

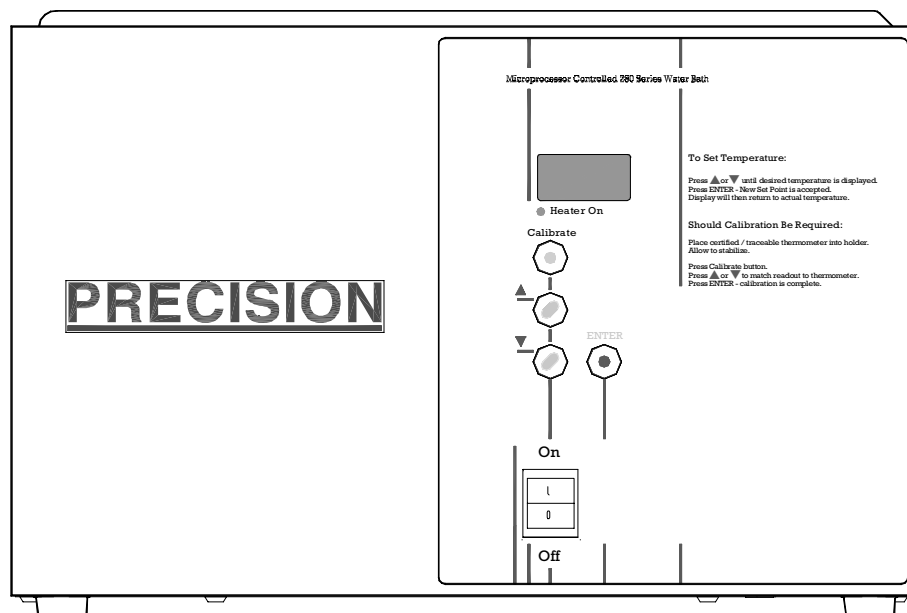
# PRECISION

## Installation and Operation Manual

### Microprocessor-Controlled General Purpose Water Baths

#### 280 Series Models

280, 281, 282, 283, 284, 285, 286 & 288



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Manual P/N 36100112 (340016400)  
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## **NOTICE**

THE MATERIAL IN THIS MANUAL IS FOR INFORMATION PURPOSES ONLY. THE CONTENTS AND THE PRODUCT IT DESCRIBES ARE SUBJECT TO CHANGE WITHOUT NOTICE. PRECISION MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THIS MANUAL. IN NO EVENT SHALL PRECISION 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 Customer Service using our toll free telephone number.

800-621-8820  
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## **REVISION STATUS**

INDEX	DATE	AMENDED PAGES	NOTES
A	12/98		Initial release
B	02/00	17	Pictorial update of wiring per ECO JGC000223A
C	07/01	2,8,9,12,17	updated electrical specifications
D	NOV01	5	Add caution "acidic & caustic substance ....."

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## 1.0 INTRODUCTION

- 1.01** Your satisfaction and safety are important to **PRECISION** and a complete understanding of this unit is necessary to attain these objectives.
- 1.02** As the ultimate user of this apparatus, you have the responsibility to understand its proper function and operational characteristics. 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 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.*

- 1.03** 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.

## 2.0 UNPACKING AND DAMAGE

- 2.01** This product was carefully packed and thoroughly inspected before leaving our factory. Save all packing material if apparatus is received damaged.

- 2.02** 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:

**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 claim. The form required to file such claim will be supplied by the carrier.

**Concealed Loss or Damage:** Concealed loss or damage is any 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 15 days of the delivery date; then file a claim with the carrier.

- 2.03** If you follow the above instructions carefully, Precision will guarantee our full support of your claim to be compensated for loss or damage in transit.

**DO NOT — for any reason — return this unit to PRECISION without first obtaining return authorization.** In any correspondence with PRECISION please supply the nameplate data, including catalog number and serial number.

### 3.0 GENERAL INFORMATION

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

**3.02** The microprocessor control panel houses all functions necessary to operate the bath. The push-button keys and single display window allows the operator to adjust bath temperature and temperature calibration via a single set of controls.

**3.03** The Proportional Integral Derivative (PID) temperature control allows precise temperature control. Use of the gable cover provided is required to maintain optimal temperature sensitivity.

**3.04** A high limit temperature cutout is provided in the event of an empty water bath. If the sensor reads a temperature 5°C higher than the set temperature, a high temperature cutout will occur indicated by a display reading of "EEE," and the heater will be inhibited from operating. To reset the bath, the power must be turned off and then back on again. The high limit temperature cutout is internally set for 5°C above any set temperature and can not be set by the user.

**3.05** 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 inhibitor's added. The body is made from galvanized steel and is painted for added protection. A gable cover is also provided with the bath.

**3.06** The 230-volt units are identical in appearance to the 120-volt units.

Model Number	Catalog Number	Electrical Characteristics			Capacity	
		Volts	Watts	Amps	Liters	Gallons
280	51221044 51221045	120 230	225	1.9 1	1.5	0.4
281	51221046 51221047	120 230	225	1.9 1	2.5	0.7
282	51221048 51221049	120 230	300	2.5 1.3	5.5	1.5
283	51221050 51221051	120 230	400	3.3 1.7	12.0	3.2
284	51221052 51221053	120 230	600	5 2.6	19.5	5.2
285	51221054 51221055	120 230	600	5 2.6	18.0	4.9
286	51221056 51221057	120 230	1200	10 5.2	43.0	11.4
288	51221058 51221059	120 230	800	6.7 3.5	12.0*	3.2*

\* Each Chamber

## 4.0 PERFORMANCE DATA

4.01 The following table identifies the specifications for the Water Baths.

4.1 Performance Data	
With Gable Cover All Models	
Uniformity @ 37°C	±0.2°C
Sensitivity @ 37°C	0.1°C

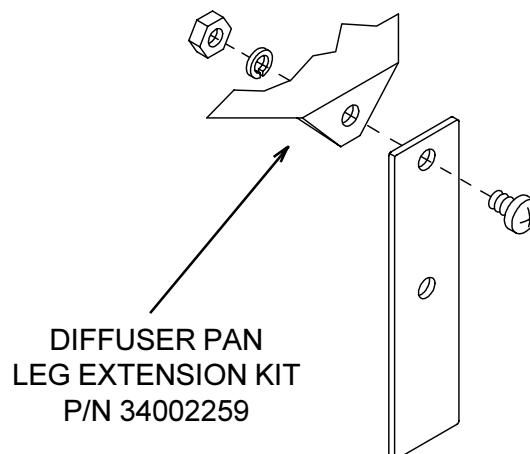
## 5.0 INSTALLATION

### WARNING

*INSTALLATION SHOULD BE COMPLETED BY QUALIFIED PERSONNEL ONLY.*

5.01 1. The most uniform operating conditions and results 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.

