LOW TEMPERATURE DIURNAL ILLUMINATION INCUBATOR

MODEL: LI15

INSTALLATION AND OPERATION MANUAL

Sheldon Manufacturing Inc. P.O. Box 627 Cornelius, Oregon 97113
EMAIL: tech@Shellab.com **INTERNET:** http://www.Shellab.com/~Shellab
1-800-322-4897 (503) 640-3000 FAX (503) 640-1366

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Operation Manual

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www.1788lab.com E-mail:info@1788lab.com

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REV.1/04
4861575

This unit is a general purpose Biochemical Oxygen Demand (BOD) incubator for professional, industrial or educational use where the preparation or testing of materials is done at approximately atmospheric pressure and no flammable, volatile or combustible materials are being heated. This unit is not intended for hazardous or household locations or use.

Section 1

RECEIVING AND INSPECTION

Your satisfaction and safety require a complete understanding of this unit. Read the instructions thoroughly and be sure operators are given adequate training before attempting to put the unit into service. This equipment must be used only for its intended application; any alterations or modifications will void your warranty.

1.1 **Inspection:** The carrier, when accepting shipment, also accepts responsibility for safe delivery and is liable for loss or damage. On delivery, inspect for visible exterior damage, note and describe on the freight bill any damage found, and enter your claim on the form supplied by the carrier.

1.2 Inspect for concealed loss or damage on the unit itself, both interior and exterior. If necessary, the carrier will arrange for official inspection to substantiate your claim.

1.3 **Return Shipment:** Save the shipping crate until you are sure all is well. If for any reason you must return the unit, first contact your customer representative for authorization. Supply nameplate data, including model number and serial number. Please see the manual cover for information on where to contact Customer Service.

1.4 **Accessories:** Verify that your accessory package is complete. Each unit is equipped with a key and five (5) shelves; three (3) large and two (2) small.

Section

2

INSTALLATION

Local city, county, or other ordinances may govern the use of this equipment. If you have any questions about local requirements, please contact the appropriate local agency. Installation may be performed by the end user. It is unnecessary for this unit to be installed by a technician.

Under normal circumstances this unit is intended for use indoors, at room temperatures between 5° and 40°C, at no greater than 80% Relative Humidity (at 25°C) and with a supply voltage that does not vary by more than 10%. Customer service should be contacted for operating conditions outside of these limits.

This unit should remain upright for 24 hours prior to operating. This will allow the oil to settle in the compressor.

2.1 **Power Source:** See the incubator's serial/data plate for the voltage, cycle, phase and ampere requirements. VOLTAGE SHOULD NOT VARY MORE THAN 10% FROM THE DATA PLATE RATING. These units are intended for 50/60 Hz application. Electrical supply to the unit must conform to all national and local electrical codes. A separate circuit is recommended to avoid overloading or failure of other equipment on the same circuit.

2.2 **Location:** When selecting a site for the incubator, consider all conditions which may affect performance, such as extreme heat from steam radiators, stoves, ovens, autoclaves, etc. Avoid direct sun, fast-moving air currents, heating/cooling ducts, and high traffic areas. To ensure air circulation around the unit allow a minimum of 5cm between incubator and any walls or partitions which might obstruct free air flow.

2.3 **Lifting / Handling:** These units are heavy and care should be taken to use appropriate lifting devices that are sufficiently rated for these loads. Units should only be lifted from their bottom surfaces. Doors, handles and knobs are not adequate for lifting or stabilization. The unit should be completely restrained from tipping during lifting or transport. All moving parts, such as shelves and trays should be removed and doors need to be positively locked in the closed position during transfer to prevent shifting and damage.

2.4 **Leveling:** The unit must sit level and solidly. Turn the leveling feet counterclockwise to raise level. If the unit must be moved, turn the leveling feet in all the way to prevent bending or damage.

2.5 Cleaning: The incubator's interior was cleaned at the factory, but not sterilizied. Remove all interior parts, including shelves and clean thoroughly with a disinfectant that is appropriate for your application. Regular periodic cleaning is required. Special care should be taken when cleaning around sensing heads to prevent damage. DO NOT USE chlorine based bleaches as this may damage the incubator interior. DO NOT USE spray cleaners that might leak through cracks and openings and get on electrical components, or that may contain solvents that will harm coatings.

