HIGH-HEAT DECONTAMINATION CO_2 INCUBATOR

SHEL LAB®

110 - 120 Voltage

Installation and Operation Manual

SCO6AD

Previously Designated:

3552

SCO6AD

HIGH-HEAT DECONAMINATION CO_2 INCUBATOR

Installation and Operation Manual

Part Number (Manual): 4861712

Revision: October 16, 2015

This unit requires a NEMA 5-15R wall power receptacle to plug into.

These units are TÜV CUE listed as air jacketed CO_2 Incubators for professional, 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 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

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TABLE OF CONTENTS

INTRODUCTION

Thank you for purchasing a Sheldon Manufacturing SCO6AD High-Heat Decontamination CO_2 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 you. We stand behind our products and will be here for you if you need us.

These incubators are intended for laboratory, industrial, and educational microbiological applications. These incubators are not intended 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 that 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 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 incubator, always follow basic safety precautions including:

- Always plug the incubator power cord into a protective earth grounded electrical receptacle (outlet) that conforms to national and local electrical codes. If the incubator 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 the user 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.
- Do not stack SCO6ADs without use of a stacking rack.
- 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 incubator. 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 the 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
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 SCO6ADs 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, SCO6ADs 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 photo on the following page can serve as a useful reference.

The unit should come with an Installation and Operation Manual and a Certificate of Compliance. Verify that the correct number of shelves, shelf slides, leveling feet, and other components have been included (see the table below for quantities).

Included Accessories

1 Anti-Microbial Copper Token

5800529

4 Leveling Feet

2700506

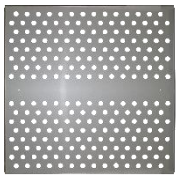
1 Power Cord

1800510

1 Stainless Steel Humidity Pan

999-00015

3 Stainless Steel Shelves



5121777

6 Stainless Steel Shelf Slides

5121028

4 Stainless Steel Shelf Standards

5170646

1 Tubing Ki

9710500

7750565

A silicon rubber stopper should come installed in the 1.5 inch (3.8 cm), copper-filtered access port on the right side of the unit. Verify the presence of the stopper.

ORIENTATION PHOTO

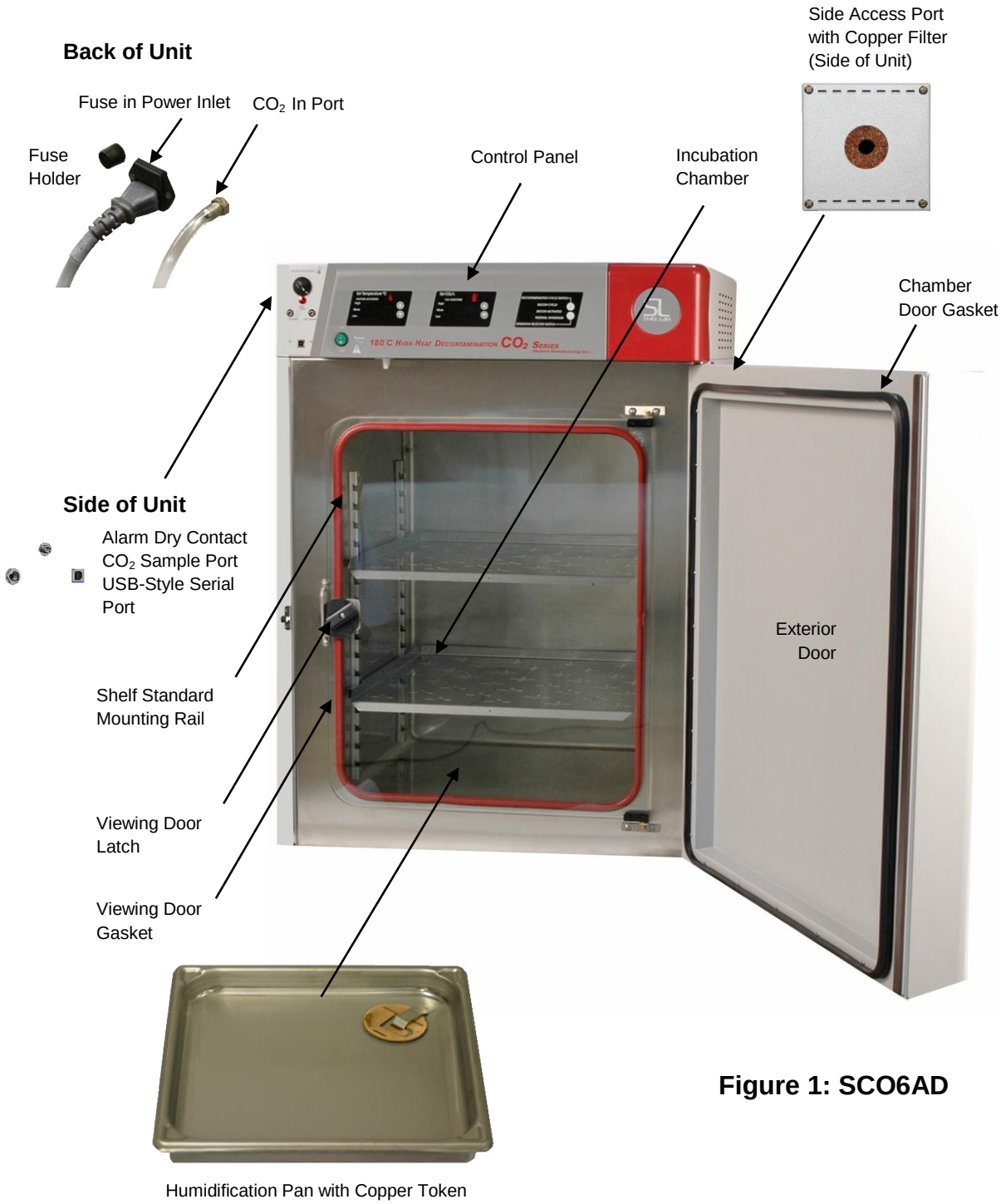


Figure 1: SCO6AD

RECORDING DATA PLATE INFORMATION

Locate the data plate on the right side of the unit, above the copper-filtered access port. The data plate contains the incubator model number and serial number. Enter this information below for future reference.

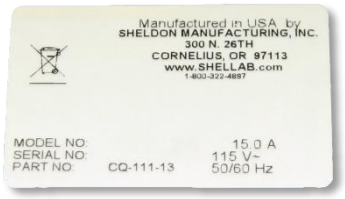


Figure 2: Data Plate

Date Plate Information

Model Number	
Serial Number	

REFERENCE SENSOR DEVICES

Reference sensor devices or a combined device must be purchased separately for performing display accuracy verifications or calibrations for temperature and CO_2 concentration.

Reference devices must be accurate to at least 0.1°C and 0.1% CO_2. The devices should be regularly calibrated, preferably by a third party. For best temperature 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. For example: a wire thermocouple probe. For best CO_2 accuracy, use a calibrated digital gas analyzer with sample tubing that can be connected to the incubator external CO_2 sample port.

