

SMI INCUBATORS 110 – 120 Voltage



Installation and Operation Manual

SMI31, SMI39

Previously Designated:

RI28, RI40

Shel Lab General Purpose Incubator 110 – 120 Voltage

Large Capacity Models

Installation and Operation Manual

Part Number (Manual): 4861763

Revised: December 14, 2015

Pictured on Cover: SMI31 left, SMI39 right

These units are general-purpose dry incubators intended for industrial, or educational use where the preparation or testing of materials is done at 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 are compliant with the following standards:

CAN/CSA C22.2 No. 61010-1:2012
CAN/CSA C22.2 No. 61010-2-010 + R:2009
UL 61010A-2-010:2002
UL 61010-1:2012
EN 61010-1:2010
EN 61010-2-010:2003

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INTRODUCTION

Thank you for purchasing a Sheldon Manufacturing 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 general purpose dry incubators are intended for professional, industrial, or educational cell cultivation applications. They are not designed for use in hazardous or household locations.

Before using the incubator read the entire manual 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 all operators are given appropriate training before the incubator begins service.

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's safety features. This can result in injury or death.

Your unit and its recommended accessories are designed and tested to meet strict safety requirements. It is designed to connect to a power source using the specific power cord type shipped with the unit.

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 incubator 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.

INTRODUCTION (CONTINUED)

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 8).

EMAIL: tech@shellab.com PHONE: 1-800-322-4897 extension 3, or (503) 640-3000 FAX: (503) 640-1366

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

RECEIVING YOUR INCUBATOR

When an incubator leaves the factory, safe delivery becomes the responsibility of the carrier. Damage sustained during transit is not covered by the manufacturing defect warranty. When you receive your incubator inspect it for concealed loss or damage to the interior and exterior. If you find damage, **follow the carrier's procedure for claiming damage or loss.**

INSPECTING THE SHIPMENT

Before leaving the factory, SMI incubators are packaged in high-quality shipping materials to provide protection from transportation-related damage.

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. Carefully check all packaging before discarding. Save the shipping carton until you are certain that the unit and its accessories function properly.

Inspect the incubator for damage. The orientation photos on the pages following this one can serve as useful visual references.

The unit should come with an Installation and Operation Manual and a Certificate of Compliance. Verify that the correct number of accessory items are present in the ship kit.

Accessory Items

Model	SMI31 Shelves	SMI39 Shelves	Shelf Clips	Leveling Feet	Power Cord
SMI31	6	0	24	4	1
SMI39	0	6	24	4	1



Each unit is provided with a 115 volt, 15 Amp, 9ft 5 in (2.86m) NEMA 5-15P power cord.

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

RECEIVING YOUR INCUBATOR (CONTINUED)

