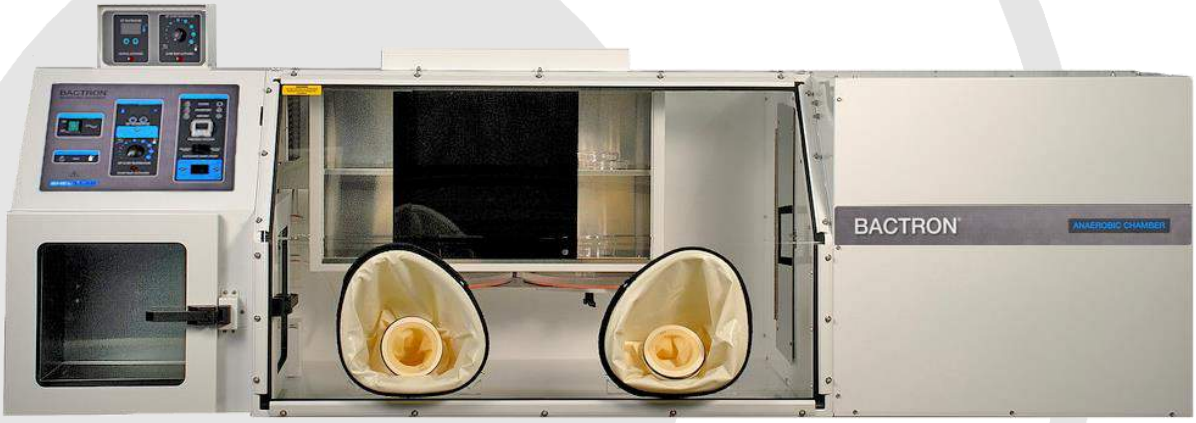
BACTRON® 110 – 120 Volts

SHEL LAB®



Installation and Operation Manual

BACTRON300, BACTRON600, BACTRON900

Previously Designated:

BACTRONII, BACTRONIV, BACTRONIV-900

BACTRON Anaerobic Workstation 110 - 120 Volts

Installation and Operation Manual

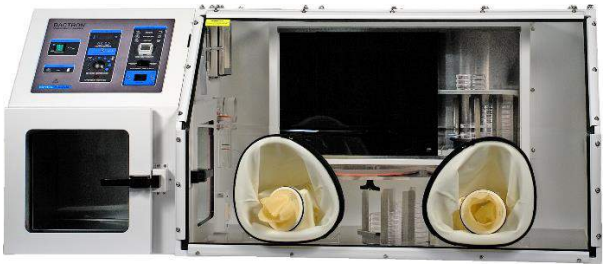
Part number (Manual): 4861700-1

Revision: August 27, 2014

Pictured on Cover: BACTRON900 (BACTRONIV-900)

BACTRON600 (BACTRONIV)

BACTRON300 (BACTRONII)



These units are TÜV CUE listed as Climactic Chambers (Anaerobic Chambers) for professional, industrial, or educational use where the preparation or testing of materials is done at approximately atmospheric pressure and no flammable, volatile, or combustible materials are being heated.

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 + 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 Shel Lab BACTRON Anaerobic Chamber Workstation. 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 there if you need us.

BACTRON workstations are intended for professional, industrial, and educational applications as anaerobic workstations suitable for the cultivation of clinical bacteria. These units are not intended for use at hazardous or household locations. Only use this equipment for its intended spectrum of applications; any alterations or modifications void the warranty.

Before using the BACTRON read this entire manual carefully to understand how to install, operate, and maintain the workstation in a safe manner. Keep this manual available for use by all workstation operators. Ensure that all operators are given appropriate training prior to using the BACTRON.

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 BACTRON and its recommended accessories are designed and tested to meet strict safety requirements. The workstation is built to connect to a wall power source using the specific power cord type shipped with the unit.

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

- Follow all local or regional ordinances in your area regarding the use of this unit. If you have any questions about local regulations, please contact the appropriate agency.
- Use only approved accessories. Do not modify system components. Any alterations or modifications to your BACTRON can be dangerous and void your warranty.
- Always plug the BACTRON power cord into an earth grounded electrical outlet that conforms to national and local electrical codes. If the workstation 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.
- Do not position the workstation in such a manner as to make it difficult to unplug the unit in the event of an emergency.
- Ensure that the vacuum line from the vacuum pump to the workstation is not kinked, and that the pump is placed in a location with adequate ventilation to avoid overheating.
- Do not attempt to move the workstation while in operation.

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 BACTRON, 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**. These will be found on the unit's data plate, which is located in the workspace chamber next to the inner pass box door. See page 8.

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

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

RECEIVING YOUR BACTRON

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

This makes it important that you inspect your BACTRON for concealed loss or damage to its interior and exterior when receiving it. If you find any damage to the workstation, follow the carrier's procedure for claiming damage or loss.

INSPECTING THE SHIPMENT

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

Verify that the correct number of components are included with the unit:

Anaerobic Indicator Strips (5 packets)

Arm Port Door Left and Right

PN 9900699 / PN 9900698

BACTRON300 / 900 Shelf Spacers

5680502

BACTRON600 Arm Port Door Stands

9990761

Catalyst Cartridges (2)

9990759

Foot Pedal Unit

9990735

Gas Regulator, AMG

7150511

LED Lamp Unit

9730514

Leveling Feet (4)

2700506

BACTRON300 Petrie Dish Rack

5110729

7 (2 x 11)

BACTRON600 Petrie Dish Rack

5110730

10 (2 x 13)

BACTRON900 Petrie Dish Racks

7 (2 x 11) 10 (2 x 13)

Power Cord 5-15 NEMA

1800540

Vacuum Pump

9740502

Sleeve Cuff Assemblies

9990738M

2 (Size 8 Medium)

RECEIVING YOUR BACTRON (CONTINUED)

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

RETURNING THE SHIPMENT

If you must return the BACTRON for any reason, contact your Shel Lab service representative for a return of material authorization (RMA). You must provide the unit's data plate information for an RMA. See Recording Data Plate Information below. Returns without RMAs will not be accepted.

BACTRONs that have been exposed to contaminants such as, pathogenic microorganisms or toxic substances, are required to undergo a decontamination procedure prior to the issuance of an RMA and shipping. Contact your service representative for details.

RECORDING DATA PLATE INFORMATION

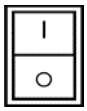
Locate the data plate in the workspace chamber above the inner pass box door. The data plate contains the BACTRON's model number and serial number. Enter this information below for future reference.

Date Plate Information

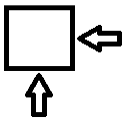
Model Number	
Serial Number	

GRAPHIC SYMBOLS

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

Symbol	Definition
	Indicates that you should consult your service manual for further instructions. Indique que l'opérateur doit consulter le manuel d'utilisation pour y trouver les instructions complémentaires.
	Indicates Temperature Repère température
	Indicates the Over Temperature Limit system Indique le système de dépassement de temperature
	Indicates AC Power Repère le courant alternatif
	Indicates I/ON and O/OFF I repère de la position MARCHE de l'interrupteur d'alimentation O repère de la position ARRÊT de l'interrupteur d'alimentation
	Indicates protective earth ground Repère terre électrique
	Indicates UP and DOWN respectively Touches de déplacements respectifs vers le HAUT et le BA
	Indicates Manually Adjustable Indique un bouton réglable manuellement
	Indicates Potential Shock Hazard Signale danger électrique

GRAPHIC SYMBOLS (CONTINUED)

Symbol	Definition
	WEEE Directive compliant logo 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 an anaerobic environment in the pass box Indique un environnement anaérobie dans le sas
	Indicates an aerobic environment in the pass box Indique un environnement aérobie dans le sas
	Indicates a injection of gas Indique un flux de gazeux
	Indicates the vacuum pump is evacuating the pass box Indique la pompe à vide se vide dans le sas
	Indicates the incubator heater is active L'élément chauffant est la production de chaleur
	Indicates the pass box doors are closed Indique les portes du sas sont fermés

INSTALLATION

AMBIENT CONDITIONS

This workstation is intended for use indoors, at room temperatures between **15°C and 30°C (59°F and 86°F)**, at no greater than **80% Relative Humidity** (at 25°C / 77°F). Allow a minimum of 4 inches (10cm) between the workstation and walls or partitions, and 2 inches (5cm) of clearance above the top of the workstation for unobstructed airflow.

Operating the unit outside of these conditions may adversely affect the unit's temperature range and stability.

For conditions outside of those listed above, please contact your distributor or Sheldon Sales to explore other unit options suited to your laboratory or production environment.

LOCATION

When selecting a location to install your BACTRON, consider environmental conditions that can affect the workstation's temperature and atmospheric integrity:

- 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

Note: Direct exposure to air conditioning vents or other sources of cold air can result in condensation or fogging on the workstation's acrylic glass panels, depending on humidity and other ambient conditions. Prolonged exposure to cold air flows may adversely affect the temperature performance of the incubator.

UV LIGHTING

Check if your laboratory or workspace contains sources of UV lighting. Sustained exposure to direct sunlight, UVC or UV germicidal lighting around 254nm, will cause a rapid aging of BACTRON acrylic glass panels and arm port sleeves. Periodic use of long-wave (365nm) UV hand lamps for bacterial identification should not damage the acrylic glass. See the **Maintaining the Acrylic Glass Panels** entry on page 58 for more details.

HIGH ALTITUDE LOCATIONS

BACTRON anaerobic workstations are equipped with two (2) digital vacuum controller - display units that control the atmospheric cycling operations of the pass box and the vacuum pump line pressure. These devices are calibrated at the factory at an altitude of 179 feet (54.5m) above sea level, and read gauge pressure rather than absolute pressure. Altitudes around 6500 feet (2000m) or higher may affect the operation of the vacuum system, depending on ambient conditions. If the vacuum pump runs continuously or near continuously when installed at a high altitude location, contact **Sheldon Technical Support** (see page 6) for assistance in adjusting the vacuum gauge settings.

POWER SOURCE

Note: The electrical supply to the BACTRON must conform to all national and local electrical codes.

Always position the workstation so that the users have access to the power cord and can quickly unplug it in the event of an emergency.

When choosing a location for the BACTRON check that the voltage and ampere requirements on the workstation's data plate match those of your wall source. The source must be an earth grounded outlet **The supplied voltage must not vary more than 10% from the data plate rating. Damage to the workstation may result if supplied voltage varies more than 10%.** Each BACTRON workstation is provided with a 110 – 120VAC 8ft (2.5m) 5-15 NEMA power cord.

These incubators are intended for a 50/60 Hz, 110 - 120 volt applications at the following amperages:

Model	Amperage
BACTRON300 (BACTRONII)	9 Amps
BACTRON600 (BACTRONIV)	11 Amps
BACTRON900 (BACTRONIV-900)	14 Amps

Use a separate circuit to prevent loss of the unit due to overloading or circuit failure.

LIFTING AND HANDLING

The BACTRON is heavy, and care should be taken to use appropriate lifting devices that are sufficiently rated for these loads. Follow these guidelines when lifting and handling the BACTRON workstation:

- Lift the BACTRON only from its bottom surface.
- Doors, handles, and knobs are not adequate for lifting or stabilization.
- Restrain the BACTRON completely while lifting or transporting so it cannot tip.
- Remove all moving parts, such as shelf spacers and trays, and secure all doors in the closed position during transfer to prevent shifting and damage.

Note: To prevent damage when moving the BACTRON, turn each of the four leveling feet completely clockwise.

LEVELING

The BACTRON must be level and stable for safe operation. Each BACTRON ships with four leveling feet. Insert one leveling foot into each of the four holes in the bottom corners of the workstation. Adjust the foot at each corner until the workstation 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.

GAS SOURCE

Warning: Never exceed a 5% hydrogen concentration inside the unit's chamber.

Avertissement: La concentration d'hydrogène ne doit pas dépasser 5% dans la chambre anaérobie.