Reference readings that avoid chamber door openings during verification and calibration eliminate subsequent waits for the chamber temperature and gas levels to re-stabilize before proceeding. This also allows temperature and gas verifications or calibrations to be performed simultaneously.

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.**

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INSTALLATION

AMBIENT CONDITIONS

The SCO6AD is 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 the incubator temperature performance, including its effective operating range, stability, and uniformity.

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. This unit is intended for 110 – 120 VAC 50/60 Hz applications at the following amperage: **12 Amps**.

- 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.
- **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 comes provided with a 125 volt, 15Amp, 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.
- Each SCO6AD is provided with a 12.5 Amp, 250V Type H 5x20mm fuse located in the power cord inlet on the back of the incubator.

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 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.

2700506

ACCESS PORT STOPPER

Each SCO6AD is provided with an access port located on the right side of the unit. The incubator is shipped with 1 silicon access port stopper installed in the copper-filtered port on the outside of the incubation chamber. When the port is not being used to introduce probes into the chamber, the stopper should be installed outside the chamber to obtain the best temperature uniformity and prevent condensation from forming inside the port.

Never tape over the copper filter around the port. The incubator depends on a controlled flow of air through the filter to achieve its temperature and CO_2 set points while maintaining its targeted relative humidity range.

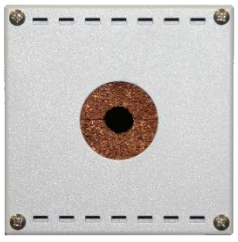

Figure 3: Access Port and Stopper

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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, and a decontamination cycle was run to verify the cycle functionality. However, Sheldon Manufacturing cannot guarantee that the incubator was not exposed to contaminants during shipping.

Remove all wrappings and coverings from shelving prior to cleaning and installation.

Please see the **Cleaning and Disinfecting** entry on page 40 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.

SHELVING INSTALLATION

Install the shelving and humidification pan in the in the incubation chamber. Always install the copper token in the pan. Copper is known to have antimicrobial properties, which retards the growth of microorganisms in the pan.

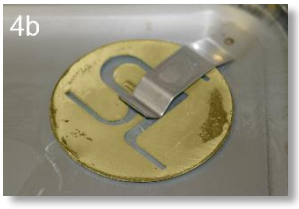


Figure 4: Shelving Installation

1. Install the shelf standard rails.
    a. Align the keyhole slot of the standard with the mounting peg on the side of the chamber wall
    b. Mount the shelf standard
2. Install the shelf slides.
    a. Insert the shelf slide into the shelf standard using a rocking motion
    b. The shelf slide will sit level when correctly installed
3. Install the shelves.
    a. Slide into position
4. Install the humidification pan.
    a. Place the copper token in the humidification pan
    b. Secure the token using the clip on the bottom of the pan
    c. Place the pan on the chamber floor

CONNECT TO THE CO_2 SUPPLY

Note: Always use medical grade CO_2. Use of non-medical grade CO_2 risks introducing contaminants into the chamber, may damage the incubator, and will void the manufacturing defect warranty.

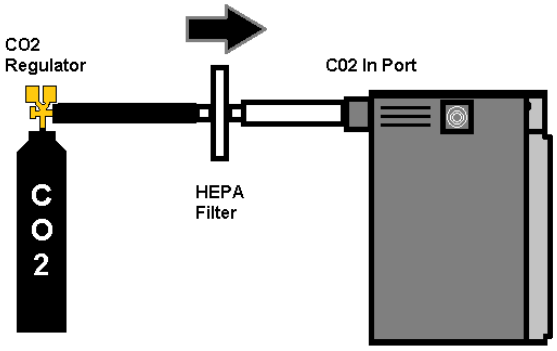


Figure 5: CO_2 Supply Source Connections

The incubator may be connected to either a building CO_2 supply source or a gas supply cylinder (tank). During normal operations the incubator uses only small quantities of CO_2 to maintain the chamber gas concentration. Precise regulation of the gas input flow is vital for the incubator performance. If connecting to a supply cylinder **always use a two-stage CO_2 pressure regulator**. Be aware that some single-stage regulators have 2 gauges. Make certain your regulator is a two-stage regulator.

1. Attach the CO_2 regulator to a medical grade CO_2 cylinder, if using a cylinder supply.
2. Set the wall source control or cylinder regulator to 15 - 20 Pounds per Square Inch (psi). **Do not exceed 25 psi**.

PSI	Megapascals	Kilopascals	Bar
15 - 20 psi	0.103 - 0.137 Mpa	103.42 - 137.89 Kpa	1.03 - 1.378 bar

Please see the **Pressure Units Conversion table** on page 53**Error! Bookmark not defined.** in the Unit Specifications section for the formulas for converting psi into other units of pressure measurement.

3. Remove the dust cover from the CO_2 to Chamber port on the back of the incubator.
4. Connect the gas tubing to the incubator and regulator or wall source.
    a. Connect the **black tubing** to the regulator or wall source.
    b. Connect the **clear tubing** to the CO_2 to Chamber port on the back of the incubator.
5. **Do not initiate a flow of CO_2** to the incubator at this time.

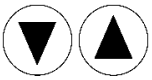
End of procedure

Figure 6: Gas Tubing Kit

Figure 7: CO_2 to Chamber

GRAPHIC SYMBOLS (CONTINUED)

The incubator is provided with multiple graphic symbols on its exterior and internal surfaces. These symbols identify hazards, and the functions of the adjustable components, as well as 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: Caution hot surface Indique: Avertissement symbole de surface chaude
	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 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)
	Indicates CO_2 Gas Indique gaz CO2

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CONTROL PANEL OVERVIEW

Figure 8: Control Panel

Power Switch

The round, black, main power switch controls all power to the incubator and its systems. “I” is the on position, and “O” the off.

Over Temperature Limit

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 21).

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

Temperature Control and Display

Labeled Set Temperature °C, this display shows the current air temperature in the incubation chamber accurate to within 0.1°C. The arrow 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.

Red LED alarm indicators marked High and Low illuminate whenever the temperature deviates by ±1°C or greater from the current set point. The yellow LED marked Mute illuminates whenever an audible deviation alarm is being muted. See the **Muting the Audible Temperature Alarm** entry on page 25 of the Operations section for more information.

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

CO_2 Control and Display Panel

Labeled **Set CO_2 %**, the display on this panel shows the concentration of CO_2 in the incubation chamber as a percentage of the chamber atmosphere, with a range of 0% to 20%. During the automatic decontamination cycle this display shows messages announcing which cycle stage the unit is running in, as well as a timer countdown while in the two-hour heat soak stage. The panel can also show the CO_2 set point, as well as display-adjustments while in gas calibration mode.

When starting the incubator, the display shows “LO” until the CO_2 sensor registers a concentration in the chamber greater than 0%. When initially injecting CO_2 into the chamber, a few minutes may be required to build up a sufficient concentration to register.

The **UP / DOWN** arrow pad can be used to adjust the CO_2 concentration set point and to mute audible gas deviation alarms. The control can also place the CO_2 display in its calibration mode, and be used to enter a calibration adjustment.

