BACTRON

Installation - Operation Manual

BACTRON400HP, 110 – 120 Volts

BACTRON400HP-2, 220 – 240 Volts

Warning: This product contains chemicals, including Triglycidyl Isocyanurate, known to the State of California to cause cancer as well as birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

¡Advertencia! Este producto contiene sustancias químicas, incluido el triglicidil isocianurato, que el estado de California sabe que causa cáncer, así como defectos de nacimiento u otros daños reproductivos. Para obtener más información, visite www.P65Warnings.ca.gov**.**

Avertissement! Ce produit peut vous exposer à des produits chimiques, dont l'isocyanurate de triglycidyle, reconnu par l'État de Californie pour provoquer le cancer, des anomalies congénitales ou daters problèmes de reproduction. Pour plus d'informations, visitez le site www.P65Warnings.ca.gov.

BACTRON400HP Anaerobic Chamber

110 – 120 Volts

220 – 240 Volts

Part Number Manual): 4861852

Revision: July 17, 2024

Bactron is a brand of Sheldon Manufacturing, Inc., an ISO 9001 certified manufacturer.

Model	BACTRON400HP	BACTRON400HP-2
Part ID	BAA400HP23	BAA400HP23-E
Safety Certifications		
	UL 61010-1:2012 Ed.3+R: IEC 61610-1:2010 Ed.3+C1;C2 UL 61010-2-010:2019 Ed.4 CSA C22.2 #61010-1-12:2012 Ed.3+U1;U2;A1 IEC 61010-2-010:2019 Ed.4 CSA C22.2 #61010-2-010:2019 Ed.4	

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INTRODUCTION

Thank you for purchasing a BACTRON400HP® Anaerobic Chamber. We know you have many choices in today's competitive marketplace for anaerobic cultivation systems. We appreciate you choosing ours. We stand behind our products and will be here for you if you need us.

READ THIS MANUAL

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

Before using the unit, read the entire manual to understand how to install, operate, and maintain the unit in a safe manner. Ensure all operators have received appropriate training before the unit begins service.

Keep this manual available for use by all operators.

SAFETY CONSIDERATIONS AND REQUIREMENTS

Follow basic safety precautions, including all national laws, regulations, and local ordinances in your area regarding the use of this unit. If you have any questions about local requirements, please contact the appropriate agencies.

STANDARD OPERATING PROCEDURES

Due to the range of potential applications this unit can be used for, the operator or their supervisors must draw up a site-specific standard operating procedure (SOP) covering each application and associated safety guidelines. Your SOP must be written and available to all operators in a language they understand.

Intended Applications and Locations

BACTRON400HP anaerobic chambers are intended for professional, industrial, and educational applications 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 range of applications.

Power

Your unit and its recommended accessories are designed and tested to meet strict safety requirements.

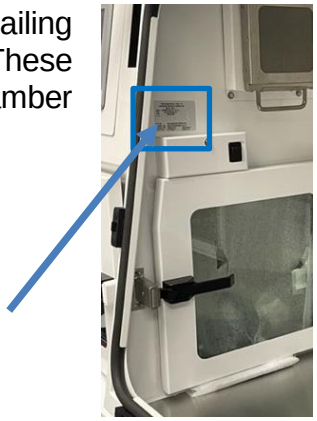
- The unit is designed to connect to a power source using the specific power cord type shipped with the unit.
- Always plug the unit power cord into a protective earth grounded electrical outlet conforming to national and local electrical codes. If the unit is not grounded properly, parts such as knobs and controls can conduct electricity and cause serious injury.
- Do not bend the power cord 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 or altered in any way.**
- Use only approved accessories.
- Do not modify system components.
    - Any alterations or modifications to your unit not explicitly authorized by the manufacturer can be dangerous and may void your warranty.

BACTRON400HP

CONTACT ASSISTANCE

Phone hours for Support are 6 am – 4:30 pm Pacific Coast Time (west coast of the United States, UTC 8), Monday – Friday.

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 data plate located in the workspace chamber above the inner airlock door.



support@sheldonmfg.com 800-322-4897

503-640-3000

FAX: 503-640-1366

Sheldon Manufacturing, INC.

P.O. Box 627

Cornelius, OR 97113 USA

ENGINEERING IMPROVEMENTS

Sheldon Manufacturing continually improves all its products. As a result, engineering changes and improvements are made from time to time. 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 BACTRON400HP dealer or distributor for assistance.

MANUFACTURING DEFECT WARRANTY

For information on your warranty and online warranty registration please visit:
www.sheldonmanufacturing.com/warranty

REQUIRED ITEMS

The following consumables and equipment are necessary for the operation of the BACTRON400HP and **must be purchased separately** from the unit.

