

# Thermo Scientific Precision Refrigerated 6.1 cu ft Incubator

Operation Manual and Parts List 7003727 Rev. 1



**Units Covered in this manual**

<b>Catalog number</b>	<b>Model number</b>	<b>Voltage</b>
PR205745R	3727	120V
PR205740R	3730	230V
PR205740RCN	3731	230V

**MANUAL NUMBER 7003727**

<b>REV</b>	<b>ECR/ECN</b>	<b>DATE</b>	<b>DESCRIPTION</b>	<b>By</b>
1	28508	4/5/12	Chg'd 115V to 120V, added 'for indoor use only' in Specifications	ccs
--	--	3/10/10	Added 3730/3731 model number to this page	ccs
0	--	2/23/10	Transfet to Marietta (was LT2088X3 4/13/09, )	ccs



**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. ▲

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

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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.



Hot surface(s) present which may cause burns to unprotected skin, or to materials which may be damaged by elevated temperatures.



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# Section 1 Introduction

Thank you for selecting Thermo Scientific for your equipment needs.

The Precision Refrigerated 6.1 cu ft Incubator offers laboratories precise temperature control over the -10°C to 60°C range. Performance meets requirements for the preservation of vaccines, biologicals, incubation of bacterial cultures, and determination of bio-chemical oxygen demand of sewage. The extended operating temperature range also includes temperatures associated with drug stability projects, dairy product evaluation and entomological studies. Features include:

- Spacious 6.1 cu ft chamber accommodates up to 114 standard BOD bottles or similar containers
- Under the counter model with reversible door
- Two removable adjustable shelves (17.5”x 20.5”, 50 lbs. weight load.)
- Three molded door shelves (18.5”x 2.75”)
- Microprocessor based temperature controller, with temperature read out to 0.1°C
- Solid state relay for heater
- Over/undertemperature safety relay and alarm LED
- Overtemperature thermostat
- Cooling control modes:
  - 1) High precision with cooling (100% mode)
  - 2) High precision without cooling (00% mode)
  - 3) Frost-free with variable cooling (50% mode)
- Compressor relay for energy conservation
- Compressor overload relay
- RTD temperature probe
- Protected setpoint mode to avoid accidental change
- Convenience outlet inside chamber, 2 amp (115V)





## Section 2 Safety Information

These instructions contain important operating and safety information. The user must carefully read and understand these instructions before using the refrigerated incubator. Your unit has been designed to optimize function, reliability, safety and ease of use. It is the user's responsibility to install the incubator in conformance with local electrical codes.

### Warnings

1. Use a properly grounded electrical outlet of correct voltage and current handling capacity. Check the nameplate on the back of the unit for voltage and current rating. This equipment must be earth grounded for safe operation.
2. Maximum ratings of accessories that may be plugged into convenience outlet: load current 2A at 115VAC, leakage current 250 microamps.
3. Disconnect unit power cord from the power supply prior to maintenance and servicing.
4. When operating at 100% cooling, the unit should be defrosted periodically, especially during times of high humidity. The customer will be responsible for any repair work done caused by evaporator ice build up. See "Defrosting" section of this manual.
5. The aluminum evaporator and other portions of these units should not be exposed to the corrosive effects of acidic or caustic materials. Extreme care must be exercised if such materials are stored within to prevent voiding the warranty. This incubator is NOT suitable for flammable material storage.
6. This equipment must be used only as specified in these instructions. If used in a manner other than as specified, the protection provided by the equipment may be impaired.



## Section 3 Specifications

### Power Requirements:

PR205745R .....120V, 9.5A, 60Hz

PR205740R .....230V, 5.8A, 50Hz

Including 2A for internal convenience outlet.

### Dimensions:

Height: .....34.5 in (87.6cm)

Width: .....24 in (61cm)

Depth: .....24.5 in (62.2cm)

Volume: .....6.1 cu ft (0.173m<sup>3</sup>)

Shelf Data: . . . 2 chamber (50 lbs. weight capacity, 3 door

Capacity: .....114 BOD bottles

Shipping Weight: .....126 lb. (57 kg)

### Operating Environment:

Indoor Use Only

Temperature Range: .....10°C to 40°C

Humidity Range: . . . 0% to 90% RH Non-Condensing

Maximum Altitude: .....6600 ft (2 km)

Air Clearances: . . . .Front and back, 3" minimum

Overvoltage Category II (IEC664)<sup>2</sup>

Pollution Degree 2 (IEC664)

### Performance Characteristics:

Operating Range: .....-10° to +60°C

Uniformity: .....±1.0°C<sup>1</sup>

Stability: .....±0.2°C<sup>1</sup>

Display Readability: .....0.1°C

<sup>1</sup>Per ASTM method E 1292-94, cooling modes 00 and 100

<sup>2</sup>Voltage supply fluctuation not to exceed ±10% of rated voltage



## Section 4 Unpacking and Installation

The refrigerated incubator is shipped in a single carton. When unpacking the unit, check each loose item against the list below. Should a shortage exist, notify Technical Services.