Red LED alarm indicators marked HIGH and LOW illuminate whenever CO_2 deviations of ±1% or greater from the set point are detected. The yellow LED marked MUTE illuminates whenever an audible deviation alarm component is being muted. See the **Muting the Audible CO_2 Alarm** entry on page 27 of the Operations section for more information.

Marked CO_2 INJECTING, this green LED indicator illuminates when the incubator is injecting CO_2 into the incubation chamber.

Decontamination Cycle Controls

This panel is used to initiate or abort the automated decontamination cycle. Its controls also lock and unlock the door prior to and after the cycle. Unlocking door after completing or aborting the cycle restores the system to its normal operations mode. The panel is also provided with LED lights that indicate what stage of the cycle or cycle-abort the incubator is in.

THEORY OF OPERATION

The SCO6AD is engineered to provide a constant temperature, humidified, CO_2-enriched incubation environment. The incubator can obtain a stable, uniform (±0.25°C) temperature in its chamber, ranging from the ambient (room) temperature +5°C up to 50°C. The unit is also provided with an automated high-heat decontamination cycle that does not require the removal of the CO_2 sensor or other electronic components.

The incubator features a glass viewing door that allows visual inspection of samples without compromising the chamber CO_2 or humidity environment.

Heating

When powered, the incubator heats to and maintains the incubation chamber air temperature at the currently programed 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 heating elements located in an insulating air jacket space surrounding the chamber on four sides and beneath the chamber floor.

A fan circulates air within the jacket, distributing heat and providing a temperature uniformity superior to direct radiant heating.

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.

The exterior chamber door is self-heating to bolster the thermal uniformity and stability of the chamber, and to minimize condensation on the glass viewing door. Leaving the exterior door open for long durations may adversely impact the temperature performance of the incubation chamber. It may also create condensation on the viewing door. Door openings should be restricted to the minimum necessary to view or access samples in the chamber.

The incubator relies on natural heat radiation for cooling. With the doors closed, the lowest chamber temperature that can be sustained is the ambient room temperature **plus the waste heat** generated by internal electrical and mechanical operations (the room temperature +5°C).

CO_2 Atmosphere

The same microprocessor board that controls the chamber temperature also manages the gas concentration of CO_2 in the chamber atmosphere by operating an internal injection solenoid valve connected to the gas input ports. The incubator monitors the chamber CO_2 concentration with an infrared sensor in a recirculation box above the incubation chamber. The sensor operates on the principle that a specific frequency set of infrared light is absorbed by CO_2.The more CO_2 present in chamber, the more of that band of infrared is absorbed. The sensor is only sensitive to CO_2, so measurement accuracy is consistent, regardless of the presence of other gasses in the incubator.

The processor employs proportional-integral-derivative analytic feedback-loop functions when measuring and controlling the CO_2 concentration. When the PID are active, injection lengths are proportional to the difference between the measured concentration and the set point. The frequency of injections is derived from the rate of change in the difference. Integrator feedback slows the rate of injection as the concentration approaches the set point, which helps prevent overshoots. When the chamber concentration is stable CO_2 injections take place in small bursts to correct for deviations less than 0.1%. The incubator is not provided with a means to actively remove CO_2 from the chamber atmosphere.

Humidification

Passive humidification is provided by filling the humidification pan included with the unit. The pan is then placed on the heated chamber floor. Evaporation driven in part by heating raises the relative humidity percentage (RH%) of the chamber. A copper token included with the pan helps to significantly slow the growth of microbiological populations in the humidification water supply.

The incubator must be operated humidified in order to achieve its stated temperature uniformity specification.

Decontamination Cycle

The SCO6AD comes with a user-initiated eight-hour high heat cycle designed to kill microbiological organisms. This automated cycle consists of three stages: A 1.5 hour ramp up from room or incubation temperature to 180°C; a 2 hour soak at 180°C; and a 4.5 hour cool down. Prior to launching a decontamination cycle the humidification pan should be drained and its copper antimicrobial token removed to prevent discoloration of the pan.

Physical and Data Access

A copper-filtered access port on the right side of the unit allows sensor and monitoring probes such as, thermocouples and humidity meter solid state probes, to be inserted and left in the chamber without compromising the CO_2 atmosphere. An atmosphere sample port for independently verifying the CO_2 concentration in the chamber is provided on a panel on the left side of the incubator. This panel also holds a dry contact port that activates whenever a temperature or CO_2 alarm is triggered. A USB-style serial port on the same panel outputs temperature and CO_2 levels as a digital logline once per minute. Please see the **Data Outputs** entry on page 37 for more details.

The Over Temperature Limit System (OTL)

When set, the OTL system prevents runaway heating in the event of a main control failure by depowering the heating element whenever the temperature in the incubator chamber exceeds the OTL setting. Typically the OTL is set 1°C above the temperature display's set point. Because of its nature as a cutoff system and its 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 incubation chamber until a failed controller board can be repaired or replaced.

PREPARING THE INCUBATOR FOR USE

Note: The preparation procedure requires approximately 20 hours to complete. This includes **at least** 8 hours for the incubator to achieve and stabilize at its temperature, humidity, and CO_2 levels, as well as 8 hours to run an auto decontamination cycle.

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 and humidity levels prior to loading the incubation chamber with samples. During this period the incubator must be powered continually, the humidification pan filled, and both the chamber and viewing doors closed. CO_2 may be supplied to the unit 2 hours prior to the completion of this stabilization period. Allowing time for stabilization helps protect samples. It is also necessary for the optional temperature and CO_2 display accuracy verification procedures, as well as any calibrations performed.

Perform the following steps and procedures to prepare the SCO6AD for use each time it is installed in a new workspace environment:

1. **Optional:** 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 28 for the correct introduction and placement of the thermocouple probe.

2. Verify that the port stopper is in place in the access port on the outside of the unit.
3. 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 12.

4. Attach the power cord that came with the incubator to the power inlet receptacle on the back of the unit.
5. Plug the power cord into the workspace supply outlet.

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

Procedure continued on next page

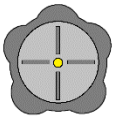
Preparation Procedure Continued

7. Perform the following procedures in the Operation section to finish preparing the incubator:

    a. **Humidifying the Incubator** page 23

    b. **Set the Temperature Set Point** page 24

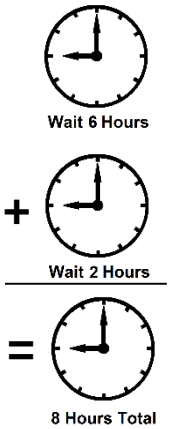
    Allow the incubator to heat undisturbed for 6 hours before continuing.



    c. Open the CO_2 supply control or gas regulator so it supplies a flow of 15 - 20 psi, as per the supply description on page 15.

    d. **Set the CO_2 Set Point** page 26

    After setting the set point, wait for an additional 2 hours for a CO_2 concentration to establish and stabilize in the chamber, and for the unit to finish stabilizing thermally, undisturbed with no door openings.