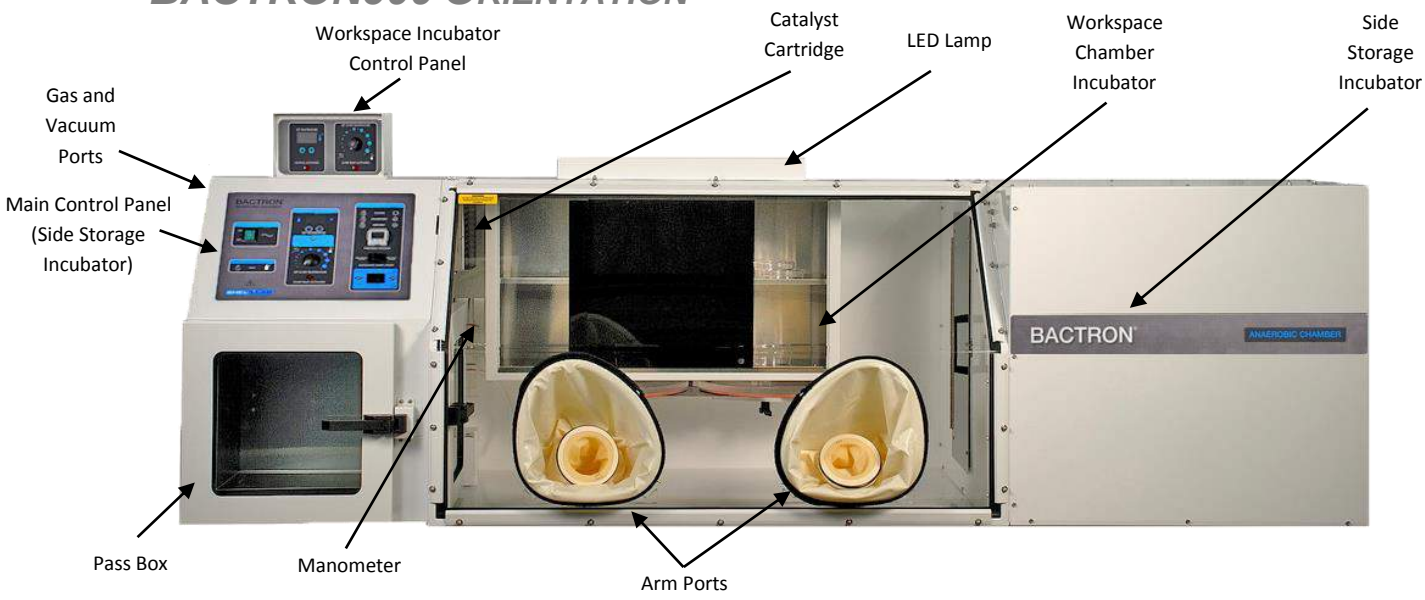
The BACTRON requires an anaerobic gas mixture with 5% hydrogen to drive the oxygen-capturing catalytic process in the workspace chamber. To reduce anaerobic gas consumption during auto cycle pass box purges, the BACTRON may also be connected to a second compressed gas cylinder containing an inert gas such as, nitrogen (N_2), for use in the first two stages of the three-stage auto cycle. **Manual cycles of the pass box will only draw from the anaerobic mixed gas cylinder attached to the GAS 1 In port.**

- For a single cylinder of anaerobic mixed gas (AMG), Sheldon Manufacturing recommends 5% hydrogen (H_2), 5% Carbon Dioxide (CO_2), and 90% Nitrogen (N_2).
- If you are using a two gas anaerobic application, Sheldon recommends one cylinder of AMG gas at the above ratios, and a second cylinder of 100% Nitrogen (N_2).
- Gas regulators for BACTRON applications will need to be set at 15 - 20 psi. Please see **the Pressure Unit Conversion table** on page 49 in the Operation Section for working with units other than Pounds per Square Inch.

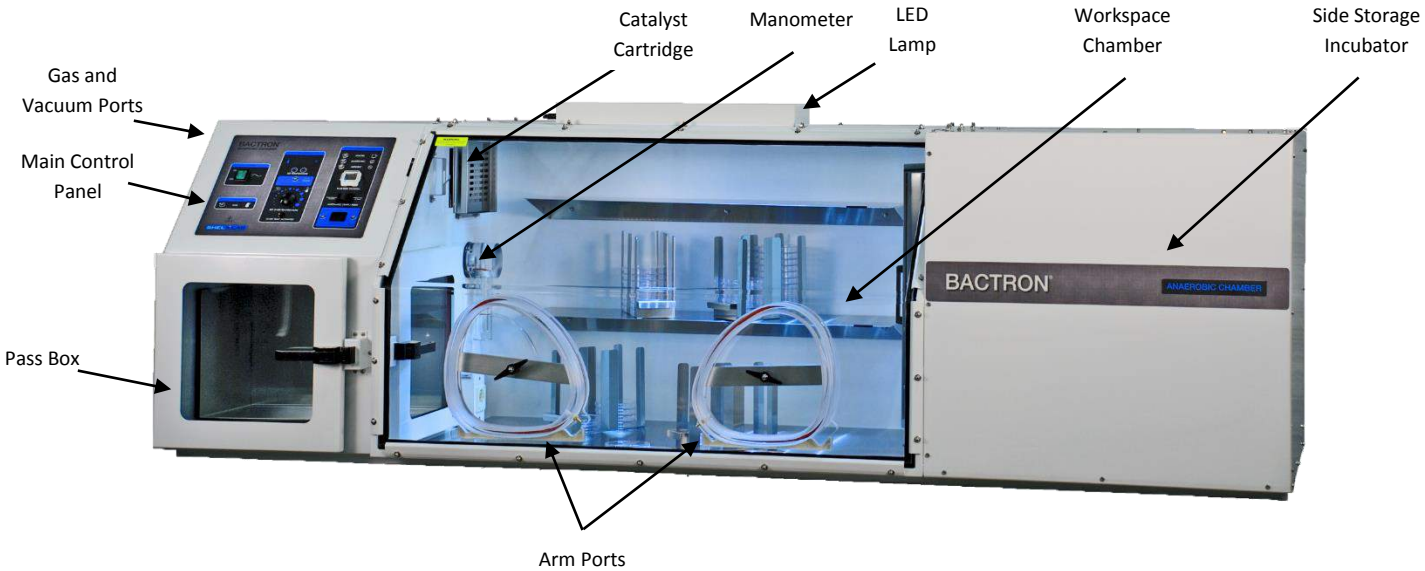
Anaerobic Mixed Gas is often sold by gas suppliers under the category of **Anaerobic Incubation Mixtures** or **Biological Atmospheres**. Contact your site safety officer and review your institutional safety protocols for handling, storing, and using compressed gasses. Follow all local ordinances and national regulations regarding compressed gases in research, clinical, or production environments.

INSTALLATION (CONTINUED)

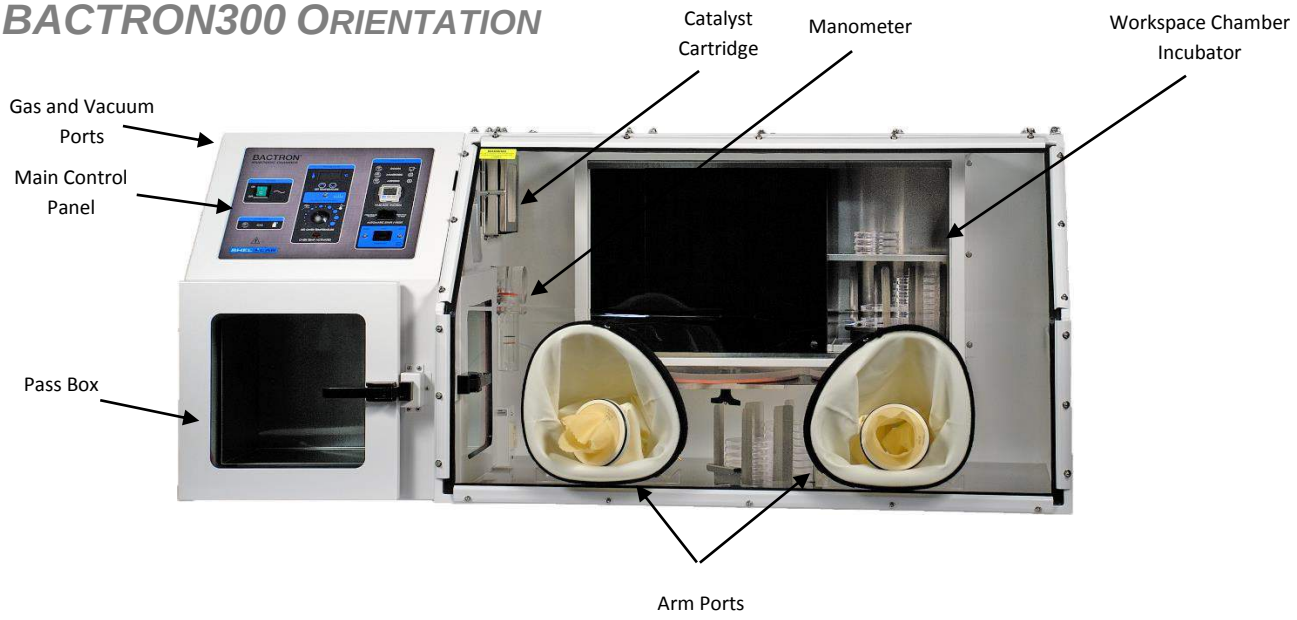
BACTRON900 ORIENTATION



BACTRON600 ORIENTATION



BACTRON300 ORIENTATION



WORKSPACE CHAMBER ORIENTATION (ALL UNITS)

Figure 1: Workspace Chamber Layout

PASS BOX ORIENTATION

Figure 2: Pass Box Inner Door and Sliding Shelf

The pass box is provided with an integral sliding shelf to facilitate material transfers. Small items may be introduced into the chamber via the Arm Port Doors and Sleeve Assemblies using proper sleeve technique.

CLEANING

The BACTRON interior was cleaned and disinfected at the factory, but not sterilized. See the **Cleaning** procedure in the User Maintenance section for more information.

CONTROL PANEL OVERVIEW

Figure3: Main Control Panel

Main Control Panel BACTRON300

The main control panel on the BACTRON300 controls the heater and the Over Temperature Limit System of the **workspace chamber incubator**. Controls for cycling the pass box atmosphere, along with the power switch for the BACTRON, and the workstation gas injection light are also located on this panel.

Main Control Panel BACTRON600

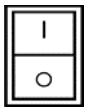
The main control panel on the BACTRON600 controls the heater and the Over Temperature Limit System of the **side storage incubator**. Controls for the purging the pass box atmosphere, along with the power switch for the BACTRON, and the workstation gas injection light are also located on this panel.

Main Control Panel BACTRON900

The main control panel on the BACTRON900 controls the heater and the Over Temperature Limit System of the **side storage incubator.** The controls for the **workspace chamber incubator** are located on the **workspace control panel** (see page 23). The controls for the pass box, along with the power switch for the BACTRON, and the workstation gas injection light are also located on the main panel.

CONTROL PANEL OVERVIEW (CONTINUED)

Main Control Panel Continued



Power Switch

The main power switch on the control panel controls all power to the workstation and must be in the on (I) position before any of the BACTRON's systems are powered. The switch will illuminate when on.

Chamber Gas Light

This light indicates that anaerobic mixed gas is being injected into the workspace chamber.

Main Temperature Control and Green Digital Display

Labeled INCUBATOR, this control consists of a green digital display and up and down arrow buttons used to adjust the incubator's operating temperature (set point). In its default mode the display shows the current incubator temperature, accurate to within ± 0.1°C. The arrow buttons can also place the unit in its calibration mode. During temperature calibrations, the controls used to enter temperature offsets to match the displayed temperature to the temperature detected by an independent reference thermometer.

Heating Activated Light

The clear pilot light located beneath the label HEATING ACTIVATED illuminates whenever the heating elements are powered and warming the incubator.

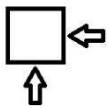
Set Over Temperature

This graduated dial sets the incubator's temperature limit for the Over Temperature Limit backup system. The OTL System operates independently of the Main Temperature Controller, and prevents uncontrolled heating of the incubator in the event of a failure of the Main Controller while in its heating mode. For more details, please see the explanation of the **Over Temperature Limit System** in the Operation section's Theory of Operation.

OTL Light

This pilot light is marked OVERTEMPERATURE ACTIVATED and is directly below the Over Temperature Limit control. The light will turn on when the OTL System has taken control of the incubator, and will be accompanied by a buzzer alarm. Under normal operating conditions this light should not illuminate.

CONTROL PANEL OVERVIEW (CONTINUED)



Pass Box Doors Light

The clear Doors pilot light indicates that both pass box doors are closed. This light must be on in order to cycle the pass box.

Anaerobic Light

This is light activates after the completion of a full auto cycle of the pass box Interior.

Aerobic Light

This light activates when the outer pass box door has been opened, exposing the pass box to aerobic atmosphere. It remains on until the next completion of a full auto cycle.

Pass Box Vacuum Controller and Digital Display

The main control panel vacuum gauge-controller displays the level of vacuum in inches of mercury in the pass box interior. It controls the application of vacuum to the pass box during the pass box auto cycle.

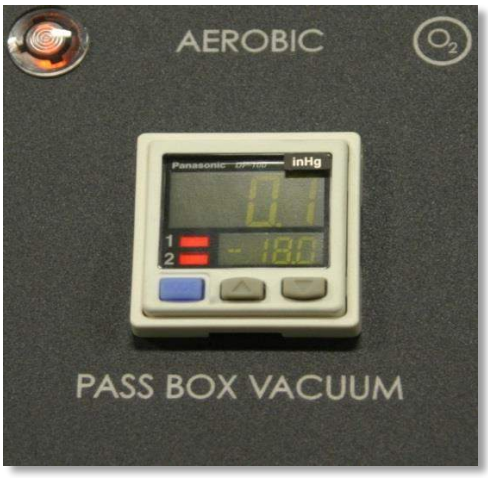
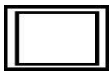


Figure 4: Pass Box Vacuum Controller and Display

CONTROL PANEL OVERVIEW (CONTINUED)



Automatic Start / Reset Switch

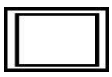
The all black Automatic Start / Reset switch initiates or aborts the pass box's auto vacuum-and-gas-recharge cycle used to remove aerobic atmosphere from the pass box. Pressing then releasing on the left (Start) the will initiate the auto cycle. Pressing and holding on the right (Reset) for three seconds will abort and then restore the pass box to a near standard atmospheric pressure sufficient that the pass box doors can be easily opened.

Pass Box Gas Light

This light indicates that the anaerobic mixed gas is being injected into the pass box during the auto cycle. The pass box Gas light **does not illuminate** during manually gas injections.

VAC Light

The clear VAC pilot light indicates that the vacuum pump is in operation when the auto cycle is vacuuming down the pass box chamber. The Vac Light **does not turn on** during manual vacuuming.



