



Thermo Scientific Precision Model 818 Incubator

Plant Growth Chamber - Microprocessor Controlled

Operating and Maintenance Manual 7013758 Rev. 0

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Covered in this manual:

Catalog Number (Model)	Volume (L /cu. ft.)	Voltage
PR505755L (3759)	504/17.8	120V
PR505750L (3758)	504/17.8	230V

Manual Number 7013758

0	40096	4/3/15	Original - new cabinet size, technical data	ccs
Rev	ECR/ECN	Date	Description	By



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. ▲

Warning If the growth chamber is not used in the manner specified in this operating manual, the protection provided by the equipment design may be impaired. ▲

Warning Hot/warm surface(s) can occur. Depending on ambient temperature and settings, surface can become warm (up to 60°C). ▲

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



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



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



Marking of electrical and electronic equipment, which applies to electrical and electronic equipment falling under the Directive 2002/96/EC (WEEE) and the equipment that has been put on the market after 13 August 2005.



This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the WEEE symbol. Thermo Fisher Scientific has contracted with one or more recycling/disposal companies in each EU Member State European Country, and this product should be disposed of or recycled through them. Further information on Thermo's compliance with this directive, the recyclers in your country and information on Thermo Scientific products will be available at www.thermoscientific.com.

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

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

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

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

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

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

Thermo Fisher Scientific
401 Millcreek Road, Box 649
Marietta, OH 45750

International customers, please contact your local Thermo Scientific distributor.

Warranty Notes

Information You Should Know Before Requesting Warranty Service

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

Repairs NOT Covered Under Warranty

- **Calibration of control parameters.** Nominal calibrations are performed at the factory; typically $\pm 1^{\circ}\text{C}$ for temperature, $\pm 1\%$ for gases, and $\pm 5\%$ for humidity. Our service personnel can provide precise calibrations as a billable service at your location. Calibration after a warranty repair is covered under the warranty.
- **Damage resulting from use of improper quality water, chemicals or cleaning agents detrimental to equipment materials.**
- **Service calls for improper installation or operating instructions.** Corrections to any of the following are billable services:
 - 1) electrical service connection
 - 2) tubing connections
 - 3) gas regulators
 - 4) gas tanks
 - 5) unit leveling
 - 6) room ventilation
 - 7) adverse ambient temperature fluctuations
 - 8) any repair external to the unit
- **Damage resulting from accident, alteration, misuse, abuse, fire, flood, acts of God, or improper installation.**
- **Repairs to parts or systems resulting from unauthorized unit modifications.**
- **Any labor costs other than that specified during the parts and labor warranty period, which may include additional warranty on CO₂ sensors, blower motors, water jackets, etc.**

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Section 1 Introduction

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

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.

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.

Note 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

The growth chamber has been commonly referred to as the standard model 818.

The PR505750L can be converted for operation on 200V or 240V by changing the input connections to the autotransformers (see wiring diagram at the end of this manual).

The PR505750L/PR505755L Plant Growth Chamber has been designed to provide the ultimate in temperature control. The user is assured of dependable and precise performance through the use of microprocessor technology in the temperature control circuitry. This growth chamber is operable in the range of -10° to 50°C without illumination, and +10°C to +50°C with illumination. These temperature ranges will meet a wide variety of applications, such as BOD determination, general incubation, as well as the preservation of critical materials.

Performance Data

**with door illumination switch on*

Set temperature	Uniformity values: Temperature deviation from set value, spatial (3 point measurement)	Uniformity values: Temperature deviation from set value, spatial (27 point measurement according to DIN 12880)	Temperature stability: Maximum temperature difference at chamber center point (1 point measurement)	Energy consumption	Heat up time / Cool down time from ambient temperature according to DIN 12880	Recovery time after door opening according to DIN 12880
-10°C	±0.8°C	±1.3°C	≤ ±0.25°C	≤ 0.3 kW	ca. 80 min	ca. 10 min
+10°C	±0.6°C / ±0.2°C	±1.9°C / ±1.3°C	≤ ±0.25°C	≤ 0.54 kW / ≤ 0.52 kW	ca. 54 min.*	ca. 4 min.
+20°C	±0.5°C / ±0.2°C	±1.8°C / ±0.9°C	≤ ±0.20°C	≤ 0.55 kW / ≤ 0.49 kW	N/A	N/A
+50°C	±0.25°C / ±0.15°C	±1.1°C / ±0.9°C	≤ ±0.15°C	≤ 0.56 kW / ≤ 0.51 kW	ca. 100 min. *	ca. 42 min. *

Note The above performance figures are based upon the following operating conditions:

- Ambient temperature of 22°C, ±3°C
- Line voltage 120V, ±5% (120V version) and 230V, ±5V (230V version)

The following test protocols have been used:

3 point measurement test: 1 thermocouple sensor in center of each shelf - 1 shelf top position, 1 shelf lowest position, 1 shelf middle position

27 point measurement test: 9 x thermocouples on each shelf - 1 shelf top position, 1 shelf lowest position, 1 shelf middle position (based on DIN 12880)

1 point measurement test: 1 thermocouple at chamber center point (temporal temperature variation characterized by the maximum temperature difference)

Theory of Operation

The refrigeration system, defrost heater, and air circulating fan are used in conjunction with a microprocessor controlled proportioning circuit to achieve sensitive temperature control. An RTD (Resistance Temperature Detector) located in the airstream senses any temperature deviation from the control point, and heat is provided proportionally to maintain the desired temperature. Regardless of what temperature is being maintained, the compressor operates continuously. This constant operation alleviates component failures associated with cycle type operation.

The circulating fan provides even air distribution throughout the chamber and ensures temperature uniformity.

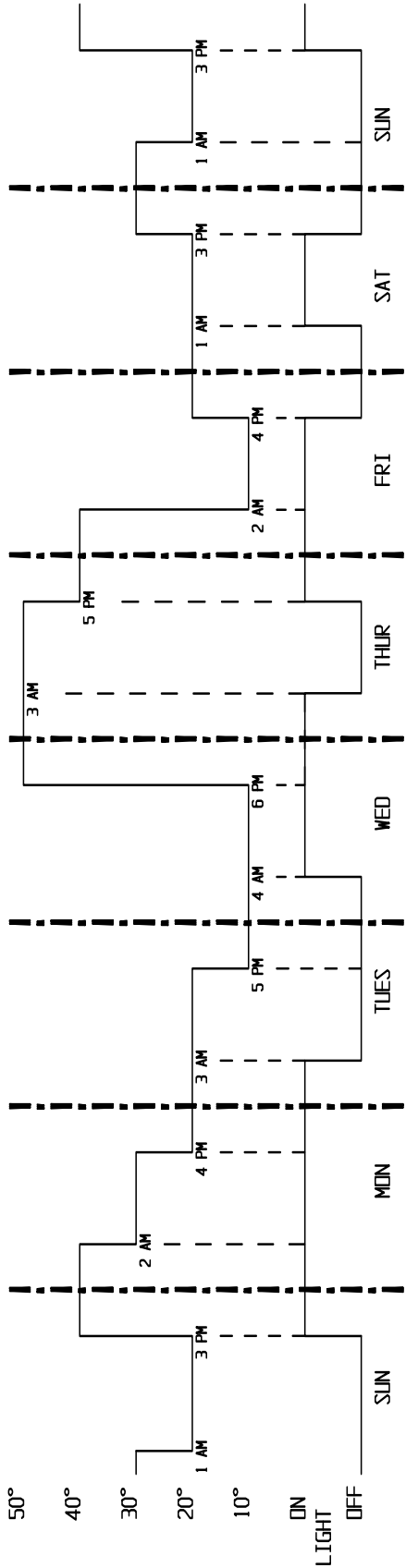
The program mode of PR505750L/PR505755L plant growth chamber allows the user to program into memory 2 sets of values for time, setpoint temperature, and light condition per day for a full week. The following is an example of a schedule and a pictorial describing the events during that week. A blank schedule sheet is provided toward the end of the manual for the user to copy, then document a schedule. It is strongly recommended to do this before any programming is performed.

