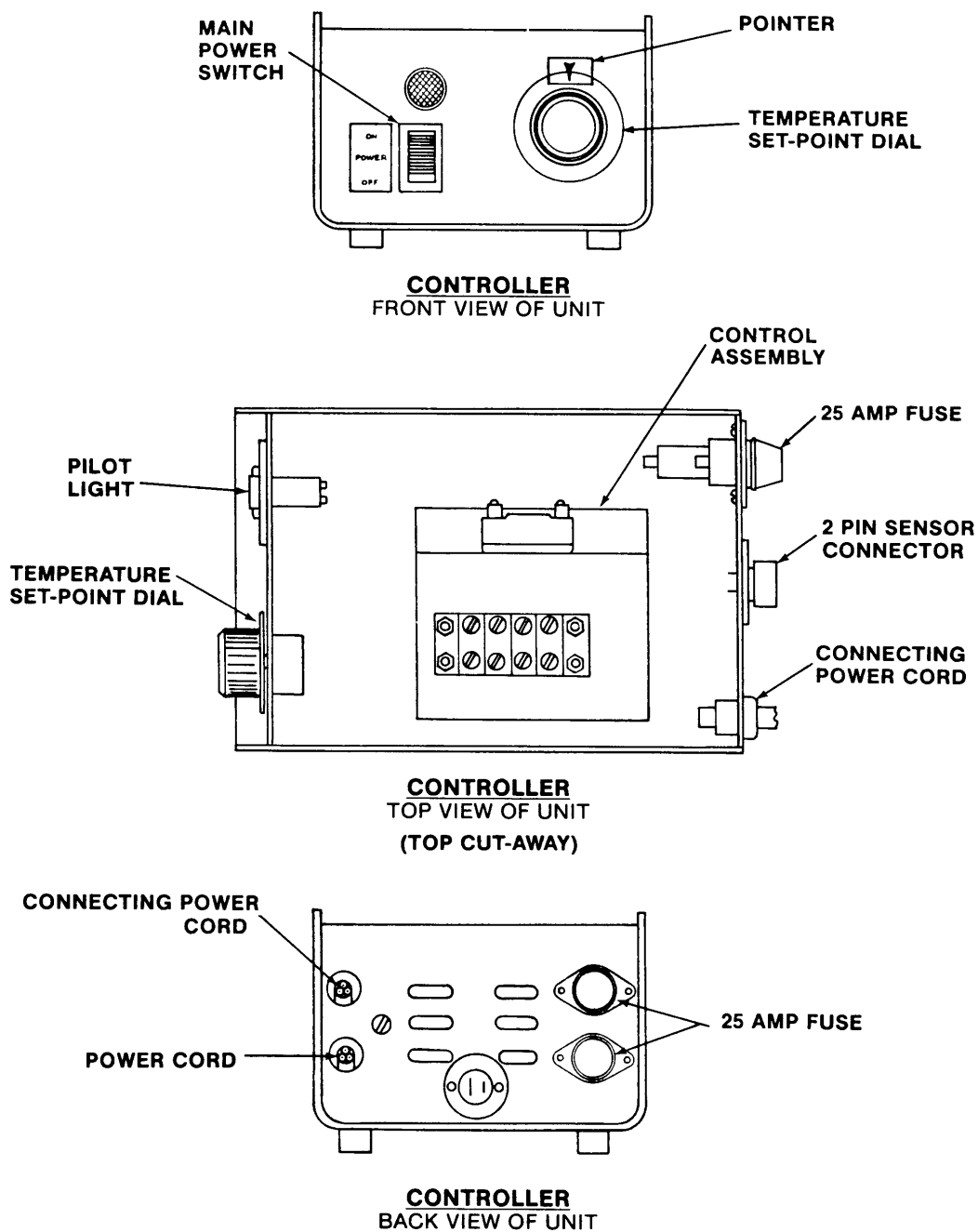


**DIGESTOR**  
SIDE SECTIONAL VIEW

### Rapid Digestor 25-Place (Digestor)

## 25-Place Controller

<u>Catalog No.</u>	<u>Description</u>
1270700	Pilot Light, 230V
1324000	Switch, DPST
2311900	Control Assembly