ORIENTATION PHOTO

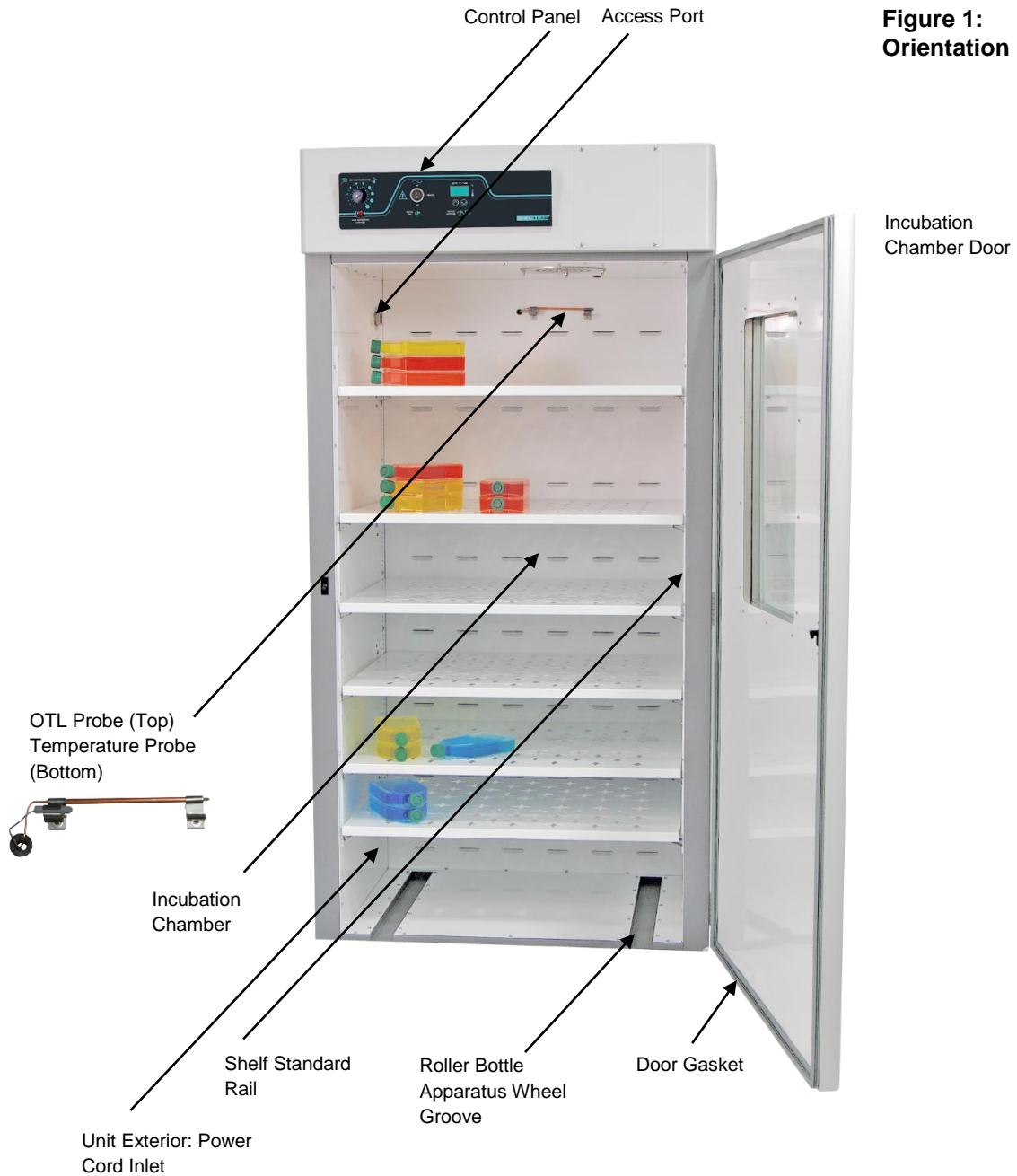


Figure 1:
Orientation Photo

RECEIVING YOUR INCUBATOR (CONTINUED)

RECORDING DATA PLATE INFORMATION

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

The data plate is located on top right corner of the incubator door, on the interior chamber side.

Date Plate Information

Model Number	
Serial Number	

REFERENCE SENSOR DEVICE

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

A reference devices 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 unit access port, while leaving the device and its display outside the unit. For example: a wire thermocouple probe. Reference readings that avoid chamber door openings during verification and calibration eliminates a subsequent hour-long wait for the chamber temperature to re-stabilize before proceeding.

Select probes suitable for the application temperature you will be calibrating or verifying the incubator displays at.

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.**

RECEIVING YOUR INCUBATOR (CONTINUED)

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INSTALLATION

REQUIRED AMBIENT CONDITIONS

SMI incubators are intended for use indoors at room temperatures between **15°C and 30°C (59°F and 86°F)**, at no greater than an ambient **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.

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.

ENVIRONMENTAL FACTORS

When selecting a location to install the incubator, consider all environmental conditions that can affect the unit temperature performance. For example:

- Proximity to 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.

The required circuit amperage to support these units is 15 amps. Wall power sources must match the voltage and ampere requirements listed on the unit data plate. These units are intended for 110 – 120 VAC 50/60 Hz applications at the following amperages: **SMI31** 12.0 Amps; **SMI39** 14.5 Amps.

- The wall power sources 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.
- **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 unit is provided with a 115 volt 15 Amp, 9ft 5 in (2.86m) NEMA 5-15P power cord.

- The unit must be positioned so that all end-users can quickly unplug the power cord in the event of an emergency.
- The unit is provided with a 250V, T16A, 5X20mm fuse located in the power cord inlet.



INSTALLATION (CONTINUED)

LIFTING AND HANDLING

The unit 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 unit must be level and stable for safe operation. Each unit ships with four leveling feet.

1. Insert one leveling foot into each of the four holes in the bottom corners of the unit.
2. 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.
3. To lower a foot, turn it in a clockwise direction.

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

Figure 2:
Leveling Foot



INSTALL THE INCUBATOR

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

ACCESS PORT CAP

SMI incubators are provided with a plastic cap for the access port on the left side of the incubation chamber. Always leave this cap in place, except when introducing probes into the chamber for temperature calibrations or verifications. Removing the cap during normal operations can adversely impact temperature stability and uniformity.



Figure 3:
Access Port
Cap

DEIONIZED AND DISTILLED WATER

Do not use deionized water to clean or humidify 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 and humidifying applications.

INSTALLATION (CONTINUED)

INSTALLATION CLEANING AND DISINFECTION

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

Remove all protective wrappings from shelving components prior to cleaning.

