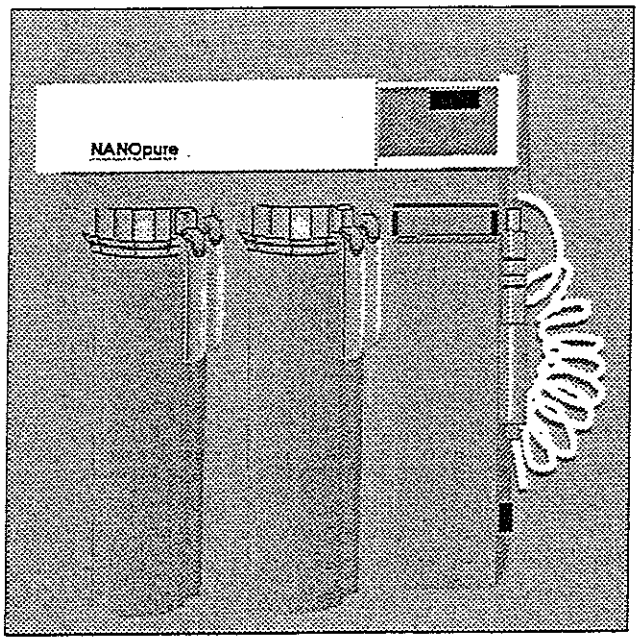
# Barnstead

Barnstead | Thermolyne Corporation

# *Type D4700*
# NANOpure Deionization System

## OPERATION MANUAL AND PARTS LIST
## *SERIES 687*




| *Bioresearch Grade Systems* | | | *Analytical Grade Systems* | | |
|---|---|---|---|---|---|
| **Model #** | **Voltage** | **Mount** | **Model #** | **Voltage** | **Mount** |
| D4751 | 120 | Wall | D4741 | 120 | Wall |
| D4752 | 240 | Wall | D4742 | 240 | Wall |
| D4753 | 100 | Wall | D4743 | 100 | Wall |
| D4754 | 120 | Bench | D4744 | 120 | Bench |
| D4755 | 240 | Bench | D4745 | 240 | Bench |
| D4756 | 100 | Bench | D4746 | 100 | Bench |

*LT687X1 • 6/18/92*

*Serial Number:* _____

**IMPORTANT INFORMATION**

This manual contains important operating and safety information. You must carefully read and understand the contents of this manual prior to the use of this equipment.

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# Safety Information

Your Barnstead NANOpure has been designed with function, reliability, and safety in mind. It is your responsibility to install it in conformance with local electrical codes. For safe operation, please pay attention to the alert boxes throughout the manual.

# Alert Boxes

**WARNING**
Warning alerts apply when there is a possibility of personal injury.

**CAUTION**
Caution alerts apply when there is a possibility of damage to the equipment.

**NOTE**
Notes alert you to pertinent facts and conditions.

# Warnings

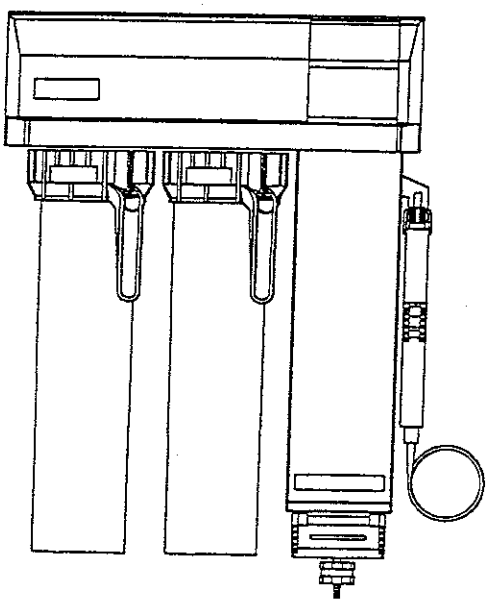
## WARNING

**To avoid electrical shock, always:**

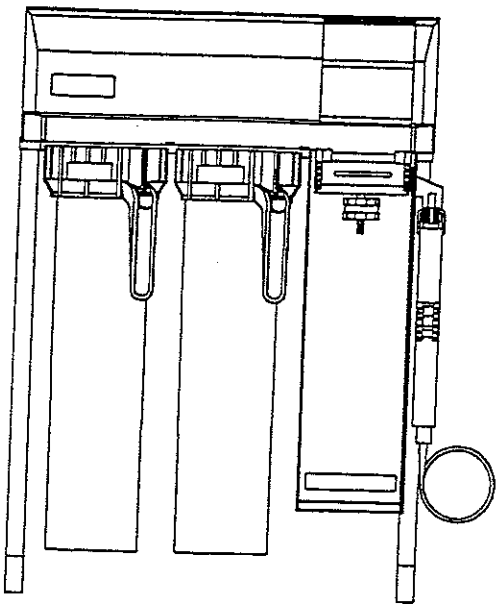
1. Use a properly grounded electrical outlet of correct voltage and current handling capacity.
2. Do not mount NANOpure directly over equipment that requires electrical service. Routine maintenance of this unit may involve water spillage and subsequent electrical shock hazard if improperly located.
3. Replace fuses with those of the same type and rating.
4. Disconnect from the power supply prior to maintenance and servicing.

**To avoid personal injury:**

1. Do not use in the presence of flammable or combustible materials; fire or explosion may result. This device contains components which may ignite such materials.
2. This device is to be used with water feeds only. Sanitizing/cleaning agents must be used in compliance with instructions in this manual. Failure to comply with the above could result in explosion and personal injury.
3. Do not mount NANOpure directly over equipment that requires electrical service. Routine maintenance of this unit may involve water spillage and subsequent electrical shock hazard if improperly located.
4. Replace fuses only with the same type and rating for continued protection against possible fire hazard.
5. Wall composition and construction, as well as fastener type, must be considered when mounting this unit. The mounting surface and fasteners selected must be capable of supporting a minimum of 275 lbs. inadequate support and/or fasteners may result in damage to mounting surface and/or equipment. If you are unsure of mounting surface composition, condition and construction, or correct fasteners, consult your building maintenance group or contractor.
6. A small amount of 1.0% hydrogen peroxide is used to preserve the ultrafilter during storage. When removing the ultrafilter from the bag, ensure adequate ventilation and wear protective gloves and glasses.
7. Avoid splashing disinfecting solutions on clothing or skin. Ensure all piping connections are tight to avoid chemical leakage. Always depressurize chemical lines before disassembly. Ensure adequate ventilation. Carefully follow manufacturer's safety instructions on labels of chemical containers and material safety data sheets.
8. Depressurize system prior to attempting to remove canisters.
9. Refer servicing to qualified personnel.



*Wall Mount NANOpure Bioresearch Model*



*Bench Mount NANOpure Bioresearch Model*

# Introduction

It is your responsibility to read and understand the contents of this manual prior to installation and use of this equipment.

This manual contains the information you will need to install, operate, and maintain the NANOpure, Series 687, ultrapure water system manufactured by Barnstead/Thermolyne Corporation.

The NANOpure is designed to produce Type I Reagent Grade Water equal to or exceeding standards established by ASTM, CAP, and NCCLS.

Careful attention to the following instructions will assure that the NANOpure runs properly and produces water to specification.

Illustrated parts lists are attached inside. Take a few minutes to familiarize yourself with the hardware before installation.

**WARNING**

This device is to be used with water feeds only. Sanitizing/cleaning agents must be used in compliance with instructions in this manual. Failure to comply with the above could result in explosion and personal injury.

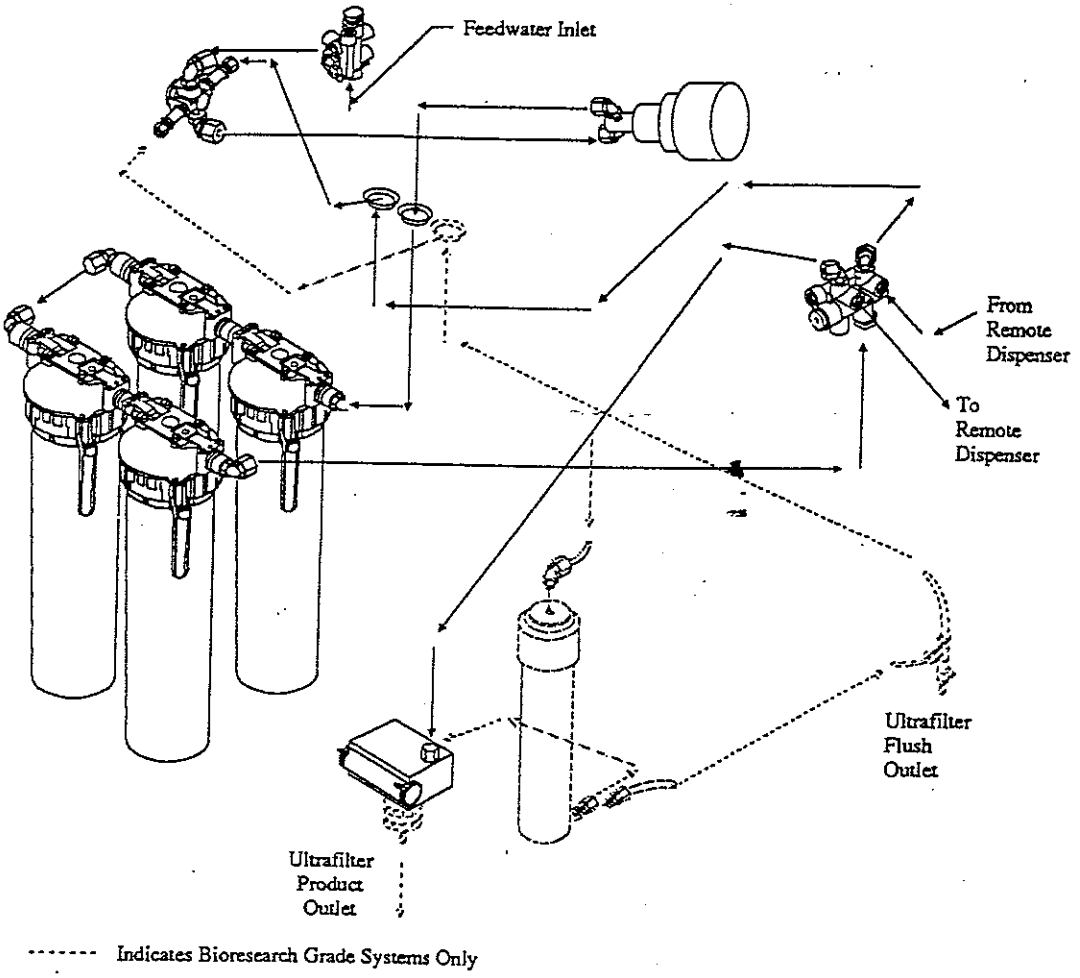



*Figure A NANOpure water pathway diagram.*
*Dotted items indicate Bioresearch Grade Systems only*

# Technical Specifications

**Feed Water Requirements**

| | | | |
|---|---|---|---|
| Types [1] | Tap (Potable), RO, DI, distilled. | | |
| Pressure Range | Gravity feed to 7 kg/cm$^2$ (100 psig) maximum. | | |
| Temperature Range | 4-49°C (40-120°F) | | |

**Product Water**

| | | | |
|---|---|---|---|
| Water Quality [1] | Type I Reagent Grade Water (RGW) per ASTM-D1193, NCCLS ASC-3, and CAP. Also general purpose deionized water (unfiltered). | | |
| Flow rate (Maximum) [2] | Pressure feed (40 psig inlet min) | 60 Hz | 2.0 lpm |
| | | 50 Hz | 2.0 lpm |
| Type I RGW | Gravity feed (12" $H_2O$) | 60 Hz | 1.5 lpm |
| | | 50 Hz | 1.3 lpm |
| General Purpose DI[3] (unfiltered) | Pressure feed | 60 Hz | 2.3 lpm |
| | | 50 Hz | 2.0 lpm |
| Ultrafiltered Type I RGW | Pressure feed | 60 Hz | 0.5 lpm |
| | | 50 Hz | 0.5 lpm |

**Dimensions**

| | | |
|---|---|---|
| *Wall mounted models* | | |
| Width | 22" | (559 mm) |
| Depth | 14 1/4" | (362 mm) |
| Height | 29 1/2" | (749 mm) |
| *Bench mounted models* | | |
| Width | 22" | (559 mm) |
| Depth | 16 1/4" | (413 mm) |
| Height | 32 1/2" | (826 mm) |

**Plumbing Connections**

| | |
|---|---|
| *Feed water Inlet* | 3/8" OD tubing or 1/4" NPTF |
| *Product Water Outlet* | |
| For Type I water | Remote Dispenser |
| For Ultrafiltered Type I water (Bioresearch models) | 1/4" NPTF or 1/4" hose-barb |

**Electrical Requirements (depending on model supplied)**

| | |
|---|---|
| *Voltage and Frequency (Nominal)* | |
| 100 VAC, 50/60 Hz | 85-110 VAC, 47-63 Hz, 1 phase |
| 115 VAC, 50/60 Hz | 98-127 VAC, 47-63 Hz, 1 phase |
| 230 VAC, 50/60 Hz | 196-253 VAC, 47-63 Hz, 1 phase |
| *Protection* | |
| 100 VAC service | 3 ampere slow blow fuse |
| 115 VAC service | 3 ampere slow blow fuse |
| 230 VAC service | 2 ampere slow blow fuse |
| *Resistivity Measurement* | |
| Range | 0.1-18.3 megohm-cm [temperature compensated to 25°C (77°F)] |
| Accuracy | ± 3 % FS |
| Cell | 0.1 constant |

[1] NANOpure will produce Type I water using pretreated water (RO, DI, Distilled) or high quality tap water, provided feedwater suitability is qualified by laboratory analysis and recommended feed flowrate is maintained.

