BOD INCUBATORS 100 - 120 Voltage

SHEL LAB®

Installation and Operation Manual

SRI3P, SRI6P, SRI20P

Previously Designated

LI3PW, LI6P, LI20P

Sheldon Refrigerated BOD Incubators 100 – 120 Voltage

Installation and Operation Manual

Revision: February 11, 2016

Part Number (Manual) 4861666-1

Pictured on Cover: SRI20P (left) - SRI6P (right)

SRI3P

These units are TÜV CUE listed as incubators and radiant warmers for professional, industrial, or educational use where the preparation or testing of materials is done at approximately an ambient air pressure range of 22.14 – 31.3 inHg (75 – 106 kPa) and no flammable, volatile, or combustible materials are being heated.

These units have been tested to the following requirements:

CAN/CSA C22.2 No. 61010-1:2012
CAN/CSA C22.2 No. 61010-2-010:2004 Reaffirmed: 2014-07
UL 61010-1:2012-05
UL 61010A-2-010:2002-03
EN 61010-1:2010
EN 61010-2-010:2014
Supplemented by: UL 61010-2-010:2015

TABLE OF CONTENTS

INTRODUCTION

Thank you for purchasing a Sheldon Manufacturing refrigerated BOD Peltier incubator. We know that in today's competitive marketplace, customers have many choices when it comes to constant temperature equipment. We appreciate you choosing ours. Our continued reputation as a leading laboratory product manufacturer rests with your satisfaction. Sheldon Manufacturing, Inc. stands behind our products, and we will be here if you need us.

These incubators are intended for professional, industrial, or educational use as BOD incubators. These units are not designed for use in hazardous or household locations.

Before using the incubator read this manual in its entirety to understand how to install, operate, and maintain the incubator in a safe manner. Keep this manual available for use by all incubator operators. Ensure that all operators are given appropriate training before the incubator begins service.

Note: This unit is not designed or intended for the growth, cultivation, incubation, or storage of **fruit flies** (*Drosophila melanogaster)*. Improper use of this unit, including use with **fruit flies**, will void any warranty. Other model types are specifically manufactured for fruit fly applications, Consult your distributor or customer service representative to identify a model suitable for your application.

GENERAL SAFETY CONSIDERATIONS

Note: Failure to follow the guidelines and instructions in this manual may create a protection impairment by disabling or interfering with the unit safety features. This can result in injury or death.

Your incubator and its recommended accessories are designed and tested to meet strict safety requirements. Only use this equipment for its intended application. Any alterations or modifications void the warranty.

For continued safe operation of your unit, always follow basic safety precautions including:

- Always plug the unit power cord into a protective earth grounded electrical receptacle (outlet) that conforms to national and local electrical codes. If the unit is not grounded properly, parts such as knobs and controls can conduct electricity and cause serious injury.
- Avoid damaging the power cord. Do not bend it excessively, step on it, or place heavy objects on it. A damaged cord can be a shock or fire hazard. Never use a power cord if it is damaged.
- Always position the unit so that end-users can quickly unplug it in the event of an emergency.
- Do not attempt to move the unit while in operation or before the unit has cooled.
- Use only approved accessories. Do not modify system components. Any alterations or modifications to your unit can be dangerous and void your warranty.
- Follow all local ordinances in your area regarding the use of this unit. If you have any questions about local requirements, please contact the appropriate agencies.

ENGINEERING IMPROVEMENTS

Sheldon Manufacturing continually improves all of its products. As a result, engineering changes and improvements are made from time to time. Therefore, some changes, modifications, and improvements may not be covered in this manual. If your unit's operating characteristics or appearance differs from those described in this manual, please contact your Shel Lab dealer or distributor for assistance.

CONTACTING ASSISTANCE

If you are unable to resolve a technical issue with your incubator, please contact Sheldon Technical Support. Phone hours for Sheldon Technical Support are 6am – 4:30pm Pacific Coast Time (west coast of the United States, UTC -8). Please have the following information ready when calling or emailing Technical Support: the **model number** and the **serial number** (see page 10).

EMAIL: tech@shellab.com PHONE: 1-800-322-4897 extension 4, or (503) 640-3000 FAX: (503) 640-1366

Sheldon Manufacturing INC.
P.O. Box 627
Cornelius, OR 97113

RECEIVING YOUR INCUBATOR

Before leaving the factory, all incubators are packaged in high-quality shipping materials to provide protection from transportation-related damage. When a unit leaves the factory, safe delivery becomes the responsibility of the carrier. Damage sustained during transit is not covered by the warranty.

This makes it important that you inspect your incubator for concealed loss or damage to its interior and exterior when receiving it. If you find any damage to the unit, follow the carrier's procedure for claiming damage or loss. The orientation photos found on the following pages may serves as a useful visual guide for inspections.

INSPECTING THE SHIPMENT

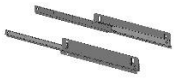
Carefully inspect the shipping carton for damage. Report any damage to the carrier service that delivered the incubator. If the carton is not damaged, open the carton and remove the contents. The unit should come with an Installation and Operation Manual, warranty card, and a Certificate of Compliance.

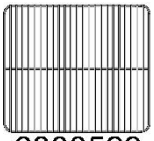
Verify that the correct number of the following accessories are present:

Model	Shelves (Med.)	Shelf Mounts	Shelf Mounts	Shelf (Small)	Shelf Clips
SRI3P	--	--	--	2	8
SRI6P	2	4 Standard Brackets	--	--	--
SRI20P	5	8 Standard Brackets	2 Sliding Brackets	--	--


6800525


5220942


9490560

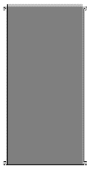

6800529


1250512

Model	Leveling Feet	Access Port Stopper*	Side Air Duct Panels
SRI3P	4	1	--
SRI6P	4	1	--
SRI20P	4	1	2


2700506


7750517




1800510

*The stopper should come installed in the access port, inside the unit incubation chamber.

The unit also comes with an 115V, 15 Amp, 8 feet (2.5m), NEMA 5-15P power supply cord.

Carefully check all packaging before discarding. Save the shipping carton until you are sure everything works properly.