Please see the [Cleaning and Disinfecting](#) entry on page 23 in the User Maintenance section for information on how to clean and disinfect without damaging the incubator or its components.

SHELVING INSTALLATION

Perform the following steps to install the shelves in the incubation chamber. Space the shelves out evenly in the incubation chamber to ensure the best possible air circulation and temperature uniformity.

1. Install the shelf clips in the slots of the shelf standard rails located on the sides of the chamber interior.
 - a. Squeeze each clip.
 - b. Insert the top tab first, then the bottom tab using a rocking motion.
2. Hang the shelves from the clips.

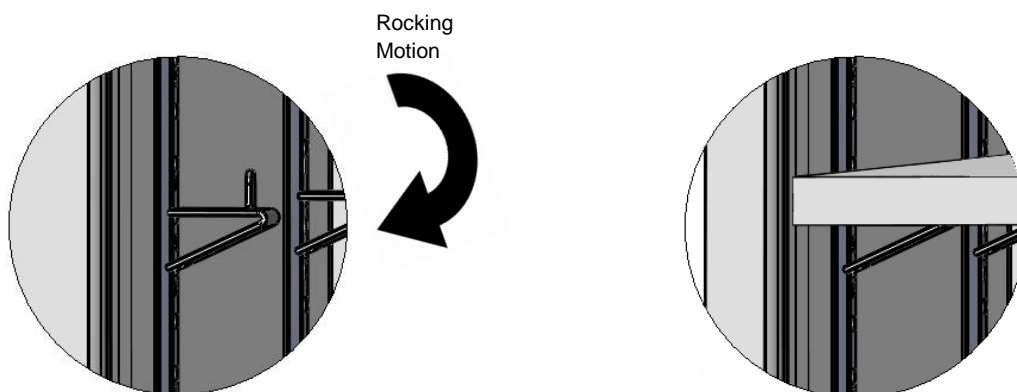












Figure 4: Installing Shelf Clip

Figure 5: Shelf Hung

GRAPHIC SYMBOLS

Your incubator comes provided with graphic symbols on its exterior surfaces. These identify hazards and the function of the adjustable components, as well as important notes in the user manual.

Symbol	Definition
	Indicates that you should consult your operator's manual for further instructions. Indique que l'opérateur doit consulter le manuel d'utilisation pour y trouver les instructions complémentaires.
	Indicates Temperature Indique un affichage de la température
	Indicates Over Temperature Protection Indique le système de dépassement de température
	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 Earthground Repère terre électrique
	Indicates Up and Down respectively Touches de déplacements respectifs vers le HAUT et le BAS
	Indicates Manually Adjustable Signale un élément réglable manuellement
	Indicates Potential Shock Hazard Signale un danger électrique
	Indicates Incubator 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 6: Control Panel

Over Temperature Limit Thermostat (OTL)



This graduated dial sets the heating cut off point for the OTL temperature limit system. The OTL system prevents unchecked heating of the chamber in the event of a failure of the main digital controller. For more details, please see the [Over Temperature Limit System](#) description in the Theory of Operations (page 15).



The red Over Temp Activated light illuminates when the Over Temperature Limit system cuts off heating by rerouting power away from the heating elements.



Power Switch

The power switch controls all power to each incubator and its systems. Power is supplied when the switch is in the (I) on position and the Power On light is illuminated.



Temperature Control and Display

Labeled Set Temperature, this display shows the current air temperature in the incubation chamber accurate to within 0.1°C. The up and down buttons can be used to adjust the temperature set point, or place the display in its temperature calibration mode and then enter a display value correction.



The green indicator labeled Heating Activated illuminates whenever the temperature control system is heating the incubation chamber.



OPERATION

THEORY OF OPERATION

The SMI general purpose incubators are engineered to provide constant temperature incubation environments. Each unit can obtain a stable, uniform temperature in its chamber, ranging from the room temperature (ambient) +8°C up to 70°C for incubation applications. Each incubator features a glass viewing window that allows visual inspection of samples without compromising the chamber temperature environment.

Heating

When powered, an incubator heats to and maintains the incubation chamber air temperature at the currently programmed temperature set point. An internal microprocessor stores the temperature set point. The microprocessor board is wired to a solid-state temperature probe located on the chamber interior right wall. When the processor detects that the chamber temperature has dropped below the temperature set point, it pulses power to a heating element located in an air recirculation duct above the incubation chamber. During normal operations with the doors closed most heating pulses correct for deviations of less than 0.1°C.

The processor employs proportional-integral-derivative analytical feedback-loop functions when measuring and controlling the chamber air temperature. PID-controlled heating pulse intensities and lengths are proportional to the difference between the measured chamber temperature and the current set point. The frequency of pulses are derived from the rate of change in that difference. The integral function slows the rate of pulses when the temperature nears the set point to avoid overshooting.