[2] Flowrates are dependent on operating conditions and filter usage. Flowrates will also depend on filter compaction.

[3] Typical flowrate with 40 psig inlet and 30 psig outlet pressure at faucet block.

# Installation

The NANOpure deionization system can be used on pretreated or high quality tap water. Some municipal tap water supplies contain a very high concentration of suspended particulates, colloids, dissolved organic and inorganic materials that should be removed by pretreatment before the water is processed by the NANOpure. If you plan to use tap water feed for your NANOpure, Barnstead encourages the use of our water analysis service to verify feedwater suitability. A sample collection kit may be obtained by contacting any of our offices, or your preferred laboratory supply dealer.

The NANOpure requires expendable pretreatment and deionization cartridges and Final Filters which are not supplied with the unit and must be purchased separately. These expendables are available as individual components or in expendables kits, as follows:

**Table 1 Expendable Kits**

**D4801 NANOpure 4-Cartridge Expendables Kit**

| | | |
|---|---|---|
| 1 each | D0835 | Pretreatment Cartridge |
| 1 each | D0803 | High Capacity Cartridge |
| 2 each | D5027 | Ultrapure SG Cartridge |
| 2 each | D3751 | Remote Dispenser Filter |

**D4802 NANOpure 4-Cartridge Expendables Kit with ORGANICfree**

| | | |
|---|---|---|
| 1 each | D0836 | Pretreatment MACROpure Cartridge |
| 1 each | D0803 | High Capacity Cartridge |
| 1 each | D5027 | Ultrapure SG Cartridge |
| 1 each | D5021 | ORGANICfree Cartridge |
| 2 each | D3751 | Remote Dispenser Filter |

**D5025 NANOpure Pretreat Feed 4-Cartridge Expendables Kit**

| | | |
|---|---|---|
| 1 each | D0835 | Pretreatment Cartridge |
| 3 each | D5027 | Ultrapure SG Cartridge |
| 2 each | D3751 | Remote Dispenser Filter |

**D5026 NANOpure Pretreat Feed 4-Cartridge Expendables Kit with ORGANICfree**

| | | |
|---|---|---|
| 1 each | D0836 | Pretreatment MACROpure Cartridge |
| 2 each | D5027 | Ultrapure SG Cartridge |
| 1 each | D5021 | ORGANICfree Cartridge |
| 2 each | D3751 | Remote Dispenser Filter |

Your NANOpure is supplied with a pre-wired jumper in the "pump interlock" connector. Installation of options D0603, D0606 (Float Switch) or D2706 (Pressure Switch) require removal of this jumper plug. DO NOT discard this plug; it will be needed for certain maintenance operations.

All models are provided with a power cord and plug to be connected to a standard grounded electrical outlet. Refer to TECHNICAL SPECIFICATIONS and Figures M, N & O in this instruction manual for the electrical requirements.

**WARNING**

To avoid electrical shock, use with a properly grounded electrical outlet of correct voltage and current handling capacity.

## Unpacking

Unpack NANOpure carefully. Remove all contents carefully. Inspect packaging for additional materials before discarding. Lift NANOpure carefully from box, holding onto either the mounting bracket or bench stand. Do not allow NANOpure to stand on canisters; lay unit down on back.

**CAUTION**

Lifting NANOpure by cartridge canisters may cause damage.

## Choosing a Site

NANOpure system features remote controls and dispenser allowing system to be mounted almost anywhere within the laboratory. Use mounting bracket for wall mounted systems as template to drill mounting holes. (NANOpure does not include screws and fasteners for mounting.) Allow a minimum of 6 inches (15 cm) clearance either side of unit for servicing and 16 inches (40 cm) in front for top cover removal.

> **WARNING**
> Do not mount NANOpure directly over equipment that requires electrical service. Routine maintenance of this unit may involve water spillage and subsequent electrical shock hazard if improperly located.

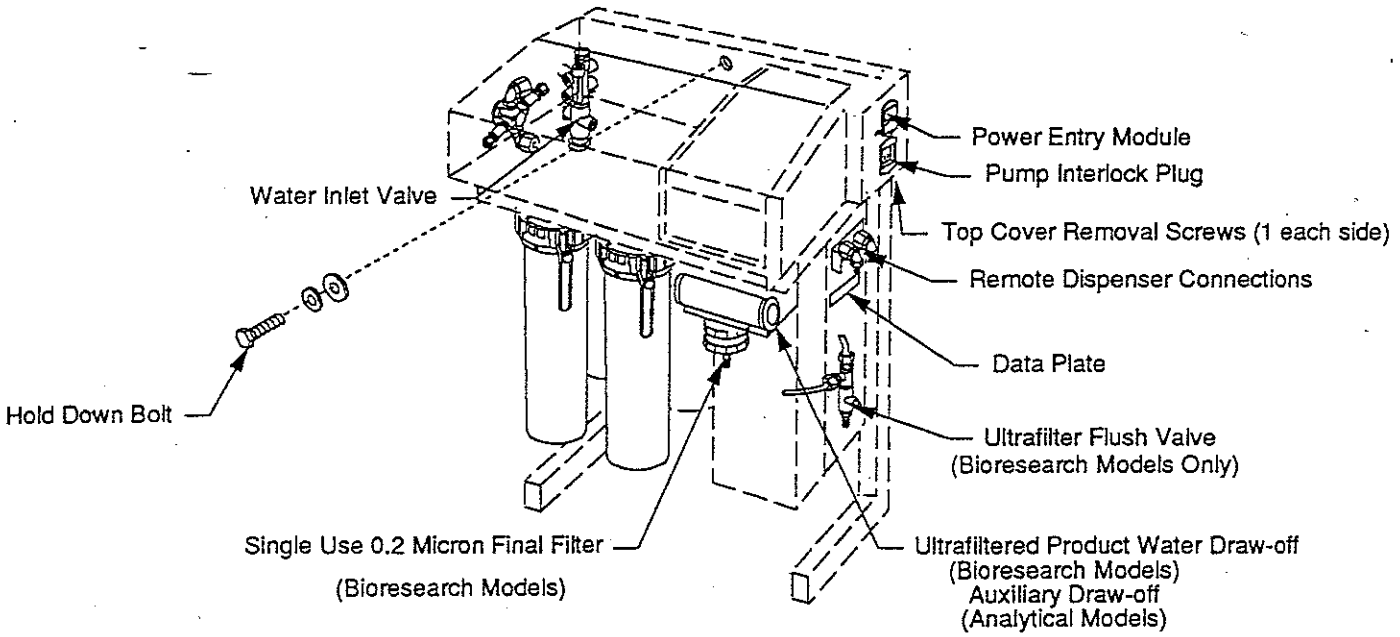



*Figure B NANOpure Inlet and Outlets*

## Mounting and Utility Connections

> **CAUTION**
> Do not connect to electrical service until instructed to do so.

1. Remove the two screws securing the top cover to the NANOpure as well as the pump interlock plug (see Figure B) and slide the top cover off away from the NANOpure. Familiarize yourself with various components and install any optional equipment, i.e. inlet cell, pressure and/or float switch. See appropriate section for instructions.

## NOTE

For bench mounted models, steps 2 thru 6 are not required — begin with step 7.

2. Remove the hold down bolt securing the NANOpure to the wall bracket. It is located on the center of the back wall inside the NANOpure cabinet. (See Figure B.)
3. Disengage the NANOpure from the wall bracket.
4. Remove the packing material from the wall bracket.
5. Use the wall bracket as a template and locate and drill the mounting holes in mounting surface. A minimum of four fasteners will be required — two on the top and two on the bottom.

## WARNING

Wall composition, condition and construction, as well as fastener type, must be considered when mounting this unit. The mounting surface and fasteners selected must be capable of supporting a minimum of 275 lbs. Inadequate support and/or fasteners may result in damage to mounting surface and/or equipment. If you are unsure of mounting surface composition, condition and construction or correct fasteners, consult your building maintenance group or contractor.

6. Hang NANOpure unit on the bracket by sliding mounting pins into bracket grooves. Reinstall the hold down screw.
7. If you are installing an Analytical Grade unit skip to step 8. If you are installing a Bioresearch grade unit, complete steps 7a-7g before proceeding to step 8. Figure C will aid you in locating the proper connections.

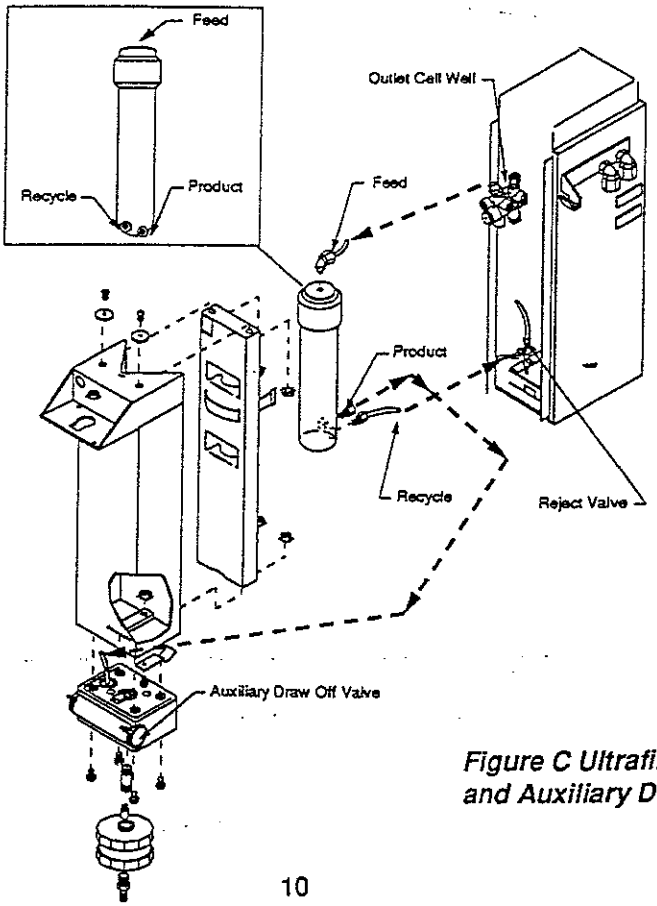



*Figure C Ultrafilter Installation and Auxiliary Draw Off Mounting*

a. Remove the ultrafilter housing by pushing up on the clip located at the bottom of the housing and pulling the housing straight forward.
b. Locate and remove ultrafilter from box and protective bag.