ORIENTATION PHOTOS

Figure 1: SRI20P

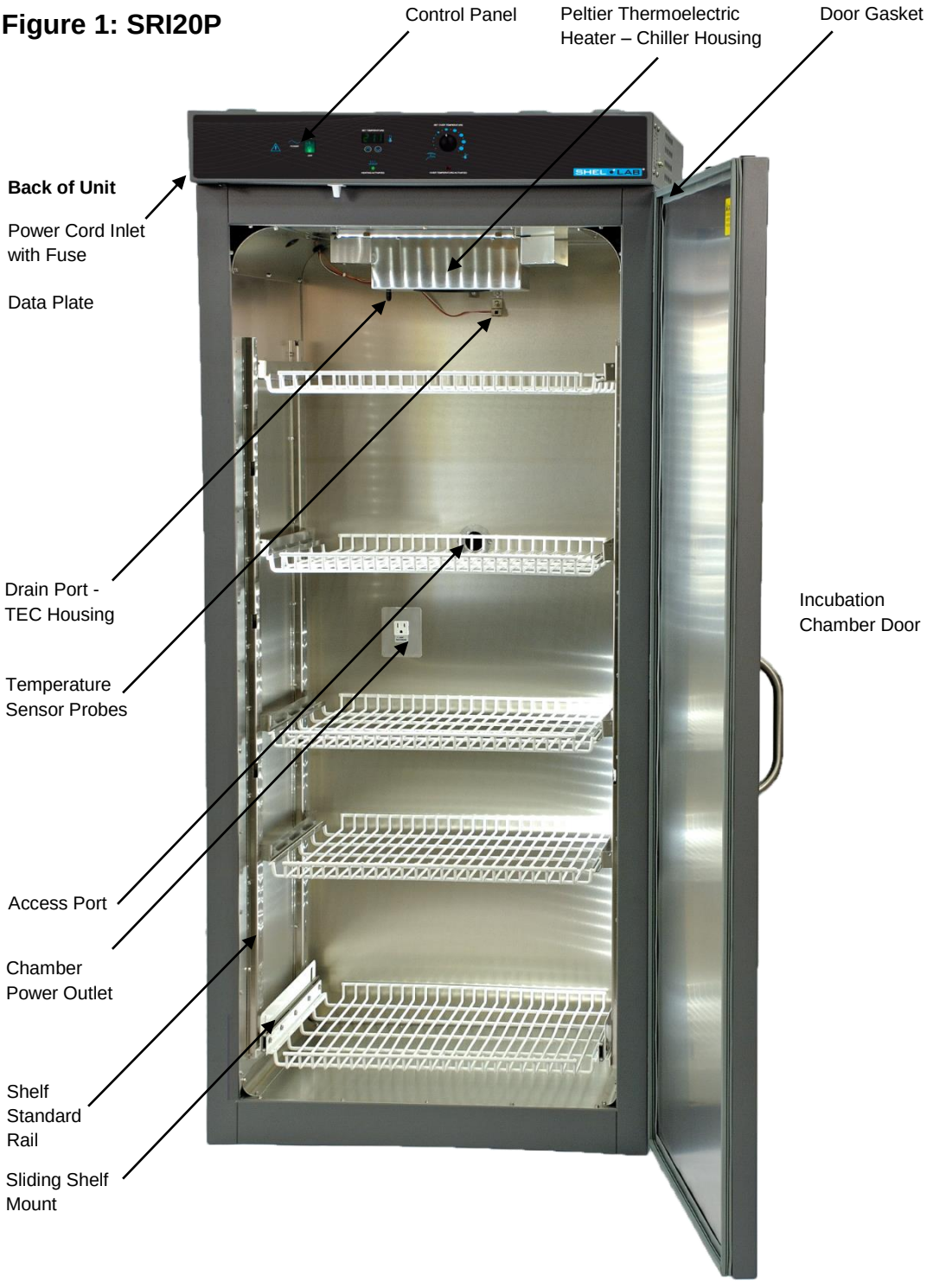


Figure 2: SRI6P

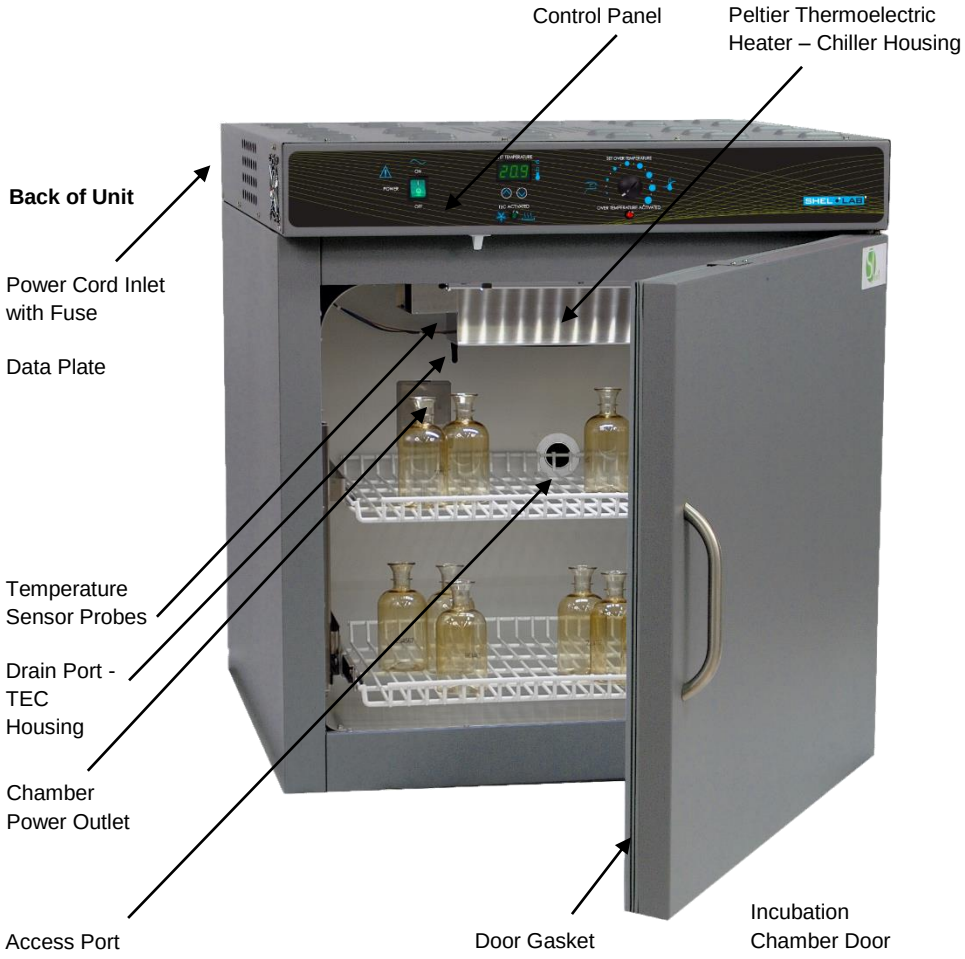
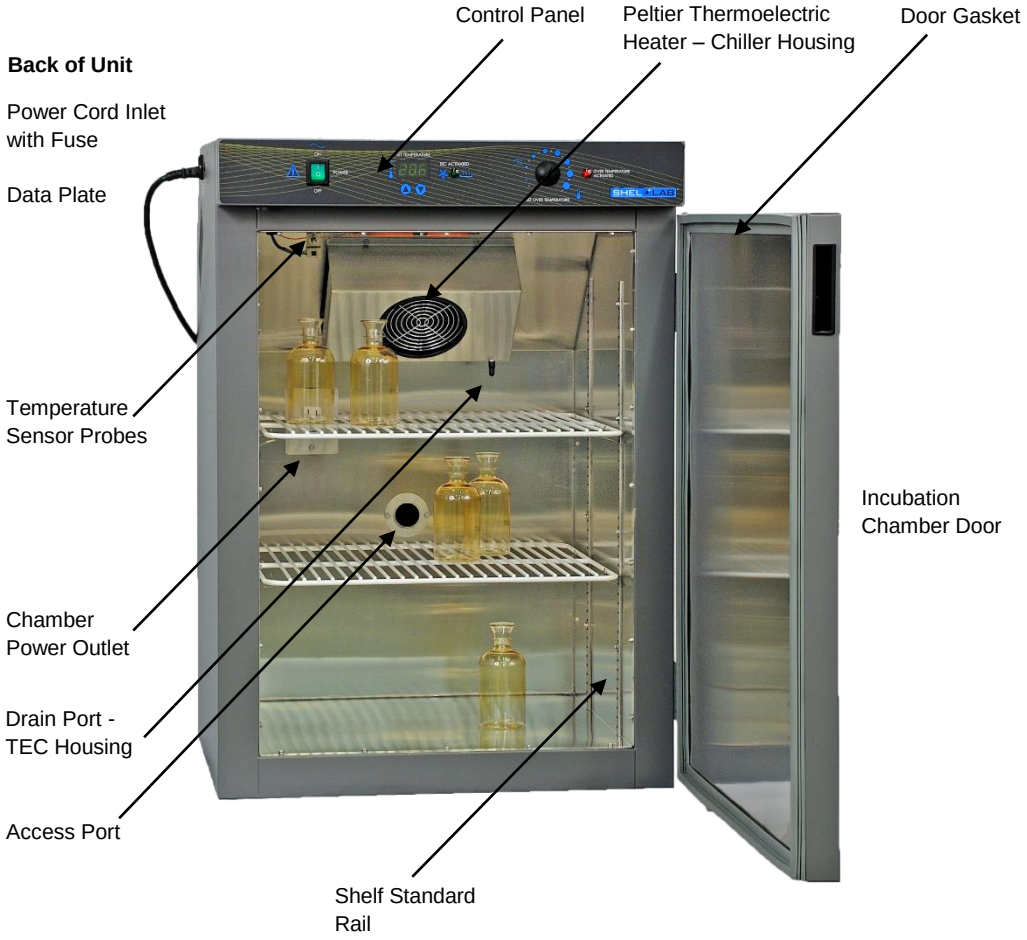


Figure 3: SRI3P



RECORDING DATA PLATE INFORMATION

The data plate contains the incubator **model number** and **serial number**. Record this information for future reference.

On the SRI6P and SRI20P the data plate is located on the back of the unit, on the top right side. On the SRI3P the data plate is on the right side of the unit, at the top next to the power cord inlet.

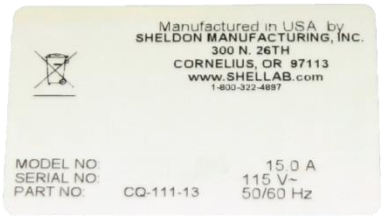


Figure 4: Data Plate

Date Plate Information

Model Number	
Serial Number	

REFERENCE SENSOR DEVICE

A reference device must be purchased separately for performing temperature display accuracy verifications and calibrations.

The reference device must be accurate to at least 0.1°C. The device should be regularly calibrated, preferably by a third party. For best results, use a digital device with a wired-connected temperature sensing probe that can be placed in the incubation chamber through the access port, or through the chamber door space, with the door closed over the probe wire. For example: a wire thermocouple probe.