Each incubator relies on natural heat radiation for cooling. An incubator can achieve a low-end temperature of the ambient room temperature +8°C.

Air Circulation

When powered the incubator circulates air between the incubation chamber and a heating duct located immediately above the chamber. The incubator heating element is located in the duct. This air circulation is required to maintain the chamber temperature uniformity and stability.

The Over Temperature Limit System (OTL)

The OTL is a backup mechanical heating control system that operates independently of the microprocessor controller. It consists of a mechanical thermostat control wired by a fluid capillary to an independent hydrostatic temperature probe located on the right wall of the incubation chamber. The OTL system prevents runaway heating by routing power away from the heating element whenever the air temperature in the chamber exceeds the OTL cutoff setting.

OPERATION (CONTINUED)

PREPARING THE INCUBATOR FOR USE

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 temperature prior to loading the incubation chamber with samples. During this period the incubator must be powered continually with the chamber door closed. Allowing time for stabilization helps protect samples. It is also necessary for the optional temperature display accuracy verification procedures, as well as any resulting calibration.

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

1. A clean and disinfected thermocouple probe for performing the optional temperature display accuracy verification may be inserted through the access port 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 18 for the correct introduction and placement of the thermocouple probe
2. Verify that the workspace power supply and the incubator power requirements listed on the unit data plate have been matched
 - a. See the [Power Source Requirement](#) entry on page 10
3. Attach the power cord that came with the incubator to the power inlet receptacle on the back of the unit
4. Plug the power cord into the workspace supply outlet
5. Place the **Power** switch in the on (I) position
6. Perform the following Operation procedures in order:



8 Hours Total

[Set the Temperature Set Point](#) page 17

Allow the incubator to heat undisturbed for 8 hours before continuing

Optional: [Verify Temperature Display Accuracy](#) page 18

[Set the Over Temperature Limit](#) page 20

[Load the Chamber](#) page 21

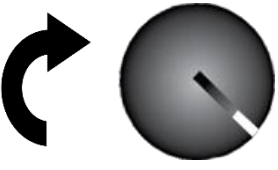






End of procedure

OPERATION (CONTINUED)

SET THE TEMPERATURE SET POINT

Perform the steps below to change the set point to your process or application temperature. The incubator comes from the factory with a set point of 37°C.

Note: The visual example below depicts adjusting the incubator set point from 35°C to a 37°C application temperature.

Set Temperature Set Point	
<ol style="list-style-type: none"> Turn the Over Temperature Limit control clockwise to the maximum setting, if not already set to max. <ol style="list-style-type: none"> This prevents the OTL cutoff from interfering with this procedure. 	
<div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <ol style="list-style-type: none"> Press and release either of the temperature arrows to activate the temperature set point adjustment mode. <ol style="list-style-type: none"> The temperature display will briefly flash the letters “SP” to indicate the Set Point is about to be displayed. The temperature display will then show the flashing, adjustable temperature set point. </div> </div> <p>Note: The display will automatically exit the adjustment mode after 5 seconds of inactivity, with the last shown set point value saved.</p>	<div style="text-align: center;">  <p>Set Point Adjustment Mode</p>  <p>Initial Set Point</p> </div>
<div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <ol style="list-style-type: none"> Use the Up or the Down arrow keys to adjust the set point to your application temperature. </div> </div>	<div style="text-align: center;">  <p>New Set Point</p> </div>
<ol style="list-style-type: none"> Wait 5 seconds after entering the set point. <ol style="list-style-type: none"> The display will stop flashing, and the set point is now saved in the controller. The chamber will now automatically heat or passively cool to match your set point. The display will revert to showing the current chamber air temperature. 	<div style="text-align: center;">  <p>Heating to Set Point</p> </div>
<p>See the Set the OTL procedure on page 20 for how to set the OTL system once the incubation chamber has stabilized at your application temperature set point, after you have performed any display verifications or calibrations.</p>	

End of Procedure

OPERATION (CONTINUED)

TEMPERATURE ACCURACY VERIFICATION

Note: Performing a temperature accuracy verification requires a temperature reference device. Please see the [Reference Sensor Devices entry](#) on page 8 for the device requirements.

Optional: Each incubator temperature display is calibrated at the factory at 37°C. A verification of the display accuracy may be carried out when preparing the incubator for use, if required by your laboratory or production protocol. The verification procedure compares the incubator display temperature with the actual chamber air temperature, as provided by a 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 26 in the User Maintenance section.

Probes

Reference device sensing probes may be introduced through the access port or through the chamber door space. Place the sensor probe of the temperature reference device as close as possible to the geometric center of the incubation chamber. A thermocouple sensor probe may be taped to the shelving, as long as the exposed copper end is 2 inches (5cm) away from the shelf (see Figure 7). An exposed sensor probe in direct contact with the shelving may experience heat sinking, which can result in an inaccurate temperature reading.