If there is shipping damage, keep the entire shipment intact, retining the carton and all packing material and file a claim with the final carrier. Usually, the firm will send an investigator to ascertain liability.

### Unpacking

Use the list below when unpacking to verify that the complete unit has been received. Do not discard packing materials until all items are accounted for.

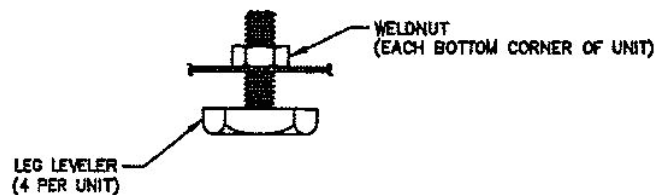
The following items are included in the shipment:

Qty	Item
1	Refrigerated incubator
1	Operation manual
1	Leg leveler instructions
1	Latching duct (used for door reversal)
1	End cap for duct (in bag with J clamps)
3	J clamps (used for door reversal, in bag with end cap)
1	Plastic bag containing 4 feet
1	Door handle with 2 mounting screws

## Leg Leveler Installation

Use the adjustable feet to level the incubator.

1. Tip unit backwards so there is one foot of clearance on front of the unit. Have someone assist in tilting the unit, to prevent the incubator from falling while installing the leg levelers.
2. Screw front two leg levelers in until snug.
3. Tip the unit forward to screw in the back two leg levelers. Have someone assist in tilting the unit, to prevent the incubator from falling while installing the leg levelers. Leg leveler installation is complete.
4. If floor conditions do not allow the unit to sit level, adjust leg leveler(s) by turning the required leveler counterclockwise to increase the height and clockwise to reduce the height.



**Figure 4-1.** Leg Levelers

## Installation

The Refrigerated Incubator should be installed on a level, stable floor.

**Caution** Do not place unit on its top, side, back, or front. If unit is accidentally placed in any position other than right side up, the unit must remain in upright position for at least 24 hours before connecting to power. ▲

Locate the unit so that area in front of door and kick grille is clear. To prevent heat build up within the unit, do not install it where it will be exposed to strong sunlight, nor near radiators, furnaces, or other sources of heat. Do not install the incubator where flammable or corrosive atmospheres may exist. The Refrigerated Incubator is not to be used out-of-doors or where excessive moisture or contamination could cause degrading of mechanical or electrical components.

## **Installation (continued)**

1. Remove all protective tape from doors and shelves.
2. Clean interior and exterior with warm soap and water. Shipping tape residue can be removed using isopropyl alcohol.
3. Uncoil line cord from rear of unit. Connect the plug to a power outlet that complies with the electrical requirements specified on the unit's label and with proper safety ground connection.
4. Record serial number from unit on front cover of owner/operator manual.