Reference readings that avoid chamber door openings eliminate significant wait periods required for the chamber temperature to re-stabilize each time the chamber is disturbed.

Alcohol thermometers do not have sufficient accuracy for conducting accurate temperature verifications and calibrations. Do not use a mercury thermometer. **Never place a mercury thermometer in the incubation chamber.**

This page left blank

This incubator is intended for use indoors, at room temperatures between **15°C and 30°C (59°F and 86°F)**, at no greater than **80% Relative Humidity** at 25°C (77°F). Allow a minimum of **4 inches (10cm)** between the incubator and walls or partitions and **2 inches (5cm)** of clearance above the top of the incubator for unobstructed airflow. Position the unit so the end-user has access to the power plug.

Operating the unit outside these conditions may adversely affect its temperature range and stability. For conditions outside of those listed above, please contact your distributor to explore other unit options suited to your laboratory or production environment.

LOCATION

When selecting a location to install the incubator, consider all environmental conditions that can affect the effective temperature range, uniformity, and stability of the unit. For example:

- Ovens, autoclaves, and any device that produces significant radiant heat
- Heating and cooling ducts, or other sources of fast moving air currents
- High-traffic areas
- Direct sunlight

POWER SOURCE REQUIREMENTS

When selecting a location for the unit, verify that each of the following requirements are satisfied:

- Wall power sources must match the voltage and ampere requirements listed on the unit data plate. These units are intended for 100 – 120 VAC 50/60 Hz applications at the following amperages: SRI20P **5.5 Amps**; SRI6P **4 Amps**; SRI3P **4 Amps**.
- **Supplied voltage must not vary more than 10% from the data plate rating**. Damage to the unit may result if supplied voltage varies more than 10%.
- The wall power source must conform to all national and local electrical codes.
- Wall power sources must be protective earth grounded. Use a separate circuit to prevent loss of product due to overloading or circuit failure.
- Each SRIP is provided with a 250V, T6.3A, 5X20MM fuse located in the power cord inlet on the back of the incubator.
- The unit must be positioned so that all end-users can quickly unplug the power cord in the event of an emergency.
- The unit comes provided with a 125 volt, 15Amp, 9ft 5 in (2.86m) NEMA 5-15P power cord.

LIFTING AND HANDLING

An SRIP Incubator should only be lifted by its bottom surfaces using proper heavy lifting machinery such as, a forklift or pallet jack. Handles and knobs are inadequate for lifting or stabilization. The unit should be completely restrained from tipping during lifting. Transporting the unit while lifted is not recommended and may be hazardous. Remove all moving parts, such as shelves and trays, and secure the door in the closed position prior to lifting the unit.

Do not attempt to move the unit while in operation or before the unit has cooled.

LEVELING

The SRIP Incubator must be level and stable for safe operation. Each incubator ships with four leveling feet. Insert one leveling foot into each of the four holes in the bottom corners of the unit. Adjust the foot at each corner until the unit stands level and solid without rocking. To raise a foot, turn it in a counterclockwise direction; to lower a foot, turn it in a clockwise direction.

To prevent damage to the feet while in transport, turn all the feet to the maximum counterclockwise position prior to transport.

Figure 5: Leveling Feet and Port Stopper

ACCESS PORT STOPPER

Each SRIP incubator is provided with an access port located in the back wall of the incubation chamber. The incubator is shipped with one rubber access port stopper installed in the port, inside the chamber. The stopper should always be installed inside the chamber to obtain the best temperature uniformity and prevent condensation from forming inside the port. A second stopper may be installed on the outside of the unit to prevent dust from building up in the port, but is not required.

Wires for thermocouples and other sensor probes may be introduced into the chamber through the access port. The stopper may be put in place over the wires.

The port stopper must be in place during operation for the incubation chamber to achieve its specified temperature stability and uniformity levels.

INSTALL INCUBATOR IN LOCATION

Install the unit in a workspace location that meets the criteria discussed in the previous entries of the Installation section.

DEIONIZED AND DISTILLED WATER

Do not use deionized water to clean the incubator. Use of deionized water may corrode metal surfaces and voids the warranty. Sheldon Manufacturing recommends the use of distilled water in the resistance range of 50K Ohm/cm to 1M Ohm/cm, or a conductivity range of 20.0 uS/cm to 1.0 uS/cm, for cleaning applications.

INSTALLATION CLEANING AND DISINFECTION

If required by your laboratory protocol, clean and manually disinfect the incubator chamber and shelving components. Cleaning and disinfecting during installation reduces the risk of contamination. The chamber and shelving were cleaned at the factory, however, Sheldon Manufacturing cannot guarantee that the incubator was not exposed to contaminants during shipping.

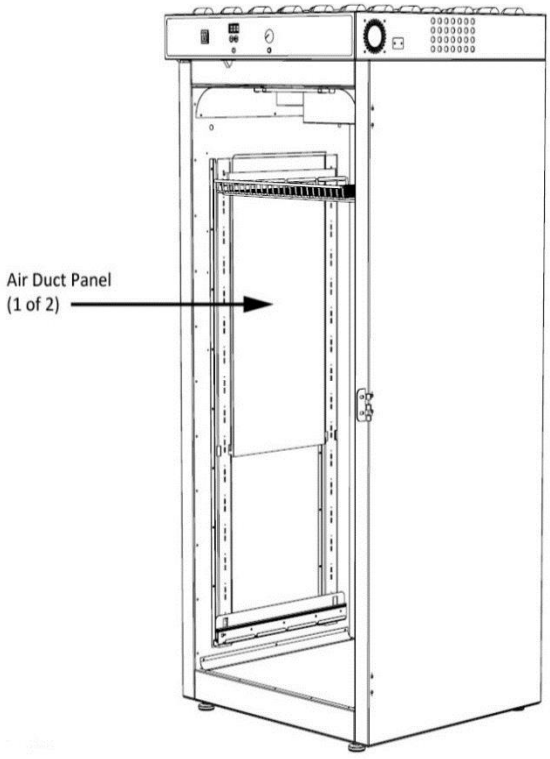
Remove all wrappings and coverings from shelving (and the air ducts of the SRI20P) prior to cleaning and installation.

Please see the **Cleaning and Disinfecting** entry on page 32 in the User Maintenance section for information on how to clean and disinfect without damaging the incubator or its components. A decontamination cycle will be run as part of the Incubator setup in the Operation section.

INSTALL SIDE AIR DUCTS SRI20P

Two (2) side air duct panels are included in the SRI20P accessories. Hang the panels on the chamber side walls, by placing the hooks on the top and bottom corners of the panels into the slots provided on the shelf standard mounting rails. The SRI3P and SRI6P incubator do not require side ducts.

Figure 6: SRI20P Air Duct Panel



Note: The air duct panels play an important role maintaining even heat distribution inside the long incubation chamber of the SRI20P. Failure to install both air duct panels may adversely impact the chamber temperature uniformity.

SHELVING INSTALLATION

SRI3P Shelf Installation

Perform the following steps to install the SRI3P incubator's wire basket shelves:

1. Install the shelf clips in the slots located on the shelf standards (mounting rails) of the chamber interior, both front and back.
    a. Squeeze each clip and hold.
    b. Insert the top tab first, and then the bottom tab using a rocking motion.
2. In shelf 1 shelf on the 4 clips.

