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Introduction

The PELCO BioWave® 34700 laboratory microwave system has a combination of features not found with any other microwave system. These include:

| | |
|--|--|
| True Variable Wattage | 100% continuous power at 6 different power levels from 250W to 750W (calibrated in 100W increments). |
| Water recirculation system | Maintains a uniform microwave environment in the microwave cavity over time. Allows use of the microwave with small loads for long duration without damage to the magnetron. |
| Temperature restrictive temperature probe | Guarantees accurate temperature control to $\pm 1^{\circ}\text{C}$ in most aqueous solutions. |
| RS232 Port, Cable and Software | Provides accurate and reliable temperature and time profiles during all processing steps. |
| Programmable times | Provides one-touch operation during processing as well as multiple time sequences. |
| Four intermittent power settings | Provides 0%, 20%, 50% and 70% power on cycles which can be used in conjunction with the variable wattage power levels. |
| Magnetron prewarming | Guarantees 100% of the power selected for 100% of the time. |
| Air Bubbler | Provides air agitation of samples for improved temperature uniformity. |
| Vacuum Cycling | When used in conjunction with a microwave vacuum chamber, provides three modes of operation, from continuous vacuum to vacuum/vent cycling. |

The above listed features make the PELCO BioWave® 34700 the most versatile microwave system available for laboratory use. It is the state-of-the-art in precision temperature control and monitoring for microwave-assisted processing of tissue in electron microscopy (all processing steps) as well as for light microscopy. It can be used for formalin fixation, decalcification, special stains, immunocytochemistry and complete processing of tissue into paraffin.

Specifications

Delivered Microwave Power to Microwave System Chamber:

Power Levels as set on the Control Console (with 100% power setting on microwave).

| | |
|---------------|--------------------|
| Level 1 | 250W ($\pm 5\%$) |
| Level 2 | 350W ($\pm 5\%$) |
| Level 3 | 450W ($\pm 5\%$) |
| Level 4 | 550W ($\pm 5\%$) |
| Level 5 | 650W ($\pm 5\%$) |
| Level 6 | 750W ($\pm 5\%$) |

Intermittent Power Settings: 0%, 20%, 50%, 70% (cycling of the magnetron, % time on)

NOTE: Any intermittent power setting can be used with any of the above variable power levels

Timer Operation Parameters when:

One Programming sequence is used1 sec. to 60 min. (1 hr.)
Two Programming sequences are used2 sec. to 120 min. (2 hr.)
Three Programming sequences are used3 sec. to 180 min. (3 hr.)
Four Programming sequences are used4 sec. to 240 min. (4 hr.)

Water Recirculation System:

This recirculates and cools the water load in the microwave chamber. During continuous microwave irradiation, the temperature of the water load is controlled to a factory set point of 30°C. Monitoring of the water load temperature is provided by a digital display meter. The system recirculates the water at >1.5 L/min. A patented water load is included (Product No. 36115) which can be used in place of the beaker. Called the PELCO ColdSpot® (Pat # 6329645), it serves as both the water load and processing surface for your tissue samples, slides, slide staining container or other processing protocols.

Temperature Restrictive Temperature Probe with PTFE Coating:

This is used to maintain preset temperature maximums during microwave processing. A special probe is included with a PTFE coat (Product No. 36145-T) for decalcification and special stain applications. The temperature probe is accurate to ±1°C (from 0°C to 100°C) and will maintain ±1°C in water and most fixative solutions. When controlling the maximum temperature of mixtures such as epoxy or acrylic resins, the set-point may need to be as much as 7°C below the maximum temperature desired due to the dissipation factor (microwave absorptive properties) of that particular reagent.

Vacuum System:

This microwave is equipped with a vacuum pump and hose fitting inside the microwave cavity. Vacuum can be run in three modes. Continuous on, Vacuum on with microwave power, Vacuum cycle. In the vacuum cycle mode the vacuum on time and the vent time can both be set from thirty seconds to five minutes. The vacuum cycles between on and vent while the microwave is on. The Vacuum pump is factory set to pump to 20 in. Hg.

Air Bubbler System:

This microwave is equipped with an air pump that delivers an adjustable air flow to a hose fitting inside the microwave cavity. Air flow can be adjusted up to 200ml/min. with a 2.5" column of water pressure.

Microwave Chamber Exhaust:

This takes fumes from the microwave cavity at the rate of 110 cfm. The exhaust must be vented by way of a duct to an exhaust fume hood with at least a 110 cfm flow rate or the microwave must be placed inside an exhaust fume hood with this flow rate.

Dimensions/Weights/Power Requirements

Dimensions/Weights:

- Chamber Dimensions 34.3 W x 40.0 D x 24.1cm H (13-½" x 15-¾" x 9-½")
- Outside Dimensions..... 55.3 W x 48.3 D x 55.9cm H (21-¾" x 19" x 22")
- Weight 47.7 kg (105 lbs.)

Power Requirements: 120V, 20 amp, 60 Hz dedicated circuit

Mains supply voltage fluctuations not to exceed ±10% of the nominal voltage.

Contents of the PELCO BioWave® 34700

| | | | |
|--------|---|--------|---|
| 1 each | PELCO BioWave® 34700 Laboratory Microwave | 1 each | 080-268 PelGraph™ Software |
| 1 each | 36145-T PELCO® PTFE-coated Temperature Probe Includes: 36145-T1 Temperature Probe Sensor and 36160-12 Temperature Probe Pigtail Lead | 1 each | 030-267 RS-232 Serial Cable |
| 1 each | 050-259 Temperature Probe Stand with base, pole and PTFE probe holder | 1 each | 36157 PELCO Prep-Eze™ |
| 1 each | 080-301 Instruction Manual | 1 each | 36115 PELCO ColdSpot® |
| 1 each | 050-280 Exhaust Hose 8' x 4" | 1 each | 020-115 Pot Adjustment Screwdriver |
| 1 each | 050-281 Exhaust Elbow - 90° | 1 each | 36131 Microwave Capsule Holder |
| 1 each | 050-010 Air Bubbler Hose | 1 each | 36133 Microwave Polymerization Tray |
| | | 1 each | 36134 Microwave Microcentrifuge Tube Holder |
| | | 1 each | 36115 PELCO ColdSpot® |
| | | 1 each | Microwave Safety Instructions |
| | | 1 each | Warranty Card |

Inspection of the PELCO BioWave® 34700

Please fill out the warranty card and return it to us.

Inspect the PELCO BioWave® 34700 laboratory microwave system for any damage. If there is any damage present, immediately notify Ted Pella, Inc. (Phone: 800-237-3526; Fax: 530-243-3761) and the appropriate commercial carrier. Please retain the shipping container and all contents including the packing material. Do not discard anything. Notify our Customer Service department of the problem and supply us with the following information from the Packing Slip (*all such information will help in expediting follow-up service*).

- Ted Pella, Inc. packing slip order number
- Your purchase order number
- Your customer code number
- Product Number
- A short description of the damage

Immediately contact the carrier and arrange for an inspection (“request an inspection”). After the inspection is completed, please request and obtain a copy of the damage report from the carrier company’s inspector or representative.

Do not return damaged shipments until a claim has been filed, the inspection is completed and the report has been received by you. Obtain an RGA (Returned Goods Authorization) number from our Customer Service Department, who will assist you with return/replacement.



Important Safety Instructions Recognize this symbol as a SAFETY message

Electrical Requirements

IMPORTANT SAFETY INSTRUCTIONS -Recognize this symbol as a SAFETY message.



- **WARNING** - This microwave system must be grounded. The microwave is equipped with a cord having a grounding wire with a grounding plug. **DO NOT** use a two-prong adapter or operate the microwave with a damaged cord.

- **DO NOT** use an extension cord. This microwave should be plugged into a dedicated 120 VOLT, 20 AMP, 60 Hz circuit.



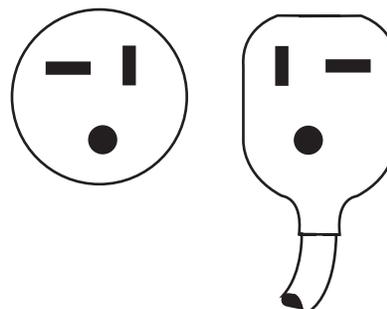
- **DO NOT, UNDER ANY CIRCUMSTANCES, CUT OR REMOVE THE ROUND GROUNDING PRONG FROM THE PLUG OR BEND THE POWER PRONGS TO FIT A RECEPTACLE OTHER THAN THE ONE SHOWN FOR YOUR OVEN. SUCH ABUSE OF THE PLUG CAN RESULT IN ELECTRICAL SHOCKS OR OVERHEATING. This plug configuration is always wired for a 20 AMP circuit.**

- Consult a qualified electrician or servicer if grounding instructions are not completely understood, or if doubt exists as to whether the microwave system is properly grounded.



- **WARNING:** Unplug the Microwave System before replacing fuses. Fuse replacement should be done only by authorized service personnel.

**Receptacle and Plug
120V 20 Amp Circuit**



- Fuse Configurations:
 - Mains (1³/₃₂" x 1-1/2", 250VAC, 30 Amp, F - Fast Acting, meet UL spec. 248)
 - F1 on PCB, Load Cooler Pump (5x20mm, 250V, 1 Amp, F - Fast Acting)
 - F2 on PCB, Bubbler (5x20mm, 250V, 1.25 Amp, F - Fast Acting)
 - F3 on PCB, Vacuum Pump (5x20mm, 250V, 5 Amp, F - Fast Acting)
 - Power Supply, 12VDC (5x20mm, 250V, 4 Amp, F - Fast Acting)
 - Power Supply, 5VDC (5x20mm, 250V, 3 Amp, F - Fast Acting)

Safety Instructions

- **READ THESE INSTRUCTIONS CAREFULLY PRIOR TO OPERATION OF THE PELCO BIOWAVE® LABORATORY MICROWAVE SYSTEM. Do Not use this microwave system for food.**

- Precautions to Avoid Possible Exposure to Microwave Energy or Unsafe Operation of the System:



- **DO NOT** try to operate this system with something caught in the door or with the door open. The safety interlocks are designed to prevent open-door operation.
- **DO NOT** allow residue to build up on the door seals. Seals may be cleaned with a mild detergent and warm water using a soft sponge or cloth (see "Care and Maintenance", Pages 14 - 15).
- **DO NOT** operate the system if the door, hinges or door seals are damaged.
- The system **SHOULD NOT** be adjusted or repaired by anyone except qualified microwave service personnel. The outer case of the microwave should not be removed at any time, except by a qualified service person.