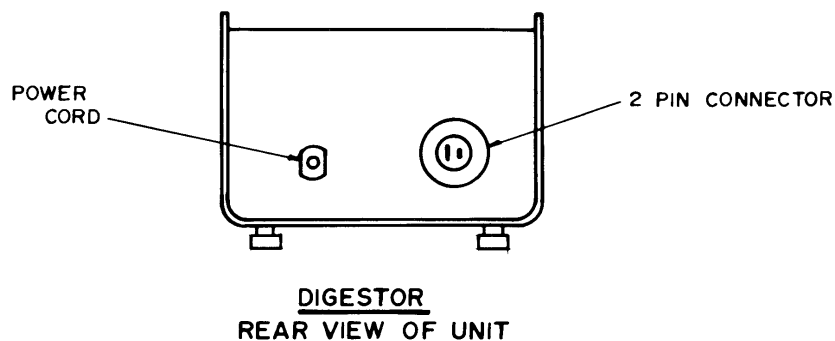
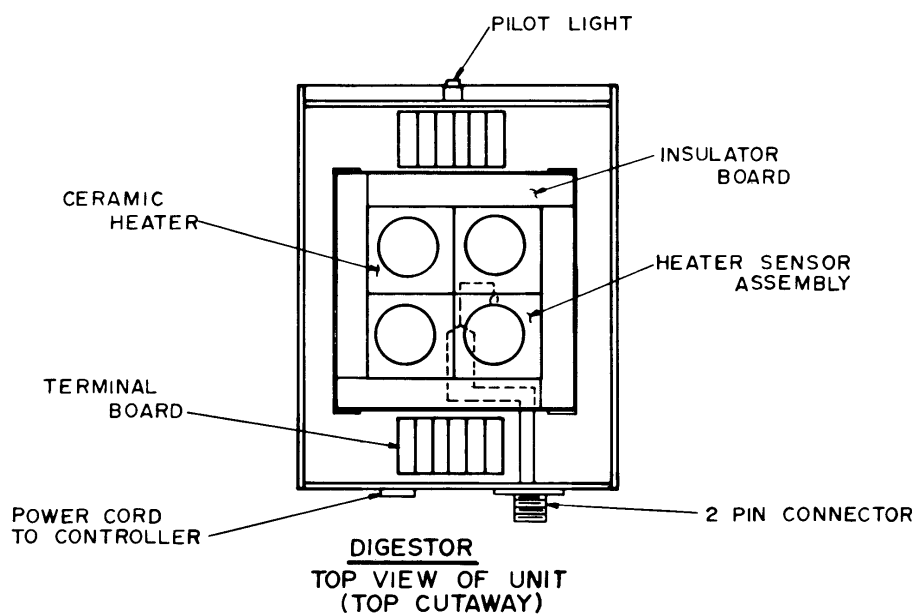


**Rapid Digestor 25-Place (Controller)**

# Rapid Digestor 4-Place

## 4-Place Digestor

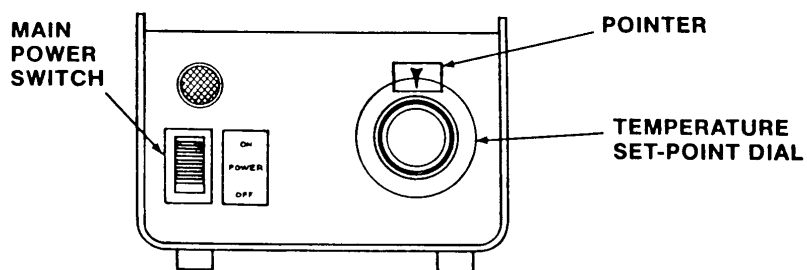
<u>Catalog No.</u>	<u>Description</u>
1276700	Lens Cap, Red
1276600	Indicator Lamp
2308400	Assembly, Heater
2303005	Tube Digestion, 250 ml volumetric (Pkg. of 5)
2304005	Tube, Digestion with <u>NO</u> volumetric marking. (Pkg. of 5)
2309700	Flask Rack



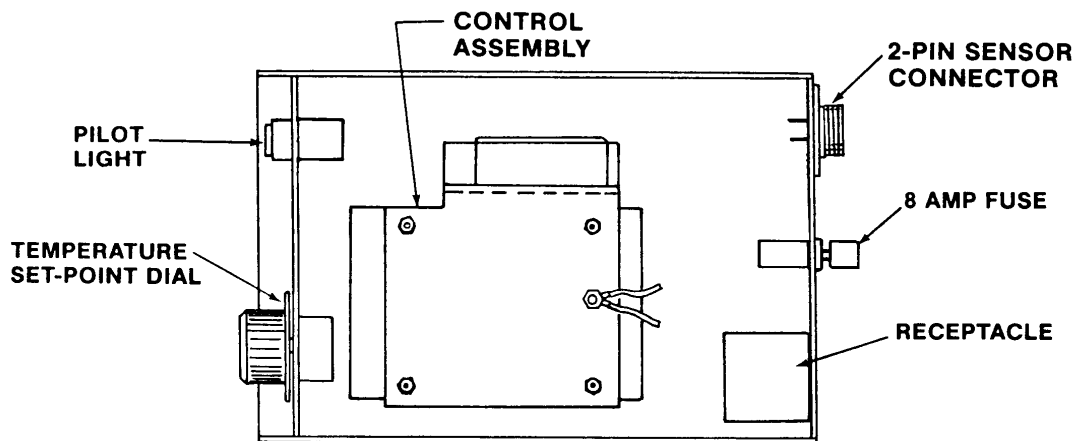
### Rapid Digestor 4-Place (Digestor)

### 4-Place Controller

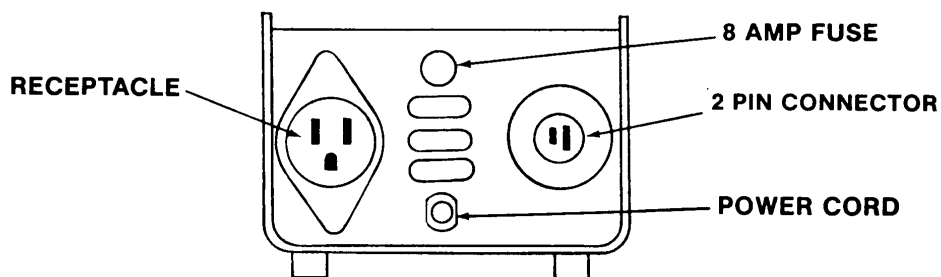
<u>Catalog No.</u>	<u>Description</u>
1276900	Pilot Light, 120V
1325700	Switch, DPST
2312400	Control Assembly