    e. **Optional: Verify Temperature Display Accuracy** page 28

    f. **Optional: Verify CO_2 Display Accuracy** page 30

    g. **Run a decontamination cycle** page 32

    h. **Set the Over Temperature Limit** page 36

    i. **Load the Chamber** page 37

End of Preparation Procedure

HUMIDIFYING THE INCUBATOR

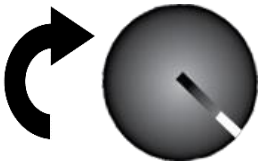
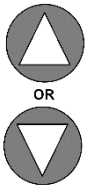
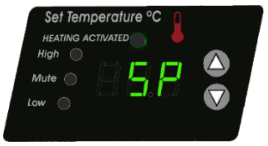
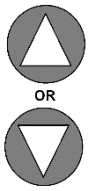
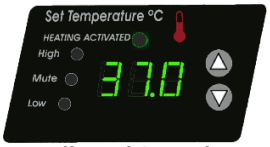
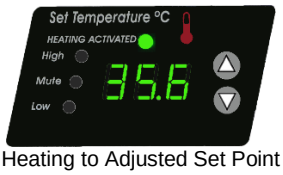
Fill the humidification pan in the incubation chamber. Make sure the pan has been placed on the chamber floor. The floor is heated and will help drive evaporation to raise the humidity level to 90 – 95% relative humidity. This helps slow the drying of samples in open, “breathable” containers.

- The humidification pan must be filled in order for the incubator to achieve its stated temperature uniformity specification.
- Always place and secure the copper token in the pan to slow the growth of microbiological populations in humidification water supply.
- Regularly clean and disinfect, or decontaminate the pan.
- Refill as needed, and change the water in the pan at least once per week.
- Use of chemical disinfectants added to the pan may alter the surface tension of the water. This may significantly reduce the rate of evaporation and impact the humidity level of the incubator chamber.
- **Never use deionized water** to humidify the incubator.

SET THE TEMPERATURE SET POINT

Perform the steps below to change the set point to the operational temperature you will be using during your incubation application. 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	
1. Turn the **OTL** control clockwise to the maximum, if not already set to max. a. This prevents the over temperature limit system from interfering with setting the set point.	
 OR 2. Press and release either of the **temperature arrows** to activate the temperature set point adjustment mode. a. The temperature display will briefly flash the letters “SP” to indicate the Set Point is about to be displayed. b. The temperature display will then show the flashing, adjustable temperature set point. **Note:** The display will automatically exit the adjustment mode after 5 seconds of inactivity, with the last shown set point value saved.	  **Initial Set Point**
 OR 3. Use the **Up** or the **Down arrow keys** to adjust the set point to your application temperature.	 **Adjusted Set Point**
4. Wait 5 seconds after entering the set point.  **Wait 5 Seconds** a. The display will stop flashing; the set point is now saved in the controller. b. The chamber will now automatically heat or passively cool to match your set point. c. The display will revert to showing the current chamber air temperature.	 Heating to Adjusted Set Point
See the **Set the OTL procedure** on page 36 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

MUTING THE AUDIBLE TEMPERATURE ALARM

An audible and visual high or low deviation alarm will activate if the incubation chamber temperature deviates by 1°C or more above or below the temperature set point. The low deviation audible alarm has a delay of 15 minutes. This prevents the low alarm from sounding whenever the doors are opened, causing a short drop in temperature.

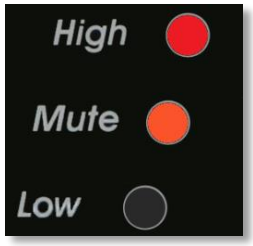
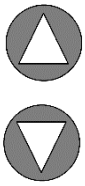


Figure 9: High Alarm Muted



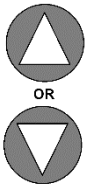
1. To mute an active high or low deviation alarm, press and hold either the **Up** or **Down arrow** on the Temperature Control panel, until the amber Mute LED illuminates and the audible alarm shuts off.
2. The audible alarm component will remain muted for the duration of the **current** temperature deviation. The visual alarm indicator will remain illuminated.
3. Any new deviation of ±1°C or greater will reactivate the audible alarm.

AUTOMATIC DOOR CUTOFF

Whenever the incubation chamber outer door is opened, the incubator stops the flow of CO_2 into the chamber, depowers the heater element, and ceases operation of the internal blower fan. This limits the amount of CO_2 released into the workspace around the incubator. It also prevents the heater from attempting to counteract the continual inflow of cooler air, which would cause a significant heat spike once the door is closed. Normal CO_2 injections, heating, and fan operation all resume automatically when the outer door is closed.

SET THE CO_2 SET POINT

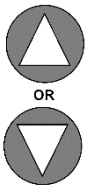
The incubator comes from the factory set to Off. Set the CO_2 set point to that of your application. The gas supply must continually deliver 15 - 20 psi while establishing and maintaining a CO_2-enriched chamber atmosphere. A CO_2 flow to the chamber must be started a minimum of 2 hours prior to the start of a display verification or calibration, or prior to loading samples in the chamber. The CO_2 display will read “LO” until enough CO_2 has built up for the sensor to register a concentration greater than 0%.



1. Press either the **Up** or **Down** arrow button on the CO_2 panel.
   a. The display will flash the letters “SP” for set point.
   b. A flashing, adjustable CO_2 set point will appear in the display.

Note: The display will automatically exit the adjustment mode after 5 seconds of inactivity, with the last shown set point value saved.

Initial Set Point



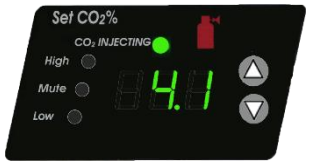
2. Use the **Up** or the **Down arrow keys** to adjust the set point to your application CO_2 concentration.

Note: This example represents adjusting the CO_2 set point from off to 5%.

New Set Point

3. Wait 5 seconds after entering the set point.

   a. The display will stop flashing, and the set point is now saved in the controller processor.
   b. The chamber will now automatically inject CO_2 or allow the current level to decay in order to achieve your set point.
   c. The display will revert to showing the current chamber concentration.



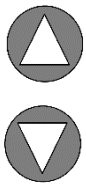
CO_2 Injecting to achieve the new set point.

Note: The CO_2 display and injections can be set to off when in the set point adjustment mode. Hold the down arrow after the blinking set point appears until the display reads “OFF”. The incubator will cease injecting CO_2.

End of procedure

MUTING THE AUDIBLE CO_2 ALARM

Visual high or low deviation indicator alarms will illuminate if the chamber CO_2 level deviates 1% above or below the CO_2 set point. An audible alarm sounds immediately for a high deviation. The low deviation audible alarm will sound after the visual low indicator alarm has been continually illuminated for 15 minutes. This delay prevents the alarm from sounding whenever a door opening creates a short-lived drop in gas concentration.



1. To mute an alarm, press and hold the CO_2 **Up** or the **Down** arrow button until the amber Mute LED illuminates.
2. The alarm will stay muted for the duration of the **current** temperature deviation.
3. Another deviation of 1% will reactivate the audible alarm.