- **WARNING:** Moving parts on top of the microwave present possible trap hazards to loose clothing and jewelry etc.
- **DO NOT** install the system next to or above a source of heat.

- To prevent spontaneous boiling (fluid eruption), liquids should be stirred or poured to mix in air prior to microwaving. If air is not mixed in and liquids are overheated (especially viscous fluids), the liquid can erupt in the microwave chamber or after removal from the chamber.



- **NEVER** use an additional thermometer in the microwave. Always use the supplied probe inside the microwave chamber during operation. The microwave is equipped with a safety feature that will prevent the magnetron from delivering power and sound an alarm if the probe fails or is removed.
- Many materials are transparent to microwave energy (i.e. most glass, plastics, PTFE, Styrofoam) and as such, will not absorb the energy or heat up. When determining the suitability of a container for use in the microwave, the following protocol should be followed.

To test an unknown container, place it in the microwave chamber, about 10cm away from a 500ml glass beaker (or other microwave transparent material) which contains 300ml of water (“the water load”). The two containers should be microwaved for 1 minute at 100% power. If the unknown container remains cool at the end of this period, it is suitable for use in the microwave.



WARNING: Care should be taken when testing **ANY** unknown object for suitability and if the composition is unknown it should not be tested. Only vessels made of plastic, glass or PTFE should be used.

- Always operate the microwave with a water load of at least 300ml. For some protocols, larger volumes may be advisable. For short durations of microwave energy (i.e. less than 15 seconds), a water load is not necessary. Extended operation times without a water load can damage the magnetron and cause dangerous heating within the microwave chamber.



If materials inside the microwave chamber should ignite or begin smoking, do the following:

- **DO NOT OPEN THE DOOR.**
- **TURN THE POWER OFF BY PRESSING RESET.**
- **DISCONNECT THE POWER CORD OR SHUT OFF THE POWER AT THE FUSE OR CIRCUIT BREAKER PANEL. REMEMBER IF THE DOOR IS OPENED, THE FIRE COULD SPREAD.**

- **DO NOT** use the microwave chamber for storage purposes.
- The use of metal or foils within the microwave chamber, unless designed for that purpose, is to be avoided. Metal objects can cause arcing to the microwave chamber, which can result in damage to the magnetron, fire or other serious mishaps.
- Keep air filter clean and unrestricted (see “Care and Maintenance of the System”, pages 14 - 15). Free air flow from the front and the back of the unit is a must. The air flows around the electronic components and magnetron. Ensure that the required 3.8cm (1.5") spacing is maintained behind and around the microwave enclosure. If air flow is restricted, the unit will not operate properly and the life of electrical parts will be shortened.
- The forced air vent at the top of the processor is provided to exhaust any toxic fume residues from the microwave chamber and away from the operator. A common 10.2cm (4") aluminum dryer duct may be used to transfer the exhaust to a fume hood or external filter system such as the PELCO® 3120 Clean Air System.



Make sure that the exhaust air vent does not become restricted and that air is being pulled from this vent at the rate of 110 cfm or better during operation.

- **DO NOT** use this microwave system for food.
- **WARNING:** During operation, the probe must, at all times, be kept at least 1” (25mm) away from the metal walls of the microwave chamber to avoid arcing.



- **CAUTION:** Always remove accessories, such as silicon tubing, clamps, plastic ware, when not using load cooler.
- **ENVIRONMENTAL CONDITIONS:** This device is to be used indoors, at an altitude up to 2000 meters, at ambient temperatures between 5°C and 40°C with the maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.

This device is designed to be safe at transient overvoltages according to Installation Categories (Overvoltage Categories) II, and Pollution Degree 2 in accordance with IEC 644.



- **WARNING:** The vacuum line (hose) is intended for pulling gasses, not liquids. Care should be taken to not allow liquids to be sucked into the hose.



- **WARNING:** The use of vacuum with solvents is strictly forbidden. Temperature restrictions below 70°C must be used for vacuum-assisted processing steps where water is present and below 37°C where Formalin is present, otherwise the liquid will boil and be drawn into the vacuum system. Formalin will become a toxic gas at that temperature. This will severely damage the vacuum components of the PELCO BioWave®. This will also prevent a vacuum from being achieved.



- Do not boil water in the microwave. This can cause electric arcing and system failure.

Certifications



The C-UL US Listing Mark applied to this product symbolizes compliance with both of the following Canadian and U.S. Safety Requirements as of the dates indicated:

March 9, 2001:

USL indicates investigation to the U.S Standard for Safety of Laboratory Use Electrical Equipment, UL 3101-1, Including Amendment 2 and ICE 61010-1.

March 9, 2001:

CNL indicates investigation to the U.S and Canadian Standard for Safety of Laboratory Use Electrical Equipment, UL 3101-1, and ICE (6)1010-1 Amendment 2, and CAN/CSA-C22.2 No. 101.1-92.

Installation Steps for the PELCO BioWave® 34700

1 READ THE SAFETY INSTRUCTIONS IN THE FIRST SECTION OF THIS MANUAL BEFORE OPERATING YOUR MICROWAVE SYSTEM.

- 2 IMPORTANT:** This manual will show you how to operate the PELCO BioWave® 34700 laboratory microwave system. The experimental protocols will demonstrate how to use the microwave tools that are included with the System. The System has been set for “instant on“ operation. This means that when the microwave door is opened, the blower begins operating and the magnetron tube filament begins its required 3-second warm-up. Microwave energy is not generated until the door is closed and the system manually started by pushing Start or a pre-programmed numbered key pad. Energy is then supplied within micro seconds.



- 3 Assembly: WARNING** - The microwave system should not be “plugged in” during assembly.
- 4 Location of the System.** The microwave system will require an area having the following minimum dimensions 63.5cm wide x 52cm deep x 61cm high (25" x 20-½" x 24"). Make sure the location allows for 3.8cm (1-½") clearance at the back of the microwave enclosure (see Fig. 1).

5 Internal Connections within the Microwave Chamber:

- The temperature probe is connected by means of its SMA connector to the top fitting on the inside right wall of the microwave chamber (Fig. 7).
- Assemble the temperature probe stand (see Fig. 3) and place the temperature probe in the stand.
- The air bubbler probe attaches to the bottom fitting on the inside right wall of the microwave chamber (Fig. 7).
- The Vacuum Line attaches to the vacuum feed-through on the inside right wall of the chamber. Care should be taken to attach it to the proper feed-through (Fig. 7).
- The water recirculation hoses (0.635mm [1/4"] ID silicone rubber - translucent) attach to the ports inside the microwave chamber. These require the PTFE O-clamps as shown in Figure 7. Make sure to attach the two hoses to the corresponding two ports that were used for the external connections. The ports are labeled inside: "Load-In" and "Load-Out" for easy recognition. The red hose should be connected to the "Load-Out" port. The hoses can be cut to shorter length if desired.

6 The microwave power cord can be plugged into the wall outlet at this time. The main plug is considered the primary disconnect devices of the equipment and should be readily identifiable and easily accessible at all times.

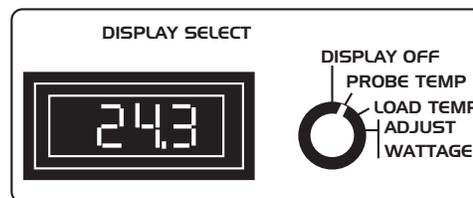
7 Software Installation.

- First attach the male end of the serial cable to the RS-232 serial port on the left side of the Microwave Processor.
- Connect the female end of the serial cable to the COM1 port on the PC.
- Follow the PelGraph™ installation instructions on the CD jacket.

Operation of the PELCO BioWave® 34700

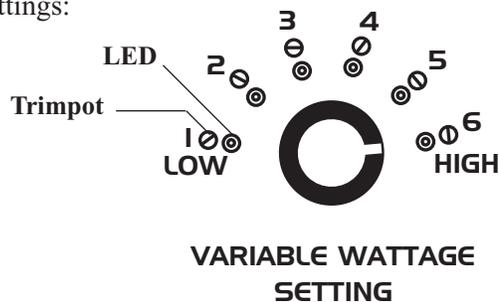
- **Theory of operation and control.** The PELCO ColdSpot® serves as the water load and processing surface for your tissue samples, slides, slide staining container or other processing protocols. During microwave processing with the model 34500 the Load Cooler is used to cool and circulate water through the PELCO ColdSpot® and its temperature can be monitored by selecting LOAD TEMP on the Main Display. The PELCO ColdSpot® absorbs microwave energy eliminating hotspots, while the microwave energy is applied continuously. This takes full advantage of the microwave effect on tissue processing by increasing the magnetron on time for a given temperature restriction. The microwave power is set using the Variable Power Control to apply the desired microwave energy. The Probe temperature is monitored on the Main Display. The Temperature Probe can be placed in the tissue processing container where the Temperature Restriction can be used to further control and limit the temperature of the tissue sample. Or the Temperature Probe can be placed in the Temperature Probe Port of the ColdSpot® and used to monitor the temperature in the ColdSpot®. The maximum service temperature for the ColdSpot® is 50°C. The temperature restriction should be set at or below this temperature. The microwave timer function determines the duration of the process. It can be programmed to perform a series of up to four heat and/or hold times of 1sec to 60 min each.
- **First Power up.** Plug the microwave into a dedicated 10 amp plug as described in Electrical Requirements, page 4 - 5. When this is done, the microwave Time Display Window will show dashes across the display. When the microwave door is opened and closed the word "ready" will appear and the exhaust and microwave cooling fan will start.

- **Main Display.** The main display is labeled “DISPLAY SELECT” on the front control panel. The display is controlled by a four position knob. With the display knob in the “DISPLAY OFF” position, the display is blank and power to the console is off. **The magnetron will not come on with the knob in this position.** With the display knob in the “PROBE TEMP” position the temperature of the temperature probe is displayed. This is the position usually selected during the normal operation of the microwave. With the display knob in the “LOAD TEMP” position, the temperature of the load cooler is displayed. This position is used to monitor the load cooler temperature if preheating of the load is desired or during the normal operation of the microwave. With the display knob in the “ADJUST WATTAGE” position, the wattage set point of the selected “VARIABLE WATTAGE SETTING” is displayed. This position is used when adjusting the trim pot next to the power setting LED or to check the wattage set point during the normal operation of the microwave.