2. Place the stainless steel metal shelf (corners facing downward) inside the bath chamber. The shelf (Diffuser Pan) provides a sample base and protects samples from touching the hot metal bath bottom. If it is necessary to increase the height of the diffuser pan, a Leg Extension Kit is included for this purpose, except for the Model 281 water bath. Following the figure shown below, attach the 4 extension legs to each of the four corners of the diffuser pan.



## 5.02 Electrical Connections -

### WARNING

*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 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 can provide 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.**

5.03 Determine the total amount of current being used by other apparatus connected to the circuit that will be used for this apparatus. It is critical that the added current demand (see nameplate) of this 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 OF THE SAME VOLTAGE AS SPECIFIED ON THE NAMEPLATE.*

## 6.0 EXPLANATION OF CONTROLS

**6.01 Power Switch** - The power switch is located near the lower portion of the control panel and provides power to the entire unit.

**6.02 Control Panel** - The Control Panel provides a digital readout of temperature readings, heater on indicator, and keys for user to make their desired selections.

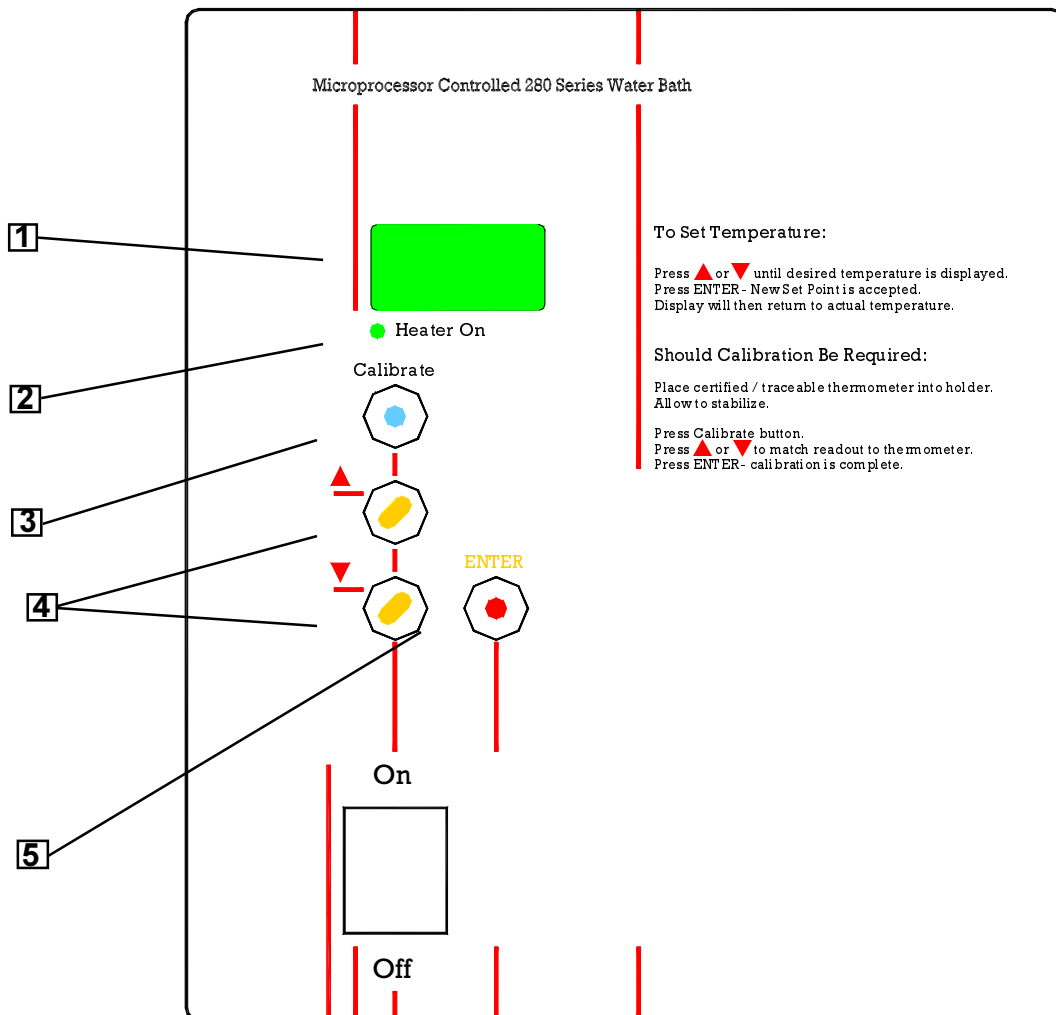
1. **LED Display** - Three digits are used to display the actual, set, and calibrated values for temperature.

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

3. **Calibrate Key** - This key puts the unit in calibrate mode to match a traceable thermometer to the actual temperature display.

4. **Temperature Selection Keys** - These keys are used to increase or decrease the setpoint and/or calibrate temperature selections.

5. **Enter Key** - The enter key is used to store a new setpoint or calibration value.





## 7.0 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.*

**7.01** When filling the bath with water, allowance must be made for the displacement of water upon immersion of samples. The maximum liquid level is 1 inch below the top of the pan.

