



# Thermo Scientific Environmental Chamber

## Models 3948 and 3907

Operating and Maintenance Manual 7003948 Rev. 2

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**Table 1.** Models Covered in This Manual

<b>Model</b>	<b>Capacity L/cu. ft.</b>	<b>Voltage</b>
3907	311/11	230V, 50/60Hz
3948	821/29	230V, 50/60Hz

**MANUAL NUMBER 7003948**

2	41195	4/20/17	Updated 3948 electrical schematics	bpg
1	40639	5/9/16	Added risk assessment information	ccs
--	40638	12/7/15	Updates per G Smith (fuses, schematics)	ccs
0	40356/IN-4670	7/6/15	Original	ccs
<b>REV</b>	<b>ECR/ECN</b>	<b>DATE</b>	<b>DESCRIPTION</b>	<b>By</b>



**Important** Read this instruction manual. Failure to read, understand and follow the instructions in this manual may result in damage to the unit, injury to operating personnel, and poor equipment performance. ▲

**Warning** All internal adjustments and maintenance must be performed by qualified service personnel. ▲



- Use this product only in the way described in the product literature and in this manual. Before using it, verify that this product is suitable for the intended use.
- Do not modify system components, especially the controller. Use OEM exact replacement equipment or parts. Before use, confirm that the product has not been altered in any way.
- Disconnect the unit from all power sources before cleaning, troubleshooting, or performing other maintenance on the product or its controls. To disconnect power supply to the incubator, unplug the supply cord at the back of the incubator. Note that turning the key switch on the front control panel to the Off position is not sufficient to disconnect power.

**Warning** The user is responsible for carrying out appropriate decontamination procedures when hazardous materials are spilled on or inside the incubator. ▲

**Caution** If the incubator is not used in the manner specified in this operating manual, the protection provided by the equipment design may be impaired. ▲

Material in this manual is for information purposes only. The contents and the product it describes are subject to change without notice. Thermo Fisher Scientific makes no representations or warranties with respect to this manual. In no event shall Thermo be held liable for any damages, direct or incidental, arising out of or related to the use of this manual.

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Important operating and/or maintenance instructions. Read the accompanying text carefully.



Potential electrical hazards. Only qualified persons should perform procedures associated with this symbol.



Equipment being maintained or serviced must be turned off and locked off to prevent possible injury.



Lifting Hazard Warning. The incubator weighs more than 200lbs (91kgs). Take adequate safety measures when moving this device.

WEEE Compliance: Thermo Fisher Scientific has contracted with companies for recycling/disposal in each EU Member State. For further information, send email to [weee.recycle@thermofisher.com](mailto:weee.recycle@thermofisher.com).

- ✓ Always use the proper protective equipment (clothing, gloves, goggles, etc.)
- ✓ Always dissipate extreme cold or heat and wear protective clothing.
- ✓ Always follow good hygiene practices.
- ✓ Each individual is responsible for his or her own safety.

## Do You Need Information or Assistance on Thermo Scientific Products?

If you do, please contact us 8:00 a.m. to 6:00 p.m. (Eastern Time) at:

1-740-373-4763	Direct
1-800-438-4851	Toll Free, U.S. and Canada
1-877-213-8051	FAX
<a href="http://www.thermofisher.com">http://www.thermofisher.com</a>	Internet Worldwide Web Home Page
<a href="mailto:service.led.marietta@thermofisher.com">service.led.marietta@thermofisher.com</a>	Tech Support Email Address
<a href="http://www.unitylabservices.com">www.unitylabservices.com</a>	Certified Service Web Page

Our **Sales Support** staff can provide information on pricing and give you quotations. We can take your order and provide delivery information on major equipment items or make arrangements to have your local sales representative contact you. Our products are listed on the Internet and we can be contacted through our Internet home page.

Our **Service Support** staff can supply technical information about proper setup, operation or troubleshooting of your equipment. We can fill your needs for spare or replacement parts or provide you with on-site service. We can also provide you with a quotation on our Extended Warranty for your Thermo Scientific products.

Whatever Thermo Scientific products you need or use, we will be happy to discuss your applications. If you are experiencing technical problems, working together, we will help you locate the problem and, chances are, correct it yourself...over the telephone without a service call.

When more extensive service is necessary, we will assist you with direct factory trained technicians or a qualified service organization for on-the-spot repair. If your service need is covered by the warranty, we will arrange for the unit to be repaired at our expense and to your satisfaction.

Regardless of your needs, our professional telephone technicians are available to assist you Monday through Friday from 8:00 a.m. to 6:00 p.m. Eastern Time. Please contact us by telephone or fax. If you wish to write, our mailing address is:

Thermo Fisher Scientific (Asheville) LLC  
401 Millcreek Road, Box 649  
Marietta, OH 45750

International customers, please contact your local Thermo Scientific distributor.

## Warranty Notes

### **Information You Should Know Before Requesting Warranty Service**

- **Locate the model and serial numbers.** A serial tag is located on the unit itself.
- For equipment service or maintenance, or with technical or special application inquiries, contact Technical Services at 1-800-438-4851 or 1-740-373-4763 (USA and Canada). Outside the USA, contact your local distributor.

### **Repairs NOT Covered Under Warranty**

- **Calibration of control parameters.** Nominal calibrations are performed at the factory; typically  $\pm 1^{\circ}\text{C}$  for temperature,  $\pm 1\%$  for gases, and  $\pm 5\%$  for humidity. Our service personnel can provide precise calibrations as a billable service at your location. Calibration after a warranty repair is covered under the warranty.
- **Damage resulting from use of improper quality water, chemicals or cleaning agents detrimental to equipment materials.**
- **Service calls for improper installation or operating instructions.** Corrections to any of the following are billable services:
  - 1) electrical service connection
  - 2) tubing connections
  - 3) gas regulators
  - 4) gas tanks
  - 5) unit leveling
  - 6) room ventilation
  - 7) adverse ambient temperature fluctuations
  - 8) any repair external to the unit
- **Damage resulting from accident, alteration, misuse, abuse, fire, flood, acts of God, or improper installation.**
- **Repairs to parts or systems resulting from unauthorized unit modifications.**
- **Any labor costs other than that specified during the parts and labor warranty period, which may include additional warranty on CO<sub>2</sub> sensors, blower motors, water jackets, etc.**

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## Section 1 Installation and Set-Up

Locate the unit on a firm, level surface in an area of minimum ambient temperature fluctuation. A minimum of 152.4mm (6 inches) clearance is required at the top and back of the incubator plus minimum 76.2mm (3 inches) clearance on the sides. This space is necessary to allow adequate airflow around the refrigeration system. At least 203mm (8 inches) clearance above the cabinet is required for service access.

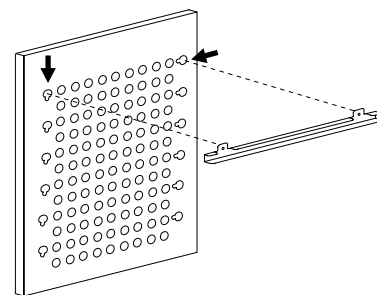
### Preliminary Cleaning and Disinfecting

Disinfect all interior surfaces with a general-use laboratory disinfectant, such as quaternary ammonium, to remove any residues that may remain from production of the incubator. Rinse thoroughly with sterile water, then spray with 70% alcohol. Dry with a sterile cloth as needed.

**Caution** Before using any cleaning or decontamination method except those recommended by the manufacturer, users should check with the manufacturer that the proposed method will not damage the equipment. ▲

### Installing the Shelves

The shelves may be installed at any level in the incubator. Install a shelf channel on each side. With the tabs pointing up, attach the channel by locating the rivet into a slotted hole, far end first. Pull the channel toward the front and slide the front rivet on the channel into the slotted hole and press down. Make sure that the channels are opposite each other so that the installed shelf will be level.



**Figure 1-1.** Install Shelf Channel

### Leveling the Unit

Place a bubble-type level on a shelf inside the incubator. Adjust the feet as needed; counterclockwise to lengthen or clockwise to shorten. Level the unit front-to-back and left-to-right.

## Installing the Wall Anchors

This unit has two wall anchor studs located on the left and right side of the cabinet. Use the provided 5/16" bolts to secure the wall anchors to each side of the cabinet top. Anchors that connect between the cabinet sides to facility wall are customer supplied.

**Warning** To prevent tipping, install the wall anchors and secure the unit before using.

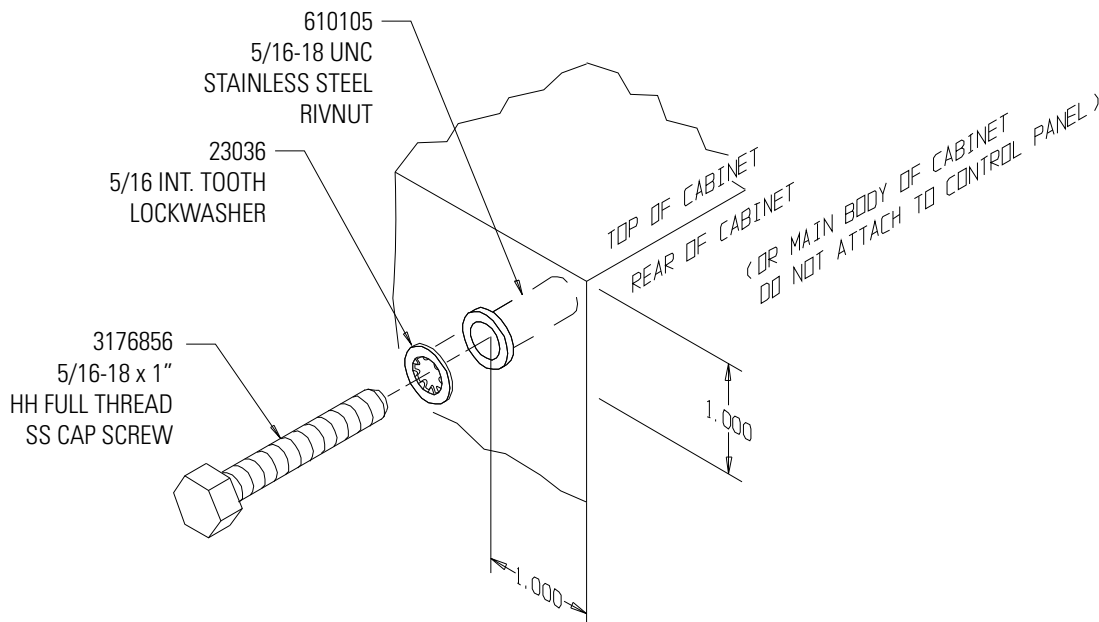


Figure 1-2. Typical Wall Anchor Installation for Both Sides

## Connect Water Inlet for Humidity System

The humidity reservoir will require approximately 0.710 liter (3 cups) of water on the initial filling. For best operation of the incubator, sterilized distilled, demineralized or de-ionized water should be used in the humidity reservoir. Water purity should be in the resistance range of 50K to 1M Ohm/cm, or a conductivity range of 20.0 to 1.0 uS/cm. Refer to ASTM Standard D5391-93 or D4195-88 for measuring water purity.

Distillation systems, as well as some types of reverse osmosis water purity systems, can produce water in the quality range specified. Tap water is not recommended as it may contain chlorine, which can deteriorate the stainless steel. Tap water may also have a high mineral content, which would produce a build-up of scale in the reservoir. High purity or ultra pure water is not recommended as it is an extremely aggressive solvent and will deteriorate the stainless steel. High purity water has a resistance of above 1M to 18M Ohm. Even high purity water can contain bacteria and organic contaminants. Water should always be sterilized or treated with a decontaminant, safe for use with stainless steel as well as safe for the product, prior to being introduced into the humidity reservoir.

## Connect Water Inlet for Humidity System (cont.)

**Caution** Distilled or de-ionized water used in the humidity reservoir must be within a water quality resistance range of 50K to 1M Ohm/cm to protect and prolong the life of the stainless steel. Use of water outside the specified range will decrease the operating life of the unit and may void warranty. ▲

The water inlet is the 1/8" FPT connection located on the rear top center of the incubator. For pressurized systems, water inlet pressure must not exceed 2,76bar (40 psi). A manual shut-off valve should be installed between the main water supply and the incubator. Also provided is a water strainer that can be connected at the back of the cabinet if desired.

**Caution** To prevent mineral buildup on humidity generator walls, it may be necessary to clean the humidity generator with a non-metallic abrasive pad and flush thoroughly every two to three months. Refer to Section 4, Cleaning the Humidity Steam Generator. ▲

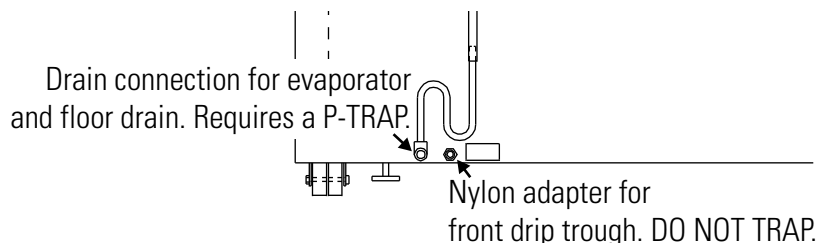
## Alternate Water Supply for Humidity System

If an in-house water supply of the required purity range (50K to 1M Ohm) is not available, an alternate water supply method can be used. A large vented carboy 18,9 liter minimum (5 gal.) of water in the required purity range can be placed on top of the unit. The provided 1/4" hose barb fitting should be used to connect it to the 1/8" FPT water inlet fitting, located on the rear top center of the incubator.