WARNING: Never clean the unit with alcohol or flammable cleaners with the unit connected to the electrical supply. Always disconnect the unit from the electrical service when cleaning and assure all volatile or flammable cleaners are evaporated and dry before reattaching the unit to the power supply.

Section

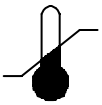
3

GRAPHIC SYMBOLS

Your incubator is provided with a display of graphic symbols on the control panel which are designed to help identify the use and function of the adjustable components.

1.  Indicates that you should consult your manual for further description and discussion of a control or user item.

2.  Indicates **"Temperature"**

3.  Indicates **"Overtemperature"**

4. °C Indicates **"Degrees Centigrade"**

5.  Indicates **"AC Power**"

6.  Indicates **"Manual Adjustment"**

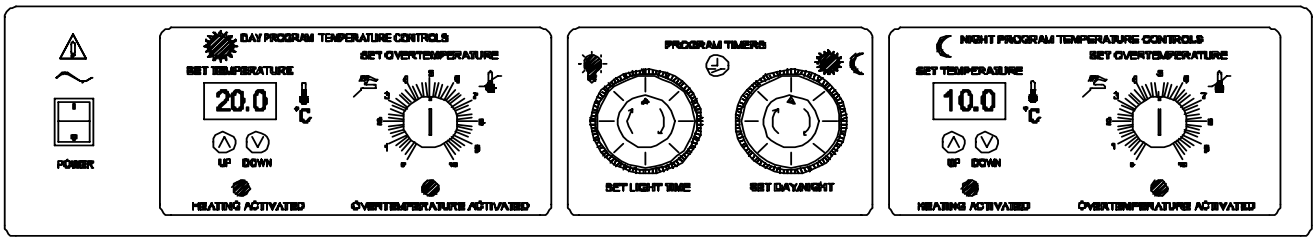
7.  Indicates **"Potential Shock Hazard"** behind partition

8.  Indicates **"Earth Ground"**

Section

4

CONTROL PANEL OVERVIEW



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The 2015 has three control modules on the panel. The left module is the Day (or high) control. The center module has timers for the lights and the Day/Night functions. The right module is the Night (or low) control. Both the Day and Night modules function in the same way, and the following operation instructions apply to both. The main power switch is on the far left side of the panel.

4.1 Power Switch: The main power I/O (on/off) switch controls all power to the unit and must be in the I/On position before any systems are operational.

4.2 Main Temperature Control: These controls are marked SET TEMPERATURE and consists of the digital display and Up/Down arrow pads for inputting set point temperatures and calibration.

4.3 Overtemperature Thermostats: These controls are marked SET OVERTEMPERATURE and are equipped with adjustment knobs and graduated dials from “0 to 10”. Completely independent of its Main Controller, the Thermostat guards against any failure which would allow temperature to rise past the Main Controllers set point. If temperature rises to the Overtemperture set point, these thermostats take control of the heating element and allows continued use of the incubator until the problem can be resolved or service can be arranged. It is not recommended that the unit be allowed to operate for an extended period of time using only the Overtemperature thermostat as temperature uniformity will suffer.

4.4 HEATING Lights: Marked HEATING ACTIVATED, these pilot lights indicate when the Main Controller has activated the heating elements to reach and maintain set point temperatures.

4.5 OVERTEMP Lights: Marked OVERTEMPERATURE ACTIVATED, these pilot

lights indicate when the Overtemperature Thermostat has been activated. Under normal operating conditions these pilot lights should never come on.

4.6 DAY/NIGHT Program Timer: This is a continuous timer with a 24 hour dial divided into two 12 hour sections indicating day and night. This timer switches between the DAY/NIGHT controls.

4.7.1 Light Program Timer: This is a continuous timer with 24 hour dial to control illumination or darkness mode.

4.7.2 Fuse: Located on the rear bottom next to the cord inlet provides protection against power source variations. Protection is in addition to the automatic high temperature limit designed into the heating element. If the fuse is blown, the unit will shut down and the cause should be determined and corrected before replacing the fuse.