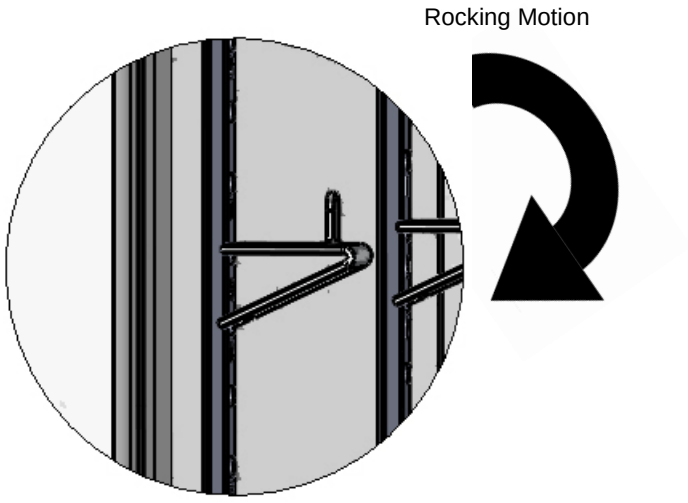


Figure 8: SRI3P Shelf Clip Installed

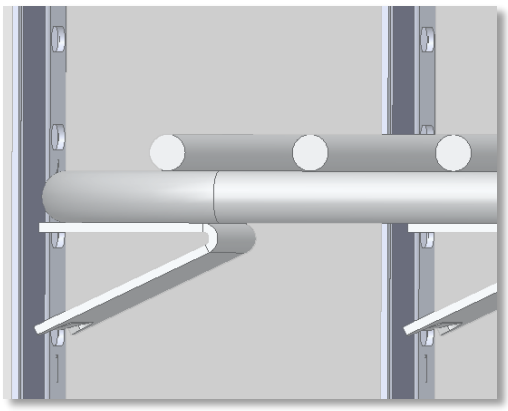


Figure 7: SRI3P Shelf Installed

SRI6P and SRI20P Standard Shelving Installation

Perform the following steps to install the SRI6P and SRI20P incubator standard shelves:

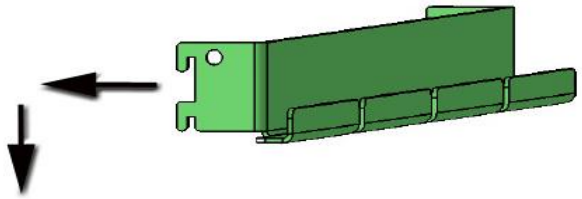


Figure 9: Standard Shelf Mounting Bracket Installation

1. Insert the 2 pairs of tabs on the bracket (front and back) into the slots on the shelf standards rails of the incubation chamber.
2. Slide the bracket down so that the tabs are securely seated in the mounting slots.
3. Repeat the process on the opposite side of the chamber with the second mounting bracket.
4. Install 1 shelf on the 2 installed mounting brackets.

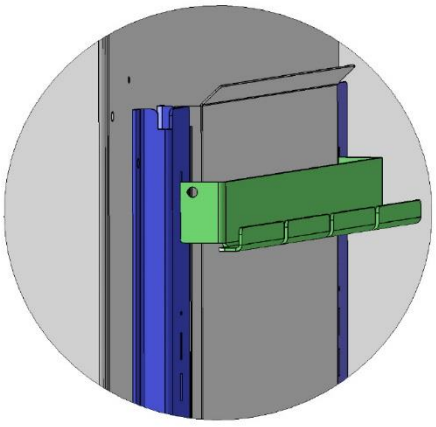


Figure 10: Standard Mounting

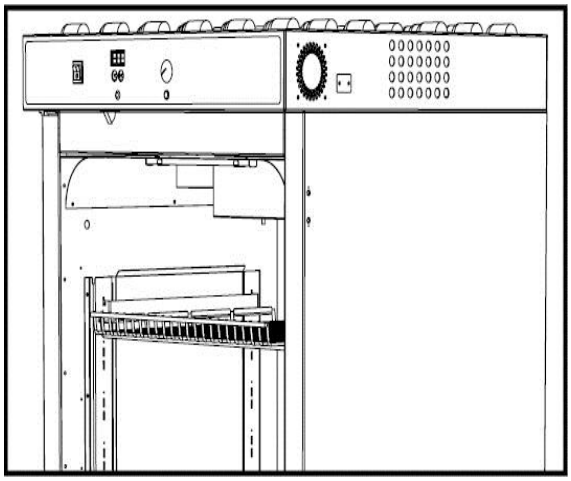


Figure 11: Standard Shelf Installed

SRI6P and SRI20P Sliding Shelf Installation

Note: The SRI6P does not come with a sliding shelf. Sliding shelf mounts for the SRI6P-2 must be purchased separately.

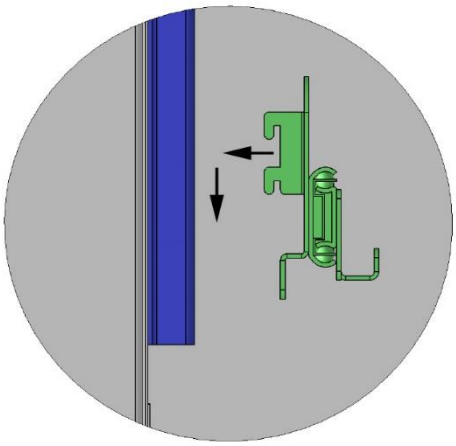


Figure 12: Sliding Shelf Mounting Bracket Installation

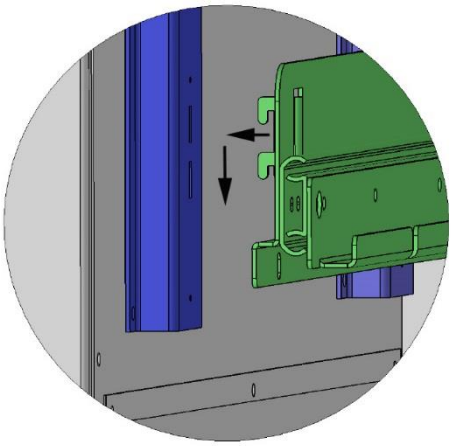


Figure 13: Sliding Shelf Mounting Bracket Installation

1. Insert the sliding bracket's two pairs of tabs (front and back) into the slots on the shelf standards. See Figure 12.
2. Slide the bracket down so that the tabs are securely seated in the mounting slots. See Figure 13.
3. Secure the bottom flange of the sliding bracket to the shelf standard rails by threading and screwing in 2 screws, on the front and back of the flange. See Figures 15 and 14.
4. Repeat the process on the opposite side of the chamber with the second sliding mounting bracket.
5. Install 1 shelf on the the 2 sliding brackets.

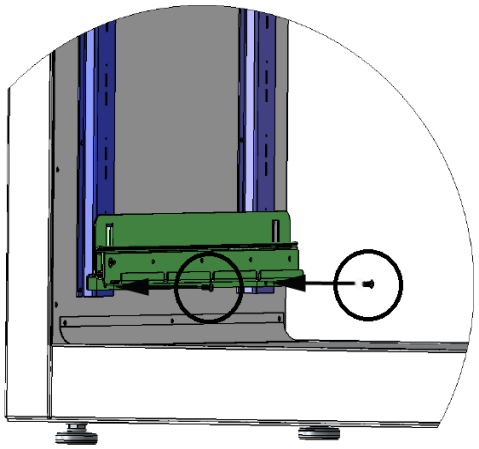


Figure 15: Sliding Mounting Bracket Screws

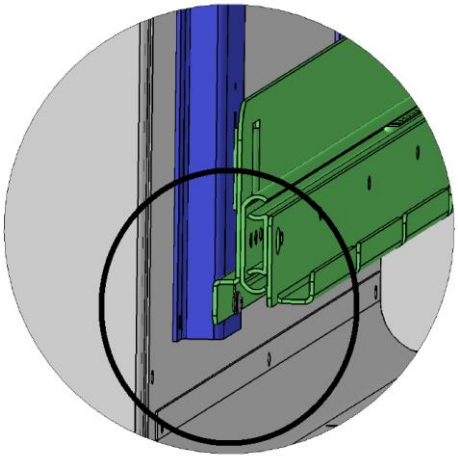
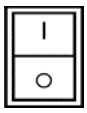


Figure 14: Sliding Mounting Bracket Front Screw Installed

GRAPHIC SYMBOLS

The incubator is provided with graphic symbols on its interior and exterior surfaces. These symbols identify hazards, as well as the functions of the adjustable components, and important notes in the user manual.