Manual GAS / OFF / VAC Switch

The all black GAS / OFF / VAC switch allows the user to manually initiate a flow of AMG from the GAS 1 IN port into the pass box by depressing the switch to the left. Pressing the switch to the right activates the vacuum pump, lowering the atmospheric pressure inside pass box. A combination of vacuum followed by injections of anaerobic mixed gas can be used to manually cycle the pass box atmosphere.

Fuse

Located on the inside the power cord inlet on the back of the workstation, the fuse protects against over current conditions. If the fuse blows, the BACTRON will shut down. For your safety and the safety of laboratory personnel, the cause of a blown fuse should be determined prior to replacing it.

CONTROL PANEL OVERVIEW (CONTINUED)

Workspace Incubator Control Panel (BACTRON900 / BACTRONIV-900 Only)

Figure 5: BACTRON900 Workspace Control Panel

The workspace incubator control panel on the BACTRON900 controls the operations of the workspace chamber incubator and the incubator's Over Temperature Limit system.

Main Temperature Control and Green Digital Display

The BACTRON900's workspace SET TEMPERATURE control panel comes with a green digital display that shows the temperature of the incubator accurate to within ± 0.1°C. The control consists of up and down arrow keys for adjusting set point temperatures or placing the display in its calibration mode.

Heating Activated Light

The clear pilot light located beneath the label HEATING ACTIVATED illuminates whenever the heating elements are powered and warming the BACTRON900's workspace chamber Incubator

Set Over Temperature

This graduated dial sets the temperature set point for the Over Temperature Limit backup system in the workspace chamber of the BACTRON900. The OTL System operates independently of the Main Temperature Controller, and prevents uncontrolled heating of the workspace incubator in the event of a temperature control board failure. For more details, please see the explanation of **the Over Temperature Limit System** in the Operation Section.

OTL Light

This pilot light is marked OVERTEMPERATURE ACTIVATED and is located directly below the Over Temperature Limit control. The light will turn on and a buzzer alarm will activate when the OTL System has taken control of the incubator. Under normal operating conditions this light should not illuminate.

THEORY OF OPERATION AND MAJOR COMPONENT FUNCTIONS

Achieving Anaerobic Conditions

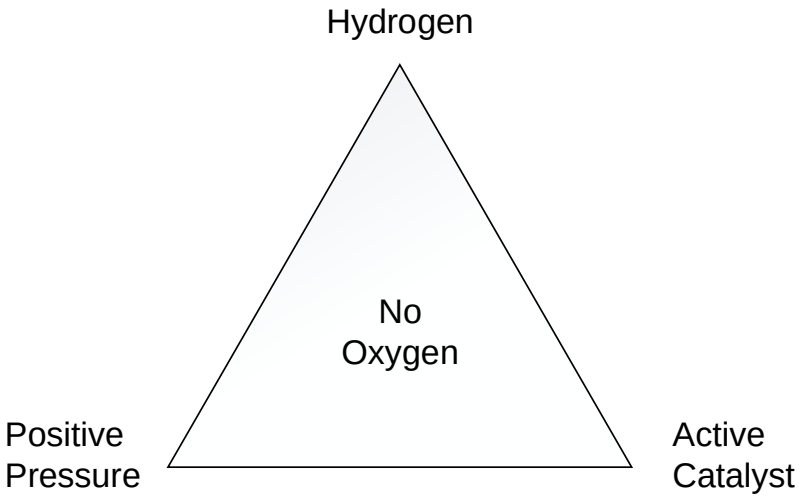


Figure 6: Atmosphere Control Measures

The BACTRON workstation is designed to establish and maintain a strict anaerobic environment suitable for the cultivation of clinical anaerobic bacteria. This is achieved through injections of an anaerobic mixed gas (AMG) with a 5% hydrogen concentration, and a subsequent catalytic reaction between the hydrogen, free oxygen in the air, and the activated palladium of the workstation's catalyst scrubber. This results in the oxygen being captured in the formation of water vapor.

A palladium catalyst must be kept clean and active by baking the catalyst cartridge at 200°C after each 24 hours of usage.

A mild chamber overpressure is maintained using a workspace pressure switch sensor, AMG, and a gas injection solenoid to help prevent infiltration by outside atmosphere.

The presence of oxygen in the workstation can be detected through the use of color-changing Oxoid brand indicator strips. Microbiological controls such as, *Clostridium novyi* or *Pseudomonas aeruginosa,* may also be used to indicate anaerobic or aerobic conditions. Use of an activated charcoal scrubber in the chamber can help absorb volatile fatty acids and hydrogen sulfides generated by cultivation processes or applications.

Condensation Management

Sample media evaporation from petri dishes and water vapor from the oxygen-capturing catalytic reaction is trapped on the cold plate of a Peltier-effect condensate chiller located behind catalyst cartridge. Condensed moisture is then channeled into a drain tube that empties into a receptacle placed in the workspace chamber by the end-user. The receptacle must be drained regularly. The Peltier condensate chiller eliminates the need to use chemical desiccants to control humidity levels inside the chamber, which can retain condensate and dry out culture media.

Accessing the Workstation

Items such as media containers and laboratory equipment can be introduced to or removed from the BACTRON's anaerobic environment through the pass box. The pass box creates a near anaerobic environment through three cyclic applications of the BACTRON's vacuum pump to reduce air volume in the pass box, followed by gas replenishment injections. The pass box operates in one of two modes: A user-initiated three stage auto-cycle, or through use of the manual control switch to cycle the pass box atmosphere three times. The option to manually cycle the pass box is primarily intended as a backup for the auto cycle system.

Users can access and work glove-free in the workspace chamber by donning the sleeve assemblies attached to the front panel arm ports. The sleeve assemblies are also compatible with exam gloves for handling pathogenic samples inside the workspace. After being donned – but prior to opening the arm port doors – the sleeve assemblies are purged by using the foot pedal assembly to apply reduced pressure to the sleeves with the vacuum pump, then to charge the sleeves with AMG.

Purging, sealing, and effective use of the sleeve assemblies requires bare skin contact between the widest part of the user's forearms and the cuff ring of the sleeve assembly. Smooth, small items held in hand may be introduced into the workspace chamber through the sleeve assemblies.

Incubators

BACTRON300 and BACTRON900 are each provided with a cabinet style incubator in the workspace chamber. The BACTRON600 and BACTRON900 come with a rotating tray (Lazy Susan) in a side storage incubator.

Each incubator's temperature is controlled by a digital controller board using a solid state temperature sensor probe attached to the incubator body and a heating element. When heating the incubator, the controller uses Proportional – Integral – Derivative (PID) analytic functions to slow the rate of heating as it approaches the user-selected set point. This is done to avoid overshooting, and to correct for naturally occurring measurement errors.

The digital controller also uses PID learning functions to optimize its warming rates for hotter or cooler environments. If the BACTRON is moved to a new location with a significant temperature difference from its previous surroundings, it may require 24 hours of incubator run time for the controller to fully adapt to the new thermal environment and obtain its previous high level of temperature stability. This is why the incubator should be run at its application set point for 24 hours prior to calibration. Additionally, the heat loss from leaving the incubator doors open for long periods of time (an hour or more) can trick the controller into thinking it is operating in a cool environment. This can result in a period of temperature overshooting.

The Over Temperature Limit System

The OTL is a mechanical heating control backup system included with each incubator, and which operates independently of the incubator's digital temperature controller board. The OTL is intended to be set to approximately 1°C above the user-selected temperature set point stored in digital controller board. The OTL prevents runaway heating in the event that the main controller fails while in its heating mode.

If the incubator's temperature exceeds to the OTL limit setting, a red pilot light indicator will illuminate and an audible alarm will buzz. The OTL System will depower the incubator's heating element, and continue to do so as long as the temperature remains higher than the OTL setting.

Manometer Pressure Gauge and Check Valve

The water-filled manometer in the workspace chamber serves as a visual pressure gauge, as well as a venting check valve during instances of excess overpressures.

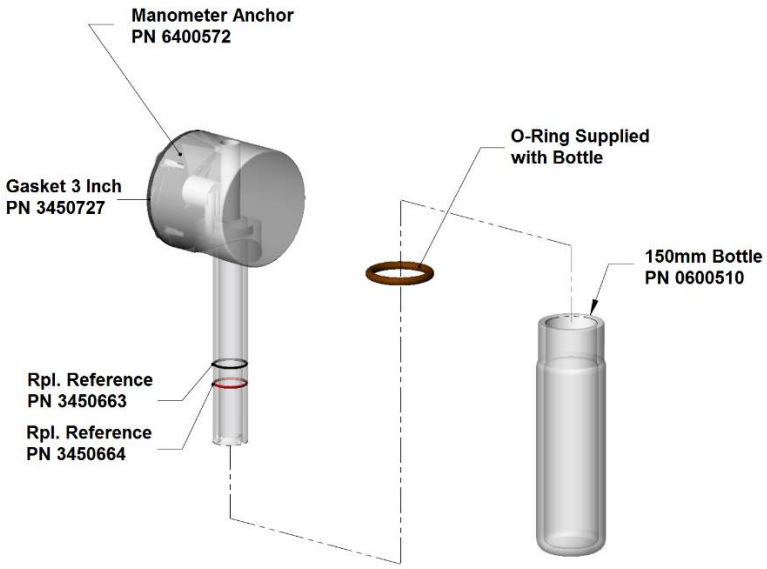


Figure 7: Manometer Components

An increase in atmospheric pressure inside the workstation drives down water within the Manometer relative to a pair of reference and refill rings. Under normal operating conditions the workstation's overpressure displaces a-half inch of water (0.5cm). Excessive pressure will cause the water to bubble as chamber atmosphere is vented through the manometer and out of the workstation. This helps prevents damage to workstation gaskets. The manometer exhaust vent is a port consisting of a transparent tube and black O-ring located on the back, right side of the BACTRON.

SETTING UP THE BACTRON

Perform the following steps to set up the BACTRON workstation for use:

1. Remove all protective wrappings from accessories and the workstation.
2. Disinfect the workstation to the standards of your laboratory or production environment protocol. The BACTRON was disinfected at the factory prior to shipment. However, Sheldon Manufacturing cannot guarantee that the BACTRON was not exposed to contaminants en route, or that the factory procedure matches the standards of your institutional protocols. See the **Cleaning** procedure in the User Maintenance section on page 56 for more information about cleaning and disinfecting the BACTRON. Also see step 3 of this procedure.
3. Clean, disinfect, and place the following items in the workspace chamber:
    a. Arm port doors
    b. The incubator bottom shelf spacers (BACTRON300 and BACTRON900). Remove the protective shipping wrappings prior to placing the spacers in the chamber.
    c. The petri dish racks. These can be placed on the top shelf of the workspace chamber incubator or (BACTRON600) shelves during the setup.
    d. At least five unopened Oxoid brand anaerobic indicator strips.
    e. A glass flask or beaker placed under the plastic condensation tube on the left side of the chamber.
    f. One or two 500ml beakers of purified water.
    g. Any equipment and other aerobic-tolerant items that you plan on introducing into the workspace chamber. Doing so now saves time and AMG usage by eliminating future pass box cycles.
4. Verify that the wall power supply and incubator electrical requirements match (See the Installation Section, page 12).
5. **Do not place a catalyst cartridge in the chamber at this time!**
6. Partly open both doors of the workspace chamber incubator (BACTRON300 and BACTRON900), and the door to the side storage incubator (BACTRON600 and BACTRON900). **Only open the doors by approximately 1 cm (0.5 inches).** Failure to open the doors during the setup will leave reservoirs of aerobic atmosphere after the workstation's chamber space has been purged of oxygen. Opening the doors all the way at the start of the BACTRON setup will cause an incubator heater to significantly overshoot its set point when the doors are finally closed.

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Figure 8: Arm Port Doors

Figure 9: Incubator Shelf Spacers

Figure 10: Petri Dish Racks

Figure 11: Oxoid Anaerobic Indicator Strips

Procedure continued on the following page

7. Perform the following procedures to setup the unit for use.

Figure 12: Gas and Vacuum Ports

SET UP THE GAS SUPPLY

See **the Gas Source entry** in the Installation section on page 14 for Sheldon Manufacturing's recommended gas applications.

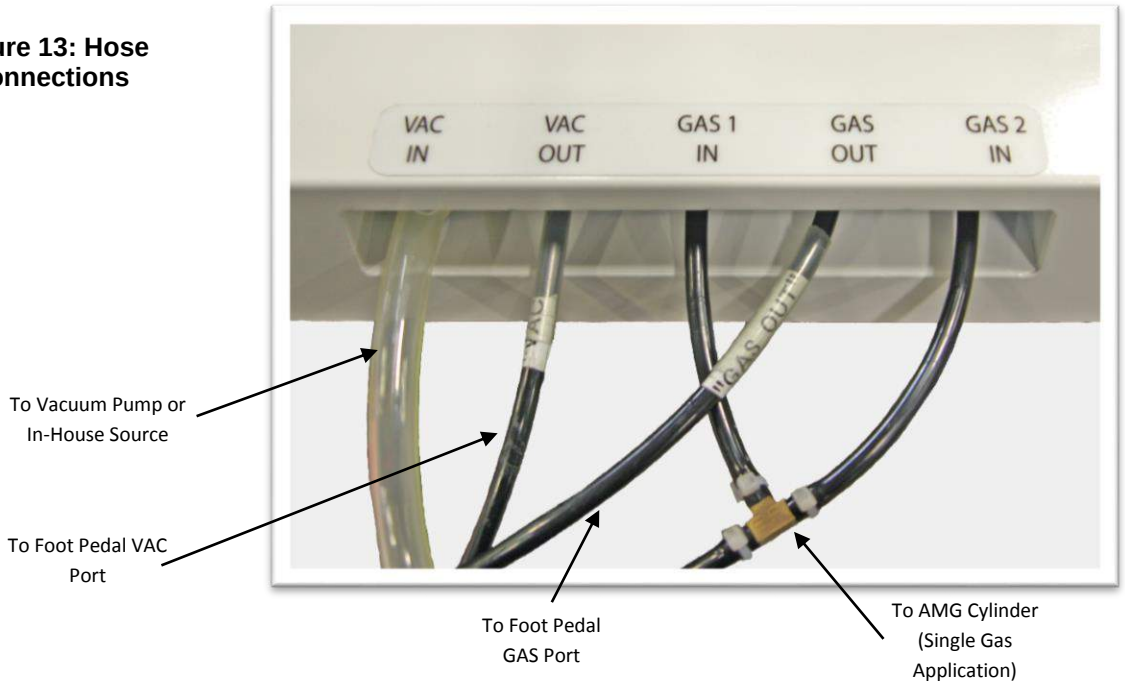
1. Install the gas regulator or regulators on the compressed gas cylinders you will be using.
2. The regulators should be set to 15 to 20 psi. Please see **the Pressure Unit Conversion table** in the Operation Section for working with units other than Pounds per Square Inch.