Figure 11: Gas Alarm Timeline

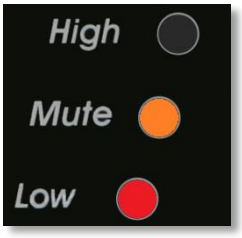


Figure 10: Low Gas Alarm Muted

NO GAS SUPPLY ALARM (NGS)

If the Low Gas deviation indicator is active for longer than 20 minutes, a second alarm will activate. The letters “ngS” will appear in the CO_2 display to indicate **No Gas Supply**. The alarm will remain active even if the incubator is turned off and turned back on. The NGS Alarm will remain on until CO_2 is restored to the chamber. It may take 2 or more minutes of CO_2 inflow to establish a concentration percentage (%) high enough to deactivate the alarm.

Figure 12: No Gas Supply

TEMPERATURE 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 37ºC. 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 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 43 in the User Maintenance section.

Humidity

Perform the verification with the chamber fully humidified. The humidity level of the chamber impacts its temperature uniformity. 8-hours are required for the unit to achieve and stabilize at its operational relative humidity level of 90 – 95%, from a dry state.

CO_2

A CO_2 display verification may be performed concurrently with the temperature verification.

Probes

Reference device sensing probes may be introduced through the access port. Carefully seat the port stopper over any probe wires, or use non-stick, non-marking tape to seal any gaps if there is no room for the stopper. Use non-stick, non-marking tape to secure the wires and probe head, and to seal any gaps.

Figure 13: Introducing a sensor probe through the access port.

Place the sensor probe head of the temperature reference device 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 14). An exposed sensor probe in direct contact with the shelving may experience heat sinking, which can result in an inaccurate temperature reading.

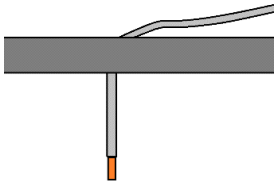
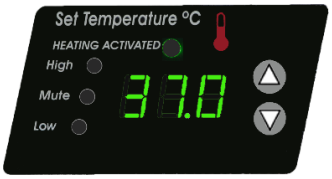
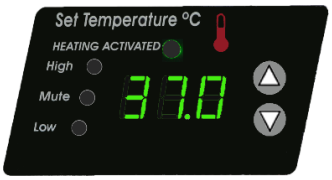


Figure 14: Probe End 2 inches (5cm) From Shelf Surface

Temperature Stability

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

The incubator must operate humidified 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.

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**   ✓
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 43 in the User Maintenance section.	Reference Device   ✗

End of procedure

CO_2 ACCURACY VERIFICATION

Note: Performing a CO_2 display accuracy verification requires a gas reference device. Please see the **Reference Sensor Devices entry** on page 10 for the device requirements.

Optional: The CO_2 display was calibrated at the factory at a 5% concentration. A display accuracy verification may be performed when preparing the incubator for use, if required by your laboratory or production protocol. The verification procedure compares the chamber CO_2 level as measured by the incubator with the actual level, as provided by a calibrated reference device.

If a difference between the actual and displayed CO_2 concentrations is discovered, perform a CO_2 display calibration. Please see the **Calibrate CO_2 Display procedure** on page 44 in the User Maintenance section.

Temperature

A CO_2 display verification may be performed simultaneously with the temperature display verification, **as long as the chamber door is not opened** during either procedure. The incubation chamber should be heated to and running at your application temperature, as temperature drives gas diffusion in the chamber.

Humidity

The incubator should be allowed to come up to humidity in the chamber prior to performing a CO_2 verification. Relative humidity affects CO_2 distribution due to its influence on the chamber atmosphere temperature.

Probes

Connect a CO_2 reference device sample tube to the sample port, located on the left side of the incubator, adjacent to the control panel.

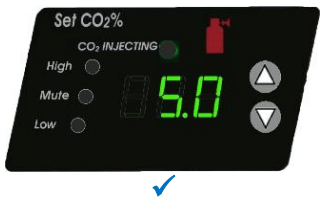
Figure 15: CO_2 Sample Port

Gas Stability

Allow the unit to operate undisturbed to run for at least 8 hours for heat and humidity stability (for example, overnight) prior to performing the verifications. A CO_2 flow to the chamber may be started 2 hours prior to the start of the verification.

Prior to a verification, the chamber must operate at its CO_2 set point for **at least 1 hour with no fluctuations** of ±0.1% 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.

Continued on next page

Verifying the CO_2 Display Accuracy	
1. Once the chamber has stabilized with no fluctuations of 0.1% or greater, compare the gas reference device and chamber CO_2 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 CO_2 concentration. **The CO_2 Verification procedure is now complete**. b. See step 2 if a difference falls outside the acceptable range of your protocol.	**Reference Device**   ✓
2. If there is an unacceptable difference, a **CO_2 calibration** must be performed to match the display to the reference device. a. Please see page 44 in the User Maintenance section.	**Reference Device**   ✘

End of procedure

Note: The incubator was run through a decontamination cycle at the factory. However, the manufacturer cannot guarantee the unit was not been exposed to contaminants during shipping.

LAUNCHING THE DECONTAMINATION CYCLE

Carryout the following steps to launch the auto decontamination cycle.

1. Remove all samples and equipment.
2. Leave shelving inside the chamber, if allowed by your laboratory protocol.
3. Empty the humidification pan of all water.
    a. Failure to empty the pan will extend the ramp up heating and cool down stages of the decontamination cycle. This may adversely impact the cycle efficacy.
4. Remove the copper token from the humidification pan.
    a. Leaving the token in the pan during a decontamination cycle will result in oxidation of the token, and possible discoloration or staining of the humidification pan.
    b. Manually disinfect the token using disinfectants and cleaning methods appropriate to your laboratory protocol.
5. Place the humidification pan back on the chamber floor.
6. Close both the internal and external incubator chamber doors.
    a. The decontamination cycle will not initiate while the doors are open.

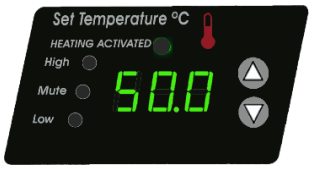
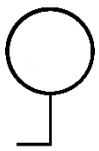
Procedure continued on next page

Note: The infrared CO_2 sensor is protected from exposure to high temperatures during the decontamination cycle. It does not need to be removed at any point during normal operations, including decontamination.

Note: The incubator automatically ceases injecting CO_2 for the duration of the cycle. The cycle will not trip the Over Temperature Limit system.

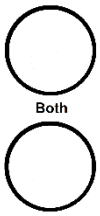
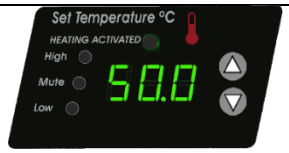
Decontamination Cycle (Continued)	
7. Take the unit out of normal operations. a. Press and hold the **Operation Selector Switch** on the Decontamination Cycle display until the amber Decon Cycle indicator begins flashing. b. The green Normal Operation indicator will extinguish.	
8. Launch the decontamination cycle. a. Press and hold the **Decontamination Cycle Switch** until the amber Decon Cycle and red Decon Activated indicators **flash alternatingly**. b. The doors will lock with an audible click.	
9. Ramp up stage. a. The Decon Cycle and Decon Activated light will continue to **flash alternatingly** while the incubator ramps up to 180°C. b. The CO_2 display will show the letters “dEC” to indicate that the decontamination cycle is running. c. Under normal conditions the ramp up will take 1.5 hours (90 minutes). However, the presence of additional mass such as, water in the humidification pan, may extend the ramp up period as more material must be brought to temperature.	 
10. Soak stage. a. When the incubator chamber air temperature reaches 180°C, the Decon Cycle and Decon Activated lights will **remain on continuously**. b. The CO_2 display will show a countdown, starting at 120 minutes. c. The 2-hour heat soak period is required to kill most microbiological organisms.	 