**7.02** To conserve energy, reduce evaporation, increase temperature control accuracy, and reach/maintain 100° C, 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. The water level should be no closer than 1" from the top of the bath when the bath is fully loaded. **NOTE: Use distilled water only.** If deionized is the only water available, a mixture with 50/50 ratio of deionized and tap water should be used. Deionized (18 MEG) will damage metals.

2. Power up: Depress the power switch located at the lower end of the control panel. Immediately after turning on power, all of the segments of the display will be on along with the HEATER ON indicator. After 3 seconds, the current set temperature will be displayed and this will last for 5 seconds. Then the display will change to the actual bath temperature.

3. To display the temperature setpoint:

To display the set temperature, quickly press the  $\wedge$  (up) or  $\vee$  (down) key. The current set temperature will be displayed. After 5 seconds, the display will return to the actual bath temperature.

4. To change the temperature setpoint:

To change the set temperature, continuously press the  $\wedge$  or  $\vee$  key until the desired set temperature is displayed. When continuously pressing either the  $\wedge$  or  $\vee$  keys, the display will change slowly at first but after 1 degree has passed the display will begin to change rapidly. With a little practice, one will become accustomed to this. After the desired set temperature is achieved, then press the ENTER key. The display with the new set temperature will flash three times and then it will return to the bath temperature.

If the ENTER key is NOT pressed, the expected new set temperature will not be accepted and the water bath will control at the previous set temperature.

5. To calibrate the water bath:

The water baths are calibrated at the factory for use over a wide range of temperatures. Due to non-linearities in the control system, it may be necessary to make the display match a calibrated thermometer's reading, even though the difference might be only a few tenths of a degree.

The calibrate function should be used only to match a STABLE bath's actual temperature to the calibrated thermometer.

To perform calibration, press the CALIBRATE key. The display will change to CAL, then flash back to bath temperature. This will occur four times, if no other keys, are pressed, then it will resume displaying the bath temperature.

After inserting a calibrated thermometer into the holder and letting it stabilize for a minimum of 15 minutes, note its reading.

Press the CALIBRATE key once again and while the display is flashing, press either the  $\wedge$  or  $\vee$  key to make the display match the noted thermometer reading. After the satisfied display is achieved, press the ENTER key. The display will flash three times with the adjusted reading and then stop flashing. The bath is now calibrated more accurately for that control set point.

## 8.0 MAINTENANCE

**8.01** Cleaning and care of stainless steel: Stainless steel will resist corrosion; however, it is not impervious to it. For maximum life, stainless steel must receive a certain amount of care.

### CAUTION

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

1. There are many chemical cleaners, but usually just changing the water and periodic cleaning with mild soapy water or a non-scratching scouring power will suffice.

Should algae or other undesirable microorganisms form on the top of the bath media, add a little formaldehyde or zephiran chloride to alleviate this problem.

### CAUTION

*ELECTROLYSIS CAN DAMAGE STAINLESS STEEL. THIS CAN OCCUR 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.*

2. Should it be necessary to use a media other than water such as those listed below, 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
LysolMercuric Chloride	Phenol
Potassium Permanganate	Stannous Chloride
Sodium Hypochlorite	Tartaric Acid
Potassium Thiocyanate	

## CAUTION

*NEVER USE THE FOLLOWING CHEMICALS:*

AQUA REGIA    FERRIC CHLORIDE    IODINE  
SODIUM AZIDE    SULFURIC ACID

3. 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

*ALWAYS OBSERVE THE FOLLOWING SAFETY PRECAUTIONS! USE HEAVY GLOVES OR OTHER ADEQUATE HAND PROTECTION. WEAR GOGGLES OR OTHER ADEQUATE EYE PROTECTION. WORK ONLY 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. Dry thoroughly.

4. During operation, quite a bit of condensation forms on the inside of the gable cover. When removing the gable cover, have one of its corners centered above the water bath, so that the water runoff goes into the bath. Shaking the cover aids the water runoff. Be sure to wipe up any water spillage on or around the bath.

## 9.0 TROUBLE SHOOTING

### WARNING

*SERVICE SHOULD 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.*

**9.01** Refer to Troubleshooting Procedures Table (9.03 through 9.06) for troubleshooting information on the baths. This table provides the basic information required to repair the bath.

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

#### Suggested Tools:

- Phillips Screwdriver
- 7/16" Socket or adjustable wrench
- Ohmmeter
- DC Voltmeter
- AC Voltmeter
- 5VDC Power Supply
- Nut Driver 11/32"

<b>Troubleshooting Procedures</b>																													
<b>Problem</b>		<b>Procedure</b>																											
<b>9.03</b> No Heat		1. Verify that setpoint temperature is greater than the actual water temperature.																											
		2. Check temperature probe. <ul style="list-style-type: none"> <li>A. Disconnect unit from electrical supply.</li> <li>B. Disconnect temperature probe connector J5 from Control Board.</li> <li>C. Place 5 volt DC between Pins 1 &amp; 3 on temperature probe connector.</li> <li>D. Place a voltmeter between Pins 2 &amp; 3 on temperature probe connector. Place the temperature probe in a bath of known temperature. Verify that the output voltage of the temperature probe approximately corresponds to the values in the table below.</li> </ul> <p style="text-align: center;"><b>Degrees Centigrade vs. Output Voltage of Temperature Probe</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Temp °C</th> <th style="text-align: left;">Vout</th> <th style="text-align: left;">Temp °C</th> <th style="text-align: left;">Vout</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>320mV</td> <td>60</td> <td>1.400V</td> </tr> <tr> <td>10</td> <td>500mV</td> <td>70</td> <td>1.580V</td> </tr> <tr> <td>20</td> <td>680mV</td> <td>80</td> <td>1.760V</td> </tr> <tr> <td>30</td> <td>860mV</td> <td>90</td> <td>1.940V</td> </tr> <tr> <td>40</td> <td>1.040V</td> <td>99.9</td> <td>2.218V</td> </tr> <tr> <td>50</td> <td>1.220V</td> <td></td> <td></td> </tr> </tbody> </table>		Temp °C	Vout	Temp °C	Vout	0	320mV	60	1.400V	10	500mV	70	1.580V	20	680mV	80	1.760V	30	860mV	90	1.940V	40	1.040V	99.9	2.218V	50	1.220V
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## Troubleshooting Procedures