Figure 14: Hydrogen Warning Label

Warning: Never exceed a 5% hydrogen concentration inside the unit's chamber.

Avertissement: La concentration d'hydrogène ne doit pas dépasser 5% dans la chambre anaérobie.

Figure 13: Hose Connections



SINGLE GAS CONNECTION

Follow these steps to connect a single cylinder of anaerobic mixed gas.

1. Locate the T-shaped brass fitting included with the BACTRON's AMG gas regulator (normally shipped in the regulator box).

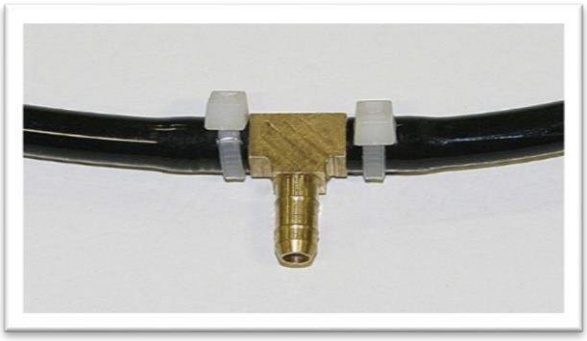


Figure 14: T-Fitting AMG

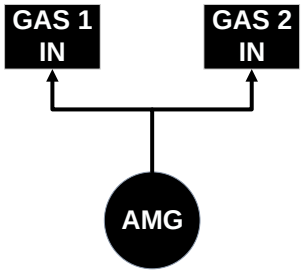


Figure 15: Single Gas Connections

2. Using the attached short lengths of black OD tubing, connect the fitting to the **GAS 1 IN** and **GAS 2 IN ports** on the top left side of the BACTRON. See figure 13 on the previous page.

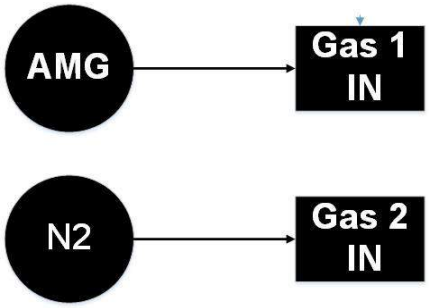
3. Connect a barb adaptor on the T-fitting to the AMG gas regulator using the length of black OD included with the regulator.

Note: Failure to connect the T-fitting to **both** the GAS 1 and 2 ports will prevent the pass box auto cycle from cycling the pass box.

Figure 16: Dual Gas Connections

DUAL GAS CONNECTION

To connect AMG and an inert recharging gas such as, nitrogen (N_2), complete the following steps:



1. Connect the AMG regulator's tubing to the BACTRON's **GAS 1 IN** port.

2. Connect the inert recharging gas cylinder regulator line to the BACTRON's **GAS 2 IN** port.

Note: When plumbed in this configuration, the BACTRON will draw twice from the GAS 2 IN port, and once from the GAS 1 IN port during pass box auto cycles. This is intended to reduce pass box AMG consumption. The BACTRON **will not draw** from the GAS 2 IN port during manual gas injections, sleeve assembly purges, or other operations.

OPERATION (CONTINUED)

CONNECTING TO AN IN-HOUSE VACUUM SYSTEM

Carry out this procedure to connect the BACTRON to an in-house vacuum system. An in-house system must be capable of evacuating a minimum of 25 inches (63.5 cm) of mercury.

1. Connect a 3/8 inch hose from the in-house system to the VAC IN port on the back, on the right side of the BACTRON.

CONNECTING THE VACUUM PUMP

Use this procedure to connect the vacuum pump included with the BACTRON.

1. Connect the 3/8 inch hose from the vacuum pump to the BACTRON's VAC IN port.

Note: Plug the vacuum pump into the circular grey power outlet located on the back of the BACTRON at the top right. **Do not plug into a wall outlet!** Plugging the pump into a wall outlet will run the pump non-stop, rather than only when needed by the BACTRON.

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2. Ensure that the vacuum pump is placed in a ventilated location to prevent overheating. An overheated vacuum pump can become a fire hazard.

3. Make sure there are no kinks in the vacuum line running from the pump to the BACTRON.

Figure 17: Vacuum Pump

FILLING THE MANOMETER

1. Fill the manometer located in the workspace chamber with distilled water to the refill ring (the top of the two reference rings). This can be done by unscrewing and removing the manometer bottle, or pouring water in through the hole on the top of the manometer assembly.

2. Distilled water is preferable to tap water to avoid long-term scaling deposits from waterborne minerals.

Figure 18: Manometer

INSTALLING THE ARM PORT DOORS

The arm port doors should already be inside the workspace chamber.

1. Turn the silver locking bar to a roughly 45° position.
2. Install each door bottom first, inserting the tabs into the slots on the arm ports.
3. Tilt the door cover up so that it fits securely within the arm port.
4. Turn the locking bar to the horizontal position:
5. Secure the door by turning the black arm port door knob clockwise, using wrist strength only, until the knob grabs and feels snug. Tightening too much may compromise the integrity of the door by pulling the post that the knob and locking bar are mounted on out of position.

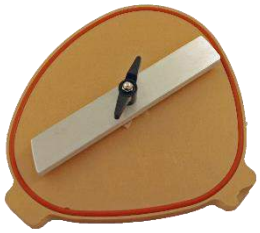

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Figure 19: Arm Port Door

CONNECTING THE FOOT PEDAL ASSEMBLY

1. Place the foot pedal assembly on the floor below the arm port doors.
2. Locate the center line on the back of the foot pedal assembly.
3. Connect the branching lines from the center line's T-fitting to the two brass barb adaptor fittings on the inner sides of the arm port door assemblies. See figure below.

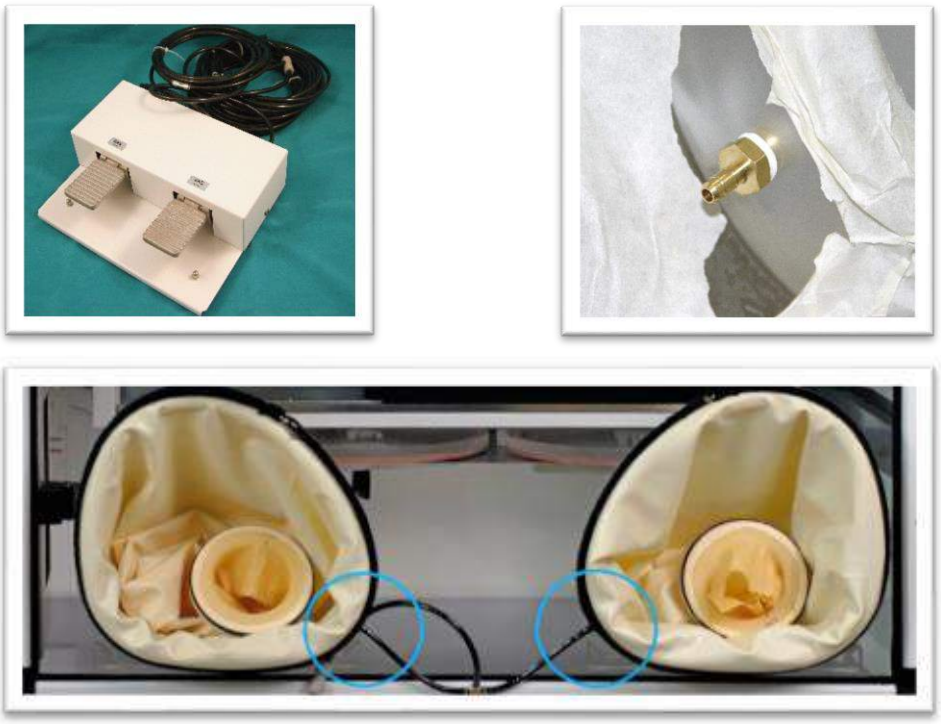

Figure 20: Foot Pedal Line Connection with the Arm Port Door Assemblies

4. Connect the line labeled VAC on the right side of the pedal assembly to the VAC OUT port on the BACTRON. This supplies vacuum for reducing atmosphere in the sleeve assemblies prior to charging with AMG.

VAC → VAC OUT

5. Connect the line labeled GAS on the left side of the pedal assembly to the GAS OUT port on the BACTRON. This supplies AMG for charging the sleeve assemblies.

GAS → GAS OUT

SHELVING INSTALLATION BACTRON300 AND BACTRON900

Install the three (3) metal bottom spacers included with the BACTRON600 and 900 on the bottom shelf of the workspace chamber incubator. These spacers shield sample containers from direct contact with the warm surface of the incubator, and ensure heat dissipation and uniformity.

Figure 21: Incubator Shelf Spacer

1. Set the spacers on the bottom shelf of the workspace chamber incubator, side by side, with the “SPACER” label facing outwards toward you.
2. Make sure to leave the incubator doors only partly open (1cm / 0.5 inches) after installing the shelf spacers while setting up the BACTRON for use.
3. An empty plate or dish placed at the bottom of each sample stack can provide additional shielding for anaerobes that are heat sensitive, or if the incubator is being run at high temperatures.

POWER THE BACTRON

1. Plug the workstation power cord into a suitable outlet (page 12).
2. Turn the power switch ON to verify that the workstation will power up.
3. The vacuum pump should turn on for a few seconds, and then turn off. If the pump does not run, consult Sheldon Technical Support. If the vacuum pump runs for a long period of time at higher altitudes it will require adjustment.
4. The following lights and displays should illuminate.
    a. The Green power switch.
    b. The Chamber Gassing pilot light will illuminate for a few seconds, if all doors are closed and the gas supply is turned on.
    c. The Pass Box Doors sealed pilot light if the doors are closed.
    d. The Auto Cycle Aerobic pilot light.
    e. The green LED Set Temperature display on the main control panel.
    f. The green LED Set Temperature Display on the workspace control panel of the BACTRON900 (BACTRONIV-900).

ESTABLISHING AN ANAEROBIC ENVIRONMENT

Carry out the following steps to purge the aerobic atmosphere from the workstation and establish an anaerobic environment. If the BACTRON has previously been in use, remove the right arm port sleeve prior to starting the procedure. This procedure requires approximately 1 to 4 hours to complete.

1. Verify the following:
    a. The interior and exterior pass box doors are closed and secured.
    b. The manometer is filled to the fill line (upper ring) with water.
    c. The foot pedal assembly center line is securely connected to the brass barb adaptors on both arm port door assemblies.
    d. The foot pedal assembly GAS and VAC lines are connected to the GAS OUT and VAC OUT ports on the BACTRON.
    e. Gas input lines are attached to the BACTRON's GAS IN 1 and GAS IN 2 ports.
2. Note the reading on the AMG gas regulator.
    a. The BACTRON300 (BACTRONII) will require approximately 200 psi of AMG for a setup purge.
    b. The BACTRON600 (BACTRONIV) and BACTRON900 (BACTRONIV-900) need around 400 psi of AMG for a setup purge.
3. Make sure the AMG cylinder regulator is set to 15 to 20 psi. Open the valve all the way to start a flow of gas to the BACTRON
    a. Nitrogen and other inert gasses **should not be used** to purge the workstation.
4. Turn on the workstation, if it is not already powered up.
5. Open the right arm port door.
6. Verify that all incubator doors are slightly open to avoid leaving reservoirs of aerobic atmosphere.
7. Unwrap and install a fresh catalyst cartridge on the left wall inside the workspace chamber. See Figure 22 to the right.
    a. Catalyst cartridges come ready for use from the factory. However, if you have stored the cartridges for longer than six months, it is strongly recommended that you reactivate prior to first use. Please see **Reactivating the Catalyst Cartridge section** on page 45.
    b. The catalyst cartridge will grow warm in the presence of oxygen and AMG.

Figure 22: Catalyst Cartridge Installed

Procedure continued on next page

Establishing an Anaerobic Environment Continued

Note: If you have opened the left armor port door to install the catalyst, reinstall and secure the door now. Leaving the left arm port unsecured may cause AMG to "stream" through the chamber directly to the door, rather than building up and pushing out aerobic atmosphere, from the left side of the chamber to the right.