**CONTROLLER**  
FRONT VIEW OF UNIT



**CONTROLLER**  
TOP VIEW OF UNIT  
(TOP CUT-AWAY)



**CONTROLLER**  
BACK VIEW OF UNIT

### Rapid Digestor 4-Place (Controller)

## Rapid Digestor Fume Removal Systems

### Model #2350025

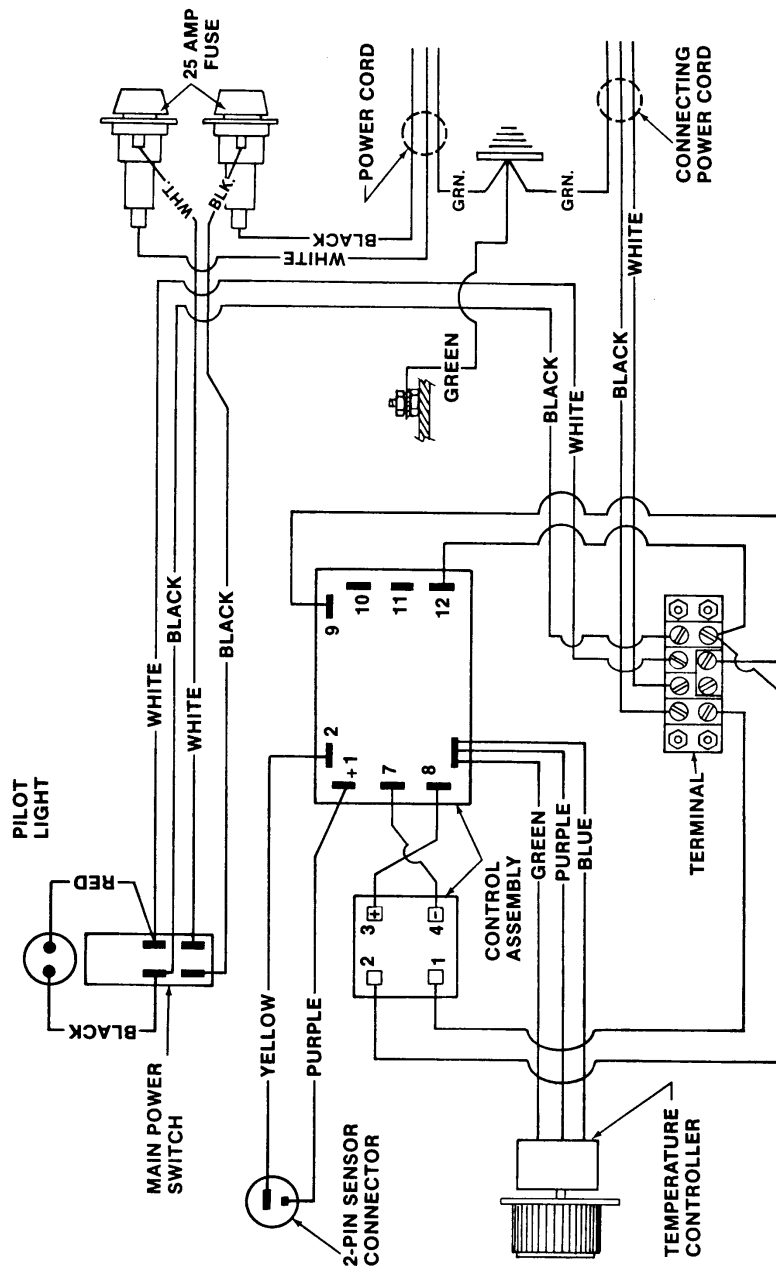
<u>Part Number</u>	<u>Description</u>
1357500	Water Jet Eductor
1622300	2' Drain Hose, Rubber
2351300	Manifold Complete – 25 Place
2353200	Glass Pipe – 25 Place
2353300	Rear, Glass Manifold – 25 Place
1540000	Tubing High Temperature – Acid Resistant (per ft)
2351700	Stainless Steel Clip