The growth chamber leaves the factory with a default schedule as follows:

Hr1	1am	Hr2	1pm
Min1	00	Min2	00
Set1	20.0	Set2	20.0
LGT1	OFF	LGT2	OFF

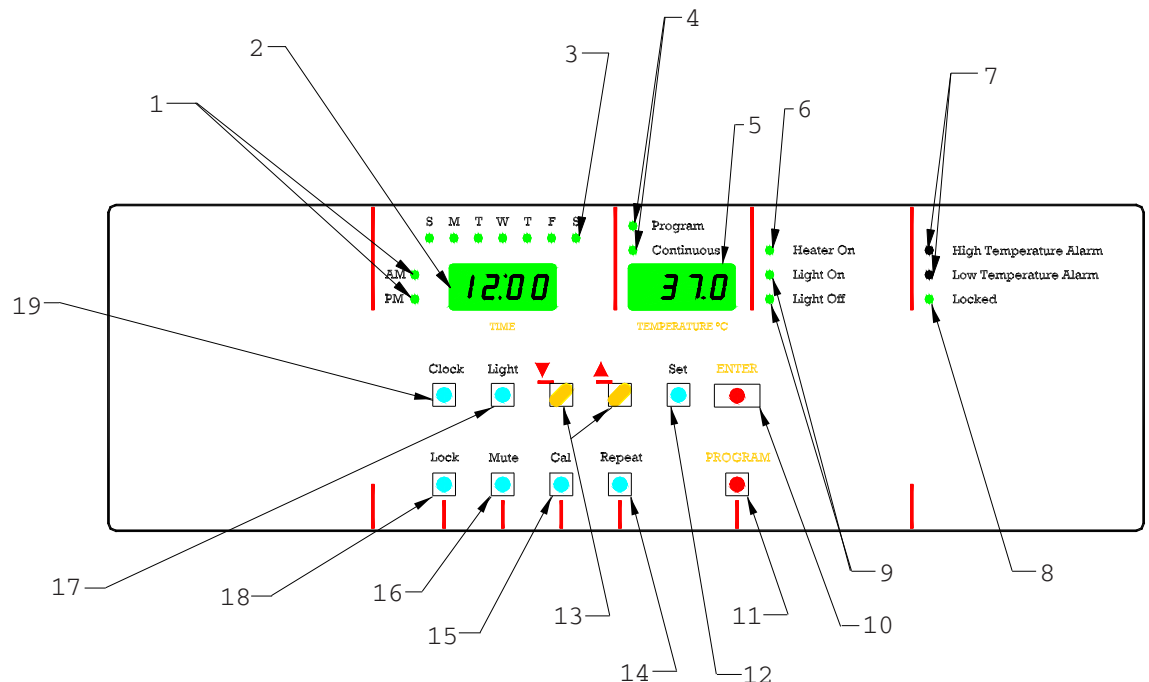
SAMPLE SCHEDULE SHEET

	HOURS AM/PM	MINUTES	SETPOINT TEMPERATURE	LIGHT ON/OFF	HOURS AM/PM	MINUTES	SETPOINT TEMPERATURE	LIGHT ON/OFF
	Hi	min	Set	Light	Hi	min	Set	Light
SUNDAY	1 AM	00	20.0	OFF	3 PM	00	40.0	ON
MONDAY	2 AM	00	30.0	ON	4 PM	00	20.0	ON
TUESDAY	3 AM	00	20.0	OFF	5 PM	00	10.0	OFF
WEDNESDAY	4 AM	00	10.0	ON	6 PM	00	50.0	ON
THURSDAY	3AM	00	50.0	OFF	5 PM	00	40.0	ON
FRIDAY	2 AM	00	10.0	ON	4 PM	00	20.0	OFF
SATURDAY	1 AM	00	20.0	ON	3 PM	00	30.0	OFF



Explanation of Front Panel Controls

- 1) **AM/PM Lamps** - These two green indicator lamps inform the user as to the 12-hour time period of the day.
- 2) **Time Display** - This four-digit display indicates the time of day. In the program mode, this display shows what parameter is being programmed.
- 3) **Day-of-the-Week Lamps** - These seven green indicators show what day it is.
- 4) **Mode Lamps** - These two indicators inform the user whether the growth chamber is in a continuous mode of operation, or a program mode of operation (timed sequence).
- 5) **Temperature Display** - This four-digit display indicates the growth chamber temperature. Also, during programming, it displays the value prompted by the time display.
- 6) **Heater On Lamp** - This lamp is illuminated when power is applied to the heater.
- 7) **High/Low Temperature Lamps** - These lamps will illuminate if the growth chamber's chamber temperature exceeds the high or low limit temperatures.
- 8) **Locked Lamp** - This lamp will illuminate if the user has locked the keyboard to avoid accidental changing of parameters.



Explanation of Front Panel Controls (cont.)

- 9) **Light On/Off Lamps** - These two lamps indicate the status of the internal light (whether it is on or off) during operation.
- 10) **Enter Key** - This key is used after any setpoint selection is made to enter the value into memory.
- 11) **Program Key** - When the program mode is selected with the SET key, the PROGRAM key will prompt the user to enter program values starting with SUNDAY.

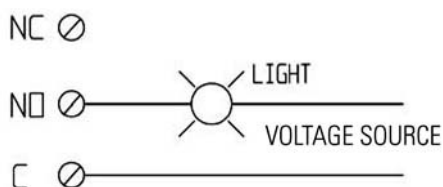
A blank schedule sheet is provided toward the end of this manual so the user can predetermine the weeks program. Use of the schedule sheet is strongly recommended before any programming is started.

- 12) **Set Key** - This key has two functions. The first being to select the continuous or program mode of operation. The second being to select a setpoint temperature if the continuous mode of operation has been selected.
- 13) **Up/Down Arrow keys** - These keys are used to increase or decrease a desired value.
- 14) **REPEAT KEY** - This key is a time saver key. When in the program mode, pressing this key will duplicate the program setting from the current day to the other 6 days.
- 15) **CAL KEY** - This key is used to calibrate the growth chamber to a certified/traceable thermometer.
- 16) **Mute Key** - This key is used to silence the internal audible alarm and to also deactivate the external alarm device if one is being used.
- 17) **Light Key** - This key, in Continuous mode, will turn the internal light on or off. In Program mode, this key is disabled. The internal light will not be allowed to operate at a setpoint temperature below 10 degrees in either the Continuous or Program mode.
- 18) **Lock Key** - This key is used to enable or disable the keyboard.
- 19) **Clock Key** - This key is used to select the day, hours, and minutes.

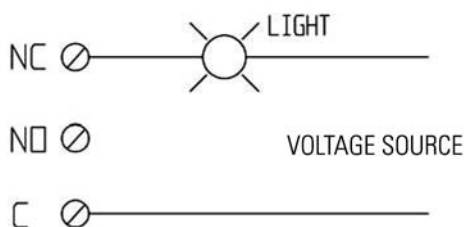
Explanation of Auxiliary Panel

On the left side of the growth chamber control panel there is an auxiliary panel which has the items shown in the figure on the next page. They are described as follows:

- 1) **Fuse** - This fuse is in line with the main power cord that comes into the growth chamber. The rating of this fuse is printed above the fuse holder. The physical size of this fuse is 5mm x 20mm.
- 2) **Alarm Relay** - This Alarm Relay output is provided to the user for the purpose of remotely monitoring the growth chamber in case of a high or low temperature alarm condition. This alarm relay will operate just as the audible alarm would. The contact itself is an isolated form C (normally open/normally closed) dry contact. This contact is to be used for low voltage class 2 connections only. The contact rating is 24 volts, 1.25 amps resistive. Typical usages of the output are shown below.

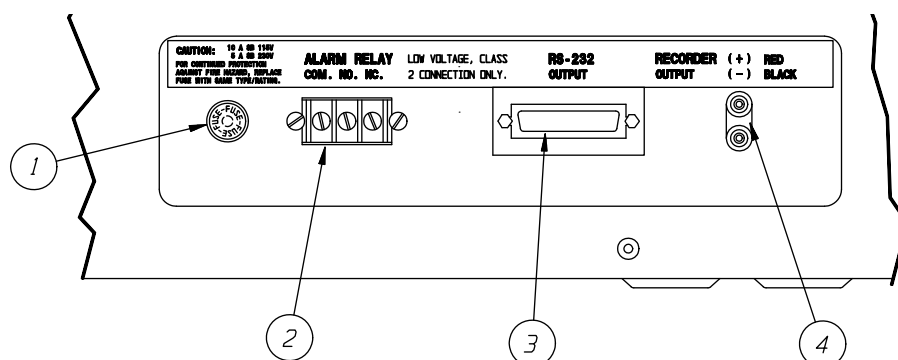


In this configuration, the light will illuminate whenever the unit goes into an alarm condition, High or Low.



In this configuration, the light will go off in a high or low temperature alarm condition.

Note Wiring must conform to all local electrical codes. ▲



Explanation of Auxiliary Panel (continued)

3) **RS-232 Output (Optional Kit P/N 3166245)** -This output is used for two way communications between the growth chamber and a personal computer. With the use of a communications/modem software program, the user can record the temperature of the growth chamber at their selected time periods and store it in a file for use with a spreadsheet program. The user can also change the setpoint temperature from their personal computer and periodically monitor the actual temperature, setpoint temperature, and alarm status.