Problem	Procedure																																														
<b>9.03</b> No Heat (cont.)	<p>E. If a 5V DC power supply is not available, leave J5 connected to the control board, turn power on, and repeat step D by placing the voltmeter probes on J5, Pins 2 &amp; 3.</p>																																														
	<p>4. Check Heater.</p> <p>A. Disconnect unit from electrical supply.</p> <p>B. Obtain access to the heater by removing the bottom cover and then removing the insulation. The heaters have red and white wires connected to them from the control board. Disconnect the red wire from the heater to isolate it from the board. Connect an ohm meter across the heater. Then using the chart below, determine which reading you should obtain depending on the model. On most of the 230-volt models, there are two separate heaters which are connected in series. The values below are approximate. If the resistance varies more than <math>\pm 20\%</math> from these listed values, then the heater should be replaced.</p> <table style="margin-left: auto; margin-right: auto; border: none;"> <tbody> <tr> <td style="padding-right: 20px;">280-120V</td> <td>60 Ohms</td> </tr> <tr> <td>280-230V</td> <td>260 Ohms</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td style="padding-right: 20px;">281-120V</td> <td>60 Ohms</td> </tr> <tr> <td>281-230V</td> <td>260 Ohms</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td style="padding-right: 20px;">282-120V</td> <td>48 Ohms</td> </tr> <tr> <td>282-230V</td> <td>196 Ohms Total (98 Ohms each)</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td style="padding-right: 20px;">283-120V</td> <td>35 Ohms</td> </tr> <tr> <td>283-230V</td> <td>140 Ohms Total (70 Ohms each)</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td style="padding-right: 20px;">284-120V</td> <td>25 Ohms</td> </tr> <tr> <td>284-230V</td> <td>100 Ohms Total (50 Ohms each)</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td style="padding-right: 20px;">285-120V</td> <td>25 Ohms</td> </tr> <tr> <td>285-230V</td> <td>100 Ohms Total (50 Ohms each)</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td style="padding-right: 20px;">286-120V</td> <td>25 Ohms</td> </tr> <tr> <td>286-230V</td> <td>100 Ohms Total (50 Ohms each)</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td style="padding-right: 20px;">288-120V</td> <td>35 Ohms</td> </tr> <tr> <td>288-230V</td> <td>140 Ohms Total (70 Ohms each)</td> </tr> </tbody> </table> <p style="text-align: center;">Re-connect the red wire back to the heater.</p>	280-120V	60 Ohms	280-230V	260 Ohms			281-120V	60 Ohms	281-230V	260 Ohms			282-120V	48 Ohms	282-230V	196 Ohms Total (98 Ohms each)			283-120V	35 Ohms	283-230V	140 Ohms Total (70 Ohms each)			284-120V	25 Ohms	284-230V	100 Ohms Total (50 Ohms each)			285-120V	25 Ohms	285-230V	100 Ohms Total (50 Ohms each)			286-120V	25 Ohms	286-230V	100 Ohms Total (50 Ohms each)			288-120V	35 Ohms	288-230V	140 Ohms Total (70 Ohms each)
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<b>Troubleshooting Procedures</b>	
<b>Problem</b>	<b>Procedure</b>
	5. Check TRIAC (High voltage output of control board) A. Make sure power is disconnected from the unit. B. Connect an AC voltmeter across the heater capable of reading 120 or 230 volts, depending on your particular unit. C. Turn power on and select a set point higher than the actual temperature to get the HEATER ON indicator to illuminate. With the HEATER ON indicator lit, there should be either 120 or 230 volts across the heater. If not, the control board should be replaced.
<b>9.04</b> Unstable temperature control	1. Use gable cover provided to improve temperature control.
	2. Verify that temperature setpoint is set at desired value.
	3. If control is stable, but not at desired temperature, check the set temperature or perform calibration. (See Paragraph 7.0, Step 5.)
	4. Check Temperature Probe (see Paragraph 9.03, Step 2).
<b>9.05</b> Too much heat	1. Check Temperature Probe (see Paragraph 9.03, Step 2).
	2. Check TRIAC (see Paragraph 9.03, Step 5).
<b>9.06</b> No Display	1. Verify that the water bath is plugged in.
	2. Verify that Power switch is in the on position.
	3. Disconnect unit from the electrical supply, gain access to the control board and check Fuse 1 located near the transformer on the control board.

## 10.0 PARTS REPLACEMENT

### WARNING

*BEFORE REPLACING ANY PART, BE SURE BATH IS DISCONNECTED FROM POWER SOURCE. SERVICE SHOULD BE PERFORMED BY A QUALIFIED TECHNICIAN.*

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

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

<b>Parts Replacement</b>	
<b>10.03</b> Replace Temperature Sensor	1. Remove the necessary screws to remove the bottom pan from underneath the water bath. Then remove the insulation necessary to view the temperature sensor and its orientation when connected to the control board.
	2. Disconnect the sensor from the control board at J5.
	3. The temperature sensor is mounted to the pan with a steel clamp. Loosen the nut that holds the clamp which in turn holds the sensor in place. Note that the sensor has its flat side against the pan. When installing a new sensor, it is important to do the same.
	4. Reverse the procedure to install the new sensor.
	5. Recalibrate the water bath with the new sensor. See Section 7.0 Operation, Step 5.
<b>10.04</b> Replace Heater	1. Remove the necessary screws to remove the bottom pan from underneath the water bath. Then remove the insulation necessary to gain access to the heater(s).
	2. Disconnect the wires that are attached to the heaters.
	3. Using a 11/32" nut driver, remove the nuts that hold the heater brackets in place.
	4. Replace the heater(s), heater brackets, and re-attach the wires.
<b>10.05</b> *Replace Control Board	1. Remove the necessary screws to remove the bottom pan from underneath the water bath. Then remove the insulation necessary to gain access to the control board, and hex nuts which hold the bath pan to the body.