Procedure continued on next page

Decontamination Cycle (Continued)	
11. Cooldown stage. a. When the CO_2 display reaches 0, the display will show the letters “CdN”. This indicates that the cycle has entered the cool down stage. The amber Decon Cycle and green Normal Operation indicators will **flash alternatingly** throughout the cool down.	 
12. The cool down stage ends when the chamber air temperature reaches 50°C. a. The CO_2 display will show the letters “PAS” when the cycle has concluded. b. The door will unlock, accompanied by click.	 
13. Restore the incubator to normal operations mode.  a. Press and hold the **Operation Selector switch** until the amber Decon Cycle light extinguishes, and the green Normal Operation indicator remains on continuously. b. The CO_2 display will return to showing the CO_2 concentration in the chamber.	 

End of procedure

ABORTING THE DECONTAMINATION AUTO CYCLE

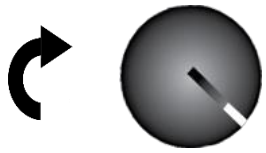
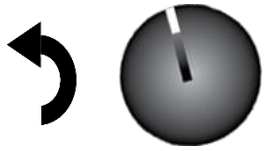
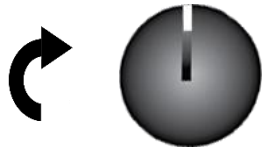
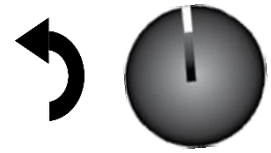
1. Press and hold **both** the **Decontamination Cycle Switch** and **the Normal Operation Switch** for approximately 4 seconds.  a. The CO_2 display will show the letters “Ab” to indicate that SCO6AD has successfully aborted the cycle. b. The Decon Activated indicator light will extinguish, though the Decon Cycle light will remain illuminated.	 
2. The CO_2 display will then show the letters “Cdn”. a. This indicates that the incubator is cooling down. b. The amber Decontamination Cycle and green Normal Operation indicators will **flash alternatingly** throughout the cool down stage. **Note:** The door will remain locked during the cool down stage. This is a safety feature to safeguard against injuries caused by exposure to hot chamber surfaces and shelving.	 
3. The cool down period ends when the temperature reaches 50°C. a. The door will unlock, accompanied by a click. b. The CO_2 display will show the letters “PAS” when the abort has concluded.	 
4. Return the SCO6AD to normal operations. a. Press and hold the **Operation Selector Switch**. b. The CO_2 display will return to showing the gas concentration level in the chamber. c. The amber Decon Cycle indicator will deactivate. The green Normal Operation light will illuminate.	 

End of procedure

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 1 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 maximum.	
2. Turn the Over Temperature Limit control 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 chamber temperature. 	
4. **Optional**: You may turn the dial slightly to the left to bracket in closer to the set point temperature. This sets the OT Limit nearer to the current chamber temperature. 	
5. Leave the OTL dial set just above the activation point.	

If the OTL sporadically activates after setting it, 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 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

LOAD THE INCUBATOR

Place items on the shelves inside the incubation chamber as evenly spaced 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**.

ACCESSORY COMPATIBILITY

Make sure that any accessory equipment used inside the incubation chamber can safely and effectively operate within your selected range of temperature, humidity, and CO_2 levels.

DATA OUTPUT CAPABILITIES

The incubator generates data outputs describing temperature and CO_2 as a digital log line, once per minute. These outputs are transmitted through a USB-style RS232 serial port located on the left side of the incubator. A software driver and data logging package for the port can be downloaded from the Shel Lab website.

To download the software, visit the product page of any Shel Lab SCO incubator, and click on the large USB bar icon titled “USB Software for CO_2 Incubators” located approximately halfway down the page.

http://shellab.com/product/sco6ad-high-heat-decontamination-co2-incubator-5-9-cu-ft/

USB-Style Serial Port Output

Output Channel	Parameter
C1	Temperature
C3	CO_2

Example logline output: **C1=37.0 C3=5.0**

A dry contact alarm port communicates any alarm activation instances.

Continued on next page

Optional Outputs

SCO6AD units may be ordered from the factory equipped with a 4 – 20 milliamp analog output board as a special quote (SQ) unit.

The analog 4-20 milliamp outputs can be connected to a building management system (BMS) or other data monitoring and capture system through the use of two jack ports on the left side of the incubator. These ports accept standard audio jacks available from most electronics retailers (¼ inch 2-pole audio connectors, also known as phono jacks). Jacks are **not** included with the incubator.

Data Monitoring Systems – Max Resistance

For building management and other data monitoring or logging systems the maximum resistance of the current loop driven by either output from the 4-20mA module is 250 Ohms. At higher loop resistances the current value will be erroneously low for parameter values near the top of the scale.

Jack Outputs:

Parameter	Parameter Value at 4mA	Parameter Value at 20mA
Temperature	0°C	70°C
CO_2	0% CO_2	20% CO_2

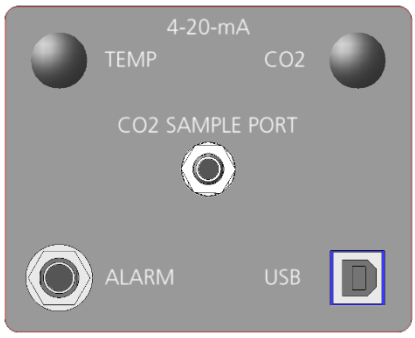


Figure 16: Data Ports

CONDENSATION AND THE DEW POINT

Relative humidity inside the incubator chamber should never be allowed to exceed 95%. Exceeding this thresholds will likely result in condensation, possible leaks around the incubator, and may cause corrosion damage if allowed to continue for any significant length of time.

Condensation appears wherever the humidity level in the incubation 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, condensation will first appear on surfaces that are cooler than the air temperature. Near the dew point, condensation will form on any item or exposed surface that is even slightly cooler than the air. When the dew point is reached, condensation 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 condensation is forming in the incubation chamber, wipe down and dry the chamber surfaces, then check the following:

- Is the access port stopper properly seated in the port on the **outside** of the unit? The SCO6AD depends on a controlled atmospheric leak rate through its copper-filtered access port to help prevent condensation. Stopping up the port by placing the stopper in the port **inside the chamber** interferes with this leak rate.
- Make sure samples and items are as evenly spaced as possible for good air circulation. There should be at least 1 inch (2.5cm) between samples and the chamber walls and door.
- Are frequent or lengthy chamber door openings causing significant temperature disruptions? If so, reduce the number of openings. Utilize the glass viewing door when conducting visual inspections of samples.
- Are the viewing and chamber doors closing and latching properly? Are the door gaskets leaking? Check each gasket for damage, wear, or signs of brittleness or dryness. Replace gaskets if needed.
- Are there are too many open or "breathable" containers of evaporating sample media in the chamber? If so, reduce the number of sample containers.
- 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.
- Does the ambient humidity in the room exceed the stated operating range of 80% relative humidity? If so, lower the room humidity.