> **WARNING**
> A small amount of 1.0% hydrogen peroxide is used to preserve the filter during storage. When removing the ultrafilter from the bag, ensure adequate ventilation and wear protective gloves and glasses.

c. The ultrafilter comes complete with fittings installed. The product, recycle and feed connections are shown in Figure C above. Install the ultrafilter into the cradle located on the inside of the housing removed in step 7a. Ensure the orientation is correct. The single feed connection is on top with the recycle and product connections on the bottom facing the installer.
d. Secure into cradle by tightening strap around the ultrafilter.
e. Remove nut from ultrafilter connections and discard. (see Figure D, page 12 for part identification.) Also remove the connectors from the three tubes that will be attached to the ultrafilter. Ensure that the nut, grab ring, back up ring and O-ring remain attached to the tubing.
f. Secure proper tubing to connections on the ultrafilter. The feed tubing is connected on the outlet cell well (see Figure C, page 10). Attach the loose end of this tubing to the top connector on the ultrafilter. The recycle and product connections are located on the bottom of the ultrafilter. The recycle connection is the upper and outside most of these two fittings. Attach the free end of the tubing attached to the reject valve (see Figure C) to the recycle connection on the ultrafilter. Attach the product tubing connected to the auxiliary outlet valve (see Figure C) to the lower and more center of the two bottom connections on the ultrafilter.

> **CAUTION**
> Do not tighten tube fitting hex nut with a wrench. Tight connections can be easily made by hand.

g. Reattach ultrafilter housing complete with ultrafilter and attached tubing to NANOpure cabinet..
8. Install front cover by sliding forward. Ensure pins on cover align with holes on forward cabinet section. Install cover lock screws and interlock plug removed in step 1. (see Figure B).
9. Remove Remote Dispenser from packaging.
10. Remove tubing connector from ends of Remote Dispenser tubing. Retain for use as replacement parts. See Figure D for identification of the connector components.
11. Remove tubing nut, grab ring, backup ring and o-ring from Remote Dispenser connection on NANOpure. Save as replacement parts.
12. Connect Remote Dispenser tubing to NANOpure at elbow connections on NANOpure (See Figure B).

> **NOTE**
> The **Tubing Connector Installation** section on page 12 will aid you in completing the next two steps.

13. Connect 3/8" OD tubing (supplied with unit) to water service.
14. Connect 3/8" OD tubing to NANOpure water inlet valve (See Figure B).
15. Remove the four canisters by depressing the thumb lever and rotating 1/4 turn to left. (See Figure E)

## Tubing Connector Installation

**CAUTION**
Do not tighten tube fitting hex nut with a wrench. Tight connections can be easily made by hand.

1. Completely disassemble the fitting. Refer to Figure D to familiarize yourself with the names of the component parts.
2. Make sure the tubing is cut off reasonably square and that no plastic burrs or ridges are present.
3. Place the grab ring and back-up ring in the hex nut in the order and orientation shown in Figure D, Thread the nut onto the connector. *Do not* use the O-ring at this time.
4. Push the tubing through the nut until it bottoms out in the connector.
5. Remove the adapter nut and tubing. Place the O-ring over the tubing. Be careful not to push the back-up ring or grab ring further back on the tubing when installing the O-ring.
6. Install the hex nut on the connector and hand tighten.

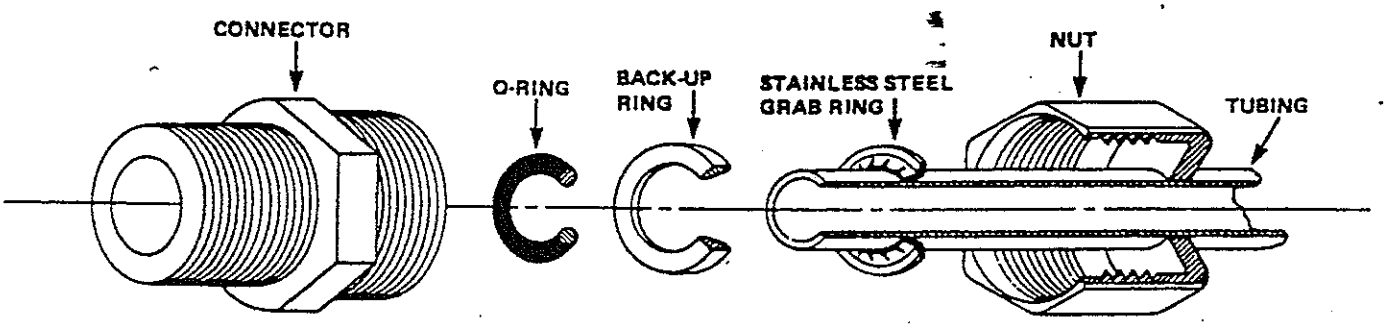



*Figure D Typical polypropylene tubing connector installation*

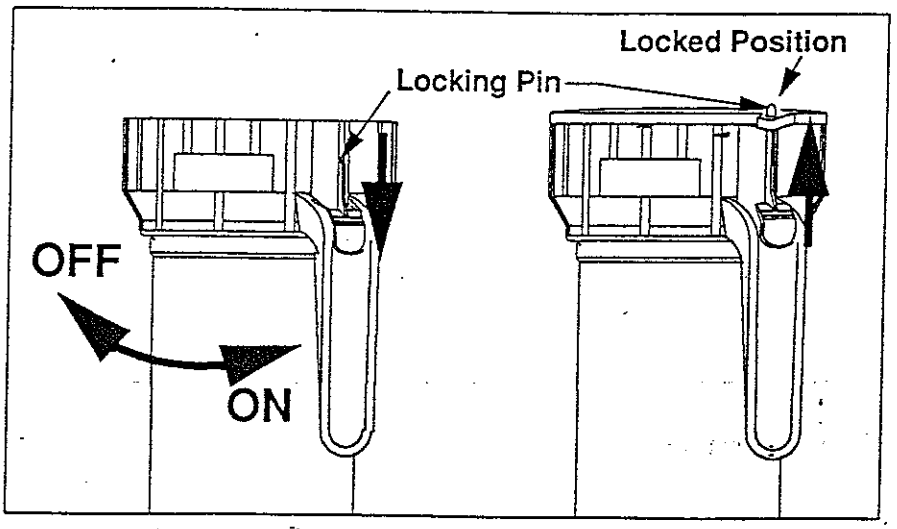



*Figure E Canister locking pin positioning*

# Initial Operation

## Analytical Grade Systems

***Install and rinse cartridges and filters as follows:***

1. Install a D0835 or D0836 pretreatment cartridge, with the small opening up, into canister position one (see Figure G). Replace canister two, three and four.

   Locking pin on canister ring must be fully engaged into hole on head before system is operated (see Figure E for proper positioning).

**CAUTION**
Secure locking pin before operating. Pin must be fully engaged before operating.

**CAUTION**
Ensure O-ring is in place in the groove and wet O-ring prior to securing on the head.

**NOTE**
An extra set of head-to-canister O-rings are supplied. These can be used to replace any O-rings that may have been damaged or deformed in shipment.

Be sure O-ring is in place before replacing canister.

Do not tighten canister beyond point where locking pin and pin hole line up.

2. Connect electrical service by installing electrical cord to power entry module on the right hand portion of the NANOpure. (See Figure L)
3. Open inlet valve and turn on power to unit and open the Remote Dispenser valve. (Ensure that the system flush housing is in Remote Dispenser prior to rinsing.) Allow to run to drain for 10 minutes through the Remote Dispenser.

**CAUTION**
Do not operate the pump dry — dry running will damage the pump.

**NOTE**
Leave system flush housing in Remote Dispenser until instructed to do otherwise.

4. Turn off system power and close inlet valve.

**WARNING**
Depressurize system prior to attempting to remove canisters.

5. Remove the canisters in positions two, three, and four and pour out water.
6. Install remaining cartridges as shown in Figure G and Table 3.
7. Open inlet valve, turn on power to unit and run system to drain through Remote Dispenser for five

minutes.

8. Turn off system power and close inlet valve. Allow system to depressurize.
9. Remove system flush housing from dispenser by gently pushing housing in direction of groove in dispenser (see Figure F). Ensure that the O-rings remain in place.
10. Install D3751, 0.2 micron Final Filter in Remote Dispenser by sliding filter into grooves on side of dispenser (see Figure F).

**NOTE**
Always wet O-rings before 0.2 Micron Final Filter installation.

11. Open the inlet valve and turn power on. Allow approximately 8 liters of water to run to drain through the Remote Dispenser to rinse the D3751, 0.2 micron filter.
12. Close Remote Dispenser and allow system to recirculate until desired purity is achieved. The NANOpure system is now ready for use.

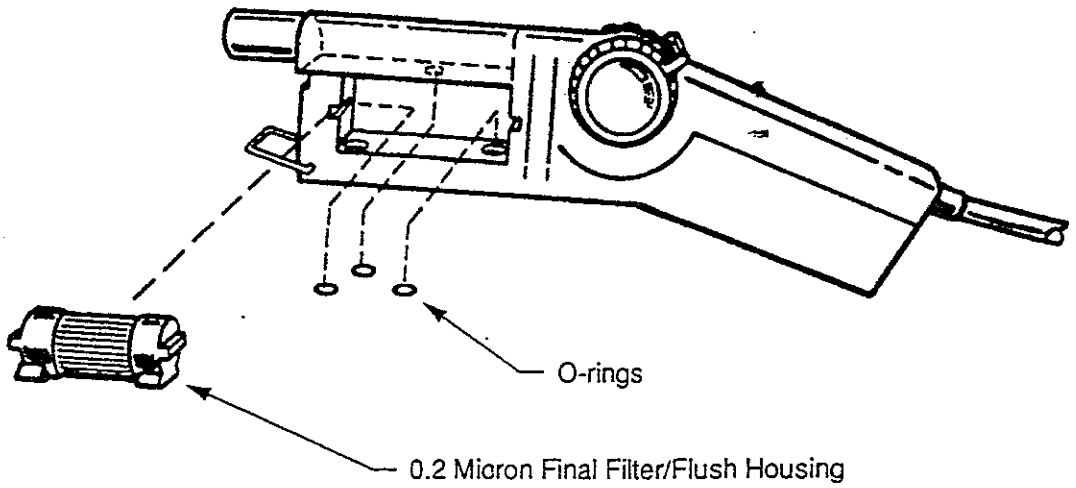



*Figure F Remote Dispenser Final Filter Installation*

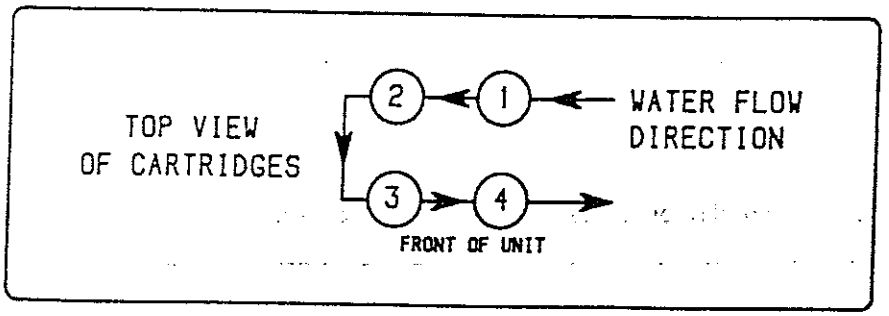



*Figure G Cartridge sequence*

## Table 2 Correct Cartridge Sequence

*Cartridge Kit with ORGANICfree*

| Position | Type | Catalog no. |
|---|---|---|
| 1 | MACROpure | D0836 |
| 2 | High capacity | D0803 |
| 3 | Ultrapure SG | D5027 |
| 4. | ORGANICfree | D5021 |

*Standard Cartridge Kit*

| Position | Type | Catalog no. |
|---|---|---|
| 1 | Pretreatment | D0835 |
| 2 | High capacity | D0803 |
| 3 | Ultrapure SG | D5027 |
| 4. | Ultrapure SG | D5027 |

