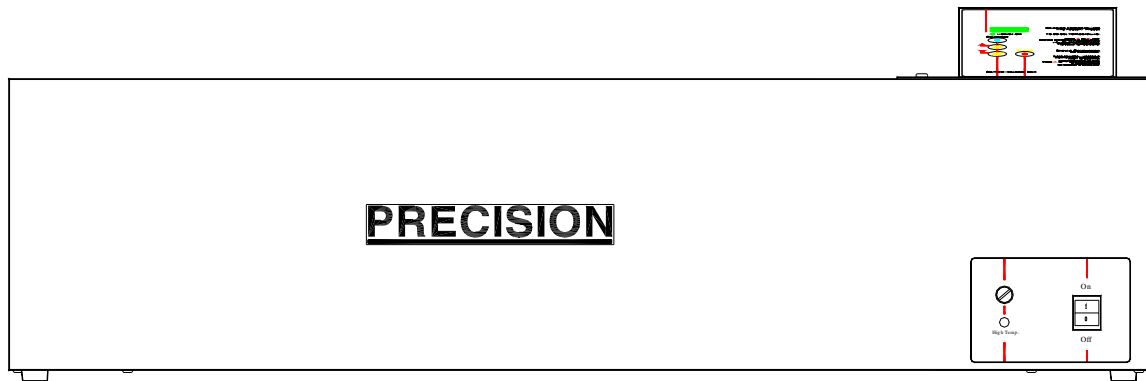


**Installation/Service Manual
Coliform Incubator Bath
Model 2862/2863 (253)**



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Manual P/N 3177876
Rev.K Dated 21MAY09

Thermo
SCIENTIFIC

NOTE:

THE 240V UNITS DESCRIBED IN THIS MANUAL WERE DESIGNED SPECIFICALLY FOR THE EUROPEAN MARKET AND ARE SUPPLIED WITH A EUROPEAN STYLE POWER CORD. FOR DOMESTIC USE, A U.S. STYLE POWER CORD (P/N: 3176836) MUST BE ORDERED SEPERATELY.

NOTICE

THE MATERIAL IN THIS MANUAL IS FOR INFORMATION PURPOSES ONLY. THE CONTENTS AND THE PRODUCT IT DESCRIBES ARE SUBJECT TO CHANGE WITHOUT NOTICE. THERMO SCIENTIFIC MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THIS MANUAL. IN NO EVENT SHALL THERMO BE LIABLE FOR ANY DAMAGES, DIRECT OR INCIDENTAL, ARISING OUT OF OR RELATED TO THE USE OF THIS MANUAL.

For repair information or replacement parts assistance from the manufacturer, call Technical Services using our toll free telephone number.

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REVISION STATUS

INDEX	DATE	AMENDED PAGES	NOTES
A	6/99	--	Initial release
B	5/00	16	Update pump assembly kit numbers (new pumps)
C	11/01	6	Add caution "acidic & caustic substance
D	4/02	5, 8, 27	Add inlet screen info, correct wire color
E	3/03	2	Update performance specs, add chamber dimensions
F	4/05	Manual P/N 31600111	New manual #, manufacture location
G	4/06	ECR23196/BA-612	Modified drain assembly (connection to H2O regulator)
H	6/06	ECRs 23443 & 23496	consolidated with 3177688, removed CE symbol and declaration
I	9/08	ECR 24808	Revised water specs
J	4/09	ECR25448/BA-670	UL information
K	5/09	ECR25227/BA-667	page 24 - half coupler

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INTRODUCTION

Your satisfaction and safety are important to Thermo and a complete understanding of this unit is necessary to attain these objectives.

As the user of this apparatus, you have the responsibility to understand the proper function and operational characteristics of your bath. This instruction manual should be thoroughly read and all operators given adequate training before attempting to place this unit in service. Awareness of the stated cautions and warnings, and compliance with recommended operating parameters — together with maintenance requirements — are important for safe and satisfactory operation. The unit should be used as described and for its intended application; alterations or modifications will **VOID THE WARRANTY.**

WARNING

AS A ROUTINE LABORATORY PRECAUTION, ALWAYS WEAR SAFETY GLASSES WHEN WORKING WITH THIS APPARATUS.

This product is not intended, nor can it be used, as a sterile or patient connected device. In addition, this apparatus is not designed for use in Class I, II or III locations as defined by the National Electrical Code.

CAUTION

WHEN UNPACKING THIS PRODUCT, TWO PERSONS ARE REQUIRED TO LIFT THE WATER BATH AND PLACE IT ON A BENCH.

THE BENCH TOP MUST BE RIGID AND STRONG ENOUGH TO COMFORTABLY SUPPORT THE WEIGHT OF THE UNIT WHEN FILLED WITH WATER.

UNPACKING AND DAMAGE

Save all packing material until unit is put into service. This merchandise was carefully packed and thoroughly inspected before leaving our factory.

Responsibility for safe delivery was assumed by the carrier upon acceptance of the shipment; therefore, claims for loss or damage sustained in transit must be made upon the carrier by the recipient as follows:

1. **Visible Loss or Damage:** Note any external evidence of loss or damage on the freight bill, or express receipt, and have it signed by the carrier's agent. Failure to adequately describe such external evidence of loss or damage may result in the carrier's refusing to honor your damage claim. The form required to file such claim will be supplied by the carrier.
2. **Concealed Loss or Damage:** Concealed loss or damage means loss or damage which does not become apparent until the merchandise has been unpacked and inspected. Should either occur, make a written request for inspection by carrier's agent within fifteen (15) days of the delivery date; then file a claim with the carrier since the damage is the carrier's responsibility.

If you follow the above instructions carefully, we will guarantee our full support of your claim to be compensated for loss or concealed damage.

DO NOT—FOR ANY REASON—RETURN THIS UNIT WITHOUT FIRST OBTAINING AUTHORIZATION. In any correspondence to Thermo, please supply the nameplate data, including catalog number and serial number.

GENERAL INFORMATION

Precision Circulating Baths are widely used in research and quality control. Their superb temperature uniformity and stability makes them especially desirable for legal or reference tests.

The microprocessor control panel houses all functions necessary to operate the bath. The 4 push-button switches and single digital display window allow the operator to adjust bath temperature and temperature calibration via a single set of controls.

The proportional integral temperature control coupled with agitation supplied by a centrifugal pump located in the control housing allows precise temperature control. Use of the gable cover provided is required to maintain optimal temperature sensitivity.

A high limit thermostat is provided and can be set to prevent heater runaway in the event of temperature control failure.

The interior of the bath is constructed of stainless steel and is designed for operation with distilled water or water solutions, such as water /ethylene glycol with corrosion inhibitors added. The body is made from galvanized steel and is painted for added protection. A drain is located at the far left hand end of the bath. A stainless steel gable cover is also provided with the bath.

The 240-volt units are identical in appearance to the 120-volt units.

PERFORMANCE DATA

The following table identifies the specifications for the Coliform Baths.

Technical Specifications

Temperature Settings (factory preset)	
35.0°C	41.5°C
44.5°C	45.5°C
Sensitivity (cover on)	Uniformity (cover on)
±0.05°C	±0.05°C

Chamber Size

Length	27 inches (68.6cm.)
Width	12 inches (30 cm.)
Height	7.5 inches (19 cm.)
Capacity (1.5" from top)	9.1 gallons (34.5L.)

INSTALLATION

WARNING

INSTALLATION SHOULD BE COMPLETED BY QUALIFIED PERSONNEL ONLY.

Location - The most uniform operating conditions will be obtained by placing the bath on a level surface in an area remote from drafts, ventilating outlets, radiators, and other rapidly changing ambient conditions.

Environmental Conditions- This instrument is designed to operate safely under the following conditions:

- Indoor Use Only
- Temperature: 5° to 40° C
- Maximum Relative Humidity: 80% for temperatures to 22°C
- Maximum Altitude 2000 meters
- Mains supply voltage fluctuation ±10, or per project plan
- Installation (Overvoltage) category II, Pollution Degree 2

Table 1
Listing of Models Included In This Manual

Catalog Number	Volts	Hertz	Watts	Amps	Mains Fuse	Power Board Fuse
3166678	120	50/60	1550	12.9	N/A	N/A
3166679	240	50/60	1550	6.5	FST-5x20-10A	FST-6.3x32-6.3mA

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.

Maximum performance is assured across the following temperature range:

- 15°C to 45°C

Electrical Connections -

IMPORTANT

FOR PERSONAL SAFETY, THIS APPARATUS MUST BE PROPERLY GROUNDED.

1. The power cord provided on this unit is equipped with a three-prong (grounding) plug which mates with a standard three-prong grounding wall receptacle to minimize the possibility of electric shock hazard from this apparatus. If in doubt, the user should have the wall receptacle and circuit checked by a qualified electrician to make sure the receptacle provides adequate current and is properly grounded.
2. Where a standard two-prong wall receptacle is encountered, it is the personal responsibility and obligation of the user to have it replaced with a properly grounded three-prong wall receptacle. **Do not, under any circumstances, cut or remove the third (ground) prong from the power cord. Do not use a two-prong adapter plug.**

Determine the total amount of current being used by other apparatus connected to the circuit to be used for this apparatus. It is critical that the added current demand of this (see nameplate) and other equipment used on the same circuit does not exceed the rating of the fuse or circuit breaker.

CAUTION

BE SURE THAT THE POWER SUPPLY IS THE SAME VOLTAGE AS ON THE NAMEPLATE.

THE POWER CORD IS THE MAINS DISCONNECT. MAKE SURE THE RECEPTACLE IS ALWAYS EASILY ACCESSIBLE.

TO AVOID BUILD-UP OF MINERAL DEPOSITS AND TO PREVENT CORROSION, USE ONLY DISTILLED WATER (50K OHM TO 1M OHM) IN THE BATH. USING CHLORINATED TAP WATER OR ADDITIVES CONTAINING CHLORINE WILL VOID THE MANUFACTURER'S WARRANTY. SIMILARLY, HIGH PURITY (DEIONIZED) WATER THAT DOES NOT FALL WITHIN A 50K TO 1M OHM RESISTIVITY RANGE AND A 7 TO 9 PH RANGE WILL ALSO VOID THE WARRANTY. CONTACT TECHNICAL SERVICES WITH ANY QUESTIONS.

ELECTROLYSIS CAN DAMAGE STAINLESS STEEL IF AN OBJECT IS ALLOWED TO REST DIRECTLY ON THE SURFACE, TRAPPING MOISTURE THAT BECOMES OXYGEN STARVED BUT IS SURROUNDED BY WATER CONTAINING OXYGEN. THE RESULTING ELECTROLYTIC ACTION WILL PIT OR ERODE THE STAINLESS STEEL.

WATER LEVEL REGULATOR **(OPTIONAL)**

INSTALLATION INSTRUCTIONS - Use the following steps along with Fig. 1 & 2 shown on the following page.

1. Turn off unit, disconnect power & drain water from the bath.
2. Unscrew drain plug from side of bath body.
3. Replace with elbow connector and reducing bushing (shipped loose). **Note** the reducing bushing is used on units built after February 2006.

NOTE

TO ENSURE A GOOD SEAL, WRAP THREADS WITH TEFLON TAPE OR EQUIVALENT SEALER.