**Note** The maximum water consumption of this incubator could be as high as 7,6 liter (2 gal.) per day. When using an alternate water supply method, it is recommended that the supply be checked periodically based on source volume. ▲

## Attaching Drain Connections

The cabinet's 3/8" MPT drain connection is located on the back (lower left side) of the cabinet (Figure 1-3). A P-trap is included with the unit and must be installed on the connection.



**Figure 1-3.** P-Trap Installation Location

## Attaching Drain Connections (cont.)

To install the drain connection:

1. Using Teflon pipe thread tape, tape the threads on the cabinet drain connection.
2. Using an open end adjustable wrench, install the P-trap onto the connection. Make sure the trap section is positioned down.
3. Push a piece of 3/8" ID tubing onto the trap and direct the tubing to a convenient drain. Install a hose clamp on the tubing, if desired. A condensate evaporator (P/N 1900031) or condensate pump (P/N 184062) may also be used.

To connect the nylon adapter from the front drip trough, **do not** install a p-trap on the nylon adapter (Figure 1-3). Push a piece of 3/8" ID tubing onto the nylon adapter and direct the tubing to a convenient drain. Install a hose clamp on the tubing, if desired.

## 4-20 Milliamp Output

The environmental chamber is equipped with 4-20mA output for the remote transmission of temperature, humidity and CO<sub>2</sub> data. A terminal strip is located on the back of the incubator for convenience. Refer to Figure 1-4 for terminal pin identification.

1	2	3	4	5	6	7	8	9	10
+	-	+	-	Common	N.O.	N.C.	+	-	
4-20		4-20		Remote Alarm			4-20		4-20
Temperature		Humidity		30V 1A max.			CO <sub>2</sub>		
4-20mA		4-20mA					4-20mA		
(-20 to 80C)		(0 to 100%)					(0 to 20%)		

**Figure 1-4.** Terminal Pin Identification

## Remote Alarm Contacts

Remote alarm connections are also included on the terminal strip (Figure 1-4) providing Normally Open (N.O.) and Normally Closed (N.C.) contacts. C is the Common terminal. The remote alarm will activate when either the incubator's temperature, humidity, or CO<sub>2</sub> go out of the set alarm limits.

## Power Connection

See the serial tag on the side of the unit or the Specifications section for electrical specifications. Refer to the electrical schematics at the end of this manual.

These units come standard with a European plug - CEE (7) VII, IEC 60884, to be connected to a grounded dedicated electrical circuit.

## Start-Up

When the humidification system is operational, the incubator may be started. Preset the controls as follows:

Overtemp Safety Thermostat . . . . . Fully Clockwise  
Undertemp Safety Thermostat . . . Fully Counterclockwise  
Main Power Switch . . . . . ON  
Humidity Controller . . . . . Desired Setpoint  
Temperature Controller . . . . . Desired Setpoint  
Door Heater . . . . . 40% (factory set)

## Set the Overtemp Safety Thermostat

For best overall performance of the incubator, the refrigeration switch should be turned On for most applications. When running Low or No humidity at high temperatures, the refrigeration switch may be turned Off.

**Caution** The defrost switch must be set to “Auto” when the temperature setpoint is 10°C or below. ▲

Allow the chamber temperature and humidity to stabilize then set the overtemp safety thermostat as follows:

1. Turn the overtemp control knob slowly counterclockwise until the audible alarm sounds and the overtemp indicator lights.
2. Turn the overtemp control knob clockwise at least 2°. The alarm should be silenced and the overtemp indicator light should go out. The overtemp safety thermostat is now set a few degrees above the control temperature setpoint. When the chamber temperature rises to the overtemp control point, the alarm system will activate, power to the heaters will shut off, and the chamber temperature will be maintained at the overtemp control point.

When an overtemp condition occurs, the cause must be determined and corrected before normal operation under the main temperature controller can be resumed.

**Note** When the chamber temperature control setpoint is changed, the overtemp safety thermostat must be reset to accommodate the change. ▲

**Note** The overtemp control is not directly calibrated. The numbers on the dial are for reference only. ▲

## Set the Undertemp Safety Thermostat

Allow the chamber temperature and humidity to stabilize, then set the undertemp safety thermostat as follows:

1. Turn the undertemp control knob slowly clockwise until the audible alarm sounds and the undertemp indicator lights.
2. Turn the undertemp control knob counterclockwise at least 2° on the scale. The alarm will silence and the undertemp indicator light go out.

The undertemp safety thermostat is now set a few degrees below the control temperature setpoint. When the chamber temperature drops to the undertemp control point, the alarm system activates, power to the compressor shuts off, and the chamber temperature is maintained at the undertemp control point.

When an undertemp condition occurs, the cause must be determined and corrected before normal operation under the main temperature controller can be resumed.

**Note** When the chamber temperature control setpoint is changed, the undertemp safety thermostat must be reset to accommodate the change. ▲

**Note** The undertemp control is not directly calibrated. The numbers on the dial are for reference only. ▲

## 6 inch 7 Day Recorder Option

If installed, the circular chart recorder is located on the front of the incubator cabinet and is protected by a glass door.

- Single pen 152.4mm (6 in.) - 7 day recorder factory installed P/N GT201144 and customer installed P/N GT201145.
- Dual pen 152.4mm (6 in.) - 7 day recorder factory installed P/N GT201146 and customer installed P/N GT201147

## 6 inch 7 Day Recorder Option (cont.)

To prepare the recorder for operation, open the glass door and snap the connector onto the 9V battery (Figure 1-5). If the unit is operating, the green LED lights steady. If the unit is not turned on, the LED blinks.

If the battery is weak or not connected, the green LED will flash. If power is lost to the cabinet, the LED will also flash. When replacing the 9V battery, use only an alkaline style battery. Dispose of the old battery following established environmental practices.

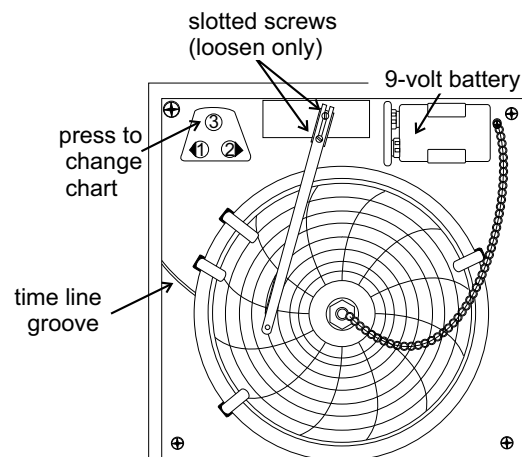


Figure 1-5. Install Battery In Recorder

## Change the Chart Paper

1. Press the Change Chart button (#3) and hold it for 1 second until the pen begins to move to the left of the chart. See Figure 1-4.
2. Remove the existing chart by unscrewing the center knob securing it.
3. Install the new chart, positioning it so that the correct time line coincides with the time line groove on the chart plate.
4. Replace the center knob and screw it tightly against the chart.

## Change the Pen

1. Using a small flat blade screwdriver, loosen the 2 screws holding the pen arm and remove the pen and arm as an assembly.
2. Unsnap the plastic hinge securing the pen. Remove and discard the old pen.
3. Install the new pen by snapping the hinge securely around the pen arm.
4. Re-install the pen assembly by sliding the pen arm under the screws, positioning the pen tip in the time line groove. Tighten the screws.
5. Push the Chart Change button and hold it for 1 second until the pen begins to move back onto the chart.

**Note** Make sure that the pen is marking on the chart. It may be necessary to gently lift the pen onto the chart paper. ▲

## Access Control Panel w/ Left Door Swing

1. After making sure the unit is not connected to power, disconnect the door plug from the lower left corner of the control panel. Just allow it to hang, still connected to the door.
2. Remove the two screws from the top and the two screws on the bottom, of the control panel. Retain them for re-assembly.
3. Pull gently on the left side of the control panel to disengage it from the tabs. You may need to lift slightly to swing open the panel.

## IR CO<sub>2</sub> Option

This section applies to units with the IR CO<sub>2</sub> option only.

### Connect the CO<sub>2</sub> Source

For the most economical use, the liquid CO<sub>2</sub> supply tanks should be without siphon tubes, so that only CO<sub>2</sub> gas enters the incubator injection system. Two tanks may be joined together with a manifold to ensure a continuous CO<sub>2</sub> supply.

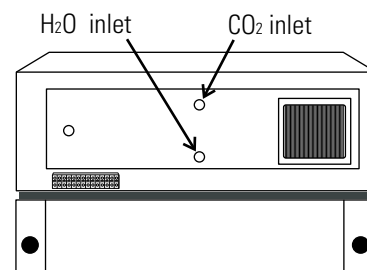
Install a two-stage pressure regulator, with indicating gauges, at the supply cylinder

The high-pressure gauge should have an indicating range of 0 to 2000 psig to monitor tank pressure. The low-pressure gauge should have an indicating range of 0 to 30 psig to monitor input pressure to the incubator injection system. A suitable two-stage pressure regulator is available.

The CO<sub>2</sub> source must be regulated at a pressure level of 15,  $\pm 5$  psig. Higher pressure levels may damage the CO<sub>2</sub> control system. The user should determine the most economical pressure level, between 10 and 20 psig appropriate for the desired CO<sub>2</sub> percentage in the chamber. Use only sufficient pressure to maintain recovery time after door openings.

To connect the CO<sub>2</sub> supply (Figure 1-6):

1. Connect the CO<sub>2</sub> tubing to the 1/4" hose fitting installed in the CO<sub>2</sub> inlet.
2. Check the tubing connection for leaks.



**Figure 1-6.** Inlet Connections



## Set the CO<sub>2</sub> Content

The Watlow CO<sub>2</sub> controller's upper display shows the actual CO<sub>2</sub> content inside the chamber. The lower display shows the CO<sub>2</sub> setpoint.

Before setting the CO<sub>2</sub> content, allow the chamber temperature and humidity to stabilize. Do not open door during the stabilization period.

To set the CO<sub>2</sub> content (0% to 20%), press the Up or Down Arrow keys on the Watlow PM6 Controller.

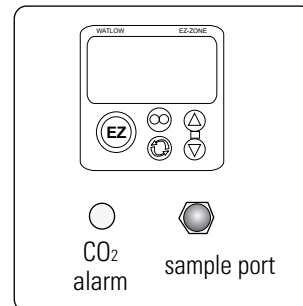


Figure 1-7. Watlow PM6 Control

## CO<sub>2</sub> Control and Indicators

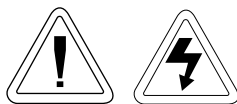
**Sample Port** - The sample port is used for checking CO<sub>2</sub> percentage in the incubator chamber by an independent test instrument (such as with a Fyrite, or similar CO<sub>2</sub> test instrument).

**Caution** To prevent CO<sub>2</sub> loss, the sample port must be capped when it is not in use. ▲

**CO<sub>2</sub> Alarm** - The CO<sub>2</sub> alarm is factory set to activate when the chamber CO<sub>2</sub> content deviates from configured alarm set points (see configuration record). When a CO<sub>2</sub> alarm occurs, the CO<sub>2</sub> Alarm indicator on the control panel lights and the audible alarm sounds.

The CO<sub>2</sub> alarm high and low setpoints are established through the Watlow PM6 CO<sub>2</sub> controller (A.LO, and A.HI). Refer to the Configuration Record included at the end of Section 4.