*Pretreated Feed Cartridge Kit with ORGANICfree*

| Position | Type | Catalog no. |
|---|---|---|
| 1 | MACROpure | D0836 |
| 2 | Ultrapure SG | D5027 |
| 3 | Ultrapure SG | D5027 |
| 4. | ORGANICfree | D5021 |

*Pretreated Feed Standard Cartridge Kit*

| Position | Type | Catalog no. |
|---|---|---|
| 1 | Pretreatment | D0835 |
| 2 | Ultrapure SG | D5027 |
| 3 | Ultrapure SG | D5027 |
| 4. | Ultrapure SG | D5027 |

**NOTE**
The correct sequence of cartridges is important in producing the desired quality of water.

## Bioresearch Grade Systems Initial Operation

For Bioresearch Grade Systems, follow steps one through seven only of INITIAL OPERATION — ANALYTICAL GRADE SYSTEMS (page 13) and then do the following:

1. Connect tubing to hose nipple on ultrafilter flush valve and run to drain (Figure B). Close Remote Dispenser valve.
2. Open ultrafilter flush valve (Figure B) and allow reject water to run to drain for five minutes.
3. Open ultrafilter flush valve and ultrafilter product water draw-off valve (Figure B) and allow product and reject to run to drain for ten minutes.
4. Close ultrafilter product water draw-off and allow reject water to run to drain for five minutes.
5. Open ultrafilter product water draw-off, close ultrafilter flush valve and allow product to run to drain for twenty minutes.
6. Turn system power off and close inlet valve. Open Remote Dispenser to depressurize system.
7. Install a new 0.2 micron disc filter (part no. D0724) in ultrafilter Final Filter housing for each use.
8. Remove system flush housing from Remote Dispenser and save for future use.
9. Install a D3751, 0.2 micron Final Filter into Remote Dispenser by sliding filter into grooves on side of dispenser.
10. Open the inlet valve and turn power on. Allow approximately 8 liters of water to run to drain through the Remote Dispenser to rinse the D3751, 0.2 micron Final Filter.
11. Close Remote Dispenser and allow system to recirculate until desired purity is achieved. The NANOpure system is now ready for use.

**NOTE**
Always wet O-rings before 0.2 Micron Final Filter installation.

**CAUTION**
Improper rinsing of ultrafilter may result in cartridge damage.

# Normal Operation

For best results and optimization of cartridge life, it is recommended that the NANOpure be left in the standby mode during periods of non-use. The standby mode is designed to automatically recirculate water through the entire NANOpure system (even Remote Dispenser and ultrafilter) for 10 minutes of each hour of inactivity. Standby mode is accessed by pushing "On/Standby/Off" membrane switch on controls until display reads "SbY." Ensure adequate water supply is available to NANOpure when the unit is in standby.

NANOpure normal operation is with the electronics set in the resistivity mode. The meter automatically compensates readings to 25°C. If the resistivity falls below the programmed set point (see SELECTING THE SET POINT, page 16), the display will flash numerals.

When the NANOpure display reads "Err," it is an indication that there is air in the system or a problem in the resistivity monitoring system. Please refer to the troubleshooting section at the back of this manual for problem identification and solution.

# Smart Purity Meter

## Modes of Operation

The NANOpure has three membrane switches which control its functions.

- ***Mode*** Allows you to choose from resistivity, set point, or temperature.
- ***Control*** Allows you to change set point values, check resistivity cell calibration, or monitor optional inlet cell.
- ***On/Standby/Off*** Allows you to turn unit on, off or operate unit in standby mode.

## Turning Unit On or Off

- To turn unit on, press the "On/Standby/Off"membrane switch once. The display will light.
- To turn unit off, press "On/Standby/Off"membrane switch until the display becomes blank.

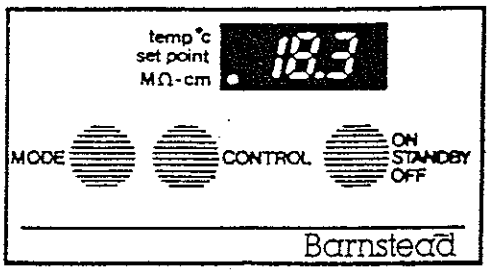



*Figure H Display indicators*

## Selecting the Set Point

The NANOpure electronics include a user programmable set point which alerts you when water quality falls below the programmed set point. The set point is user selectable from 0.1 megohm-cm to 18.3 megohm-cm. The display will flash numerals when actual resistivity measurement is at or below programmed set point.

1. Push the "Mode" membrane switch until orange light (Figure H) is lit alongside the set point indicator. Preset set point in electronics will appear on display.
2. To change set point, press and hold the "Control" membrane switch and then press the "Mode" membrane switch. The set point display will automatically begin to scroll backward. To reverse the scrolling, release the "Control" membrane switch until desired set point is attained.

3. When desired set point is reached, release the "Mode" switch. NANOpure electronics will automatically retain set point until you re-enter set point mode and repeat procedure.

## Displaying the Temperature

To display water temperature, simply push the "Mode" switch until orange light on left hand side of display is aligned with the "Temp °C" indicator. The display will now read water temperature in degrees centigrade.

## Checking the Calibration

The NANOpure system is equipped with a manual electronics calibration check which allows you to verify meter accuracy.

1. Ensure that reference/inlet cell toggle switch inside top housing (Figure I, page 18) is in the reference position.
2. Ensure display is in the resistivity mode.
3. Depress and hold control switch on electronics panel until a reading is given.
4. To verify temperature accuracy, ensure display is in the temperature mode and depress and hold control switch.

If electronics are within calibration, the reading will be between 9.7 and 10.3 megohm-cm for resistivity, and between 24.3 and 25.7 for temperature. If the reading is not between these values, the electronics will need to be recalibrated — call Barnstead|Thermolyne Customer Service.

## Inlet Cell Installation

The NANOpure system offers as an optional feature the ability to monitor the resistivity at the NANOpure inlet water. To install the inlet cell:

1. Close inlet valve and disconnect electrical service to unit. Open Remote Dispenser to depressurize unit.
2. Remove top cover.
3. Install cell (part no. E550X1A) into NANOpure inlet well (Figure I) by removing plug from top of inlet cell well.

**NOTE**

E550X1A includes 1/2" NPS threaded bushing and an o-ring.

4. Thread all lead wires through NANOpure system as shown in Figure I.
5. Wire cell to inlet cell terminal (Figure I) according to wiring scheme shown in Table 3.
6. Ensure that the reference/inlet cell toggle switch is in the inlet cell position.
7. Turn inlet water ON and check for leaks.
8. Reinstall top cover and power cord.

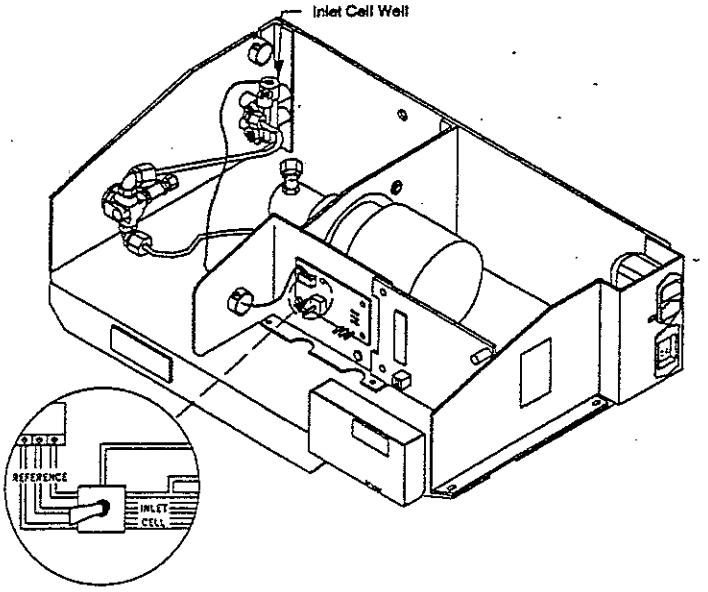



*Figure I Inlet Cell Installation*

## Table 3 Inlet Cell Wire Connections

| Cell lead | Connector block position |
|---|---|
| White | Position 1 |
| Red | Position 2 |
| Black | Position 3 |

## Inlet Cell Operation

To monitor inlet cell readings, select proper mode and depress and hold the "control" membrane switch. The reading shown on display will be for the inlet cell and will revert to primary cell when switch is released.

## Remote Display Mounting

The NANOpure includes as a standard feature the ability to remotely mount the electronic control display up to 10 feet away by means of an umbilical cord included with each unit.

1. Disconnect electrical service and remove power cord from NANOpure.
2. Remove top cover of unit by removing cover lock screws and pump interlock cable or jumper plug and pull cover straight out.
3. Locate the 10 ft. display interconnect cable. Remove the 6" cord from its connection points on the main circuit board and the display unit.
4. Remove display unit from mounting bracket by pulling display straight up until pins on back line up with mounting holes then pull straight forward.
5. Attach the 10 foot cord to the connector on the main circuit board and route interconnect cable through NANOpure as shown in Figure J (page 19).
6. A bracket is supplied to permanently mount display in a remote location. Attach bracket to desired location using user supplied screws. Attach cable to display and attach display to bracket by lining up mounting pins on display with bracket grooves.
7. A filler panel is supplied to fill the void left when display is removed. Prior to attaching filler panel, remove mounting bracket forward by loosening and reattaching mounting screws.

8. Remove screws from filler panel and reassemble through slots on mounting bracket.

**CAUTION**
Do not mount display where water may spill or drip on electronics.

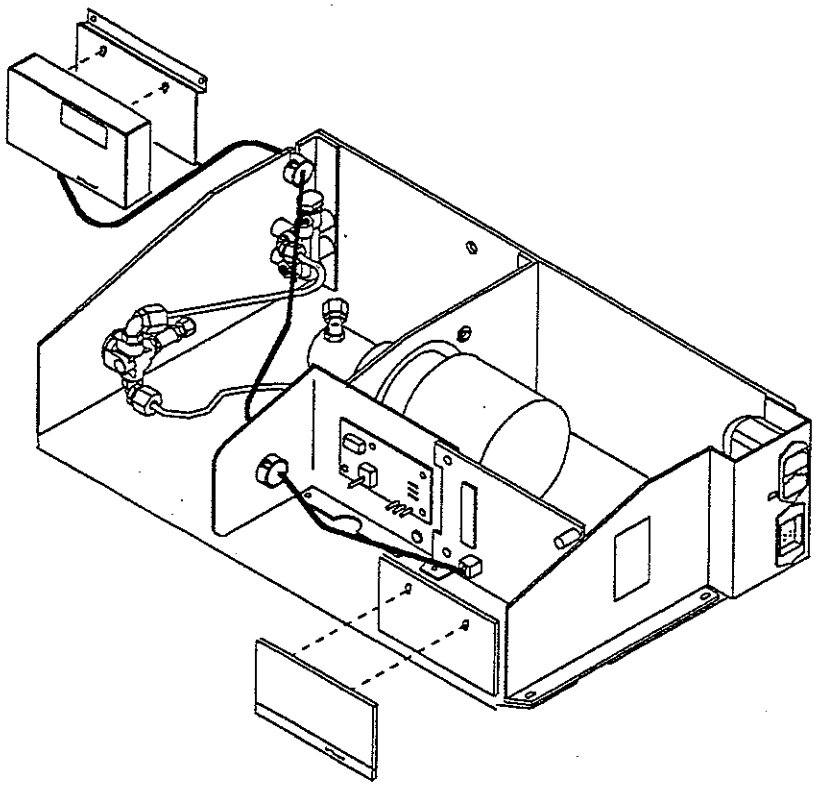


*Figure J Remote Display Mounting*

# Remote Dispenser

## Initial Operation

Each NANOpure system includes a Remote Dispenser unit. The Remote Dispenser is shipped with a system flush housing included. This housing is to be used during cartridge rinsing procedures. The dispenser incorporates an "easy to use" thumb wheel dispensing mechanism which is designed to deliver a steady stream when the thumb wheel is completely forward; drop by drop when it is slightly forward of the center; and spray when it is back. When the thumb wheel is in the center, water will be in recirculation (no water out of dispenser).