<b>Parts Replacement (cont.)</b>	
<b>10.05</b> Replace Control Board (cont.)	2. Disconnect the wires that are attached to the heater. Then disconnect the temperature sensor from J5 on the control board.
	3. Remove the bath pan from the body by removing each 11/32" nut from each corner of the pan. NOTE: MODEL 286 has 6 hex nuts which hold the pan in place.
	4. Disconnect J1 and J2 from the control board.
	5. Remove the 4 nuts that support the board. Remove the control board and replace it, then reverse this procedure.
<b>10.06</b> Replace Diffuser Pan Leg Extension	1. Attach the four extension legs to each of the four corners of the diffuser pan using the nut, splitwasher and screw provided. Refer to figure shown on page 3 of this manual.

**\*CAUTION**

When replacing the Control Board #34393401, note the following:

1. For 115 Volt models, JP3 and JP4 must be installed.
2. For 230 Volt models, JP3 and JP4 must be removed.

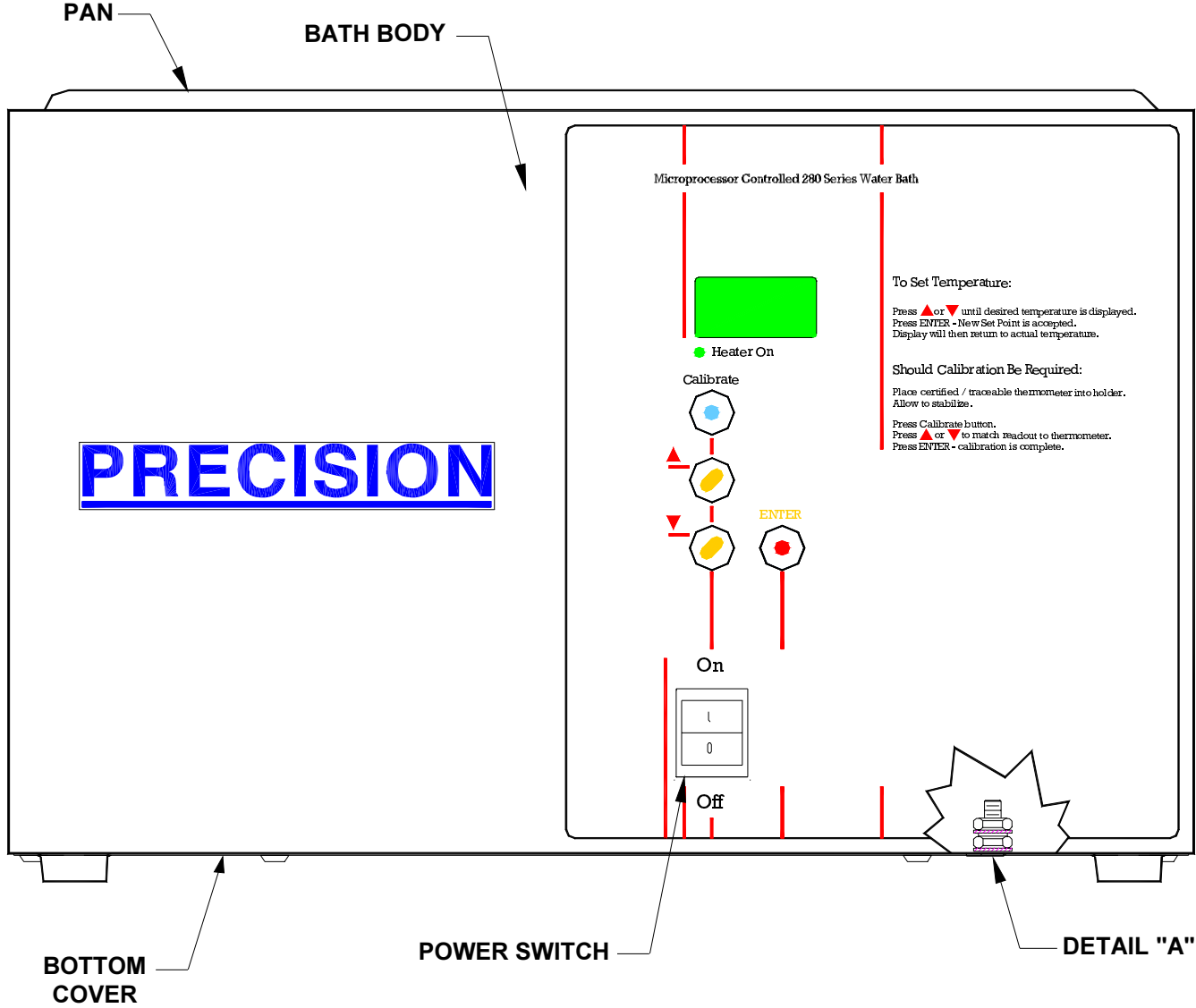
## 11.0 Replacement Parts List

	120-Volt Models							
	280	281	282	283	284	285	286	288
<b>Pan</b>	34541683	34541928	34541916	34541917	34541929	34541918	34541930	34541917
<b>Diffuser Plate Assy.</b>	34537946	34537945	34537946	34537949	34537947	34537954	34537953	34537949
<b>PCB Assy.</b>	34393401							
<b>Heater</b>	34247411	34247411	34247412	34247413	34247414	34247414	34247414	34247413
<b>Heater Harness</b>	34394301							
<b>Power Harness</b>	34394401							
<b>Temp. Probe Assembly</b>	34542496							
<b>Heater Insulator</b>	34637401	34637401	34637402	34637403	34637404	34637404	34637404	34637403
<b>On/Off Switch</b>	34240618							
<b>Leg Extension Kit</b>	34002259							
<b>Line Cord</b>	36353081							
<b>Gable Cover</b>	51200823	34002499	51200823	51200824	51200827	51200838	51200839	51200824