### Model #2354000

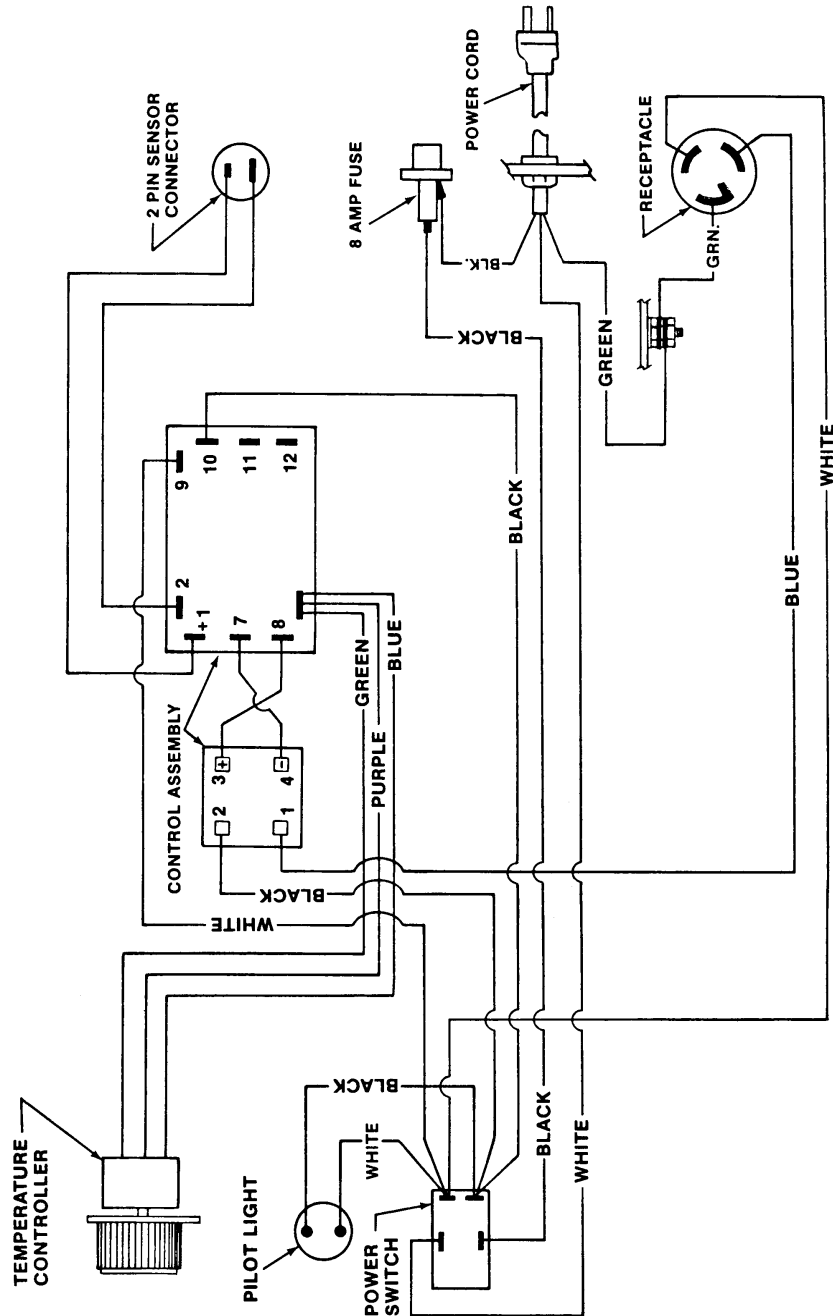
<u>Part Number</u>	<u>Description</u>
1622600	Tubing, high temperature and acid resistant
2308500	Glass Pipe