**NOTE**
Do not discard system flush housing after initial cartridge rinsing. Keep for future cartridge changes.

## Installing the 0.2 Micron Final Filter

1. Turn system power off, close inlet valve and open Remote Dispenser to depressurize system.
2. Remove system flush housing by pushing housing towards open grooves on dispenser (see Figure F, page 14).

3. Wet O-rings to allow 0.2 micron Final Filter to slide easily into place.
4. Install 0.2 micron Final Filter into dispenser by inserting into grooves as shown in Figure F.
5. Rinse 6 to 10 liters of D.I. water to drain through filter.
6. Periodically replace remote filter as noted on page 22.

**NOTE**
To prevent leakage at filter connection, do not allow O-rings to become deformed during installation. If O-rings are damaged, replace.

### Single Use 0.2 Micron Disc Filter Replacement (Bioresearch Grade NANOpure only)

1. Remove the bottom half of the disc holder.
2. Using a pair of tweezers, install a 47mm disc filter into the filter housing.

**NOTE**
The filter is placed on top of the black support screen and the O-ring on top of the filter.

The filter is the white disc; the blue and yellow discs are separating material and can be discarded.

3. Reinstall the bottom half of the disc holder (including filter and O-ring) on the top half of the holder.
4. An initial flush of the filter disc using 2-3 liters of product is advised. Carefully open the vent on the top of the holder (1/4 turn counter-clockwise) to remove any trapped air. Do not totally remove the vent.

**NOTE**
It is recommended that the filter disc be changed daily to prevent the build-up of bacteria.

# Auxiliary Draw-Off Mounting

The NANOpure systems are shipped with the auxiliary draw-off in one of two positions. For bench mounted models, the draw-off is immediately below the cover on the ultrafilter housing. For wall mounted models, the draw-off is located on the bottom of the ultrafilter housing (Figure C).

To move the draw-off from one location to the other, do the following:-

1. Turn inlet valve off and disconnect power to system. Open Remote Dispenser to depressurize system.
2. Remove top cover.
3. Remove the ultrafilter housing cover by releasing the clamp at the bottom of the housing and pulling the housing straight forward.
4. Disconnect 1/4" OD tubing from the outlet cell well (Analytical models) or from the bottom of the ultrafilter (see Figure A).
5. Remove screws securing valve body (see Figure C, page 10).
6. Remount in desired position using mounting screws.
7. Route 1/4" OD tubing through holes provided in the ultrafilter housing and reconnect to the ultrafilter (bioresearch models) or the outlet cell well.

# Installing Float or Pressure Switch

Accessories D0603, D0606 (float switches) and D2706 (pressure switch) are designed to protect the NANOpure pump by alerting the NANOpure of an inadequate feedwater condition so pump can be shut down. Use the following instructions for installation.

1. Disconnect electrical power.
2. If using D0603 or D0606 float switch, follow installation instructions included with unit for installation to tank.
3. If using D2706 low pressure switch, install a 1/4" NPT PVC tee (supplied with D2706) in incoming water line (see Figure K). Screw the switch into the top of the tee, then connect the inlet tubing to NANOpure with the remaining opening.
4. Route cable from float or low pressure switch either above or below NANOpure cover as shown in Figure K (page 21).
5. Remove jumper plug and save for future use.
6. Plug cable into jumper plug outlet.
7. Reconnect electrical cord.

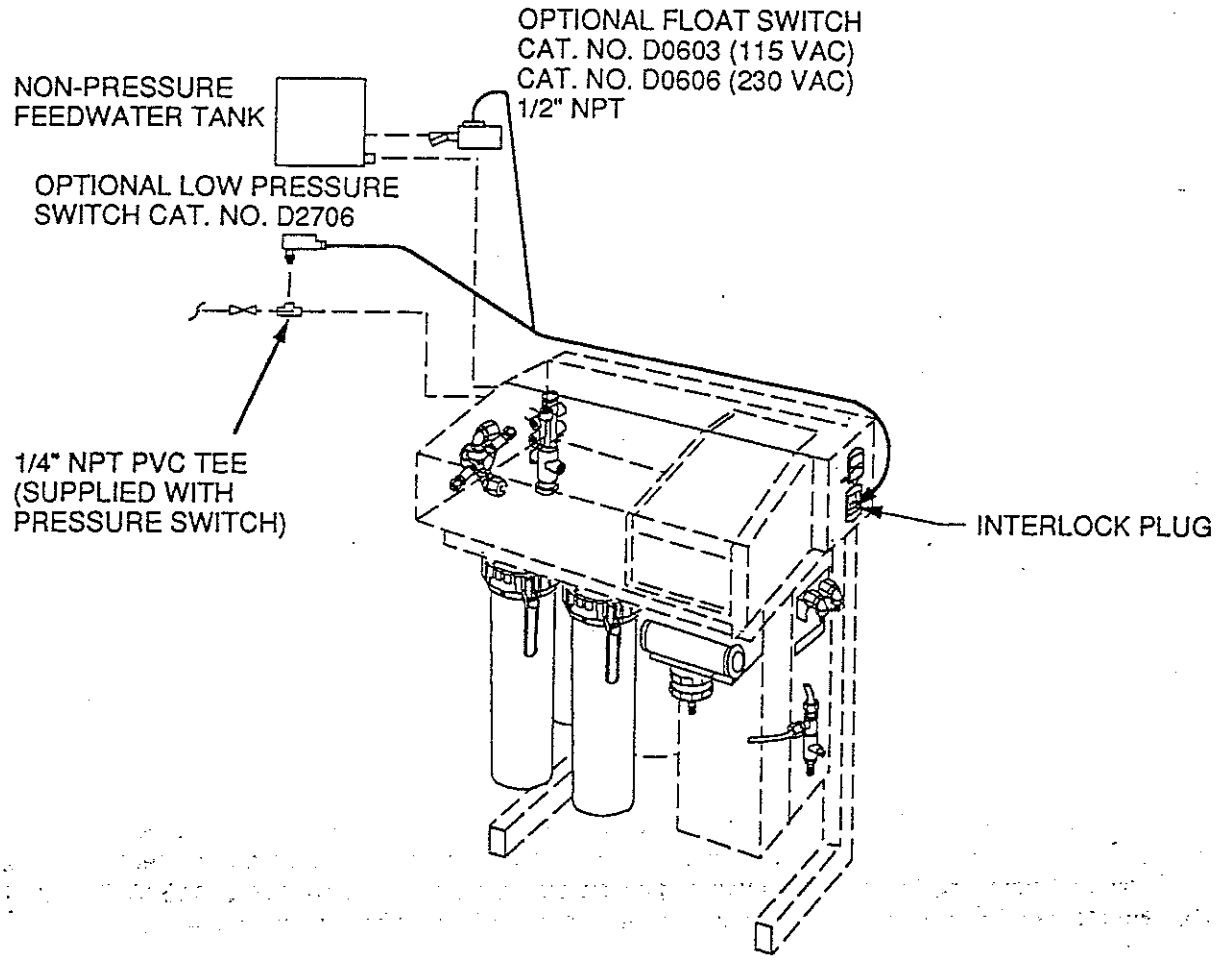



*Figure K Pump Protector/Pressure Switch Installation*

# Maintenance and Servicing

**WARNING**
To avoid electrical shock, always disconnect from power supply before maintenance and servicing. Refer servicing to qualified personnel.

## Replacing Cartridges

When the resistivity of the water drops below the desired level, change all of the cartridges together.

1. Disconnect power to the system.
2. Close the shut off valve on the inlet side of the system.
3. Open the Remote Dispenser valve to depressurize the system. Close the valve.
4. Place a container under the cartridge canister to collect any spillage.

**WARNING**
Depressurize system prior to attempting to remove canisters.

5. Carefully remove the canister from the head by depressing thumb-lever and rotating the canister from right to left 1/4 turn. Pull cartridge from head and discard, drain the canister into a container.
6. Install a new cartridge as explained in INITIAL OPERATION section (page 13).

**NOTE**
Do not tighten canister beyond point where locking pin and pin hole line up.

## Replacing Remote Dispenser Filters

It is recommended that the Remote Dispenser 0.2 micron Final Filter be replaced every 45 days, when there is an unacceptable bacteria passage or when flow decreases to less than one liter per minute.

To replace filter follow instructions in the 0.2 MICRON FINAL FILTER INSTALLATION section (pages 19 & 20).

Always run at least 8 liters of deionized water through a new 0.2 Micron Final Filter before using water.

## Replacing Fuses

**WARNING**
For continued protection against possible fire hazard, replace fuses with those of the same type and rating.

***Main Fuse Replacement*** The "main fuse" is located in a fuse holder at the upper right side of the top housing. To access, remove top cover, squeeze the clip on the fuse holder and remove. Replace with a slow blow 2 ampere fuse for 230 VAC units and a slow blow 3 ampere fuse for 100 or 115 VAC units. The fuses are labeled. To reassemble, simply insert the fuse in the fuse holder and push the fuse holder until it snaps into place.

***Printed Circuit Fuse Replacement*** The "printed circuit fuse" is located in a fuse holder on the front of the printed circuit board. Replace this device with a 0.1 ampere slow blow fuse.

## Cleaning the Ultrafilter

**NOTE**
It is recommended that you utilize the Barnstead sanitization cartridge Catalog #D50223. This cartridge will completely sanitize the entire system including the ultrafilter.

It is recommended that the NANOpure ultrafilter be sanitized on a monthly basis or when pyrogen breakthrough occurs to ensure maximum performance. To sanitize the ultrafilter, utilize the Barnstead Sanitization Cartridge or use the following instructions.

1. Disconnect power to system and turn inlet valve off. Open Remote Dispenser to depressurize system.

**WARNING**
Depressurize system prior to attempting to remove canisters.

2. Remove cartridges, single use Disc Filter and Remote Dispenser Final Filter from NANOpure system. Install system flush housing in Remote Dispenser. Do not pour water out of canisters or discard cartridges if resistivity is acceptable.

**WARNING**
- Avoid splashing disinfecting solutions on clothing or skin
- Ensure all piping connections are tight to avoid chemical leakage
- Always depressurize chemical lines before disassembly
- Ensure adequate ventilation
- Carefully follow manufacturer's safety instructions on labels of chemical containers and material safety data sheets

3. Reinstall rear canisters #1 and #2. Add 125 ml of bleach (5.25% sodium hypochlorite) to canister #4 and reinstall in the front right position. Replace canister #3.
4. Reconnect power to unit and turn inlet valve on.
5. Open ultrafilter flush valve and ultrafilter draw-off faucet. Turn system power on and allow water to run to drain for 2 minutes.
6. Turn system power off, close inlet valve and depressurize system.

**WARNING**
Depressurize system prior to attempting to remove canisters.

7. Remove canisters and discard disinfecting solution.
8. Reinstall cartridges in system and follow BIORESEARCH GRADE SYSTEMS INITIAL OPERATION (page 15) procedure to rinse ultrafilter.

## System Sanitization

Frequency of cleaning is difficult to determine because of the wide variety of feedwater supplies which can be used, but the need for cleaning can be easily determined. Whenever a cartridge is replaced,

always examine the inside of the canister for any residual deposits. If residual deposits are observed, the systems can be sanitized by: a) a new, easy-to-use sanitization cartridge (#D50223) (an instruction sheet is included with the cartridge) or b) proceeding as follows:

1. Turn system off and disconnect power.
2. Shut inlet valve and depressurize system.

**WARNING**

Depressurize system prior to attempting to remove canisters.

3. With the cartridges removed from the canisters, wash the inside of the canisters and the inside heads with soap or detergent, using a sponge or clean cloth. Rinse out the canisters and the heads with clean water several times to remove the detergent residues.
4. Make up the following disinfecting solution: Add 1 liter (1 quart) of bleach (5.25% sodium hypochlorite) to 15 liters (4 gallons) of water to make a 0.3% solution.