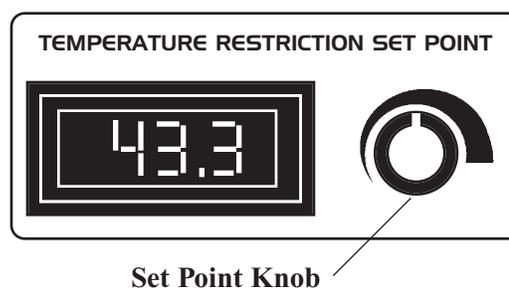
- **Variable Power Controls.** The 6 position ”Variable Wattage Setting” knob, shown below and in Figure 2, selects the desired wattage from the following settings:

- 1=250W
- 2=350W
- 3=450W
- 4=550W
- 5=650W
- 6=750W



The green LED indicates the currently selected wattage setting. This LED turns red when the magnetron is on. Position of this dial may be changed at any time during operation and does not conflict with any intermittent power setting or temperature restriction that you wish to use. The wattage can be displayed by setting the display knob to “ADJUST WATTAGE” thus displaying the power setting. The wattage is precalibrated at the factory. The Wattage should be verified and recalibrated, if necessary, for your location using the procedure given in Wattage Adjustment/Calibration, page 13.

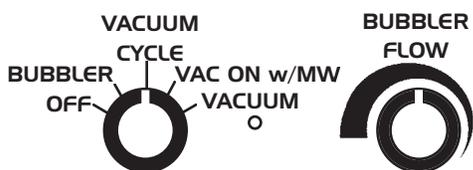
- **Temperature Restriction Controls.** The “TEMPERATURE RESTRICTION SET POINT”, shown to the right and in Fig. 2, controls microwave output when the temperature measured by the temperature probe exceeds that set on the Set Point Display. This control is achieved by automatically turning off the magnetron when the set point is reached and turning it back on when the temperature measured by the probe falls below the set point. The temperature restriction is set with the Set Point Knob. Temperature can be maintained within 0.5°C of the set temperature when using lower wattages (settings 1-3) or when using solutions that heat slowly to moderately. Solutions that heat vigorously, especially when higher wattages (settings 4-6) are used, can be maintained very close ($\pm 2^\circ\text{C}$) to the desired temperature maximum by setting the restriction at an appropriate point below the required maximum. The use of this set temperature does not conflict with either intermittent power setting or variable power levels that you might wish to use.





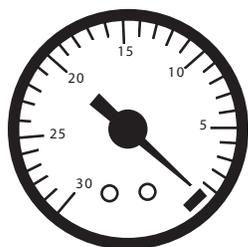
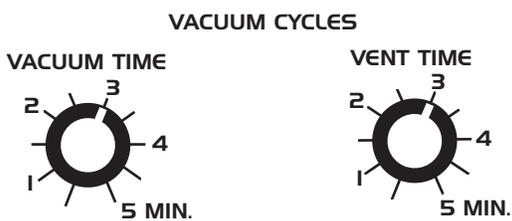
• **Load Cooler Controls.** The operation of the Load Cooler circulating pump is controlled by the three position “Load Cooler” knob, shown to the left and in Figure 2. In the OFF position the pump DOES NOT recirculate water within the microwave chamber. In the AUTO position, water circulation is synchronized with the microwave’s operation. The pump will remain on after a microwave run until the water load temperature has fallen below 30°C. In the ON position the circulating pump is ALWAYS running. The AUTO position is the recommended operation mode. Note that the fan for the Load Cooler is always on at low speed and turns to high speed whenever the load temperature exceeds 30°C. Before starting the Load Cooler make sure both internal hoses are connected properly. Place both hoses inside the chamber into a beaker filled with water (400ml of water in a 600ml beaker). Turn the Load Cooler switch to ON. Within several seconds the pump should begin quietly pumping water. Lift the “Load In” marked tube slightly above the water surface. Water should be flowing continuously out of this tube and the pump should be operating quietly. **Note:** The load cooler pump is self-priming. The PELCO ColdSpot® can now be connected to the system. See Appendix A, page 22 for instructions on the connection and use of the PELCO ColdSpot®.

The load cooler fan will turn on to increase cooling efficiency when the water temperature exceeds the factory set point of 30°C. The temperature of the load cooler can be monitored on the main display when the display knob is in the “LOAD TEMP” position.



• **Air Bubbler and Vacuum Controls.** The bubbler or vacuum features are selected using the five position knob shown to the left and in Figure 2. With the “VACUUM” knob in the “OFF” position neither bubbler nor vacuum is activated. With the “VACUUM” knob in the “BUBBLER” position, the vacuum is off and air is metered through the air bubbler line inside the microwave chamber.

The air bubbler control designated “BUBBLER FLOW”, shown above and in Figure 2, is a needle valve that accurately meters the air. As with all needle valves, you must be careful not to over tighten the valve to avoid damaging it. Air flow can be accurately regulated from full pressure to a single bubble every few seconds. Turning the valve counterclockwise increases the flow. Several different bubbler attachments are available depending on your particular application.



The vacuum system has three modes of operation. With the “VACUUM” knob in the “VACUUM” position, the bubbler is off and the vacuum is on continuously. The vacuum is drawn via the vacuum hose inside the microwave chamber (Fig. 7). With the “VACUUM” knob in either the “VAC ON w/MW” or “VACUUM CYCLE” positions, vacuum is synchronized with the microwave’s operation. The vacuum cycle switches on the vacuum for a preset time and then vents the line for a preset time. The vacuum on time can be set from 30 seconds to 5 minutes using the “VACUUM TIME” knob shown above and in Figure 2. The vacuum vent time can be set from 30 seconds to 5 minutes using the “VENT TIME” knob shown above and in Figure 2. The vacuum level can be read on the vacuum gauge to the right of the control panel (see to left). The LED below the “VACUUM” setting comes on when the vacuum pump is pumping.

The Vacuum is factory set to 20” Hg maximum vacuum.

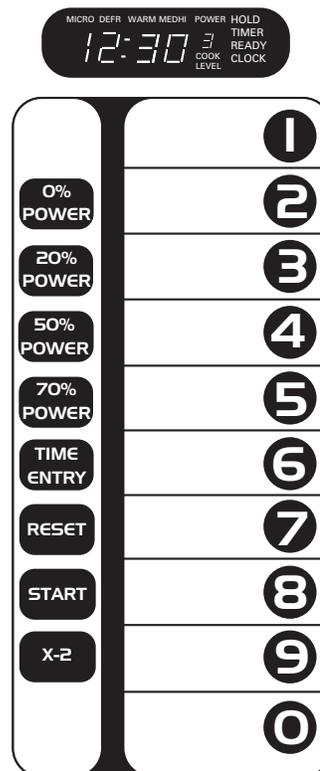
• **Running PelGraph™ Software.** Be sure the cable is connected to the COM1 port of the computer and the temperature probe is in the solution you wish to monitor and record the data. Follow the instructions in the PelGraph™ Help file.

- **Microwave Timing Functions**

NOTE: To stop a microwave run at any point either open the door or press RESET. Press RESET a second time to clear the time in the Time Display Window.

- **Manual Time Entry:**

- 1 Open and shut the door if the word “Ready” does not appear in the Time Display Window.
- 2 Press the pad labeled Time Entry.
- 3 Press the numbers for the desired time up to 60:00 min.
- 4 Turn the selector to the desired wattage (#1 through #6) on the Control Unit.
- 5 Although not recommended a % power other than Full Power can be selected if desired by pressing one of the power level pads.
NOTE: % power is a duty cycle that cycles the magnetron power on and off where the on to off ratio is represented by the % power. The variable wattage setting is a more precise means of achieving a desired power level since the magnetron is on continuously at the variable wattage setting selected until the temperature restriction set point is reached.
- 6 Press the START pad.
- 7 NOTE: Any % power can be used with any variable wattage setting. Variable wattage and % power can be changed during operation (while the microwave is operating).



- **Factory Preset One Touch Operation:**

Each numbered key pad has been preset to operate at 100% power at any wattage level chosen for the following times:

| | | | |
|-------|------------|-------|-------------|
| Pad 1 | 10 seconds | Pad 6 | 1.5 minutes |
| Pad 2 | 20 seconds | Pad 7 | 2.0 minutes |
| Pad 3 | 30 seconds | Pad 8 | 3.0 minutes |
| Pad 4 | 45 seconds | Pad 9 | 4.0 minutes |
| Pad 5 | 1 minute | Pad 0 | 5.0 minutes |

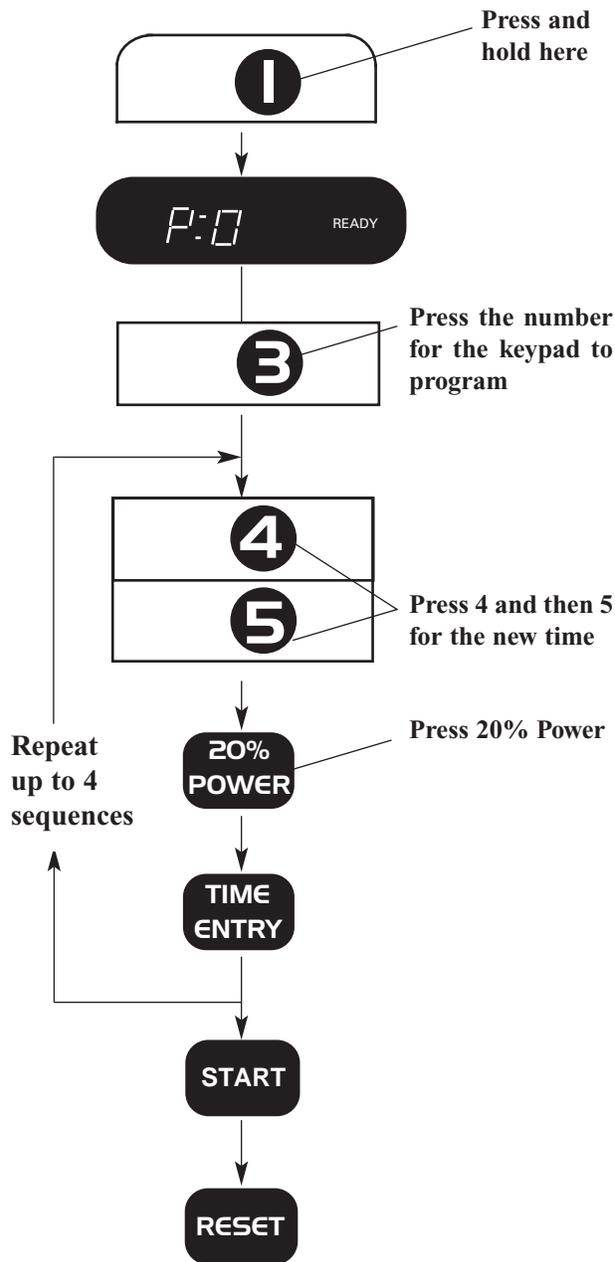
Press the desired pad and the process will start.