4) **Recorder Output** - This is a DC millivolt output which represents the temperature of the growth chamber. The recommended main use of this is with a chart recorder having an input impedance of at least 1M ohm. The scaled temperature output change is 10mV°C. When the growth chamber is operating at a negative temperature, the chart recorder output is still positive. Use the chart at right to relate temperature to output voltage.

When connecting a chart recorder to the recorder output connector, it is recommended to use a shielded cable with the shield grounded at the chart recorder and to keep the cable short as possible.

Temperature (Degree C)	Recorder Output (Millivolts)
-10	100
0	200
10	300
20	400
30	500
40	600
50	700

Instrumentation Port

Located on the rear side of the growth chamber is an instrumentation port for the user to insert sensor wires, external meter leads, etc. into the chamber. The rubber plug provided must always be used in this port to insure the uniformity specifications. An extra plug is supplied for the user's convenience. Be sure to seal any gaps around the wire(s) going through the plug.

Section 2 Installation

Use the proper lifting equipment when moving this unit. The shipping weight of this unit is 340 lbs. (154 kg).

To ensure proper ventilation, allow 4" minimum clearance between the rear, top, and sides of the growth chamber and adjacent walls. If two or more growth chambers are positioned side by side, allow a minimum of 8" between cabinets. Adjust the front leveling feet of the growth chamber so that the front is higher than the rear. This will assist in door closing. Choose a site free from rapidly changing ambient temperature conditions.

Caution The growth chamber should not be operated in an environment where the ambient temperature exceeds 90°F, as the compressor thermo-overload will be tripped and will result in a wide band control cycle of approximately $\pm 4^{\circ}\text{C}$. Such cycling should not be misinterpreted as a malfunction of the electronic controls. ▲

Radiators, air-conditioning outlets, other ventilating system outlets, and drafts can affect the operation of the growth chamber by a sudden inrush of air that is at a temperature different than operating conditions.

Warning For personal safety, this apparatus must be properly grounded. ▲

Wall mount brackets are attached to the top rear of the cabinet. Remove any packaging materials from the brackets. Rotate the brackets so they point straight out from the back. Secure bracket in place with the included hardware. Attach brackets to wall.

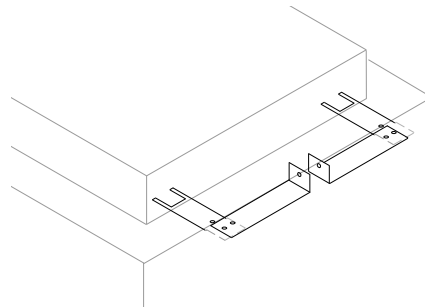


Figure 2-1. Brackets During Shipping

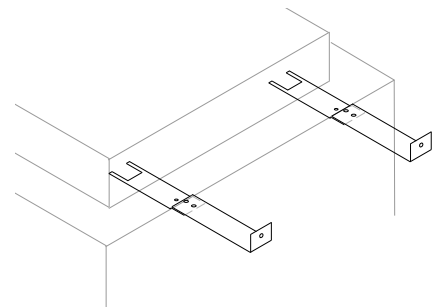


Figure 2-2. Brackets During Use

The power cord is the mains disconnect. Make sure the outlet and plug are accessible at all times.

The power cord of this instrument 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. The customer should have the wall receptacle and circuit checked by a qualified electrician to make sure the receptacle is properly grounded.

Where a 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.

Warning Do not, under any circumstances, cut or remove third (ground) prong from the power cord. Do not use a two-prong adapter plug. ▲

Determine the total amount of current presently being used by other apparatus connected to the circuit that will be used for this unit.

It is critical that the added current demand and other equipment on the circuit not exceed the rating of the fuse or circuit breaker in use.

Caution Be sure the power supply is the same voltage as specified on the nameplate. ▲

When loading the growth chamber, a space of 1/2" must be allowed between adjacent items in the chamber. This will allow maximum air circulation, necessary for proper temperature uniformity. The uniformity will be adversely affected if air circulation is obstructed.

Liquid containers should never be placed in the growth chamber without covers. The evaporation of moisture within the chamber will only add frost and hasten the need for defrosting. This chamber is not self-defrosting.

Excessive frost buildup on the evaporator coil located on the lower back wall will also affect temperature uniformity.

Safety Precautions

1. Do not place any explosive,combustible, or flammable materials in the chamber.
2. Do not place sealed containers in the chamber. Sealed containers, filled with material, do not provide room for expansion and can develop dangerous vapor pressure as the temperature increases.
3. Avoid spillage of liquids within the chamber.
4. Do not evaporate noxious fumes.

Caution Do not store containers filled with acidic or caustic solutions, as vapors from these materials will attack the evaporator and void the

Section 3 Operation and Calibration

In the "Explanation of Controls" section, all of the control panel keys were discussed. In this section, some of those keys will be discussed in greater detail due to their more involved operation.

1. **Clock Key** - Pressing the CLOCK key will enable the user to select the hours, minutes, and day. The clock will continue to function correctly if the growth chamber's power has been removed.

The date, month, and year selection is performed in Configuration mode and will be discussed later. The date, month, and year have been preset at the factory. If required, see CALENDAR in this section.

- A. Press the CLOCK key and the displays will show the following:



A number other than 10 might be shown in the right display. Also, if no keys are pressed within 15 seconds, the displays will return to their previous state.

Using either the up or down arrow keys, the user can select the correct hour of the day. After the correct hour has been selected, ENTER must be pressed and the displays will change to those illustrated in Step B. If the hour was correct when the CLOCK was pressed, press ENTER and the displays will change to those shown in Step B.

- B. The displays will be similar to those below. These are for the minute selection.



Again, a number other than 21 will most likely appear. This display also has a 15-second time-out, just as the hour display. Also, the next two displays in Steps C and D will have a 15-second time-out.

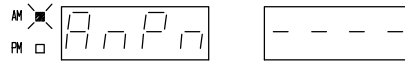
If the minutes are correct, press the ENTER key and the displays will go to those in Step C.

If the minutes are incorrect, use the up or down arrow keys to select the correct minutes and then press ENTER. The displays will go to those shown in Step C.

Section 3

Operation and Calibration

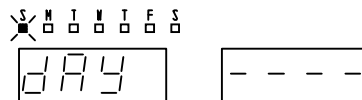
- C. The displays will be similar to those below. This is for AM/PM selection.



If the AM/PM is correct as indicated by the AM/PM lamps, then press ENTER and the displays will go to those in Step D.

If the AM/PM is incorrect, use the up or down arrow keys to select the proper one and then press ENTER.

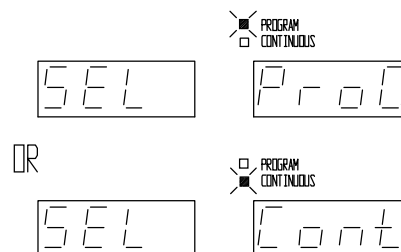
- D. The displays will be similar to those below. These are for the day selection.



If the day is correct, press ENTER and the growth chamber will return to regular operation and the setting of the clock is complete.

If the day is incorrect, use the up or down arrow keys to select the day. While using the up or down arrow keys, observe the seven day-of-the-week lamps for selecting the correct day. After the correct day has been selected, press ENTER and the growth chamber will return to normal operation and the setting of the clock is complete.

2. **Set Key** - Pressing this key will change the displays to one of the combinations shown below.



At this time, the user can select the growth chamber to operate in the PROGRAM mode or CONTINUOUS mode.

If CONT is displayed, and you wish to change to PROG, press the up arrow key. The displays will return to their normal operation of showing time and temperature. Also the continuous lamp will extinguish and the PROGRAM lamp will illuminate. The growth chamber will automatically determine the programmed set point temperature and light status for the present time and day of the week.

If PROG is displayed and you wish to change to CONT, press the down arrow key and the displays will change to the following:



Now the user can select the SETPOINT temperature to operate at by means of the up or down arrow keys, then pressing the ENTER key.

Note If the user selects the CONTINUOUS mode of operation after being in Program mode, the setpoint and light condition will remain the same while the growth chamber was in Program mode. ▲

3. **PROGRAM KEY** - Before reading about this key, please take some time to study the sample schedule sheet provided on page 1-4.

For each day, there are eight items which must be programmed and are as follows:

Hour 1	Hour 1 (AM or PM)
min 1	Minute 1
SEt 1	Setpoint Temperature 1
Light 1	Light On/Light Off 1
Hour 2	Hour 2 (AM or PM)
min 2	Minute 2
SEt 2	Setpoint Temperature 2
Light 2	Light On/Light Off 2

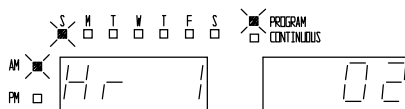
When programming, it is important to keep in mind that "Hour 1" must always be before "Hour 2". Also keep in mind that AM is before PM.