4. Tighten elbow connector so open end (tube fitting) faces straight down.
5. Place Water Level Regulator Bracket Assembly on the lip of the bath pan (drain side of the bath towards the rear of the unit). The small flange with gasketing near the top of the bracket should rest against the inside of the bath pan. The other 2 flanges with gasketing should rest against the outside of bath body.
6. Insert the plastic tubing (coming from the bottom of the water level regulator) into the elbow connector (at the drain) and tighten the elbow connector fitting firmly to ensure a good seal.
7. Uncoil Tygon tubing and press onto 1/4" Hose Barb Fitting (located at the top of water level regulator). Hose clamps are provided to ensure a good seal.
8. Hook-up other end of the tygon tubing to water supply and turn on water. (Water pressure should fall within the following range: MIN is approx. 15 PSI, MAX is approx 75 PSI)

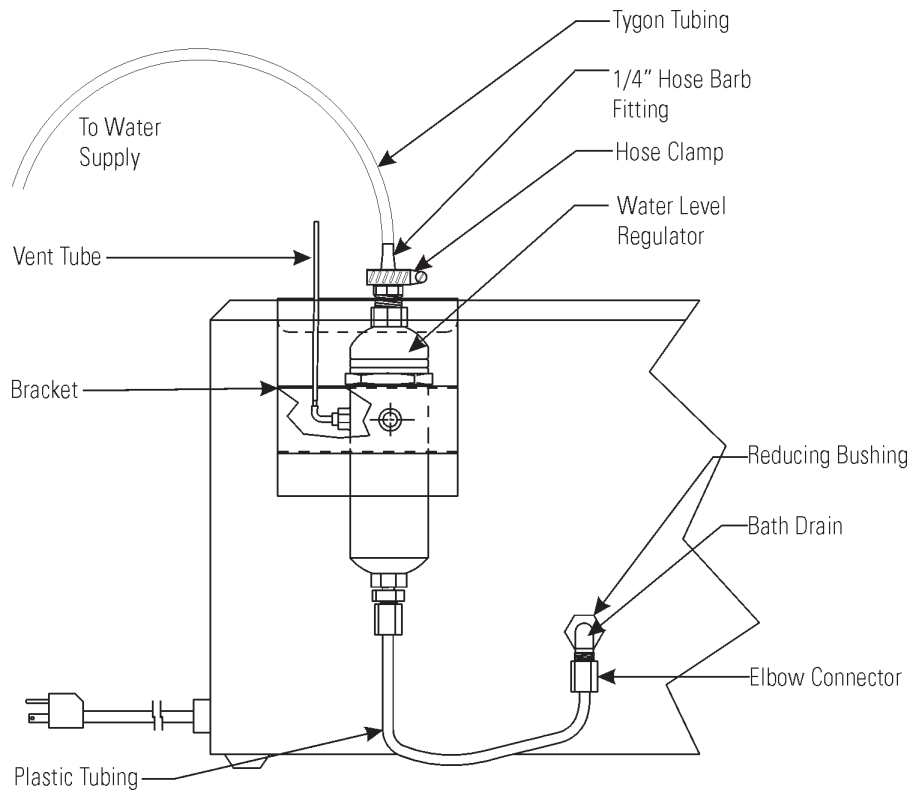
NOTE

WATER LINE MARKING ON THE WATER LEVEL REGULATOR IS AN INDICATOR OF THE APPROXIMATE WATER LEVEL THAT TO BE MAINTAINED IN BATH. THE ASSEMBLY HAS BEEN SET TO MAINTAIN APPROXIMATELY 1-3/4" OF WATER. TO RAISE THE SET WATER LEVEL, LOOSEN THUMBSCREW & RAISE WATER LEVEL REGULATOR TO DESIRED LEVEL (COINCIDE WITH WATER LINE MARK) & TIGHTEN THUMBSCREW TO HOLD WATER LEVEL REGULATOR IN PLACE.

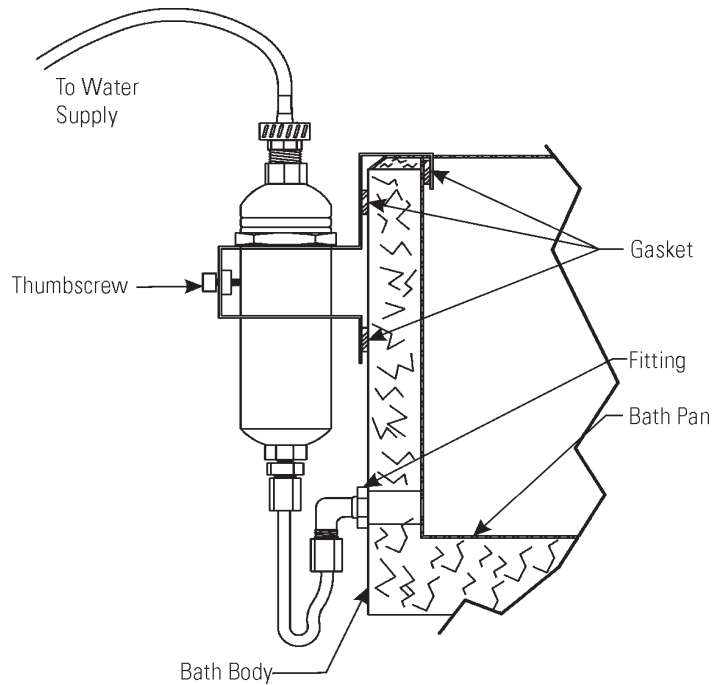
NOTE:

DO NOT OVER-TIGHTEN THUMBSCREW

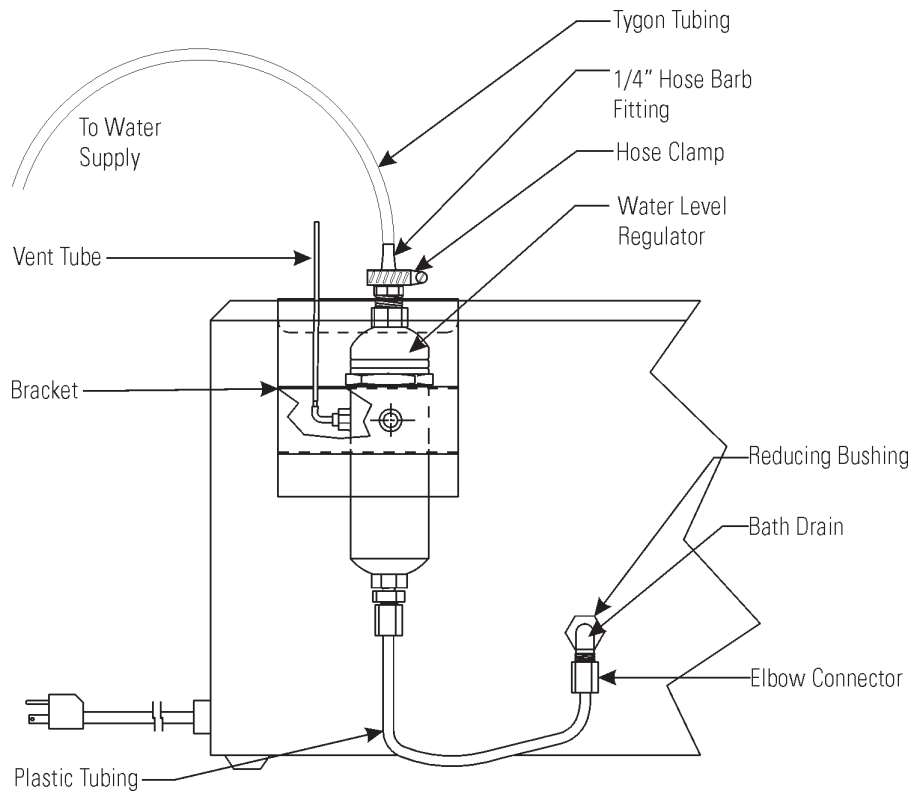
WATER LEVEL REGULATOR ASSEMBLY



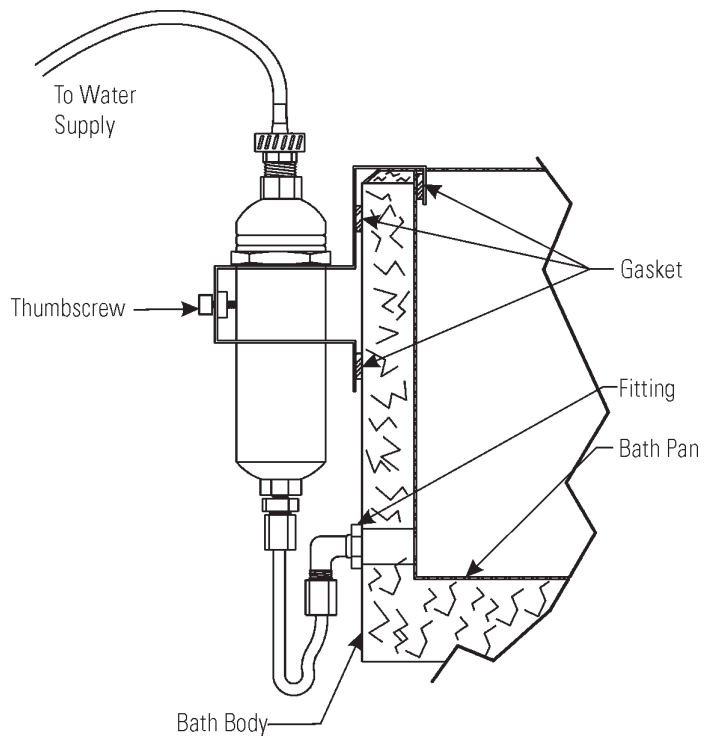
**FIGURE 1
SIDE VIEW OF BATH (120V UNITS)**



**FIGURE 2
CUTAWAY FRONT VIEW OF BATH (120V UNITS)**



**FIGURE 1
SIDE VIEW OF BATH (240V UNITS)**



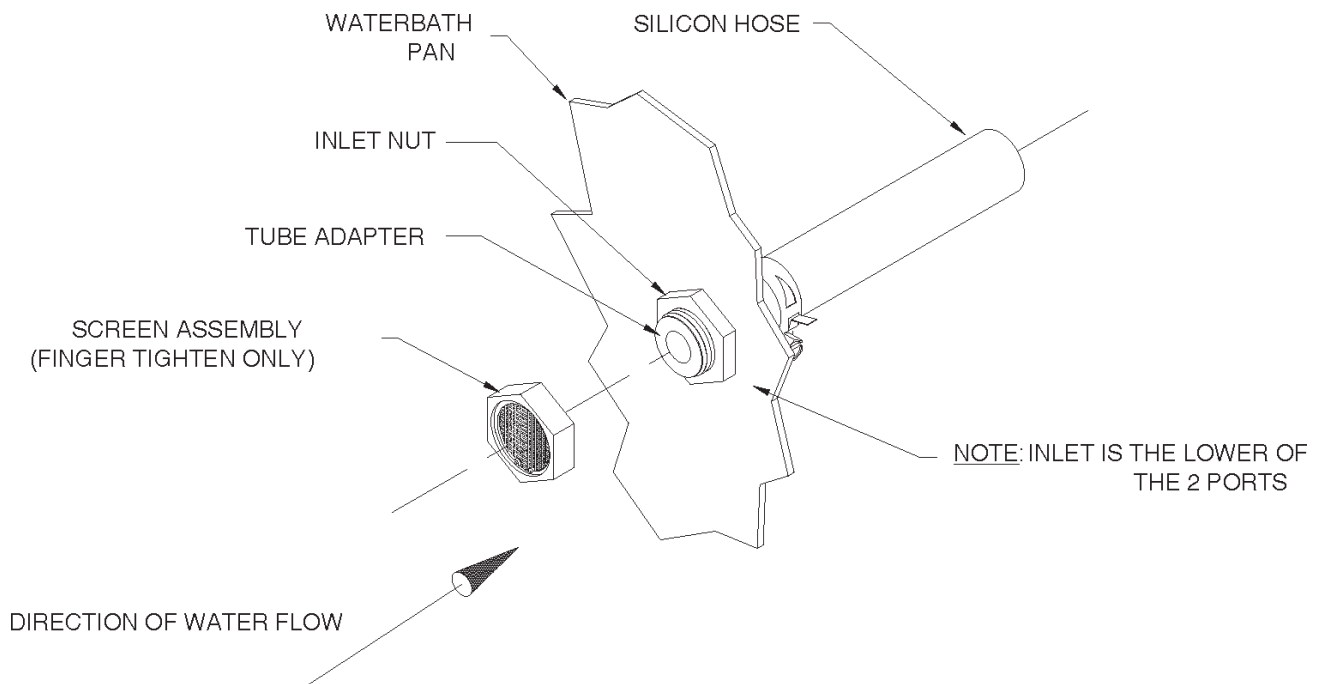
**FIGURE 2
CUTAWAY FRONT VIEW OF BATH (240V UNITS)**

INLET SCREEN ASSEMBLY **(OPTIONAL)**

An optional inlet screen assembly is packaged with each unit. If used, this screen will filter foreign materials (i.e. pieces of paper) from being sucked through the pump. To install the screen assembly, refer to the diagram below.

NOTE:

IF USED, THE SCREEN ASSEMBLY MUST BE INSPECTED DAILY. REMOVE ANY DEBRIS FOUND ON THE SCREEN.



EXPLANATION OF CONTROLS

Power Switch - The power switch is located on the lower right hand side of the bath, it provides power for the entire unit.

Hi-Limit Thermostat - The hi-limit thermostat is located immediately to the left of the power switch on the lower right hand corner of the bath. The high limit is an adjustable control used to prevent thermal runaway in the event that the primary control fails. After you have stabilized the bath temperature, use a standard screwdriver to adjust the potentiometer. When delivered, the Hi-Limit is turned fully clockwise (highest setting). In this position, the Hi-limit light will be **OFF**. Turn the potentiometer counterclockwise until the Hi-Limit light is **ON**, then adjust clockwise 1/8 of a turn. Verify that the Hi-Limit light is **OFF**. Now if your bath temperature rises above the desired setting, the Hi-Limit protection will be activated.