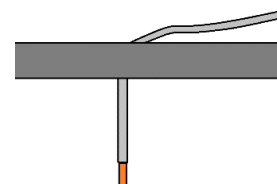


Figure 7: Probe End 2 inches (5cm) From Shelf Surface

Seal gaps around the probe wire in the access port or door space using non-stick, non-marking tape.

Stability

After introducing and placing the temperature probe, allow the incubator to run undisturbed for 8 hours (for example, overnight) prior to performing the verification.

Prior to a verification the chamber must operate at its verification temperature set point for **at least 1 hour with no fluctuations** of $\pm 0.1^{\circ}\text{C}$ 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 with no fluctuations before continuing.







Wait 8 Hours



Wait 1 Hour

OPERATION (CONTINUED)

Verifying the Temperature Display Accuracy	
<p>1. Once the chamber temperature has stabilized, compare the reference device and incubator display readings.</p> <p>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.</p> <p>b. See step 2 if a difference falls outside the acceptable range of your protocol.</p>	<p>Reference Device</p>  <p>Set Temperature</p> 
<p>2. If there is an unacceptable difference, a display temperature calibration must be performed to match the display to the reference device.</p> <p>a. An acceptable difference is normally determined by laboratory or study protocol parameters.</p> <p>b. Please see page 26 in the User Maintenance section.</p>	<p>Reference Device</p>  <p>Set Temperature</p> 

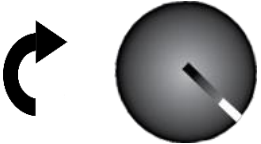
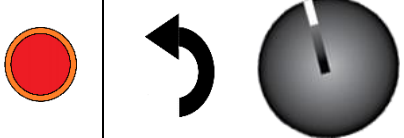
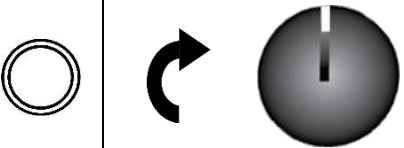


End of procedure

OPERATION (CONTINUED)

Note: Test the OTL system at least once per year for functionality.

SET THE OVER TEMPERATURE LIMIT

The incubator must be operating at your incubation application temperature, and must be stable for at least one hour prior to setting the OTL. Perform the following steps to set up the **Over Temperature Limit** system for use:

Set OTL	Example
1. Turn the Set Over Temperature Limit control dial clockwise to the maximum position, if it is not already set to max.	
2. Turn the dial counterclockwise until the red Over Temperature Limit Activated light illuminates.	
3. 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 approximately 1°C above the current incubator air temperature.	
4. Optional: You may turn the dial slightly to the left to bracket in closer to the set point temperature. This sets the OTL cutoff threshold nearer to the current incubator air temperature.	
5. Leave the OTL dial set just above the activation point.	

If the OTL is sporadically activating, you may turn the dial very slightly to the right (clockwise).

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

OPERATION (CONTINUED)

LOAD THE INCUBATOR

After the incubator has been run for 8 hours at your set point, place samples on the shelves inside the incubation chamber. Space as evenly as possible. Good spacing allows for maximum air circulation and a high degree of temperature uniformity. Leave 1 inch (2.5cm) between sample containers and the chamber walls.

This is the final step in the [Preparing the Incubator procedure](#).

INTERIOR ACCESSORY OUTLET

This unit is provided with a pair of accessory power outlets located inside the incubation chamber. The power switch on the control panel controls power to the outlets. The outlets can power devices such as, magnetic stirrers, rockers, etc. Do not attach devices drawing a total of more than 1 amp to these outlets.

Accessory devices may produce heat. This heat can impact the temperature performance of the incubator. Check that the incubator operates within your protocol or application temperature range when accessory devices are active in the chamber.

HUMIDIFYING THE INCUBATOR

Long-term use of a large open water container such as, a humidifier pan, may create excess water vapor in the unit and can damage the electrical components of a SMI series dry incubator. Additionally, use of **deionized water** may cause significant corrosion damage to the incubator.

Placing only a small number of petri dishes or other media containers in the incubator chamber may lead to excessive drying of sample media. Leaving a small water-filled container such as, an open flask, in the chamber will help to prevent sample drying with **small loads**. Use of a large open container, such as a humidifier pan, can generate corrosion and damage electrical components. Overloading the unit with sample media may also damage the incubator from excessive media evaporation and disruption of air flow pathways through the shelf space.