## Accessory Outlet



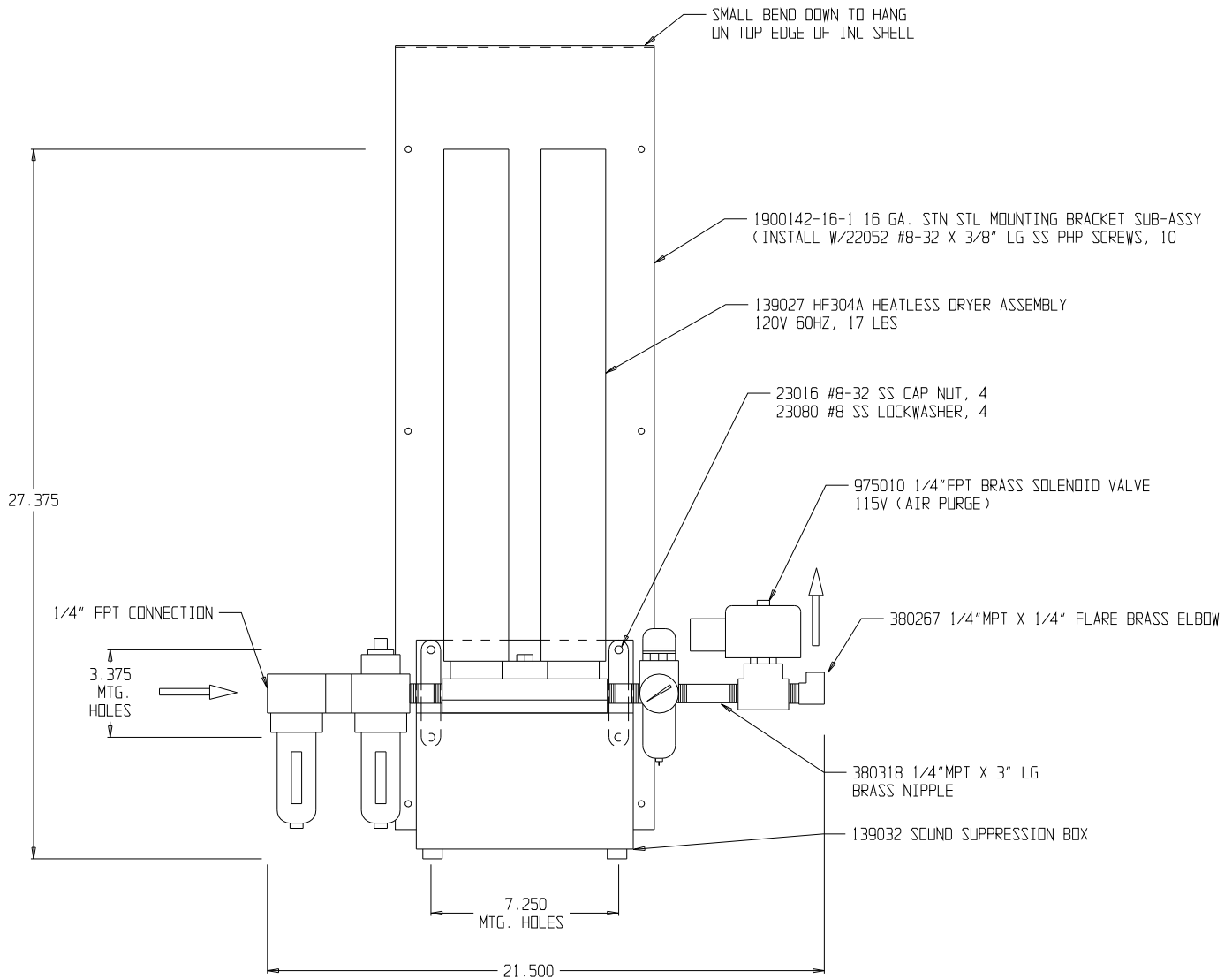
The 230V accessory outlet is powered by an independent line cord, thus will be energized whenever its line cord is connected to a power source. Any devices using the accessory outlet must be approved to operate in the environment the cabinet is set to control. Additionally, the outlet is capable of providing up to 16A at 230V.

## Heatless Dryer (Optional)

**Note** Cabinets with factory installed heatless driers are tested and calibrated at 30°C/30% RH. It is recommended that cabinets are re-calibrated when set parameters are changed to another temperature and/or humidity set point.

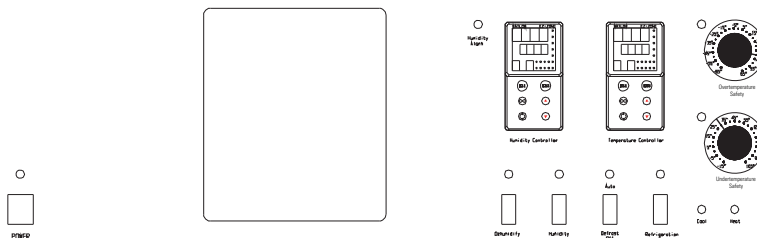
The Heatless Dryer is a factory installed option. If your unit includes this option, the oil removal filter will need to be installed. The filter is shipped in a separate box, wrapped in bubble wrap with the manual. It has a ½ inch female pipe thread inlet and outlet.

1. The heatless dryer requires an air supply of 6,2 bar (90 psi) capable of 7,0 m<sup>3</sup>/h (10 cfm), at minimum. It is recommended that the air supply be greater than the minimum required by the dryer. This air supply is to be provided by the user. The connection is a ¼ inch female pipe thread.
2. Install the required oil removal filter between the customer air supply and the connection to the heatless dryer assembly. Refer to Figure 1-8.



**Figure 1-8.** Heatless Dryer Assembly

## Section 2 Start-Up and Operation

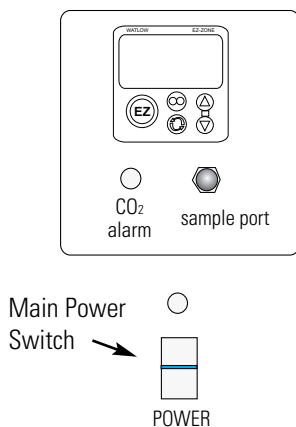


**Figure 2-1.** Control Panel

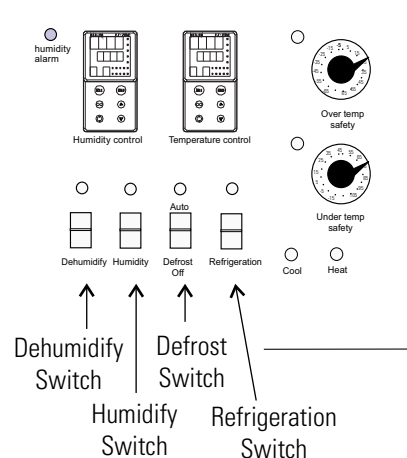
### Control Panel

#### Main Power Switch and Indicator Light (Figure 2-2)

The main power switch controls power to the incubator. The main power indicator lights when the power switch is on and the unit is receiving power.



**Figure 2-2.** Main Power



**Figure 2-3.** Switches

#### Refrigeration Switch and Indicator Light (Figure 2-3)

The refrigeration switch controls power to the refrigeration system. The refrigeration indicator lights when the refrigeration switch is on and the compressor is receiving power.

## Control Panel (continued)

### Defrost Switch and Indicator Light (Figure 2-3)

The defrost switch controls power to the defrost system. Setting the defrost switch to Auto will provide two 15-minute defrost cycles during a twenty-four hour period. The defrost indicator lights when the defrost switch is on and the incubator is in a defrost cycle.

**Caution** The defrost switch must be set to Auto when the temperature setpoint is 10°C, or below. ▲

### Humidity Switch and Indicator (Figure 2-3)

The humidity switch controls the power to the humidification system circuit. The humidity indicator light will cycle as the controller toggles between humidify and dehumidify.

### Dehumidify Switch and Indicator (Figure 2-3)

The dehumidify switch is used with the optional heatless dryer P/N 1900139 to provide dehumidification. The heatless dryer injects dry air into the incubator chamber as needed, to maintain humidity levels. When controlling humidity, the dehumidification switch should be in the ON position for most applications. The dehumidification light will cycle on and off as the humidity controller toggles between humidify and dehumidify.

### Heat Indicator (Figure 2-4)

The Heat Indicator illuminates when the heater activates.

### Cool Indicator (Figure 2-4)

The Cool Indicator illuminates when the refrigeration system activates.

### Overtemp Safety Control, Indicator Light & Audible Alarm (Figure 2-4)

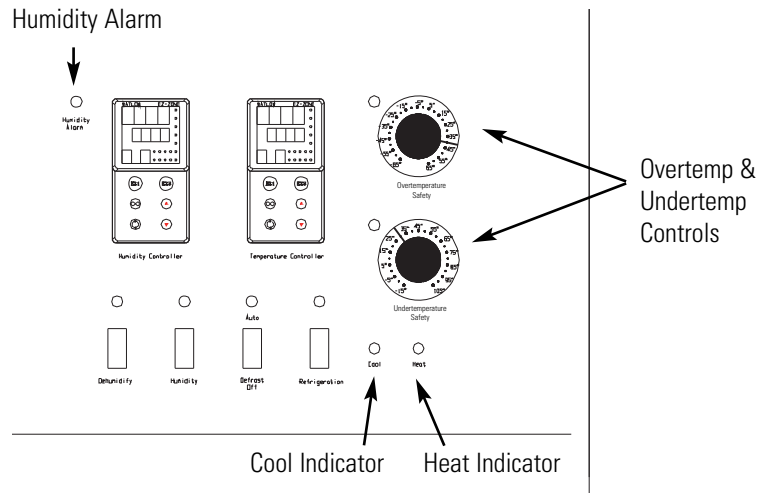
The overtemp safety thermostat should be set slightly above the operating temperature of the incubator. In the event of an overtemp condition, the overtemp safety thermostat:

- Activates the audible alarm and the overtemp indicator light.
- Interrupts power to the heaters and maintain the incubator's cabinet temperature at the overtemp safety control point.

**Note** The overtemp control is not directly calibrated. The numbers on the dial are for reference only.

If an overtemp condition occurs, the alarm can only be silenced by raising the overtemp safety thermostat setting. However, the cause of the problem must be determined and corrected before normal operation under the main temperature controller is resumed.

## Control Panel (continued)



**Figure 2-4.** Indicators and Controls

### Undertemp Safety Control, Indicator Light and Audible Alarm (Fig. 2-4)

The undertemp safety thermostat should be set slightly lower than the operating temperature of the incubator. In the event of an undertemp condition, the undertemp safety thermostat will:

- Activate the audible alarm and the undertemp indicator light.
- Interrupt power to the refrigeration system and maintain the incubator's cabinet temperature at the undertemp safety control point.

**Note** The undertemp control is not directly calibrated. The numbers on the dial are for reference only.

If an undertemp condition occurs, the alarm can only be silenced by lowering the undertemp safety thermostat setting. However, the cause of the problem must be determined and corrected before normal operation under the main temperature controller is resumed.

### Audible Humidity Alarm and Indicator Display (Figure 2-4)

The humidity alarm is a function of the humidity controller (Figure 2-4). When the cabinet humidity goes outside the set parameters of the controller, "4" indicator on the controller lights, the audible alarm sounds, and the humidity alarm indicator on the control panel lights. The alarm can be silenced by pressing either EZ key.

## Control Panel (continued)

**Note** The humidity controller's high and low limits are factory-set at 100% and 0%. Therefore, the system will go into the alarm state when the humidity exceeds these percentages by one percent. When operating the incubator near these high or low humidity levels, frequent alarms may occur. This will require that the controller's high or low limit be reset to three or four percent over the high limit or three or four percent under the low limit. Refer to the Watlow User's guide provided. Refer also to the factory configuration records located at the end of Section 4 of this manual. ▲

### Set the Operating Temperature

The Watlow temperature controller's upper numerical display shows the actual temperature inside the incubator chamber. The lower display shows the temperature setpoint.

To raise or lower the setpoint, press the Up or Down Arrow. Temperatures are set in 0.1°C increments.

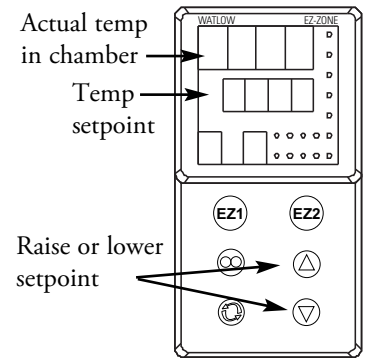


Figure 2-6. Changing Temp

### Set the Operating Humidity

The Watlow humidity controller's upper numerical display shows the actual humidity inside the incubator. The lower display shows the humidity setpoint.

To raise the setpoint, press the Up or Down Arrows. Humidity is set in one percent increments.

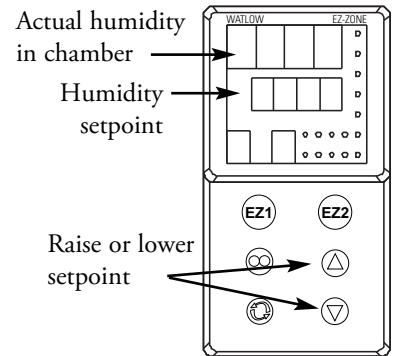


Figure 2-7. Changing Humidity

## **Air Exchange Ventilator Caps**

Air exchange for the incubator is regulated through the manually adjustable intake and exhaust ventilator caps located on the top of the cabinet. When viewed from the front of the incubator, the intake cap is on the left and the exhaust cap is on the right. The ventilator caps may be opened by turning counterclockwise, and closed by turning clockwise.

For optimum performance of the unit, the vent caps should be closed at all times.

## **Set Up the Heatless Dryer (Optional)**

The optional heatless dryer (P/N 1900139) provides dehumidification for the incubator chamber (oil removal filter must be installed and an air supply connected - Section 1). The dehumidify switch must be turned On for the dryer to operate. The dryer is controlled with the humidity controller and will purge dry air into the incubator as needed to maintain the control set point.

**Note** Cabinets with factory installed heatless driers are tested and calibrated at 30°C/30% RH. It is recommended that cabinets are re-calibrated when set parameters are changed to another temperature and/or humidity set point.