Another important note about the operation of the program mode is that, if the present time is before "Hour 1" of any day, the operation of the growth chamber will be that of "Hour 2" of the previous day.

Section 3

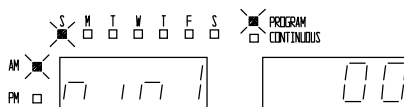
Operation and Calibration

PROGRAM mode of the 3758/3759 Plant Growth Chamber allows the user to program in two sets of time, setpoint temperature, and light conditions for each day of the week. This is started by selecting PROGRAM mode pressing the SET key, then pressing the PROGRAM key. The displays and the indicator lamps will change to the following:

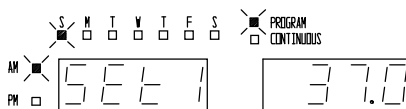


Use the up or down arrow keys to select your choice for the first hour for Sunday.

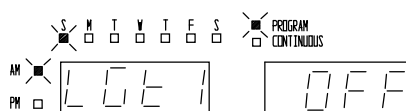
There is no separate selection for AM/PM here as there is for setting the clock, but note the AM/PM lamps.



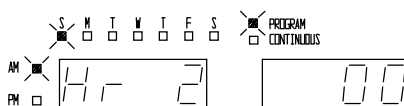
After your selection is displayed, press the ENTER key and the displays will change to the following:



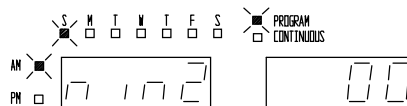
Use the up or down arrow keys to select your choice for the first minutes for Sunday. After your selection is displayed, press the ENTER key and the displays will change to the following:



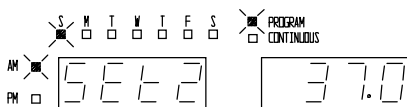
Use the up or down arrow keys to select your choice for the setpoint you want the growth chamber to switch to at your first hour and minute you have chosen. After your selection is displayed, press the ENTER key and the displays will change to the following:



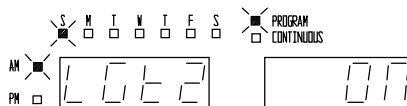
Use the up or down arrow keys to select if you want the internal door lamps to be on or off at your first hour and minute selection. After your selection is displayed, press the ENTER key and the displays will change to the following:



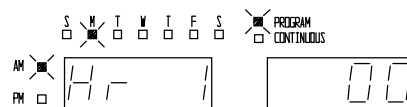
Use the up or down arrow keys to select your choice for the second hour for Sunday. Note the AM/PM lamps. After your selection is displayed, press the ENTER key and the displays will change to the following:



Use the up or down arrow keys to select your choice for the second minutes for Sunday. After your selection is displayed, press the ENTER key and the displays will change to the following:



Use the up or down arrow keys to select your choice for the setpoint you want the growth chamber to switch to a your second hour and minute you have chosen. After your selection is displayed, press the ENTER key and the displays will change to the following:



Use the up or down arrow keys to select if you want the internal door lamps to be on or off at your second hour and minute selection. After your selection is displayed, press the ENTER key and the displays will change to the following:

At this point, the whole sequence starts over except that it is for Monday instead of Sunday.

If any of the selections are already what you desire, for any day, just press the ENTER key to advance to the next parameter.

While in PROGRAM mode, if you do not press any keys for 10 seconds, the growth chamber will automatically return to the normal operation mode.

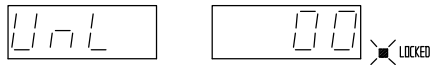
Section 3

Operation and Calibration

4. **Repeat Key** - This is a convenience key for the user. If the user desires to program each day with the same times, temperature set points, and light conditions, then the use of this key is very helpful.
 - A. Select PROGRAM mode of the growth chamber by using the SET key.
 - B. Press the PROGRAM key, then go to the present day by means of the ENTER key.
 - C. Select and enter all eight of the days' parameters desired.
 - D. After the last parameter (LGT2) is entered for the present day, the day of the week lamps will indicate the next day. At this time, press the REPEAT key. After about a half second, the displays will return to normal operation.
 - E. All of the days program schedules will be the same as the present day.
5. **Lock Key** - The keyboard may be locked to prevent inadvertent changes to previously stored values.

To Lock the Keyboard

- A. Press the LOCK key and the displays will show the following:



- B. Using the up or down arrow keys, select a numerical password of your choice.
- C. Press the ENTER key. The LOCKED lamp will light and the displays will return to their normal operation.

Your numerical password is stored and the keyboard is now locked.

Note Record your password in a safe place. ▲

The locked keys are CLOCK, LIGHT, up or down arrow keys, REPEAT, and PROGRAM.

To Unlock the Keyboard

SET and CAL will show the present values, but if changes are attempted, they will be locked out.



- A. Press the LOCK key and the displays will show the following:
- B. Using the up or down arrow keys, select the numerical password that was chosen to lock the keyboard.
- C. Press ENTER. The LOCKED lamp will go out and the displays will return to their normal operation. The keyboard is unlocked at this point.

Note If you have forgotten or lost your password, enter the number 257 to unlock the keyboard. ▲

6. CALIBRATE KEY - The growth chamber is calibrated at the factory for use over a wide range of temperatures. Due to the slight non-linearization 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 tenth's of a degree.

The CALIBRATE key should be used ONLY to match a stable growth chamber's actual temperature to the calibrated thermometer.

Place a calibrated thermometer (or the probe of one) at the center of the third shelf of the growth chamber. Select the SETPOINT you wish to run the unit at. Allow the unit to run for at least an hour after it reaches the setpoint, before the calibration is performed.

Note If possible, place the thermometer into a liquid for stability. ▲

To perform calibration, press the CAL key. The displays will show the following:



Note The temperature displayed will be current operation. ▲

Then press either the up or down arrow keys to make the display match the noted thermometer reading. After the satisfied display is achieved, press the ENTER key. The temperature display will then return to showing the newly calibrated actual temperature. The TIME display will return to displaying the time of day.

Section 3

Operation and Calibration

7. ALARMS - The growth chamber has high and low alarms. There are settable delay timers and alarm band associated with these alarms. The high and low timers provide a delay before either alarm will go off if the chamber temperature has deviated from the setpoint temperature by the amount set in the alarm band. These time delays and alarm band are used in the control to distinguish between door openings and real alarms. The following is an example of this:

The growth chamber is controlling at 40.0°C and the low delay timer is set for 2 minutes and the alarm band is set for 1°. Now the door is opened. Most likely, the temperature will begin to drop.

If the door is not closed and the control senses a temperature of 39°C or less after 2 minutes, the low alarm temperature will go off along with the compressor. This is not a real alarm failure. If the door is left open long enough for this to occur, then the door must be closed sooner so the growth chamber can recover in time. Alternately, the delay times can be set for a longer period of time, or the alarm band can be increased.

To adjust the delay timers and the alarm band, follow these instructions:

- A. Press and hold the up or down arrow keys and then press the ENTER key and the displays will change to the following:



Use the up arrow key to select 01 and then press ENTER. The displays will change to the following:



A number other than 01 might be shown. This is the delay time setting, in minutes, for the high alarm. Use the up or down arrow keys to select your time value and press ENTER and the displays will change to the following:



This is the delay time setting for the low alarm. A difference between the high alarm and low alarm delay that should be noted at this point is that when you select a value for the high alarm delay and then turn power off, that value will appear again when power is turned on again. The low alarm delay however will always be 20 minutes when power is turned on. The reason for this, if the delay is set for too short of a time and the compressor goes off, it will be approximately 10 minutes before the compressor turns back on. This is due to an internal time delay within the compressor. The user can change this 20 minutes to a value desired, but when power is turned off and on again, it will reset to 20 minutes again. Use the up or down arrow keys to select your time value and press ENTER.

The displays will change to the following:

AL 6 1.0

This is the value for the alarm band, the amount of temperature deviation allowed before either the high or low delay timers are started. Use the up or down arrow keys to select your value and then press ENTER and the displays will return to their normal operation.

8. CALENDAR - The clock key allows the hours, minutes, and day of the internal clock to be set. To set the internal clock, select Configuration mode 2. To set the date, month, and year, follow these instructions:

- A. Press and hold the up or down arrow keys and then press the ENTER key and the displays will change to the following:

FF 00

Use the key to select 02 and then press ENTER. The displays will change to the following:

date 01

A number other than 01 might be shown.

This is the day of the month selection. Use the up or down arrow keys to select the correct date and then press ENTER and the displays will change to the following:

mon 01

Section 3

Operation and Calibration

Use the up or down arrow keys to select the correct month and then press ENTER and the displays will change to the following:



Use the up or down arrow keys to select the correct year and then press ENTER. The calendar is set and the growth chamber will return to normal operation at this point.