Section

5

OPERATION

The refrigeration system, heater, and air circulating fan are used in conjunction with the temperature control circuit to achieve sensitive temperature control. The thermostat sensor located in the air stream senses any temperature deviation from the control point, and heat is provided to maintain desired temperature. The circulating fan provides even air distribution throughout the chamber and assures temperature uniformity.

Regardless of the temperature maintained, the refrigeration system operates continuously. This constant operation minimizes component failures which are more frequently associated with a cycling type operation. Note that a factory set Low-Limit Thermostat will shut off the compressor when temperatures reach around 1°C so sample will not freeze.

5.1 Plug incubator into electrical service corresponding to data plate rating located on the side of the unit. Turn the power switch to the ON position and turn each Overtemperature Thermostat to its maximum position, clockwise using a coin or flat edged tool.

5.2 Place a certified reference thermometer (not supplied) in the center of the chamber. Be certain the thermostat is not touching any shelving or chamber walls. Taping the thermometer to a petri dish raises it off the shelf and keeps the scale in view. Placing a reference thermometer in the chamber at this stage of operation will allow for calibrating the control without the loss of processing time.

5.3 **Loading Procedure:** Adequate spacing should be allowed between items whenever possible. Proper spacing will allow maximum air circulation, which is necessary for temperature uniformity.

5.4 **Frost Buildup:** Excessive frost buildup on the evaporator coil located on the lower rear wall can affect temperature uniformity. Liquid containers should never be placed in the chamber without covers. The evaporation of moisture within the chamber will only add frost and hasten the need for defrosting. Defrosting instructions are available in section 6.0, Maintenance.

5.5 **Set Main Temperature Controls:** Enter desired set point temperature. To enter set point mode on either Control, press the Up or Down arrow pad one time. The digital display will start to blink, going from bright to dim. While blinking, the digital display is showing the set point. To change the set point, use the Up and Down

arrow pads. If the arrow pads are not pressed for five (5) seconds, the display will stop blinking and will read the temperature of the chamber. Allow the incubator at least 24 hours to stabilize.

5.6 **Calibration:** It is recommended that calibration is done once the unit is installed in its working environment and has been stabile at set point for several hours. Once stabile, compare the digital display with the reference thermometer. If there is an unacceptable difference, put the display into calibration mode by pressing both the Up and Down arrow pads at the same time for five (5) seconds until the display begins to blink. While blinking the display can be calibrated to match the thermometer by pressing the Up or Down arrow pads until the display reads the correct value. Allow the incubator temperature to stabilize again, and recalibrate if necessary.

5.7 **Overtemperature Thermostat:** As mentioned in step 5.1, this should be initially set to its maximum position, clockwise, to allow the temperature to stabilize. Once the incubator is stabile at the desired set point, turn the Thermostat counterclockwise until its OVERTEMP Light turns on. Next, turn the Thermostat clockwise just until the light turns off. Then turn the thermostat clockwise two (2) of the smallest divisions on its scale, past the point where the indicator light went out. This will set the Overtemperature Thermostat at approximately 1^{o}C above its Main temperature set point.

5.8 **Timer Instructions:** There are two separate timer controls. One is labeled SET DAY/NIGHT and the other is labeled SET LIGHT TIME. Each timer control rotates in a clockwise direction. On the face of each dial you will note an outer orange colored band, 96 small black actuator segment switches, and the inner clock face. One actuator segment switch represents a 15 minute period of time.

A. Setting the Clock (Both Dials): To set the correct time, gently grasp the outer diameter (orange band and tips of actuator segments) of the timer dial and rotate in a clockwise direction until the stationary arrow in the center of the dial is pointing to the desired time. Each clock face is divided into two, 180 degree twelve hour sections, indicating day/night time frames. You will note that the outer orange band, actuator segment switches and clock face all rotate together. Only the inner arrow(s) remain stationary during dial rotation.

B. Setting DAY/NIGHT (temperature): When an actuator segment is pressed inward, exposing the outer orange band, the Day temperature control is activated. When a actuator segment is in the outward position, covering the orange band, the Night temperature control is activated.

C. Set LIGHT TIME CONTROL PROGRAM Timer : If an actuator segment switch is pressed inward, exposing the outer orange band, the lights are on. When an actuator segment is in the outward position, the lights are off.