Control Panel - The control panel is located on top of the bath and provides primary temperature control. The control panel contains the following features (See Figure A).

1. LED Display - The three-digit LED display is used to show both the actual and setpoint values for the temperature.

2. Heater On Lamp - The "Heater ON" lamp is illuminated when power is applied to the heater.

3. Calibrate - The Calibrate key is used to adjust the actual temperature value to match a calibrated reference thermometer.

4. Temperature Selection Keys - ("UP" or "Down") These keys are used to select one of the four temperature setpoints.

5. Enter Key - The Enter Key is used to store a new setpoint value.

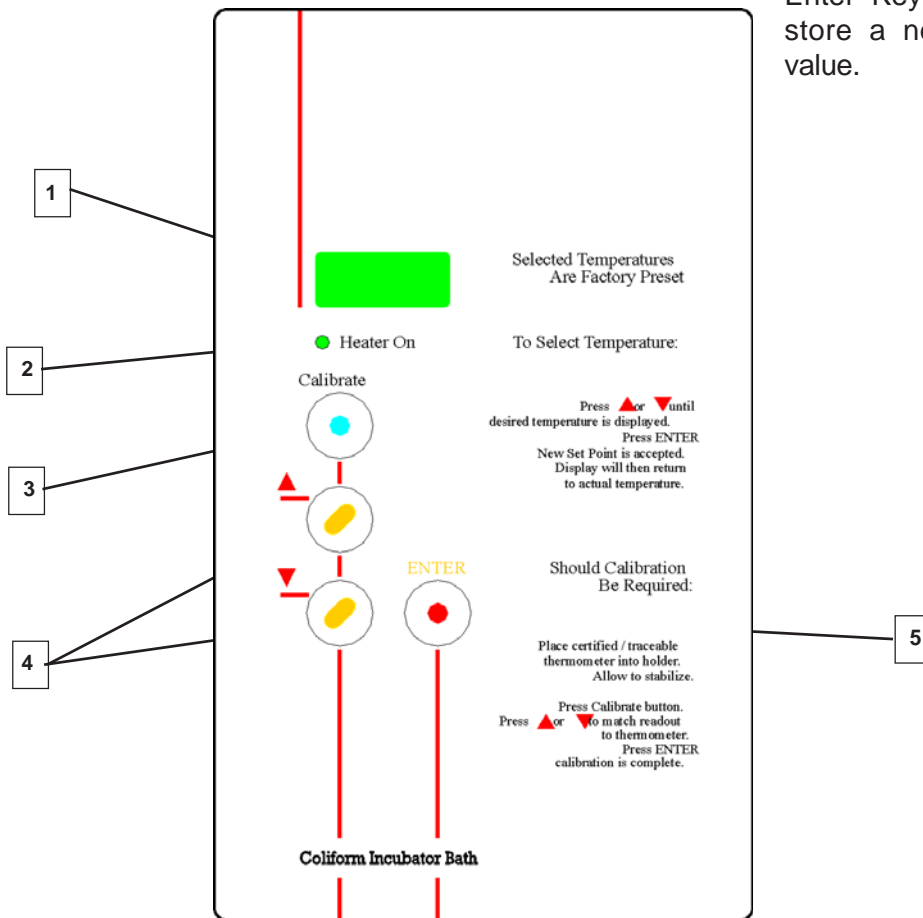


FIGURE A

OPERATION

CAUTION

EXERCISE CARE WHEN USING ACIDIC OR CAUSTIC SOLUTIONS AS THEY WILL ATTACK THE GALVANIZED STEEL BATH BODY IF SPILLED INTO THE BATH. IF SPILLS DO OCCUR, THE BATH LIQUID SHOULD BE IMMEDIATELY DRAINED AND THE UNIT THOROUGHLY FLUSHED. SPILLS AND CONDENSATION SHOULD BE CLEANED/REMOVED FROM ALL METAL SURFACES AFTER EACH USE.

When filling the bath with water, allowance must be made for the displacement of water upon immersion of samples. **Do not use deionized water. See water specs in CAUTION on Page 3.**

CAUTION

*WATER LEVEL REQUIREMENTS ARE - **MINIMUM LEVEL** - WATER LEVEL SHOULD BE 1 1/2 INCHES ABOVE THE PUMP OUTLET. THIS WILL KEEP THE PUMP FROM RUNNING DRY AND FAILING TO OPERATE. **MAXIMUM LEVEL** - WATER LEVEL SHOULD NOT BE HIGHER THAN 1 INCH FROM THE TOP OF THE BATH PAN.*

To conserve energy, reduce evaporation, and increase temperature control accuracy, use the gable cover provided. Do not use aluminum foil as a cover, as it may cause corrosion due to an electrochemical reaction.

1. Add distilled water to bath. Use water levels as instructed above.
2. Power up: Depress the power switch located at the lower right hand corner of the bath. The unit is fully operational upon application of power and the display will read actual bath temperature.

3. **To set temperature control point:**
 - a. Press SETPOINT. The display shows the current temperature setpoint.
 - b. Press UP or DOWN until the desired temperature setpoint displays.
 - c. Press ENTER to store the new value.
 - d. Display returns to actual temperature.

If ENTER is not pressed, new value will not be set and display will return to actual temperature.

4. **To calibrate temperature display:**
 - a. Use a calibrated reference thermometer.
 - b. Press CALIBRATE key.
 - c. Press UP or DOWN to adjust display to match thermometer.
 - d. Press ENTER.
 - e. Display should now match your calibrated thermometer.

If ENTER is not pressed, new value will not be set and display will return to previous actual temperature.

NOTE

AS WATER BATHS ARE OPERATED, ESPECIALLY AT ELEVATED TEMPERATURES, CONDENSATION WILL FORM ON THE UNDERSIDE OF THE GABLE COVER. THE AMOUNT OF CONDENSATION CAN BE CONSIDERABLE. CARE SHOULD BE EXERCISED WHEN REMOVING THE COVER SO THAT WATER WILL FALL BACK INTO THE BATH CHAMBER, AND NOT ON THE BATH SURFACE. THE COVER SHOULD BE PLACED UPSIDE DOWN WHEN REMOVED TO MAINTAIN A DRY WORK AREA.

CAUTION

WHEN OPERATING AT TEMPERATURES GREATER THAN 60 °C, DO NOT TOUCH THE METAL SURFACE OF THE GABLE COVER. LIFT THE GABLE COVER BY THE KNOB ONLY.

WARNING

EXPLOSION, IMPLOSION OR THE RELEASE OF TOXIC OR FLAMMABLE GASES ARISING FROM THE MATERIAL BEING HEATED IS THE SOLE RESPONSIBILITY OF THE USER.

MAINTENANCE

Cleaning: Stainless steel resists corrosion; however, it is not impervious to it. Proper maintenance of the stainless steel bath chamber helps assure many years of service.

CAUTION

AVOID SPILLING HARSH CHEMICALS ONTO THE BATH, AS CORROSION OF THE STAINLESS STEEL MAY RESULT.

IMPORTANT

THE USER HAS THE RESPONSIBILITY FOR CARRYING OUT APPROPRIATE DECONTAMINATION IF HAZARDOUS MATERIAL IS SPILT ON OR INSIDE THE BATH.

The bath should be cleaned regularly with mild soapy water and rinsed with distilled water. Should algae or other undesirable microorganisms form on the top of the bath media, add a little formaldehyde or quaternary ammonium germicide, available from Thermo (P/N 3166250).

IMPORTANT

IF IT IS NECESSARY TO USE THE FOLLOWING CHEMICALS, LIMIT THE TIME TO A MAXIMUM OF FOUR HOURS. CLEAN SURFACES IMMEDIATELY AFTER USE.

-Aluminum Chloride	-Barium Chloride
-Bichloride of Mercury	-Calcium Chloride
-Carbolic Acid	-Chlorinated Lime
-Citric Acid (boiling)	-Dakin's Solution
-Ferrous Chloride	-Mercury Salts
-Lysol Mercuric Chloride	-Phenol
-Potassium Permanganate	-Stannous Chloride
-Potassium Thiocyanate	-Tartaric Acid
-Sodium Hypochlorite	

CAUTION

NEVER USE THE FOLLOWING CHEMICALS:

-Aqua Regia	-Ferric Chloride
-Iodine	-Sodium Azide
-Sulfuric Acid	

CAUTION

DO NOT USE OTHER CLEANING OR DECONTAMINATION METHODS WITHOUT FIRST CONTACTING TECHNICAL SERVICES.

Removing Discoloration: Should the stainless steel ever become discolored by iron rust, use the following procedure to remove all traces of the rust and restore the stainless steel.

WARNING

OBSERVE THE FOLLOWING SAFETY PRECAUTIONS! USE HEAVY GLOVES OR OTHER ADEQUATE HAND PROTECTION. WEAR GOGGLES OR OTHER ADEQUATE EYE PROTECTION. ONLY WORK IN AREAS WITH ADEQUATE VENTILATION.

Prepare a solution of 20% nitric and 1.5% hydrochloric acid (if preferred, a 2% to 5% solution of warm oxalic acid may be used). Swab solution over surface, allowing it to remain until all rust is loosened. This will usually take 1 to 2 minutes.

As soon as rust is loosened, immediately flush with clean water until all acid is removed.

Screen assembly option: If this option is installed, inspect daily and remove any debris from the screen.

Periodic Safety Check: Test the operation of the Hi-Limit thermostat, as described on page 7, every three months.

TROUBLESHOOTING

WARNING

*SERVICE SHOULD ONLY BE PERFORMED BY A QUALIFIED TECHNICIAN. BEFORE REPLACING ANY ELECTRICAL OR MECHANICAL COMPONENTS, UNPLUG THE LINE CORD. IF ELECTRICAL POWER IS REQUIRED FOR SERVICE, **USE EXTREME CARE.***

Refer to Problems and Solutions for troubleshooting information on the baths. This guide provides the basic information required to repair the bath.

The following is a list of the tools and instruments required to perform the procedures outlined in the Troubleshooting Procedures table.

Tools Needed:

- Phillips or Flat Blade Screwdriver
- 7/16" Socket or adjustable wrench
- Ohmmeter
- DC Voltmeter
- AC Voltmeter
- 5VDC Power Supply

When changing circuit boards, please use CAUTION when re-installing the flat cable connectors that come from the display board. Make sure the pins are NOT bent or broken. Boards that are fine otherwise, will not operate correctly if these pins have been abused, because they will not receive the necessary signals from other boards.

Before attempting any troubleshooting for a particular problem, it is good practice to verify power supply voltages of the POWER SUPPLY board #3176677. Read these steps before performing them to get acquainted with the procedure.

1. Be sure that the main power source is OFF or disconnected.
2. Connect J101 and J105 to the POWER SUPPLY BOARD. DO NOT connect J102 that comes from the CPU and the DISPLAY at this time.
3. Connect the negative lead of the voltmeter to TP2 - COM. Select a VDC of 20. Connect the positive lead to TP1 - UNREG.
4. Turn ON the main power.
5. The voltmeter should be reading approximately 14 volts DC ± 2 .
6. Connect the positive lead to TP3 $\pm 5V$. The voltmeter should be reading +5 volts DC ± 0.5 .

7. Turn OFF main power.
8. Connect the display board ribbon connector to the power supply board at J102 and then repeat steps 3 thru 6. Do not connect the connector to the CPU board at this time. If the above voltages are not measured again, the display board has a bad component which is loading down the voltages. If the voltages are still present, continue on to step 9.
9. Connect the display board ribbon connector to the CPU board J310 and repeat steps 3 thru 6. If the above voltages are not measured again, the CPU board has a bad component which is loading down the voltages. This board will have to be replaced.

GENERAL INFORMATION: The POWER SUPPLY PCB ASSEMBLY #3176677 has the triac (solid state AC voltage switch) on it which supplies the power to the heater. This triac is "told" to operate, when need be, by the microprocessor. There is another device known as an opto-coupler which serves as the high/low voltage isolator between the triac and the microprocessor.

When the bath starts experiencing temperature problem and/or variations, due to known controller malfunctioning, these two components become prime suspects. The reason being, they are under higher operating stress than other components.

If the bath starts experiencing temperature problems such as no heat, or "creeping" upward heat, then follow the troubleshooting instructions below. These instructions require the use of a voltmeter being able to measure DC and AC voltages (preferably a digital voltmeter).