Symbol	Definition
	Indicates that you should consult your user manual for further instructions. Indique que l'opérateur doit consulter le manuel d'utilisation pour y trouver les instructions complémentaires.
	Indicates Temperature Repère température
	Indicates the Over Temperature Limit system Indique le système de dépassement de temperature
	Indicates AC Power Repère le courant alternatif
	Indicates I/ON and O/OFF I repère de la position MARCHE de l'interrupteur d'alimentation O repère de la position ARRÊT de l'interrupteur d'alimentation
	Indicates protective earth ground Repère terre électrique
	Indicates UP and DOWN respectively Touches de déplacements respectifs vers le HAUT et le BA
	Indicates Manually Adjustable Indique un bouton réglable manuellement
	Indicates Potential Shock Hazard Signale danger électrique
	Indicates the unit should be recycled (Not disposed of in land-fill) Indique l'appareil doit être recyclé (Ne pas jeter dans une décharge)

CONTROL PANEL OVERVIEW

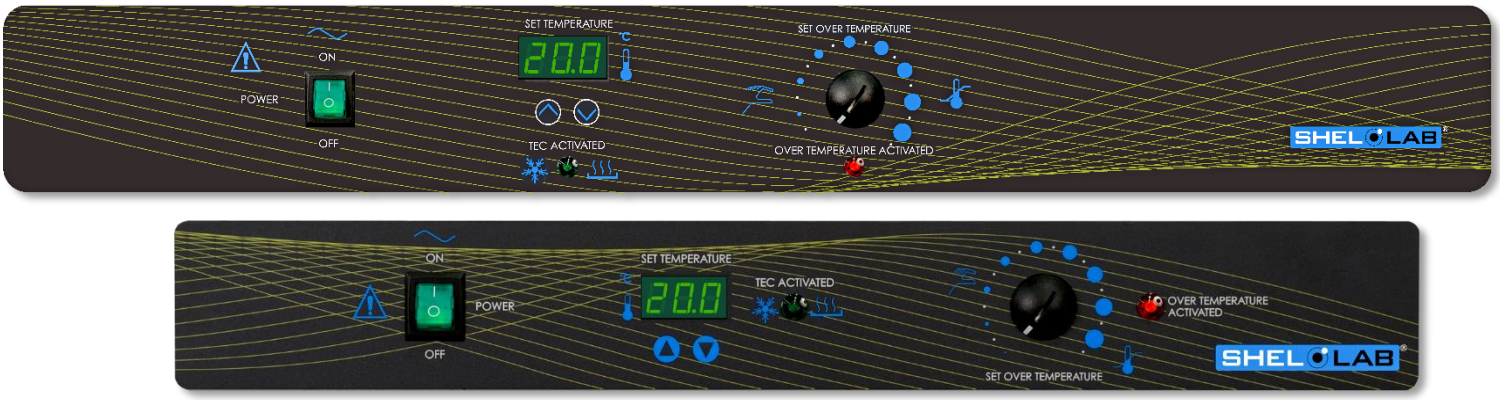
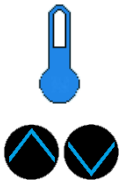


Figure 16: Control Panel SRI6P SRI20P Top | SRI3P Bottom

Power Switch

The green power switch on the panel controls all power to the unit and its systems. The switch illuminates when in the I on position.

Temperature Display and Controls



Marked SET TEMPTERATURE, the incubation chamber temperature display shows the air temperature within the chamber, accurate to 0.1°C. The display can also show an adjustable temperature set point, as well as display-value adjustments during temperature calibrations. The up / down arrow buttons of the display can input a new temperature set point, adjust the display value during calibrations, and turn the door open alarm off or on.

Heating and Cooling Light

The green light located next to the label TEC ACTIVATED illuminates whenever the Peltier TEC-H device is actively cooling or heating the chamber. This light will illuminate frequently during normal operations.

Set Over Temperature

This control is equipped with a graduated dial. The OTL is a mechanical heating cut off system that operates independently of the digital temperature controller. It guards against a failure of the digital controller that would allow the chamber temperature to rise past the controller set point. Please see the **Over Temperature Limit System** description in the Theory of Operations section (page 21) for a more complete explanation.

OTL Light

The red pilot light marked OVER TEMPERATURE ACTIVATED illuminates when the Over Temperature Limit system cuts power to the Peltier TEC heating circuits. Under normal operating conditions this indicator should never turn on.

THEORY OF OPERATION

The SRIP incubator family is designed to provide a highly stable and uniform constant-temperature environment suitable for applications in biological oxygen demand studies. These units offer a uniformity of ±0.5ºC and stability of ±0.1ºC throughout the incubation chamber shelf space, when set to operate at 20ºC. Additionally, these incubators are high-efficiency units. SRIP incubators consume significantly less electricity and produce less waste heat than traditional units, which rely on a competition between a refrigeration compressor and a conventional resistive heating element to achieve a stable temperature

Heating and Cooling

In place of a compressor and element, SRIP incubators employ a thermoelectric cooling-and-heating (TEC) device. The TEC-H operates using the Peltier effect, in which the junctures between two electrified conductive plates generate a gradient of temperature differences. In other words, a current between the conductors produces a flow of heat away from one plate to the other. The direction of this gradient can be flipped by reversing the direction of the current. The sandwiched TEC conductors effectively operate as a reversible heat pump that is significantly more efficient than a compressor – element pairing. This power-use efficiency results in far less waste heat and a corresponding reduction in cooling demand placed on laboratory air conditioning systems.

Heating and cooling of the incubation chamber is controlled by a microprocessor controller. The controller stores a user-selected temperature set point, and monitors the air temperature of the incubation chamber using a solid state sensor probe located in the chamber airstream. When the controller detects an air temperature deviation from the set point, it pulses power to the TEC-H device to add or remove heat from the chamber. Heated or chilled air is circulated through the chamber using a circulation fan attached to the TEC-H.

The controller employs proportional-integral-derivative (PID) analytical feedback-loop functions when measuring and controlling the chamber temperature. The intensity of PID-controlled heating or chilling is proportional to the difference between the measured chamber temperature and the set point. The frequency of heating or chilling pulses is derived from the rate of change in the difference. Integrator feedback slows the rate of heating or chilling as the chamber temperature approaches the set point, which helps prevent overshoots.

During normal operations, with the chamber door closed, the Peltier device will pulse heat or cold to the chamber almost continuously, as indicated by a flickering of the green TEC device pilot light. These are short, low-power pulses to compensate for deviations of a hundredth degree Celsius (±0.01°C).

As a solid state device, the Peltier TEC-H offers significant maintenance savings cost. The device can be replaced by a service technician using a screwdriver and a nut driver. It does not require a certified refrigeration compressor specialist with refrigeration tools, replacement coolant fluid, and does not contain a system of easily deformed, pressurized fluid vessels

Door Alarm

Leaving the incubation chamber door open for extended periods disrupts the temperature uniformity and stability of the chamber, and may result in significantly increased power usage as the controller attempts to compensate for the disruption. The incubator is equipped with a magnetic induction door alarm, which activates when the door is opened and the sensor components are moved out of range of one another for 60 seconds. When the alarm is active, an audio alert will sound and the control panel display will flash. The alarm may be turned off using the Set Temperature controls, as per the **Turn Alarm Off / On** procedure in the Operation section.

Accessory Compatibility

Make sure that any accessory equipment you will be using inside an SRIP incubator can safely operate within your selected temperature range. Powered accessories such as, stirrers or shakers that produce significant waste heat may interfere with the temperature uniformity and operating range of the chamber.

The Over Temperature Limit System

The OTL cutoff system is provided with an independent, hydrostatic temperature probe, located in the chamber air stream. When set, the OTL cutoff prevents runaway heating in the event of a failure of the microprocessor controller or its sensor probe. Whenever the chamber temperature exceeds the OTL setting, the system reroutes power to prevent current from flowing through Peltier TEC-H device in the direction that transmits heat into the chamber. This allows the TEC refrigeration function to continue operating without interruption.

The system is set **by the end-user** at approximately 1°C above the application temperature.

Because of its nature as a mechanical cutoff and lack of PID analytics, the OTL cannot deliver the same degree of temperature stability and measurement precision as the digital display and controls. The OTL System should only be used as a means of heating regulation for the cultivation chamber until a failed processor and its temperature probe can be repaired or replaced.

The OTL cutoff will not prevent a rise in heat caused by a complete failure of the Peltier TEC-H itself. With the loss of the refrigeration function, the chamber temperature will rise to the ambient room temperature, plus 1 or 2°C.

PREPARING THE INCUBATOR

Setting up the incubator for use in a new workspace environment requires an 8-hour period for the unit to come up to and stabilize at the set point temperature, prior to loading the incubation chamber with samples (step 5b below). During this period the chamber must be powered continually, and the chamber door closed. Allowing time for stabilization helps protect samples. It is also necessary in order to perform the optional Temperature Display Accuracy Verification procedure (step 5c), as well as any resulting display calibration.

Perform the following steps and procedures to prepare the incubator for use each time it is installed in a new location:

1. **Optional:** A clean and disinfected thermocouple probe for performing the optional temperature display accuracy verification may be inserted through door space into the cultivation chamber now. This saves time by allowing the unit chamber temperature to stabilize undisturbed prior to the verification procedure.

    a. See the **Temperature Display Accuracy Verification procedure** on page 24 for the correct introduction and placement of the thermocouple probe.

2. Verify that the workspace power supply and the chamber power requirements listed on the unit data plate have been matched.

    a. See the **Power Source Requirement** entry on page 12.

3. Plug in the power cord.

    a. Plug the female end of the supplied power cord into the inlet on the incubator.

    b. Plug the male end into the workspace supply receptacle (outlet).