5.9 Accessory Outlet: There is an electrical outlet inside the chamber for use with equipment not exceeding 1 amp. Note that equipment in the chamber may provide additional heat that could effect the temperature range of the incubator. It is recommended that testing be done with the incubator and any additional equipment to insure that the desired operating conditions can be met.

CAUTION: This incubator is capable of safely operating at conditions that might otherwise damage certain accessory equipment. Make absolutely certain accessory equipment is capable of operating under the conditions you intend to run your incubator.

5.10 Exterior Heat: Under normal operating conditions the unit walls may feel warm. This is normal and does not indicate improper performance.

Section

6

MAINTENANCE

The design of the chamber is such that periodic maintenance is kept to a minimum. NO lubrication or adjustments of components is needed. If the incubator is used frequently at temperatures below ambient room temperature or in any manner that increases moisture build-up within the chamber, a frequent defrosting schedule is recommended.

6.1 Defrosting: Frost can appear inside the unit due to moisture accumulating and condensing on the coldest surface. The unit should be defrosted and cleaned on a regular basis. The unit can be defrosted either manually or automatically. The water drains from the chamber into an evaporate pan. Make sure to completely dry out the interior and evaporate tray in the bottom of the body when defrosting is complete.

A. Manual Defrost: Turn the unit off, open the door and allow the frost to melt. Then clean the chamber following the directions in 6.2.

B. Automatic Defrost: the automatic defrost switch is located on the back of the unit. It is an ON/OFF switch. In the ON position, the frost sensor is activated once every twelve (12) hours. If the sensor detects frost, the compressor is shut down until the frost has melted, and then the compressor is reactivated. The amount of time the compressor is shut down is roughly one-half hour. During this time, the temperature in the chamber will spike and the Main temperature Controller will cycle off, shutting down the heating element. When the compressor is activated, the temperature will stabilize at set point.

6.2 Cleaning: Clean the incubator chamber on a regular basis. Remove all interior parts and clean thoroughly with a disinfectant that is appropriate for your application. Shelving should be cleaned with the same solution. Special care should be taken when cleaning around sensing heads. DO NOT USE chlorine based bleaches or abrasives as this can damage the interior. DO NOT USE spray cleaners that might leak through openings and cracks and get on electrical parts or that may contain solvents that will harm coatings.

WARNING: Never clean the unit with alcohol or flammable cleaners with the unit connected to the electrical supply. Always disconnect the unit from the electrical service when cleaning and assure all volatile of flammable cleaners are evaporated and dry before reattaching the unit to the power supply.

6.3 Compressor Compartment: Located at the back bottom of the unit, the compressor compartment can collect dust which will inhibit proper air flow. This compartment should be vacuumed out at least once every six (6) months to ensure maximum efficiency.

6.4 Electrical Components: There is NO maintenance to electrical components. If the incubator fails to operate as specified, please review Section 7.0, Troubleshooting, prior to calling for service.

Section 7

TROUBLESHOOTING AND SERVICE

When troubleshooting, always make a visual inspection of the incubator and it's control console to find loose or disconnected wires which may be the source of the trouble. In the event the incubator does not operate properly, check the following before calling for service.

TEMPERATURE

Temperature too high	
	1/ controller set too high-see section 5.5 **2/ controller failed on – call Customer Service** **3/ wiring error – call Customer Service**
Display reads "HI" or "400"+	
	probe is unplugged, is broken or wire to sensor is broken – trace wire from display to probe; move wire and watch display to see intermittent problems
Chamber temp spikes over set point and then settles to set point	
	Recalibrate – see Section 5.6
Temperature too low	
	1/ Overtemperature Thermostat set too low – see section 5.7 **2/ controller set too low – see section 5.5** **3/ unit not recovered from door opening – wait for display to stop changing.** **4/ unit not recovered from power failure or being turned off – incubators will need 24 hours to warm up and stabilize.** **5/ element failure – see if HEATING light is on; compare current draw to data plate.** **6/ controller failure – confirm with front panel lights that controller is calling for heat.** **7/ Overtemperture Thermostat failure – confirm with front panel lights that Thermostat is operating correctly.** **8/ wiring problem – check all functions and compare wiring to schematic in section 8.0 - especially around any areas recently worked on.** **9/ loose connection – check shadow box for loose connections.**
Display reads "LO"	
	1/ sensor is plugged in backwards – reverse sensor wires to controller **2/ if ambient temperature is lower than range of unit – compare set points and ambient temperature to rated specifications in section 8.0, Unit Specifications.**