WARNING

THE FOLLOWING TROUBLESHOOTING INSTRUCTIONS REQUIRE THAT POWER BE ON. ONLY QUALIFIED SERVICE PERSONNEL SHOULD PERFORM THESE PROCEDURES.

Open the control cover and familiarize yourself with the POWER SUPPLY assembly #3176677. Locate the triac (Q2), the opto-isolator (U1), resistor (R4), test point #2 (TP2-COM). The first measurements will be DC voltage measurements, a DC scale of at least 10 volts should be selected.

PROBLEMS & SOLUTIONS

***** Problem A : No Heat *****

1. Verify that the setpoint temperature is greater than the actual water temperature.
2. Verify that the HIGH TEMP light is "OFF". If the light is "ON", turn the HIGH LIMIT CONTROL fully clockwise.
3. Check temperature probe voltage reference. These measurements are on the CPU board #3176678.
 - a. Place the negative lead of a DC voltmeter on TP1-COM test point. Measure the voltage at U7-pin 2. It should be approximately 14 volts DC. Then measure the voltage at U7-Pin 6. It should be approximately 5 volts DC. If the 14 volts is present but not the 5 volts, the CPU board must be replaced.
4. Check temperature probe.
 - a. Measure the bath water temperature and make note of it. Make sure it will not change drastically during this check.
 - b. With a DC voltmeter, measure the supply of the temperature sensor at J302 pins 1 & 3. It should be approximately 5 volts. If it is, then continue on to step "c". If not, see Step 3a.
 - c. Measure the output of the temperature sensor at J302 pins 2 & 3. Pin 3 being the reference or ground. The output relationship of voltage to degrees centigrade is listed in the table below. Compare the measured voltage to the temperatures listed to determine if the probe is working.

Temp Degrees C	Volt	Temp Degrees C	Volt
10	0.500V	60	1.400V
20	0.680V	70	1.580V
30	0.860V	80	1.760V
40	1.040V	90	1.940V
50	1.220V	99	2.218V

5. The bath is not heating when it should be requesting heat. Voltage measurements are made on the POWER SUPPLY BOARD #3176677.
 - a. Select a setpoint temperature at least 10° above what the actual temperature is. The bath should be requesting heat as indicated by the heater "ON" indicator lamp on the front panel. It should be on continuously, not flashing.
 - b. Measure the voltage at U1-PIN 2 with respect to TP2-COM. It should be no greater than 4 VDC.
 - c. Measure the DC voltage across R4. Since the bath is requesting heat, there should be current flowing through this resistor making the voltage drop equal to 3 VDC ± 0.5 .
 - d. If the last two steps are not as stated, then most likely the CPU board is bad and it will have to be replaced. Otherwise continue to step "e".
 - e. Switch the voltmeter to an AC volts scale capable of reading 120 volts.
 - f. Measure the voltage between U1-PIN 4 and U1-PIN 6. It should be less than 1 VAC.
 - g. If it is not, then most likely the opto-coupler U1 is bad and the POWER SUPPLY board will have to be replaced. If it is, continue to step "h".
 - h. Measure the voltage directly across the heater. It should be line voltage 110VAC to 120 VAC.
 - i. If it is not, then most likely the triac Q2 is bad, and the POWER SUPPLY board will have to be replaced.

6. Check heater.

- a. Disconnect the bath from its electrical supply.
- b. Isolate the heater from any circuitry by disconnecting one of the heater leads.
- c. Using an ohmmeter, check the heater resistance. Appropriate heater resistance values are listed below:

	120 Volt	240 Volt
MODEL 2862/2863	10 OHMS	40 OHMS

If the resistance reads 0 or infinity, then replace the heater.

- d. Check the resistance between the heater leads and ground (green wire). If the resistance reads 0 ohms, replace the heater.

***** **Problem B: Constant Heat** *****

- 1. Bath is heating when it is not requesting heat.
 - a. Select a setpoint temperature at least 10° below the actual temperature. The bath should not be requesting heat as indicated by the HEATER ON indicator lamp on the front panel. It should NOT be on continuously or even flashing.
 - b. Measure the voltage at U1-PIN 2 with respect to TP2-COM. It should be no less than 4 VDC.
 - c. Measure the DC voltage across R4. The voltage should be approximately zero volts.
 - d. If the last two steps are NOT as stated, then most likely the CPU board is bad and it will have to be replaced, otherwise continue to step "e".
 - e. Switch the voltmeter to an AC volts scale capable of reading 120 volts.
 - f. Measure the voltage between U1-PIN 4 and U1-PIN 6. It should be line voltage 110 VAC to 120 VAC.

- g. If it is not, most likely the opto-coupler U1 is bad and the POWER SUPPLY board will have to be replaced. If it is, continue to step "h".
- h. Measure the voltage directly across the heater. It should be approximately 0 VAC.
- i. If it is not, then most likely the triac Q2 is bad, and the POWER SUPPLY board will have to be replaced.

2. Check Temperature Probe. Problem A, Step 4.

*** **Problem C: Unstable Temperature Control or Display** ***

- 1. Use gable cover provided to improve temperature control.
- 2. If control is stable but not at desired temperature, then check temperature calibration. Re-adjust if necessary.
- 3. Check Temperature Probe, Problem A, Step 4.

** **Problem D: Display Reads NNNN or UUUU** **

The control boards have the ability to detect an OPEN or SHORTED temperature sensor. These two conditions are shown on the display as follows:

<u>DISPLAY</u>	<u>CONDITION</u>
UUUU	SHORT CIRCUIT
NNNN	OPEN CIRCUIT

Before coming to the conclusion that the probe is bad when one of these displays appear, check the connection of the probe to the circuit board for polarity and alignment.

*****Problem E: Display Reads all Eights (8888)*****

- 1. The most common cause of this problem is the failure of the driver integrated circuit on the DISPLAY/KEYBOARD board (#3176679). Replace it.

***** Problem F: Pump Does Not Circulate Water *****

1. Verify that the water level is above both the pump inlet and outlet.
2. If pump is not running, verify that power is applied to the bath. If power is present, check wiring of pump to power switch. If wiring is correct, replace the pump.
3. If pump is running but water is not circulating, open the control panel and gently squeeze the long piece of rubber tubing a few times to help remove any air trapped within the pumping system.
4. If water is still not circulating, check for foreign matter in the pump inlet fitting.

PARTS REPLACEMENT

Before removing any parts for replacement, verify part in question by following the instructions listed in the troubleshooting guide.

Refer to Parts Replacement Table below for appropriate replacement procedures. Failure to follow parts replacement procedures may cause damage to the bath.

WARNING

BEFORE REPLACING ANY PART, TURN POWER SWITCH TO OFF, THEN UNPLUG THE UNIT FROM ITS POWER SOURCE. SERVICE SHOULD BE PERFORMED BY A QUALIFIED TECHNICIAN.

CAUTION

WHEN REPLACING TEMPERATURE SENSOR, HEATER OR CIRCULATING PUMP, MAKE SURE ALL SEALS ARE WATERTIGHT BEFORE APPLYING ELECTRICAL POWER.

PARTS REPLACEMENT	
NOTE: For easiest access to the control housing, place bath on the edge of a bench or table. Remove four screws on upper side of control housing and carefully lower hinged control panel to the vertical position.	
Circulating Pump Replacement	<ol style="list-style-type: none"> 1. Drain water from bath. 2. Remove the two pump leads attached to power switch and green wire from pump to ground lug. 3. Loosen the two visible hose clamps with a screwdriver and remove tubing from pump. 4. Disconnect pump from pump bracket by removing two screws and remove pump from bath. 5. Reverse above procedure to install new circulating pump.
Replace Temperature Sensor	<ol style="list-style-type: none"> 1. Drain water from bath. 2. Remove diffuser pan from bath. 3. Remove connector J302 from CPU board. 4. Remove temperature sensor fitting from inside bath pan. <ul style="list-style-type: none"> - Hold small nut on fitting firmly with a wrench. - Remove large fitting piece with another wrench. 5. Remove rubber grommet from temperature sensor. 6. Carefully slide sensor through the control housing and remove. 7. Reverse above procedure to install new temperature sensor. 8. Recalibrate new temperature sensor. See Temperature Calibration on page 15.

PARTS REPLACEMENT (CONT'D)

<p>Replace Heater</p>	<ol style="list-style-type: none"> 1. From inside control housing, remove 2 nuts and disconnect wires from heater leads. 2. Remove two hex nuts from heater ends using a 13/16" socket and remove heater. 3. Reverse above procedure to install new heater.
<p>Replace "HI LIMIT" Thermostat</p>	<ol style="list-style-type: none"> 1. Remove four leads from thermostat terminals. 2. Remove two screws from thermostat bracket and remove bracket. 3. Carefully tilt bath on its side. 4. Remove eight screws from bottom plate and remove plate. 5. Remove insulation from bottom of pan and between pan and control panel wall. 6. Loosen two nuts from thermostat bulb bracket. 7. Carefully remove thermostat from control housing by sliding bulb through hole in control panel wall. 8. Reverse above procedure to install new Hi Limit thermostat. Use extreme care when installing new thermostat. A sharp bend in the thermostat capillary will crimp off flow of hydraulic fluid.
<p>Replace Power Supply Board</p>	<ol style="list-style-type: none"> 1. Remove connectors J101, J102, J103, and J105 from board. Use extra care when removing J102 so as not to bend connector pins. 2. Remove five nuts from board and then remove it. 3. Reverse above procedure to install new power supply board.
<p>Replace CPU or Display/Keyboard Board See note on the following page **</p>	<ol style="list-style-type: none"> 1. Remove connectors J302 and J303 from CPU board. 2. Remove connector J102 from power supply board. Use extreme care when removing J102 so as not to bend connector pins. 3. Remove four nuts from CPU board and remove CPU board and Keyboard/Display board. 4. Remove J201 from CPU board. Use extreme care when removing J301 so as not to bend connector pins. Remove board. 5. Reverse above procedure to install new board.

PARTS REPLACEMENT (CONT'D)

Replace CPU or
Display/Keyboard Board
See note below **

6. The software must be configured to match the Bath model. To enter configuration mode, press the upper left push-button switch while applying power. The upper left switch is labeled "Calibrate." This switch is used to enter configuration codes and steps through the different levels of configurations. When a triangle is shown in the chart, the push-button is to be depressed once for each symbol.

Immediately following power up with the switch depressed, the readout will display a 3-digit number. This is the software revision. The readout will then begin to do a self-test of digits. Press the "Calibrate" switch once. The readout will display 0000. Follow the listing below to complete the configuration.

- | | |
|--|-------------------|
| A. Enter 37 using up/down arrows. | Press "Calibrate" |
| B. Enter 51 using up/down arrows. | Press "Calibrate" |
| C. Enter 2.0 using up/down arrows. | Press "Calibrate" |
| D. Enter 500 using up/down arrows. | Press "Calibrate" |
| E. Enter 1 using up/down arrows. | Press "Calibrate" |
| F. Display Not Used. | Press "Calibrate" |
| G. Display Not Used. | Press "Calibrate" |
| H. LOW TEMP CALIBRATION*
LITTLE c. Factory Setting. | Press "Calibrate" |
| I. HI TEMP CALIBRATION
BIG C. Factory Setting. | Press "Calibrate" |

Configuration is now complete

* Calibration of the low and high end of the sensor input is done at the factory. Field calibration of the sensor may be performed using the following technique: Enter the configuration routine and press the top left switch until a little "c" (Item H) is displayed. Add water that is around 10°C to the bath completely covering the sensor. Insert a calibrated thermometer. After the thermometer stabilizes, match the display setting to the thermometer reading by pressing the "UP" or "DOWN" push button switch. Press the top left switch. The readout will now display a big "C" (Item I). Remove water from the bath and add hot water of about 70 - 80°C. After the unit stabilizes, match readout display to temperature on thermometer and press the top left switch. Calibration is now complete.

****Note:**

When replacing CPU printed circuit board reprogramming may be necessary.
Follow thoroughly instructions provided with the replacement circuit board.

TEMPERATURE CALIBRATION

The following provides a step-by-step procedure for temperature calibration. ***Do not deviate from the procedure or the calibration of your bath may be inaccurate.***

CAUTION

THIS PROCEDURE SHOULD ONLY BE PERFORMED AFTER INSTALLING A NEW TEMPERATURE PROBE INTO THE BATH.