## Section 3 Routine Maintenance

**Warning** De-energize all potential sources of energy to this unit and lockout/tagout their controls. (O.S.H.A. Regulation, Section 1910-147.) ▲

The continued cleanliness of the stainless steel used in this unit has a direct effect on the appearance and operation of the unit. Use the mildest cleaning procedure that will do the job effectively. Clean the outside of the incubator with soap and water or with any non-abrasive commercial spray cleaner. Clean the inside of the chamber with alcohol and/or soap and water. Disinfect the interior panels with a general use laboratory disinfectant, such as quaternary ammonium, diluted according to the manufacturer's instructions. Rinse the surface thoroughly after each cleaning and wipe the surfaces dry. Always rub in the direction of the finish polish lines.

**Caution** Do not use chlorinated solvents on stainless steel as they can cause rusting and pitting. ▲

**Caution** Do not use volatile or aromatic solvents for cleaning inside the cabinet as their residue can contaminate the cabinet environment. ▲

**Warning** It is the responsibility of the user to immediately clean up after all accidental spills of hazardous materials. Be certain to follow local EHS policies with regards to personal protective equipment, cleaning, and disposal. ▲

The Thermopane glass door may be cleaned with commercial glass cleaner or with a solution of ammonia and water.

### Maintaining the Humidity Generator

Depending on the quality of water used in the humidification system, it may be necessary to clean the humidity generator every 2 to 3 months. Refer to Section 4 for cleaning instructions.



## Preventive Maintenance for Environmental Chambers

Your equipment has been thoroughly tested and calibrated before shipment. Regular preventive maintenance is important to keep your unit functioning properly. The operator should perform routine cleaning and maintenance on a regular basis. For maximum performance and efficiency, it is recommended that the unit be checked and calibrated periodically by a qualified service technician. We have qualified service technicians, using NIST traceable instruments, available in many areas. For more information on Preventive Maintenance or Extended Warranties, contact Technical Services.

The following is a condensed list of preventive maintenance requirements. See the specified section of the instruction manual for further details. Cleaning and calibration adjustment intervals are dependent upon use, environmental conditions and accuracy required.

### Tips for all incubators:

- Do NOT use bleach or any disinfectant w/ high chlorine content.
- Use sterile, distilled or demineralized water.
- Avoid spraying cleaner on the CO2 sensor.
- Do not use powdered gloves for tissue cultures.

See Manual Section	Action	Yearly	2 Years	5 Years	6 Years
--	Inspect the inner and outer door latches and hinges for proper operation and excessive mechanical wear; inspect the line cord insulation and inner door silicone gasket for chips and cracks. Replace as required.	✓			
3	Check air exchange ventilator caps for adjustment; open or close as required	✓			
4	Perform a complete decontamination procedure. Wipe down interior, shelves, side panels with disinfectant. Rinse everything well with sterile water.	Before first use, after every service call and between experiments to prevent cross contamination <i>More frequent decontamination may be required, depending on use and environmental conditions.</i>			
5	Verify and document all calibrations, minimum.	✓			
5	Inspect and clean the humidity generator, minimum. *	✓			
--	Clean drip pan and drain lines	✓			
--	Clean refrigeration system condenser	✓			
--	Verify defrost cycle for below 10°C operation	✓			
--	Change filters (under normal conditions)	✓			
--	Replace filter elements on the dryer, if applicable. †	✓			
--	Rebuild solenoid valves on the dryer, if applicable. †		✓		
--	Replace/repack desiccant towers on dryer, if applicable. †			✓	
--	Replace check valve and o-rings on dryer, if applicable. †				✓

\* Qualified service personnel only - Regular monitoring routines of the various levels in your unit is encouraged.

† Refer to Puregas Dryer manual included in shipping box.

## Section 4 Service

**Caution** Service must be performed by qualified service personnel only! ▲

**Warning** De-energize all potential sources of energy to this unit and lockout/tagout their controls. ▲

### Access Electrical Components

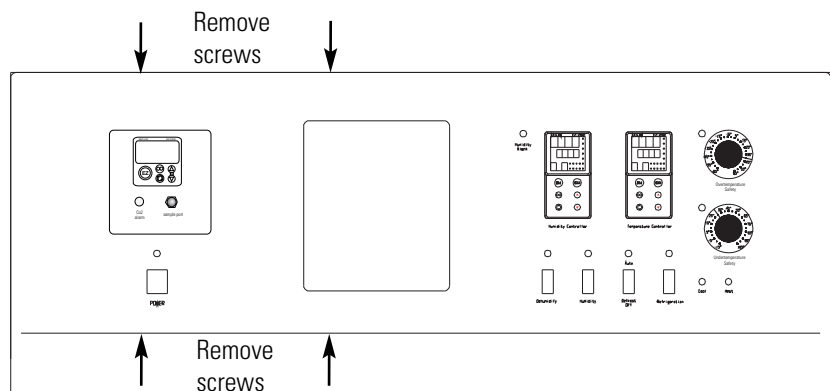
To gain access to the electrical components, remove the two screws located on the left side of the control panel with a Phillips screwdriver. The control panel is hinged and will swing open.

### Fuse Replacement

Fuse replacement should be performed by qualified service personnel only. See enclosure drawing 3948-71-1-D for fuse location and type.

### Over/Undertemp Probe and Thermostat

1. Remove the incubator top right side air dam by removing the screws holding it in place.
2. Remove the top three screws from the top of the right duct cover.
3. Lean the duct sheet out, and remove the Permagum seal from around the probe access hole.
4. Remove the 15" copper capillary overtemp probe by extracting two plastic clips that hold the probe in place.
5. Open the control panel by removing the four screws located on the top and bottom of the control panel.



**Figure 4-1.** To Open Control Panel

## Over/Undertemp Probe and Thermostat (cont.)

6. Pull the probe up through the access hole and into the control panel.
7. Follow the wires from the probe to the thermostat mounted on the control panel. Clip the plastic ties holding the overtemp cable to the existing wiring.
8. Pull the overtemp knob on the control panel off.
9. Remove the two screws that hold the overtemp assembly to the control panel.
10. Disconnect the two wires from the back of the thermostat assembly.
11. Pull the entire assembly from the panel, and remove the unit.
12. Replace the thermostat and probe.
13. Re-assemble in reverse order.

**Note** Reseal probe access hole with Permagum and tie-wrap overtemp cable to existing wires after replacing probe. ▲

## Humidity/Temp Sensor

1. Follow Steps 1-6 from 'Over/Undertemp Probe and Thermostat' section to locate and remove the probe from the chamber.
2. Clip any plastic ties securing the probe wiring. Disconnect the probe.
3. Install the replacement probe in the chamber. When replacing the humidity sensor, be sure to mount the probe at the same angle as originally mounted.
4. Route the probe wire through the access hole into the control housing.
5. Connect the probe to the appropriate controller wiring.
6. Reseal the probe access hole with Permagum and tie-wrap the probe wire to existing wires.

# Program Humidity/ Temp Controllers

The Watlow temperature and humidity controllers have been set at the factory to operate the incubator within the specifications listed in the Specifications section of this manual. Reference copies of the Watlow configuration records are included at the end of this section.

To prevent tampering, software lockouts are employed in the system. These lockouts must only be removed by persons skilled in configuring controller software.

**Caution** Re-programming either the temperature or humidity controllers alters the factory defaults and will seriously alter the performance of the incubator. This may also void the warranty. Do not re-configure the controllers without first consulting the Technical Services Department. ▲

## Remove Software Lockout

1. Press the Advance and Infinity keys at the same time and hold them for about six seconds. The word “Fcty” (factory) will appear in the bottom display. If numbers in the bottom display begin to scroll up or down, the keys have not been pressed simultaneously. Try again.
2. Press the Up Arrow until “LoC” (lock) appears in the upper display. The word “Fcty” will remain in the lower display (Figure 4-2).
3. Press the Advance key to scroll through the menus as follows:

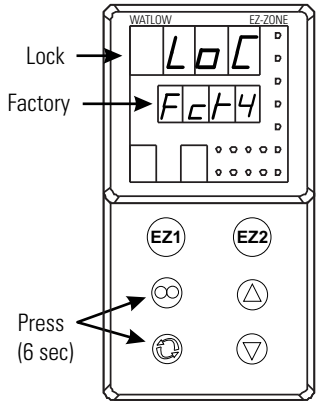


Figure 4-2. Displays

Lower display	Upper display	Keystrokes
LoC.o	1	Change to 3 = unlocked
LoC.P	1	No changes required
PAS.E	1	No changes required
rLoC	1	Change to 5 = unlocked
SLoC	1	Change to 5 = unlocked

## Restore Software Lockout

To turn the software lockout back On:

1. Set Lock values back to previous setting. See 'Remove Software Lockout' above.

## Controller Configuration

The Watlow PM Temperature and Humidity Controllers have been configured at the factory. Copies of the Watlow Configuration records are included at the end of this section.

**Caution** Do not re-configure the controller without first consulting the Technical Services department. ▲

## Offset Calibration (Temp/Humidity)

It may be necessary to calibrate the temperature or humidity controllers to match an independent temperature or humidity sensor. To do so, follow the next few steps.

1. Perform the "Remove Software Lockout" procedure in this section.
2. Suspend an independent, calibrated sensor(s) in the center of the interior chamber.
3. Allow approximately 30 minutes for the incubator to stabilize.
4. Press Up and Down Arrow keys simultaneously for 3 seconds. The word "OPER" appears in the lower display.
5. Press Down Arrow until "Ai" appears in the upper display.
6. Press the Advance key until "i.CA" appears in the lower display. Press Up or Down Arrow key to either add or subtract an offset value. This value is the difference between the actual value shown on the controller, and the reference sensor value.
7. Press the Infinity key until the display reverts to normal operation.
8. Perform the 'Restore Software Lockout' procedure in this section.

## Replace Optional Recorder and Probe(s)

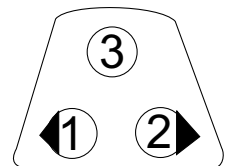
1. Open the incubator door, and locate the probe mounting plate attached to the center of the right interior wall. Remove the mounting plate.
2. The recorder probe is attached to the lower end of the back of the mounting plate. Remove the probe by carefully sliding it out of the housing.
3. Remove the screws securing the right side air dam.
4. Remove the top three screws on both edges of the right duct sheet.
5. Lean the duct sheet out in order to remove the Permagum seal from around the probe access hole.
6. Remove the four screws located on the top and bottom of the control panel and open the control panel door. Remove any Permagum from around the access hole.
7. Pull the probe(s) carefully up through the hole.
8. Follow the probe cable(s) to the back of the recorder, and carefully clip any plastic ties holding the cable(s) to other wiring.
9. Remove the four screws securing the recorder and pull it carefully out from the front of the control panel.
10. Replace the recorder with the correct part.

**Note** When replacing the recorder and probe(s), retie the probe cable(s) to the existing wires. ▲

## Calibrate the Recorder

Place an accurate thermometer(s) in the chamber next to the recorder's probe(s). After about three minutes, compare the thermometer with the chart recorder. For 2 pen operations, also compare the second thermometer.

**Note** For 2 pen operations, first select the pen to be calibrated. Hold down the #1 arrow for the red (#1) pen or the #2 arrow for the blue (#2) pen (Figure 4-3), until the light goes out. Adjust as necessary.



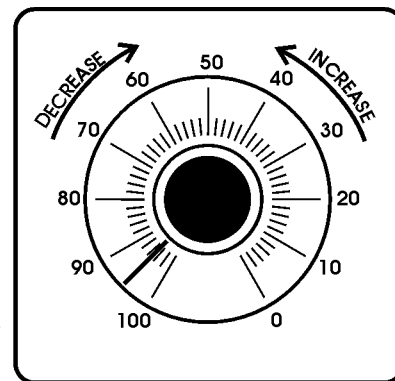
**Figure 4-3.** Arrows

If an adjustment is necessary, press either the #1 or #2 arrow to move pen left or right. The arrow must be held about five seconds before pen begins to move. Release the arrow when pen matches thermometer.

## Set Door Heater Control

**Warning** High voltage is present behind control panel. Servicing must be performed only by qualified electrical service personnel. ▲

The infinite heater control is located in the left side of the incubator top compartment behind the control panel door. The control varies the amount of door heat from no heat (zero) to full heat (100) as indicated by the dial face. If the knob is turned past zero, a “click” indicates that all power to the door is shut off. If turned past 100, a similar “click” indicates that the heat is set at maximum.



**Figure 4-4.** Door Heater Control

Initially, the units leave the factory with the dial set at 40. If desired, the amount of heat can later be reduced until moisture appears on the door, then the heat advanced. However, in fluctuating ambient conditions, it is recommended that a minimum of 40% door heat be used.

## Clean/Adjust Steam Generator

Depending upon the quality of water used in the humidification system, it may be necessary to clean the humidity steam generator (P/N 1900190) every 2 to 3 months.