- **Using X-2 Pad:**

The X-2 pad increases the process time when processing multiple items. The amount of time added is 80% of the original preprogrammed pad time. Press X-2 pad, then press a numbered pad and the process will start.

- **Door Open Reset.** When the door to the microwave is opened, during a process, the countdown time will stop until the door is closed and the start button is pressed. The door must be closed within 10 minutes in order to resume the current process. After 10 minutes the microwave power and light shuts down and the keyboard is disabled. A new time must be entered to restart the process.
- **Temperature Probe Failsafe Feature:** In the unlikely event of a temperature probe failure the PROBE TEMP display will read 100° C. This will prevent the magnetron from delivering microwave energy, in conjunction with the temperature restriction. If the probe fails due to an open circuit or the temperature probe is removed (probe connector unplugged or cable cut or broken) an audible alarm will sound until the problem is corrected. If you want to operate the microwave without the temperature probe in your sample, place the probe in either the water load beaker or the temperature probe

port of the PELCO ColdSpot®. If you remove the temperature probe you can silence the alarm by turning the DISPLAY SELECT knob to DISPLAY OFF.



• **Programmable Time Entry for “One Touch” Operation:**

Each of the 10 numbered key pads, on the microwave Key Pad, can be reprogrammed for a single or up to 4 time sequences and at four different % power settings (see 4) (NOTE: % indicates percentage of time magnetron is on, as compared to off, in the cycling of the magnetron).

- 1 Open the microwave door so that the word “Ready” appears in the Time Display Window.
- 2 While the door is open press and HOLD down continuously for 5 seconds on Key Pad #1. After 5 seconds a “beep” will sound and “P:0” will appear in the Time Display Window. You can release the pressure on Key Pad #1.
- 3 Next, select the Key Pad number you wish to program. For example, if you wanted to program Key Pad #3, you would simply press on the #3 and release. The pad number will appear in the Window as well as the factory preset time and power level if less than 100%.
- 4 Press the numbered pad to correspond with the time you want. The new time will appear in the Window. If other than 100% power is desired, select the % power (e.g. example shown to right, 45sec and 20% power) by pressing the appropriate % power pad. It will appear in the Window as follows:

- 0% power = hold (magnetron not operating)
- 20% power = defrost (magnetron operating 20% of the time)
- 50% power = medium (magnetron operating 50% of the time)
- 70% power = med-hi. (magnetron operating 70% of the time)

Pressing the previously selected % pad again toggles back to 100% power.

- 5 Press TIME ENTRY pad, the display briefly shows “P:03⁽¹⁻⁴⁾” indicating programming Pad 3, stage 2. Then the process time and power level for this stage show in display.

- 6 A this point you have two options 1) Press START pad to save the new process times and power levels program into the system memory. P:0 will show in the display. Skip to step 7; or 2) Repeat steps 4 and 5 to create additional stages. (Each numbered keypad has four programmable time and % power sequences. The total time of the four stages can not exceed 240 minutes). After the fourth sequence, START is the only option.
- 7 If another Key Pad is to be programmed, select that pad by pressing its number. Then repeat 4, 5 and 6 until all time and % power sequences have been entered.
- 8 To exit the programming mode press RESET or close the microwave door. "Ready" will be displayed in the Window.

To run the programmed sequence open and close the microwave door if "Ready" does not appear in the Time Display Window. Press the programmed key pad and the process will start. Total sequence time will appear in the display window and start counting down.

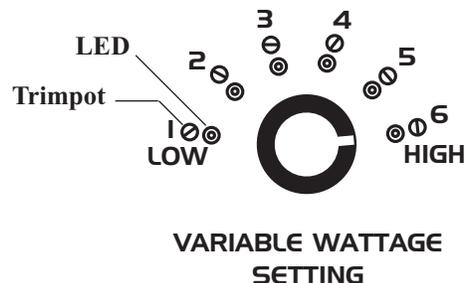
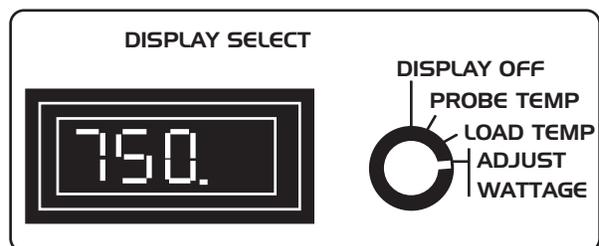
NOTE: The microwave key pad has been designed so that programmed time settings can be written on the microwave control panel to the left of each numbered pad. An indelible marker can be used. Use alcohol on a soft cloth to remove.

Wattage Adjustment/Calibration. Microwave wattage calibration, using the "One Liter Test" is the first step in changing the factory settings. A 1 liter beaker is filled with 1000ml of 20°C (±2°C) tap water. The variable wattage knob is turned to the desired wattage setting (#6 being used for the example below) and the test is conducted as follows:

- 1 The microwave chamber is emptied and only a beaker containing 1000ml of water is placed in the center of the microwave cavity and irradiated at 100% power at the wattage setting chosen for 2 minutes (record the starting water temperature).
- 2 At the end of the 2 minutes the water in the beaker is stirred and the temperature recorded (the first stable temperature, i.e. a constant reading for 3-4 seconds).
- 3 Subtract the starting temperature from the ending temperature and multiply the difference by 35.

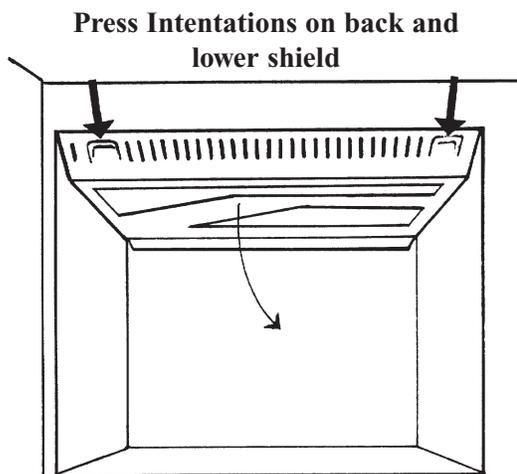
EXAMPLE: 21.6°C difference: $T_{\text{final } 41.6^{\circ}\text{C}} - T_{\text{initial } 20^{\circ}\text{C}} = 21.6 \times 35 = 756\text{W}$

The product (756W) is the delivered wattage from your power source. Repeat the above steps for each of the remaining settings. If the delivered wattage is within 5% of the wattage setting, no adjustment should be made. If an adjustment is necessary, the wattage can be fine-tuned by setting the "Display Select" knob to "ADJUST WATTAGE" thus displaying the power setting. The wattage adjust will only display properly when the temperature restriction setpoint is set above the probe temperature otherwise and erroneous negative number will be displayed. Subtract the delivered power from the power setting displayed and adjusting the pot for that power setting (clockwise = increase, counter clockwise = decrease) to add or subtract the difference to give the desired setting. For example, if the variable wattage setting of 750 watts delivers 775 watts actual power then reduce the displayed setting to 725 watts to achieve the desired 750 watts delivered. Rerun the 1 liter test to confirm.



Care and Maintenance of the PELCO BioWave® 34700

- **Cleaning the Microwave Chamber, Exterior and Door.** Simply wipe with a paper towel or clean with a mild detergent in warm water using a soft sponge or cloth. Be sure to properly “wring” sponge or cloth to remove excess water before wiping unit. Water-pressure cleaning systems should not be used to clean the system interior or exterior. Do Not use abrasive cleansers or cleaners containing ammonia; they might damage the finish. Never pour water into the bottom of the processor.



- **Cleaning the Splatter Shield.** The splatter shield is the white plastic cover located at the top of the microwave interior that keeps the top of the chamber and antenna from getting dirty. Normally, a damp cloth will remove any soil from the shield; however, if you want to clean it more thoroughly, you may wish to remove the splatter shield. Be careful not to bend the antenna when removing the shield. The shield snaps into a lip in the front of the microwave chamber and three slots in the back of the cavity. Place your thumbs in the two indentations in the front of the shield. Press lightly toward the back and carefully lower the shield away from

the antenna. Pull the shield out of the back slots and out of the microwave chamber. NOTE: Be careful not to break the tabs on the back of the shield when removing it. Wash the shield in hot soapy water. Do not wash in a dishwasher. Do not use harsh or abrasive cleansers. When replacing, again be careful not to bend the antenna. To replace, fit shield tabs into the three slots in the top back of the microwave cavity. Lift front until shield snaps into place.

- **Checking Antenna Operation.** Place a glass or cup of water in the microwave chamber, close the door and start the unit. A rotating shadow should be visible above the splatter shield.
- **Changing the Microwave Bulb.** The light bulb for the inside of the microwave chamber can be changed only from the rear outside of the microwave (see Fig. 5). On the upper left hand side of the microwave back is a removable metal plate. The bulb is located behind the metal plate.



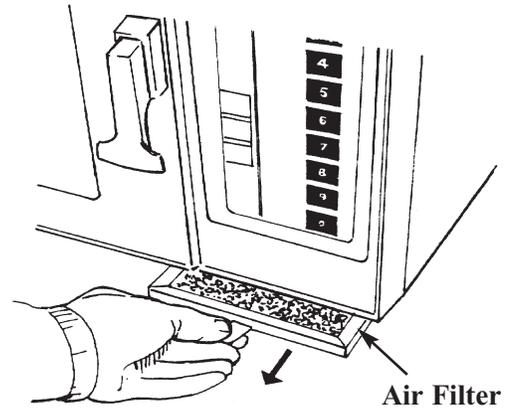
CAUTION: To avoid electrical shock hazard, you must unplug the microwave from the electrical outlet.