1. Connect the temperature probe connector to J302 on CPU board.
2. Turn Power switch to the OFF position.
3. Press and hold UP, DOWN, and ENTER keys while turning Power ON.
4. The unit will now cycle through an LED display test. Press ENTER to end test.
5. The display will now read 0000. Press UP until display reads 0012.
6. Press ENTER - The unit is now in calibration mode. If some other value than 0012 is displayed and ENTER is pressed, the unit will return to normal operating mode and display will show actual bath temperature.
7. The display will now show CXX.X (XX.X is the actual bath temperature) - this is Low Temperature Calibration.
8. Place the temperature probe and a calibrated reference thermometer into an ice bath. Press UP or DOWN until the display value matches the reference thermometer. Press ENTER to store the new low temperature calibration value.
9. The display will now show CXX.X - this is High Temperature Calibration. (XX.X is the actual bath temperature).
10. Place the temperature probe and a calibrated reference thermometer into a steaming water bath. Press UP or DOWN until the display value matches the reference thermometer. Press ENTER to store the new high temperature calibration value.

NOTE

PRESSING OFFSET AT ANY TIME DURING THE CALIBRATION PROCESS WILL RETURN UNIT TO NORMAL OPERATION MODE AND DISPLAY WILL SHOW ACTUAL BATH TEMPERATURE.

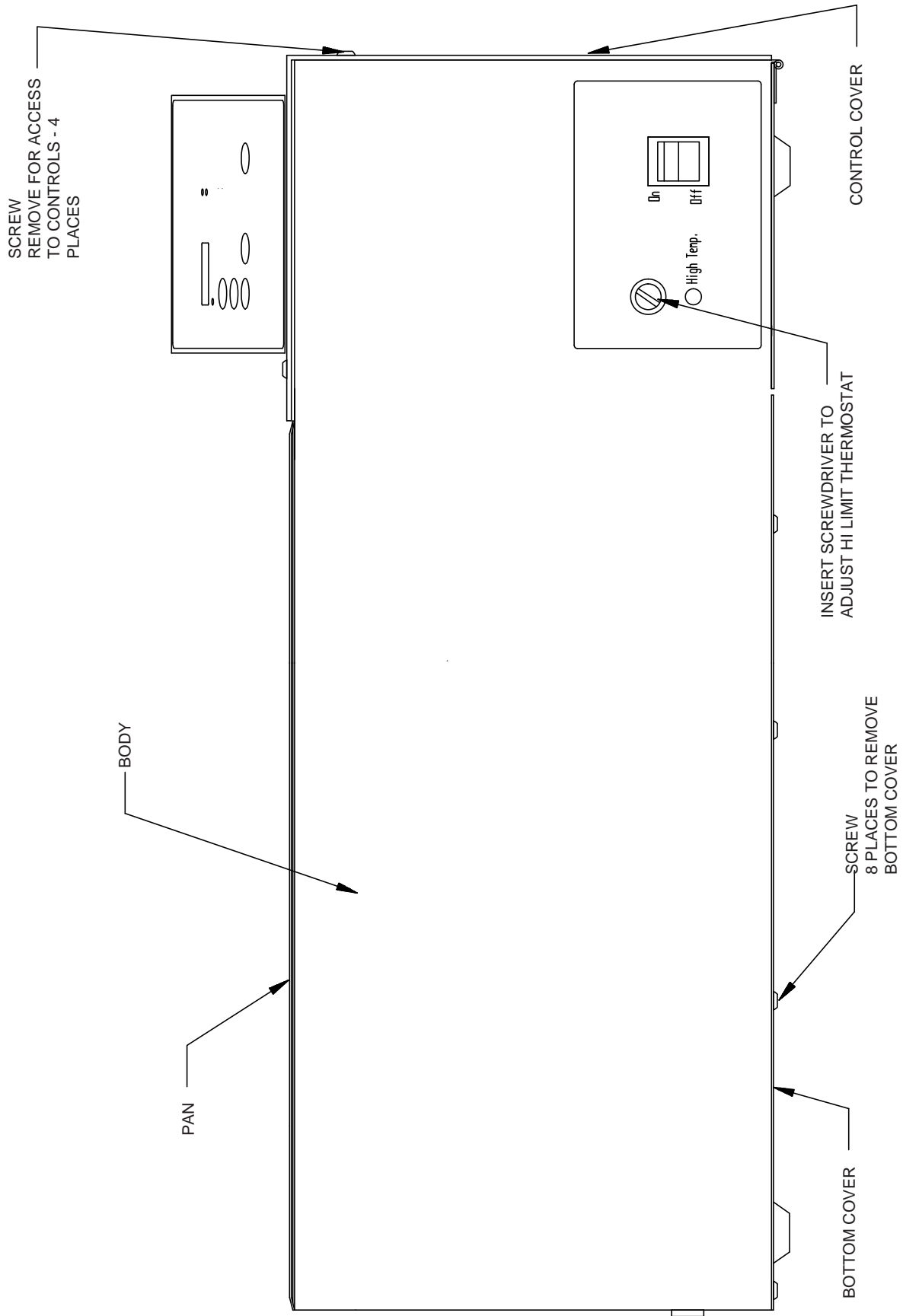
REPLACEMENT PARTS LIST

	Model #2862/2863	
	120V	240V
Bath Pan Kit	3167141	
Diffuser Pan Assy	3164479	
PCB Kit, PowerSupply	3166924	
PCB Assembly, CPU	3167119	
PCB Assembly, Display	3166679	
Heater Kit	3167136	3167137
Voltage Connector	3176698	3176699
Wire Harness	3176700	
Temperature Probe Kit	3167144	
O-Ring Kit, Water Bath	3167129	
Tubing Kit	3167145	
"Hi- Limit" Thermostat Kit	3167143	
ON/OFF Switch	3175318	
Hi Limit Light, Amber	3177575	3173907
Line Cord	3178034	3179481
Pump Assembly Kit	3167333	3167342
Drain Kit (includes Nut & O-Ring)	3166191	

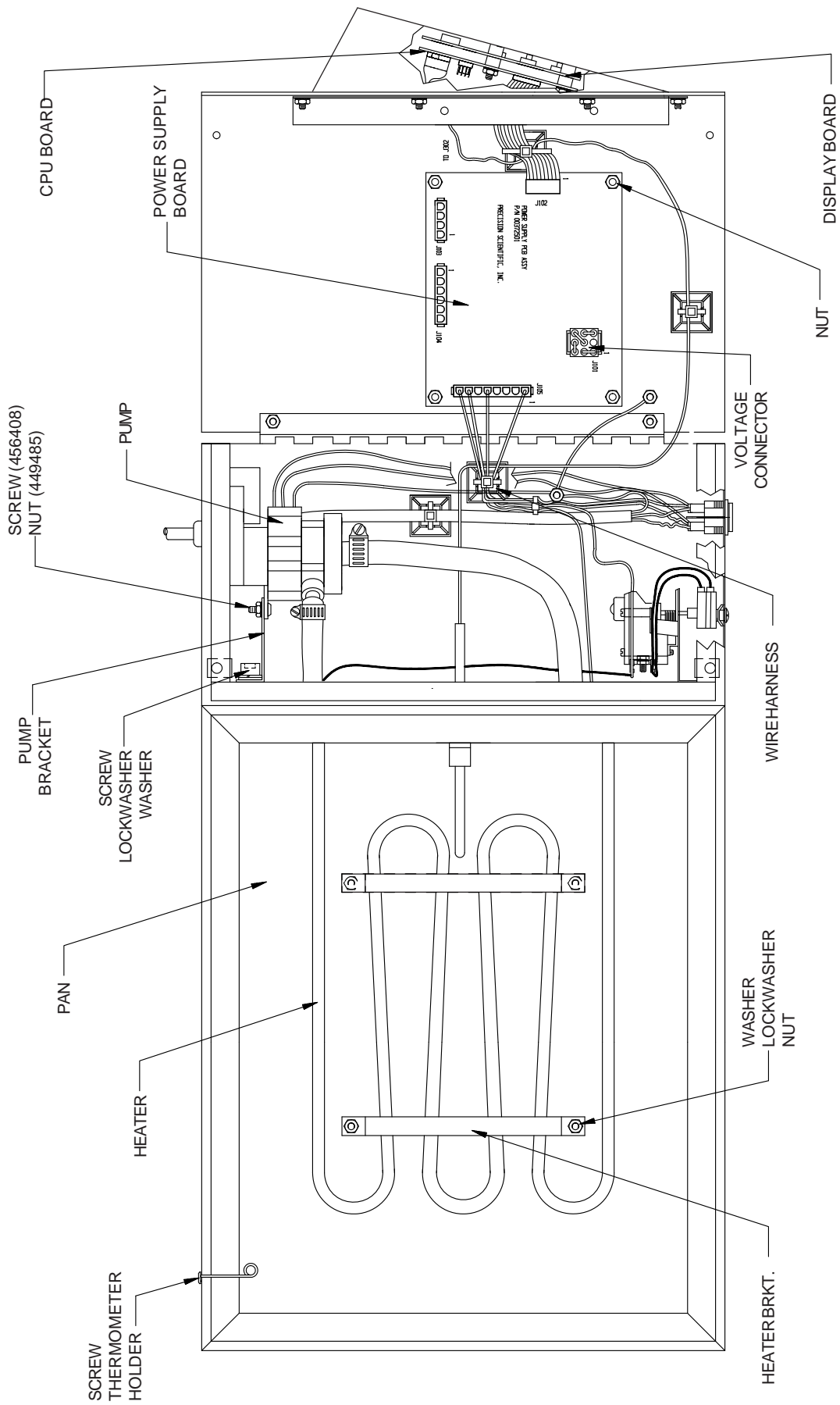
ACCESSORY PARTS LIST

	Model #2862/2863	
	120V	240V
Cover, Gable	3166208	
Kit, Water Level Regulator	3166223	
Sanitizer, Oakite	3166250	
Test Tube Rack (Capacity 50 tubes)	3161601	
Petri Dish Rack (Capacity 96 dishes)	3166183	

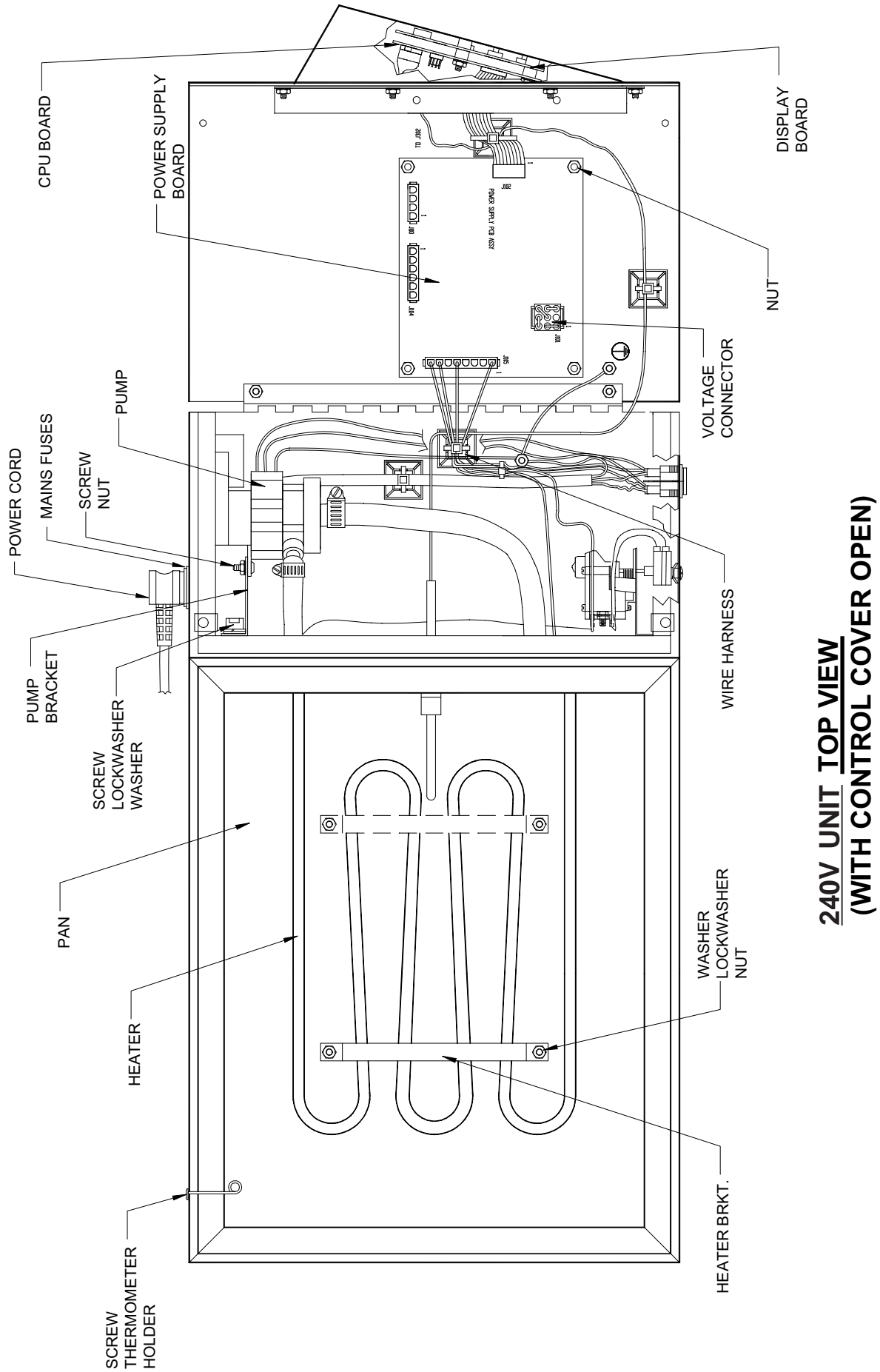
ASSEMBLY & SCHEMATIC DWGS.