**WARNING**

- Avoid splashing disinfecting solutions on clothing or skin
- Ensure all piping connections are tight to avoid chemical leakage
- Always depressurize chemical lines before disassembly
- Ensure adequate ventilation
- Carefully follow manufacturer's safety instructions on labels of chemical containers and material safety data sheets

5. Partially fill each canister with the above disinfecting solutions, and reassemble the canisters on the unit.
6. Remove the NANOpure Final Filter from the dispenser and replace with system flush housing. Do not attempt to sanitize Final Filter with chemical solutions. Also remove Disc Filter (Bioresearch Grade NANOpure only).
7. If an external pressure switch or pump protector is used, disconnect from the receptacle and install the jumper provided.
8. Disconnect the feedwater line at the feedwater source.
9. Place the feedwater inlet line into the container holding the remaining disinfecting solution. Ensure container is no more than 12 inches below the NANOpure inlet.
10. Connect power to the unit and start the pump.
11. Drain off some solution through the auxiliary draw-off until a steady flow is achieved. Discard this solution.
12. Recirculate the disinfecting solution for about one-half hour. Then open the auxiliary draw-off and allow the remaining disinfecting solution to enter the system, directing the output to drain.

**NOTE**

Do not operate the pump dry, dry running will damage the pump.

13. Turn the unit off and disconnect the power.
14. Leave the Remote Dispenser valve open to depressurize the system and to drain as much of the system as possible.
15. Carefully remove all the canisters from the system and discard the solution remaining in the

canisters. Do not rinse the canisters.

16. Install fresh cartridges in the system as indicated under REPLACING CARTRIDGES (page 22). Do not reinstall used cartridges (they may contain large amounts of bacteria).
17. Reconnect the feedwater line to the feedwater source, and reconnect the pump protector or pressure switch to the receptacle in the top housing. Save the jumper for future use.
18. Open the feedwater shutoff valve, connect the power to the unit, and press the control panel "on/off" button to start the pump and fill the system. Run water through the system to drain any remaining disinfecting solution. A flush of 10 liters is sufficient.
19. Close the Remote Dispenser valve, and allow the resistivity of the water to rise above the "set point" setting on the resistivity meter. Install a new Remote Dispenser 0.2 micron Final Filter as indicated under 0.2 MICRON FINAL FILTER REPLACEMENT (page 19).

## Cleaning the Resistivity Cell

Disconnect power to unit, shut off inlet valve and depressurize system. Remove top cover securing screws and slide cover toward you. Remove the ultrafilter housing by pushing up on the clip located at the bottom of the housing and pulling the housing straight forward. Disconnect tubing at outlet cell well. Also, disconnect and remove tubing connected to ultrafilter flush valve assembly. Carefully remove the power supply microprocessor circuit board. Disconnect three cell leads at the printed circuit board connector and gently pull cable down through grommet toward the cell. Unscrew and remove the cell. Carefully remove O-ring to clean cell.

**CAUTION**
The cell electrodes are etched to improve wetting characteristics. Do not mechanically abrade or damage this surface.

Wash the cell in a mild detergent solution or a 10% inorganic acid solution (follow acid manufacturers recommended handling procedure). This may be done in an ultrasonic cleaner or with a soft brush. The cell must be thoroughly rinsed in deionized or distilled water following the detergent or acid cleaning.

**CAUTION**
Do not immerse the entire cell assembly in cleaning solution, only the electrode portion.

After cleaning, check o-ring on cell, replace if necessary. Reinstall cell into cell well and hand tighten. Reroute cable up through housing and reconnect leads. Refer to wiring diagram for proper lead terminal position. Replace power supply microprocessor circuit board and ultrafilter housing. Reconnect tubing to outlet cell well and flush valve assembly. Replace top cover.

## Shutdown

If NANOpure is to be shut down for an extended period of time, the system should be completely drained and the cartridges removed to prevent the growth of bacteria.

If the system has remained inactive and full of water, then the system should be drained, sanitized and new cartridges installed prior to use.

## Troubleshooting Guide

| Problem | Possible Causes | Solutions |
|---|---|---|
| NANOpure completely inactive. (pump not operating, control panel not lit, etc.). | No electrical power to NANOpure. | Ensure that the NANOpure power cord is connected to a live power source and completely plugged into electrical outlet |
| | Main fuse blown. | Replace the main fuse as indicated in the REPLACING FUSES section (page 22). |
| | Top cover removed or improperly installed. | Properly install top cover |
| Pump runs, but no display (no digital display). | Printed circuit fuse blown. | Replace the printed circuit fuse as indicated in the REPLACING FUSES section (page 22). |
| | Printed circuit board inter-connect cable disconnected. | Reconnect cable. |
| Reduced or no product flow from the Remote Dispenser. | 0.2 micron final filter clogged. | Replace the Final Filter as indicated in the 0.2 MICRON FINAL FILTER INSTALLATION section (pages 19 & 20). |
| Leaking canisters. | Large o-ring in canister is missing, damaged or not sealed properly. | Replace or position correctly. |
| | Loose Head/Canister fit. | Tighten handle ring. |
| Pump does not run. Display light. | Pump protector (in reservoir), feedwater line pressure switch or jumper plug not connected to pump interlock. | Connect the pump protector or pressure switch cord to the receptacle located inside top cover. If a Barnstead pressure switch is installed in the feedwater line, the pump will not start until the line pressure rises to 0.35 kg/cm$^2$ (5 psi). |
| | | Open the feedwater line shut off valve or fill the feedwater reservoir. |
| | | Make sure the jumper plug is installed. |

| | | |
|---|---|---|
| Recirculated water will not rinse up to desired purity level. | Exhausted cartridge. | Replace all the cartridges as indicated in the REPLACING CARTRIDGES section (page 22). |
| | Cartridges out of order. | Install the cartridges in the proper order as indicated in the INITIAL OPERATION section (page 13). |
| | Cartridges upside down. | Install the cartridges right side up as indicated in the INITIAL OPERATION section (page 13). |
| | Feed water bypassing cartridge(s). | Be sure that small o-ring inside head is not damaged and is properly installed. |
| | Check valve malfunctioning. | Remove tubing from check valve, turn unit on, if water leaks from end of check valve, wash to remove any particulates. |
| Display reads "Err" when checking resistivity. | Resistivity cell disconnected or wired improperly. | Check resistivity cell wiring. |
| | Air in system. | Purge air from system by opening dispenser and/or auxiliary valve. |
| | System electronics or cell out of calibration. | Check resistivity of reference cell. If resistivity displayed is not between 9.7 and 10.3 electronics need recalibration. If resistivity reading is proper, clean cell and reinstall. If problem persists, replace cell. |

| | | |
|---|---|---|
| Short cartridge life. | Cartridges being used are beyond expiration date. | Check the expiration date. Cartridges begin to lose capacity after being stored two years from the date of manufacture. Replace the cartridges with unexpired ones. |
| | Change in feedwater characteristics. | If a Barnstead ROpure is the feedwater source, check that the membrane is functioning properly.<br><br>If a Barnstead Still is the feedwater source, ensure that the distillate temperature to the NANOpure does not exceed 49°C (120°F).<br><br>If tap water is the feedwater source, check the quality of the water. In some cases the quality of the water will change with the seasons. Changing the source (city water to well water, or well water to city water) will result in a water quality change.<br><br>If feedwater is from a central water purification system, verify water quality and proper functioning of the system. |

# Replacement Parts Listing

## Recommended Spares

### Consumables

Consumable parts are those *required* to support the day-to-day operation of this equipment. Barnstead |Thermolyne establishes two types of consumables; those items that *must* periodically be replaced to maintain performance (filters, resin cartridges, etc.) and other items of limited life (indicator lights, fuses, etc.) that you can expect to replace on a more or less random basis. Where practical, Barnstead |Thermolyne recommends the frequency of replacement, or provides information on life expectancy from which you may calculate a replacement interval compatible with your usage pattern.

The replacement of consumable parts is discussed in the MAINTENANCE AND SERVICING section (page 22-25) to assist you in accomplishing your own service.

Consumables may be ordered separately and in some cases, as an expendables kit. Check with your Barnstead/Thermolyne representative for additional information on the expendables kit.

| Description | Catalog No. | Recommended Quantity |
|---|---|---|
| Remote Dispenser Final Filter | D3751 | 2 |
| Pretreatment Cartridge | D0835 or D0836 | 1 |
| High Capacity DI Cartridge | D0803 | 1 |
| Ultrapure SG Cartridge | D5027 | 2 |
| OrganicFree Cartridge | D5021 | 1 |
| 3.0 Ampere Slow Blow Fuse, 115 Volt | 04455 | 1 |
| 2.0 Ampere Slow Blow Fuse, 230 Volt | 04420 | 1 |
| Teflon® Tape, Roll | 06078 | 1 |
| Printed Circuit Board Fuse | FZX43 | 1 |

### General Maintenance Parts

General maintenance parts are defined as laboratory level repair parts which do not require great expertise or special tools for installation. Barnstead |Thermolyne recommends that you stock the general maintenance parts as an aid to ensuring the continued operation of this equipment.

| Description | Catalog No. | Recommended Quantity |
|---|---|---|
| O-ring (between heads) | 06440 | 2 |
| O-ring (head-to-canister) | GSX28 | 4 |
| O-ring (head-to-cartridge) | GSX27 | 4 |
| Fastener Pin | FP550X1 | 2 |
| Connector (head to head) | BR550X4 | 1 |
| Adapter (head end) | BR550X2 | 1 |
| Inlet Valve | 02273 | 1 |
| Check Valve | 02214 | 1 |
| 1/4" O.D. x 1/4" NPT Connector | 05931 | 1 |

### Safety Stock

For critical applications where performance with *minimum* downtime is required, Barnstead |Thermolyne recommends that you maintain a local stock of those parts listed in the GENERAL MAINTENANCE PARTS and SAFETY STOCK sections.

| Description | Catalog No. | Recommended Quantity |
|---|---|---|
| Resistivity Display | SW550X1A | 1 |
| Main PC Board 100 & 120 VAC | PC550X1A | 1 |
| Main PC Board 240 VAC | PC550X4A | 1 |
| Recirculation Pump & Motor 100 & 120 VAC | PU687X1A | 1 |
| Recirculation Pump & Motor 240 VAC | PU687X2A | 1 |
| Cartridge Canister Head | BK550X2 | 1 |
| Cartridge Canister Handle Ring | HN550X1A | 1 |
| Cartridge Canister | CS550X1 | 1 |
| Pressure Regulator | 02280 | 1 |
| Resistivity Cell | E550X1A | 1 |

® *Registered trademark of Dupont.*

## Exploded View Figure L (Pages 31-32)

| Key | Part # | Description |
|---|---|---|
| 1 | BC630X5A | Wall bracket |
| 2 | DL687X1A | Top cover |
| 3 | 05766 | 1/4" OD x 1/4 NPT Elbow |
| 4 | PU687X1A | Pump assembly, 100 /120V |
| " | PU687X2A | Pump assembly, 240V |
| 5 | CRX72 | Cord set 100/120V |
| " | CRX70 | Cord set 240V |
| 6 | JSX113 | Snap bushing |
| 7 | 04247 | Pump interlock plug |
| 8 | BR550X1 | Bushing 1/2" NPT x 1/4 NPT |
| 9 | BK630X3 | Inlet cell well |
| 10 | FS550X3 | Plug 1/2" NPS |
| 11 | 02273 | Inlet valve |
| 12 | 03039 | 3/8" OD x 1/4 NPT tubing adapter |
| 13 | BC687X1A | Cabinet assembly |
| 14 | PC550X3A | PC board, reference cell |
| 15 | SW550X1A | Display |
| 16 | WH550X2 | Interconnect cable 10' (WH550X1 6") |
| 17 | PC550X1A | Main PC board, 100/120V |
| " | PC550X4A | Main PC board, 240V |
| 18 | TRX154 | Terminal block |
| 19 | 02280 | Pressure reducing valve |
| 20 | 02214 | Stainless steel check valve (2 required for Bioresearch Grade Systems) |
| 21 | BR550X2 | Head end fitting |
| 22 | 06440 | O-ring between heads |
| 23 | FP550X1 | Head connector pins |
| 24 | BR550X4 | Head connector |
| 25 | BK550X2 | Head |
| 26 | GSX27 | Head o-ring |
| 27 | GSX28 | Head to canister o-ring |
| 28 | HN550X1A | Canister handle ring |
| 29 | CS550X1 | Canister |
| 30 | CV630X4A | Auxiliary draw-off (Analytical models) |
| " | CV630X5A | Auxiliary draw-off (Bioresearch models) |
| 31 | PM550X2 | Filter nipple (Bioresearch models) (not shown) |
| 32 | 16927 | Filter assembly (Bioresearch models) |
| 33 | 05930 | Hose barb connector |
| 34 | DL630X18 | Ultrafilter housing |
| 35 | 15847 | 1/4 NPT x 1/8 NPT Elbow (Bioresearch models) |
| 36 | D4722 | Ultrafilter module (Bioresearch models) |
| 37 | E550X1A | Resistivity cell |
| 38 | BK630X2 | Outlet cell well |
| 39 | DL630X17 | Ultrafilter case |
| 40 | 05929 | 1/4 NPT Tee (Bioresearch models) |
| 41 | CS663X1A | Remote dispenser |
| 42 | GSX24 | O-rings |
| 43 | FL563X2 | System flush housing |
| " | D3751 | 0.2 micron Final Filter |
| 44 | 03169 | 1/4" OD x 1/8 NPT Adapter (Bioresearch models) |
| 45 | GSX29 | O-ring |

| | | |
|---|---|---|
| 46 | FZX44 | Fuse holder |
| 47 | D4740 | Floor stand |
| 48 | CEX172 | Power Entry Module |
| | Not Shown | |
| | TN687X1A | Transformer 100 volt |

# Ordering Procedures

Please refer to the Specification Plate for the complete model number, serial number, and series number when requesting service, replacement parts or in any correspondence concerning this unit.