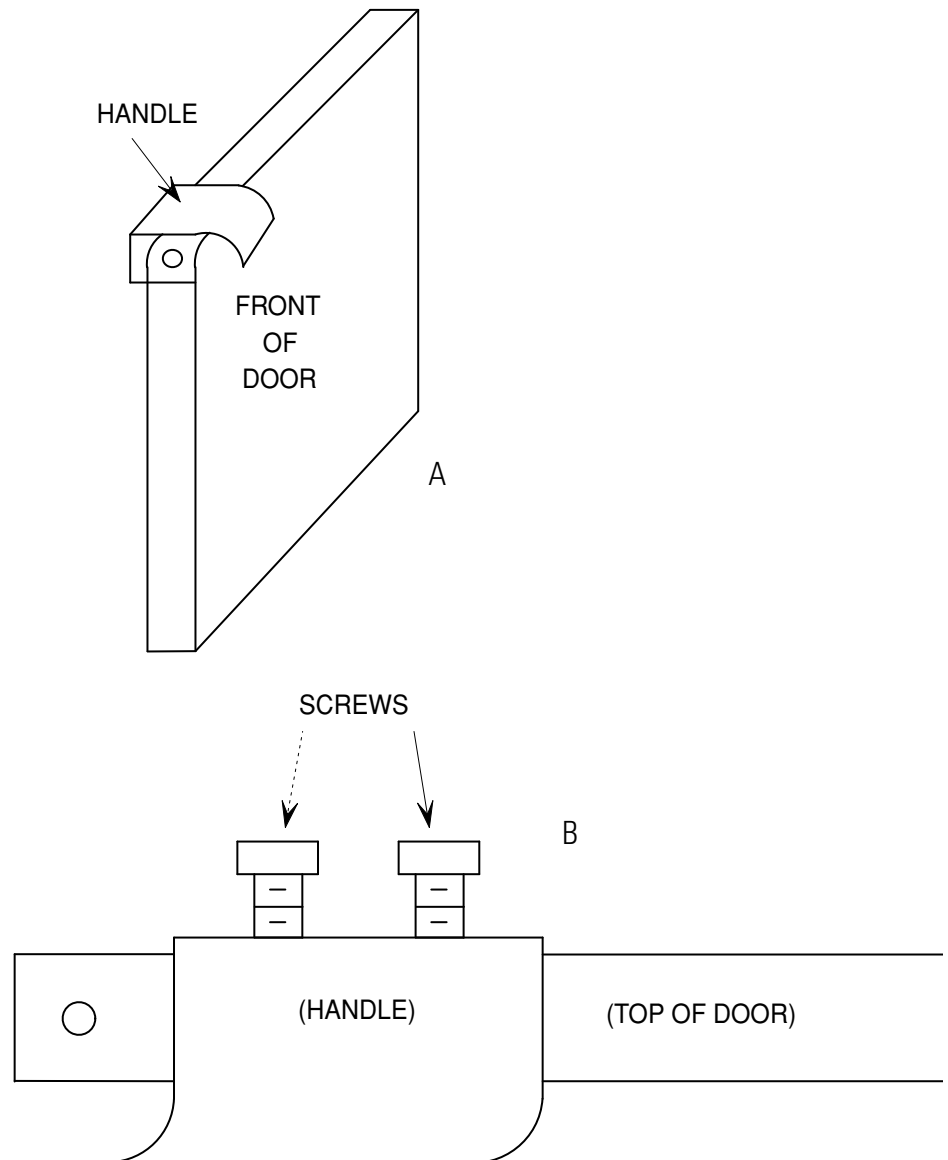
## **Door Reversal (if necessary)**

1. Disconnect unit from power source. On inside of door, directly behind controller, open snapped conduit and remove controller cable.
2. Remove screw that secures cable clamp holding controller cable, then replace screw.
3. Remove controller cable from anchors and ties that run along inside chamber side and back walls.
4. Place 3 provided adhesive-backed mounting anchors at approximately the same spacing (on opposite side) as existing anchors.
5. While supporting door with one hand, remove screw securing door to upper hinge, then lift door off bottom hinge.
6. Remove the three screws securing each hinge to chassis.
7. Remove three plug screws covering holes on left side, then install them in holes on right side.
8. Install hinges on left side using screws removed in Step 6. Position hinge with door screw on bottom.
9. Position door on hinge, then insert screw previously removed in Step 5.
10. Attach supplied latching duct to inside on door, in line with controller cable toward opposite side on door from other duct.
11. Route cable using mounting anchors, ties and latching duct.
12. Remove screw on left front of enclosure and install cable clamp with removed screw.
13. Adjust size of loop in cable where door is hinged to ensure door can fully open and close without interference.



## Door Handle Installation

1. Push the handle down over the top of door on left side until it bottoms out. See Figure 4-2A.
2. While holding the handle in place, tighten the screws with a 1/4" nut driver until they are tight against the top inner-side of the door. DO NOT OVERTIGHTEN. SCREWS DO NOT GO INTO THE DOOR.



**Figure 4-2.** Installing the Door Handle

## Section 5 Operation

Control descriptions are listed below.

### Power ON/OFF Switch:

Located inside chamber area, is used to turn power (I) ON or (O) OFF to entire unit.