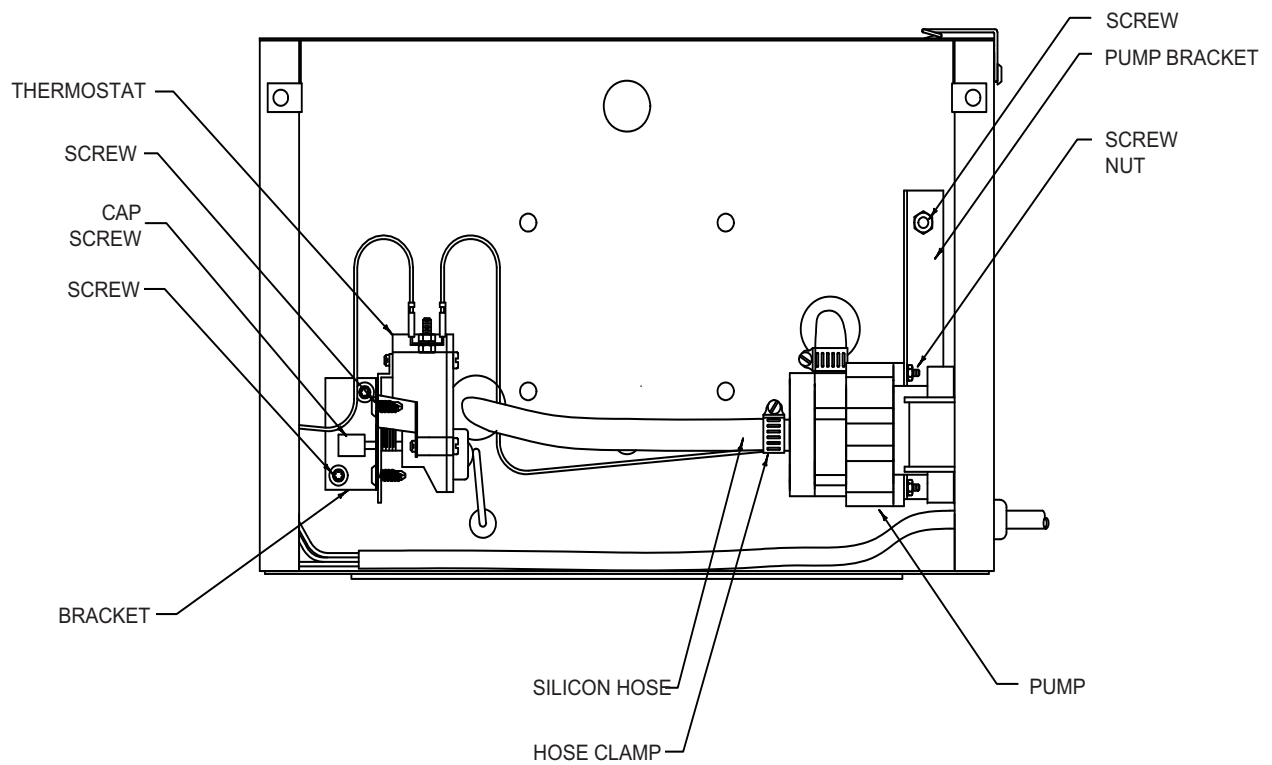


FRONT VIEW

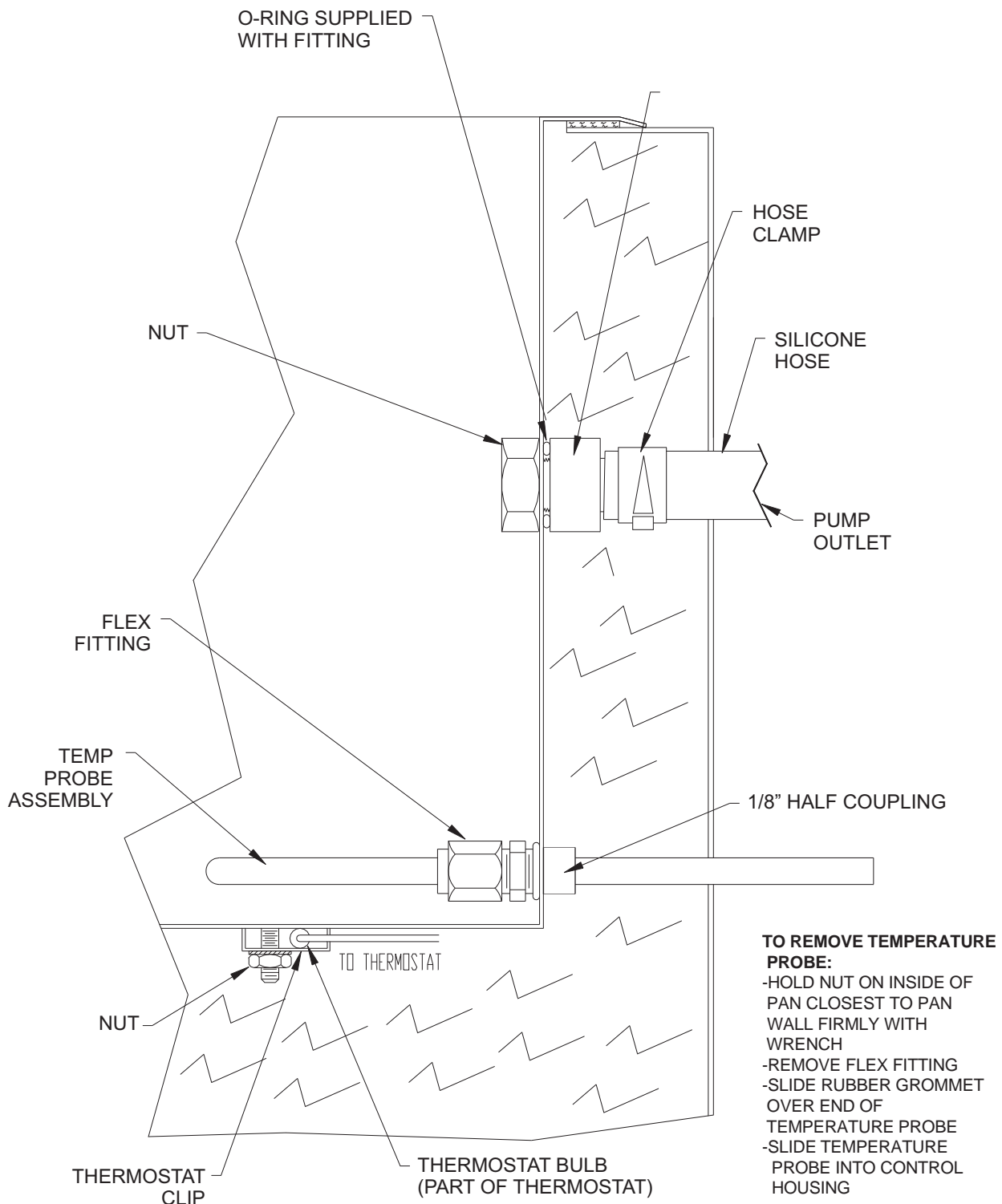


**120V UNIT TOP VIEW
(WITH CONTROL COVER OPEN)**

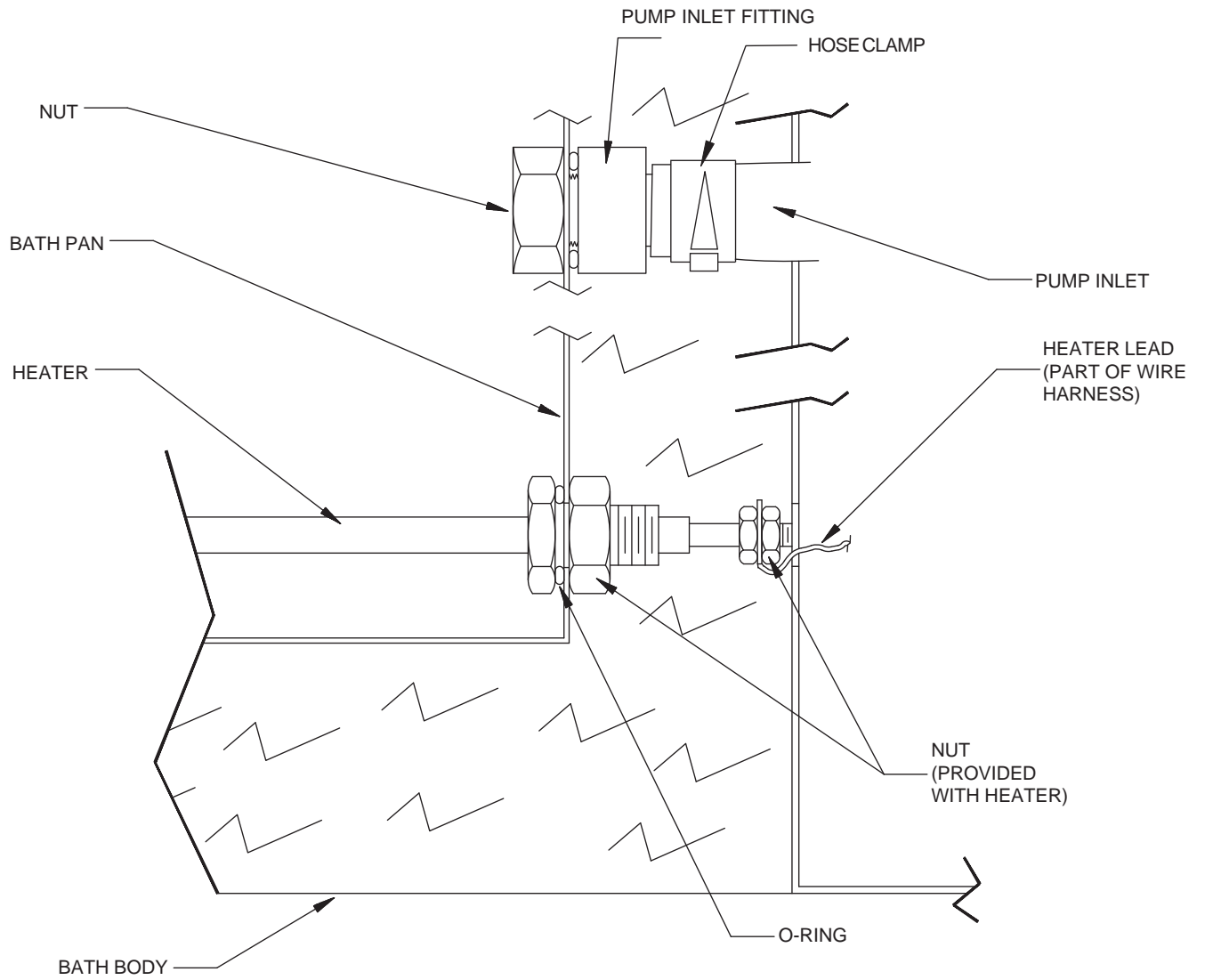




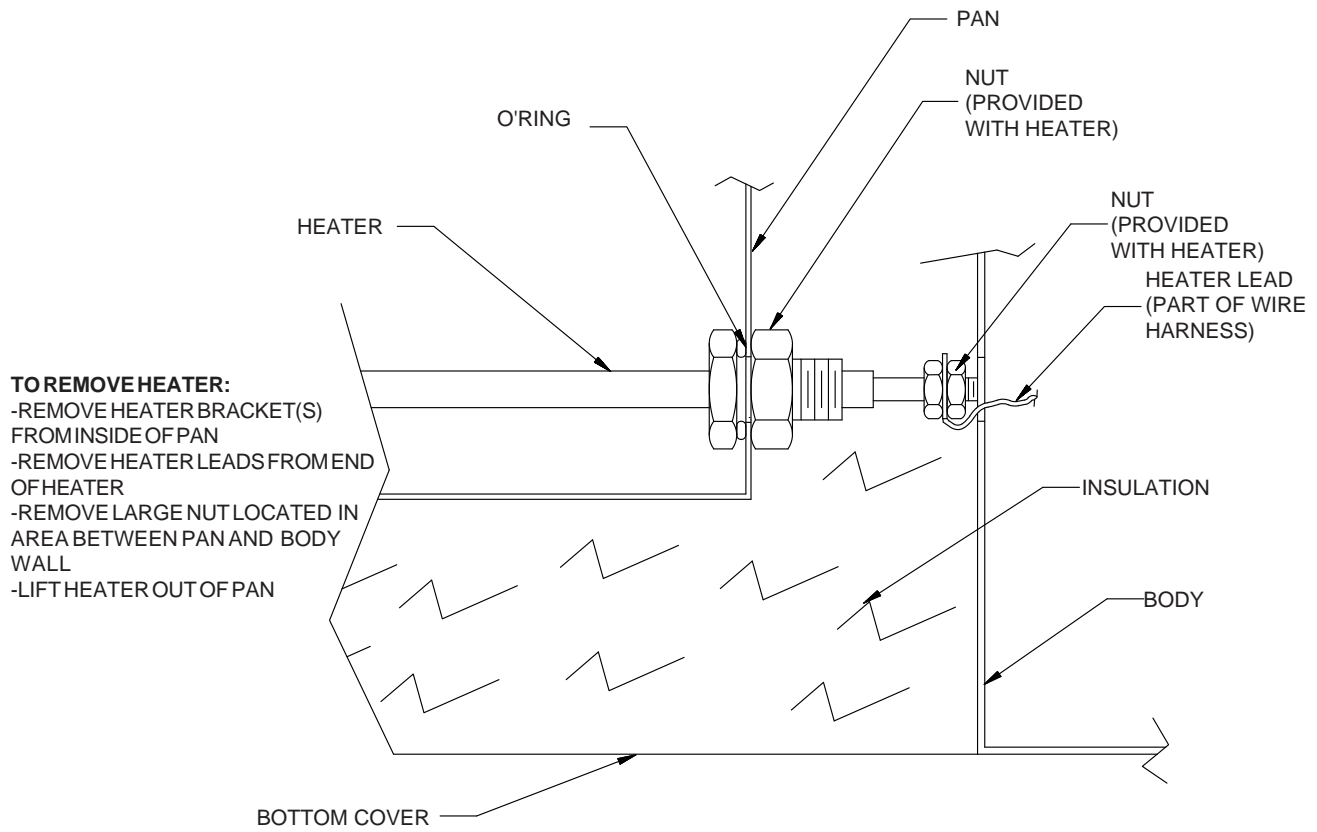
SIDE VIEW
