



# Low Temperature Incubator

Owner/Operator Manual and Parts List

Model No. 3554-35A (115 VAC)

---

# Table of Contents

Safety Information .....	3
Alert Signals.....	3
Warning .....	3
Caution.....	3
Important .....	3
Introduction.....	4
Specifications .....	5
Power Requirements .....	5
Shipping Weight.....	5
Operating Environment .....	5
Performance Characteristics .....	5
Unpacking and Installation .....	6
Packing List .....	6
Installation .....	6
Wall Mounting .....	7
Controls and Displays .....	8
Controls .....	8
Display and Indicators .....	8
Operation .....	9
General Function Checks .....	9
Controller Operation .....	9
Changing Chamber Temperature Control Setpoint .....	10
Accessing Controller Menus .....	11
Safety Thermostat .....	12
Maintenance.....	13
Cleaning.....	13
Defrosting.....	13
Calibration .....	14
Repair.....	15
Replacing Temperature Controller, Alarm or S2 .....	15
Replacing RTD Temperature Sensor.....	15
Replacing SSR1, K1, K2, or T1 .....	16
Replacing FAN, S1 or THM1 .....	16
Troubleshooting .....	17
Replacement Parts.....	18
Wiring Diagram.....	19
Ordering Procedures .....	20
Warranty.....	24

# Safety Information

---

## Alert Signals



### Warning

Warnings alert you to a possibility of personal injury.



### Caution

Cautions alert you to a possibility of damage to the equipment.



### Note

Notes alert you to pertinent facts and conditions.



### Hot Surface

Hot surfaces alert you to a possibility of personal injury if you come in contact with a surface during use or for a period of time after use.



### Caution

Risk of electric shock.

---

## Warning

- This manual must be carefully read and thoroughly understood before operating the unit, failure to follow directions or precautionary measures could result in serious adverse effects.
- 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.
- This equipment is intended for indoor use only.
- This equipment must be earth grounded for safe operation.
- Maximum ratings of accessories that may be plugged into convenience outlet: Load current 2 Amps. @ 115VAC, Leakage Current 250 micro Amps.

---

## Caution

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.

---

## Important

When operating at 100% cooling, the compressor runs continuously and thus cools continuously. If no manual defrosting is conducted for over 2 weeks, ice will build and the unit will not maintain temperature. See *Defrosting*.

---

# Introduction

The Thermo Scientific Lab-Line Low Temperature 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 biochemical oxygen demand of sewage. The extended operating temperature range also includes temperatures associated with drug stability projects, dairy product evaluation and entomological studies.

The spacious chamber accommodates up to 300 standard BOD bottles, or similar containers. The 5 reinforced shelves can handle up to 60 lbs of sample weight each.

Features include:

- 5 Removable shelves
- 6 Molded door shelves
- Door Lock with key
- Microprocessor based temperature controller, with temperature readout to .1°C
- 3 Cooling control modes: High precision with cooling, high precision without cooling and Frost free with variable cooling
- Solid state relay for heater
- Over/ under temperature safety relay and alarm  
Over temperature thermostat
- Compressor relay for energy conservation
- Compressor overload relay
- RTD temperature probe
- Protected setpoint mode to avoid accidental change
- Convenience outlet inside chamber, 2 amp
- Interior light with door switch

---

# Specifications

---

## Power Requirements

115V, 8.9A, 60 Hz (Including 2 A for convenience outlet)External

---

## Dimensions

Height: 70 in (179cm)  
Width: 32 in (81cm)  
Depth: 32.5 in (83cm)  
Volume: 20.3 cu ft (0.58m3)  
Shelf Data: 5 in chamber, 6 on door, 1 basket  
Capacity: 300 BOD bottles

---

## Shipping Weight

283 lb. (128 kg)

---

## Operating Environment

Temperature Range: 10°C to 40°C  
Humidity Range: 0% to 90% RH  
Maximum Altitude: 6600 ft (2 km)  
Air clearances: Back, top and sides 3.0" min.  
Over-voltage Category II (IEC664)  
Pollution Degree 2 (IEC664)

---

## Performance Characteristics:

Operating Range: -10° to +60°C  
Uniformity: ±0.5°C\*  
Stability: ±0.2°C\*  
Display Readability: 0.1°C

\* Per ASTM method E 1292-94, cooling modes 00 and 100

---

# Unpacking and Installation

**Note**

If damage is observed, keep the shipment intact (including the carton and all packing material) and file a claim with the final carrier. Remove shipping box by cutting bands that attach box to pallet then lift box off.