The following steps are involved in changing the bulb:



- Remove the screw that retains the plate covering the bulb
- Turn the bulb counter clockwise to remove
NOTE: allow the bulb to cool before trying to remove.
- Replace the bulb with a 40 watt, 220-240V appliance bulb.
- Turn the bulb clockwise to replace.
- Replace plate and screw.
- Connect microwave to power source.

- **Cleaning the Microwave Air Filter.** The filter is located under the unit on the lower right corner. To remove the air filter, grasp the tab and pull down, then slide forward. Wash the filter in detergent and water, then dry and replace.



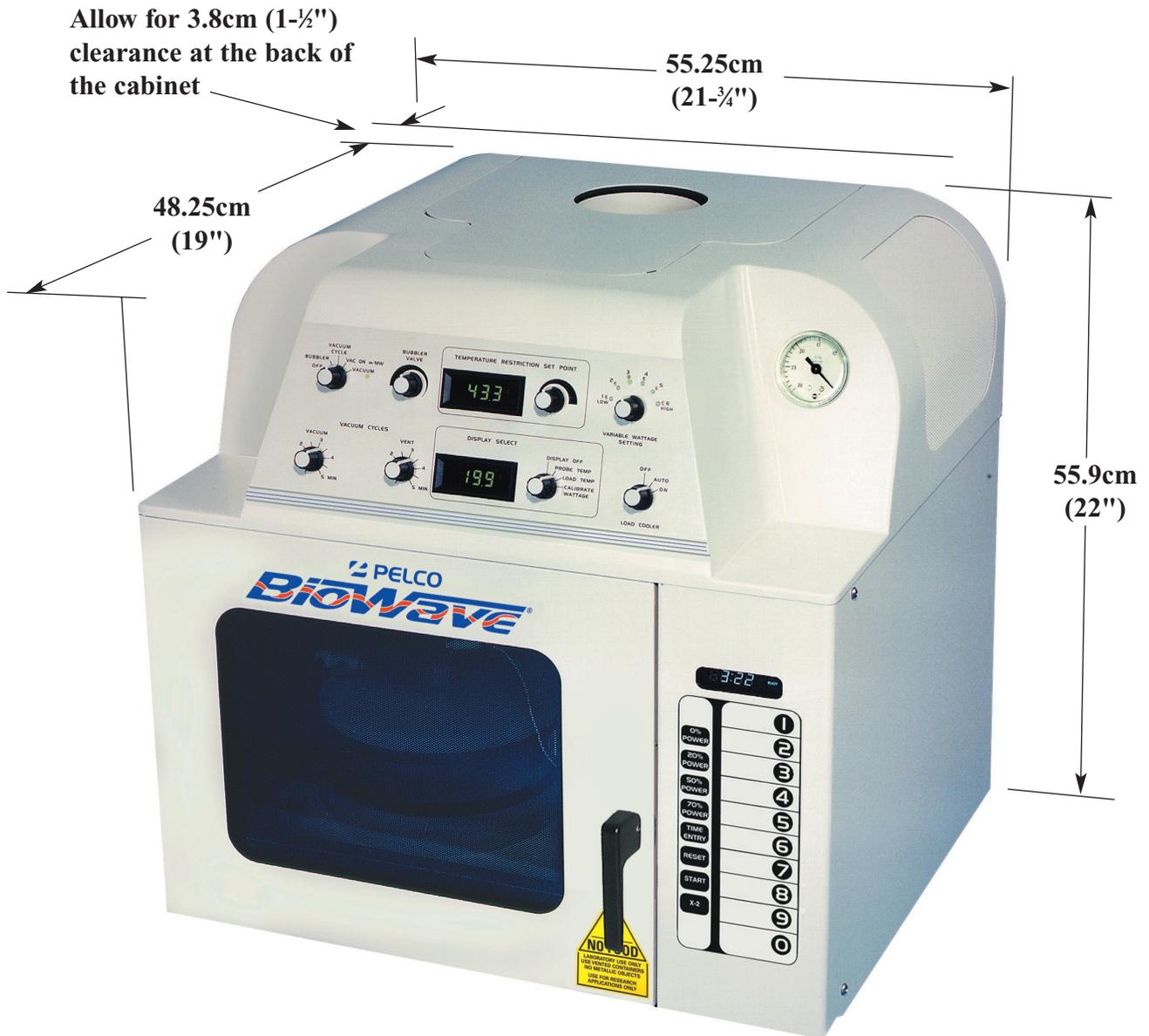


Figure 1 Microwave System, Dimensions and Placement Information

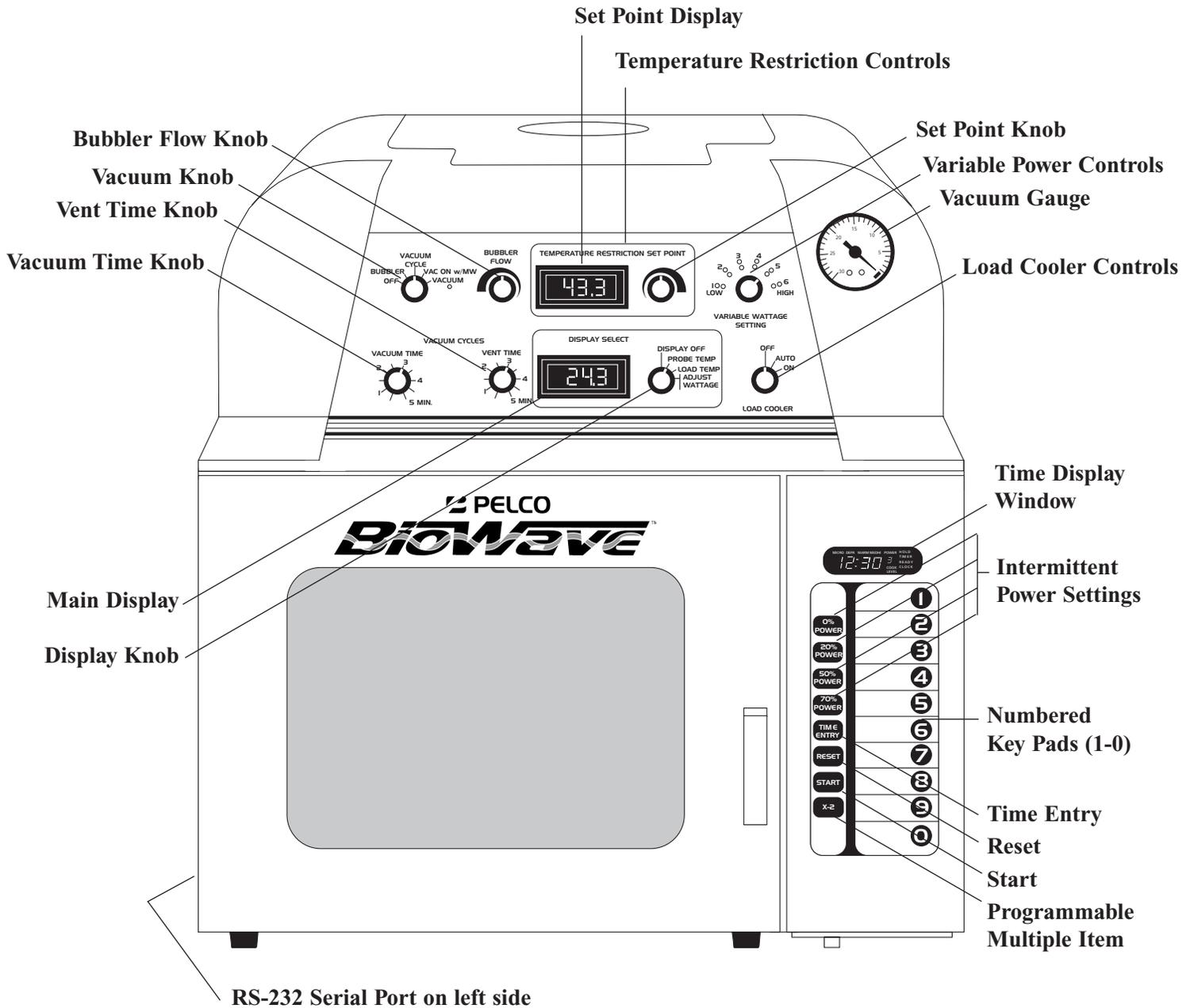


Figure 2 Microwave System, Front View

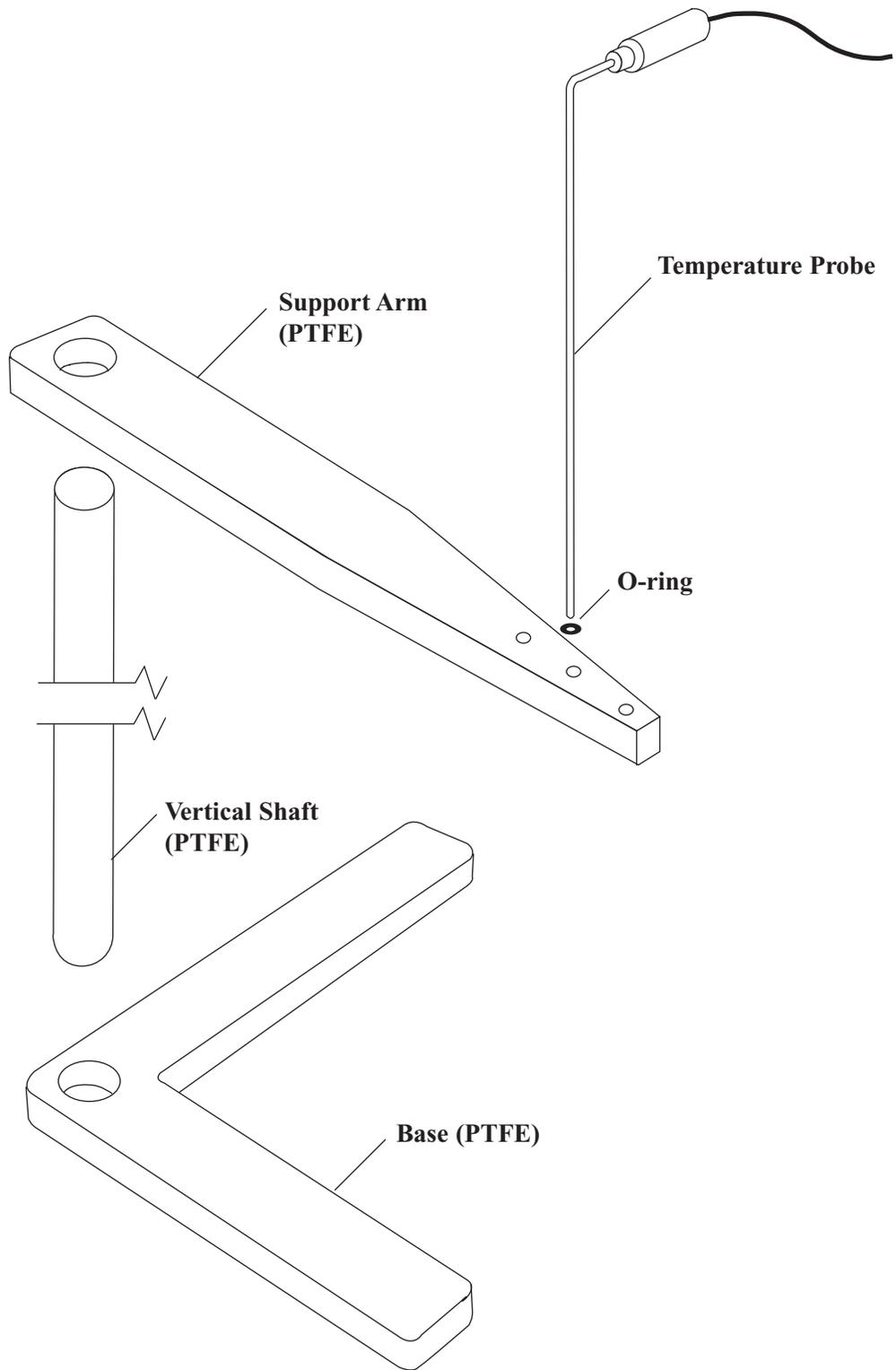
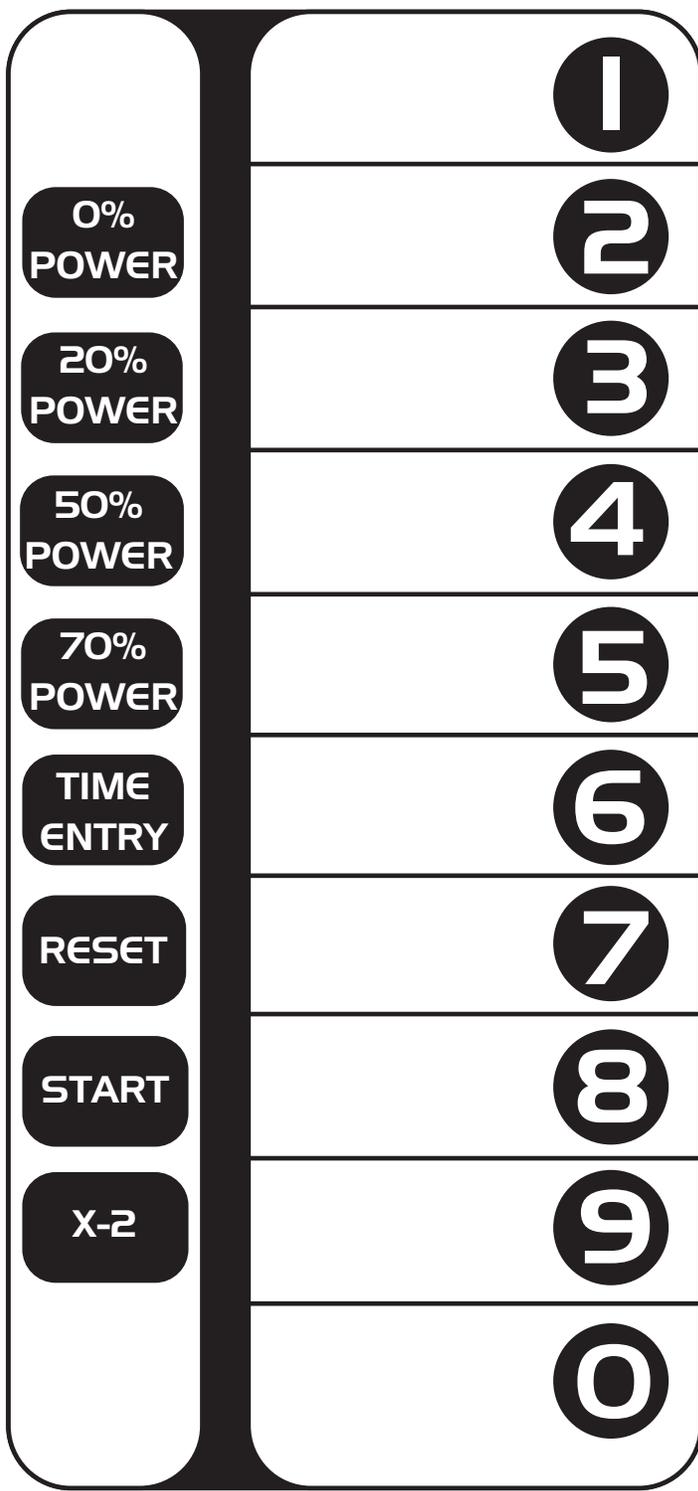


Figure 3 Microwave System, Temperature Probe Stand Assembly



Notes:



Horizontal lines for notes, corresponding to the numeric keypad buttons 1 through 0.