(WITH CONTROL COVER REMOVED AND WIRING EXCLUDED)



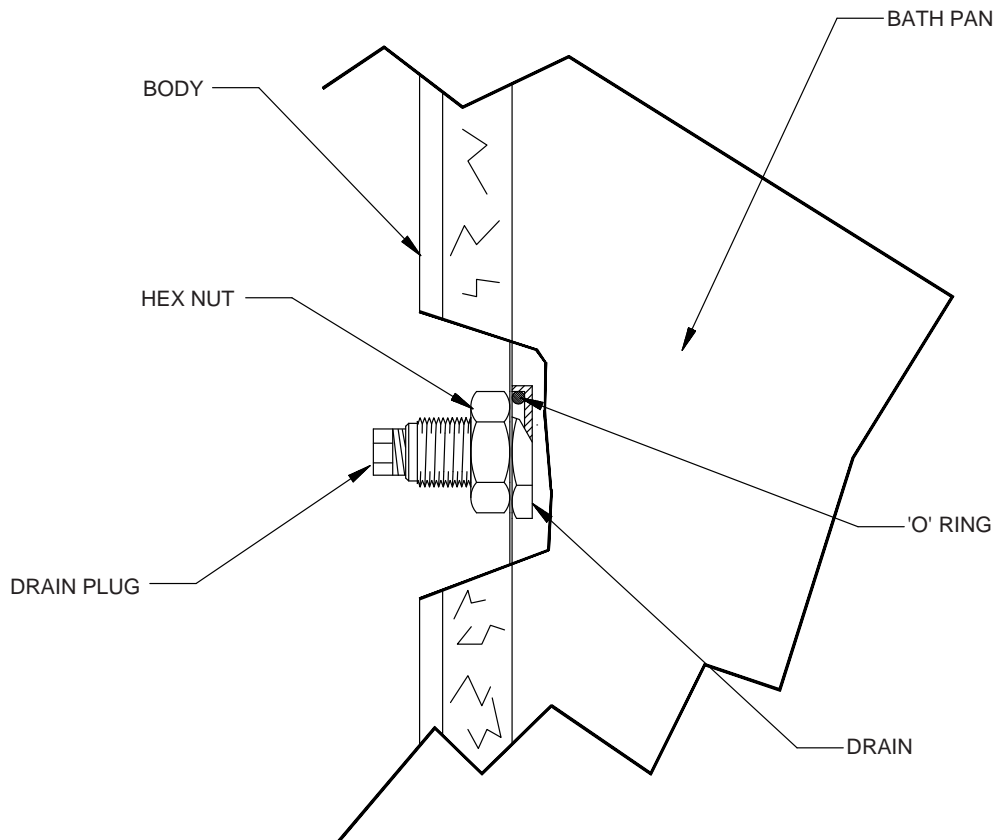
**FRONT VIEW
 (CUTAWAY DETAIL OF TEMP PROBE & PUMP OUTLET)**



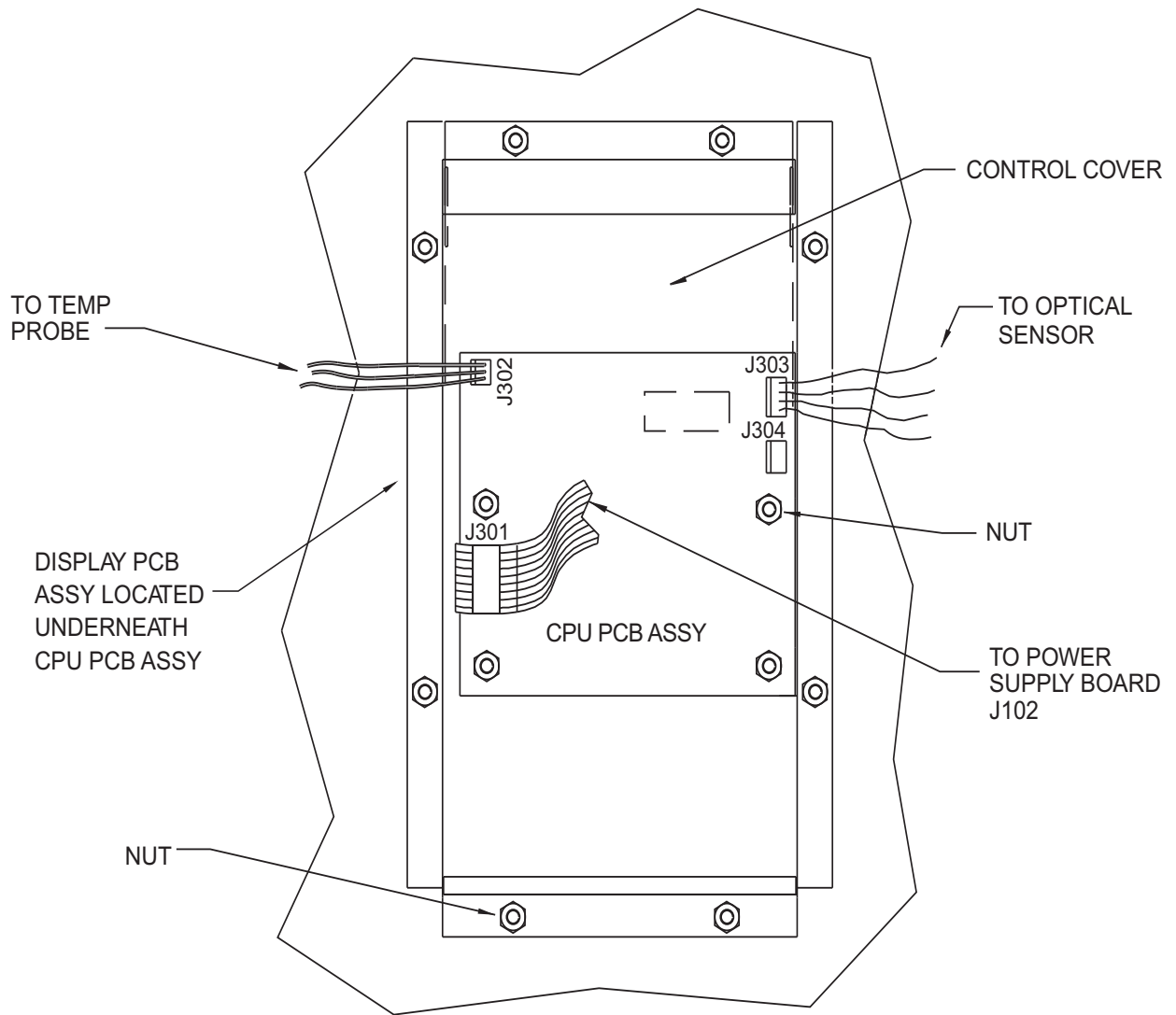
FRONT VIEW
(CUTAWAY DETAIL OF PUMP INLET & HEATER)