Adjusting the Intake and Exhaust Ports

The exhaust port is the top port on the door. Open it slightly by turning it counterclockwise to permit exhausting of chamber air. The intake port is the bottom port on the door. Open the intake port by turning it counterclockwise to permit an air exchange in the chamber.

PREVENTIVE MAINTENANCE

Incubators

Your equipment has been thoroughly tested and calibrated before shipment. Regular preventive maintenance is important to keep your unit functioning properly. The operator should perform routine cleaning and maintenance on a regular basis. For maximum performance and efficiency, it is recommended the unit be checked and calibrated periodically by a qualified service technician.

The following is a condensed list of preventive maintenance requirements. See the specified section of the operating manual for further details.

We have qualified service technicians, using NIST traceable instruments, available in many areas. For more information on Preventive Maintenance or Extended Warranties, please contact us at the number listed below.

Cleaning and calibration adjustment intervals are dependent upon use, environmental conditions and accuracy required.

Tips for all incubators:

- Do NOT use bleach or any disinfectant that has high chloros
- Do not use powdered gloves for tissue cultures.
- Use sterile, distilled or demineralized water.

401 Millcreek Road, Box 649 • Marietta, Ohio 45750 USA • 740-373-4763
USA and Canada 800-438-4851 • Telefax: 740-373-4189 • <http://www.service.led.marietta@thermofisher.com>

Preventive Maintenance for Model 815 Incubators

Refer to Manual Section	Action	Daily	Weekly	Yearly
3	Check temperature display versus setpoints, w/ independent instrument		✓	
--	Inspect door latch, hinges and door gasket seal.			✓
3	Verify and document temp calibration, as applicable. See Calibration section.			✓
5	Perform a complete decontamination procedure. Wipe down interior, shelves and side panels with disinfectant. Rinse everything well with sterile distilled water.	Between experiments <i>More frequent decontamination may be required, depending on use and environmental conditions</i>		

Section 4 Service

Warning Service should be performed only by qualified service personnel. Exercise care as line voltage is present in the control compartment. ▲

If refrigeration service is required, after review of the Troubleshooting Section, contact Technical Services.

In any communication with Thermo, include the model and serial numbers from both nameplates.

Troubleshooting

Problems encountered with any constant temperature chamber will most frequently be related to temperature control. Before proceeding with detailed troubleshooting, be certain that the Low Limit and High Limit controls are adjusted properly. If the limit controls are set too close or beyond the operating temperature, the growth chamber may be consistently going into alarm. This will result in erratic temperature control. First, the symptoms and possible causes will be listed for quick reference. Possible solutions will be suggested later.

Warning Hazardous high voltage conditions exist inside the control panel. unplug line cord and turn "off" line switch before removing the cover. only qualified electrical instrument personnel are authorized to perform troubleshooting and/or servicing. ▲

Symptoms and Possible Causes

Freeze-up or gradual drop in chamber temperature:

No air circulation in chamber; inoperative fan (see Solution 1)

Heater (see Solution 2)

Power Supply PCB Assembly (see Solution 3)

RTD Temperature Probe (see Solution 3, Step D and/or Solution 4).

Side walls are getting warm:

Depending on ambient temperature and the specific settings, the side walls may get warm to the touch - up to 60°C (140°F) .

This is not a malfunction. This is normal due to the location of the condenser heat exchanger of the cooling system. Note that it has no impact on the specified performance of the unit.

Symptoms and Possible Causes (continued)

Temperature variations at set point (poor control):

Excessive ambient temperature variations (see Solution 10)
Compressor Relay failure (see Solution 12)
No air circulation in chamber; inoperative fan (see Solution 1)
RTD Temperature Probe Location (see Solution 5)
Ice buildup on evaporator coils (see paragraph on "Defrosting")
RTD Temperature probe (see Solution 3, Step D and/or Solution 4).
Power Supply PCB Assembly (see Solution 3)

Does not reach a high set point temperature:

No air circulation in chamber; inoperative fan (see Solution 1)
Low line voltage, less than 110V (see Solution 9)
RTD Temperature Probe (see Solution 3, Step D and/or Solution 4).
Power Supply PCB Assembly (see Solution 3)
Overcharged compressor (see Solution 11)

Differences between Temperature Set and Digital Temperature Readout: (see performance figures, page 3)

RTD Temperature Probe (see Solution 3, Step D and/or Solution 4).
Malfunctioning Power Supply PCB assembly (see Solution 3)

Takes an extremely long time to reach high temperature set point:

No air circulation in chamber; inoperative fan (see Solution 1)
Low line voltage, less than 110V (see Solution 9)
Power Supply PCB assembly (see Solution 3)
Overcharged Compressor (see Solution 11)

Display indicates **nnnn or **uuuu****

Malfunctioning RTD Temperature Probe (Solution 4)

Possible Solutions

1. Inoperative Fan:

Open the door. Place your hand near the grille at the top rear of the chamber and check for air circulation. If there is no air circulation, the fan motor is malfunctioning. Contact Technical Services.

2. Burned-out heater:

To check this, the control panel cover must be removed.

Warning Hazardous high voltage conditions exist inside control panel. Turn 'OFF' line switch on front panel and disconnect line cord. ▲

Remove all screws that fasten the cover. Locate nylon connector J1 on the Limit/Alarm PCB Assembly. Depress both ears on the plug housing and gently pull out the connector.

With an Ohmmeter, measure the resistance between TB1-4 (Orange wire) and TB1-6 (Red wire).

The proper heater resistance is 24 ohms. If heater resistance is correct, then measure between one heater lead (RED or ORANGE) and growth chamber ground, it must be infinity (Open). If the heater resistance check indicates an open circuit, it may or may not be open. In series with the heater is a thermal overload switch. It might be that this thermal overload is open and not the heater. To check the heater and thermal switch directly, the shelves of the growth chamber and the back wall cover must be removed. Unplug heater and measure its resistance. If the resistance is correct, check resistance between heater terminal and the heater sheath. It must be an open circuit. If the heater is good, then check the thermal overload switch. At room temperature it should be closed (0 ohms). This switch should only open at 80°C, then close at 65°C. If the heater and thermal switch are good, then the problem is directed towards the heater wires in the harness. If heater is defective, contact Technical Services.

3. Malfunctioning Power Supply PCB assembly:

The Power Supply PCB Assembly has the triac (solid state AC voltage switch) on it which supplies the power to heater. This triac is "told" to operate, when need be, by the microprocessor.

Possible Solutions (continued)

There is another device known as an Optoisolator which serves as the high/low voltage isolator between the triac and the microprocessor.

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

If the growth chamber starts experiencing temperature problems such as no heat, constant 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 and preferably a digital voltmeter.

Warning The following troubleshooting instructions require that power be on. Only qualified service personnel should perform these procedures. ▲

- A) Remove the control cover and familiarize yourself with the power supply assembly #3176818. Locate the Triac (Q2), the Opto-isolator (U1), resistor (R4). Also locate the test point #2 (TP2). The first measurements will be DC voltage measurement, so a DC scale of at least 10 volts should be selected. Connect the negative lead to TP2. This is DC ground. Also locate the terminal block (TB1).
- B) This first section will be to verify the heater command is correct from the microprocessor, through the optoisolator, and through the triac when the growth chamber is NOT requesting heat. The steps in this section must be followed in succession.
 - 1. Select a setpoint temperature at least 10° below what the actual temperature is. The growth chamber 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.
 - 2. Measure the voltage at U1-Pin 2 with respect to TP2. It should be no less than 4 volts DC.
 - 3. Measure the DC voltage across R4, since the growth chamber is not requesting heat, there should be no current flowing through this resistor, making the voltage drop equal to 0 volts.
 - 4. If the last two steps are not as stated, then most likely the CPU board is bad and should be replaced.
 - 5. Switch the voltmeter to an "AC Volts" scale capable of reading 120 volts.

Possible Solutions (continued)

6. Measure the voltage between U1-Pin 4 and U1-Pin 6. It should be line voltage; 110 VAC to 120 VAC.
 7. If it is not, most likely the Optoisolator is bad and the power supply board should be replaced.
 8. Measure the voltage TB1-4 (Orange wire) and TB1-6 (Red wire). It should be approximately 0 VAC.
 9. If it is not, then most likely the triac is bad, and the power supply board should be replaced.
- C) This next section will be to verify the heater command is correct from the microprocessor, through the optoisolator, and through the triac when the growth chamber IS requesting heat. The steps in this section must be followed in succession.
1. Select a setpoint temperature at least 10° above what the actual temperature is. The growth chamber should be requesting heat as indicated by the "Heater On" indicator lamp on the front panel. It should be on continuously, not flashing.
 2. Measure the voltage at U1-Pin 2 with respect to TP2. It should be no greater than 4 volts DC.
 3. Measure the DC voltage across R4, since the growth chamber is requesting heat, there should be current flowing through this resistor, making the voltage drop equal to 3 volts, ± 0.5 volts.
 4. If the last two steps are not as stated, then most likely the CPU board is bad and should be replaced.
 5. Switch voltmeter to "AC Volts" scale capable of reading 120 volts.
 6. Measure the voltage between U1-Pin 4 and U1-Pin 6. It should be less than 1 VAC.
 7. If it is not, most likely the optoisolator is bad and the power supply board should be replaced.
 8. Measure the voltage between TB1-4 (Orange wire) and TB1-6 (Red wire). It should be line voltage; 110 VAC to 120 VAC.
 9. If it is not, then most likely the triac is bad. The power supply board should be replaced.