4. Place the **Power** switch in the on (I) position.

    a. The controller display will illuminate. The unit comes from the factory with a set point of 20°C.

5. Perform the following procedures in the Operation section to finish preparing the chamber:

    a. **Set the Temperature Set Point** page 23

    b. Allow the chamber to operate undisturbed, with the door closed for 8 hours to stabilize before continuing.

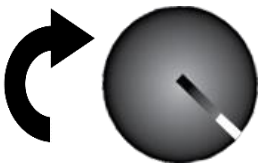
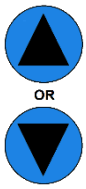
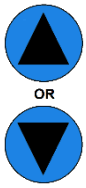
    c. **Optional: Temperature Display Accuracy Verification** page 24

    d. **Set the Over Temperature Limit Control** page 26

    e. **Load the Chamber** page 28

SET THE TEMPERATURE SET POINT

The unit comes from the factory set to 20°C. Set the temperature set point to the temperature of your BOD study protocol or other application, if other than 20°C.

1. Turn the **OTL** control clockwise to the maximum, if not already set to max. a. This prevents the Over Temperature system from interfering with setting the set point.	
2. Press and release either the **Up** or **Down** key one time on the Set Temperature control panel to activate the temperature set point mode.  OR a. The temperature display will briefly flash the letters “SP” to indicate a Set Point is about to be displayed. b. The digital display will then dim and showing the blinking, adjustable temperature set point.	**SET TEMPERATURE**  **Set Point Indicator** **SET TEMPERATURE**  **Initial Set Point**
3. Use the **Up** and the **Down key** to enter a new set point.  OR a. If neither key is pressed within 5 seconds, the temperature display will stop blinking and return to displaying the current temperature of the incubator.	**SET TEMPERATURE**  **New Set Point**
4. Wait 5 seconds after entering the new set point.  **Wait 5 Seconds** a. The display will stop flashing. The new set point is now saved in the microprocessor controller. b. The incubator will automatically heat or cool adjust to achieve the new set point.	**SET TEMPERATURE**   **Heating to Adjusted Set Point**
See the **Set the OTL procedure** on page 26 for how to set the OTL system once the incubation chamber has stabilized at your application temperature set point, and after you have performed any display verifications or calibrations.	

End of Procedure

TEMPERATURE DISPLAY ACCURACY VERIFICATION

Note: Performing a temperature accuracy verification requires a temperature reference device. Please see the **Reference Sensor Devices entry** on page 10 for the device requirements.

Optional: The incubator was calibrated at the factory to 20ºC. A verification of the display accuracy may be carried out when preparing the incubator for use or when required by your laboratory or production protocol. The verification procedure compares the incubator displayed temperature with the actual chamber air temperature, as provided by the calibrated reference device.

If a difference between the actual and displayed temperatures is discovered, perform a temperature calibration. Please see the **Calibrate Temperature Display procedure** on page 34 in the User Maintenance section.

Probes

A temperature reference device probe may be introduced through the access port. Carefully seat the port stopper over any probe wires. The probe may also be introduced through the chamber door space. Use non-stick, non-marking tape to secure the wires and probe head, and to seal any gaps. The door must close and latch fully.

Figure 17: Introducing a sensor probe through the access port.

Place the sensor probe head as close as possible to the geometric center of the incubation chamber. A thermocouple sensor probe sleeve may be taped to the shelving, as long as the exposed copper end is 2 inches (5cm) away from the shelf (see Figure 18). An exposed sensor probe in direct contact with the shelving may experience heat sinking, which can result in an inaccurate temperature reading.

Temperature Stability

After introducing and placing the temperature probe, allow the incubator to operate undisturbed, with the door closed, for at least 8 hours to stabilize prior to performing the verification. This is often done overnight.

The incubator must operate at its verification temperature set point for **at least 1 hour with no fluctuations** of ±0.1°C or greater in order to be considered stabilized. Failure to wait for stabilization will result in an inaccurate verification. If the chamber door is opened during the verification, the chamber must be allowed to re-stabilize before continuing.

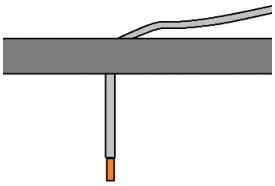


Figure 18: Probe End 2 inches (5cm) From Shelf Surface

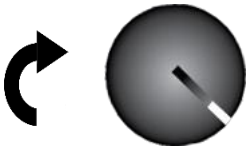
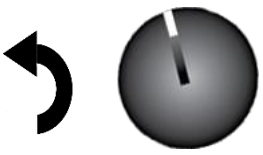
Verifying the Temperature Display Accuracy	
1. Once the incubation chamber has stabilized, compare the reference temperature device and chamber temperature display readings. a. If the readings are the same, or if a difference between the two (2) falls within the acceptable range of your protocol, the display is accurately showing the chamber air temperature. **The Temperature Verification procedure is now complete**. b. See step 2 if a difference falls outside the acceptable range of your protocol.	**Reference Device**  **SET TEMPERATURE** 
2. If there is an unacceptable difference, a display **temperature calibration** must be performed to match the display to the reference device. a. Please see page 34 in the User Maintenance section.	**Reference Device**  **SET TEMPERATURE** 

End of procedure

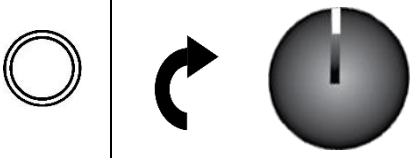
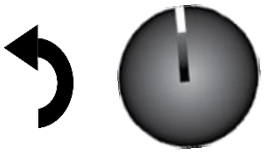
SET THE OVER TEMPERATURE LIMIT

Note: Test the OTL for functionality once per year.

The incubator temperature must be stable running at your temperature set point for at least 1 hour prior to setting the OTL. Perform the following steps to set up the Over Temperature Limit system for normal use:

Setting the OTL Heating Cutoff	Example
1. If not already set to maximum, turn the **Set Over Temperature Limit dial** all the way clockwise.	
2. Increase the temperature set point to +1°C above your application temperature. The temperature set point will be restored to your application temperature during step 7.   a. Briefly press the **Up Arrow button** once, to place the temperature display in its blinking, adjustable set point mode. b. Then use the **Up Arrow button** to increase the temperature set point by +1°C. c. After entering the new set point, wait 5 seconds for the display to exit its set point adjustment mode, automatically saving the new set point. **Note:** If neither arrow key is pressed within 5 seconds of the temperature display being placed in the adjustable set point mode, the display will stop blinking and return to showing the current temperature of the incubator.	**SET TEMPERATURE**  **Entering Set Point Mode** **SET TEMPERATURE**  **Set Point Increased**
3. After increasing the set point, wait for the incubation chamber to achieve and stabilize at the raised set point. a. After achieving the raised set point there should be no temperature fluctuations of ±0.1°C or greater for 15 minutes in order for the chamber to be considered stabilized, for this stage of the procedure.	**SET TEMPERATURE**  **Unit Heating to New Set Point (21.0°C)**
3. Once the chamber temperature has stabilized at the increased set point, turn the Over Temperature Limit **control dial** counterclockwise until the red Over Temperature Limit Activated light illuminates. 	

Continued on next page

Setting the OTL Heating Cutoff (Continued)	
4. Slowly turn **the dial** clockwise until the Over Temperature Limit Activated light turns off. Stop turning the control. a. The Over Temperature Limit is now set at approximately 1˚C above the application temperature set point.	
5. **Optional**: You may turn the dial slightly to the left to bracket in even closer to the 1˚C above your application temperature set point.	
6. Return the temperature set point to the application temperature of your study or lab protocol.  a. Briefly press the button once, to place the temperature display in its adjustable set point mode.  b. Use down arrow key to lower the set point to your application temperature.	**Set Temperature**  **Application Set Point Restored**
7. Leave the OTL dial set just above the activation point.	

Notes

If the OTL activates after an extended door opening, you may turn the dial very slightly to the right (clockwise), to deactivate the OTL, and leave the dial in that position.

If the OTL continues activating, check for ambient sources of heat or cold that may be adversely impacting the unit temperature stability. Check if any powered accessories in the chamber are generating heat. If you can find no sources of external or internal temperature fluctuations, contact Tech Support or your distributor for assistance.

End of procedure

LOADING THE INCUBATOR

Place items on the shelves inside the incubator chamber as evenly spaced as possible. Good spacing allows for maximum air circulation and a higher degree of temperature uniformity.

End of the Preparing the Incubator Procedure

INTERIOR ACCESSORY OUTLET

The incubator has a 1A (maximum) accessory outlet located inside the chamber. The power switch on the front panel controls power to the accessory outlet. This outlet can power equipment such as magnetic stirrers, rockers, etc. Do not attach any equipment drawing more than 1A to this outlet.