**Note** When power is first applied, if display indicates S instead of L, a switch setting on the controller must be changed. Refer to 'Replacing Temp Controller' to change dipswitch setting as required. ▲



**Figure 5-1.** Power Switch

### Keys located on front panel:

MENU - Used to access menus

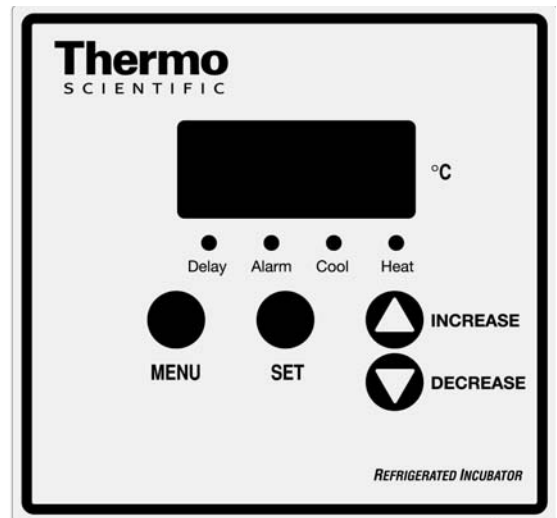
SET - Used to display setting

▲ - INCREASE setting

▼ - DECREASE setting

### Display (on front panel):

Displays chamber and set point temperatures in °C and prompts from menu.



**Figure 5-2.** Front Panel

### Indicators (on front panel):

**DELAY:** Lights when delay start timer for compressor is timing. Will begin timing when power is first applied or when cooling is first turned off.

**ALARM:** Indicates that chamber temperature is not within limits and the safety relay is opened.

**COOL:** Lights when cooling compressor is on.

**HEAT:** Lights when controller demands heat.

## General Functional Checks

1. Turn power on to unit by placing the Power ON/OFF Switch to I (ON) position. The Controller (mounted on front of door) will display S , then, 88.8 (to test display), then actual chamber temperature.
2. After 3 seconds, the alarm LED on the controller should extinguish and the safety relay should close, applying power to the heater, fan, compressor relay and convenience outlet.
3. Press and hold MENU key, after 3-5 sec. the display will indicate CAL. Release and press MENU again to display Pct, press SET, display should indicate 100. Press and release MENU again to indicate Pro, press SET, display should indicate 00, press and release MENU to return to normal control mode. Press SET to display control setpoint, display should read 25.0. If the control setpoint or any of the other parameters aren't set correctly, use the up or down arrow keys while pressing SET to change the setting.
4. The DELAY LED will be lighted for 7 minutes after power is first applied, the COOL LED will be out during this delay period. When the DELAY LED goes out, the COOL LED will light and the compressor relay will close, starting the compressor.
5. Allow unit to stabilize for a minimum of 1 hour at 25°C, to ensure that all systems are functioning.

## Operation

Perform the procedure under General Functional Checks if incubator is new or hasn't been operated for a long time.

## Controller

Usually the only controller setting that is necessary to change is the chamber temperature control setpoint. Other parameters of the controller may be changed by accessing them through the MENU key, covered later.

## Changing Chamber Temp Control Setpoint

1. The chamber temperature is continuously displayed, unless a key is pressed.
2. To display the setpoint temperature, press the SET key. The setpoint temperature will remain on the display for 1 second after the SET key is released.
3. To change the setpoint temperature, press and hold SET while pressing the up or down arrow keys to change the setting. (Note that when either up or down arrow keys are first pressed, the display will begin to change slowly at first, then increase change rate after a few seconds.)
4. Select the desired chamber setpoint, then release all keys. The controller display will revert back to actual chamber temperature after a few seconds. Allow up to an hour for unit to stabilize at the new setpoint temperature.

After the incubator temperature has stabilized, place samples into incubator chamber. For best results, arrange samples evenly throughout the chamber. Liquid samples should be covered to prevent evaporation and eventual frost build-up on evaporator coils, particularly when operating below ambient.

**Note** Frost build-up is normal when unit is being operated below 35°C, with cooling set to 100% mode. ▲

The Refrigerated Incubator has an internal 2 amp convenience outlet inside the chamber to operate devices such as: shakers, rotators, photosynthesis lights, recording thermometers, etc.

## Accessing Controller Menus

The temperature controller has three menu selections that can be accessed by pressing and holding the MENU key for 3 seconds. To access menu parameters, press and hold the SET key. To change the parameter, use the up or down arrow keys.

**Note** Once a menu parameter has been accessed, if no keys are pressed within 8 to 10 seconds, the controller will automatically revert back to the home display (measured control temperature). ▲

## Accessing Controller Menus (continued)

CAL (Calibration) Menu - Used to change the temperature offset value to correct for differences in chamber temperature and the displayed temperature. Range -5° to 5°C. See Calibration Procedure.