Possible Solutions (continued)

- D) Measure RTD temperature probe resistance at the connector after unplugging it from plug J302. The resistance between contacts, at various temperatures are as follows:

TEMPERATURE	RESISTANCE
0°C	100 OHMS
20°C	108 OHMS
37°C	114 OHMS
50°C	119 OHMS

Note Only 2 of the 3 connector positions are used. ▲

4. Malfunctioning RTD Temperature probe:

The Control Board can detect if the temperature probe or the connection of the temperature probe to the circuit board is "OPEN" or "SHORTED". These two conditions are shown on the display as follows:

DISPLAY	CONDITION
nnnn	OPEN CIRCUIT
UUUU	SHORT CIRCUIT

Before deciding that the probe is bad when one of these displays appear, check the connection of the probe to the circuit board.

5. RTD Temperature Sensor Probe Location:

The Proper RTD location is important. The RTD is supported by the stainless steel bracket attached on the rear wall and near the top of the chamber. Two tube shaped clips securely support the RTD probe into place. The RTD must be inserted fully into its support bracket.

6. Constantly Experiencing Low Temperature Alarm:

If the growth chamber is constantly going into low temperature alarm, then most likely the setpoint temperature setting is too close to the low temperature alarm/setpoint setting. The setpoint temperature setting should be a minimum of 2° above the low temperature alarm setting. If the problem persists, then see Solution 3.

7. Constantly Experiencing High Temperature Alarm:

If the growth chamber is constantly going into high temperature alarm, then most likely the setpoint temperature setting is too close to the high temperature alarm/setpoint setting. The setpoint temperature setting should be a minimum of 2° below the high temperature alarm setting. If the problem persists, then see Solution 3.

Possible Solutions (continued)

Note Software version 2.00 and later has a 30 minute delay for the low and high alarm to avoid nuisance alarms caused by door openings. ▲

8. Ice buildup on evaporator coils:

Excessive frost buildup is the result of the introduction of outside moisture. This may be caused by the evaporation of liquids placed in the chamber, or it may be the result of excessive opening of the door during high humidity conditions. The door gasket should also be examined for proper seal. If repairs are necessary, contact Technical Services.

9. Excessive line voltage variation:

Incubator will operate satisfactorily over full temperature range (-10°C to 50°C) when line voltages vary from nominal voltage by -5% or +10%. Larger voltage variations may impair the Temperature Control. Correct as required.

10. Excessive ambient temperature variation:

If the growth chamber is placed close to the air-conditioning outlet, hot radiators, or direct sunlight, or if the ambient temperature changes drastically, the chamber temperature will be affected. Correct as necessary.

Caution The growth chamber should not be operated in an environment where the ambient temperature exceeds 90°F, as the compressor thermo-overload will be tripped and will result in a wide band control cycle of approximately $\pm 4^{\circ}\text{C}$. Such cycling should not be misinterpreted as a malfunction of the electronic controls.

11. Overcharged compressor:

This would happen only if compressor was overcharged after installation. For correct charge, see nameplate located behind lower portion of door. If unit has more charge than shown, it will not reach 50°C. Compressor must be discharged and recharged correctly.

12. The circuit design calls for continuous compressor operation.

If compressor cycles "On-Off", it is an indication that the starting relay is overriding the control circuit. This may be the result of excessive (90°F) ambient temperature adjacent to the compressor, excess dirt on the compressor, or a relay malfunction. Provide additional wall clearance and/or circulation around the unit, clean compressor, or contact Technical Services.

Section 5 Maintenance

The design of the growth chamber is such that periodic maintenance is kept to a minimum. No lubrication is required. The following paragraphs cover the few minor procedures necessary for continuous operation.

Warning Turn off power switch and unplug line cord from power source before starting any maintenance procedure. ▲

If the chamber needs to be cleaned, a mild soap and water solution, or bicarbonate of soda (1tbsp./gallon of water), is recommended.

When the growth chamber is used frequently below ambient temperatures, or in any manner that increases moisture buildup within the chamber, an appropriate defrosting schedule must be determined. Defrosting is accomplished by turning the growth chamber off for 24 hours. Moisture will collect in the drip pan beneath the growth chamber.

General Cautions

- 1) Overcharging a refrigeration system can cause excessive system pressure and can be dangerous.
- 2) The compressor terminal protective cover must be properly in place before applying electric power to the compressor.
- 3) Caution should be exercised by service personnel when servicing refrigeration system.
- 4) Service should be performed by a certified refrigeration technician only.

Section 6 Options

RS232

Instructions to install and operate the RS232 option follow.

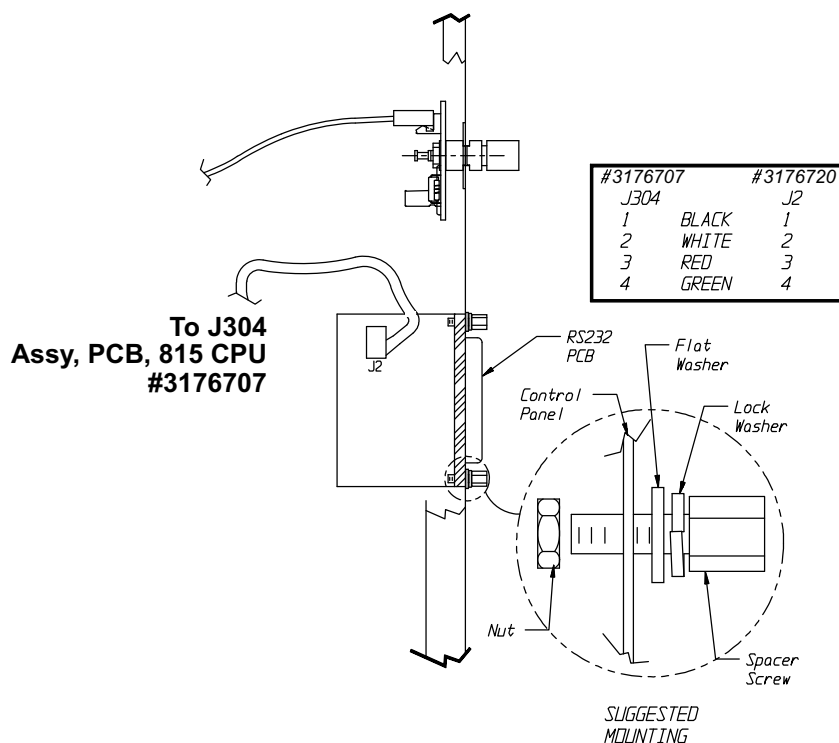
1. Remove the eight (8) screws securing the control panel. There are four (4) on the top and 2 on each of the sides. Then remove the cover by sliding it towards the front of the growth chamber.
2. Slide open the auxiliary panel door and locate the mounting area of the RS232 board as shown on page 4.
3. Mount the RS232 printed circuit board assembly using the screws or standoffs provided. See Figure below.
4. Connect one end of the cable to J304 located on the left edge of the left printed circuit board (p/n 3176707). Be careful of alignment.
5. Connect the other end of the cable to the cable connector on the RS232 PCB assembly (see sketch).
6. Replace the control panel and secure with the eight (8) screws.

The RS232 PCB provides a bi-directional communication port that will allow the user to monitor the performance or the change the operating valves of the growth chamber from a remote computer. RS232 Communication will require a communication program such as a modem program installed in your computer which will allow the storage of data within your files.

The RS232 PCB utilizes one of the users computer serial ports, such as COM1 or COM2. The communication software must be configured to the selected port. The serial port is an IBM PC AT-style port. The cable that connects to it must end in a DB-25 (25-pin) male connector. The cable is a one-to-one wiring format. The pin assignments for the serial port are:

PIN	SIGNAL	DESCRIPTION
2	TXD	Serial Transmitted Data
3	RXD	Serial Received Data
7	GND	Signal Ground (0 V)

TOP VIEW OF CONTROL PANEL



Setting Up the Incubator for Communication

Your growth chamber requires the selection of 3 parameters for communications:

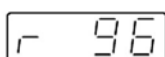
- A) Baud Rate - This is the speed of communication between the growth chamber and computer. Whatever is selected for the growth chamber must also be selected in the communication software selected to be used.
- B) Status Update Time Interval - This is the time between information being sent from the growth chamber until it is received by the computer.
- C) Status Display Type - Selection of the format of data to be sent to your computer.