Accessory equipment may produce additional heat. This heat could affect the temperature range and uniformity of this incubator. Verify that the incubator operates within your protocol's required temperature range when the accessory equipment is installed and operating.

HUMIDIFYING THE INCUBATOR

Humidification should not be needed for closed bottle BOD applications.

Placing only a small number of open or breathable media containers in the incubator chamber may lead to excessive drying of sample media. Unusually dry environmental conditions may also contribute to sample drying. To counteract this, Sheldon Manufacturing offers an optional humidity collection pan and tubing accessory kit: **Part Number 9900708**. The kit redirects moisture that normally condenses on the heat sink fins of the Peltier TEC heating and cooling device, and uses it to humidify the incubator. After ordering and receiving the kit, place the stainless steel pan on the lowest chamber surface. Connect the tubing that comes with the kit to the port on the back of the Peltier duct cover. Run the tubing down the back of the incubator behind the shelves, and secure the end of the tubing inside the pan. The pan is supplied with a copper slug to help prevent microbial contamination.

The humidification kit is intended for use while running **small loads**.

MANAGING CONDENSATION

Excessive condensation in the incubation chamber may create leaks around the chamber door, and may cause corrosion damage if allowed to continue for significant lengths of time.

Condensation takes place wherever the humidity level in the incubator chamber reaches the dew point. The dew point is the level of humidity at which the air cannot hold more water vapor. The warmer the air, the more water vapor it can hold. Evaporating sample media can be a source of chamber humidity.

As the level of humidity rises in an incubation chamber, condensate will first appear on surfaces that are cooler than the air temperature. Near the dew point, condensate forms on any item or exposed surface that is even slightly cooler than the air. When the dew point is reached, condensate will form on nearly all exposed surfaces.

Managing condensation primarily depends on either lowering the humidity level or increasing the air temperature in the incubator chamber.

Note: Rising or falling air pressure from weather will adjust the dew point up and down in small increments. If the relative humidity in the incubation chamber is already near the dew point, barometric fluctuations may push it across the dew point threshold.

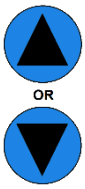
Note: Thin air at higher altitudes holds less humidity than the denser air found at or near sea level.

If condensate is forming in the incubation chamber, wipe down and dry the chamber, then check the following:

- Make sure items on the shelves are evenly spaced to allow for good airflow.
- Empty the optional accessory humidity collection pan frequently, if in use.
- Are frequent or lengthy chamber door openings causing significant temperature disruptions and chilling the chamber surfaces? If so, reduce the number of openings.
- Does the ambient humidity in the room exceed the stated operating range of 80% relative environmental humidity? If so, lower the room's humidity.
- Is the chamber door closing and latching properly? Is the door gasket leaking? Check the gasket for damage, wear, or signs of brittleness or dryness. Replace the gasket if needed.
- Is the incubator exposed to an external flow of cold air such as, an air-conditioning vent or a door to a cooler hallway or adjacent room? Block or divert the air, or move the incubator.

TURN ALARM OFF / ON

Perform the following steps to turn the door alarm off or on. Note that once set to Off, the alarm will not activate until the user has turned it back on. This procedure is applicable to units manufactured after January 15, 2015, or older units retrofitted with a new door alarm control chip.

Alarm OFF	
1. Place the incubator into the adjust temperature set point mode.  OR a. Press and release either the up or the down arrow key on the Set Temperature panel. b. The screen will briefly flash the letters “SP”. c. The display will then show an adjustable, flashing temperature set point.	**SET TEMPERATURE**  **Set Point Indicator** **SET TEMPERATURE**  **Current Set Point, Adjustable**
2. Press and hold the up arrow until the temperature display reads “dO”.  a. “dO” indicates that “door alarm off” is selected.	**SET TEMPERATURE**  **Door Alarm Off**
3. Release the up arrow. a. “dO” will flash approximatly six times. b. The display will then revert to showing the current chamber temperature. c. The door open alarm is now set to Off, and the temperature set point **has not been changed.**	**SET TEMPERATURE**  **Current Temperature**

Procedure continued on next page

Turn Alarm On

Alarm ON	
1. Place the incubator into the adjust temperature set point mode.  OR  a. Press and release either the up or the down arrow key on the Set Temperature panel. b. The screen will briefly flash the letters “SP”. c. The display will then show an adjustable, flashing temperature set point.	**SET TEMPERATURE**  **Set Point Indicator** **SET TEMPERATURE**  **Current Set Point, Adjustable**
2. Press and hold the up arrow until the temperature display reads “dI”.  a. “dI” indicates that “door alarm on” is selected.	**SET TEMPERATURE**  **Door Alarm On**
3. Release the up arrow. a. “dI” will flash approximatly six times. b. The display will then revert to showing the current chamber temperature. c. The door alarm is now set to On, and the temperature set point **has not been changed.**	**SET TEMPERATURE**  **Current Temperature**

End of procedure

Warning: Prior to any maintenance or cleaning of this unit, disconnect the power cord from the power supply.

Avertissement: Avant d'effectuer toute maintenance ou entretien de cet appareil, débrancher le cordon secteur de la source d'alimentation.

CLEANING AND DISINFECTING

If a hazardous material or substance has spilled in the unit, immediately initiate your site Hazardous Material Spill Containment protocol. Contact your local Site Safety Officer and follow instructions per the site policy and procedures.

The unit chamber should be cleaned and disinfected prior to first use. Periodic cleaning and disinfection are required to prevent microbiological contamination.

Do not use spray on cleaners or disinfectants. These can leak through openings and coat electrical components. Do not use cleaners or disinfectants that contain solvents capable of harming mill finish aluminum or paint coatings. **Do not use chlorine-based bleaches or abrasives; these will damage the chamber liner.** Consult with the manufacturer or their agent if you have any doubts about the compatibility of decontamination or cleaning agents with the parts of the equipment or with material contained in it.

Warning: Never clean the unit with alcohol or flammable cleaners.

Avertissement: Ne jamais nettoyer l'appareil à l'alcool ou avec des nettoyants inflammables.

Cleaning

1. Remove all non-attached accessories (shelves, racks, and any additional items) from the chamber.
2. Clean the chamber interior with a mild soap and water solution, including all corners.
3. Take special care when cleaning chamber sensor probes.
4. Clean all removable accessories and components.
5. Clean and disinfect any attached sample tubing and replace if discoloring is present.
6. Rinse the chamber surfaces and shelving with distilled water and wipe dry with a soft cloth. **Do not use deionized water.**

Disinfecting

Disinfect the unit chamber on a regular basis. Perform the following steps to manually disinfect the chamber:

1. Turn the unit off. Open the door and carry out your laboratory, clinical, or production space disinfection protocol.
2. Disinfect the unit chamber using commercially available disinfectants that are non-corrosive, non-abrasive, and suitable for use on painted surfaces. If disinfecting external surfaces use disinfectants that will not damage painted metal or plastic. Contact your Site Safety Officer for detailed information on the disinfectants compatible with your cultivation or culturing applications.
3. If permitted by your protocol, remove all interior accessories (shelving and other non-attached items) from the chamber when disinfecting.
4. Disinfect all surfaces in the chamber, making sure thoroughly disinfect the corners. Exercise care to avoid damaging the sensor probes.
5. Gas concentrations from evaporating disinfecting agents can inhibit growth or cause metabolic symptoms in microbiological sample populations. Make sure that chlorines, amphyls, quaternary ammonias, or any other overtly volatile disinfecting agents have been rinsed or otherwise removed from the chamber surfaces, prior to placing samples in the chamber.

End of procedure

MAINTAINING ATMOSPHERIC INTEGRITY

Periodically, inspect the door latch, trim, catch, and gasket for signs of deterioration. Failure to maintain the integrity of the door system shortens the life span of the incubator.

ELECTRICAL COMPONENTS

Electrical components do not require maintenance. If the incubator fails to operate as specified, please contact your Shel Lab Dealer or **Sheldon Technical Support** for assistance (please see page 5).

CALIBRATE THE TEMPERATURE DISPLAY

Note: Performing a temperature display calibration requires a temperature reference device. Please see the **Reference Sensor Devices entry** on page 10 for device requirements.

Temperature calibrations are performed to match the incubator temperature display to the actual air temperature inside the incubation chamber. The actual air temperature is supplied by a calibrated reference sensor device. Calibrations compensate for drifts in the unit microprocessor controller as well as those caused by the natural material evolution of the sensor probe in the heated chamber space. Calibrate as often as required by your laboratory or production protocol, or regulatory compliance schedule.