**Note**

When cooling is enabled, heat is dissipated on sides of unit resulting in side temperatures that are warm but not hazardous.

---

## Packing List

Item	Qty
Low Temperature Incubator	1
Instructions	1
Wall Bracket (with screws)	2

---

## Installation

The Low Temperature Incubator should be installed on a level, stable floor. Use the adjustable feet to level the incubator. Locate the unit so that there is at least 3 inches of clearance around the sides, top and back to ensure sufficient ventilation. 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.

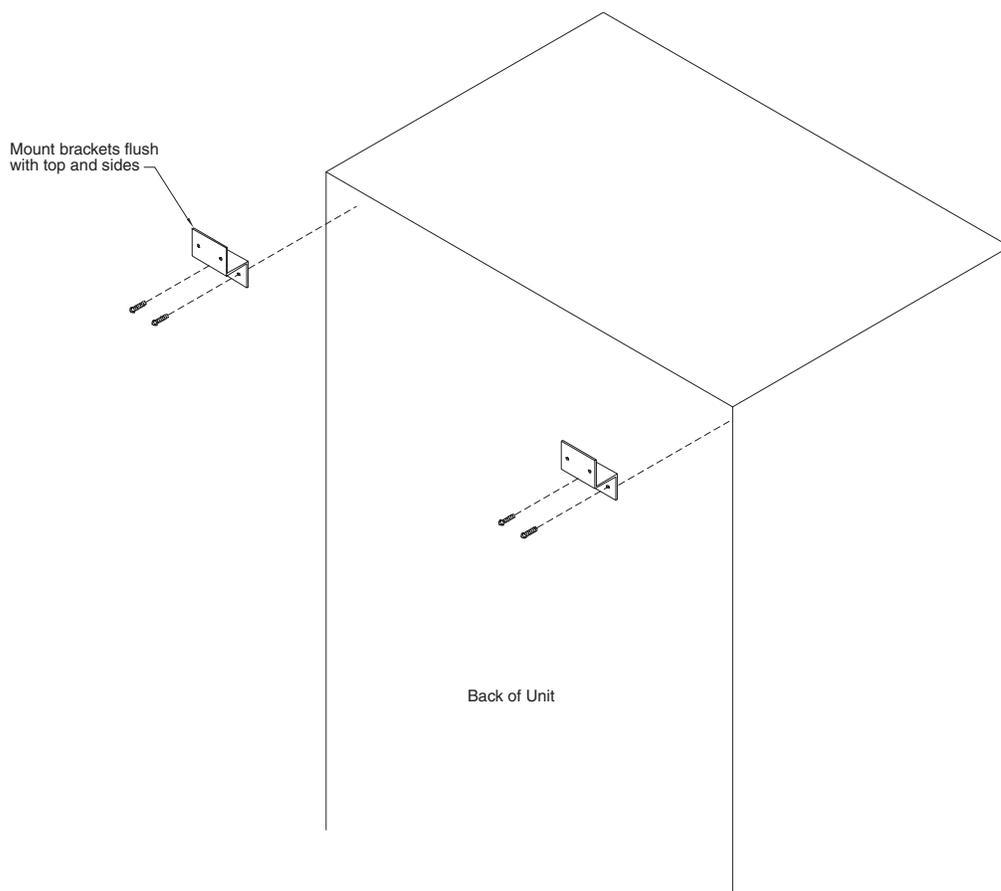
The Low Temperature Incubator is not to be used out-of-doors or where excessive moisture or contamination could cause degrading of mechanical or electrical components.

1. Unbolt and remove the wooden slats underneath unit.
2. Remove all protective tape from doors and shelves.
3. Clean interior and exterior with warm soap and water. Shipping tape residue can be removed using isopropyl alcohol.
4. 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. If line cord replacement is necessary, use CSA types: SJ, SJO or SJT, 16 GA, 3 cond. or equivalent.