8. Reinstall the right arm port door and secure it. From the snugly tightened positioned, loosen the knob on the on the right arm port door by about half a turn. This should create a small leak that aerobic atmosphere can be pushed out through.

    a. AMG should pulse rather than flow continually into the chamber. The Chamber Gas light should activate for 1 to 2 seconds before deactivating for 1 to 2 seconds. This will be accompanied by a clicking sound that is the gas solenoid opening and closing.

    b. If the interval between pulses are longer than 1 to 2 seconds, or if there is no pulsing, slowly loosen the arm port knob until the interval decreases.

    c. If gas continually pulses into the chamber, tighten the right arm port door knob until an injection interval of 1 to 2 seconds is established. Continual streaming means that gas is likely streaming through the chamber directly to a door, rather than accumulating and creating the turbulence necessary to purge the chamber atmosphere.

Note: Depending on ambient conditions (temperature of the room and humidity) there may be mild or heavy condensation on the inside of the chamber during the gas purge. This is due to the formation of water vapor during the catalytic reaction. Condensation should dissipate by the end of the purge as oxygen decreases and the condensate controller removes water vapor from the chamber atmosphere.

9. End state:

    a. BACTRON300 (BACTRONII). When the purge process has gone through 200 psi of AMG **or** gone on for 2 hours (whichever happens first), tighten and secure the right arm port door. Then carry out the **Installing the Sleeve Assemblies**, **Chamber Entry**, and **Verifying Anaerobic Atmosphere** procedures on the following pages.

    b. BACTRON600 (BACTRONIV) and BACTRON900 (BACTRONIV-900). When the purge process has used 400 psi of AMG **or** gone on for 4 hours (whichever happens first), tighten and secure the right arm port door. Then carry out the **Installing the Sleeve Assemblies**, **Chamber Entry**, and **Verifying Anaerobic Atmosphere** procedures on the following pages.

INSTALLING THE SLEEVE ASSEMBLIES

Prior to verifying the achievement of an anaerobic atmosphere, install the arm sleeve assemblies in order to access the chamber without introducing oxygen.

Start with either side.

1. Unroll the large opening of a sleeve over the plastic lips of the arm port door opening. The sleeve should at least stretch to the base of the barb adaptor.
2. Secure the sleeve to the arm port using the 48 inch (121cm) self-griping strap included with the sleeve assembly. Place the strap between the outside lip and the brass gas-and-vacuum line barb adaptor
3. Repeat the process for the 2nd sleeve assembly and arm port.

Note: Sleeve assemblies can be left attached to the BACTRON when not in use. No stowing procedure is required.

Figure 23: Mounted Sleeve Assemblies

CHAMBER ENTRY

Perform these steps to access and work in the workspace chamber without drawing in aerobic atmosphere. See the **Exiting the Chamber procedure** on page 39 for how to withdraw your arms from the chamber and sleeve assembly without compromising the anaerobic atmosphere.

1. Remove watches, bracelets, large rings, and any sharp objects that might damage the cuffs or sleeves.
2. Place your hands in the sleeve assemblies so that the cuff rings are secure around the bare skin of the widest part of your forearms.
    a. The BACTRON comes with mid-size size 8 cuff. Size 6 cuffs are available for users with smaller forearms; size 9 for larger users. Please see the Parts List on page **Error! Bookmark not defined.**.
3. Keep your hands approximately 4 – 6 inches (10 cm – 15 cm) away from the arm port doors, and slightly to either side. This helps prevent the collapsing sleeves from pulling your hands into the arm port doors during the next step.
4. Depress the VAC foot pedal (right). Both sleeves will deflate simultaneously. Continue deflating until can see the definition of your fingernails through the sleeves.
5. Flush the sleeves with AMG mixture by depressing the gas foot pedal (left). Stop as soon as you can no longer see the definition of your fingers through the sleeve, and the sleeve material does not cling to your forearms. Do not overfill the sleeves. “Ballooning” the sleeves wastes gas, and risks compromising the seals around the cuff rings and arm ports.
6. Repeat steps 4 and 5 for a minimum of three (3) complete evacuation and replacement cycles.
7. Loosen both arm port door knobs by two or three turns.
8. Rotate the locking bars to a roughly 45° diagonal: 
9. Slowly push one door in to the chamber, then the second. The Arm port doors can be hung in the arm port door holders on the bottom of the workspace chamber incubator (BACTRON300 and BACTRON900) or placed in the arm port door stands included with the BACTRON600.

MOVING IN THE PRESSURIZED CHAMBER

There is a minor, but noticeable feeling of resistance while working in the overpressure environment of the workspace chamber. Moving in the chamber will temporarily increase the chamber pressure. Large and fast movements can cause the manometer to bubble as anaerobic atmosphere is forced out of the BACTRON. Move deliberately and steadily. Withdrawing one sleeved arm partly into the arm port while reaching in with the other (a movement combination that looks something like swimming) can help reduce pressure and gas consumption. Additionally, use of the vacuum foot pedal can help reduce any ballooning of the sleeves while working in the chamber.

VERIFYING AN ANAEROBIC ATMOSPHERE

This procedure verifies that an anaerobic atmosphere has been established prior to placing anaerobe samples in the workstation.

1. After entering the workspace chamber, open one (1) of the Oxoid brand anaerobic indicator strip packages.

    a. Do not touch the indicator strip. Doing so risks contaminating the strip and creating a false positive.

    b. For the best accuracy, and to lengthen the amount of usable time, the strip should be left in the packet, partly exposed, to avoid contamination from surfaces, and to wick oxygen detecting fluid from bottom of the packet.

    c. Bending the edges or partly folding the packet will allow it to stand upright.

    d. Once an indicator strip has dried out, it can no longer indicate the presence of oxygen.

    e. There should be one, opened, moist anaerobic indicator strip in the workspace chamber at all times while maintaining anaerobic conditions. Place the strip where it will be clearly visible.

Figure 23: Pink indicating the presence of oxygen in an office environment

2. If the strip remains white, the chamber atmosphere is free of oxygen and ready to use. Exit the chamber using the steps described in the **Exiting the Chamber procedure** on page 39.

3. If the strip turns partly or completely pink, exit the chamber using the **Exiting the Chamber procedure** steps to avoid introducing more oxygen into the chamber.

    a. Loosen the right arm port door to create a slight leak that aerobic atmosphere can be expelled through. See Step 11 of the **Establish an Anaerobic Environment procedure** on page 35.

    b. Flush an additional 50 psi or 30 minutes worth of AMG through the chamber.

Note: The sleeve assemblies can be left on the BACTRON during this second purge.

    c. When 30 minutes has elapsed **or** 50 psi of AMG have been flushed through the chamber (whichever comes first), re-enter the chamber using correct entry procedures, and open a second anaerobic indicator strip.

    d. If the second anaerobic indicator strip shows less pink than before, repeat steps b and c to finish purging the chamber.

    e. If the second strip turns completely pink or shows the same degree of coloring as the first, contact **Sheldon Technical Support** for assistance. See page 6. Also, see the optional troubleshooting procedure on the next page for steps to identify possible sources of oxygen in the workstation.

TROUBLESHOOTING THE PRESENCE OF OXYGEN

1. Verify that proper sleeve donning, entry, and exiting procedures have been used
2. Check if closed containers are being introduced through the pass box. Closed containers can hold significant volumes of oxygen.
3. Seek to reduce amount of daily pass box usage.
4. Make sure that the arm port doors and sleeve assemblies are correctly installed.
5. Verify that the manometer is filled to the fill line with water.
6. Verify that gas input lines are attached to the BACTRON's GAS IN 1 and GAS IN 2 ports.
7. Make sure the foot pedal assembly center GAS / VAC line is securely connected to the brass barb adaptors on both arm ports.
8. Check that the foot pedal assembly GAS and VAC lines are connected to the GAS OUT and VAC OUT ports on the BACTRON.
9. Turn the AMG cylinder regulator to 20 psi.
10. Uninstall the catalyst cartridge. If the cartridge is not warm, it may not be active, or it has not been exposed to AMG and oxygen. Replace it with the second catalyst cartridge included with the BACTRON. Reactivate the first cartridge. Please see the **Reactivating the Catalyst** procedure on page 45.

Note: Use caution when uninstalling the catalyst cartridge. The catalyst may have grown hot during the anaerobic atmosphere establishment procedure.

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11. Make sure that the anaerobic indicator strip packets have not been opened prior to being placed in the oxygen-free atmosphere of the chamber

EXITING THE CHAMBER

The following steps are used to exit the chamber without pulling in aerobic atmosphere.

1. Check that the exterior and interior pass box doors are both closed and secured, to avoid drawing aerobic atmosphere through the pass box.
2. Depress the GAS foot pedal (left) for one or two seconds. Charging the sleeves with gas will help prevent them from constricting while withdrawing from the chamber.
3. Grasp the arm port doors by the silver locking bars, and slowly withdraw one arm, then the other. Inset the tabs on the doors into the slots of the arm port assembly. Then tilt the doors toward you so that they sit securely in the ports. Rotate both locking bars from the diagonal to horizontal position.
4. Tighten the arm port door knobs until the knobs start to grab, using wrist strength only.
5. Withdraw both hands from the cuffs. Exit the sleeves.

Door Check

6. Grasp both sleeves tightly, approximately three (3) to four (4) inches (7 – 10cm) behind the cuffs.
7. Gently and slowly push both sleeves towards the doors. This will cause the sleeves to balloon up.
8. This creates pressure in the sleeves. If the manometer bubbles in response, the doors are not sealed.

Note: Never physically press on the arm port doors to test the seal! Doing so, especially doing so repeatedly, may warp front panel or damage the doors.

9. If the manometer bubbles, renter the sleeves, and re-secure both arm port doors.
10. When the arm port doors are sealed, slowly withdraw both arms from the sleeves.

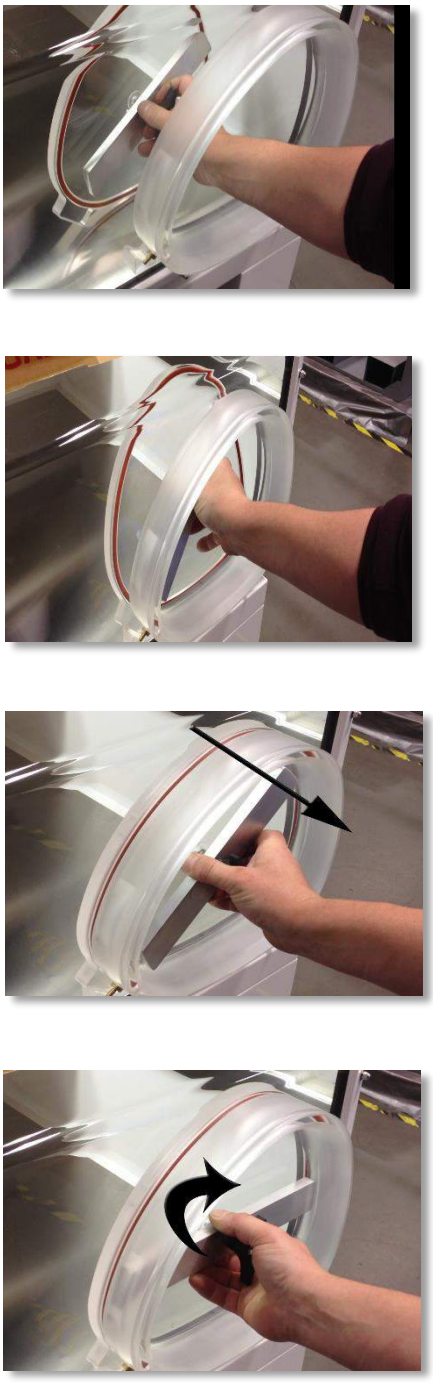


Figure 24: Securing the Arm Port Doors

SETTING THE INCUBATOR TEMPERATURE

1. Using a coin or other flat metal implement, turn the **Over Temperature Limit** control dial clockwise to the maximum position indicated by the largest dot. This prevents the Over Temperature Limit System from interfering with setting a new temperature for the incubator.
2. Press either the **Up** or **Down** key one time on the Temperature Control sub-panel to activate the temperature set point mode.
3. The Set Temperature digital display will briefly flash the letters “SP” for Set Point. The display will then go from bright to dim, and start to blink. The display will now show an adjustable temperature set point.
4. Use the **Up** or the **Down Arrow keys** to adjust the set point to the temperature you want the incubator to run at.
5. If neither key is pressed within 5 seconds, the Set Temperature display stops blinking and returns to displaying the current temperature of the incubator.
6. After selecting your set point, wait 5 seconds. The display will stop flashing, and the set point is now saved in the temperature controller. The incubator will now adjust to match your set point.
7. Set the Over Temperature Limit System, using the procedure below.

Note: Sheldon Manufacturing recommends waiting for 24 hours for the incubator temperature to stabilize prior to loading samples.

SETTING THE OVER TEMPERATURE LIMIT

Perform the following steps to set up the Over Temperature Limit system for use.

1. If you have not done so already, turn the Set Over Temperature Limit control dial clockwise to the maximum position. This allows the Set Temperature control to stabilize.
2. Turn the Over Temperature Limit control dial counterclockwise until the Over Temp Limit Activated light illuminates and the audible alarm buzzes.
3. Slowly turn the Over Temperature Limit control dial clockwise until the light and audible alarm turn off.
4. This adjusts the Over Temperature Limit control to approximately 1˚C above the temperature configured by the Set Temperature control.