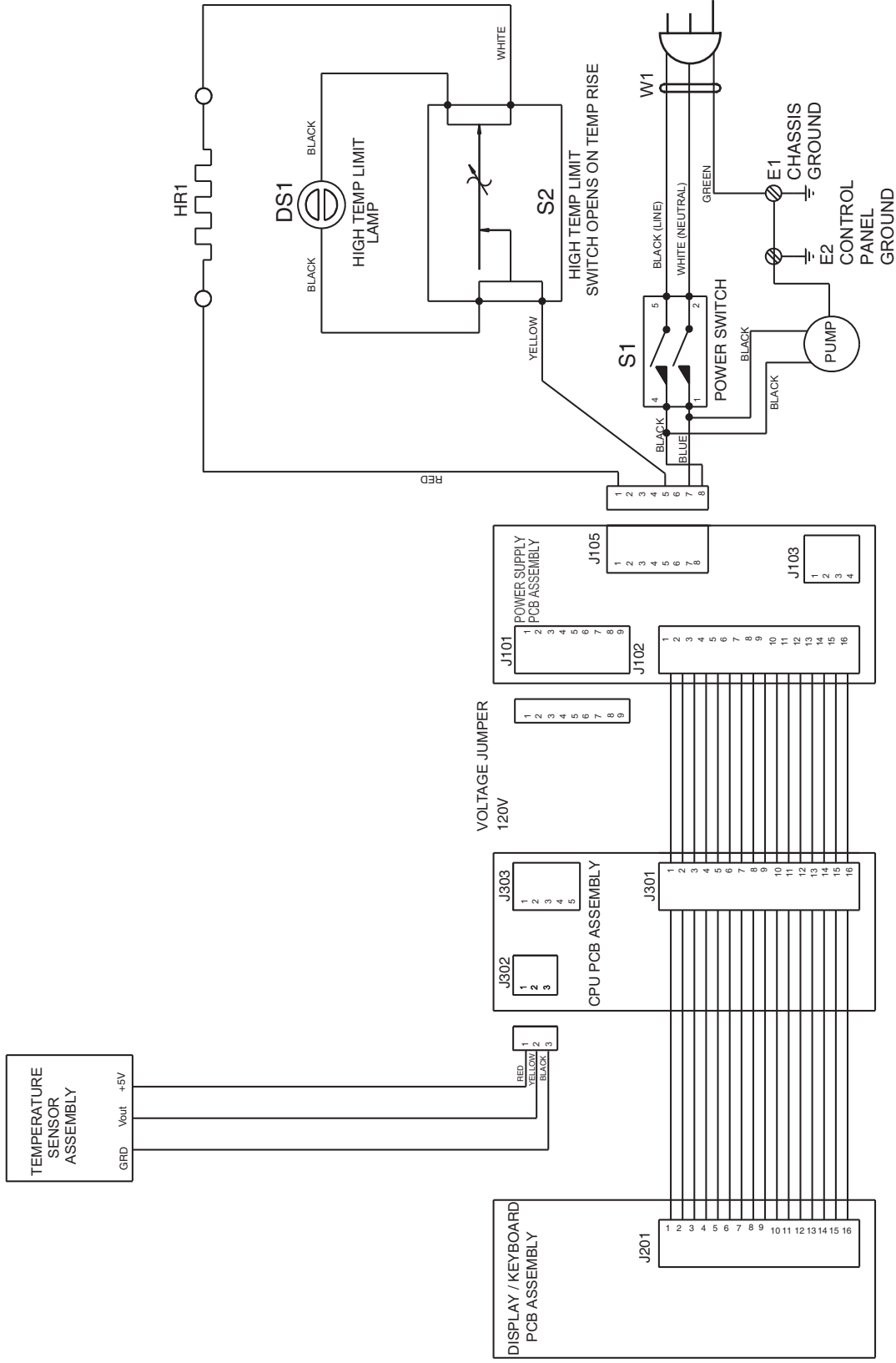
HEATER REMOVAL DETAIL



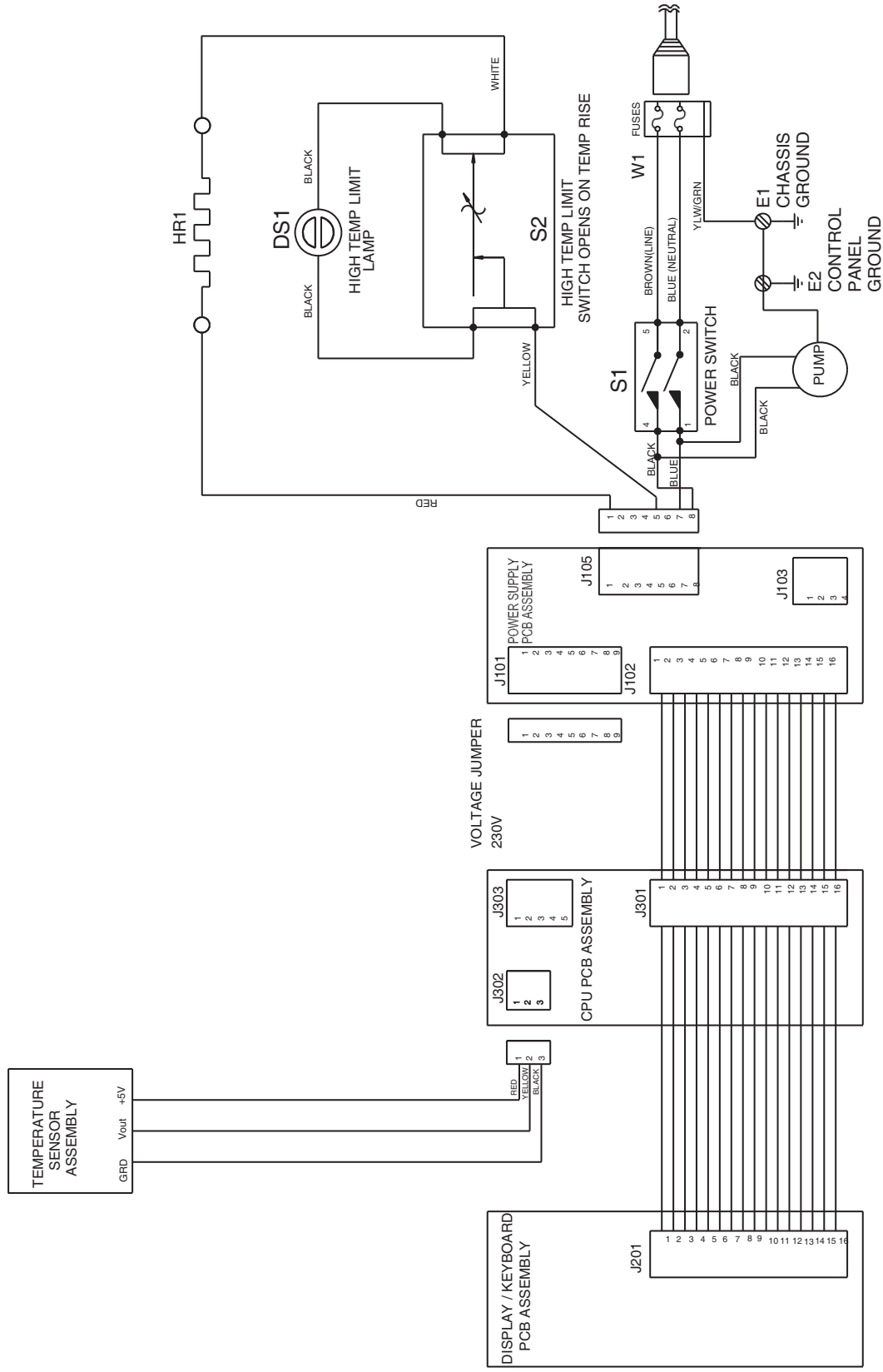
CUTAWAY VIEW OF DRAIN



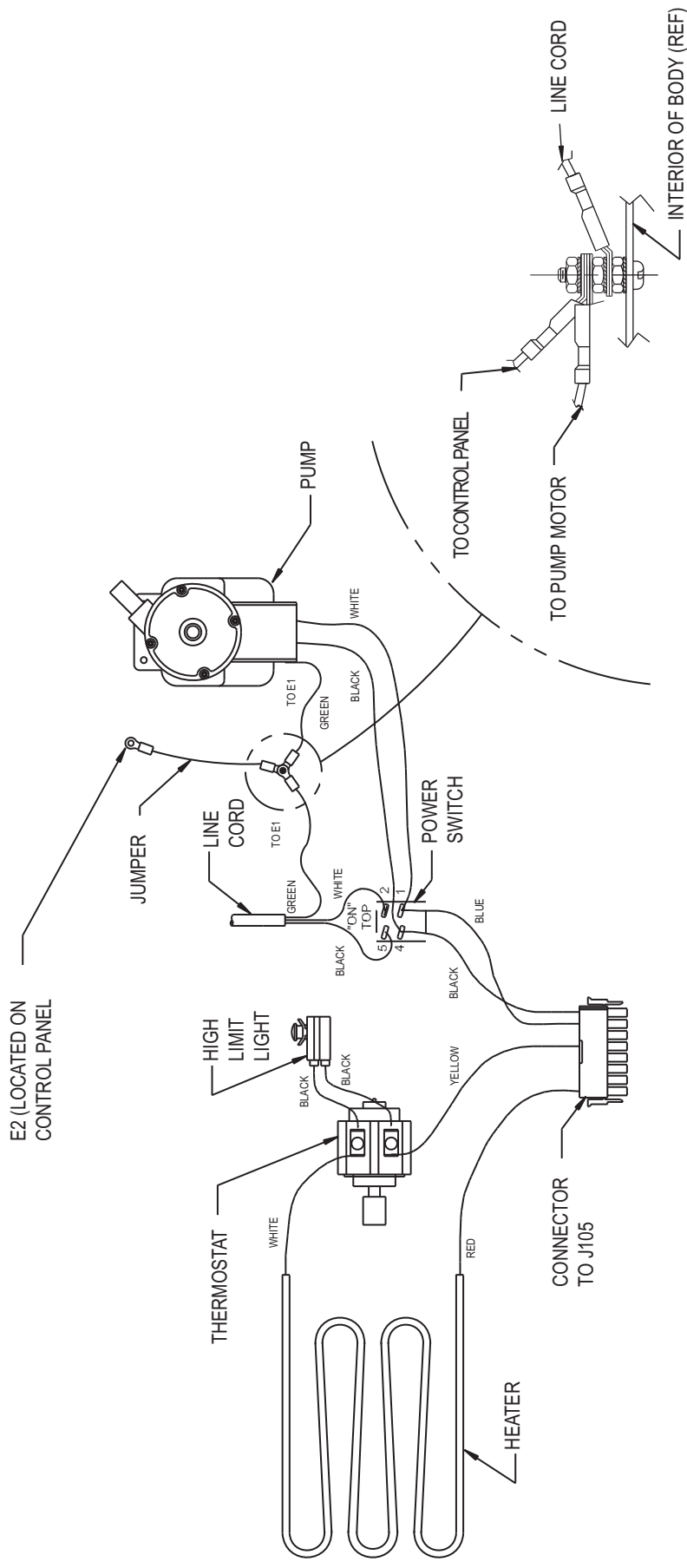
CPU/PCB ASSEMBLY CONFIGURATION



SCHEMATIC DIAGRAM (120V)

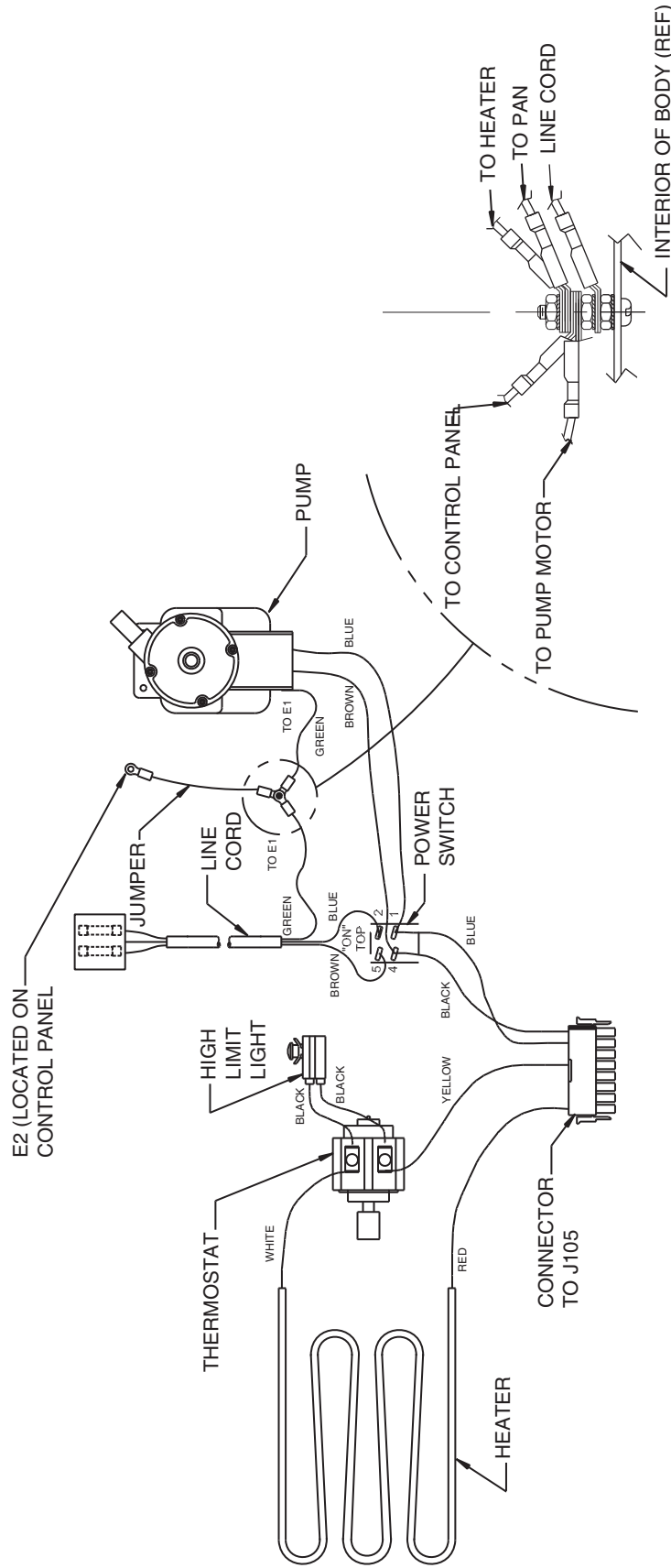


**SCHEMATIC DIAGRAM
(230V)**



DETAIL A
GROUND CONNECTION-E2

WIRING CONNECTION DIAGRAM
(120V)s



DETAIL A
GROUND CONNECTION-E2

WIRING CONNECTION DIAGRAM
(230V)

THERMO FISHER SCIENTIFIC STANDARD PRODUCT WARRANTY

The Warranty Period starts two weeks 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.

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 included. 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, filters 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 Electron Corporation 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.

If equipment service is required, please call your Technical Services Department at 1-800-438-4851 (USA and Canada) or 1-740-373-4763. We're ready to answer your questions on equipment warranty, operation, maintenance, service and special application. Outside the USA, contact your local distributor for warranty information.



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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. 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, filters, 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.

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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.



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