Figure 4 Microwave System, Control Panel

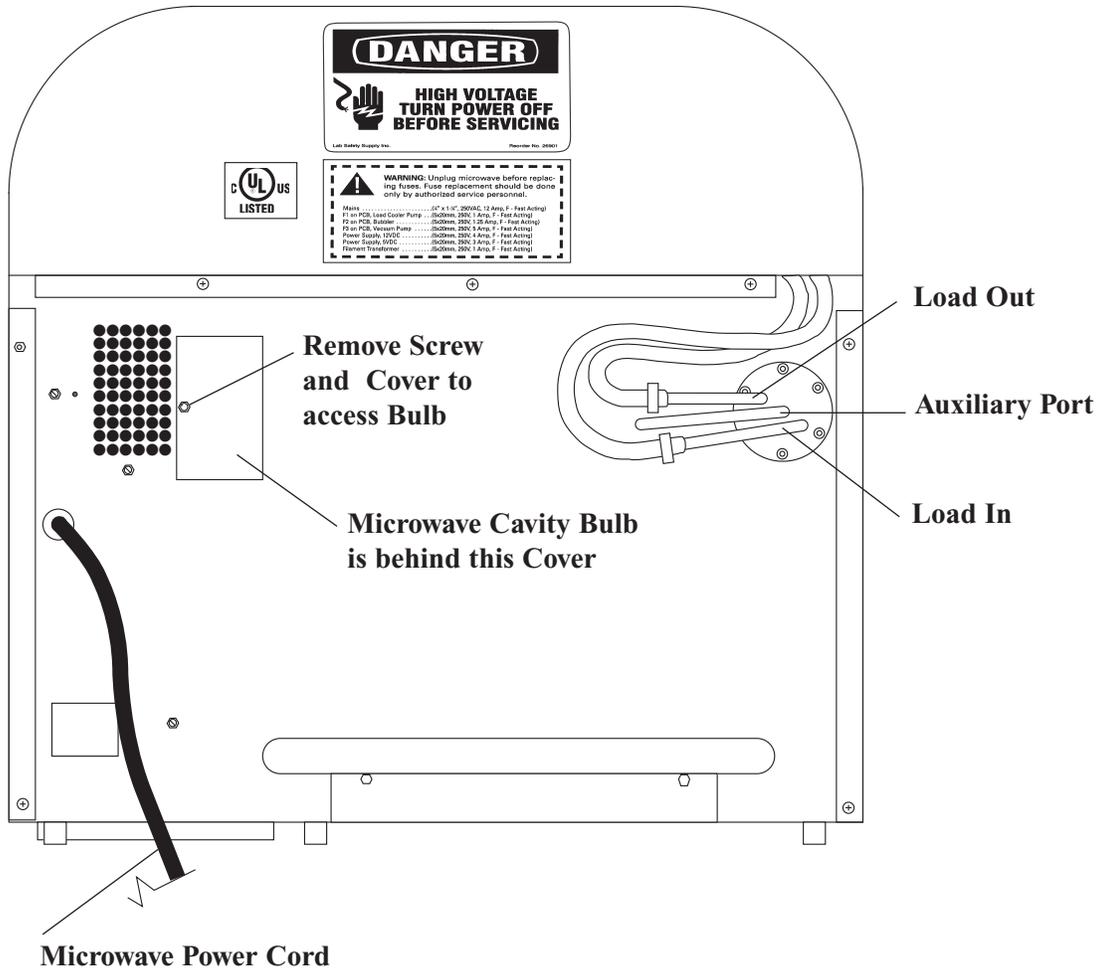


Figure 5 Microwave System, Back View

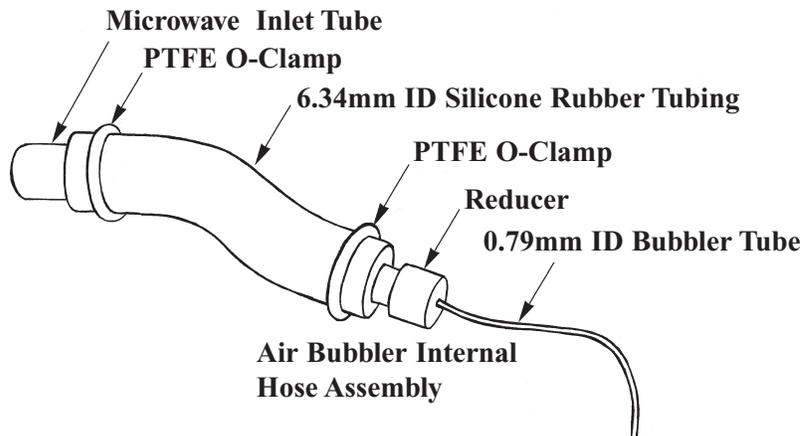


Figure 6 Microwave System, Air Bubbler Hose Assembly

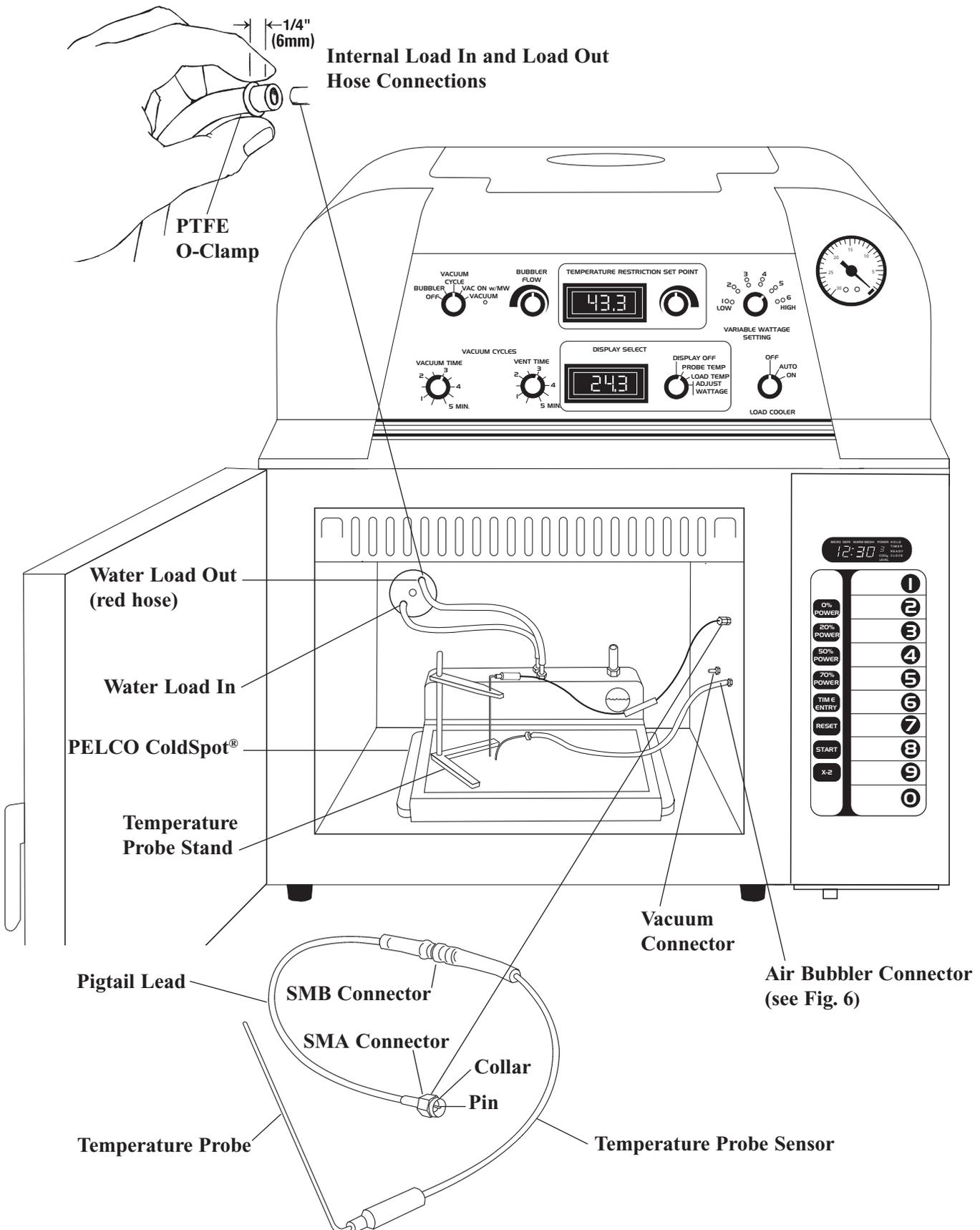


Figure 7 Microwave System, Temperature Probe and Air Bubbler Installation

Appendix A

PELCO ColdSpot®

The PELCO ColdSpot® serves as the water load and processing surface for your tissue samples, slides, slide staining container or other processing protocols.

Features

- Dampens the standing wave patterns generated by the closed cavity design of the microwave
- Simplifies the operation of microwave processing by omitting the need for most microwave calibration
- Offers speed, control and simplicity, a true revolution in microwave processing
- Rests on the floor of any model PELCO® Microwave System, connecting to the PELCO® Load Cooler or PELCO SteadyTemp™.
- Holds cooled water which is continuously circulated between the PELCO ColdSpot® and the Load Cooler
- Designed for use with the PELCO® 3435 Vacuum Chamber (Product No. 3435). The glass surface of the PELCO ColdSpot® can be used as the base for PELCO® Microwave Vacuum Chamber to allow processing of samples directly on the water-cooled surface while under vacuum.
- Can be used with the Sequenza™ Slide Rack (Product No. 36105). Each rack holds ten slides at a time during microwave-assisted staining protocols.

Installation and Operation of the PELCO ColdSpot®.

1. With the PELCO ColdSpot® outside the microwave fill with water until the water level is at the halfway point on the Water Level Window (Figure 8) on the right-rear of the unit. When the unit is filled outside the microwave any spills can be easily dried off prior to placement in the microwave. The halfway point is determined when the unit is sitting flat on a counter. **NOTE:** Remove as many bubbles as possible under the glass plate by lifting the rear of the PELCO ColdSpot® and tapping the front gently on the counter.
2. Attach the two silicon rubber hoses that are supplied with the unit to the “Load-In” and “Load-Out” ports on the inside upper left rear of the microwave chamber. The red hose should be attached to the “Load-Out” port.