### Materials Required:

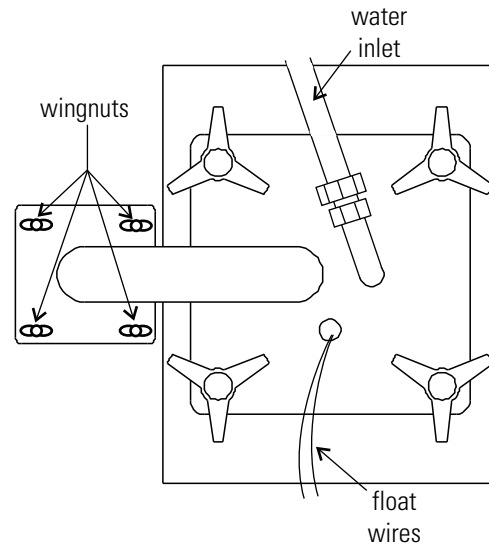
- 6-foot stepladder
- Flat and Phillips screwdrivers
- 11/32 Nutdriver or wrench
- Laboratory disinfectant
- 9/16 Open end wrench
- 1/2 Open end wrench
- Sponge & cleaning materials

**Warning** De-energize all potential sources of energy to this unit and lockout/tagout their controls. ▲

1. Remove all contents from the incubator, turn it off, and disconnect from power source.
2. Turn off the valve supplying the sterile distilled water.

## Clean/Adjust Steam Generator (continued)

3. From the stepladder, remove the eight screws securing the top of the incubator cabinet.
4. When the steam generator has cooled, remove the four thumbscrews and wingnuts (Figure 4-5).



**Figure 4-5.** Access to Steam Generator

5. Disconnect water inlet from steam generator.

**Warning** The internal temperature of the steam generator is hot enough to boil water. Make certain sufficient time is allowed for the unit to completely cool before removing the top. ▲

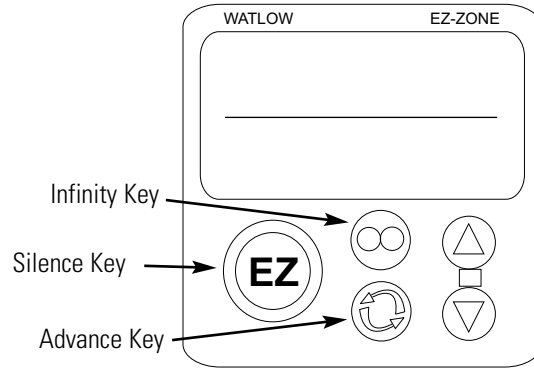
6. Lift the top off the steam generator and set it aside.
7. Loosen the four nuts holding the front cover and remove it. Mark the top of heater location for future reference. Unsnap the two toggle clamps on the heater.
8. Remove the can through the top of the steam generator, taking care not to spill water out of the can. Empty the water. Clean the can with a good quality laboratory detergent and disinfectant. Do not use any type of chloride cleaner. A bristle brush may be needed for stubborn rust and scale. Also clean the inside of the steam tube using a test tube brush. Repeat cleaning with soap and water as necessary.
9. Re-assembly in reverse order. Replace the cabinet top and return incubator to service.



## CO<sub>2</sub> Controller Calibration

If it should become necessary to calibrate the CO<sub>2</sub> controller, perform the procedures on Pages 4-3 through 4-4.

Start from the standard operating display (setpoint in bottom display, actual CO<sub>2</sub> reading in the upper display).



**Figure 4-6.** Key Locations

<b>TEMPERATURE CONFIGURATION RECORD (WATLOW PM8)</b>									
MODELS:	3907, 3911, 3913, 3920, 3940, 3948 & 3949								
JOB NUMBER:	_____								
UNT SERIAL NUMBER:	_____								
CONTROL TYPE:	Temperature								
PREPARED BY:	GLS	DATE	24-Sep-2012						
<u>Operations Page: (Press "UP" &amp; "DN" keys for 3 sec.)</u>									
<b>Ai:</b>	Ai 1		Ai 2		§ = AC.Pu in version 10 firmware				
	§(Ain)	---	§(Ain)	---					
	i.Er	*	i.Er	nSrc					
	i.CA	@	i.CA	@					
<b>Lnr:</b>	Lnr 1		Lnr 2						
	Su.A	*	Su.A	*					
	oFSt	@	oFSt	@					
	o.u	*	o.u	*					
<b>Pu:</b>	Pu 1		Pu 2						
	Su.A	*	Su.A	*					
	oFSt	@	oFSt	@					
	o.u	*	o.u	*					
<b>dio:</b>	dio 5		dio 6						
	di.S	oFF	do.6	oFF					
	Ei.S	iACt							
<b>Mon:</b>	C.MA	Auto	C.Pr	*	Pu.A	*			
	h.Pr	*	C.SP	*					
<b>Loop:</b>	r.En	no	Aut	no	h.Pb	2.3	td	12	
	C.M	AUto	C.SP	*	c.Pb	1.3	db	0.0	
	A.tSP	90	id.S	23.9	ti	90	o.SP	0.0	
<b>ALM:</b>	ALM 1		ALM 2		ALM 3		ALM 4		
	A.Lo	-20.0	A.Lo	32.0	A.Lo	32.0	A.Lo	32.0	
	A.hi	34.0	A.hi	300.0	A.hi	300.0	A.hi	300.0	
	<sup>1</sup> (A.St)	*	<sup>1</sup> (A.St)	*	<sup>1</sup> (A.St)	*	<sup>1</sup> (A.St)	*	
<b>P.StA:</b>	P.Str	1	Ent1	oFF	JC	0			
	P.ACr	nonE	Ent2	oFF					
(P.AtA group parameters are for Ramp/Soak programming only)									
<u>Setup Page: (Press "UP" &amp; "DN" keys for 6 sec.)</u>									
<b>Ai:</b>	Ai 1			Ai 2					
	SEn	rO.IH	dEC	0.0	SEn	oFF	<sup>1</sup> (i.CA)	@	
	rt.L	3	<sup>1</sup> (i.CA)	@	FiL	0.5	<sup>1</sup> (Ain)	*	
	FiL	2.0	<sup>1</sup> (Ain)	*	i.Er	oFF	<sup>1</sup> (i.Er)	*	
	i.Er	oFF	<sup>1</sup> (i.Er)	*	dEC	0			
<b>Lnr:</b>	Lnr 1		Lnr 2		(All other parameters at default values)				
	Fn	oFF	Fn	oFF					
<b>Pu:</b>	Pu 1		Pu 2						
	Fn	oFF	Fn	oFF					
	FiL	0.0	FiL	0.0					
<b>dio:</b>	dio 5		dio 6						
	dir	otPt	dir	otPt					
	Fn	oFF	Fn	oFF					

<b>TEMPERATURE CONFIGURATION RECORD (WATLOW PM8)</b>								
<b>MODELS:</b>		3907, 3911, 3913, 3920, 3940, 3948 & 3949						
<b>JOB NUMBER:</b>		_____						
<b>UNT SERIAL NUMBER:</b>		_____						
<b>CONTROL TYPE:</b>		Temperature						
<b>PREPARED BY:</b>		GLS	DATE	24-Sep-2012				
<hr/>								
<b>LooP:</b>	h.Ag	Pid	<sup>1</sup> (db)	0.0	L.dE	no	SP.hi	100.0
	C.Ag	Pid	t.tUn	no	rP	oFF	<sup>1</sup> (o.SP)	0.0
	C.Cr	oFF	<sup>1</sup> (A.tSP)	90	L.SP	-20.0	<sup>1</sup> (C.M)	AUto
	<sup>1</sup> (h.Pb)	2.3	t.Agr	Cr it	h.SP	60.0		
	<sup>1</sup> (c.Pb)	1.3	P.dL	0.0	<sup>1</sup> (C.SP)	*		
	<sup>1</sup> (ti)	90	UFA	USEr	<sup>1</sup> (id.S)	23.9		
	<sup>1</sup> (td)	12	FAiL	USEr	SP.Lo	-100.0		
<hr/>								
<b>otPt:</b>	otPt 1		otPt 2		otPt 3		r.Lo	-20.0
	Fn	CooL	Fn	hEAt	o.ty	MA	r.hi	80.0
	o.tb	30.0	o.Ct	Ftb	Fn	rMt	o.CA	@
	o.Lo	0	o.tb	5.0	r.Sr	Ai		
	o.hi	100	o.Lo	0	Fi	1	otPt 4	
			o.hi	100	S.Lo	4.00	Fn	ALM
					S.hi	20.00	Fi	1
<hr/>								
<b>ALM:</b>	ALM 1		ALM 1		ALM 1		ALM 2	
	A.ty	Pr.AL	A.Sd	both	A.Si	oFF	A.ty	oFF
	Sr.A	Ai	<sup>1</sup> (A.Lo)	-20.0	A.dSP	oFF	ALM 3	
	iS.A	1	<sup>1</sup> (A.hi)	34.0	<sup>1</sup> (A.dL)	0	A.ty	oFF
	A.hy	0.6	A.LA	nLAt	<sup>1</sup> (A.St)	*	ALM 4	
	A.Lg	ALC	A.bL	oFF			A.ty	oFF
<hr/>								
<b>FUn:</b>	FUn 1		FUn 2					
	LEv	high	LEv	high				
	Fn	nonE	Fn	nonE				
	Fi	0	Fi	0				
<hr/>								
<b>gLbL:</b>	C_F	C	gSE	oFF	C.LEd	both	d.ti	0
	AC.LF	60	Si.A	5	ZonE	oFF	USr.S	nonE
	r.tyP	ti	Si.b	6	ChAn	oFF	USr.r	nonE
	P.tyP	StPt	Pot i	0	d.PrS	1		
<hr/>								
<b>CoM:</b>	Ad.S	1	MAP	1	nU.S	yES		
<hr/>								
<b>rtC:</b>	hoUr	@	Min	@	doW	@		
<hr/>								
<b>Factory Page: (Press "Infinity" &amp; "Advance" kry for 6 sec.)</b>								
<b>LoC:</b>	LoC.o	2	PAS.E	oFF	SLoC	1 \$		
	LoC.P	3	rLoC	1 \$				
<hr/>								
<b>CUS:</b>	CUS: 1		CUS: 2		CUS: 3		CUS: 4 thru 20	
	PAr	AC.Pu	PAr	AC.SP	PAr	P.ACr	PAr	nonE
<hr/>								
* Displays current controller value. (Display only)								
\$ LOC should be set at 5 until factory testing and calibration is complete.								
@ This is a calibration factor and will vary from unit to unit.								
<sup>1</sup> Indicates parameters added in version 11.00 control firmware. Not present in ver. 10.00								

## HUMIDITY CONFIGURATION RECORD (WATLOW PM8)

**MODELS:** 3907, 3911, 3913, 3940, 3948 & 3949  
**JOB NUMBER:** \_\_\_\_\_  
**UNT SERIAL NUMBER:** \_\_\_\_\_  
**CONTROL TYPE:** Humidity  
**PREPARED BY:** GLS                      DATE                      24-Sep-2012

Operations Page: (Press "UP" & "DN" keys for 3 sec.)

<b>Ai:</b>	Ain	<u>*</u>	i.Er	<u>*</u>	i.CA	<u>@</u>		
<b>Lnr:</b>	Su.A	<u>*</u>	oFST	<u>@</u>	o.u	<u>*</u>		
<b>Pu:</b>	Su.A	<u>*</u>	oFST	<u>@</u>	o.u	<u>*</u>		
<b>dio:</b>	<u>dio 5</u>		<u>dio 6</u>					
	di.S	<u>oFF</u>	do.S	<u>oFF</u>				
	Ei.S	<u>iACt</u>						
<b>Mon:</b>	C.MA	<u>Auto</u>	C.Pr	<u>*</u>	Pu.A	<u>*</u>		
	h.Pr	<u>*</u>	C.SP	<u>*</u>				
<b>LoopP:</b>	C.M	<u>AUto</u>	C.SP	<u>*</u>	c.Pb	<u>3.8 (4)</u>	db	<u>0.0 (0)</u>
	A.tSP	<u>100</u>	id.S	<u>75.0 (75)</u>	ti	<u>51</u>	o.SP	<u>24.0</u>
	AUt	<u>no</u>	h.Pb	<u>6.0 (6)</u>	td	<u>8</u>		
<b>ALM:</b>	<u>ALM 1</u>		<u>ALM 2</u>		<u>ALM 3</u>		<u>ALM 4</u>	
	A.Lo	<u>0.0 (0)</u>	A.Lo	<u>32.0</u>	A.Lo	<u>32.0</u>	A.Lo	<u>32.0</u>
	A.hi	<u>100.0 (100)</u>	A.hi	<u>300.0</u>	A.hi	<u>300.0</u>	A.hi	<u>300.0</u>
	<sup>1</sup> (A.St)	<u>*</u>	<sup>1</sup> (A.St)	<u>*</u>	<sup>1</sup> (A.St)	<u>*</u>	<sup>1</sup> (A.St)	<u>*</u>
<b>P.StA:</b>	<u>P.Str ( 1 thru 40)</u>		Ent1	<u>oFF</u>	JC	<u>0</u>		
	<u>P.ACr nonE</u>		Ent2	<u>oFF</u>				

(P.ATA group parameters are for Ramp/Soak programming only)

Setup Page: (Press "UP" & "DN" keys for 6 sec.)