Set Up the Incubator for Communications (cont.)

Read the following steps before performing any of them. It will allow you to familiarize yourself with the procedure and to determine the values you want beforehand.

Note In the following setup mode, there is a five (5) second time-out feature that is active following each entry. If the five (5) seconds is exceeded, the unit will return to the normal operation mode. If the time-out occurs before the value was entered, start over. ▲

1. With the growth chamber ON, simultaneously press and hold the UP and DOWN keys, then press the ENTER key. The letters will be shown in the display. A number other than 96 might be shown in the display:



Choose the number appropriate for the Baud Rate desired.

3 = 300

6 = 600

12 = 1200

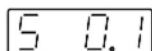
24 = 2400

48 = 4800

96 = 9600

Press the UP or DOWN key until the display shows your selection. Press ENTER. The baud rate has been entered.

2. The display should change to the following. Again, the number in the display might be different than 0.1, but it will have a decimal point.



Choose the number appropriate for the Status Update Time Interval desired.

0.0 MinutesNo report

0.1 MinutesBetween reports

0.5 MinutesBetween reports

1.0 MinutesBetween reports

2.0 MinutesBetween reports

5.0 MinutesBetween reports

10.0 MinutesBetween reports

30.0 MinutesBetween reports

60.0 MinutesBetween reports

Set Up the Incubator for Communications (cont.)

Press the UP or DOWN key until the setpoint display shows your selection. Press ENTER. The value is entered.

3. The display should have changed to the following. Again, the number in the display might be different than 1. This selection is for Status Display Type.



Listed are the numbered selections with explanations and examples of the values displayed on your computer's monitor when the growth chamber transmits information.

- 0 = Used for a raw, one-line status output suitable for importing into a spreadsheet.
- 1 = Used for a multi-line format with English headings with continuous screen.
- 2 = Used for the format as "1" but preceded by a clear screen command used by terminals or computers running terminal software. This mode overwrites the previous transmission.

With Status Display Type = 0:

10 -5.0 0

Where:

10 = Actual Temperature

-5.0 = Setpoint Temperature

0 = Normal

With Status Display Type = 1 or 2:

Actual Temperature: 10

Setpoint Temperature: -5.0

Alarm Status: Normal

LOW

HIGH

4. Allow the setup to time out.

The growth chamber is now ready to communicate with your computer.

Setting up the Computer for Communication

Your communications software will most likely have a setup routine to set the parameters listed below. These are the values the growth chamber is using, so the computer parameters must match accordingly. Also, you will probably have to select the “COM” serial port you chose when you connected the cable from your computer to the growth chamber. The software may ask what format the data is in. You should choose “ASCII”.

Parameter	Settings
Baud Rate:	Baud Rate value selected earlier in Step 1.
Parity:	None (0)
Data Bits:	Eight (8)
Stop Bits:	One (1)
COM Port:	Selected by user
Format:	ASCII

Using the Communication

The growth chamber transmits information on its RS232 port as long as the status update time interval is not “0.0.”

If you start your communication software with the growth chamber on, most likely you will see the error(s) messages as follows:

```
ERR
? VALUE IS READ ONLY
? ILLEGAL COMMAND
```

Wait for the Status Update Time duration you selected to complete, and the communications will correct itself.

Besides having the growth chamber transmit information in one of the three formats, the user can monitor other values or even change some of these from their computer.

Using the Communication (continued)

The following table lists the available commands for monitoring or controlling your unit.

View Command:	Description:	Unit:	Range:	Change Command
A?	Actual Temperature	Degrees	-10 to 50	Read Only
T?	Setpoint Temperature	Degrees	-10 to 50	T10 thru T50
R?	Baud Rate	-	0 - 5	R0 thru R5
S?	Status Update Time	-	0 - 8	S0 thru S8
V?	EPROM Version Number	-	Current Rev.	Read Only
D?	Status Display Type	-	0 - 2	D0 thru D2
O?	Display the Alarm Status	-	0 - 2	Read Onl

To View Data: If Status Update Time is “0.0” no data will automatically be displayed. To view data within a particular command code, type that command code followed by the question mark (?) symbol and then ENTER (Return).

Example: To view Setpoint Temperature type: T? <CR>

To Change Data: To change the value within the command type the command code followed by the new value and ENTER (Return).

Example 1: To change Setpoint Temperature to 25.0°C type: T25.0 <CR>

Example 2: To change Setpoint Temperature to -.8°C type: T-.8<CR>

(A) Actual Temperature: The actual temperature within the growth chamber.

Using the Communication (continued)

(T) Setpoint Temperature: The temperature at which the user has selected the growth chamber to operate.

(R) Baud Rate: The rate at which data is transmitted between the growth chamber and your computer.

- 0 = 300 Baud
- 1 = 600 Baud
- 2 = 1200 Baud
- 3 = 2400 Baud
- 4 = 4800 Baud
- 5 = 9600 Baud

(S) Status Update Time Interval: The time between data messages sent from the growth chamber to your computer.

- 0 = 0 Minutes, No report
- 1 = 0.1 Minutes (6 seconds)
- 2 = 0.5 Minutes (30 seconds)
- 3 = 1.0 Minutes
- 4 = 2.0 Minutes
- 5 = 5.0 Minutes
- 6 = 10.0 Minutes
- 7 = 30.0 Minutes
- 8 = 60.0 Minutes

(V) EPROM Version Number: The growth chamber software version level.

(D) Status Display Type: Selection of format that data is sent to your computer

- 0 = Used for a raw, one-line status output suitable for importing into a spreadsheet
- 1 = Used for a multi-line format with English headings
- 2 = Used for the format as “1” but preceded by a clear screen command used by terminals or computers running terminal software.

(O) Display the Alarm Status: The alarm has three (3) possible values:

- 0 = Normal, no alarms
- 1 = Low alarm
- 2 = High alarm

Section 7 Specifications

Catalog Number	PR505755L	PR505750L
Temperature Range	-10°C to +50°C / +10°C to +50°C *	
External dimensions D x W x H (mm/in)	787 x 864 x 1956 / 31 x 34 x 77	
Internal dimensions D x W x H (mm/in)	508 x 673 x 1448 / 20 x 26.5 x 57	
Chamber volume (L / cu ft)	504 / 17.8	
Shelves (supplied / max)	4 / 6	
Shelf size W x D (mm / in)	642 x 422 / 25.3 x 16.6 642 X 372 / 25.3 x 14.6 (bottom shelf)	
Loading capacity per shelf (kg / lbs)	22.6 / 50	
Weight (kg / lbs)	136 kg / 300 lbs.	
Shipping weight (kg / lbs)	154 kg / 340 lbs.	
Power line voltage (±5%) / frequency	120V - 60Hz	230V - 60Hz
Power rating	720 W	720 W
Max current	6.8 A	3.4 A
Plug type	120V / Nema 5-15P	230V / Nema 6-15P
Max. BTU output	2220 (650W)	
Access port diameter (mm / in)	30 / 1.2	
Door Illumination	Rated Avg Life [12 hour start]: 24000 hr color: cool white supreme color temperature (for complete plant testing): 4100 K Lumens (Brightness) per fluorescent lamp: 2600 Lm illumination level (measured at chamber center point at 20°C): 3678 Lux / 342 foot-candles	
Installation Conditions	Indoor use Altitude: 2,000 meters Temperature: 5°C to 40°C Humidity 80% RH at or below 31°C, decreasing linearly to 50% RH at 40°C Mains Supply Fluctuations Rated Voltage ±10% Installation Category II ** Pollution Degree 2 *** Class of Equipment I	