Unit will not heat over a temperature that is below set point	
	1/ confirm that fan is moving and that amperage and voltage match data plate – check fan motor and feel for air movement in chamber **2/ confirm that set point is set high enough –turn Thermostat all the way clockwise and see if HEATING light or OVERTEMP light comes on** **3/ check connections to sensor** **4/ check calibration – using independent certified thermometer, follow instructions in section 5.6**
Unit will not heat up at all	
	1/ verify that controller is asking for heat by looking for controller light – if pilot light is not on continuously, there is a problem with the controller. **2/check amperage – amperage should be virtually at maximum rated (data plate) amperage.** **3/ do all controller functions work?** **4/ is the Thermostat set high enough? – for diagnostics, should be fully clockwise with the pilot light never on.** **5/ has the fuse/circuit breaker blown?**
Indicated chamber temperature unstable	
	1/ ±0.1 may be normal **2/ is fan working? – fan must operate for uniformity** **3/ is ambient room temperature radically changing – either door opening or room airflow from heaters or air conditioning ? – stabilize ambient conditions.** **4/ sensor miss-located, damaged or wires may be damaged - check mounts for control and Thermostat sensors, then trace wires or tubing between sensors and controls.** **5/ calibration sensitivity – call Customer Service** **6/ Overtemperature set too low – be sure that Thermostat is more than 5 degrees over desired set point; check if OVERTEMP pilot is on continuously; turn controller knob completely clockwise to see if problem solved then follow instructions in owner's manual for correct setting – see section 5.7** **7/ electrical noise – remove nearby sources of RFI including motors, arcing relays or radio transmitters.** **8/ bad connection on temperature sensor or faulty sensor – check connectors for continuity and mechanical soundness while watching display for erratic behavior; check sensor and wiring for mechanical damage.** **9/ bad connections or faulty relay – check connectors for mechanical soundness and look for corrosion around terminals or signs of arcing or other visible deterioration.**
Will not maintain set point	
	1/ assure that set point is at least 5 degrees over ambient - **2/ see if ambient is fluctuating**
Display and reference thermometer don't match	
	1/ calibration error – see section 5.6

	2/ temperature sensor failure – evaluate if pilot light is operating correctly. **3/ controller failure – evaluate if pilot light is operating correctly** **4/ allow at least two hours to stabilize.** **5/ see if reference thermometer is certified.**
Can't adjust set points or calibration	
	1/ turn entire unit off and on to reset. **2/ if repeatedly happens, call Customer Service**
Calibrated at one temperature, but not at another	
	This can be a normal condition when operating temperature varies widely. For maximum accuracy, calibration should be done as close to the set point temperature.

REFRIGERATION

Temperature can't get up to set point	
	1/ assure that power is going to heating coils. **2/ if the displacement is erratic, see if air is being circulated.** **3/ confirm that controller is calling for heat (check front panel light).** **4/ if light not coming on, check control set point and Thermostat set point .** **5/ confirm that fan is operating and airflow is not blocked.** **6/ reset by turning unit off and on.**
Unit won't cool	
	<u>If the compressor is running</u>: **1/ see if condenser is cold but free of ice.** **2/ be sure that fan is circulating air in the chamber and over the compressor.** **3/ confirm proper sensor location and operation.** **4/ look for leaks in the chamber or around the door gasket.** **5/ assure ample room around the unit as described in Installation section 2.2** **6/ adjust calibration on controller, see section 5.6** **7/ compare ambient specifications to Unit specifications in section 8.0.** **8/ If 1 through 7 has been tried and still not functioning correctly, call customer service.** **<u>If compressor isn't running</u>:** **9/ if too cold inside adjust "cold control" located outside on bottom right rear** **10/ check for non-operating relay** **11/ confirm that compressor cooling fan motor is operable.** **12/ check if motor has voltage to it.** **13/ see if refrigeration is running too hot and thermal cutoff activated:** **a- dirty coil or poor circulation** **b- coil next to heat source** **c- ambient temperature too high**
Ice build up in chamber	
	1/ Search for leak in door gasket.