Pct (Percent Cooling) Menu - Used to select one of three cooling modes:

**100% Mode** (-10°C to 60°C) - Compressor runs continuously which provides high precision control ( $\pm 0.2^\circ\text{C}$  Stability) over entire temperature range. Requires manual defrost.

**Note** All units are factory preset to 100%. ▲

**50% Mode** (15°C to 60°C) - Compressor runs approximately half the time, which conserves power and also reduces the amount of frost buildup on the evaporator. This method greatly reduces the frequency of manual defrosting but provides less temperature stability ( $\pm 1.5^\circ\text{C}$ ).

**00% Mode** (35°C to 60°C) - Compressor is completely off. This mode is ideal for incubating samples at temperatures 10°C or higher above ambient (35°C to 60°C). It provides the greatest power savings yet still maintain the advertised stability. No defrosting required.

Pro (Protection) Menu - Used to select the Protection mode of operation that determines when the alarm is activated and if the control setpoint can be changed. Range 00 to 02.

**00 Mode**- Normal mode that allows the user to change setpoint. Alarm activates if chamber temperature (chamber) and setpoint temperature (setpoint) are as follows:

chamber  $\leq 15.0^\circ\text{C}$  and chamber  $< (\text{setpoint} - 3)$  or

chamber  $\geq 40.0^\circ\text{C}$  and chamber  $> (\text{setpoint} + 3)$ .

**Note** All units are factory preset to 00. ▲

While ALARM is activated, the safety relay is opened, interrupting power to the heater, fan, convenience outlet and compressor. When chamber temperature returns to acceptable limits, the ALARM will automatically terminate and power is reapplied. In order to allow changing of setpoint and eliminate nuisance alarms, an alarm by-pass takes effect when the setpoint is changed or when power is first applied. The alarm by-pass works as follows: Present chamber temperature is stored as a nominal alarm temperature (nominal). If chamber  $<$  setpoint then alarm temperature (alarm) = nominal - 3. If chamber  $>$  setpoint then alarm = nominal + 3. If chamber should go beyond alarm or  $< -13$  or  $> 63$  then the ALARM will activate. This alarm by-pass is active until chamber reaches setpoint  $\pm 1^\circ\text{C}$ .

**01 Mode** - Same as 00 Mode, except that the setpoint is locked and can't be changed.

## Accessing Controller Menus (continued)

02 Mode - Setpoint is locked, plus, the ALARM will activate and the safety relay will open as follows:

chamber < (setpoint -3) or chamber > (setpoint +3)

In order to use this mode of protection, modes 00 or 01 will have to be used to reach the setpoint temperature. Once the chamber temperature reaches the setpoint and is stable, protection mode 02 can be set.

This mode can only be used if the door is to remain shut and other disturbances don't effect the chamber temperature.

As an added safety feature, the incubator has a thermostat in the heater compartment that limits the upper chamber temperature to 65°C.

**Note** If the chamber temperature falls outside the setpoint by  $\pm 3^{\circ}\text{C}$ , the ALARM will activate and safety relay will interrupt power. ▲



## Section 6 Maintenance

**Warning** To reduce risk of electric shock, disconnect unit from power source before servicing. ▲

Before re-applying power, after maintenance is complete, check to ensure that safety ground is intact and making a good connection.

### Cleaning

Disconnect incubator from power source. Immediately clean all spilled materials from the incubator and wipe dry. If necessary, moisten a cloth with soap and water and clean inside and out. Do not use any harsh chemical cleaners.

### Defrosting

Periodic defrosting may be necessary. The time between defrosts depends on operating temperature, ambient humidity and moisture from samples. Time between defrosts may be from 30 days to years. Defrosting may be necessary when operating at 50% mode as well, especially for control temperatures less than 15.0°C.

### Suggested Defrost Methods

**Method I:** For control setpoint down to 10°C, this method is the least disruptive, if samples can withstand temperature stability of  $\pm 1.5^{\circ}\text{C}$  for 24 hours. Samples may remain in chamber during this procedure.

1. (Refer to Accessing Controller Menus) Press and hold MENU key until CAL is displayed, then release and press MENU again until Pct is displayed.
2. Select 50 in the Pct menu then press MENU key twice to return control mode.
3. Allow incubator to remain in this mode for about 24 hours or until frost disappears.
4. Use the MENU key to re-establish the previous selection for Pct (i.e. 100).