OPERATION (CONTINUED)

CONDENSATE AND THE DEW POINT

Ambient humidity in excess of 80% relative humidity or overloading the incubation chamber with open or breathable sample containers will likely result in condensation in the chamber, and subsequent leakage from the incubator. This may cause corrosion damage if allowed to continue for any significant length of time.

Condensation takes place whenever 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.

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 even slightly cooler than the air. When the dew point is reached, condensate forms 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 excessive condensate has appeared in the incubation chamber, dry the chamber interior and check the following.

- Verify that the access port on the left side of the chamber is closed. The black, plastic shipping cap that came with the unit should be installed in the port on the outside of the unit, and not inside the chamber.
- Make sure samples on the shelves are evenly spaced to allow for good airflow.
- Ensure the chamber door is closing and latching properly.
- Are frequent or lengthy chamber door openings causing significant temperature disruptions and chilling the chamber surfaces? If so, reduce the number of openings.
- Are there too many open or “breathable” containers of evaporating sample media in the chamber? If so, reduce the number of open sample containers.
- Does the ambient humidity in the room exceed the stated operating range of 80% relative environmental humidity? If so, lower the room humidity.
- 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 reposition the unit.
- Check the door gasket for damage, wear, or signs of brittleness or dryness. Arrange for replacement of the gasket if damaged or excessively worn.

USER MAINTENANCE



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 incubator, immediately initiate your site's Hazardous Material Spill Containment protocol. Contact your local Site Safety Officer and follow instructions per the site policy and procedures.

The incubator 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 paint coatings or plastic surfaces. **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 nettoyeurs inflammables.

Cleaning

1. Remove all non-attached incubation chamber components and accessories (shelves, racks, and any additional items), if present.
2. Clean the chamber interior with a mild soap and water solution, including all corners.
3. Take special care when cleaning chamber sensor probes located at the rear of the chamber on the back wall.
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.**

USER MAINTENANCE (CONTINUED)

Disinfecting

Disinfect the incubation chamber on a regular basis. For maximum effectiveness disinfection procedures are typically performed after cleaning and the removal of gross matter contamination. Perform the following steps to manually disinfect the incubator:

1. Turn the unit off. Open all doors and carry out your laboratory, clinical, or production space disinfection protocol.
2. Disinfect the incubation chamber using commercially available disinfectants that are non-corrosive, non-abrasive, and suitable for use on stainless steel surfaces. If disinfecting external surfaces use disinfectants that will not damage painted metal or plastic. Contact your local 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 to 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.

MINIMIZING CONTAMINATION EXPOSURE

The following are suggestions for minimizing exposure of the incubator chamber to potential contaminants.

- Maintain a high air quality in the laboratory workspaces around the incubator.
- Avoid placing the incubator near sources of air movement such as, doors, air vents, or high traffic routes in the workspace.
- Minimize the number of times the incubator chamber door is opened during normal operations.

USER MAINTENANCE (CONTINUED)

STORAGE OF THE INCUBATOR

Perform the following steps if the incubator will be out of use for more than 24 hours to prevent microbiological contamination such as, fungus or mold.

1. Depower the incubator.
2. Disinfect and clean if required by your laboratory protocol, or if the chamber has been exposed to pathogenic microorganism.
3. Use a soft cloth to dry the chamber surfaces.

MAINTAINING ATMOSPHERIC INTEGRITY

Periodically, inspect the door latch, trim, catch, and gaskets 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 distributor or [Sheldon Technical Support](#) for assistance (please see page 5).

USER MAINTENANCE (CONTINUED)

CALIBRATE THE TEMPERATURE DISPLAY

Note: Performing a temperature display calibration requires a temperature reference device. Please see the [Reference Sensor Devices entry](#) on page 8 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

Reference device sensing probes may be introduced through the access port, or through the chamber door space. Place the sensor probe of the temperature reference device as close as possible to the geometric center of the incubation chamber. A thermocouple sensor probe may be taped to the shelving, as long as the exposed copper end is 2 inches (5cm) away from the shelf (see Figure 9). An exposed sensor probe in direct contact with the shelving may experience heat sinking, which can result in an inaccurate temperature reading.

Seal gaps around the probe wire in the access port or door space using non-stick, non-marking tape.

Stability

Prior to a calibration the chamber should operate undisturbed running at its application temperature set point with the doors closed for 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.

The chamber is considered stabilized when it has operated for **1 hour** with no fluctuations of $\pm 0.1^{\circ}\text{C}$ or greater. Failure to wait for stabilization will result in an inaccurate calibration and incubator temperature display reading.