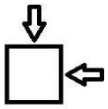
The Over Temperature Limit System will activate if the incubator temperature exceeds the temperature setting of the OTL System. If the main temperature controller system has failed, or the OTL is set below your chosen temperature set point, the OTL alarm will buzz and continue to turn on and off indefinitely. Contact **Sheldon Technical Support**. See page 6.

OPERATING THE PASS BOX

The pass box is used to introduce items into or remove items from the workspace chamber.

Automatic Cycle

1. Make sure the inner pass box door is closed and secured.
2. Open the outer pass box door. If not already on, the Pass Box Aerobic light will illuminate, indicating that the pass box has been exposed to the aerobic atmosphere of the room.



3. Load the pass box slider shelf with items to be introduced in the workspace chamber.
4. Close and secure the outer door. The Pass Box Doors light will then illuminate. The light will only do so when both the inner and outer doors are closed. **The Doors light must be on for the auto cycle to initiate.**

Note: Contact Sheldon Technical support if the Air Lock Doors light will not illuminate when both doors are closed and secured.

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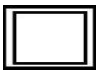
5. Briefly depress the Auto Cycle Start / Reset Switch to the left (Start) to initiate the auto cycle.
6. The Aerobic and Anaerobic indicator lights will alternately flash on and off, indicating that a cycle is in process. The vacuum pump will cycle the air pressure inside the pass box three times (from -18 inHg to -4 inHg), refilling twice from the GAS 2 IN port, and on the final cycle from the GAS 1 IN port.

7. The anaerobic light will illuminate once the cycle has finished. The inner pass box door may now be opened, and items introduced into the workspace chamber.
8. Do not open the outer pass box door while the inner pass box door is opened!
9. After removing items from the slider shelf, return the shelf to the pass box chamber. Close the inner pass box door. This safeguards against inadvertently introducing oxygen into the workspace chamber if someone opens the outer door later on.

Vacuum Interruption: The Chamber Gas light illuminates when the BACTRON is injecting AMG into the workspace chamber. Chamber injections are made in response to the workspace atmospheric pressure falling below a factory-set threshold. If the light illuminates while the vacuum pump is active, the BACTRON will briefly depower the vacuum pump. If the Chamber Gas light illuminates frequently during auto cycle, abort the cycle (see below). There may be a leak along the inner pass box door, which is allowing the pass box to pull atmosphere out of the workspace chamber and into the vacuum lines. Contact Sheldon Technical support.



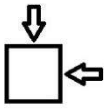
Aborting: To abort the automatic cycle, depress and hold the Auto Cycle Start / Reset switch to the right for **three (3) seconds**. The BACTRON will cease vacuuming and automatically restore pressure to the pass box. The vacuum gauge must rise to at least -2 inHg (near room pressure) before the Pass Box Aerobic and Anaerobic lights will stop flashing, and the inner pass box door can be opened.

Manual Cycle

The manual cycle is intended as a backup for use in the event the auto cycle is not functioning.

1. Verify that the inner pass box door is closed and secured.

2. Open the outer pass box door. The Pass Box Aerobic Light will illuminate, indicating that the pass box chamber has been exposed to the aerobic atmosphere of the room.



3. Load the pass box slider shelf with items to be introduced into the workspace chamber.
4. Close and secure the outer door. The Pass Box Doors light will illuminate when both doors are closed. **Do not manually cycle the pass box if the Pass Box Doors light is not illuminated!**

Note: Contact Sheldon Technical support if the Air Lock Doors light will not illuminate when both doors are closed and secured.

5. Depress the Manual Gas – OFF – VAC switch to the right (VAC). Hold the switch down until the vacuum gauge display shows -17 inHG to -20 inHg of air pressure in the pass box.

Note: If the Chamber Gas light illuminates frequently and disrupts operation of the vacuum pump while vacuuming down the chamber, release the Manual Gas – Off – Vac switch. Immediately cease vacuuming if the water in the manometer gauge begins to bubbles. In both cases there may be a leak along the inner pass box door. Continuing to vacuum may seriously damage the BACTRON. Contact Sheldon Technical Support for assistance.

6. Depress the Manual Gas – OFF – VAC switch to the left (GAS) to inject AMG into the pass box. Hold the switch until the vacuum gauge display reads approximately -4 inHg. This completes one sub-cycle. Note that manual injections only draw from the GAS 1 IN port.
7. Repeat step 5 twice more. On the third and final sub-cycle, hold the Manual – Gas – Off switch to the left until the vacuum gauge display reads 0. The pass box has now been restored to the room's atmospheric pressure, and the pass box interior door can now be opened.
8. The Anaerobic indicator light **will not** illuminate following the completion of a manual cycle. It only illuminates after the auto cycle completes.
9. Do not open the outer pass box door while the inner pass box door is opened!
10. After removing items from the slider shelf, return it to the pass box chamber. Close the inner pass box door. This safeguards against inadvertently introducing oxygen into the workspace chamber if someone opens the outer door later on.

Note: Failure to cycle the pass box to the standards described above risks allowing significant amount of aerobic atmosphere into the workspace chamber.

LOADING THE WORKSTATION

Sheldon Manufacturing recommends waiting 24 hours after establishing an anaerobic atmosphere before loading samples into the unit.

Airtight containers can introduce significant amounts of oxygen into the anaerobic environment of the BACTRON. Whenever possible, closed containers placed in the pass box should be loose-capped or ventilated to allow the pass box cycles to draw oxygen from the containers. Syringes should be loosened and sealed containers partly opened, if permitted by your laboratory or production protocol.

The pass box sliding shelf can hold and transport up to 252 plates. Place samples and other media containers on the shelves inside each incubator as evenly spaced as possible. Good spacing allows for atmosphere circulation and a higher degree of temperature uniformity. If the anaerobes sensitive to heat are being cultivated, it may be necessary to place an empty petri dish or plate at the bottom of each stack.

This concludes the Setting up the BACTRON portion of the Operation Section.

REACTIVATING THE CATALYST CARTRIDGE

An active catalyst cartridge must be installed to maintain anaerobic conditions. A spare cartridge is provided with each BACTRON so that cartridges can be swapped out for reactivation. For optimum performance, reactivate a catalyst cartridge after every 24 hours of use.

To reactivate a cartridge, perform the following:

1. Heat the catalyst cartridge at 200°C overnight prior to installing in the BACTRON.
    a. The handle of the cartridge can be removed prior to heating, and reinstalled afterwards. Use appropriate Personal Protective Equipment (PPE) to prevent burns.
2. A quality control test should be performed on each cartridge once per month.

Note: A flow of AMG for testing can be obtained by disconnecting the foot pedal gas / vacuum line from an arm port while the door is closed, and then depressing the Gas pedal.

    a. Flow anaerobic mixed gas with hydrogen over a reactivated catalyst cartridge in a normal aerobic atmosphere. Or place the reactivated catalyst cartridge in the pass box and run a full auto cycle.
    b. The palladium coated pellets inside the catalyst cartridge should grow warm in the presence of oxygen and hydrogen, indicating that the cartridge is ready for use.
    c. If the cartridge does not heat up when exposed to AMG and oxygen, reheat to 200°C. While the cartridge is still hot, flow AMG over the cartridge in an oxygen environment. This should help remove any buildup of hydrogen sulfides or other contaminants that might interfere with the cartridge's effectiveness.
    d. Test the room temperature reactivated cartridge again with another flow of AMG in an aerobic environment.

CALIBRATE THE INCUBATOR TEMPERATURE DISPLAY

Temperature calibrations are performed periodically to ensure that the control panel temperature display matches the actual temperature inside a BACTRON incubator. Each BACTRON incubator is calibrated at the factory to 37°C. Calibrate as often as required by your laboratory or production protocols, or regulatory requirements.

Allow the incubator at least 24 hours to stabilize heated at its operational set point, with the incubator doors closed, before performing a calibration. Always use a certified temperature sensing reference device that is regularly calibrated to 0.1°C by an independent party to conduct temperature verifications or calibrations. For best results use a device with a thermocouple or other temperature probe.

1. Place the temperature sensor of a calibrated reference device inside the incubator as close as possible to the chamber's geometric center. Check that the sensor is not in direct contact with the shelving.

Note: A thermocouple sensor probe's sleeve may be taped to the shelving, as long as the exposed copper end is 2 inches (5cm) above the shelf. An exposed sensor probe in direct contact with the shelving may experience heat sinking, which can result in an inaccurate temperature reading.

2. Allow the temperature to re-stabilize after closing the door.
    a. The reference device's temperature measurement should not change for at least one (1) hour after a significant disruption for the chamber to be considered stabilized.
3. If the reference device's and the incubator's temperature readings are the same, or the difference between the two falls within the acceptable range of your laboratory protocol after one (1) hour of stability, **the incubator is calibrated**.
4. If there is a difference between the two (2) readings, and that offset falls outside your laboratory protocol's acceptable range, adjust the incubator's temperature display to match the reference device's reading. **See the next step**.
    a. If the door was **briefly** opened for a few seconds to take a reading, wait fifteen minutes for the temperature to stabilize before correcting for the offset. If the opening was longer, wait one (1) hour for the temperature to stabilize.
5. Press and hold both the **UP** and **DOWN** arrows simultaneously. The Temperature Display of most models will flash the letters "CO" when the controller enters calibration mode.
6. The display will continue flashing and display the **current temperature value**. Adjust the **current value** until it matches the reference device's temperature reading.
7. After matching the unit's current value to that of the reference device, wait five seconds. The incubator's Temperature Display will cease flashing, and the incubator will begin adjusting to compensate for the entered temperature offset.

Procedure continued on next page

8. Allow the incubator a minimum of four (4) hour to stabilize after reaching the new temperature.
9. Compare the reference device's reading with the incubator's. If the reference device's and the incubator's temperature readings are the same or fall within the range of your laboratory protocol, the incubator is now calibrated.
10. If the two readings still fall outside your laboratory protocol, repeat steps 5 – 8.
11. If the temperature readings of the incubator and the reference device fall outside your laboratory protocol after three calibration attempts, contact **Sheldon Technical Support** for assistance.

GAS CONSERVATION METHODS

1. Minimize the number of times per day the pass box is purged and opened.
2. Introduce small individual items such as, sealed micro plates or transport tubes, into the workspace chamber through the sleeve assemblies.
3. Moving a large number of items through the pass box in one transport will reduce the volume of AMG used in an auto or manual cycle.
4. When transporting a small number of items through the pass box, placing a large solid object in the pass box can also help to reduce the volume of gas utilized.
5. Employ proper sleeve techniques when entering and exiting the workspace chamber.
6. Avoid making fast or large movements while working in the chamber. Use a swimming motion, withdrawing one arm partly into the arm port while reaching in with the other.

ACTIVATED CHARCOAL SCRUBBER AND REJUVENATION CYCLE

An activated charcoal scrubber can be placed in the workspace chamber to absorb volatile fatty acids (VFAs) or volatile sulfur compounds (VSCs) produced by sample cultivation. This helps keep the workstation interior clean and maintains catalyst endurance when running cultivation processes or applications that produce large amounts of VFAs or VSCs. See the **Accessories section** on page 66 for Sheldon Manufacturing's recommended charcoal scrubber and Anatox fan scrubber unit.

1. Recommended use is 250 grams (one packet) placed in a 500ml beaker inside the chamber. Place another 250 grams into a second 500ml beaker.
2. On day two (2) replace the first beaker of charcoal scrubber with the second.
3. On day three (3) reactivate the first beaker of charcoal scrubber by heating at a minimum of 160°C for at least two (2) hours). Place the reactivated scrubber in the chamber. Remove and reactivate the second scrubber. For best effect, reactivate the scrubber overnight.
4. Repeat this cycle for six (6) months. Discard scrubbers after six months and replace.

ATTACHING EQUIPMENT TO THE CHAMBER ACCESSORY OUTLETS

BACTRON workstations are provided with two 1 amp accessory outlets located inside the workspace chamber, on the left internal wall. The power switch on the main control panel controls power to the accessory outlets. The outlets can power equipment such as magnetic stirrers, an Anatox activated charcoal scrubber fan, etc. Do not attach equipment drawing more than one (1) amp.

Accessory equipment may produce additional heat in the workspace chamber. This can affect the temperature range of the incubator. Monitor the chamber pressure and incubator performance when using powered accessories inside the workspace chamber.

DEIONIZED AND DISTILLED WATER

Note: Do not use deionized water for cleaning or humidifying your incubator.

Use of deionized water may corrode metal surfaces and will void your 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.

HUMIDIFYING THE INCUBATOR

Placing a small number of petri dishes or open media containers in the BACTRON for several weeks may lead to excessive drying of sample media. A small open container such as, a flask, of 500ml of distilled water, set on each shelf of the incubator can help to slow sample drying.

PRESSURE UNIT CONVERSION

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 25: Pressure Measurement Unit Conversions

Chamber Quality Control Check Sheet

Month:	Temperature	Catalyst Changed	Condensate Drained	Cylinder Pressure Reading	Indicator Strip Changed
Date:					
1					
2					
3					
4					
5					
6					
7					
8					
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11					
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31					

You may copy this sheet for institutional use

DAILY MAINTENANCE

1. Exchange the catalyst cartridge with a reactivated one.
2. Remove and empty the condensate collection container as needed.
3. Change the anaerobic indicator strip at least once per 24 hours, or as often as necessary so that the indicating strip in the workspace chamber remains moist.
4. Visually inspect that the pass box gaskets are properly seated.
5. Check the cuffs on the sleeve system for holes, tears, and other signs of wear that may compromise integrity. Replace if necessary.
6. Check the incubator temperature to ensure that the setting is correct.
7. Record the gas cylinder reading(s).
8. Change or reactivate the charcoal scrubber, if installed. Please see the **Activated Charcoal Scrubber and Rejuvenation Cycle** on page 48 in the Operation section.
9. Clean and disinfect the workspace chamber after each use, or in accordance with your laboratory or production protocols, or regulatory requirements.