AMG Supply

The BACTRON400HP requires a continual supply of Anaerobic Mixed Gas (AMG) to establish and maintain an anaerobic atmosphere. The gas mix must have 5% hydrogen to drive the BACTRON400HP catalytic oxygen scrubbing process. The manufacturer recommends an AMG mixture ratio of **5% hydrogen, 5% carbon dioxide**, and **90% nitrogen**.

Note: Do Not exceed 5% hydrogen concentration or explosive mixtures can occur.

The BACTRON400HP can be connected to either a standalone supply cylinder or an in-house system.

On-Site Supply

The manufacturer strongly recommends keeping at least two size 200 cylinders of AMG (size N 8.76M^3) on hand or a house supply system equivalency to ensure a continual supply.

Gas Usage

AMG usage in the BACTRON400HP is highly variable. Consumption is primarily driven by the following factors:

- The number of times the chamber is accessed each day.
    - Airlock and armport sleeve cycles consume AMG.
- The amount of time laboratory personnel spends working with their arms in the sealed workspace chamber.
    - Movement displaces the chamber atmosphere; some chamber atmosphere is vented and must be replaced with AMG injections.
- Laboratory personnel adhere as close as possible to the proper movement technique guidelines while working in the chamber.

Airlock cycles may be supplemented with nitrogen to help reduce AMG usage.

Required Gas Pressure Delivery to the BACTRON400HP

Delivery of less than 50 psi gas flow pressure to the BACTRON400HP may slow cycle times. Delivery pressures of less than 40 psi will interrupt the airlock, sleeve, and commissioning cycles, and prevent the BACTRON400HP from keeping overpressure in the workspace chamber.

Factors that can reduce gas pressure delivery include:

- The total volume of the delivery system, including:
  - The distance between the BACTRON400HP and the supply source.
  - Incorrectly sized gas tubing.
- The total number of units attached and drawing from a building gas supply system.
- Incorrect regulator settings.

If necessary, gas regulators may be set higher than 50 psi gas flow to overcome factors lowering the pressure in the supply system. **Never exceed a setting of 60 psi.**

The manufacturer recommends waiting to introduce electronic devices into the workspace chamber until an anaerobic atmosphere has been established. Condensation may take place in the chamber during the anaerobic commissioning cycle.

Open all incubator doors.

The incubator doors must be open during the commissioning cycle while the BACTRON400HP establishes an anaerobic atmosphere in its workspace chamber.

- Failure to open the incubator doors will leave significant reservoirs of oxygenated atmosphere in the incubators.
- The airlock doors must be closed and latched prior to launching a commissioning cycle. The inner door locks when the BACTRON400HP is turned on.
- The armport doors must be installed for the commissioning cycle to successfully create an anaerobic atmosphere.

Incubator Doors Open

Scrubber Cartridge Reactivation Oven

The BACTRON400HP requires a scrubber cartridge oven to reactivate the O_2/activated carbon media scrubber cartridges.

There are two Catalyst/Activated Carbon containers included in the BACTRON400HP.

Each cartridge requires a bake out of at least 8 hours at 200°C to reactivate after 24-hours of use in the chamber. This results in at least one bake-out per day, with one scrubber mounted in the BACTRON400HP workspace chamber while the other is being baked out.

Beakers

A glassware beaker (or flask) is placed under the drain tube for the condensate-capturing chiller plate in the chamber.

Additionally, the manometer pressure valve/gauge in the workspace chamber requires periodic water refills. Water is added by pouring or injecting water into the fill port on the top of the manometer body. Using a beaker or other glassware is useful when transporting and pouring distilled water into the manometer.

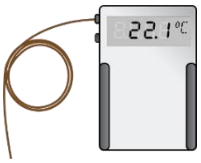
TEMPERATURE REFERENCE DEVICE

Must be purchased separately.

A temperature reference device is needed to calibrate the BACTRON400HP incubator temperature displays.

Reference devices must meet the following standards:

- Accurate to at least 0.05°C



Temperature Reference

The device should be regularly calibrated, preferably by a third party.

Temperature Probe

Use a digital device with a wire thermocouple probe that can be introduced into the incubator through the incubator door space. Select temperature sensors suitable for the application temperature to which you will be calibrating.

Why Probes?

Reference readings taken outside an incubator using a wire temperature probe eliminates the need to open incubation chamber doors. Opening chamber doors will disrupt the chamber temperature. Each disruption requires **a minimum 1-hour wait** to allow the temperature to re-stabilize before continuing.

No Alcohol or Mercury Thermometers

Alcohol thermometers do not have sufficient accuracy to conduct accurate temperature calibrations. **Never place a mercury thermometer in an incubator.** Always use thermocouple probes.