## Wall Mounting

In order to allow the user to improve the stability of the incubator, two wall mounting brackets are included. These brackets allow the incubator to be attached to a wall.

1. Attach brackets to the upper corners on the back of the unit. Use the screws included with the unit and the pre-drilled holes located near the top corners. Do not drill additional holes which could result in damage to the unit.
2. Move the unit into position and attach the brackets to a structurally sound wall or other support. The brackets will ensure that the appropriate 3 inches of clearance from the wall is maintained.



---

# Controls and Displays

---

## Controls

**Power ON/OFF Switch:**

Located on back wall of chamber, is used to turn power ON or OFF to entire unit.

**Keys:** Located on front panel.

MENU - Used to access controller menus.

SET - Used to display setting.

▲ INCREASE setting.

▼ DECREASE setting.

---

## Display and Indicators

**DISPLAY:** (On front panel)

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

**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 compressor is turned off.

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

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

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

---

# Operation



## Note

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

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

---

## General Function Checks

1. Apply power by placing the Power ON/ OFF switch (Located inside chamber) to I (ON) position. The Controller, on front of door, will display L, then, 88.8 (to test display), then begins reading actual chamber temperature.
2. After 3 seconds, the alarm LED on the controller should extinguish and the safety relay will close applying power to the heater, fan, compressor relay and convenience outlet.
3. Press and hold MENU key, after 3 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 ▲ or ▼ keys while pressing SET to change the setting.
4. The DELAY LED will be lit 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 1 hour at 25°C, to ensure that all systems are functioning.

---

## Controller Operation

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 Temperature 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 sec. after the SET key is released.
3. To change the setpoint temperature, press and hold SET while pressing the ▲ or ▼ keys to change the setting. (Note that when either ▲ or ▼ 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.

The Low Temperature Incubator has an internal 2 amp. convenience outlet inside 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 sec. To access menu parameter, press and hold the SET key. To change the parameter, use the ▲ or ▼ keys

**CAL Menu-** Calibration Menu is 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 Menu-** (Percent Cooling Menu) Used to select one of three cooling modes:

100% Mode - Compressor runs continuously which provides high precision control ( $\pm 2^{\circ}\text{C}$  Stability) over entire temperature range. Requires manual defrosting.

50% Mode - Compressor runs approximately half the time, which conserves power and also reduces frost buildup inside chamber. This method decreases the frequency of manual defrosting but provides less temperature stability ( $\pm 1.5^{\circ}\text{C}$ ).

00% Mode - 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 maintains the advertised stability. Defrosting is not required.

**Pro Menu-** 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 0.0 to 0.2.

0.0 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  $> (\text{setpoint} + 3)$   
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  $< \text{setpoint}$  then alarm temperature (alarm) = nominal -3. If chamber  $> \text{setpoint}$  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  $\pm 1^{\circ}\text{C}$ .



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

0.1 Mode - Same as 0.0 Mode, except that the setpoint is locked and can't be changed.

0.2 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 0.0 or 0.1 will have to be used to reach the setpoint temperature. Once the chamber temperature reaches the setpoint and is stable, protection mode 0.2 can be set.

---

## Safety Thermostat

As an added safety feature, the incubator has a thermostat in the heater compartment that limits the upper chamber temperature to  $65^{\circ}\text{C}$  in the event that all other controls fail.

---

# Maintenance



## Warning

To reduce the risk of electric shock, disconnect 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

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. Do not attempt to clean the incubator while the unit is plugged into a power source.

---

## Defrosting

Periodic defrosting may be necessary depending on operating temperature, ambient humidity, moisture from samples and cooling mode. Time between defrosts may be from 30 days to years.

---

## 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).

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 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 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 ▲ or ▼ 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 old controller.
5. Locate switch DS1 on lower left corner of new controller and set the switches as follows:  
Set DS1-1 (A) to on (down).  
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 Temp. Sensor

1. Disconnect incubator from power source.
2. Refer to Replacing Temp Controller, but only remove sensor wires from TB2.
3. Open incubator door and remove screw that holds Temp Sensor on door shelf 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 back panel(s) then remove back panel(s).
3. Locate device to be replaced on bottom panel then remove mounting screws.
4. Unplug quick connect terminals, noting positions.
5. Place quick connects on new device and mount on panel.
6. Replace back panel, then apply power.
7. Refer to General Functional Checks to ensure that new device is operating.