NORMAL GAS CONSUMPTION

A sealed and undisturbed BACTRON workstation will typically go for more than 30 minutes between gas injections into the workspace chamber. When injecting, the Chamber Gas pilot light will illuminate, accompanied by a pair of audible clicks from the activated gas solenoid.

The manometer water column should be depressed by approximately half an inch (1 cm) under normal operating conditions.

Injections taking place every thirty minutes or less in an undisturbed unit **may** indicate a small leak. Injections every 10 – 30 seconds are indicative of a large leak.

Note: Pass box cycles, entering or exiting the arm port doors, or working within the workspace chamber may temporarily increase the frequency of gas injections.

LEAK DIAGNOSIS – UNIT FULL

Perform this leak check procedure for a unit that is in use and that cannot be powered off or otherwise taken out of operation.

1. Read the **Normal Gas Consumption** section on the previous page prior to performing a leak diagnosis.
2. Record the gas cylinder gauge level at the end of the workday. Note the gauge level next morning. This is done to help establish a loss level for while the BACTRON is undisturbed. In other words, when no one is accessing or working in it.
3. Review the gas level entry in the BACTRON's maintenance log. For periods of high gas consumption, check if lab personnel are accessing the unit through the pass box and arm port doors with greater frequency. Accessing increases gas usage.
4. Make sure the inner pass box door is being closed after all sample transfers are complete.
5. The Pass Box Doors light should illuminate when both doors are closed. If the light does not activate, check that both doors are sealed. The pass box doors should sit flush against the door gaskets.
6. Check the integrity of the door gaskets. There should be no brittleness or dryness, and no cracks. Check that both gaskets are evenly and securely seated on the mounting frames. If sticky sample media has been spilled on the interior surfaces of a pass box door, the door may be pulling off the gasket whenever it is opened.
7. Verify that manometer is filled up to the refill (top) ring with water.
8. Check that the arm port doors are secure when not in use. The locking bars should be in the horizontal position, and the knobs tightened clockwise using wrist strength. Check the door ring seals for signs of damage or excessive wear.
9. Check that the water level of the manometer is pushed down by approximately half an inch (1 cm). If the manometer is filled and the water level is not depressed, the system is either failing to inject gas when needed, or there is a significant leak.
10. If there is a gas leak, the Chamber Gas light will turn on and off frequently. This will be accompanied by a "clicking" sound that is the chamber gas solenoid injecting gas into the chamber.
11. A gas leak detector capable of detecting hydrogen (Part Number 4600501) can be used to find leaks along the edges of acrylic glass front panel, arm port doors, outer airlock door, back panel, and side incubator in the BACTRON600 and 900.

Note: Some hydrogen gas will naturally diffuse through the water-filled manometer. If you are using a handheld hydrogen gas detector, the manometer exhaust port on the back of the BACTRON will register as a leak under normal operating conditions. **Do not seal or otherwise obstruct the manometer exhaust port.** Doing so will compromise the unit's pressure management and gas regulation systems, and void your warranty.

12. Contact your institutional maintenance department or Sheldon Technical Support for assistance if a leak is confirmed, or if heightened gas consumption is not restricted to periods of increased access and use.

LEAK CHECK – EMPTY UNIT

Use this procedure to verify the atmospheric integrity of a BACTRON that is not in use, or that can be taken out of operation. Read the **Normal Gas Consumption** section on page 51 prior to performing a leak check.

1. Remove the catalyst cartridge from the BACTRON. The catalytic production of water vapor reduces the volume of atmosphere in the chamber, and will interfere with performing an accurate leak check.
2. Make sure the BACTRON's incubator(s) is either off and at room temperature, or heated at and stabilized at the its application set point. An incubator that is actively heating from ambient temperature to reach a set point creates increased air pressure in the workstation from atmospheric thermal expansion.

Note: The unit should be at a steady temperature and atmospheric pressure state when performing a leak check.

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3. Close and secure the outer and inner pass box doors.
4. Verify that manometer is filled up to the refill (top) ring with water.
5. Check that the arm port doors are secure, with the locking bars in the horizontal position, and the knobs tightened clockwise using wrist strength. Check the door ring seals for signs of damage or wear.
6. Check that the gas regulator is set to 15 to 20 psi. Open the gas cylinder valve all the way on if not already opened. Turn the power switch on if the workstation is turned off. Check that the Chamber Gas light illuminates.
7. The pass box doors light should illuminate, indicating that both doors are closed. If the light does not activate, check that both doors are sealed.
    a. The pass box doors should sit flush against the surrounding body of the workstation.
    b. Check the integrity of the door gaskets. There should be no brittleness or dryness, and no cracks.
8. Check that the water level of the manometer is pushed down by approximately half an inch (1 cm). If the manometer is filled, the BACTRON is powered and injecting, and the water level is not depressed, the system is either not injecting gas or there is a significant leak.
9. If there is a gas leak, the Chamber Gas light will turn on and off frequently. This will be accompanied by a "clicking" sound that is the gas solenoid injecting gas into the chamber. Record the frequency of injections.
10. If there are no leaks in the system, the Chamber Gas light will remain OFF, and the water level in the manometer will remain stable at approximately 05. Inches (1 cm) of displacement.

Procedure continued on next page

11. A gas leak detector capable of detecting hydrogen (Part Number 4600501) can be used to find leaks along the edges of acrylic glass front panel, arm port doors, outer airlock door, back panel, and side incubator in the BACTRON600 and 900.

Note: Some hydrogen gas will naturally diffuse through the water-filled manometer. If you are using a handheld hydrogen gas detector, the manometer exhaust port on the back of the BACTRON will register as a leak under normal operating conditions. **Do not seal or otherwise obstruct the manometer exhaust port.** Doing so will compromise the unit's pressure management and gas regulation systems, and void your warranty.

12. If the arm port doors and pass box doors are secure, and the leak persists contact your institutional maintenance or Sheldon Technical Support for assistance.

DOOR GASKET MAINTENANCE AND USAGE

BACTRON door gaskets are subject to significant compression during pass box cycles. Users cycling the pass box more than fifteen times per day will need to replace the door gaskets every three (3) to six (6) months. Heavy institutional users may want to keep a pair of spare door gaskets on hand (Part Number 3450507).

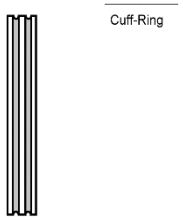
Spilling sample media on door gaskets or the interior surfaces of pass box doors may cause the gaskets to stick to the doors. This can compromise the atmospheric integrity of the pass box. The gaskets can be cleaned with dish soap and warm water, if your laboratory or production protocol permits.

SLEEVES MAINTENANCE AND USAGE

Sleeves may be washed with dish soap and warm water between uses. Disinfection should be carried out per lab or production protocols. Institutions with several users for each BACTRON may wish to keep a pair of sleeves in small, medium, and large sizes on hand. Or keep a pair of sleeves for each user.

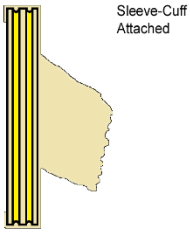
REPLACING THE SLEEVE CUFFS

A sleeve cuff should be replaced if it shows signs of brittleness or dryness, or if cracks are visible.

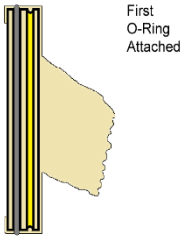


Standard Sleeve Cuff (4 Inches / 10cm)

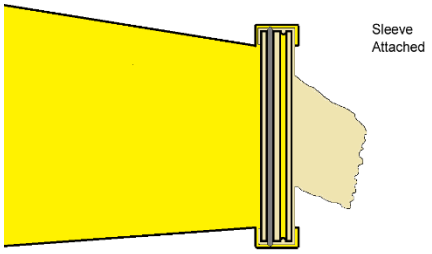
Remove the sleeve cuff by performing the following.



1. Remove the black O-ring located on the outside of the sleeve assembly, around the cuff. Gently roll the ring off to avoid damaging it or the sleeve.
2. Slowly and gently remove the sleeve-cuff and its sleeve cuff-ring from the sleeve.
3. Remove the second (2nd) black O-ring, which holds the sleeve-cuff to the cuff-ring.

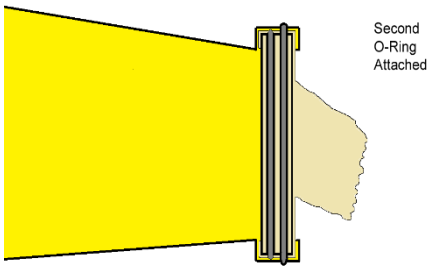


4. Remove the old sleeve-cuff from the cuff-ring and discard. Inspect the cuff-ring. Replace the cuff-ring if there are cracks, dryness, brittleness, or a loss of flexibility.
5. Inspect the black O-rings. Replace if cracks, dryness, brittleness, or a loss of flexibility are present.
6. Inspect the sleeve. Replace if cracks, dryness, or brittleness are present.



Replace the sleeve-cuff.

7. Pull a new sleeve-cuff on over the cuff-ring.
8. Pull an O-ring onto the cuff-ring, over the sleeve-cuff. Fit the ring into the groove opposite the cuff's fringed side.
9. Pull the lip of the sleeve over the sleeve-cuff and cuff-ring. The cuff's fringed end should be left outside the sleeve.



10. Pull on the second O-ring. Fit the O-ring into the groove on the outside of the sleeve and sleeve cuff. This is the unoccupied cuff-ring groove.

End of Procedure

Warning: Disconnect the power cord from the wall power supply prior to cleaning or disinfecting the BACTRON.

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

If a hazardous material/substance has spilled in the BACTRON, 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.

Periodic cleaning and the disinfection are required to prevent microbiological contamination.

Warning: Never clean or disinfect the BACTRON with alcohol or flammable cleaners.

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

Note: Do not use spray cleaners or disinfectants that might leak through openings and cracks and get on electrical components, or that contain solvents that will harm coatings. Do not use chlorine-based bleaches or abrasives; these will damage the interior surfaces.

CLEANING

Note: The BACTRON's chamber and incubator should be cleaned and disinfected prior to first use.

1. Remove all items (shelves, racks, and any additional items) from the incubator(s).
2. Clean the workstation's interior with a mild soap and water solution, including all corners.
3. Clean all removable accessories including arm port doors, gaskets, and sleeve assemblies with a mild soap and water solution.
4. Rinse with distilled water and wipe dry with a soft cloth. **Do not use deionized water**. See the **Distilled and Deionized Water** paragraph in the Operation section.
5. Take special care when cleaning around the pass box door alarm sensors and chamber power outlets to prevent damage.
6. **Do not use chloride-based cleaners** except Zephiran benzalkonium chloride solution. Other types may have adverse effects on microbiological samples.
7. Wipe down the interior surfaces with Zephiran. Do not wipe up, allow the Zephiran to evaporate.

DISINFECTING

Disinfect the BACTRON on a regular basis. Perform the following steps to disinfect the workstation:

1. Turn the unit off. Open all doors and carryout your laboratory, clinical, or production space disinfection protocol.
2. If possible, remove all interior accessories (shelves, racks, and other non-attached items) from the incubators when disinfecting. Disinfect all corners, the incubator interior(s), and the pass box. Take special care when cleaning around the pass box door and arm port door gaskets so as not to impair the positive seal.
3. Disinfect the BACTRON using commercially available disinfectants that are non-corrosive, non-abrasive, and suitable for use on stainless steel surfaces. Contact your local Site Safety Officer for detailed information on the disinfectants compatible with your cultivation or culturing applications.
4. Do not use overtly volatile disinfecting agents. Chlorines, amphyls, and quaternary ammonias will evaporate into the chamber environment. Over time the concentration in the chamber atmosphere will continue to increase, potentially leading to inhibited growth or metabolic symptoms in sample populations.
5. After completion of your institutional protocol, allow all disinfectants to evaporate completely. Wipe down all surfaces, except the acrylic glass panels, with distilled water and Zephiran until the unit no longer has a volatile odor. Use nonabrasive wipes.

VACUUM PUMP MAINTENANCE

Refer to the operation manual supplied with your vacuum pump for recommended maintenance routines.

MAINTAINING THE ACRYLIC GLASS PANELS

Sheldon Manufacturing recommends using Novus brand acrylic glass cleaner and scratch remover for cleaning and maintaining the BACTRON's acrylic glass surfaces. Please see the **Accessories section** on page 65. Alcohol or alcohol-based solvents and other aggressive solvents should never be used to clean the BACTRON, and may damage the acrylic glass panels

Never expose the BACTRON to sustained UV light. Prolonged exposure to UV will result in rapid aging of the acrylic glass, leaving it vulnerable to compression forces, and generating cracks across all exposed areas. UV light will also quickly age sleeve assemblies, turning the sleeves yellow and result in a quick loss of elasticity.

Disable or redirect laboratory UV lighting away from the BACTRON. The BACTRON should not be exposed to direct sunlight. Verify that your laboratory or workspace environment does not use UV lighting at night. This type of light is usually referred to as short wave UVC or germicidal UV light, and operates at roughly 254nm.

Damage from prolonged or high intensity UV exposure is not covered under the warranty. Periodic use of long-wave (365nm) UV hand lamps used for bacterial identification should not damage the acrylic glass.