# Chapter 10: Wiring Diagrams & Detailed Drawings

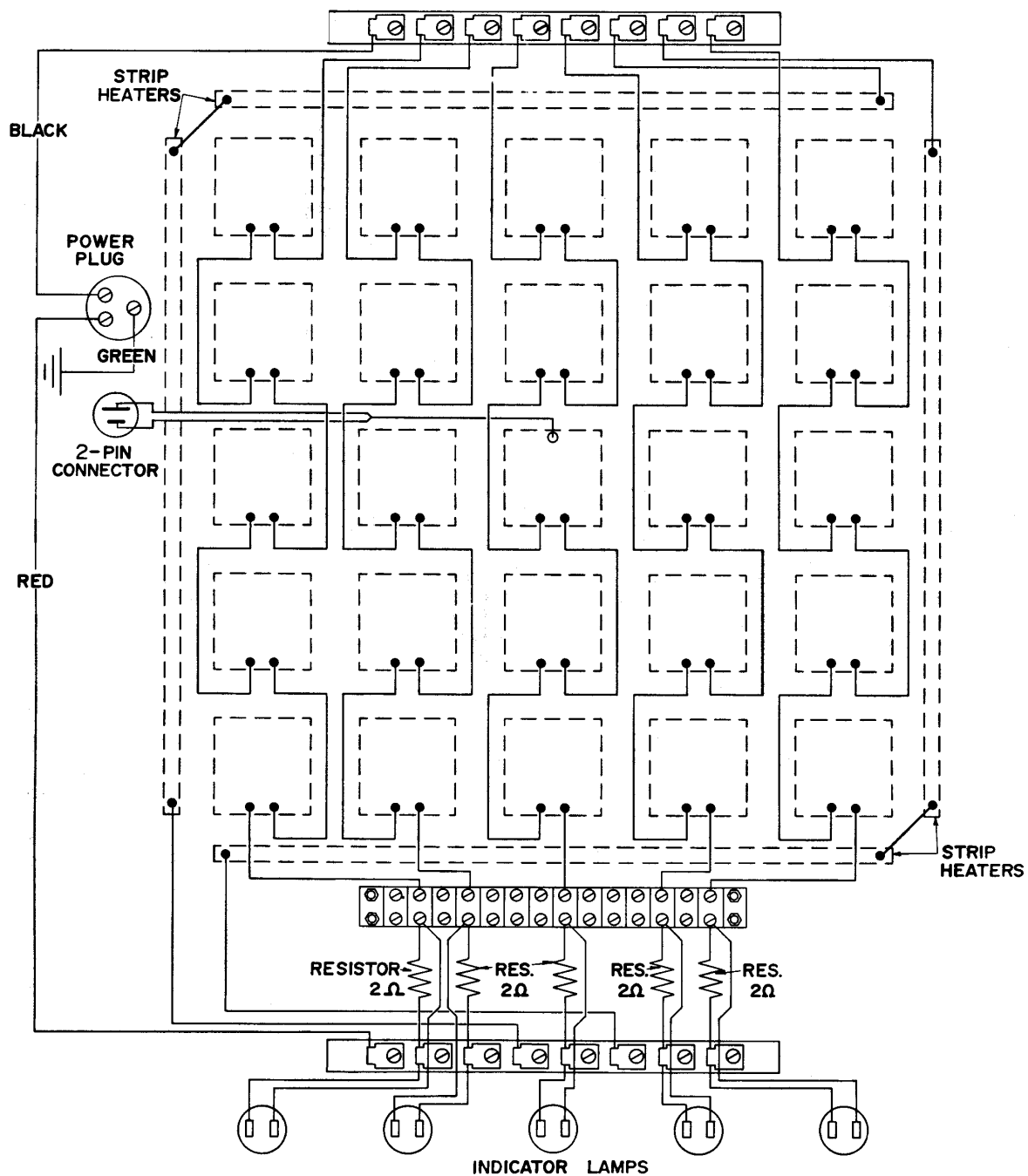
## Wiring Diagram – 25-Place Controller



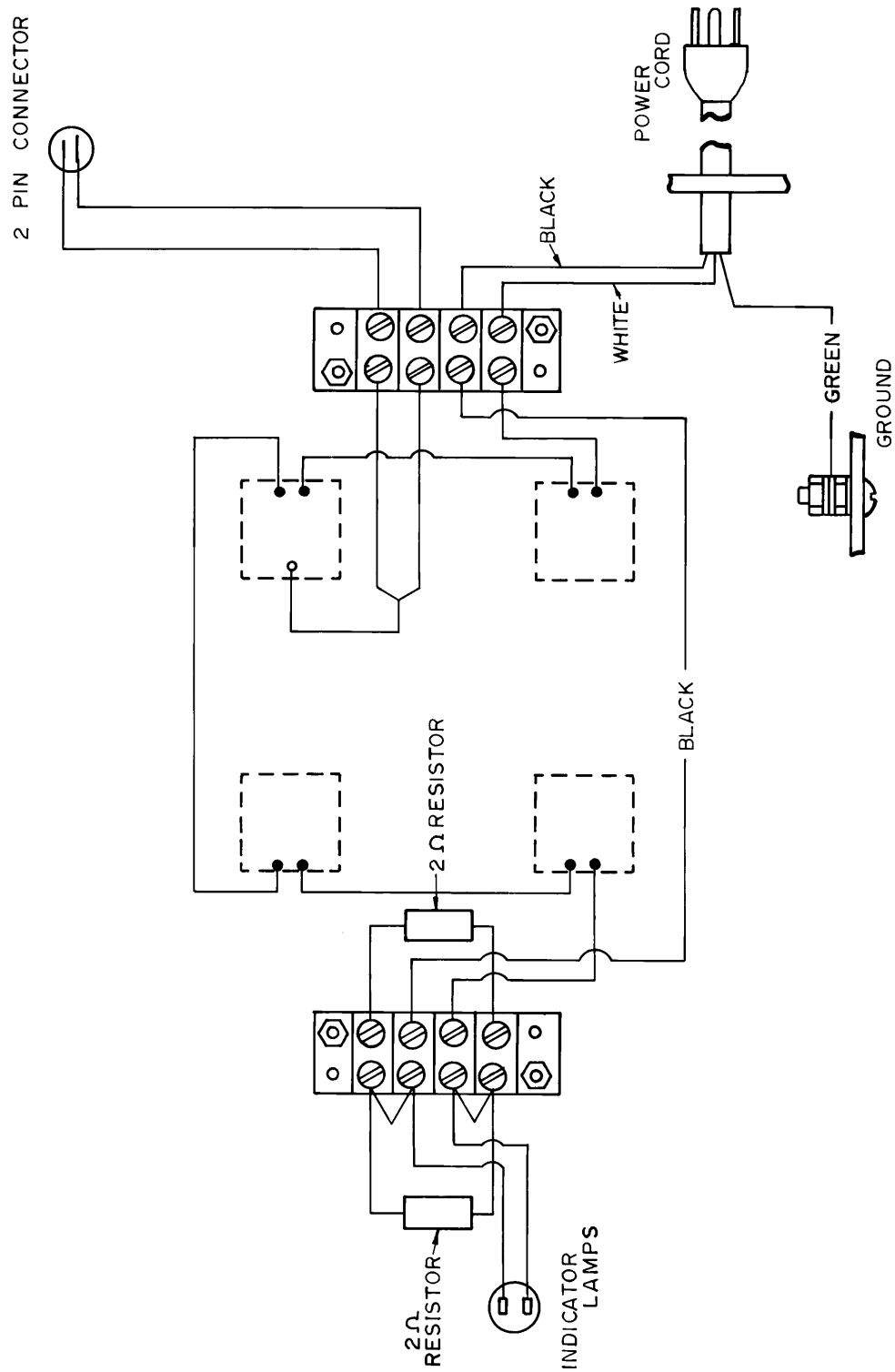