<b>Ai:</b>	SEn	<u>voLt</u>	r.Lo	<u>0 (0)</u>	i.Er	<u>oFF</u>	<sup>1</sup> (i.Er)	<u>*</u>
	Unit	<u>rh</u>	r.hi	<u>100 (100)</u>	dEC	<u>0</u>		
	S.Lo	<u>0.00</u>	P.EE	<u>oFF</u>	<sup>1</sup> (i.CA)	<u>@</u>		
	S.hi	<u>5.00</u>	FiL	<u>2.0</u>	<sup>1</sup> (Ain)	<u>*</u>		
<b>Lnr:</b>	Fn	<u>oFF</u>	(All other parameters at default values)					
<b>Pu:</b>	Fn	<u>oFF</u>	FiL	<u>0.0</u>				
<b>dio:</b>	<u>dio 5</u>		<u>dio 6</u>					
	dir	<u>in</u>	dir	<u>otPt</u>				
	LEv	<u>high</u>	Fn	<u>oFF</u>				
	Fn	<u>nonE</u>						
	Fi	<u>0</u>						
<b>LoopP:</b>	h.Ag	<u>Pid</u>	<sup>1</sup> (db)	<u>0.0 (0)</u>	L.dE	<u>no</u>	SP.hi	<u>100.0</u>
	C.Ag	<u>Pid</u>	t.tUn	<u>no</u>	rP	<u>oFF</u>	<sup>1</sup> (o.SP)	<u>24.0</u>
	C.Cr	<u>oFF</u>	<sup>1</sup> (A.tSP)	<u>100</u>	L.SP	<u>0.0 (0)</u>	<sup>1</sup> (C.M)	<u>Auto</u>
	<sup>1</sup> (h.Pb)	<u>6.0 (6)</u>	t.Agr	<u>Cr it</u>	h.SP	<u>100.0 (100)</u>		
	<sup>1</sup> (c.Pb)	<u>3.8 (4)</u>	P.dL	<u>0.0</u>	<sup>1</sup> (C.SP)	<u>*</u>		
	<sup>1</sup> (ti)	<u>51</u>	UFA	<u>0</u>	<sup>1</sup> (id.S)	<u>75.0 (75)</u>		
	<sup>1</sup> (td)	<u>8</u>	FAiL	<u>USEr</u>	SP.Lo	<u>-100.0</u>		
<b>otPt:</b>	<u>otPt 1</u>		<u>otPt 2</u>		<u>otPt 3</u>		<u>r.Lo</u>	
	Fn	<u>CooL</u>	Fn	<u>hEAt</u>	o.ty	<u>MA</u>	r.hi	<u>100</u>
	o.tb	<u>10.0</u>	o.Ct	<u>utb</u>	Fn	<u>rMt</u>	o.CA	<u>@</u>
	o.Lo	<u>0</u>	o.Lo	<u>0</u>	r.Sr	<u>Ai</u>		
	o.hi	<u>100</u>	o.hi	<u>100</u>	Fi	<u>1</u>	<u>otPt 4</u>	
					S.Lo	<u>4.00</u>	Fn	<u>ALM</u>
					S.hi	<u>20.00</u>	Fi	<u>1</u>

## HUMIDITY CONFIGURATION RECORD (WATLOW PM8)

**MODELS:** 3907, 3911, 3913, 3940, 3948 & 3949  
**JOB NUMBER:** \_\_\_\_\_  
**UNT SERIAL NUMBER:** \_\_\_\_\_  
**CONTROL TYPE:** Humidity  
**PREPARED BY:** GLS                      **DATE**    24-Sep-2012

<b>ALM:</b>	<u>ALM 1</u>	<u>ALM 1</u>	<u>ALM 1</u>	<u>ALM 2</u>
A.ty	<u>Pr.AL</u>	<sup>1</sup> (A.Lo) <u>0.0 (0)</u>	A.dSP <u>on</u>	A.ty <u>oFF</u>
Sr.A	<u>Ai</u>	<sup>1</sup> (A.hi) <u>100.0 (100)</u>	<sup>1</sup> (A.dL) <u>0</u>	<u>ALM 3</u>
A.hy	<u>0.3 (0)</u>	A.LA <u>nLAt</u>	<sup>1</sup> (A.St) <u>*</u>	A.ty <u>oFF</u>
A.Lg	<u>AL C</u>	A.bL <u>oFF</u>		<u>ALM 4</u>
A.Sd	<u>both</u>	A.Si <u>on</u>		A.ty <u>oFF</u>

<b>FUn:</b>	<u>FUn 1</u>	<u>FUn 2</u>		
LEv	<u>high</u>	LEv <u>high</u>		
Fn	<u>SiL</u>	Fn <u>SiL</u>		
Fi	<u>1</u>	Fi <u>1</u>		

<b>gLbL:</b>	<u>C_F</u>	<u>C</u>	<u>gSE</u>	<u>oFF</u>	<u>C.LEd</u>	<u>oFF</u>	<u>d.ti</u>	<u>0</u>
	<u>AC.LF</u>	<u>60</u>	<u>Si.A</u>	<u>5</u>	<u>ZonE</u>	<u>oFF</u>	<u>USr.S</u>	<u>nonE</u>
	<u>r.tyP</u>	<u>ti</u>	<u>Si.b</u>	<u>6</u>	<u>ChAn</u>	<u>oFF</u>	<u>USr.r</u>	<u>nonE</u>
	<u>P.tyP</u>	<u>StPt</u>	<u>Pot i</u>	<u>0</u>	<u>d.PrS</u>	<u>1</u>		

<b>CoM:</b>	<u>Ad.S</u>	<u>1</u>	<u>MAP</u>	<u>1</u>	<u>nUS</u>	<u>yES</u>
-------------	-------------	----------	------------	----------	------------	------------

<b>rtC:</b>	<u>hoUr</u>	<u>@</u>	<u>Min</u>	<u>@</u>	<u>doW</u>	<u>@</u>
-------------	-------------	----------	------------	----------	------------	----------

Factory Page: (Press "Infinity" & "Advance" kry for 6 sec.)

<b>LoC:</b>	<u>LoC.o</u>	<u>2</u>	<u>PASE</u>	<u>oFF</u>	<u>SLoC</u>	<u>1 \$</u>
	<u>LoC.P</u>	<u>3</u>	<u>rLoC</u>	<u>1 \$</u>		

<b>CUS:</b>	<u>CUS: 1</u>	<u>CUS: 2</u>	<u>CUS: 3</u>	<u>CUS: 4 thru 20</u>				
	<u>PAr</u>	<u>AC.Pu</u>	<u>PAr</u>	<u>AC.SP</u>	<u>PAr</u>	<u>P.ACr</u>	<u>PAr</u>	<u>nonE</u>

\* Displays current controller value. (Display only)  
 \$ LOC should be set at 5 until factory testing and calibration is complete.  
 @ This is a calibration factor and will vary from unit to unit.  
 () Parameter values in parenthesis are seen in version 11.00 and later firmware controls.  
<sup>1</sup> Indicates parameters added in version 11.00 control firmware. Not present in ver. 10.00

## Section 5 Specifications

### Temperature

Control	..... $\pm 0.1^{\circ}\text{C}$ @ $+37^{\circ}\text{C}$ (98.6 $^{\circ}\text{F}$ )
Range	..... $0^{\circ}\text{C}$ (32 $^{\circ}\text{F}$ ) to $+60^{\circ}\text{C}$ (140 $^{\circ}\text{F}$ )
Sensor	.....RTD
Controller	.....Digital electronic proportional
Setpoint	.....Digital
Display	.....Digital LED
Readability	..... $0.1^{\circ}\text{C}$
Stability	..... $0.1^{\circ}\text{C}$
Uniformity	... $\pm 0.3^{\circ}\text{C}$ at $25^{\circ}\text{C}$ to $37^{\circ}\text{C}$ with six shelves installed*

### Shelves

Standard	.....3907 - 3, 3948 - 6
Maximum	.....3907 - 11, 3948 - 19
Dimensions W x D	... 778mm x 656mm F-B, (30.62" x 25.81")
Construction	.....Solid stainless steel reinforced
Surface Area	..... $0,5\text{ m}^2$ (5,4 $\text{ft}^2$ ) per shelf
Max. Per Chamber	..... $9,69\text{ m}^2$ (104,3 $\text{ft}^2$ )
Clearance	.....Adjustable on 76mm (3") centers
Loading	... 16 kg (35 lbs.) (slide in and out), 23kg (50 lbs.) (stationary)

### Construction

Volume	.....3948 - 821 liters (29 cu. ft.) .....3907 - 312 liters (11 cu. ft.)
Interior	.....304 2B stainless steel
Exterior	.....Cold rolled steel
Insulation	.....5.1cm (2") Foamed urethane
Outer Door Gasket	..Four sided vinyl compression
Finish	.....Powder coated, Salt spray tests exceed 1000 hrs. per ASTM Standard B117-85

\* *Better than  $\pm 0.5^{\circ}\text{C}$  uniformity at all other temperature parameters.*

**Weight**

Net - 3907 .....136 kg (300 lbs.)  
Net - 3948 .....363 kg (800 lbs.)

**Shipping Weight**

Motor - 3907 .....170 kg (375 lbs.)  
Motor - 3948 .....386 kg (850 lbs.)

**Temperature Alarm**

Sensor .....Thermostat  
Controller .....Thermostat  
Setpoint .....Analog reference dial  
Alarm .....Audible/visual

**Humidity**

Control .....±5% RH  
Range .....Above ambient to 95%  
Sensor .....Thin film polymer  
Controller .....Electronic, direct set in % RH  
Setpoint .....Digital  
Display .....Digital LED  
Readability .....1%  
Setability .....1%  
Steam Generator . . . Initial fill approx. 0.95 liters (1 quart)

**Fittings**

Fill Port .....0.32cm (1/8") FPT  
Drain Port .....0.95cm (3/8") FPT

**Unit Heat Load** .....1750W (6000 BTU/Hours)

**Refrigeration**

Compressor .....186W (1/4 Horsepower) air-cooled  
Refrigerants .....R134a

**Electrical** .....230V, ±10%, 50/60Hz

Max current\* .....15A

**Line Cord** .....Standard EU plug: CEE (7) VII, IEC 60884

*\*Measured at ambient temperature of 32°C / 90°F*

## Dimensions

### Model 3907

Exterior (W x H x D) . . . . .965mm x 1308mm x 813mm  
 . . . . .(38.00"W x 51.5"H x 32.00")

Interior (W x H x D) . . . . .787mm x 609mm x 686mm  
 . . . . .(31.00"W x 24.00"H x 27.00")

### Model 3948

Exterior (W x H x D) . . . . .965mm x 2248mm x 813mm  
 . . . . .(38.00"W x 88.5"H x 32.00")

Interior (W x H x D) . . . . .787mm x 1524mm x 686mm  
 . . . . .(31.00"W x 60.00"H x 27.00")

## Certifications

Thermo Fisher Scientific declares that the applicable CE marked models meet the provisions of the following EC directives.

204/108/EC Electromagnetic Compatibility Directive

2006/95/EC Low Voltage Directive

2011/65/EU RoHS Directive

CE Declarations are available upon request from the factory.

## Safety Specifications

Indoor Use Only

Ingress Protection . . . . .IP20

Altitude . . . . .Up to 2000 meters

Temperature . . . . .5°C to 32°C

Humidity . . . . . Maximum 80% RH for temperatures up to 31°C, decreasing linearly to 50% RH at 32°C, non-condensing

Mains Supply Fluctuations . . Not to exceed ±10% of the nominal voltage

Installation Category 2<sup>1</sup>

Pollution Degree 2<sup>2</sup>

Class of Equipment 1

*Continuing research and improvements may result in specification changes at any time. Performance plus or minus the least significant digit unless otherwise specified.*

---

1 Installation category (overvoltage category) defines the level of transient overvoltage which the instrument is designed to withstand safely. It depends on the nature of the electricity supply and its overvoltage protection means. For example, in CAT II which is the category used for instruments in installations supplied from a supply comparable to public mains such as hospital and research laboratories and most industrial laboratories, the expected transient overvoltage is 2500V for a 230V supply and 1500V for a 120V supply.