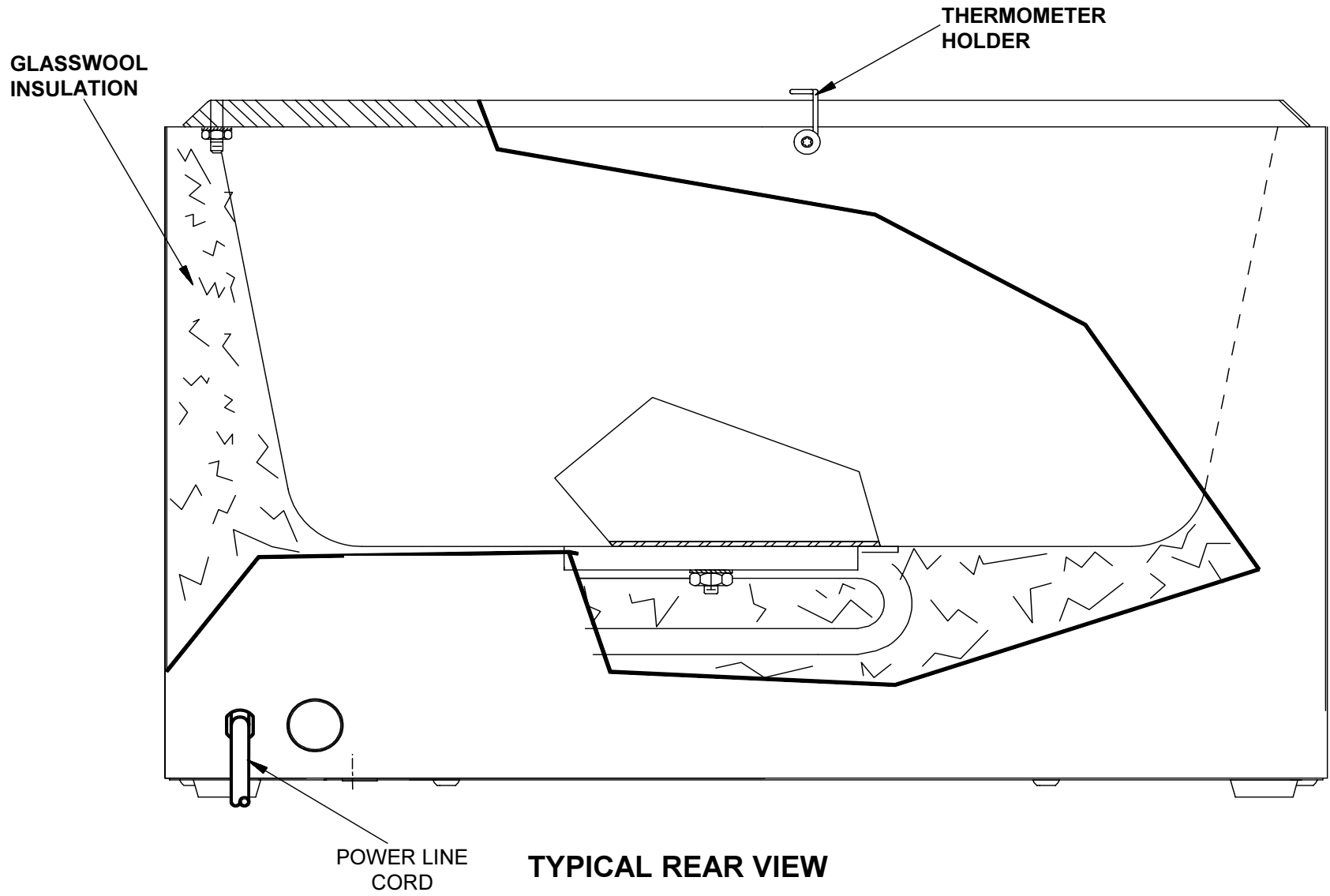
## 11.0 Replacement Parts List (cont.)

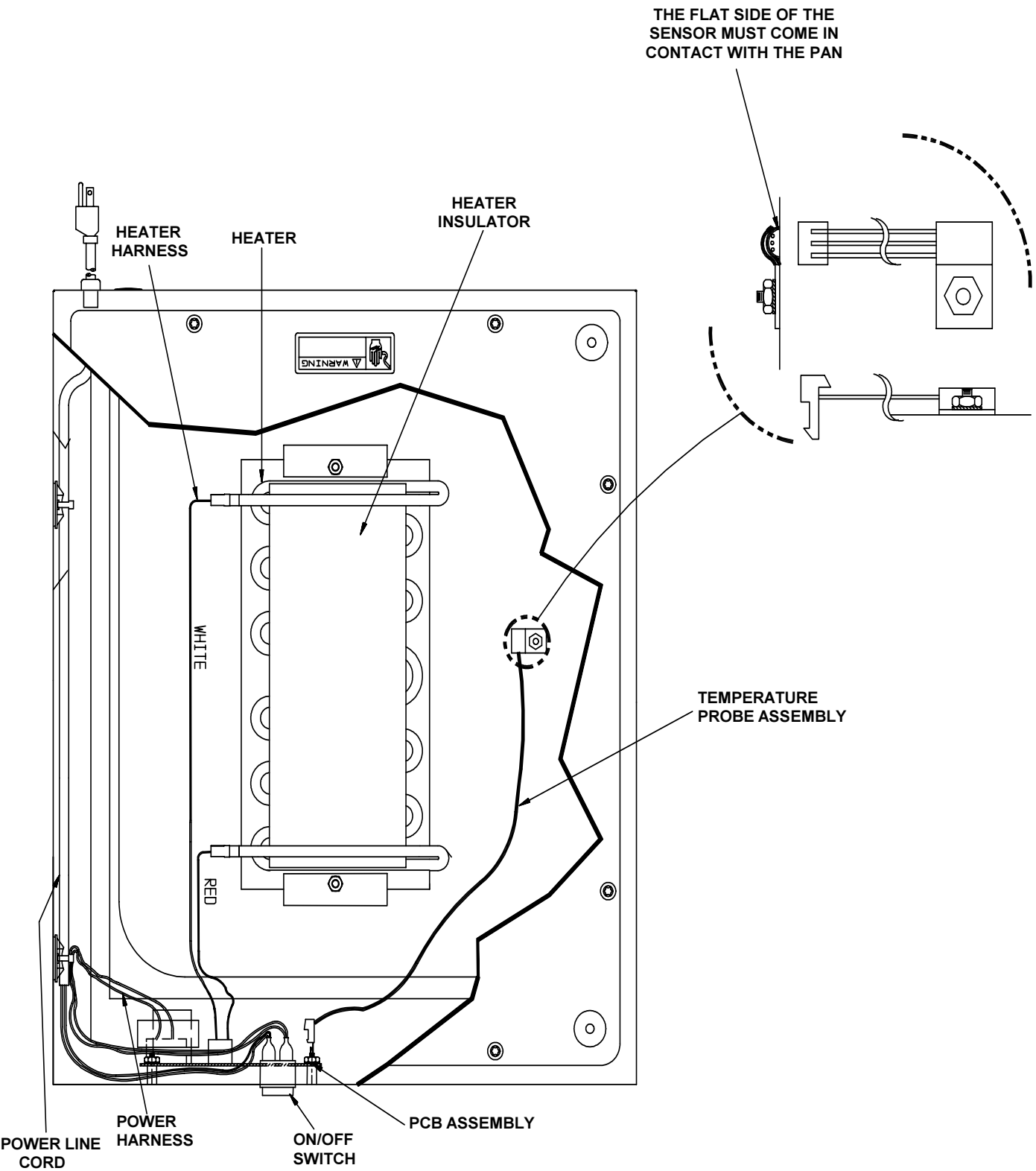
	230-Volt Models							
	280	281	282	283	284	285	286	288
Pan	34541683	34541928	34541916	34541917	34541929	34541918	34541930	34541917
Diffuser Plate Assy.	34537946	34537945	34537946	34537949	34537947	34537954	34537953	34537949
PCB Assy.	34393401							
Heater	34247399	34247399	34247346	34247347	34247348	34247348	34247348	34247347
Heater Harness	34394302							
Power Harness	34394402							
Temp. Probe Assy.	34542496							
Heater Insulator	34637401	34637401	34637402	34637403	34637404	34637404	34637404	34637403
On/Off Switch	34240618							
Leg Extension Kit	34002259							
Line Cord	34353046							
Gable Cover	51200823	34002499	51200823	51200824	51200827	51200838	51200839	51200824