---

## Replacing FAN, S1 or THM1:

1. Disconnect incubator from power source.
2. Remove basket and shelves from chamber area.
3. Remove screws from heater cover at rear of chamber.
4. Rotate heater cover to right side of chamber.
5. Fan is located on back wall and S1 and THM1 are on switch panel attached to heater cover.
6. Replace desired part, then coat electrical connections with RTV102 or other electrical insulator.
7. Re-assemble in opposite order as previously described. Be sure to install gaskets on either side of heater cover.
8. Apply power, refer to General Functional Checks to ensure that new device is operating.

# 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.
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.
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	Open sensor or sensor connection.  Cabinet temp. above 63°C. Heater held on.	Check sensor connection at controller. Check sensor with ohm meter, 100 ohms at 0°C and 110 ohms at 25°C. If temps inside the chamber seem excessive, check SSR1 for short
Display EEE/99.8	Shorted sensor or connection	Check sensor connection at controller.
Display EEE/temp	Cabinet temp below -13°C. Heater not working Incubator needs defrosted	Check for Heat LED and if lit, check heater circuit including SSR1 See erratic temperature display readings.

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

---

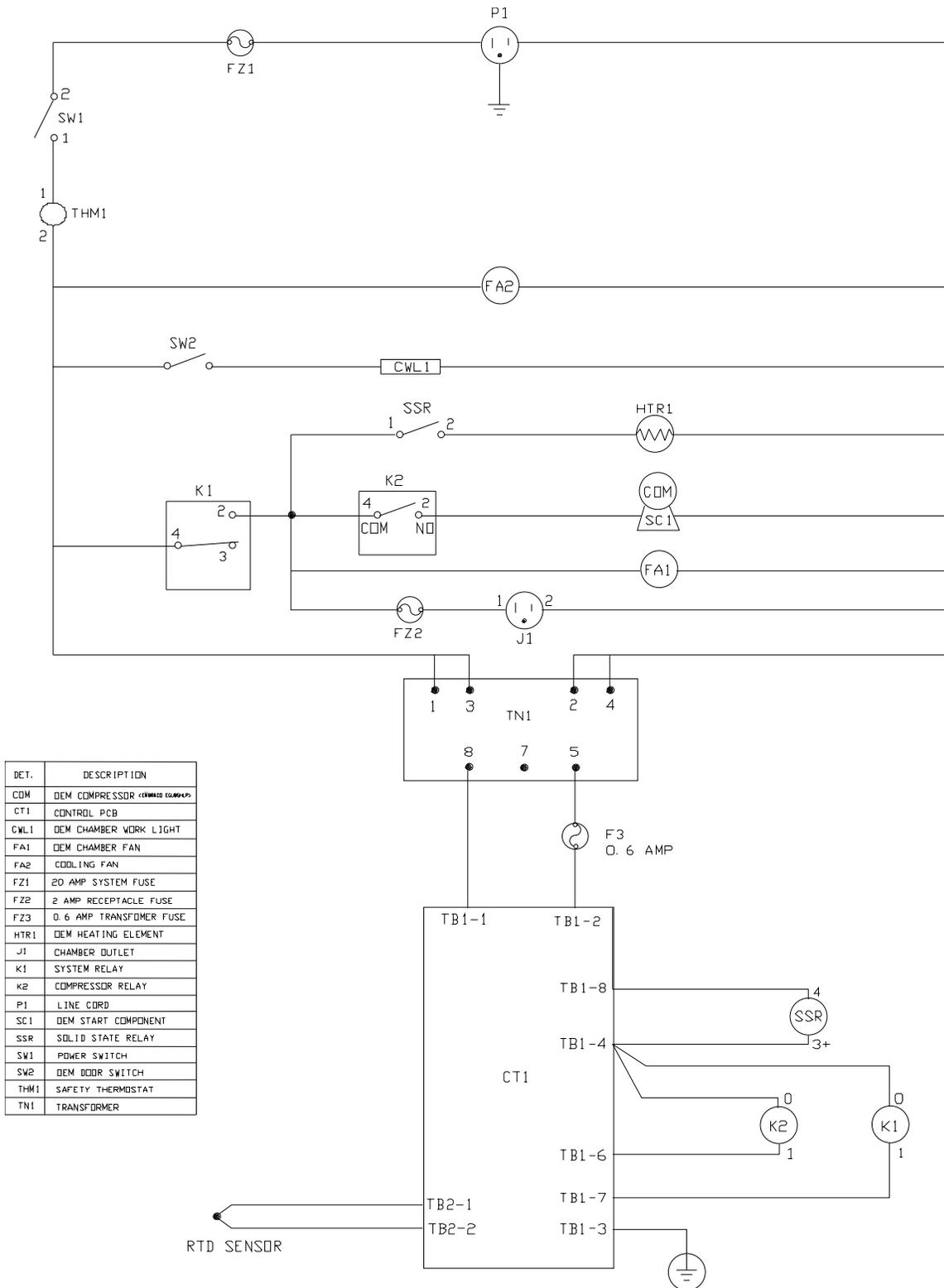
# Replacement Parts

---

## Replacement Parts

<b>Description</b>	<b>Part Number</b>
TC1 Controller	SPN102214
Sensor, RTD	SPN88613
SSR1 Relay	SPN88616
K1 Safety Relay	SPN102260
K2 Comp. Relay	SPN102259
S1 Switch	SWX143
FAN1 Motor	RF1639X33
THM1 Thermostat	SPN88612
T1 Transformer	TNX135
<b>Technical Assistance</b>	1-800-926-0505
<b>Customer Service</b>	1-800-766-7000

# Wiring Diagram



---

# Ordering Procedures

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 Customer Service Department at 563-556-2241 or 800-553-0039.

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

---



---

---

# One Year Limited Warranty

This Thermo Scientific product is warranted to be free of defects in materials and workmanship for one (1) year from the first to occur of (i) the date the product is sold by the manufacturer or (ii) the date the product is purchased by the original retail customer (the "Commencement Date"). Except as expressly stated above, the MANUFACTURER MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO THE PRODUCTS AND EXPRESSLY DISCLAIMS ANY AND ALL WARRANTIES, INCLUDING BUT NOT LIMITED TO, WARRANTIES OF DESIGN, MERCHANT ABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