All parts listed herein may be ordered from the **Barnstead|Thermolyne** dealer from whom you purchased this unit or can be obtained promptly from the factory. When service or replacement parts are needed we ask that you check first with your dealer. If the dealer cannot handle your request, then contact our Customer Service Department at 319-556-2241 or 800-553-0039.

Prior to returning any materials to **Barnstead|Thermolyne Corp.**, please contact our Customer Service Department for a "Return Goods Authorization" number (RGA). Material returned without a RGA number will be refused. Minimum invoice: $25.

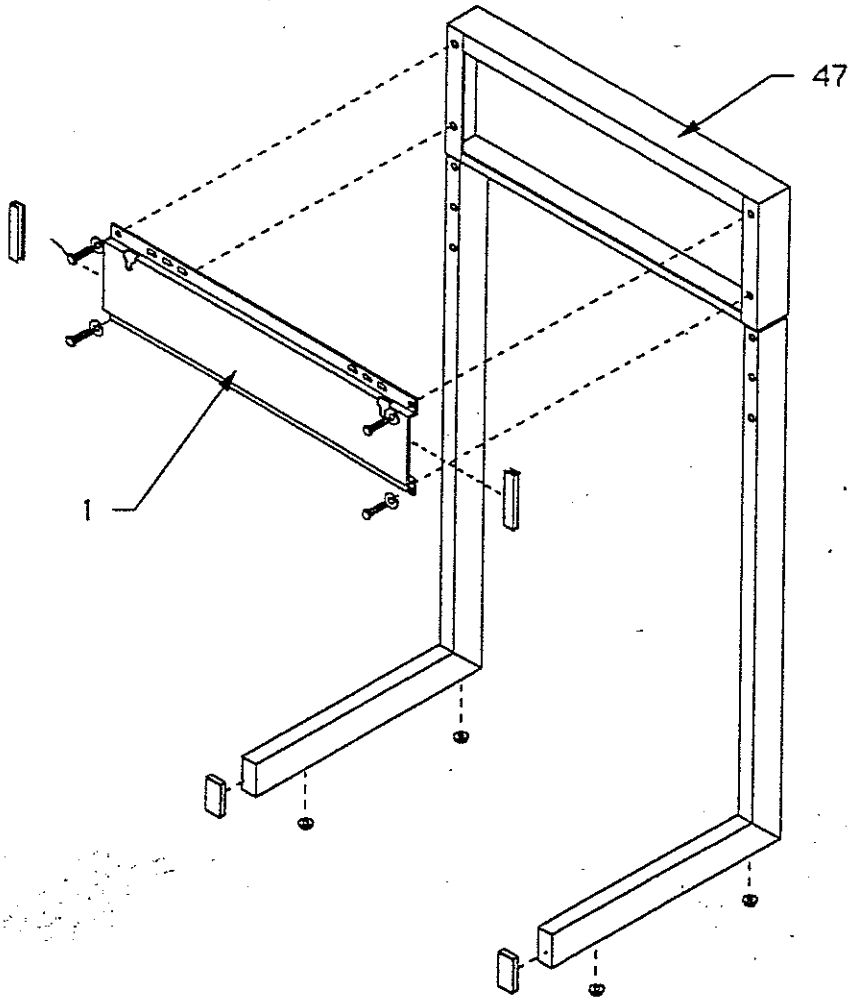



*Figure L*

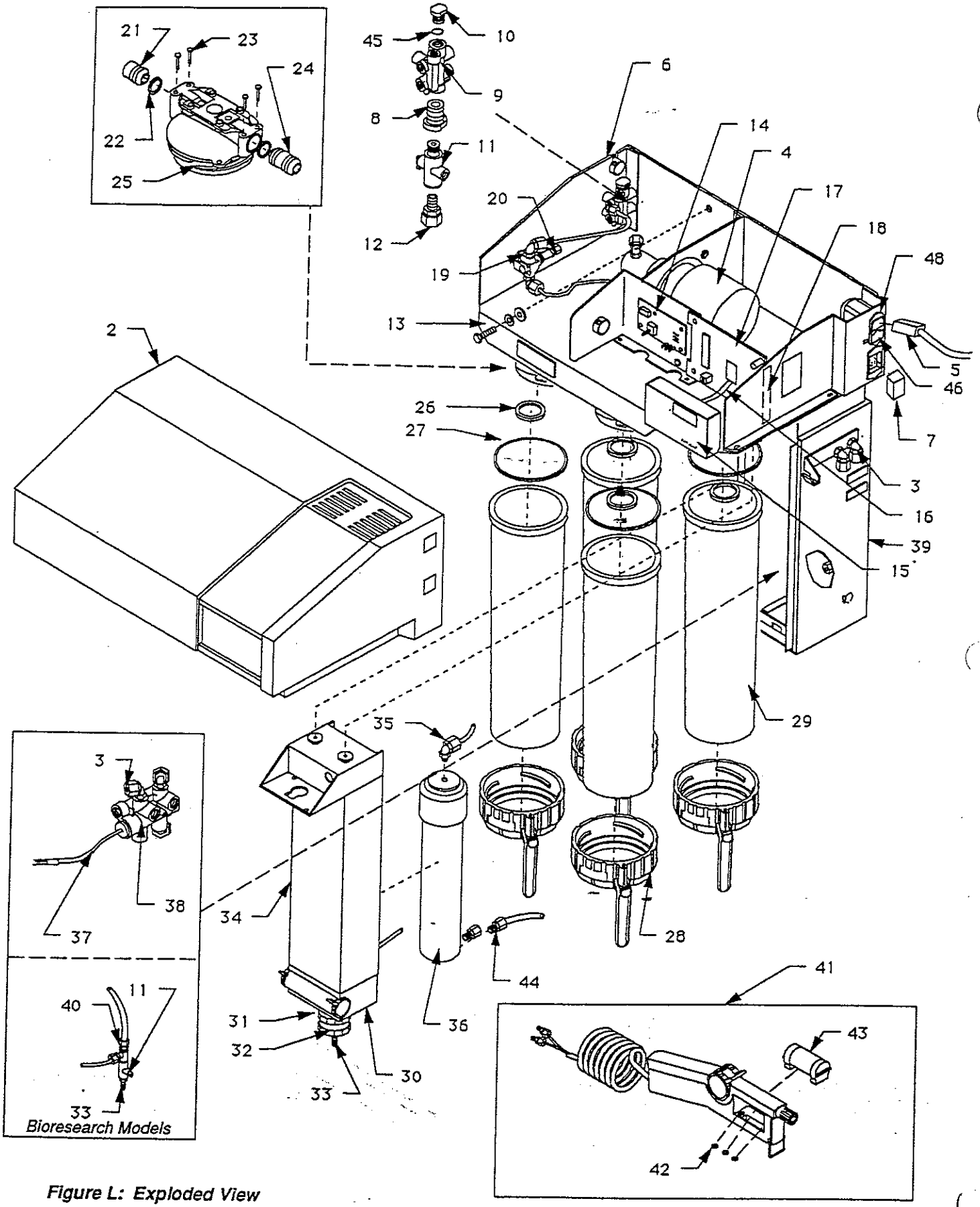



*Figure L: Exploded View*

## DIAGRAM COMPONENT LIST

| KEY NO. | DESCRIPTION |
|---|---|
| SW1 | MEMBRANE SWITCH |
| SW2 | 3 PDT TOGGLE SWITCH |
| PCB1 | POWER SUPPLY M PROC. BOARD |
| PCB2 | DISPLAY BOARD |
| PCB3 | REF./ CELL BOARD |
| R1 | 562 OHM RESISTOR |
| R2 | 35.7 K-OHM RESISTOR |
| R3 | 1.0 MEGOHM RESISTOR |
| S1 | PCB CONNECTOR |
| S2 | PUMP INTERLOCK CONNECTOR |
| S3 | PCB TERMINAL STRIP |
| FU1 | FUSE 3.0 ASB |
| FU2 | FUSE 3.0 ASB |
| MTR1 | PUMP AND MOTOR |
| CS1 | INTERCONNECT CABLE |
| T1 | TRANSFORMER 100/115V |