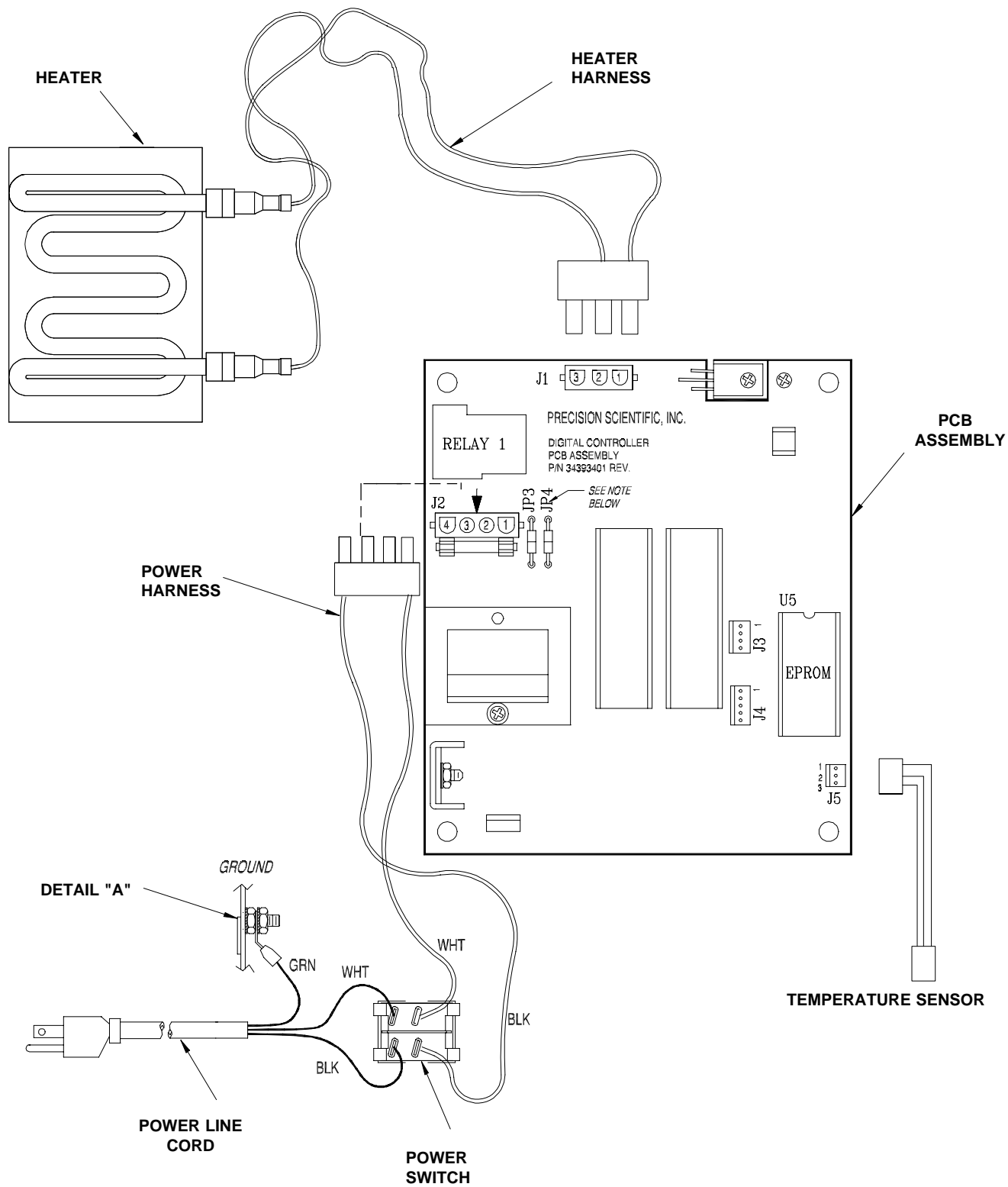
TYPICAL FRONT VIEW

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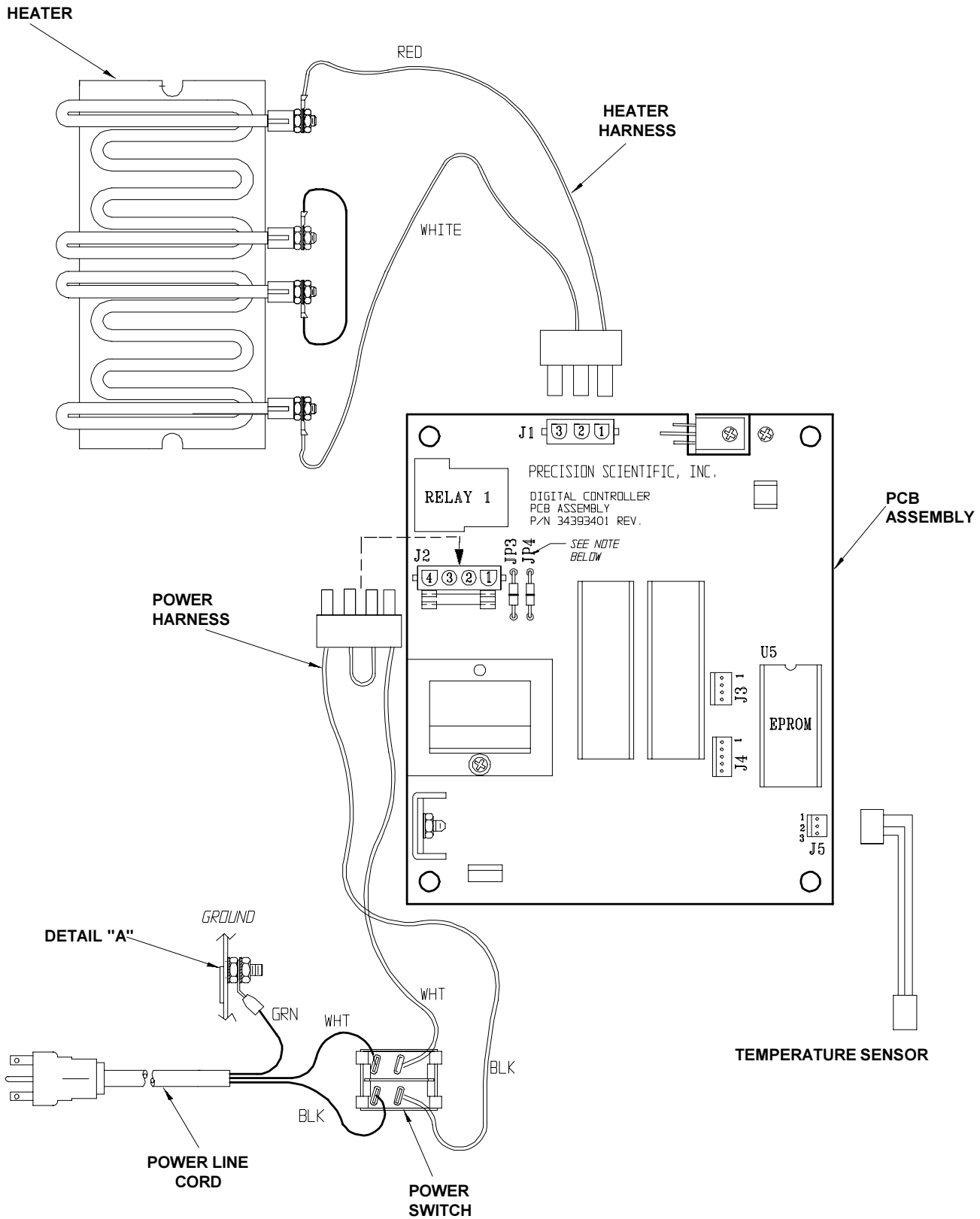


**TYPICAL BOTTOM VIEW**



## 120 VAC WIRING DIAGRAM

*NOTE: JP3 & JP4 MUST BE INSTALLED FOR 120 VAC OPERATION.*



## 230 VAC WIRING DIAGRAM

NOTE: JP3 & JP4 MUST BE REMOVED FOR 230VAC OPERATION

## 13.0 Warranty

**13.01 PRECISION** warrants its products against defects in material or in workmanship when used under appropriate conditions and in accordance with appropriate operating instructions for a period of no less than one (1) year from the date of delivery of the products.

**13.02** Sole obligation of **PRECISION** shall be to repair or replace at our option, FOB factory or locally, without charge, any part(s) that prove defective within the warranty period, provided the customer notifies **PRECISION** promptly and in writing of any such defect. Compensation for labor by other than **PRECISION** employees will not be our obligation. Part(s) replacement does not constitute an extension of the original warranty period.

**13.03 PRECISION MAKES NO WARRANTY OR MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, AS TO THE DESIGN, SALE, INSTALLATION, OR USE OF ITS PRODUCTS, AND SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGE RESULTING FROM THE USE OF ITS PRODUCTS.**

**13.04 PRECISION** will not assume responsibility for unauthorized repairs or failure as a result of unauthorized product modifications, or for repairs, replacement, or modification negligently or otherwise improperly made or performed by persons other than **PRECISION** employees or authorized representatives.

**13.05** While our personnel are available to advise customers concerning general applications of all manufactured products, oral representations are not warranties with respect to particular application and should not be relied upon if inconsistent with product specification or the terms stated herein.

**13.06** In any event, the terms and conditions contained in **PRECISION** formal sales contracts shall be controlling; and any changes must be in writing and signed by an authorized executive of **PRECISION**.

**13.07** All defective components will be replaced without charge one (1) year from the date of delivery. There will be no charge for labor if the apparatus is returned to the factory prepaid.

**13.08** Conditions and qualifications of the warranty statement shall prevail at all times.