An authorized representative of the manufacturer must perform all warranty inspections. In the event of a defect covered by the warranty, we shall, as our sole obligation and exclusive remedy, provide free replacement parts to remedy the defective product. In addition, for products sold within the continental United States or Canada, the manufacturer shall provide free labor to repair the products with the replacement parts, but only for a period of ninety (90) days from the Commencement Date.

The warranty provided hereunder shall be null and void and without further force or effect if there is any (i) repair made to the product by a party other than the manufacturer or its duly authorized service representative, (ii) misuse (including use inconsistent with written operating instructions for the product), mishandling, contamination, overheating, modification or alteration of the product by any customer or third party or (iii) use of replacement parts that are obtained from a party who is not an authorized dealer of Thermo Scientific products.

Heating elements, because of their susceptibility to overheating and contamination, must be returned to the factory and if, upon inspection, it is concluded that failure is due to factors other than excessive high temperature or contamination, the manufacturer will provide warranty replacement. As a condition to the return of any product, or any constituent part thereof, to the factory, it shall be sent prepaid and a prior written authorization from the manufacturer assigning a Return Materials Number to the product or part shall be obtained.

IN NO EVENT SHALL THE MANUFACTURER BE LIABLE TO ANY PARTY FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, OR FOR ANY DAMAGES RESULTING FROM LOSS OF USE OR PROFITS, ANTICIPATED OR OTHERWISE, ARISING OUT OF OR IN CONNECTION WITH THE SALE, USE OR PERFORMANCE OF ANY PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, TORT (INCLUDING NEGLIGENCE), ANY THEORY OF STRICT LIABILITY OR REGULATORY ACTION.

For the name of the authorized Thermo Scientific product dealer nearest you or any additional information, contact us:

2555 Kerper Blvd., Dubuque, Iowa, 52004-0797

Phone: 563-556-2241 or 1-800-553-0039

Fax: 563-589-0516

Web: [www.thermo.com](http://www.thermo.com)