## Wiring Diagram – 4-Place Controller



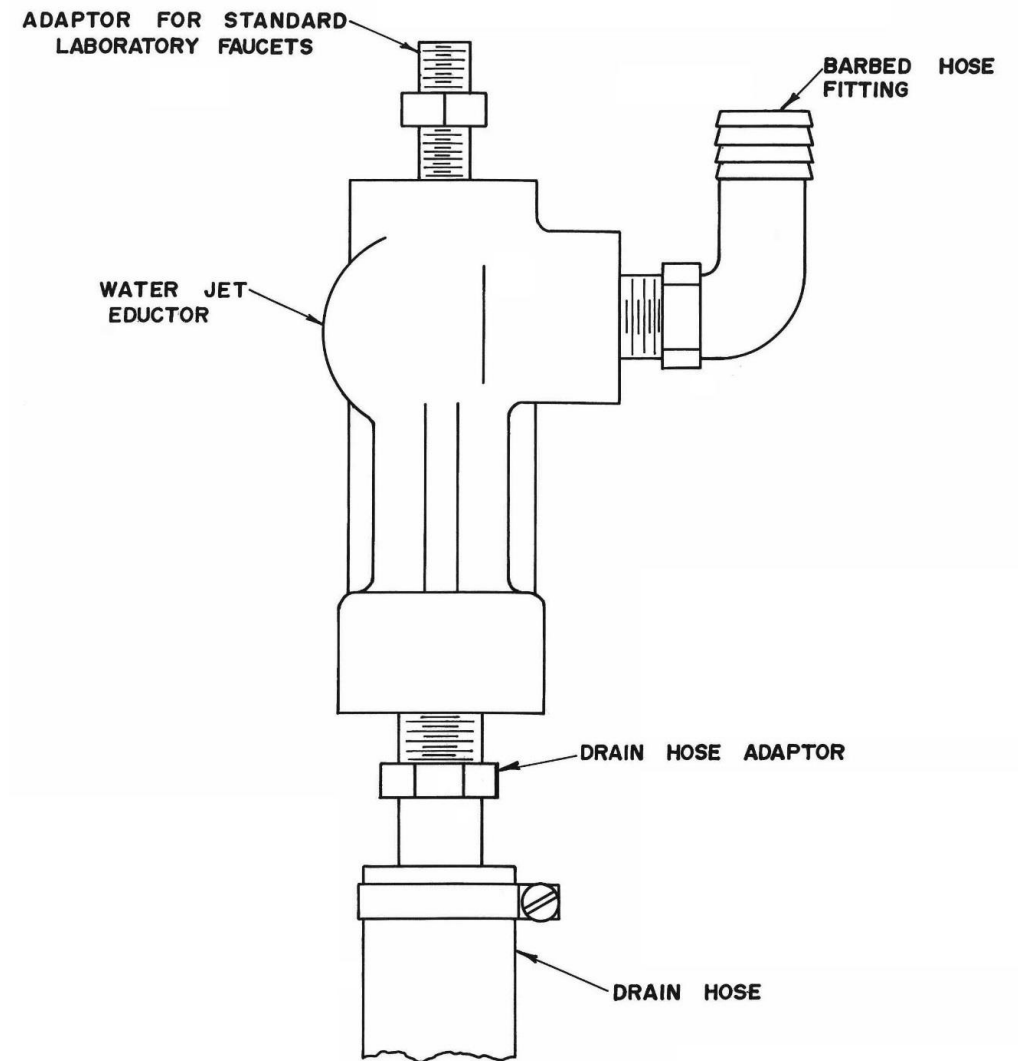
## Wiring Diagram – 25-Place Digestor



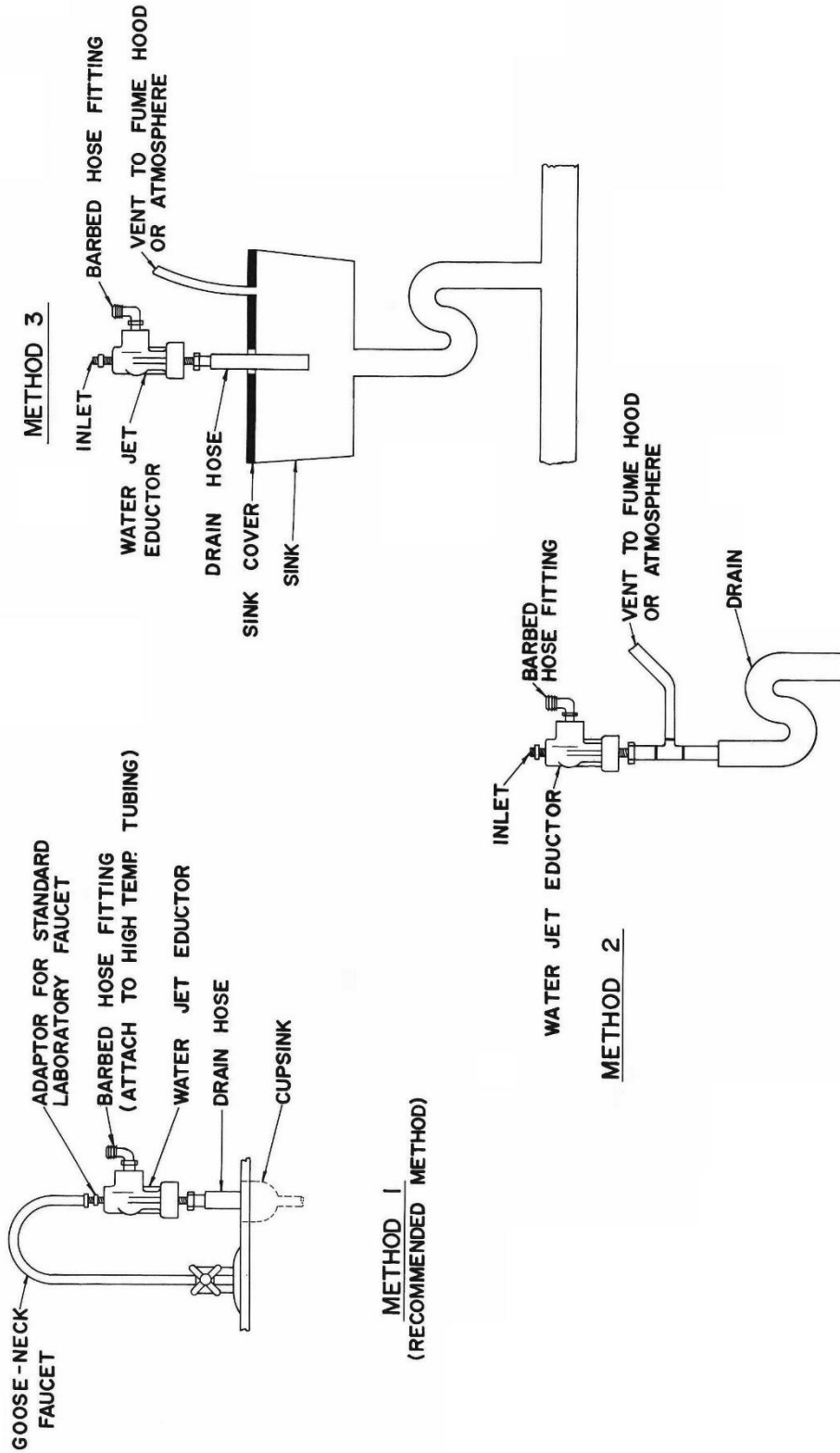
## Wiring Diagram – 4-Place Digestor