Reference Device Reading



Incubator Display Reading



Figure 8: Out of Calibration

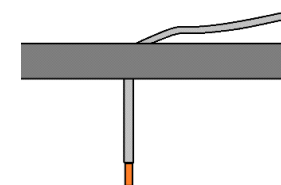




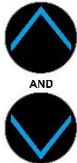



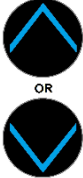








Figure 9: Probe End 2 inches (5cm) From Shelf Surface

USER MAINTENANCE (CONTINUED)

Temperature Calibration	
<p>1. Once the chamber temperature has stabilized, compare the reference device and temperature display readings.</p> <p>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.</p> <p>b. If a difference falls outside of your protocol range, advance to step 2.</p>	<p>Reference Device</p>  <p>Set Temperature</p> 
<p>2. A display calibration adjustment must be entered to match the display to the reference device. See next step.</p> <p>a. An acceptable difference is normally set by a laboratory or study protocol parameters.</p>	<p>Reference Device</p>  <p>Set Temperature</p> 
<p>3. Place the temperature display in its calibration mode.</p>  <p>a. Press and hold both the UP and DOWN temperature buttons simultaneously for approximately 5 seconds.</p> <p>b. Release the buttons when the temperature display shows the letters "CO". The display will begin flashing the current temperature display value.</p> <p>Note: If an arrow key is not pressed for five seconds, the display will cease flashing, and store the last shown number as the new current chamber temperature value.</p>	<p>Set Temperature</p> 



Continued on next page

USER MAINTENANCE (CONTINUED)

Temperature Calibration (Continued)	
 <p>4. Use the Up or Down buttons to adjust the current display temperature value until it matches the reference device temperature reading.</p>	<p>Reference Device</p>  <p>Set Temperature</p> 
 <p>Wait 5 Seconds</p> <p>5. After correcting for the difference, wait 5 seconds.</p> <ol style="list-style-type: none"> The temperature display will cease flashing and store the corrected chamber display value. The incubator will now begin heating or passively cooling in order to reach the set point with the corrected display value. 	<p>Set Temperature</p>  <p>Adjusting to Set Point</p>
 <p>Wait 1 Hour</p> <p>6. Allow the incubator to operate undisturbed for at least one 1 hour to stabilize after it has achieved the set point with the corrected display value.</p> <ol style="list-style-type: none"> Failure to wait until the incubation chamber is fully stabilized will result in an inaccurate reading. 	<p>Set Temperature</p> 
<p>7. Compare the reference device reading with the incubator temperature display again.</p> <ol style="list-style-type: none"> 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. See the next step if the readings fail to match or fall outside of your protocol range. 	<p>Reference Device</p>  <p>Set Temperature</p> 

Continued on next page

USER MAINTENANCE (CONTINUED)

Temperature Calibration (Continued)	
<p>8. If a difference between the two readings still falls outside the acceptable range of your protocol, repeat steps 3 – 7 up to two more times.</p> <p>a. Three calibration attempts may be required to successfully calibrate units that are more than $\pm 2^{\circ}\text{C}$ out of calibration.</p>	<p>Reference Device</p>  <p>Set Temperature</p> 
<p>9. 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.</p>	

End of procedure

INCUBATOR SPECIFICATIONS

These incubators are 110–120 volt. Please refer to the incubator data plate for individual electrical specifications.

Technical data specified applies to units with standard equipment at an ambient temperature of 25°C and a voltage fluctuation of $\pm 10\%$. 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
SMI31	610 lbs. / 276.7kg
SMI39	655 lbs. / 297.1kg

DIMENSIONS

In inches

Model	Exterior W x D x H	Interior W x D x H
SMI31	38.5 x 34.0 x 75.3 in	30.5 x 26 x 62 in
SMI39	41 x 34 x 87 in	35 x 26 x 76.5 in

In centimeters

Model	Exterior W x D x H	Interior W x D x H
SMI31	98 x 86 x 191 cm	77 x 66 x 157 cm
SMI39	104 x 86 x 221 cm	88.9 x 66 x 194 cm

U SPECIFICATIONS (CONTINUED)

CAPACITY

Model	Cubic Feet	Liters
SMI31	28	793
SMI39	40	1133



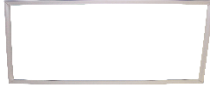



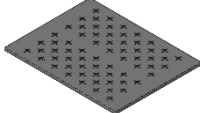
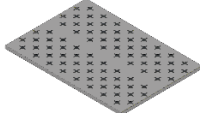
TEMPERATURE

Model	Range	Uniformity	Stability
SMI31	Ambient +8° to 70°C	±0.5° @ 37°C	±0.1°C
SMI39	Ambient +8° to 70°C	±0.5° @ 37°C	±0.1°C