## Suggested Defrost Methods (continued)

### Method II:

1. Remove any samples that may be damaged by temperatures up to 35°C.
2. Refer to Accessing Menu section of manual and set Pct parameter to 00.
3. Place Setpoint to 35.0°C.
4. Allow temperature to stabilize for 1 hour.
5. After 1 hour, remove power from unit. Open door and wipe up any excess moisture on floor of chamber with paper towels or sponge.
6. Apply power and set desired operating parameters back into controller. After chamber temperature stabilizes, place samples previously removed back into unit.

## Calibration

If it becomes necessary to calibrate the temperature controller, perform the following:

1. Place an accurate temperature-measuring device in the geometric center of the chamber.
2. Set the controller to the desired operating temperature in 100% cooling mode and allow 2 hours for stabilization.
3. Note the chamber temperature on the controller display and the temperature at the geometric center.
4. Subtract the chamber display reading from the geometric center reading.
5. Enter into the Calibration Mode as described in Accessing Menu.
6. Press and hold SET key, using the up or down keys, set the calibration parameter to the value determined in Step 4.
7. Allow unit to stabilize for 1 hour and check that controller value and geometric center value agree  $\pm 0.2^{\circ}\text{C}$ .

*Repeat calibration if necessary.*

## **Replacing Temp Controller**

1. Disconnect incubator from power source.
2. Remove front panel bezel by removing four screws in top and bottom of bezel.
3. Remove four screws that mount controller to mounting bracket.
4. Note wire colors and positions on TB1 and TB2, then remove all wires from TB1 and TB2 and remove old controller.
5. Locate switch DS1 on lower left corner of new controller and set the switches as follows:  
Set DS1-1 (A) to off (up).  
Set DS1-2 (B) to off (up).
6. Attach wires previously removed from old controller to new controller.
7. Mount new controller and bezel, then apply power.
8. Refer to Calibration section of this manual, to calibrate new controller.

## **Replacing RTD Temperature Sensor**

1. Disconnect incubator from power source.
2. Refer to Replacing Temp. Controller, but only remove sensor wires from TB2.
3. Open incubator door, remove Sensor on door bracket.
4. Remove old sensor, then place new sensor on bracket.
5. Connect new sensor wires to controller then mount controller and bezel.
6. Apply power, then refer to Calibration section.

## **Replacing SSR1, K1, K2 or T1**

1. Disconnect incubator for power source.
2. Remove screws from lower back panel, then tilt back panel out.
3. Locate device to be replaced on back panel, then remove mounting screws.
4. Unplug quick connect terminals, noting positions.
5. Place quick connects on new device and mount on back panel.
6. Replace back panel, then apply power.
7. Refer to General Functional Checks to ensure that new device is operating.

## **Replacing FAN2, THM1, HTR1**

1. Disconnect incubator from power source.
2. Remove shelves from chamber area.
3. Remove heater cover at top back of chamber by removing 2 screws on either side.
4. Replace the THM1 or HTR1, if necessary, then coat electrical connections with RTV102 or other electrical insulator. To replace fan, remove HTR1, then remove 4 screws that hold enclosure, then replace fan.
5. Re-assemble in opposite order as previously described.
6. Apply power, refer to General Functional Checks to ensure that new device is operating.