	2/ door being opened too often. **3/ open container inside the chamber.** **4/ check tightness of seal around all chamber wire and plumbing access to outside.** **5/ turn defrost switch on, Note: defrost switch must be turned off for best temperature uniformity; If no defrost option available, call Customer Service.**
Making noise	
	1/ assure that fan is not miss-aligned. **2/ Steady internal clicking may be broken spring or valve – call Customer Service.**
MECHANICAL	
Motor doesn't move	
	1/ if shaft spins freely: check connections to motor and check voltage to motor. 2/ if shaft rubs or is frozen, relieve binding and retest.
Motor makes noise	
	1/ If noise is from the motor, tap the top of motor shaft with ball peen hammer. 2/ If the sound gets worse, tap the other end of the shaft - avoiding touching the fan blade. 3/ If there is no change, call Customer Service. 4/ If noise is from shaft or fan blade, realign shaft.
Door not sealing	
	1/ Confirm that unit has not been damaged and body is square.
Water leaking	
	1/ If leaking inside: dry chamber, run at temperature with door open. Check all seams with flashlight including front face. 2/ If leaking outside: dry out and see if leak repeats and find source of leak. Sources may include: fittings that need tightening, condensation due to missing insulation or evaporate pan needs to be emptied.
OTHER	
Controller on at all times - "locked-up"	
	1/ Adjust set point to room temperature. If the light goes out but is still heating, replace the solid state relay. **2/ turn unit off and on to reset.** **3/ if cannot change any condition on the front panel, call Customer Service.**
Front panel displays are all off	
	Check for wire damage.
Unit or wall fuse/circuit breaker is blown	
	1/ check wall power source. **2/ compare current draw and compare to specs on data plate.** **3/ see what other loads are on the wall circuit.**
Unit will not turn on	
	1/ check wall power source. **2/ check fuse/circuit breaker on unit or in wall.** **3/ see if unit is on, e.g., fan or heater, and just controller is**

	off. **4/ check all wiring connections, especially around the on/off switch.**
Unit is smoking – Out of box	
	This is not an unusual situation for new units powering up. Put unit under vent and run at full power for one hour.
Contamination in chamber	
	1/ see cleaning procedure in operator's manual **2/ develop and follow Standard operating procedure for specific application; include definition of cleaning technique and maintenance schedule.**

Service

If none of the suggestions listed above have solved the problem, Customer Service should be contacted for assistance.

Call 1-800-322-4897, and have the model number, serial number and voltage (listed on the data plate on the side of the incubator) as your service representative will require it.

Section 8

PARTS LIST

Description	115V	220V
Ballast /Fixture	700003	700003
Control Relay	891024	891024
Cooling Fan	210002	210002
Cord Set, European	NA	1850500
Cord Set, USA	100014	101990
Defrost Switch	X1000124	X1000124
Feet, Adjustable Glides	2700500	2700500
Florescent Light	700024	700024
Fuse, 6.3 amp 250V (CE Unit)	NA	103555
High Limit Control	100001	100001
Interior Outlet	100020	101483
Interior Outlet, European	NA	X1000779
Low Limit Control	1750538	1750538
Main Temperature Control	1750633	1750633
Pilot Light, Green	200021	200021
Pilot Light, Red	200020	200020
Power Switch	103351	103351
Step Down Transformer	NA	103372
System Logic Relay	101971	101971
Thermal Limit Control, Non-Adjustable	1750506	1750506
Timer (24 Hour)	103552	103552

Unit Specifications

Shipping Weight	400 lbs.
Net Weight	280 lbs.
Exterior LxDxH (in.)	32 x 32 x 77
Interior LxDxH (in.)	27 x 23.5 x 57
Capacity	20.3 Cubic Ft
Capacity	282 Bottles
Temperature Range	-10 to 45°C
Temperature Uniformity	±.5° @ 20°C

Wire Diagram