3. Place the two hoses into a 600ml beaker filled with at least 400ml of water. Turn the load cooler on and make sure the pump is primed and water is flowing through both hoses.
4. Turn off the load cooler and slide the PELCO ColdSpot® into the microwave cavity so that the beaker can be repositioned on the glass surface of the PELCO ColdSpot® with the water hoses still in the beaker. Attach the hose bringing water into the beaker to the “Load-In” fitting shown on Figure 8. Attach the red hose to the “Load-Out” fitting shown in Figure 8.
5. Turn on the load cooler and lift the end where the hoses are attached to remove any trapped air from under the glass.
6. At the end of operation for the day or when the Load Cooler is turned off, place a 600ml or larger beaker containing approximately 250ml of water back on the PELCO ColdSpot®, disconnect the hoses from the PELCO ColdSpot® fittings and place in the beaker.

7. To resume operation turn on the Load Cooler and check that the water is being recirculated and the lines are again filled with water. Turn off the Load Cooler and reconnect each hose to the correct fitting on the PELCO ColdSpot®. Check the water level in the Water Level Window. The water should be halfway up the window.



WARNINGS

- Never plug the temperature probe port, on the right rear of the PELCO ColdSpot®, with a foreign object during operation. If the port were plugged it could cause pressurization of the system during periods of microwave irradiation.
- Check the level at the Water Level Window with the load cooler running to ensure the correct volume of water is in the unit prior to beginning a microwave protocol.
- If Step #6 of operation instruction is not done at the end of the day or when the Load Cooler is turned off, water will drain back from the system and cause the PELCO ColdSpot® to spill water out of the temperature probe port and into the microwave cavity.
- The PELCO ColdSpot® should never be used without the Load Cooler. The maximum service temperature for the water inside the unit is 50°C. This temperature will not be reached or exceeded with a properly operating Load Cooler.

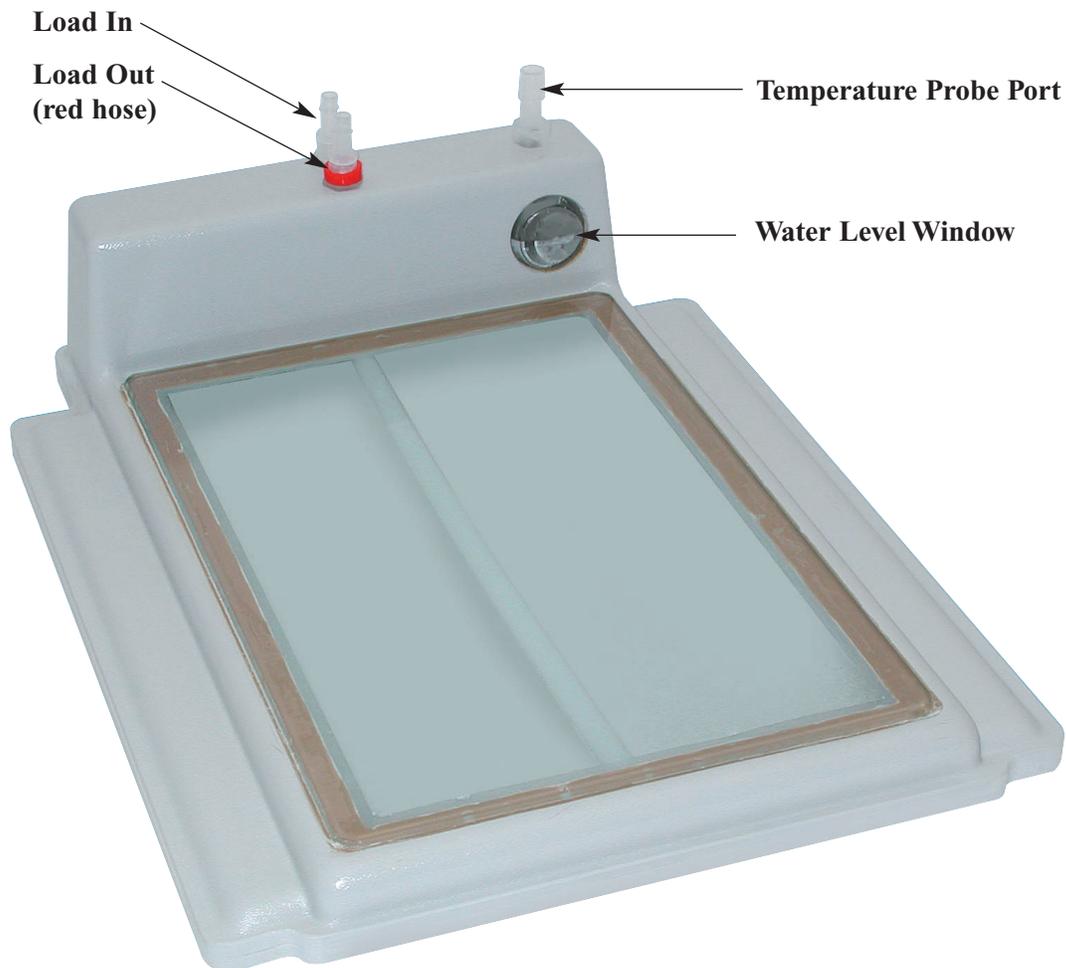


Figure 8 PELCO ColdSpot® with the load ports configured as used with Load Cooler

Patent #6329645

Appendix B

Installation and Operation of the PELCO ColdSpot[®] with a PELCO SteadyTemp[™].