## Section 7 Troubleshooting

Symptom	Possible Cause	Possible Solution to Condition
Incubator controller isn't functioning, no lights, etc.	Power switch isn't ON or no power to unit.	Place Power ON/OFF switch inside chamber to ON. Check power outlet by plugging a known good device into it.
	Blown Fuse	Check Fuses.
Erratic temperature display readings above or below set point.	Frost buildup. Look for frost inside chamber around evaporator.	Defrost per instructions. If possible, operate in 50% Cooling Mode to avoid frost buildup.
Temperature uniformity in chamber above specified limit.	Frost buildup or airflow blocked by samples.	Defrost per instruction. If airflow blocked by sample containers, remove some to allow top to bottom airflow.
Temperature readings too high or too low compared to thermometer.	Controller may need to be calibrated.	Refer to CALIBRATION section of this manual.
Control goes into power on reset sequence while operating.	Inadequate line power. Test line voltage of outlet to Incubator while unit is operating	If line voltage is < 106 VAC while unit is running, then a higher capacity AC line is required.
Compressor not operating while COOL LED is lit.	Compressor stalled and the thermal overloads opens. Test line voltage of outlet while operating.	If line voltage is < 106 VAC while unit is running, then a higher capacity AC line is required.
Temperature readings go far below setpoint and trigger alarm at 15°C	Open heater or heater control relay SSR1.	Unplug unit from power then refer to replacing HTR1. Check heater with OHM meter, about 29 ohms. (97-995E 60 ohms)
Temperature readings go far above setpoint and triggers alarm at 40°C or above.	Defective cooling relay, compressor or shorted heater SSR1. Check if compressor is running, if so, touch evaporator in chamber, it should be cold.	If compressor isn't running while Cool LED is on, then replace K2 relay. If compressor is running and evaporator isn't cold, then cooling system needs repair. If evaporator is cold, then SSR1 may be shorted.
Controller display works but heater, compressor and chamber fan don't.	Safety relay K1 not closing.	K1 relay may need replaced.
Display EEE/99.9 & Alarm 1	Open sensor or sensor connection.	Check sensor connection at controller. Check sensor with ohm meter, 100 ohms at 0°C and 110 ohms at 25°C.
Display EEE/99.8 & Alarm 1	Shorted sensor or connection.	Check sensor connection at controller.
Display EEE/temp & Alarm 1	Incubator needs defrosted.	See erratic temperature display readings.
Failed Line Cord	Replace line cord.	Use CSA types: SJ, SJO or SJT, 16 GA 3 conductor or equivalent.

1. Temp Limit = Temp ( $\pm 3^{\circ}\text{C}$  or more from setpoint)  $\& \circledast$  ( $> 40^{\circ}\text{C}$  or  $< 15^{\circ}\text{C}$ ), safety relay opens.