---

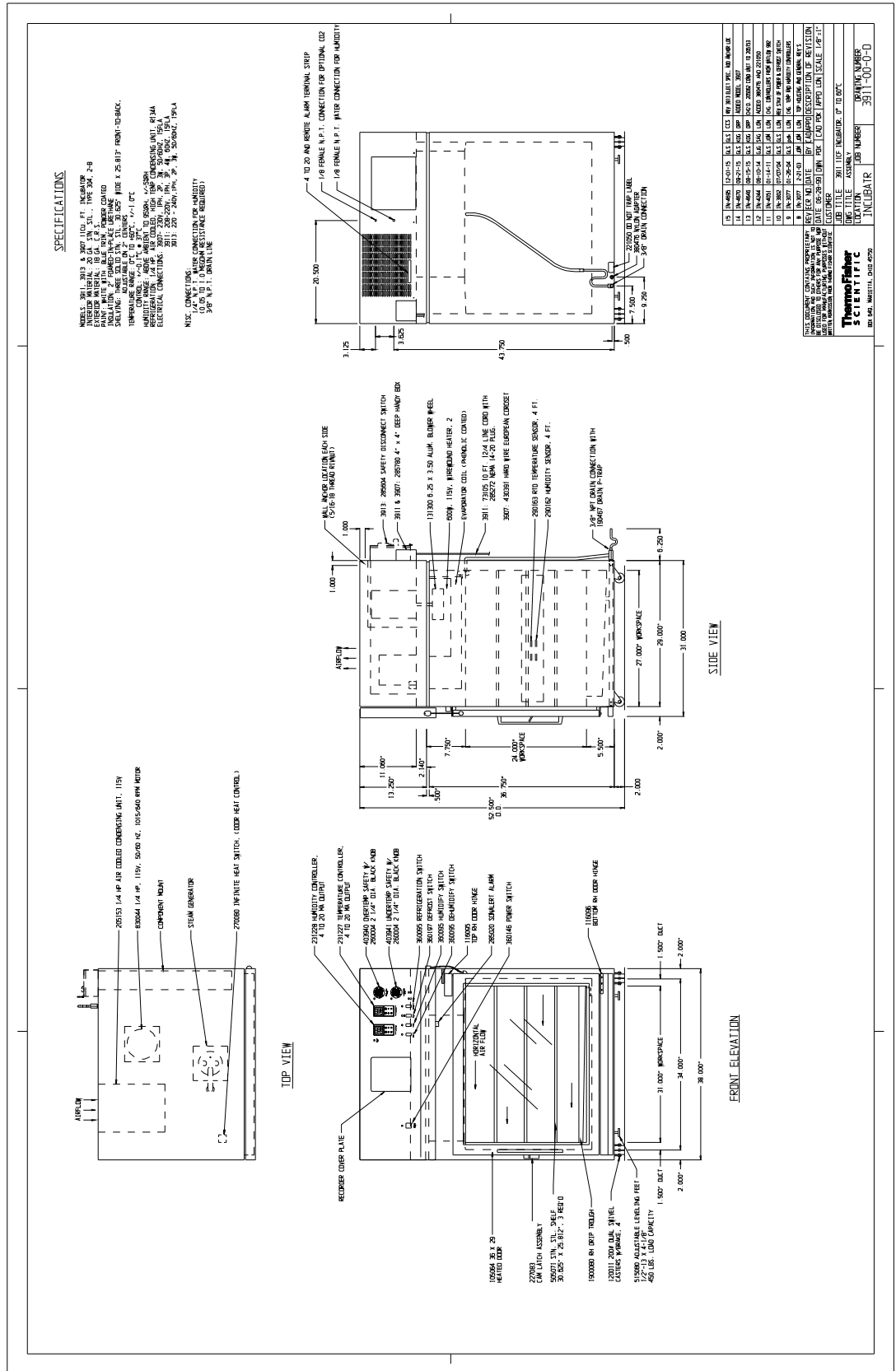
2 Pollution Degree describes the amount of conductive pollution present in the operating environment. Pollution Degree 2 assumes that normally only non-conductive pollution such as dust occurs with the exception of occasional conductivity caused by condensation.



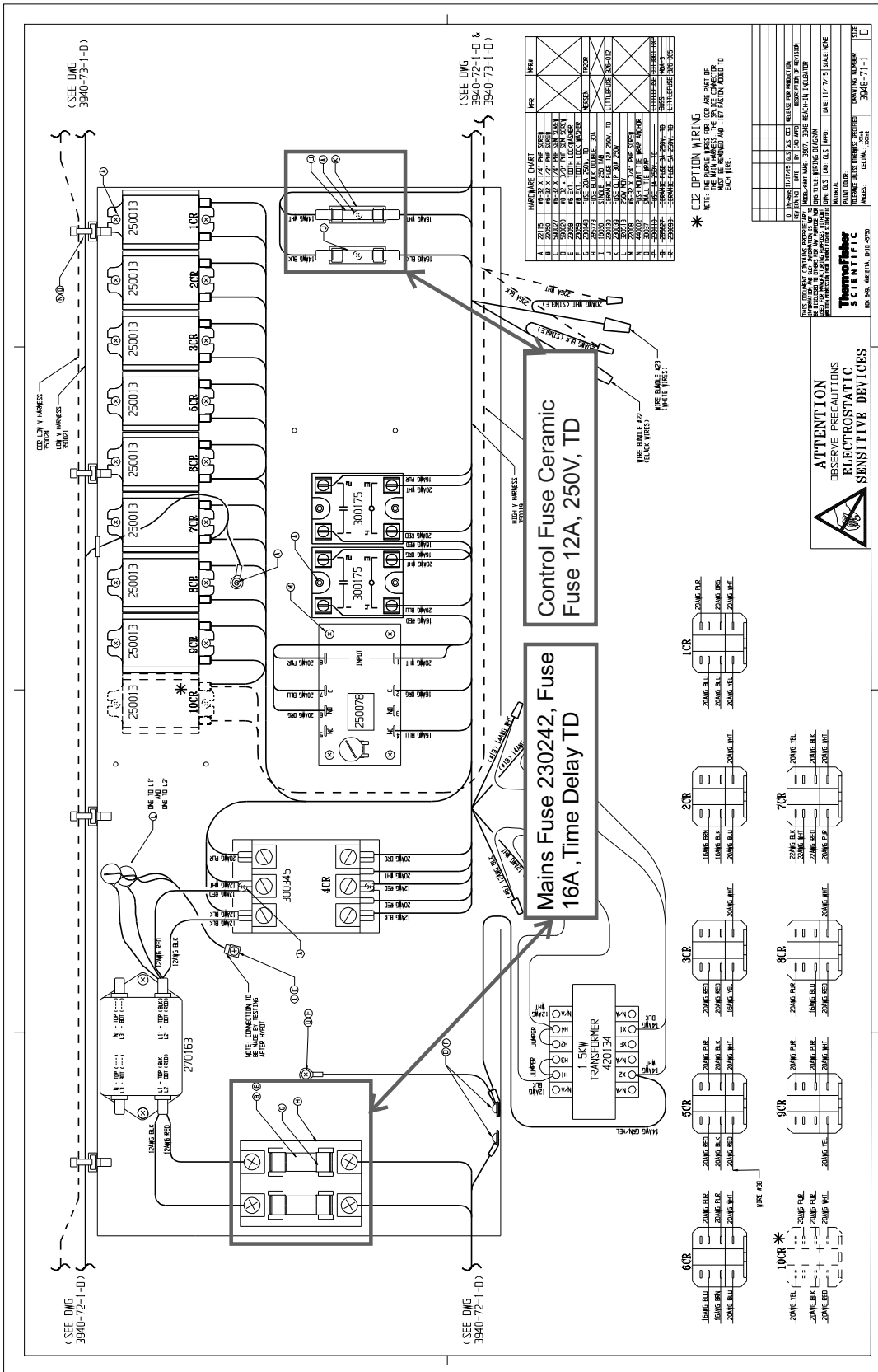
## Section 6 Spare Parts

Part No.	Description	Qty
290163	RTD Temperature Sensor	1
230130	Fuse, Ceramic 12A 350V	2
400051	Power Supply	1
290162	RH Sensor	1
231227	Watlow PM8 Temperature Controller	1
231228	Watlow PM8 Humidity Controller	1
231226	Watlow PM6 Optional CO2 Controller	1
270129	Arc Filter for Watlow PM Controller	1
230242	16A Time Delay Fuse	2
137022	Heater (steam)	1
403940	Over Temp Thermostat	1
403941	Under Temp Thermostat	1
410048	Defrost Timer	1
630090	Heater (wirewound)	1
205156	Condensing Unit, 1/4 HP 115V R-134A	1
991334	Solenoid, 120V .101" Port (Refrig.)	1
230214	Thermal Fuse, 250V 17A	1
830044	Blower Motor, 1/4 HP, 115V	1
110092	SS Humidity tank	1
300175	SS Relay	2

**Section 6**  
Spare Parts

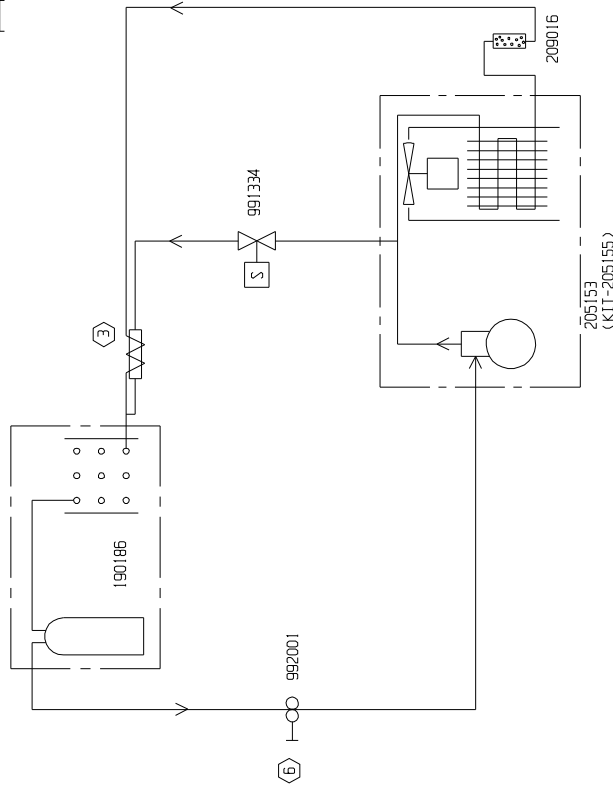






DRAWING NUMBER: 1900189-90-1

REV	TECH NO.	DATE	BY	CAO	APPD	DESCRIPTION OF REVISION
0	190377	2-11-03	CAW	CAW	AAL	RELEASED FOR PRODUCTION
1	190377	12-02-15	GLS	GLS	CCS	CHG FROM 205062 COND. UNIT



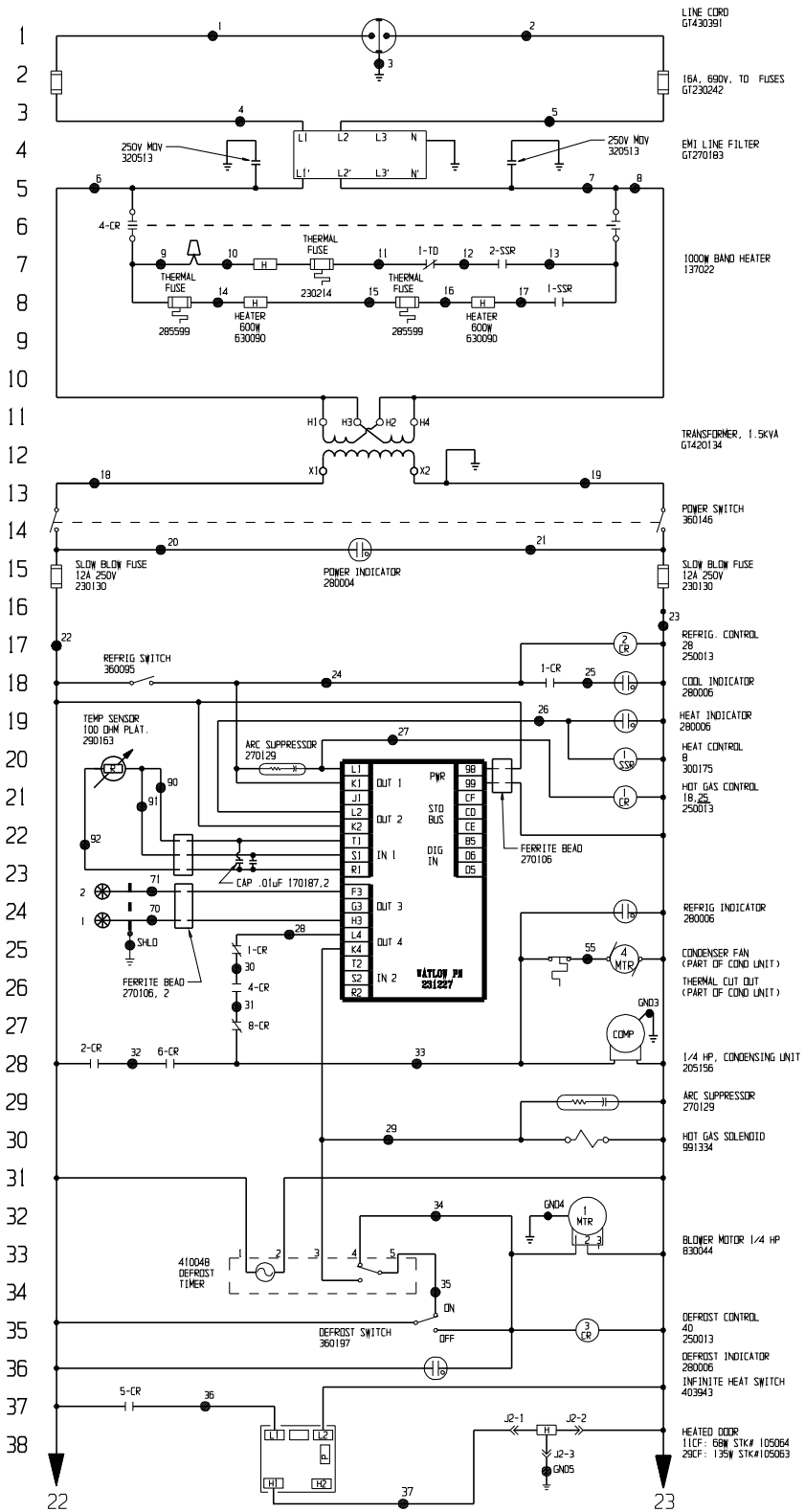
- 6. CAP TUBE ITEM (3) , 6' DF 050
- 5. WRAP 5' DF CAP TUBE TO 1/2" HOT GAS TUBE.
- 4. SUCTION LINE: 3/8" O.D.
- 3. HOT GAS LINE: 1/4" O.D.
- 2. SET CRV VALVE (6) AT 25 LBS.
- 1. REFRIGERANT 134A: 13.5 OZS.