* with door illumination on

*** 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 1500V for a 120V supply.*

**** 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.*

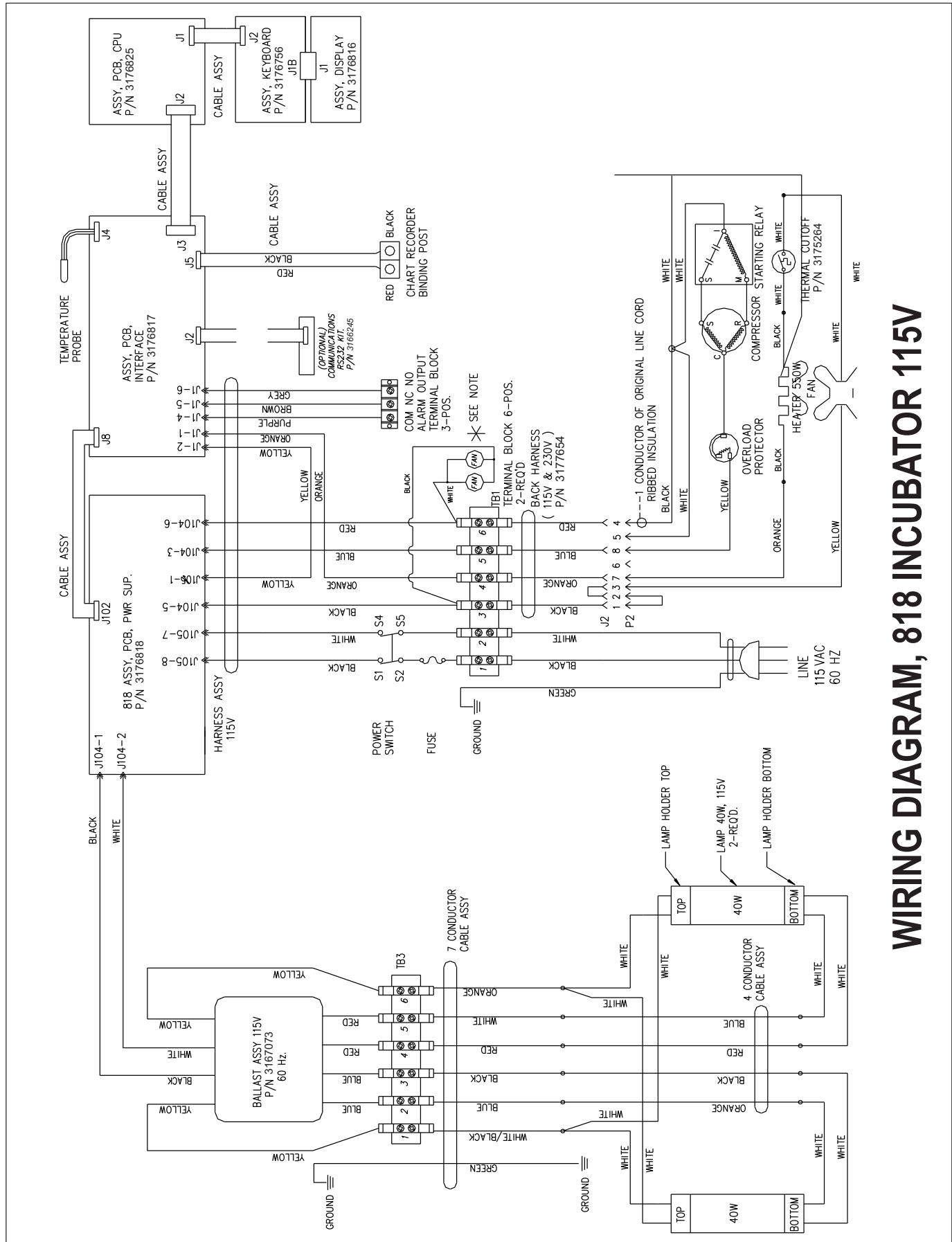
***** measured at ambient temperature of 32°C (90°F)*

Section 8 Spare Parts

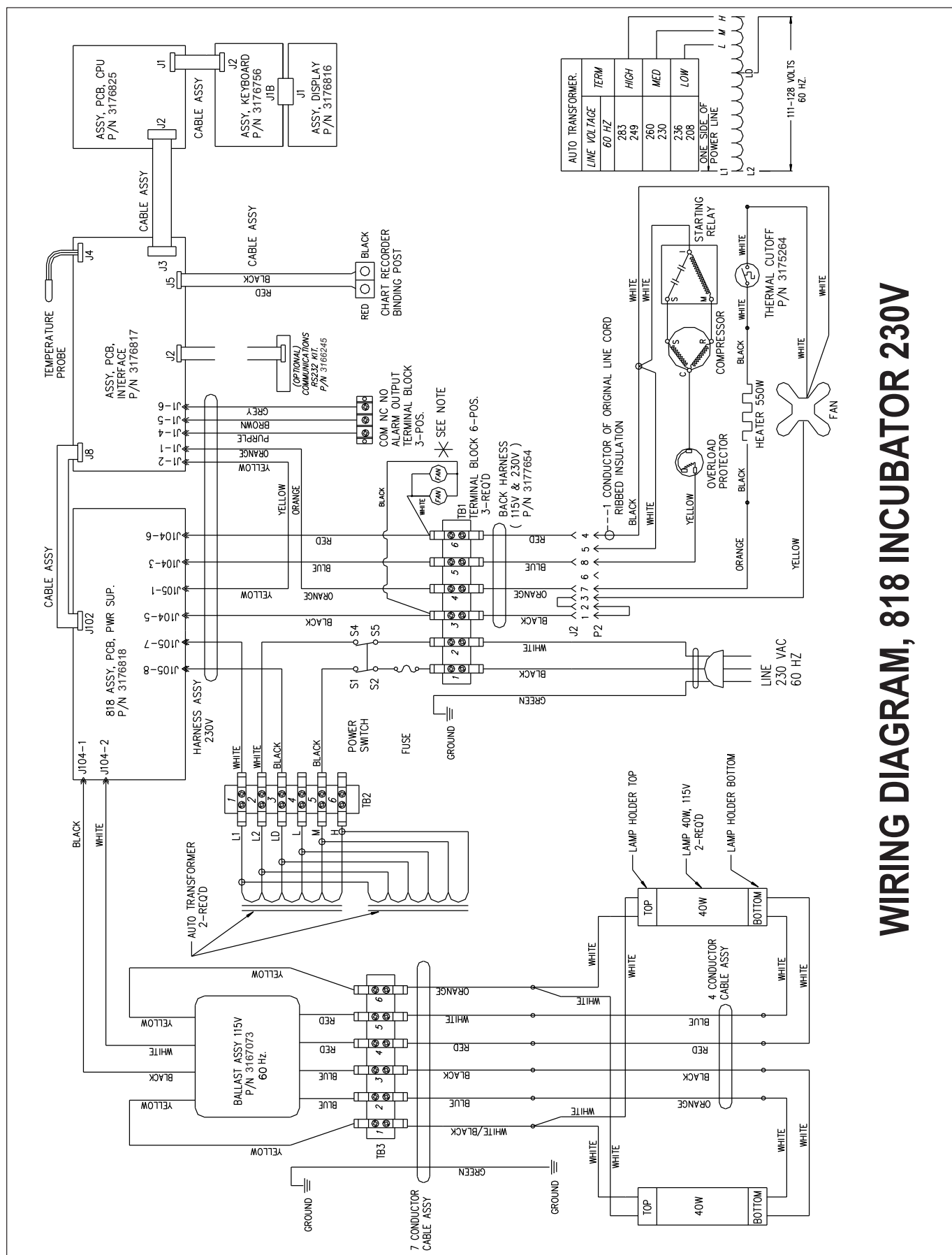
DESCRIPTION	PART NUMBER
ASS'Y, PCB, DISPLAY, 818	3176816
ASS'Y, PCB, 818 CPU	3176825
ASS'Y, PCB, 818 PWR SUP	3176818
ASS'Y, PCB, 818 INTERFACE	3176817
DISPLAY/KEYBOARD, NEWCO2	3176756
ASS'Y, RTD TEMP. PROBE, 100	3176738
SWITCH, ON/OFF	3175318
ASS'Y, CABLE, INTERFACE	3176759
CABLE ASS'Y, INT. TO REC.	3176760
CABLE ASS'Y, KEY. TO CPU	3176761
CABLE ASS'Y, CPU TO INT.	3176762
CABLE ASS'Y, INT. TO PWR	3176763
BALLAST ASS'Y	3167073
FUSE KIT, 10 AMP, 115V	3167218
FUSE HOLDER KIT, 115V	3167216
FUSE HOLDER KIT, 230V	3167217
CORD W/PLUG, 115V	3178034
HARNESS, 815/818, 115V	3177651
CORD W/PLUG, 230V	3176551
HARNESS, 815/818, 230V	3177652
FUSE KIT, 5 AMP, 230V	3167219
RS232 COMMUNICATIONS OPTION	3166245
THERMAL CUTOFF SWITCH	400141
STOPPER KIT	3167215
BULB KIT	3167220
MOTOR, FAN- REAR (MODEL FFU2064DW1)	130630
AUTO TRANSFORMER	3174991
INS. TEMP SENSOR BRACKET	316129
BACK HARNESS	3177654
REAR COMPRESSOR COVER	1900381

Accessories

Name	Part Number
Glass Thermometers	3173710
RS232 Interface Kit	3166245
Digital Chart Recorder	3166207
Chart Paper (100 sheets)	3174255
Access Port Stopper	3167215
Shelf includes fall protection strip and shelf mounting grommets	GT3185275



WIRING DIAGRAM, 818 INCUBATOR 115V



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