POWER

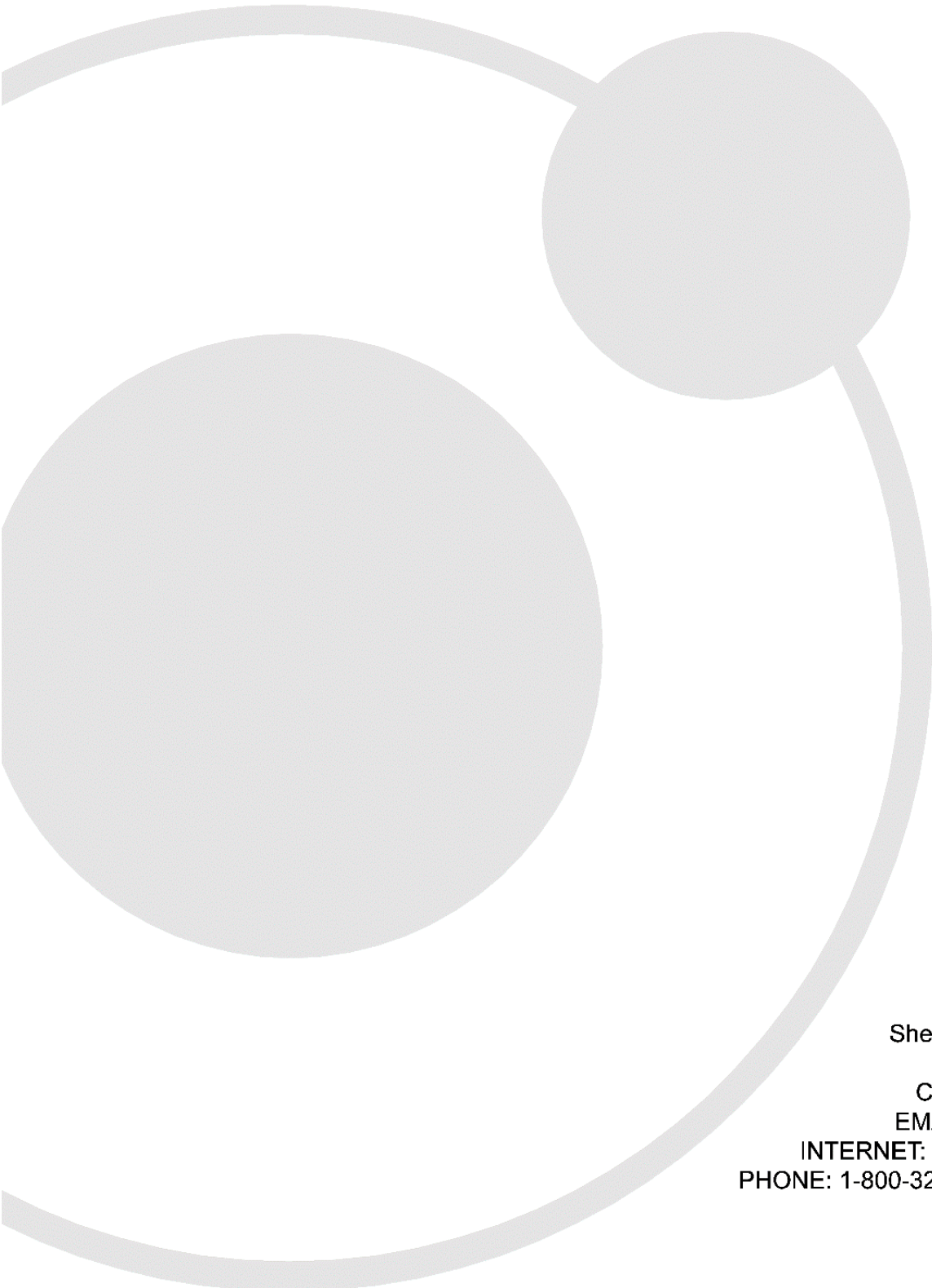
Model	AC Voltage	Amperage
SMI31	110 – 120	12.0
SMI39	110 – 120	14.5

PARTS LIST

Description	Parts Number
Fuse, 250V, T16A, 5X20mm	 3300513
Door Gasket, SMI31, 37 x 64	 3450660
Door Gasket, SMI39, Magnetic, 40 X 76	 3450715
Leveling Foot	 2700506
Power Cord 115 volt 15 Amp, 9ft 5 in (2.86m), NEMA 5-15P	 1800510
Shelf Clip	 1250512
Shelf SMI31	 9750500
Shelf, SMI39	 9750545

ORDERING REPLACEMENT PARTS

If you have the Part Number for an item, you may order it directly from Sheldon Manufacturing by calling 1-800-322-4897 extension 3. If you are uncertain that you have the correct Part Number, or if you need that specific item, please contact Sheldon Technical Support for help at 1-800-322-4897 extension 4 or (503) 640-3000. 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.



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