If the PELCO SteadyTemp[™] is not connected to the PELCO BioWave[®], unhook the load cooler tubing lines from the port at the rear of the microwave in order to attach the PELCO SteadyTemp[™] tubing lines. The plastic hose clamps can be removed by pushing or prying the two ends in opposite direction to disengage the teeth. Drain these into a beaker while running the load cooler. Fold each end and crimp with the hose clamp. The Load Cooler controls will no longer provide any function. The Red hose from the PELCO SteadyTemp[™] is then clamped to the top "Load Out" port and the clear hose is clamped to the lower "Load In" port. It will look like Figure 10.

1. The pinch valve must be on the clear "Load In" line. Connect the translucent silicone tube from the "Load-In" port to the front fitting and red silicone tube from the "Load-Out" port to the rear fitting of the PELCO ColdSpot[®]. These require the PTFE O-clamps. The rear fitting draws water from the top of the PELCO ColdSpot[®] reservoir.
2. Fill the PELCO SteadyTemp[™] reservoir with 7.5 liters of water.
3. Set the pinch valve on the supply line to the "6" mark.
4. Press the I/O button on the SteadyTemp[™] to turn it on. This will start circulation of the water into the PELCO ColdSpot[®].
5. Add fluid to the SteadyTemp[™] reservoir as necessary to maintain the water level between the high and low level markers.
6. Adjust the pinch valve after the fluid reaches the "Load Out" return line opening in the PELCO ColdSpot[®] to restrict the supply flow to match the return flow, thus maintaining the desired level. When properly adjusted, the pump inlet will draw an occasional air bubble to prevent overflow. Maximizing the flow rate will optimize the temperature control of the PELCO ColdSpot[®].
7. Set and adjust the temperature as instructed in the PELCO SteadyTemp[™] manual and allow the water to reach that temperature. The maximum operation temperature of the PELCO ColdSpot[®] is 50° C. The PELCO SteadyTemp[™] set point should be below 45° C in order to remain below 50° C during microwave processing. The temperature probe can be placed in the Temperature Probe Port of the PELCO ColdSpot[®] and the temperature restriction set at or below 50° C to protect the PELCO ColdSpot[®] from overheating.



WARNINGS

- The designations of the "Load In" and "Load Out" ports on the PELCO ColdSpot[®] are different when used with the SteadyTemp[™] than when used with a Load Cooler. See Figure 9 and Figure 11 for an explanation.
- Never plug the temperature probe port, on the right rear of the PELCO ColdSpot[®], with a foreign object during operation. If the port were plugged it could cause pressurization of the system during periods of microwave irradiation, damage to the PELCO ColdSpot[®] and flooding in the microwave chamber.
- The Load Cooler controls will no longer provide any function. The user has to make sure the PELCO SteadyTemp[™] is on when operating the PELCO BioWave[®] with the PELCO ColdSpot[®]. The PELCO ColdSpot[®] should never be used without the PELCO SteadyTemp[™]. The maximum service temperature for the water inside the unit is 50°C. The temperature restriction should be set at or below this temperature.
- The PELCO SteadyTemp[™] does have check valves but the user should drain the PELCO SteadyTemp[™] or unplug the PELCO ColdSpot[®] and disable the load in and load out lines by connecting a piece of tubing between them when not in use for any extended period (like overnight) to prevent the possibility of a water spill should the check valves leak. Even a small leak of a few drops per minute will be a large spill after several hours.
- The rated cooling capacity of the PELCO SteadyTemp[™] is 500 watts at 20° C. When used in conjunction with a PELCO[®] microwave, if the power setting of the microwave is 450 watts or higher, the

PELCO SteadyTemp™ will not maintain set point temperature over time. If process times of less than 10 minutes are used, this should not be a factor. If a set point below 20° C is used, the cooling capacity is derated and even lower power settings may be necessary. (See PELCO SteadyTemp™ addendum)

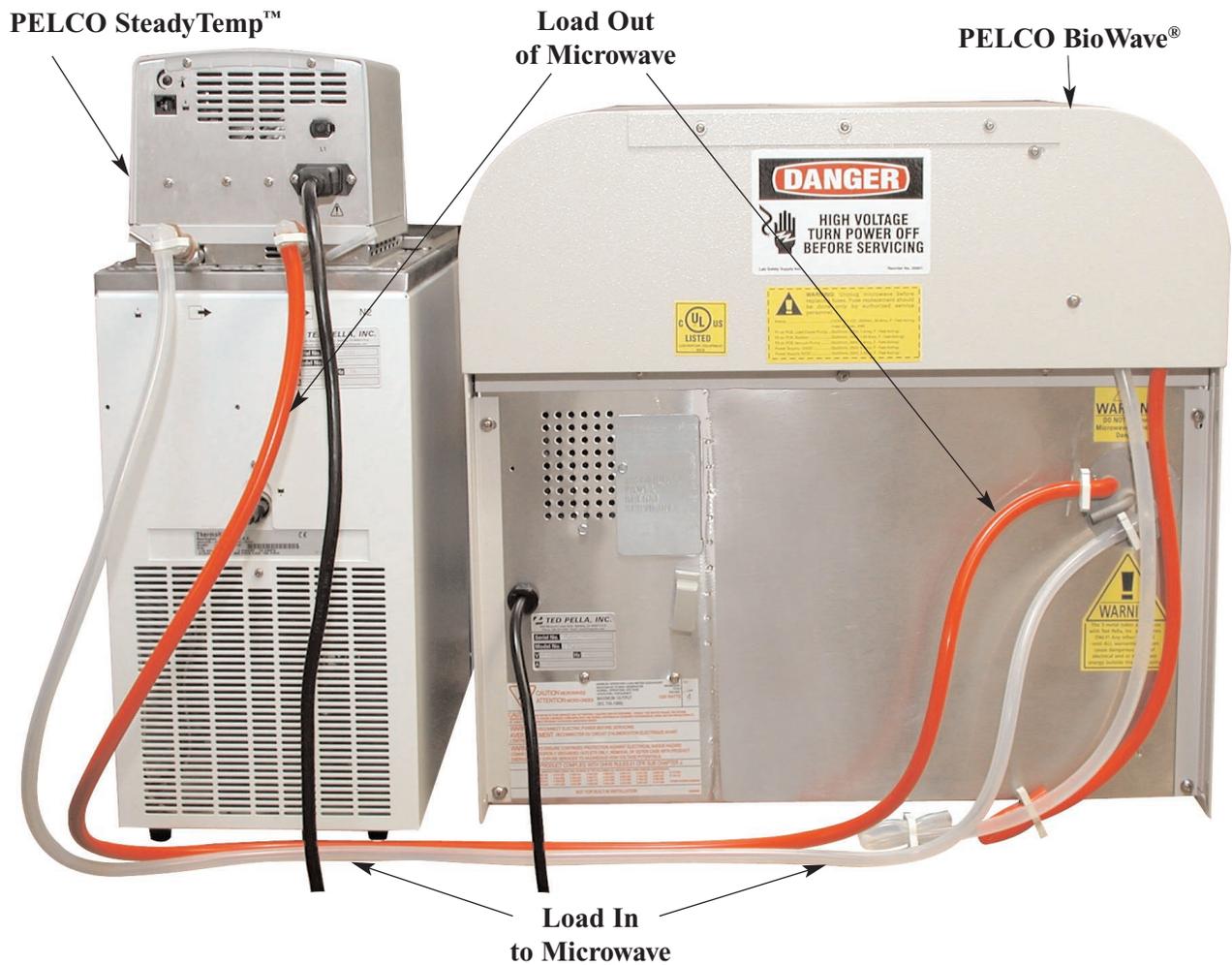


Figure 9 Connections: PELCO SteadyTemp™ to the PELCO BioWave® when using the PELCO ColdSpot®

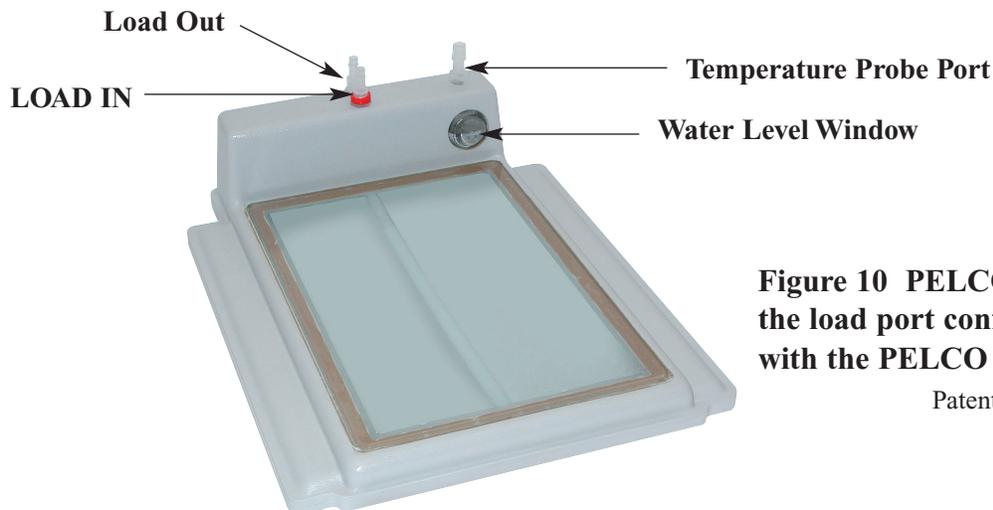


Figure 10 PELCO ColdSpot® with the load port configuration as used with the PELCO SteadyTemp™

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