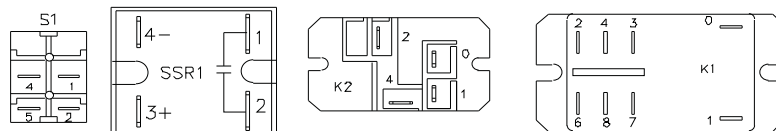
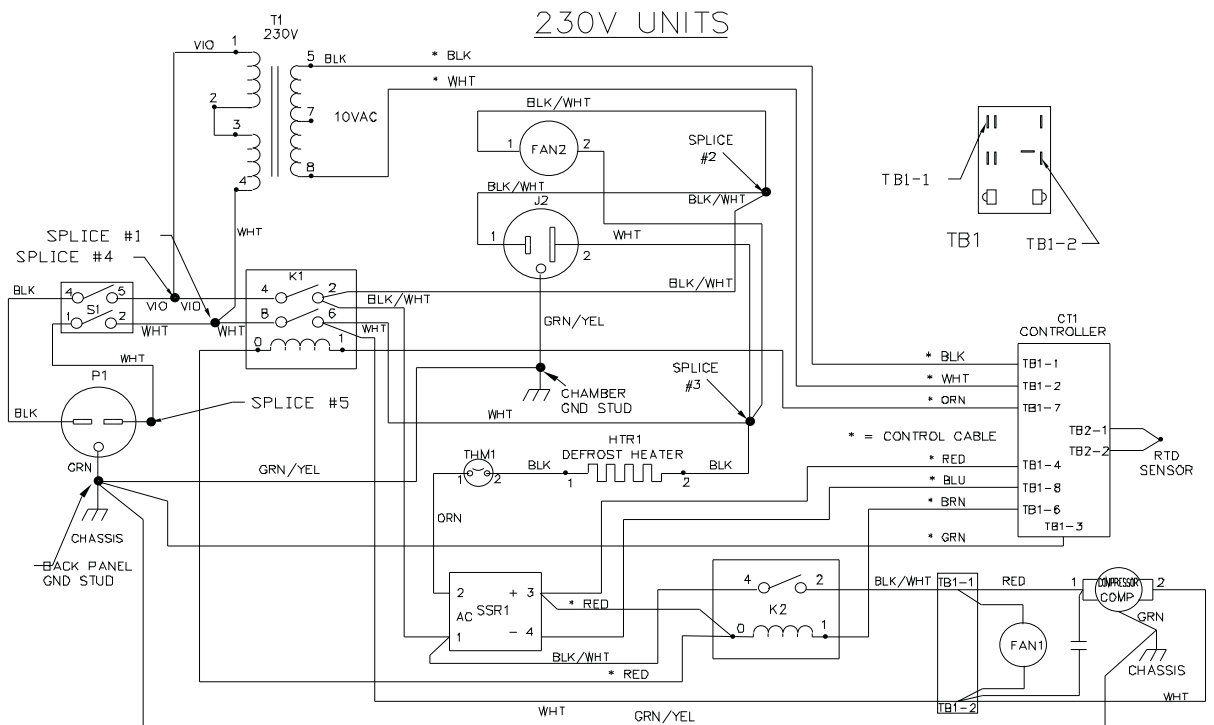
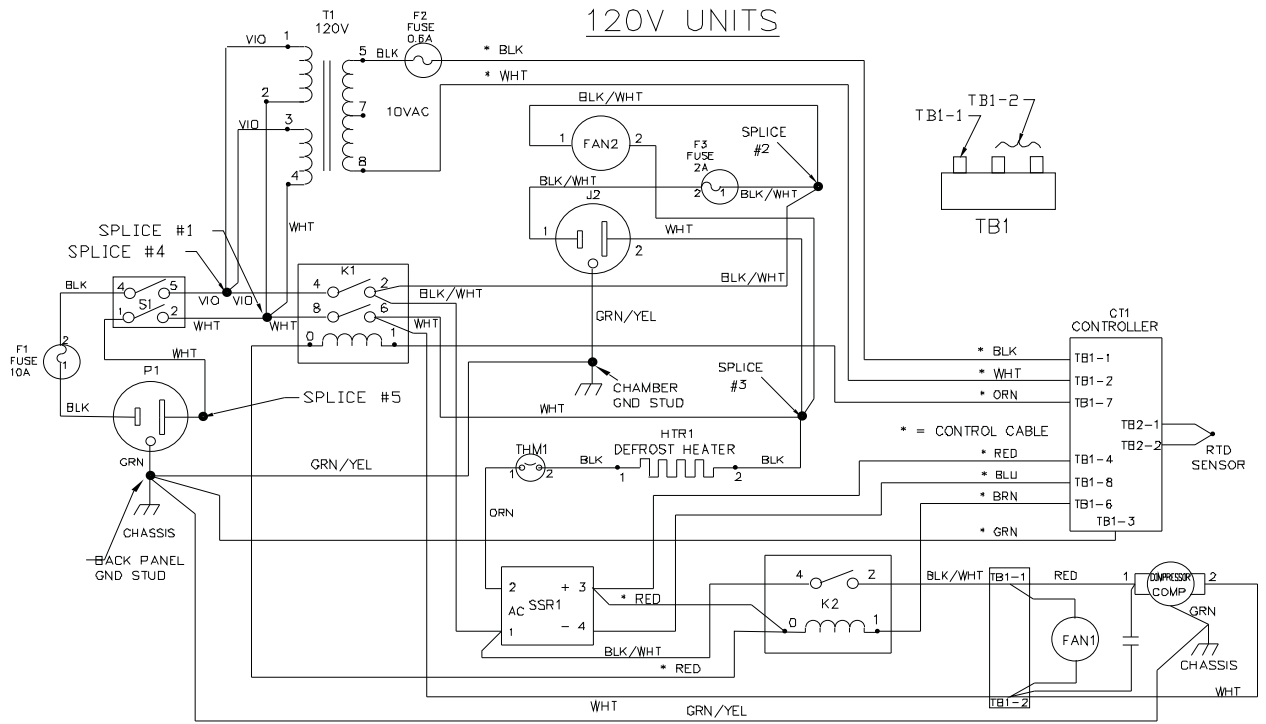
**Section 7**  
Troubleshooting

<b>Description</b>	<b>Part Number</b>
TC1 Controller	315090
Sensor, RTD	315137
SSR1 Relay	315138
K1 Safety Relay	315092
K2 Comp. Relay	315091
T1 Transformer	315034
Compressor (3550A)	107416
S1 Switch	315100
HTR1 Heater (115V)	315083
HTR1 Heater (230V)	315159
FAN2 (115V)	315116
FAN2 (230V)	39854
THM1 Thermostat	315136
Compressor (3550A-1)	107423
Fuse Holder	315132
Fuse, 10A	315113
Fuse, 2A	315026
Fuse, 0.6A	230081

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

All parts listed herein may be ordered from the Thermo Scientific dealer from whom you purchased this unit, or can be obtained promptly from the factory. When service or replacement parts are needed, we ask that you check first with your dealer. If the dealer cannot handle your request, then contact our Technical Services Department.

Prior to returning any materials, please contact our Technical Services Department for a "Return Materials Authorization" number (RMA). Material returned without an RMA number will be refused.





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