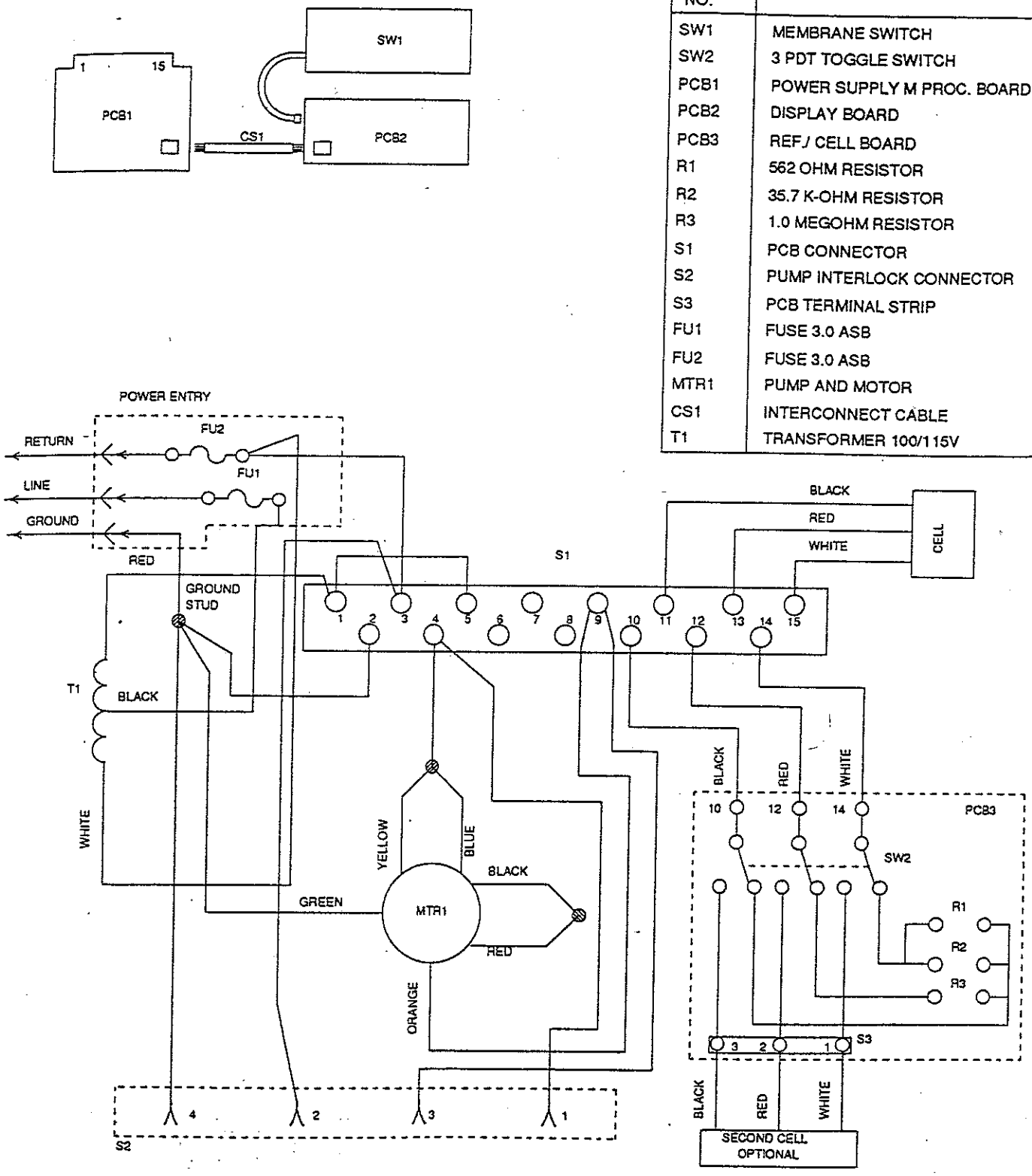



*Figure M Wiring Diagram for 100V Model*

## DIAGRAM COMPONENT LIST

| KEY NO. | DESCRIPTION |
|---|---|
| SW1 | MEMBRANE SWITCH |
| SW2 | 3 PDT TOGGLE SWITCH |
| PCB1 | POWER SUPPLY M PROC. BOARD |
| PCB2 | DISPLAY BOARD |
| PCB3 | REF./ CELL BOARD |
| R1 | 562 OHM RESISTOR |
| R2 | 35.7 K-OHM RESISTOR |
| R3 | 1.0 MEGOHM RESISTOR |
| S1 | PCB CONNECTOR |
| S2 | PUMP INTERLOCK CONNECTOR |
| S3 | PCB TERMINAL STRIP |
| FU1 | FUSE 3.0 ASB |
| FU2 | FUSE 3.0 ASB |
| MTR1 | PUMP AND MOTOR |
| CS1 | INTERCONNECT CABLE |

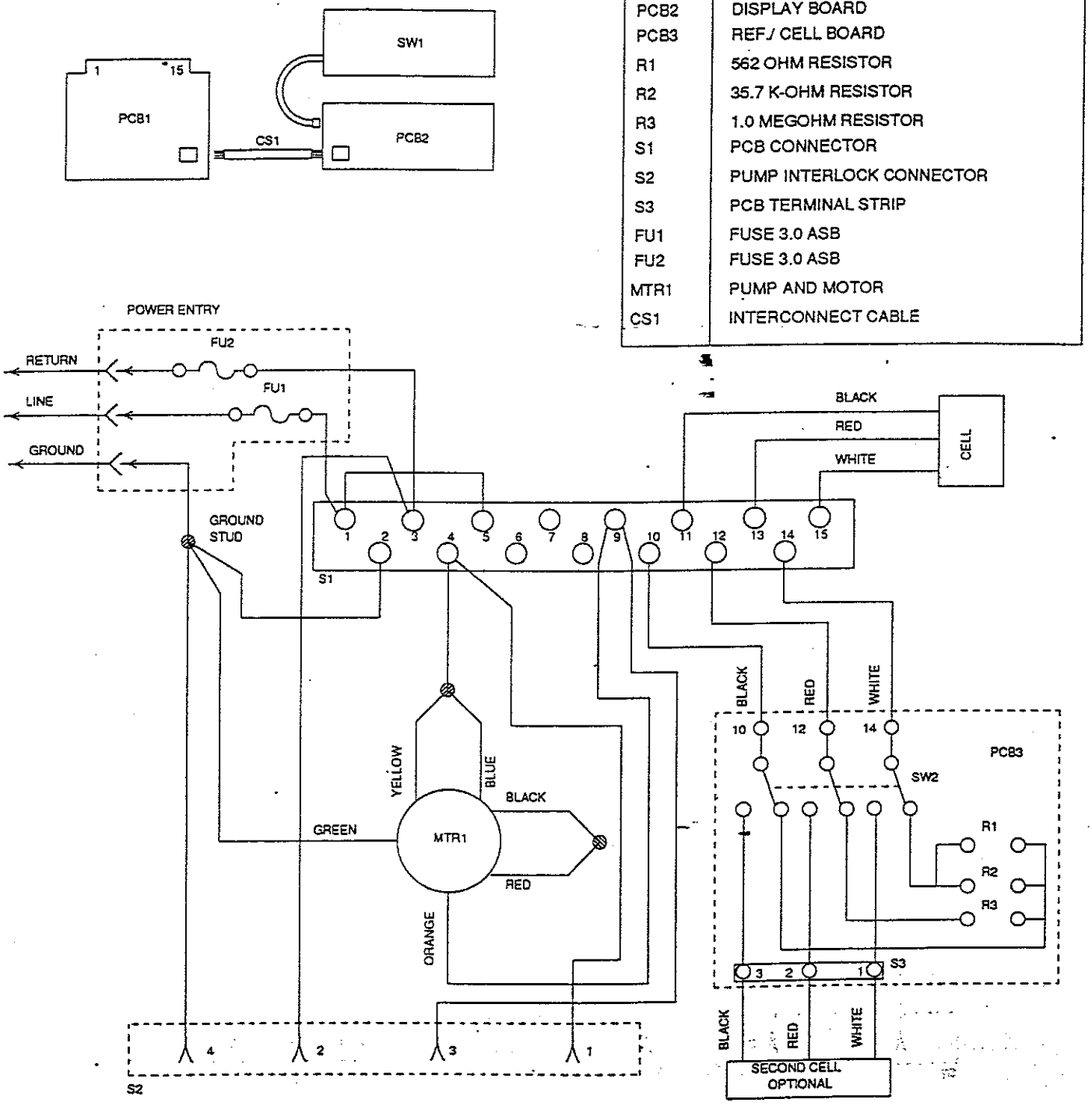



*Figure N Wiring Diagram for 120V Model*

## DIAGRAM COMPONENT LIST

| KEY NO. | DESCRIPTION |
|---|---|
| SW1 | MEMBRANE SWITCH |
| SW2 | 3 PDT TOGGLE SWITCH |
| PCB1 | POWER SUPPLY M PROC. BOARD |
| PCB2 | DISPLAY BOARD |
| PCB3 | REF./ CELL BOARD |
| R1 | 562 OHM RESISTOR |
| R2 | 35.7 K-OHM RESISTOR |
| R3 | 1.0 MEGOHM RESISTOR |
| S1 | PCB CONNECTOR |
| S2 | PUMP INTERLOCK CONNECTOR |
| S3 | PCB TERMINAL STRIP |
| FU1 | FUSE 2.0 ASB |
| FU2 | FUSE 2.0 ASB |
| MTR1 | PUMP AND MOTOR |
| CS1 | INTERCONNECT CABLE |

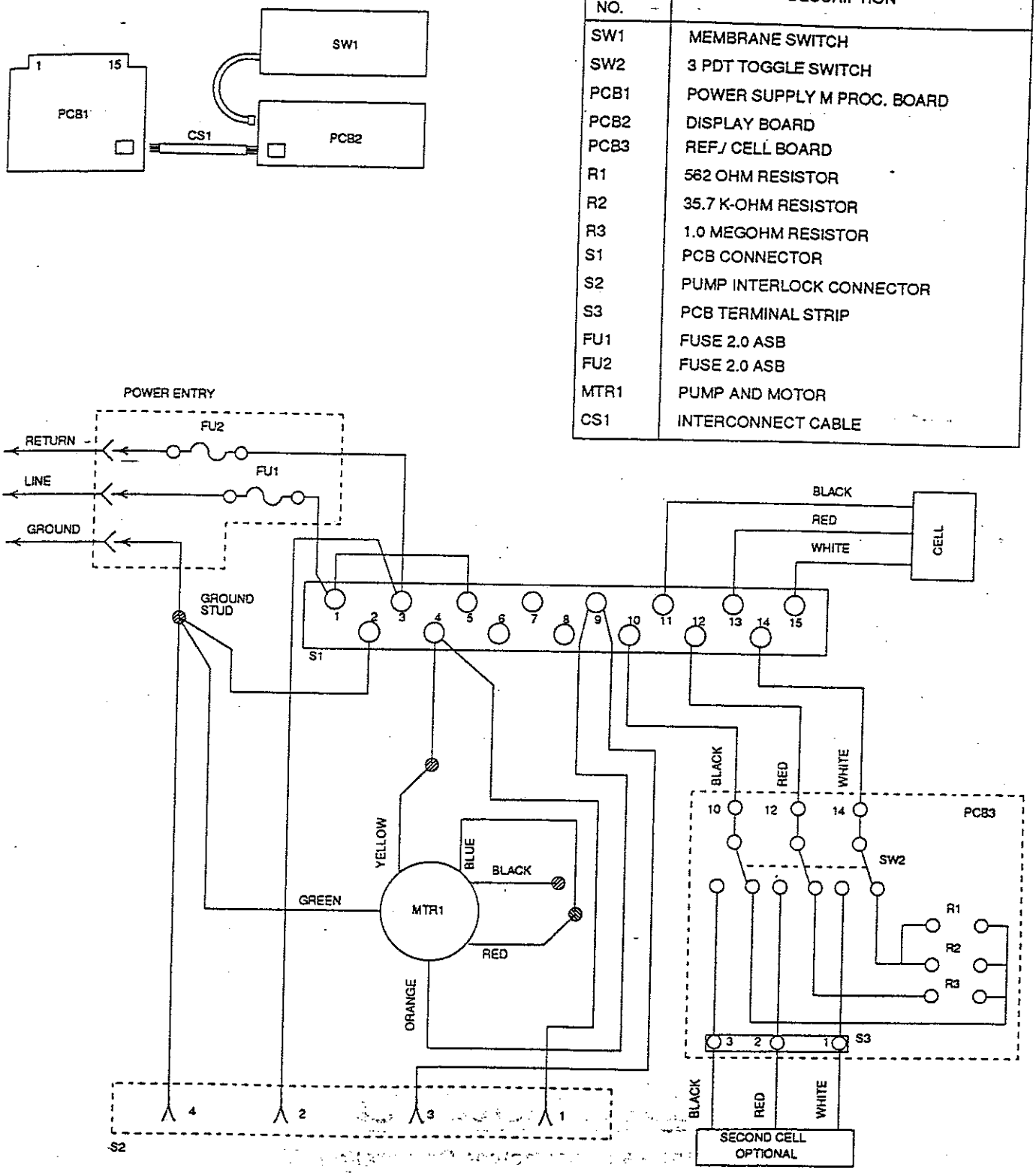



*Figure O Wiring Diagram for 230V Model*

# Barnstead|Thermolyne
# One Year Limited Warranty

**Barnstead|Thermolyne Corporation** warrants that if a product manufactured by **Barnstead|Thermolyne** and sold by it within the continental United States or Canada proves to be defective in material or workmanship, it will provide you, without charge, for a period of ninety (90) days, the labor, and a period of one (1) year, the parts, necessary to remedy any such defect. The warranty period shall commence either six (6) months following the date the product is sold by **Barnstead|Thermolyne** or on the date it is purchased by the original retail consumer, whichever date occurs first.

All warranty inspections and repairs must be performed by and parts obtained from an authorized **Barnstead|Thermolyne** dealer or **Barnstead|Thermolyne**. Heating elements, however, because of their susceptibility to overheating and contamination, must be returned to our factory, and if, upon inspection, it is concluded that failure is not due to excessive high temperature or contamination, warranty replacement will be provided by **Barnstead|Thermolyne**. The name of the authorized **Barnstead|Thermolyne** dealer nearest you may be obtained by calling 1-800-446-6060 or writing to:

**Barnstead|Thermolyne**
P.O. Box 797
2555 Kerper Boulevard
Dubuque, IA 52004-0797
FAX: (319) 556-0695

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