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**Thermo Forma**  
800.646.1462/ETA, 01010.45700

MODEL/PART NAME: 3900 TOP HOUSING	PAINT COLOR: N/A
DWG TITLE: REFRIGERATION SCHEMATIC	TOLERANCE UNLESS OTHERWISE SPECIFIED
DWG: CAW   CAO: CAW   APPD: AAL   DATE: 2-11-03   SCALE: NONE	DECIMAL: .XX±   ANGLES: .XXX±
MATERIAL: N/A	DRAWING NUMBER: 1900189-90-1
SIZE: B	

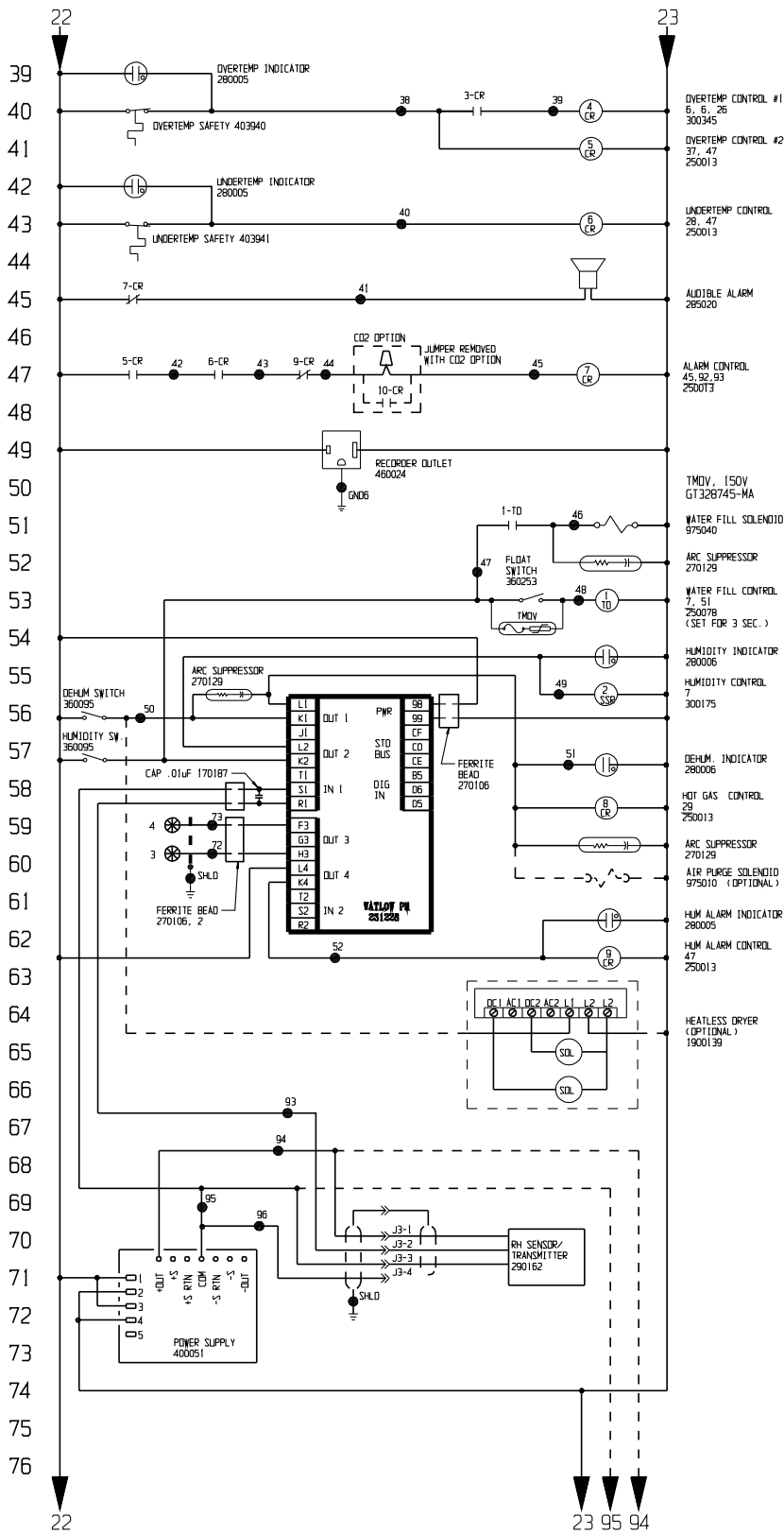
POWER CONNECTION  
230V, 1PH, 2P, 3W, 50/60HZ, 15FLA



Electrical Schematic  
Model:  
3948 and 3907  
Environmental  
Chamber

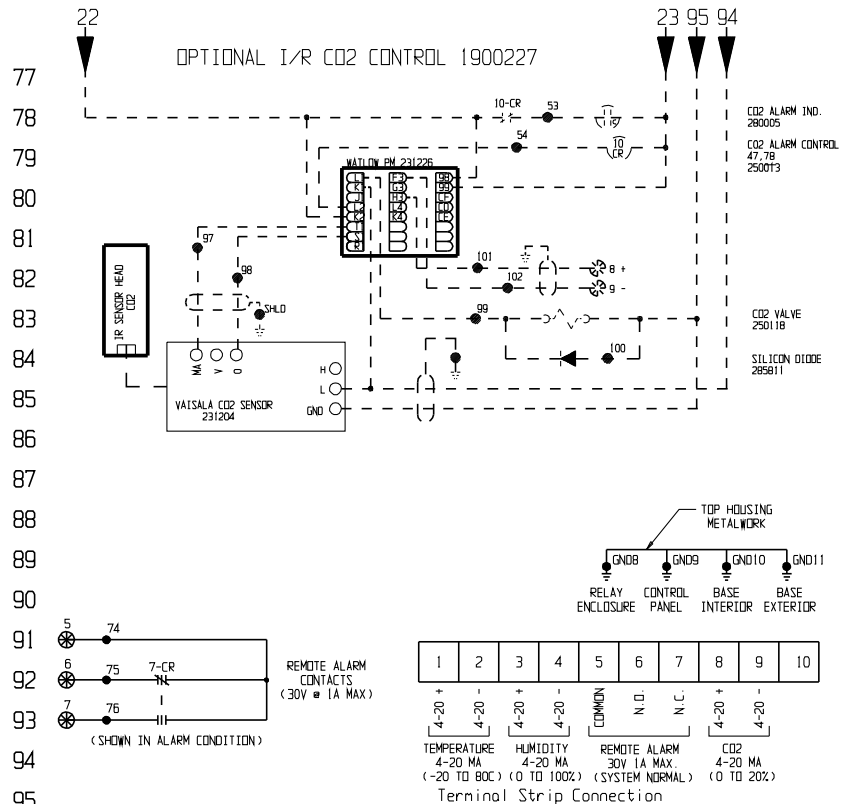
3948-70-0-0 REV.2  
Page 1 of 3

**Section 8**  
Electrical Schematics



Electrical Schematic  
Model:  
3948 and 3907  
Environmental  
Chamber

3948-70-0-D REV.2  
Page 2 of 3



**WIRE REFERENCE CHART**

NO.	AWG	COLOR	NO.	AWG	COLOR	NO.	AWG	COLOR	NO.	AWG	COLOR
1	1.5MM	BRN	31	20	PLUR	70	22	RED	---	---	---
2	1.5MM	BLU	32	16	BRN	71	22	BLK	---	---	---
3	1.5MM	GRN/YEL	33	16	BLU	72	22	RED	90	22	WHT
4	12	BLK	34	16	YEL	73	22	BLK	91	22	RED
5	12	RED	35	16	BRN	74	22	RED	92	22	BLK
6	12	BLK	36	20	RED	75	22	BLK	93	22	RED
7	12	RED	37	20	BLK	76	22	WHT	94	22	GRN
8	12	WHT	38	20	RED	77	N/A	N/A	95	22	BLK
9	16	BLK	39	20	RED	78	N/A	N/A	96	22	WHT
10	16	DRG	40	20	BLU	79	N/A	N/A	97	22	RED
11	16	BLU	41	20	YEL	---	---	---	98	22	BLK
12	16	DRG	42	20	PLUR	---	---	---	99	22	RED
13	16	RED	43	20	PLUR	---	---	---	100	22	WHT
14	16	BLK	44	20	PLUR	---	---	---	101	22	BLK
15	16	BLK	45	20	PLUR	---	---	---	102	22	WHT
16	16	BLK	46	20	BLU	---	---	---	---	---	---
17	16	PLUR	47	20	DRG	---	---	---	GND1	12	GRN
18	14	BLK	48	20	PLUR	---	---	---	GND2	16	GRN
19	14	WHT	49	20	BLU	---	---	---	GND3	16	GRN
20	14	BLK	50	20	BRN	---	---	---	GND4	16	GRN
21	14	WHT	51	20	RED	---	---	---	GND5	20	GRN
22	16	BLK	52	20	YEL	---	---	---	GND6	16	GRN
23	16	WHT	53	20	YEL	---	---	---	GND7	16	GRN
24	20	BLU	54	20	RED	---	---	---	GND8	14	GRN
25	20	BLU	55	22	BLK	---	---	---	GND9	BRATO	N/A
26	20	RED	---	---	---	---	---	---	GND10	16	GRN
27	20	YEL	---	---	---	---	---	---	GND11	16	GRN
28	20	PLUR	---	---	---	---	---	---	---	---	---
29	20	DRG	---	---	---	---	---	---	---	---	---
30	20	DRG	---	---	---	---	---	---	---	---	---

**ATTENTION**  
OBSERVE PRECAUTIONS  
ELECTROSTATIC  
SENSITIVE DEVICES

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2	IN-4806	04-14-17	GLS	SAG	403943 WAS 270080. CHG. SWITCH WIRING	
1	IN-4646	12/01/15	GLS	MSB	MISC CHANGES PER I.A. & R&S COMPLIANCE	
0	IN-4670	09/03/15	GLS	DRP	RELEASED FOR PRODUCTION	
REV	EN	NO.	DATE	BY	CAO (APPD)	DESCRIPTION OF REVISION
MODEL/PART NAME: 3907, 3948 EURO REACH-IN INCUBATOR						
DWG TITLE: ELECTRICAL SCHEMATIC						
DWN: GLS CAD: KDG APPD: DRP DATE: 09-03-15 SCALE: NONE						
MATERIAL:						
PAINT COLOR:						
TOLERANCE UNLESS OTHERWISE SPECIFIED: .XX+1						
ANGLES: DECIMAL: .XXX+1						
				DRAWING NUMBER	SIZE	
				3948-70-0	D	

Electrical Schematic  
Model:  
3948 and 3907  
Environmental  
Chamber

3948-70-0-D REV.2  
Page 3 of 3





### THERMO FISHER SCIENTIFIC INTERNATIONAL DEALER WARRANTY

The Warranty Period starts two months from the date your equipment is shipped from our facility. This allows for shipping time so the warranty will go into effect at approximately the same time your equipment is delivered. The warranty protection extends to any subsequent owner during the first year warranty period. Dealers who stock our equipment are allowed an additional six months for delivery and installation, provided the warranty card is completed and returned to the Technical Services Department.

During the first year, component parts proven to be non-conforming in materials or workmanship will be repaired or replaced at Thermo's expense, labor excluded. The Watlow EZ-ZONE PM controller is covered for one additional year for repair or replacement (parts only), provided the unit has not been misapplied. Installation and calibration are not covered by this warranty agreement. The Technical Services Department must be contacted for warranty determination and direction prior to performance of any repairs. Expendable items, glass, fillers, reagents, tubing, and gaskets are excluded from this warranty.

Replacement or repair of components parts or equipment under this warranty shall not extend the warranty to either the equipment or to the component part beyond the original warranty period. The Technical Services Department must give prior approval for return of any components or equipment. At Thermo's option, all non-conforming parts must be returned to Thermo postage paid and replacement parts are shipped FOB destination.

**THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL OR IMPLIED. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY.** Thermo shall not be liable for any indirect or consequential damages including, without limitation, damages relating to lost profits or loss of products.

Your local Thermo Sales Office is ready to help with comprehensive site preparation information before your equipment arrives. Printed instruction manuals carefully detail equipment installation, operation and preventive maintenance.

Contact your local distributor for warranty information. We're ready to answer your questions on equipment warranty, operation, maintenance, service and special application.



Rev. 5 8/13

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