Probes

A reference device sensor probe may be introduced through the access port. Carefully seat the port stopper over any probe wires (see figure 19). Probes may also be introduced through the chamber door space. Use non-stick, non-marking tape to secure the wires to the incubator body and seal any exterior gaps. The door must close and latch fully.

Figure 19: Introducing a sensor probe through the access port.

Place the head of the sensor probe as close as possible to the geometric center of the chamber. A thermocouple sensor probe sleeve may be taped to the shelving, as long as the exposed copper end is 2 inches (5cm) away from the shelf (see Figure 20). An exposed sensor probe in direct contact with the shelving may experience heat sinking, which can result in an inaccurate temperature reading.

Stability

Prior to a calibration the chamber should operate undisturbed at its application temperature set point for at least 8 hours in order to stabilize. A common practice is to introduce and place the temperature sensor probe in the chamber, allow the unit to operate and stabilize overnight, and then conduct the calibration the next day.

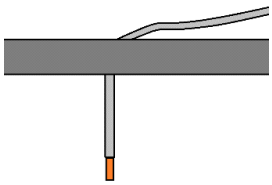
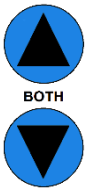


Figure 20: Probe End 2 inches (5cm) From Shelf Surface

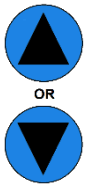
The chamber is considered stabilized when it has operated for **1 hour** with no fluctuations ±0.1°C or greater. Failure to wait for stabilization will result in an inaccurate calibration and incubator temperature display reading. If the chamber door is opened during the calibration, the chamber must be allowed to re-stabilize before continuing.

Procedure continued on next page

Temperature Display Calibration	
1. Once the chamber temperature has stabilized, compare the reference device and temperature display readings. a. If the readings are the same, or if a difference between the two (2) falls within the acceptable range of your protocol, the display is accurately showing the chamber air temperature. **The Temperature Calibration procedure is now complete**. b. If a difference falls outside of your protocol range, advance to step 2.	**Reference Device**  **SET TEMPERATURE** 
2. A display calibration adjustment must be entered to match the display to the reference device. See next step.	**Reference Device**  **SET TEMPERATURE** 
3. Place the temperature display in its calibration mode.  a. Press and hold both the **UP and DOWN** temperature arrow buttons simultaneously for approximately 5 seconds. b. Release the buttons when the temperature display shows the letters “CO”. The display will begin flashing the **current temperature display value**. **Note**: If an arrow key is not pressed for five seconds, the display will cease flashing, and store the last displayed value as the new current chamber temperature value	**SET TEMPERATURE**  **Calibration Mode** **SET TEMPERATURE**  **Current Display Value**

Procedure continued on next page

Temperature Display Calibration (Continued)



4. Use the **Up** or **Down** arrows to adjust the current display temperature value until it matches the reference device temperature reading.

Reference Device

SET TEMPERATURE

Corrected Display Value

5. After correcting for the offset, wait 5 seconds.

Wait 5 Seconds

a. The incubator Temperature Display will cease flashing, store the correction, and resume showing the current temperature.

b. The incubator will now begin heating or cooling in order to reach your set point with the corrected display value.

SET TEMPERATURE

Cooling to Set Point

6. Allow the incubator to operate undisturbed for at least 1 hour to stabilize after it has achieved the set point **with the corrected display value**.

Wait 1 Hour

a. Failure to wait until the incubation chamber is fully stabilized will result in an inaccurate reading.

SET TEMPERATURE

Stabilized

7. Compare the reference device reading with the incubator temperature display again.

a. If the reference device and the incubator temperature display readings are the same or the difference falls within the range of your protocol, **the incubator is now calibrated for temperature**.

b. See the next step if the readings fail to match or fall outside of your protocol range.

Reference Device

SET TEMPERATURE

Procedure continued on next page

Temperature Display Calibration (Continued)	
8. If a difference still falls outside the acceptable range of your protocol, repeat steps 3 – 7 up to two (2) more times. a. Three calibration attempts may be required to successfully calibrate units that are more than ± 2°C out of calibration. b. If the temperature readings of the incubator and the reference device still fall outside your protocol after three calibration attempts, contact your distributor or **Technical Support** for assistance.	**Reference Device**  **SET TEMPERATURE** 

End of Procedure

UNIT SPECIFICATIONS

These incubators are 100 - 120 voltage units. Please refer to the incubator data plate to verify its electrical specifications.

Technical data specified applies to units with standard equipment at an ambient temperature of 25°C and a voltage fluctuation of ±10%. The temperatures specified are determined in accordance to factory standard following DIN 12880 respecting the recommended wall clearances of 10% of the height, width, and depth of the inner chamber. All indications are average values, typical for units produced in the series. We reserve the right to alter technical specifications at all times.

WEIGHT

Model	Shipping	Net Weight
SRI3P	145lbs / 65.8kg	105lbs / 47.6kg
SRI6P	245lbs / 111.1kg	125lbs / 56.7kg
SRI20P	405lbs / 183.7kg	246lbs / 111.6kg

DIMENSIONS

In inches

Model	Exterior W × D × H	Interior W × D × H
SRI3P	24.1 x 21.3x 33.8 in	18.9 x 16.9 x 26.4 in
SRI6P	30 x 31.5 x 33.5 in	25.5 x 24.0 x 18.5 in
SRI20P	30 x 31.5 x 69.5 in	25.5 x 24.0 x 54.5 in

In Centimeters

Model	Exterior W × D × H	Interior W × D × H
SRI3P	61.2 x 54.1 x 98.55 cm	48 x 42.9 x 67.06 cm
SRI6P	76.2 x 80.01 x 85.09 cm	64.8 x 61.0 x 47.1 cm
SRI20P	76.20 x 80.01 x 176.53 cm	64.77 x 60.96 x 138.43 cm

CAPACITY

Model	Cubic Feet	Liters
SRI3P	3.5	99
SRI6P	6.55	185.53
SRI20P	19.30	546.57

UNIT SPECIFICATIONS (CONTINUED)

SHELF CAPACITY BY WEIGHT

Model	Per Shelf	Total
SRI3P	35lbs / 15.9kg	70lbs / 31.7kg
SRI6P	75lbs / 34kg	150lbs / 34kg
SRI20P	75lbs / 34kg	375lbs / 170kg

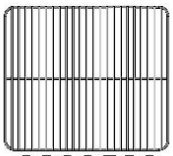
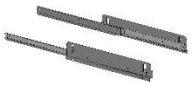
TEMPERATURE

Model	Temp Range	Uniformity	Stability
SRI3P	15° to 40°C	±0.5° @ 20°C	±0.1°C @ 20°C
SRI6P	15° to 40°C	±0.5° @ 20°C	±0.1°C @ 20°C
SRI20P	15° to 40°C	±0.5° @ 20°C	±0.1°C @ 20°C

POWER

Model	Voltage	Amperage	Frequency
SRI3P	100 - 120V	4.0	50/60 Hz
SRI6P	100 - 120V	4.0	50/60 Hz
SRI20P	100 - 120V	5.5	50/60 Hz

PARTS AND CONSUMABLES

Description	Part Number		Description	Part Number
Access Port Stopper	 7750517		Power Cord, 125V, 15 Amp, 8 foot (2.5m) NEMA 5-15P	 1800510
Feet, Adjustable Glide	 2700506		Shelf Clip, SRI3P (1)	 1250512
Fuse 250V T6.3A, 5X20mm (1, Requires 2 for operation)	3300515		Shelf (1) SRI3P	 6800529
Gasket, Magnetic Door SRI3P (28.25 inches X 22.25 Inches)	 3450758		Shelf (1), SRI6P, SRI20P	 6800525
Gasket, Magnetic Door SRI6P (29 inches X 26 inches)	 3450743		Static Shelf Mount (1 Bracket)	 5220942
Gasket, Magnetic Door SRI20P (29 inches X 62 inches)	 3450732		Sliding Shelf Mounting Kit (2 Brackets)	 9490560
Humidity Reservoir Pan and Tubing (Optional Accessory)	 9900708			

If you have the Part Number for an item, you may order the item directly from Sheldon Manufacturing by calling (503) 646-3000 Ext. 3. If you are uncertain that you have the correct Part Number or if you need that specific part, please contact Sheldon Technical Support for help at 1-800-322-4897 or (503) 640-3000 extension 4. Please have the **model number** and **serial number** of the unit ready, as Tech Support will need this information to match your unit with its correct part.

This page left blank

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

SHELLAB®