ELECTRICAL COMPONENTS

Electrical components do not require maintenance. If the BACTRON's electrical systems fail to operate as specified, please contact your Shel Lab dealer, distributor, or Technical Support for assistance.

CONDENSATION AND THE DEW POINT

Relative humidity inside the BACTRON should never exceed 80% at 25°C. Exceeding this threshold will likely result in condensation on incubator and workspace surfaces.

Condensation will appear wherever the humidity level in the 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 the 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.

Mild condensation can be present in BACTRON units fully loaded or loaded to near capacity with open media plates, depending on ambient temperature and humidity. Cold air blowing on the exterior of the BACTRON may help to cause condensation in the workspace chamber by chilling the acrylic glass panels or metal bulkheads.

Managing excessive condensation at humidity levels that overwhelm the BACTRON condensate controller depends on either lowering the humidity level in the chamber or increasing its air temperature.

Note: 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 BACTRON is already near the dew point, barometric fluctuations may push it across the dew point threshold.

If excessive condensation is forming in the BACTRON chamber, check the following:

- Is the BACTRON 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 BACTRON's stated operating range of 80% relative humidity? If so, lower the room's humidity.
- Does the number of media containers in the BACTRON exceed its rating? The BACTRON300 can hold 300 plates; the BACTRON600 holds 600 plates; the BACTRON900 can hold 900 plates. Reduce the number of sample containers.
- Remove or cap open containers of water or media. Drain the condensate controller catch vessel. **Do not drain the manometer**.

UNIT SPECIFICATIONS

These BACTRONs are110 - 120 workstations. Please refer to the BACTRON's data plate for individual electrical specifications.

Technical data specified applies to units with standard equipment at an ambient temperature of 25°C (77°F) and a voltage fluctuation of ±10%. The temperatures specified are determined in accordance to factory standard following DIN 12880 respecting the recommended wall clearances of 10% of the height, width, and depth of the inner chamber. All indications are average values, typical for units produced in the series. We reserve the right to alter technical specifications at all times.

WEIGHT

Model	Shipping Weight
BACTRON300 (BACTRONII)	610lbs / 276kg
BACTRON600 (BACTRONIV)	760lbs / 344.7kg
BACTRON900 (BACTRONIV-900)	760lbs / 344.7kg

WORKSTATION DIMENSIONS

By Inches

Model	Exterior W × D × H	Workspace Chamber W × D × H
BACTRON300 (BACTRONII)	61.3 x 31.3 x 26.5 inches	42.5 x 28.5 x 25.2 inches
BACTRON600 (BACTRONIV)	88.2 x 31.3 x 26.5 inches	42.5 x 28.5 x 25.2 inches
BACTRON900 (BACTRONIV-900)	88.2 x 31.3 x 26.5 inches	42.5 x 28.5 x 25.2 inches

By Centimeters

Model	Exterior W × D × H	Interior Chamber W × D × H
BACTRON300 (BACTRONII)	155.7 x 79.5 x 67.3 cm	108 x 72.4 x 64 cm
BACTRON600 (BACTRONIV)	224 x 79.5 x 67.2 cm	108 x 72.4 x 64 cm
BACTRON900 (BACTRONIV-900)	224 x 79.5 x 67.2 cm	108 x 72.4 x 64 cm

UNIT SPECIFICATIONS (CONTINUED)

STAND DIMENSIONS

Model	Inches W × D × H	Centimeters W × D × H
BACTRON300 (BACTRONII)	61.5 x 30 x 30 inches	156 x 76.2 x 76.2cm
BACTRON600 (BACTRONIV)	88.5 x 30 x 31 inches	225 x 76.2 x 78.7 cm
BACTRON900 (BACTRONIV-900)	88.5 x 30 x 31 inches	225 x 76.2 x 78.7 cm

PASS BOX INTERIOR DIMENSIONS

Model	Inches W × D × H	Centimeters W × D × H
All Models	12 x 13.5 x 12	30.5 x 34.3 x 30.5

PASS BOX PLATE CAPACITY

Model	Plates
All Models	252

INCUBATOR DIMENSIONS

Workspace Chamber Incubator

Model	Inches W × D × H	Centimeters W × D × H
BACTRON300 (BACTRONII)	27.5 x 8 x 13.5	70 x 20 x 34
BACTRON600 (BACTRONIV)	N / A	N / A
BACTRON900 (BACTRONIV-900)	27.5 x 8 x 13.5	70 x 20 x 34

Side Storage Incubator

Model	Inches	Centimeters
BACTRON300 (BACTRONII)	N / A	N / A
BACTRON600 (BACTRONIV)	23.5 diameter x 18.5	59.7 diameter x 47
BACTRON900 (BACTRONIV-900)	23.5 diameter x 18.5	59.7 diameter x 47

CAPACITY

Workspace Chamber Volume

Model	Cubic Feet	Cubic Liters
BACTRON300 (BACTRONII)	17.6	498
BACTRON600 (BACTRONIV)	19	538
BACTRON900 (BACTRONIV-900)	17.6	498

Workspace Incubator Volume

Model	Cubic Feet	Cubic Liters
BACTRON300 (BACTRONII)	1.4	39.6
BACTRON600 (BACTRONIV)	N / A	N / A
BACTRON900 (BACTRONIV-900)	1.4	39.6

Side Storage Incubator Volume

Model	Cubic Feet	Cubic Liters
BACTRON300 (BACTRONII)	N / A	N / A
BACTRON600 (BACTRONIV)	4.6	130
BACTRON900 (BACTRONIV-900)	4.6	130

Pass Box Volume

Model	Cubic Feet	Cubic Liters
All Models	1.1	31

UNIT SPECIFICATIONS (CONTINUED)

TOTAL PLATE CAPACITY

Model	Plates
BACTRON300 (BACTRONII)	300
BACTRON600 (BACTRONIV)	600
BACTRON900 (BACTRONIV-900)	900

TEMPERATURE

Model	Range	Uniformity Workspace Incubator	Uniformity Side Incubator
BACTRON300 (BACTRONII)	Ambient +5°C to 70°C	±-0.5°C @ 37°C	N / A
BACTRON600 (BACTRONIV)	Ambient +5°C to 70°C	N / A	±1°C @ 37°C
BACTRON900 (BACTRONIV-900)	Ambient +5°C to 70°C	±0.5° @ 37°C	±1°C @ 37°C

POWER

Model	AC Voltage	Amperage	Frequency
BACTRON300 (BACTRONII)	110-120	9	50/60 Hz
BACTRON600 (BACTRONIV)	110-120	11	50/60 Hz
BACTRON900 (BACTRONIV-900)	110-120	14	50/60 Hz

PARTS LIST

Description	Parts Number
Anaerobic Indicator Strips (box of 100 packets)	9900706
Pass Box Door Gasket 12 x 12 (burgundy)	3450507
Arm Port Door Left	9900699
Arm Port Door Right	9900698
Arm Port Door O-Ring	6000509
BACTRON600 Arm Port Door Stand	9990761
Catalyst Holder Assembly (includes catalyst cartridge)	9990759
Foot Pedal Assembly	9990735
Gas Regulator Assembly, Anaerobic Mixed Gas	9740501
Leveling Foot	2700506
Petrie Dish Rack 2 x 11 inches (5 X 28cm)	5110729
Petrie Dish Rack 2 x 13 inches (5 X 33cm)	5110730
Power Cord 5-15 NEMA	1800540
Shelf Spacer (BACTRON300 and 900 workspace Incubator)	5680502
Sleeve Assembly Size 7 Small (2 cuffs, 2 cuff-rings, 4 0-rings, 2 sleeves, 2 straps)	9990738S
Sleeve Assembly Size 8 Medium (2 cuffs, 2 cuff-rings, 4 0-rings, 2 sleeves, 2 straps)	9990738M
Sleeve Assembly) Size 9 Large (2 cuffs, 2 cuff-rings, 4 0-rings, 2 sleeves, 2 straps)	9990738L
Sleeve Assembly) Size 6.5 Extra Small (2 cuffs, 2 cuff-rings, 4 0-rings, 2 sleeves, 2 straps)	9990738XS
Sleeve Cuff-Ring 4 Inches (interior diameter)	6400590
Sleeve Cuff-Ring Black O-ring	6000504
Sleeve Cuff-Ring 3.5 Inches (interior diameter) Small	6400619
Sleeve Cuff-Ring Red O-ring	6000503
Sleeve Cuffs Latex (for sleeve assembly) size 7	3600500
Sleeve Cuffs Latex (for sleeve assembly) size 8	3600501
Sleeve Cuffs Latex (for sleeve assembly) size 9	3600502
Sleeve Cuffs Nitrile (for sleeve assembly) size 7	3600513
Sleeve Cuffs Nitrile (for sleeve assembly) size 8	3600514
Sleeve Cuffs Nitrile (for sleeve assembly) size 9	3600515
Sleeve 10 inches (25 cm)	3600521
Vacuum Pump 110-120 Volt	9740502

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 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 BACTRON ready, as Tech Support will need this information to match your workstation with its correct part.

ACCESORIES

Shel Lab offers the following BACTRON accessories for sale. Please see our website for prices.

Acrylic Glass Cleaner (8 oz)

Novus brand acrylic / plastic glass cleaner.

Part Number 1060503

Acrylic Glass Scratch Remover (2 oz)

Helps remove visible scratches and nicks from acrylic glass.

Part Number 1060504

Anaerobic Chamber Start-Up Kit BACTRON300
BACTRON600, BACTRON 900

Includes a spare 12 X 12 pass box door gasket, Anatox brand odor control charcoal scrubber, chamber cleaner (benzalkonium chloride solution), Novus acrylic glass cleaner and scratch remover, 10 Oxoid brand anaerobic indicator strips, 2 sets of spare latex cuffs, and a spare sleeve O-ring.

Part Number 9490511

Anatox Activated Charcoal (2 lbs / 0.9 kgs)

For scrubbing hydrogen sulfides, fatty acids, and some toxic or corrosive compounds from the workstation's atmosphere.

Part Number 1060500.

Anatox Fan

Holds anatox charcoal filters and significantly speeds the removal of sulfides, fatty acids, and toxic or corrosive compounds.

Part Number 9490578

Anaerobic Indicator Strips

A box of 100 Oxoid anaerobic indicator strips.

Part Number 9900706

ACCESSORIES (CONTINUED)

CAT 180 Bake Catalyst Oven

A small, slide-loading desktop oven designed specifically for baking out BACTRON catalysts. Features automatic baking and cooling cycles.

Part Number CAT180 (110 - 120 Volts)

Compressed Gas Cylinder Switcher, Automatic

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

Part Number 2002-B (110 - 120 Volts)

BACTRON300 and BACTRON600 & BACTRON900 Microscope Adaptors

Designed for the Lecia S6 Spotting Stereo Microscope.

BACTRON300: Part Number 9990535

BACTRON600 and BACTRON900: Part Number 9990511

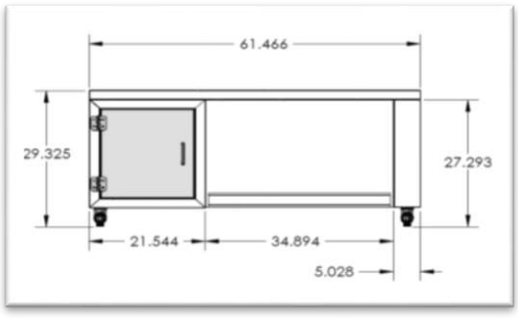
BACTRON300 Stand

A rolling stand with cabinet for the BACTRON300.

29.3 inches high by 61.5 inches wide

(74cm high by 156cm wide)

Part Number 9000511



ACCESSORIES (CONTINUED)

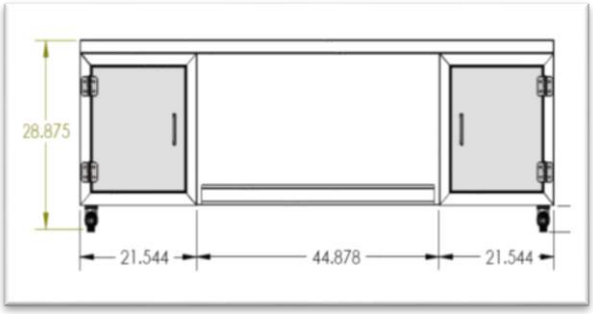
BACTRON600/900 Stand

A rolling stand with two (2) cabinets for the BACTRON600 and 900.

29 inches high by 88 inches wide

(74cm high by 156cm wide)

Part Number 9000512



Leak Detector for BACTRON Anaerobic Chamber

A handheld gas detector for locating leaks. Recommended for units that have been in service for four (4) or more years.

Part Number 4600501

Leica S6 Spotting Stereo Microscope and Assembly

Requires the appropriate BACTRON microscope adaptor.

Part Number 9990516

Lukas Fiber Optic Micro Lite Illumination System

A fiber optic, adjustable brightness, halogen light box and guide. Provides a stable, long lasting light for use with BACTRON workstations and stereo microscopes.

Part Number 4650503

Nitrogen Regulator Assembly

Delivery gauge range of 2 – 40 PSIG. Includes barbed adaptor fitting and 10 feet (3 meters) of flexible tubing.

Part Number 9740546

ACCESSORIES (CONTINUED)

UV Viewing Lamp

A handheld UV lamp for use with BACTRON workstations.

Parts Number 9490507

Zephiran Benzalkonium Chloride Chamber Cleaner

1 Gallon, 0.133%.

Part Number 1060501

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

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