## Detailed Drawings

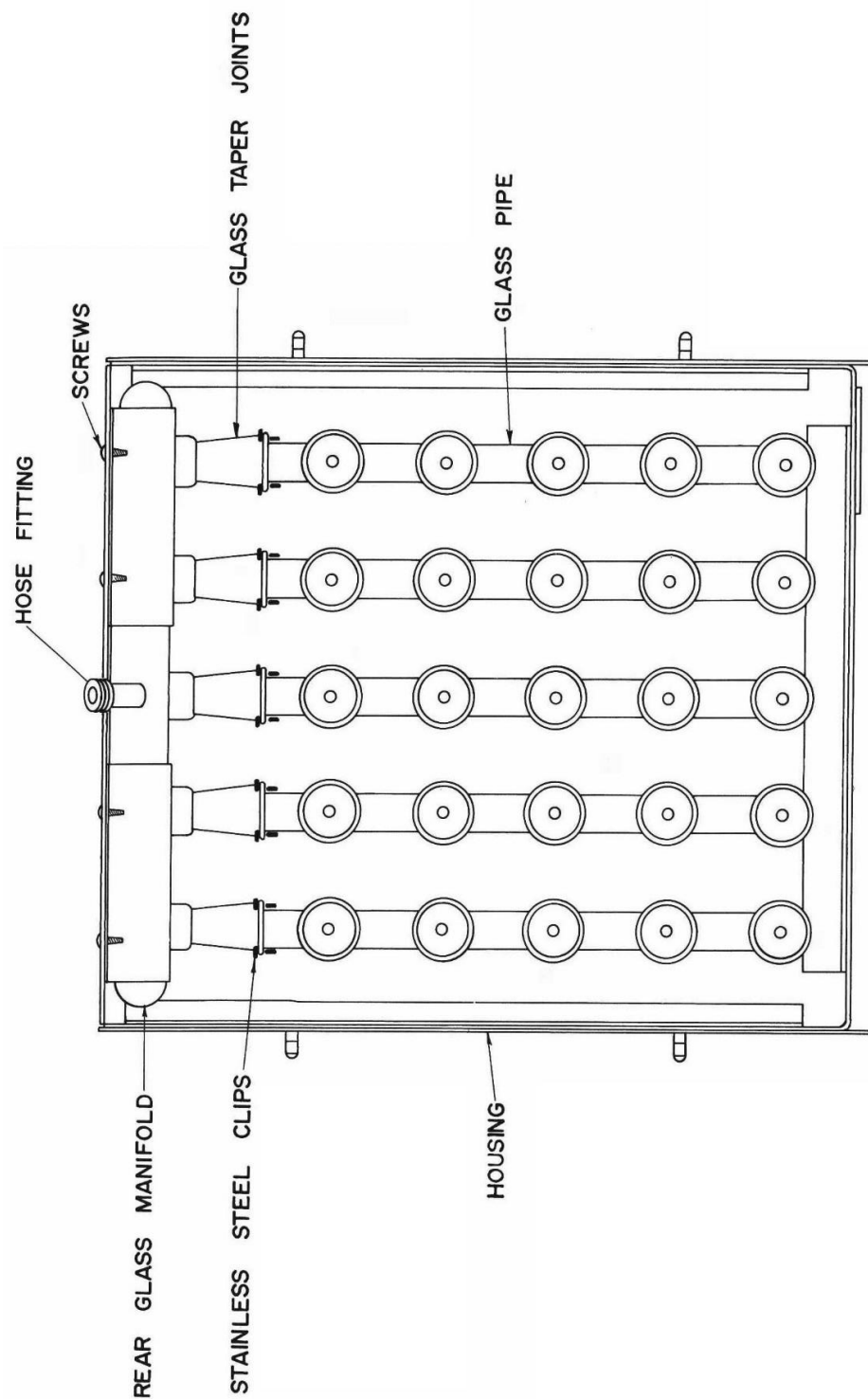


**Water Eductor Assembly**



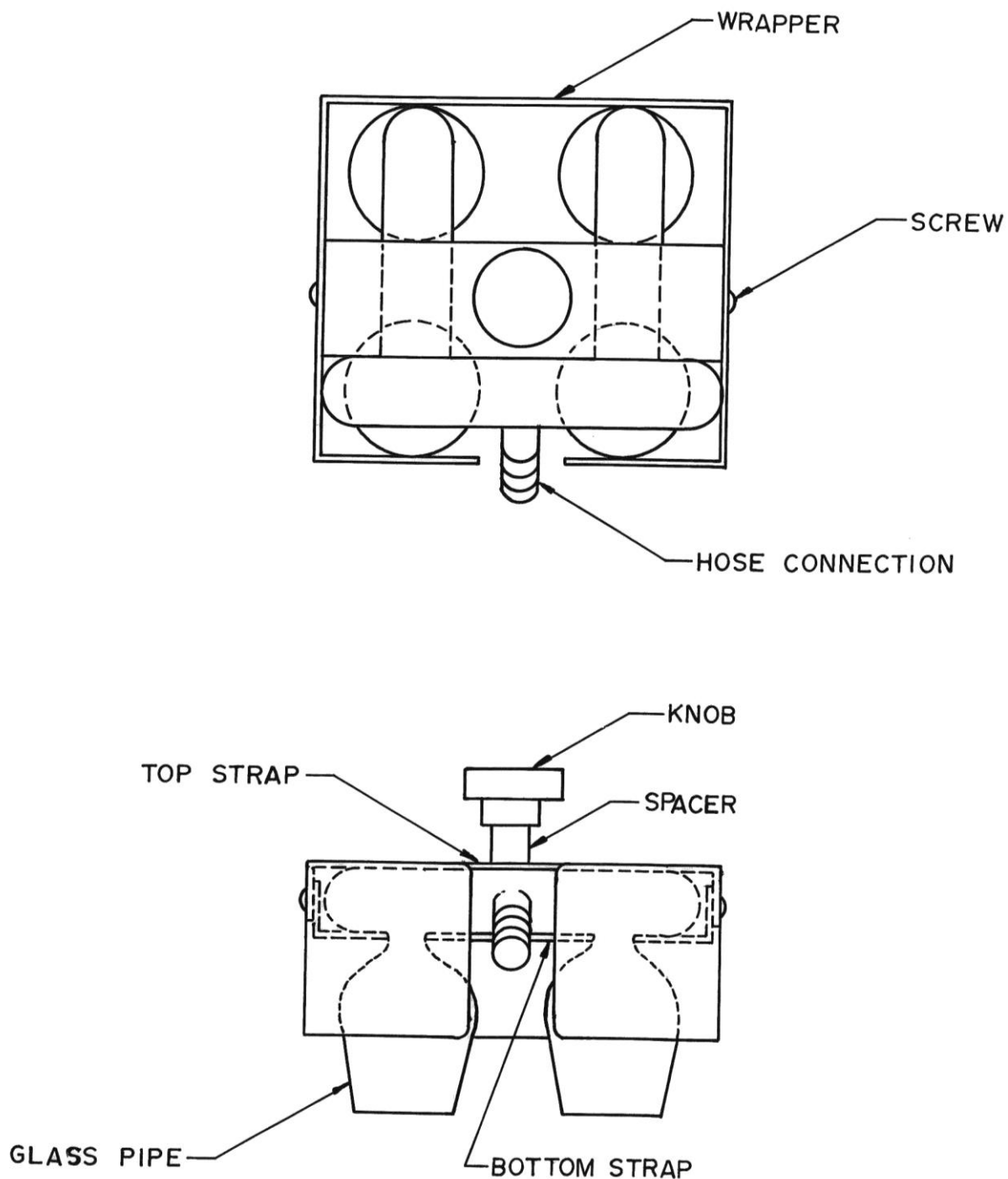
Water Eductor Installation Methods

## Optional Fume Removal System, 25-Place



**Model No. 2350025**  
**(For 25-Place Digestion Units)**

## Optional Fume Removal System, 4-Place



**Model No. 2354000**  
**(For 4-Place Digestion Units)**