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 stainless steel 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 nettoyants 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.
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

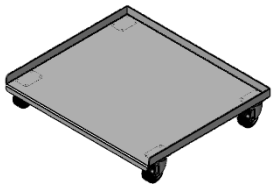
Disinfect the incubation chamber on a regular basis. Perform the following steps to manually disinfect the incubator:

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 possible, 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 temperature sensor probes.
5. Gas concentrations from evaporating disinfecting agents can inhibit growth or 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 doors are opened during normal operations.
- Placing the unit on a rolling caster platform will facilitate cleaning of the floor around the unit. If possible, move floor seated units out of the space prior to cleaning the floor there. See the **Accessories** section on page 56 to order a castor platform from Sheldon Manufacturing.



HEPA Filter and Gas Lines

Sheldon Manufacturing recommends replacing the external in-line gas HEPA filter once per year, or more often when the filter is noticeably discolored. The filter is directional, and must be installed facing in the correct direction. The word "IN" is stamped on the rim of the filter assembly on the side that faces toward the gas source.

Gas lines should be replaced when cracking, brittleness, permanent kinking, or other signs of damage are present. Please see the **Parts List** on 54.

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 prior to drying 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.

Door and Electrical Components

Inspect the door latch, trim, catch, and gasket for signs of deterioration every six months. Failure to maintain the integrity of the door components shortens the lifespan of the incubator.

Electrical components do not require maintenance. If the SCO6AD fails to operate as specified, please contact your Shel Lab dealer or distributor or Shel Lab Technical Support for assistance.

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 humidified and heated chamber space. Calibrate as often as required by your laboratory or production protocol, or regulatory compliance schedule.

Humidity

Humidity affects the incubation chamber temperature uniformity. Calibrate with the chamber humidified.

CO_2

A CO_2 calibration may be conducted simultaneously with a temperature calibration **as long as the chamber door is not opened** during either procedure.

Probe

Reference device sensing probes may be introduced through the access port. Carefully seat the port stopper over any probe wires, or use non-stick, non-marking tape to seal any gaps, if there is no room for the stopper. Use non-stick, non-marking tape to secure the wires and probe head.

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

Place the sensor probe of the temperature reference device inside 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 18). 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 must operate undisturbed and humidified at its application temperature set point 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.

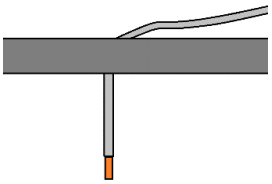
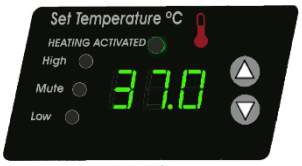
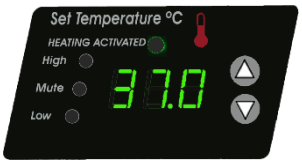
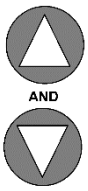
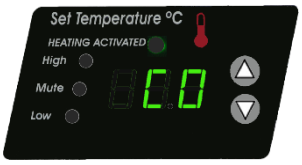


Figure 18: Probe End 2 inches (5cm) From Shelf Surface

Failure to humidify the chamber will result in an inaccurate calibration and display reading.

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.

Temperature 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**   ✓
2. A display calibration adjustment must be entered to match the display to the reference device. See next step.	**Reference Device**   ✗
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.	

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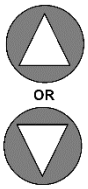
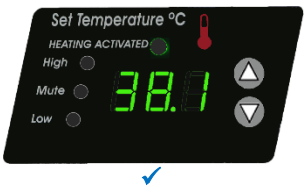
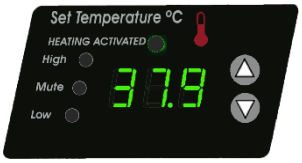
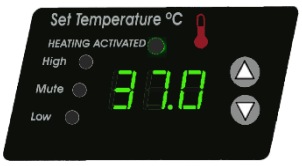
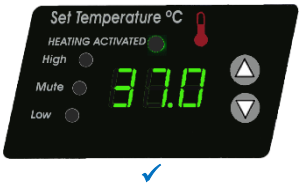
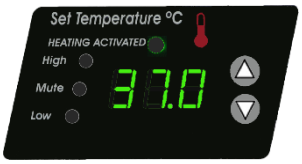
USER MAINTENANCE (CONTINUED)

Temperature 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**   ✓
5. After correcting for the difference, wait 5 seconds.  a. The temperature display will cease flashing and store the corrected chamber display value. b. The incubator will now begin heating or passively cooling in order to reach the set point with the corrected display value.	 **Adjusting to Set Point**
 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**. a. Failure to wait until the incubation chamber is fully stabilized will result in an inaccurate reading.	
7. Compare the reference device reading with the chamber temperature display again. a. If the reference device and the chamber 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   ✓

Continued on next page

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

End of procedure

CALIBRATE THE CO_2 DISPLAY

Note: Performing a CO_2 display calibration requires a gas reference device. Please see the **Reference Sensor Devices entry** on page 10 for the device requirements.

CO_2 calibrations are performed to match the incubator CO_2 display to the actual gas concentration in the incubation chamber. The actual concentration 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 IR CO_2 sensor when continually exposed to a heated and humidified atmosphere with elevated CO_2 concentrations. Calibrate as often as required by your laboratory or production protocol, or regulatory compliance schedule.

CO_2 Supply

The incubator must be powered, the CO_2 set point set, and the chamber supplied with CO_2 for at least two hours prior to the calibration.

Temperature

Temperature drives gas diffusion in the chamber. CO_2 calibrations must be performed with the chamber fully heated and stable at your operational temperature set point. A CO_2 display calibration may be performed during a temperature calibration **as long as the chamber door is not opened during either procedure**.

Humidity

Because humidity impacts CO_2 concentration through its influence on temperature stability and uniformity, the CO_2 display should be calibrated with the chamber humidified.

Probes

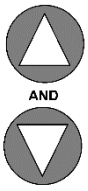
Connect a digital CO_2 analyzer sample tube to the sample port, located on the left side of the incubator, adjacent to the control panel.

Figure 19: CO_2 Sample Port

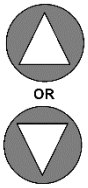
Stability

Prior to a calibration the chamber must operate at its CO_2 set point for **at least 1 hour with no fluctuations** of ±0.1% or greater in order to be considered stabilized. Failure to wait for stabilization will result in an inaccurate calibration and incubator display reading.

For best results, allow the unit to operate undisturbed for 8 hours supplied to achieve temperature and RH stability (for example, overnight). A continual CO_2 supply stream may be introduced a minimum of 2 hours, with the incubator otherwise undisturbed, prior to performing the calibration.

Calibrate the CO_2 Display	
1. Once the incubation chamber has stabilized, compare the gas reference device and chamber CO_2 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 CO_2 concentration. **The CO_2 calibration procedure is now complete**. b. If there is a difference between the two readings that falls outside the acceptable range of your protocol see the next step.	Reference Device   ✓
2. A display calibration adjustment must be entered to match the incubator CO_2 display to the reference device.	Reference Device   ✗
3. Place the display in its CO_2 calibration mode.  a. Press and hold both the **UP and DOWN** Set CO_2 arrow buttons simultaneously for approximately 5 seconds. b. Release the buttons when the display shows the letters “CO”. The display will begin flashing the **current CO_2 display value**. **Note:** If an arrow key is not pressed for 5 seconds, the display will cease flashing, and store the last displayed value as the new current chamber CO_2 value.	

Procedure continued on next page

Calibrate the CO_2 Display (Continued)	
 OR 4. Use the **Up** or **Down** arrows to adjust the current CO_2 display value until it matches the reference device CO_2 reading.	Reference Device   ✓
5. After matching the display to the reference device, wait 5 seconds.  Wait 5 Seconds a. The display will cease flashing and store the corrected display value. b. The incubator will begin injecting CO_2 or allow the current gas concentration to decay in order to achieve the set point with the corrected display value.	 **Adjusting to Set Point**
 Wait 1 Hour 6. Allow the incubator to operate undisturbed for at least 1 hour to stabilize after it has achieved the CO_2 set point **with the corrected display value**. a. Failure to wait until the unit is fully stabilized will result in an inaccurate reading and calibration.	
7. Compare the reference device reading with the incubator CO_2 display again. a. If the reference device and the CO_2 display readings are the same or the difference now falls within the range of your protocol, **the incubator is now calibrated for CO_2**. b. See next step if the difference still falls outside your protocol range.	Reference Device   ✓

Procedure continued on next page

CO_2 Calibration (Continued)	
8. Repeat steps 3 – 7 up to two more times if a difference that still falls outside your protocol range. a. Three calibration attempts may be required to successfully calibrate units that are more than ±2% out of calibration.	**Reference Device**   ✖
9. If the CO_2 readings of the display and the reference device still fall outside your protocol after three calibration attempts, contact your distributor or **Technical Support** for assistance.	

End of procedure

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UNIT SPECIFICATIONS

The SCO6AD High Heat Auto-Decontamination Incubator is a 100–120 voltage unit. Please refer to your incubator's 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 ±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

Shipping	Net Weight
302 lbs. / 137 kg	238 lbs. / 108 kg

DIMENSIONS

By inches

Exterior W × D × H	Interior W × D × H
28.5 x 30.8 x 39.5 inches	20.2 x 20 x 25.5 inches

By centimeters

Exterior W × D × H	Interior W × D × H
72.4 x 78.2 x 100.4 cm	51.4 x 50.8 x 64.7 cm

Access Port

Diameter
1.5 inches (3.8 cm)

CAPACITY

Cubic Feet	Liters
5.9	167

CO_2

Range	Accuracy	Recovery Time
0 – 20%	± 0.1%	Less than 5 minutes

TEMPERATURE

Range	Uniformity	Stability
Ambient +5ºC to 50ºC	± 0.25ºC at 37ºC	± 0.1°C @ 37°C

POWER

Model	AC Voltage	Amperage	Frequency
SCO6AD	110 – 120	12.0	50/60 Hz

PRESSURE CONVERSION TABLE

Conversion table for pressure units

	kPa	MPa	kgf/cm^2	bar	psi	mmHg (Torr)	inHg	atm
1 kPa	1	1×10^{-3}	1.01972×10^{-2}	1×10^{-2}	1.45038×10^{-1}	7.50062	0.2953	9.86923×10^{-3}
1 MPa	1×10^{3}	1	1.01972×10	1×10	1.45038×10^{2}	7.50062×10^{3}	0.2953×10^{3}	9.86923
1 kgf/cm^2	9.80665×10	9.80665×10^{-2}	1	9.80665×10^{-1}	1.42234×10	7.35559×10^{2}	2.8959×10	9.67841×10^{-1}
1 bar	1×10^{2}	1×10^{-1}	1.01972	1	1.45038×10	7.50062×10^{2}	2.953×10	9.86923×10^{-1}
1 psi	6.89473	6.89473×10^{-3}	7.03065×10^{-2}	6.89473×10^{-2}	1	5.17147×10	2.036	6.80457×10^{-2}
1 mmHg (1 Torr)	1.33322×10^{-1}	1.33322×10^{-4}	1.35951×10^{-3}	1.33322×10^{-3}	1.93368×10^{-2}	1	3.9370×10^{-2}	1.31579×10^{-3}
1 inHg	3.3864	3.3864×10^{-3}	3.4531×10^{-2}	3.3864×10^{-2}	0.4912	2.5400×10	1	3.342×10^{-2}
1 atm	1.01325×10^{2}	1.01325×10^{-1}	1.03323	1.01325	1.46960×10	7.60000×10^{2}	2.9921×10	1

Figure 20: Pressure Conversion Table

PARTS LIST

COMPONENTS

Description	Parts Number	Description	Parts Number
Access Port Stopper	 7750565	Humidification Pan	 995-0015
Brass Tubing Fitting (Gas Tubing Kit Component)	 3100520	Humidification Pan Copper Antimicrobial Token	 5800529
Door Gasket Inner	 3450644	Power Cord 125 volt 9ft 5 in (2.86m) NEMA 5-15P	 1800510
Door Gasket Exterior (Sold by the foot. Requires 9 feet)	 3450534	Shelf Slide	 5121028
Feet, Leveling	 2700506	Shelf Standard	 5170646
Fuse, 12.5 Amp, 1250V,Type H, 5x20mm	 3300520	Stainless Steel Shelf	 5121777
HEPA Filter for CO_2 Gas Line (Tubing Kit Component)	 2800525	Tubing Black 1/8 OD (Gas Tubing Kit Component)	 8500516
Gas Tubing Kit Complete	 9710500	Tubing Clear 5/16 OD (Gas Tubing Kit Component)	 8500512

ORDERING PARTS AND CONSUMABLES

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 not certain 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 incubator ready, as Tech Support will need this information to match your unit with its correct part.

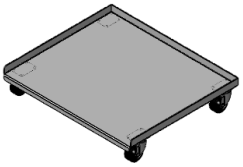
ACCESORIES

Shel Lab offers the following accessories for the SCO6AD

Caster Platform

A rolling platform for the SCO6AD. Allows for greater ease of transportation and cleaning of floor space.

Part Number 9000574



CO_2 Cylinder Regulator

Part Number 7150509

Compressed Gas Cylinder Switcher, Automatic

Allows two gas cylinders to be connected to one gas port, and automatically switches from the first to the second cylinder when the first is empty.

Part Number 2002-B

Copper Shelf Assembly

Three copper shelves. Includes six copper shelf slides. Copper is known to have antimicrobial properties.

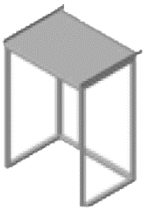
Part Number: 9750582 complete assembly described above.

PN 5820504 Individual Shelf PN 5820505 Individual Slide

Stacking Stand

A stacking stand for two SCO6AD incubators

Part Number 9000575



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®