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INSPECT THE BACTRON400HP SHIPMENT

- When a unit leaves the factory, safe delivery becomes the responsibility of the carrier.
- Damage sustained during transit is not covered by the manufacturing defect warranty.
- Save the shipping carton until you are certain the unit and its accessories function properly.

When you receive your unit, inspect it for concealed loss or damage to its interior and exterior. If you find any damage to the unit, **follow the carrier's procedure for claiming damage or loss.**

- Carefully inspect the shipping carton and report any damage to the carrier service that delivered the unit.
- If the carton is not damaged, open the carton and remove the contents.
- The unit should come with an end-user Installation and Operation Manual.
- Verify that the correct number of accessory items have been included.

Standard accessory items included with the BACTRON400HP:

Leveling Feet
2700506 (4)

Armport Door Left
9521253 (1)

Armport Door Right
9521254 (1)

Power Cords
Part Number varies by location and line voltage
(2)

Catalyst and Activated Carbon Cartridges
9990953 (2)

Foot Switch Control
9830516 (1)

AMG Regulator Kit
9740560 (1)

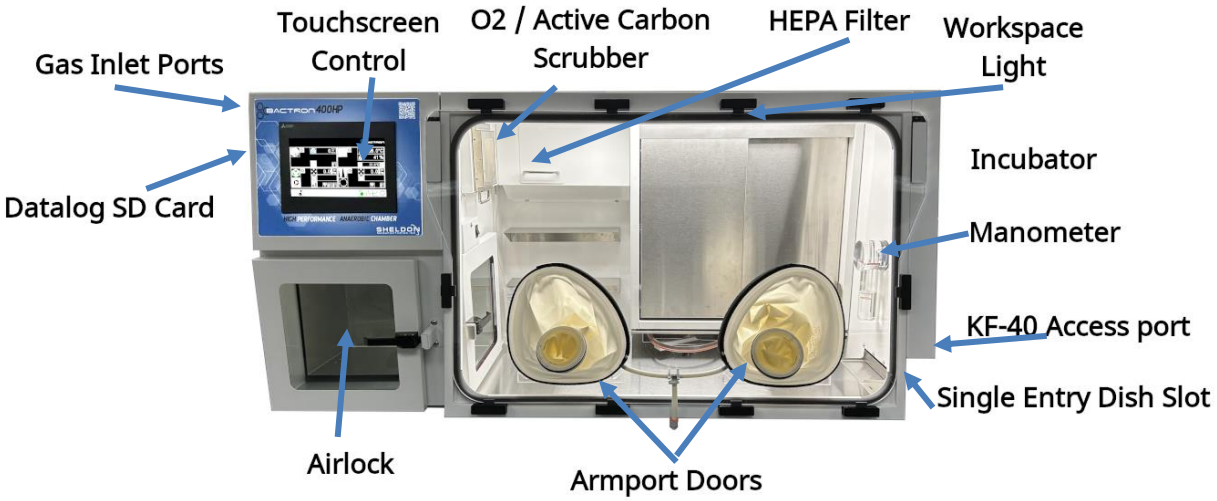
Petri Dish Rack 2X12
5111228 (1)

Sleeve Assemblies (Size 8 Medium)
9990738M (2)

Small Cuffs (Size 7 Small)
3600500 (2)

Workspace Standard HEPA Filter
2800562 (1)

ORIENTATION



BACTRON400HP

Petri Dish Slot

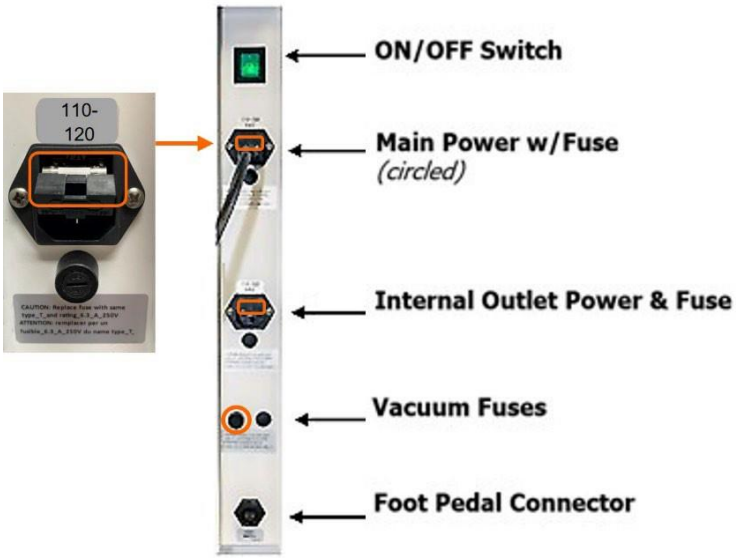
Interior Petri Dish Slot Closed

Exterior Petri Dish Slot Opened

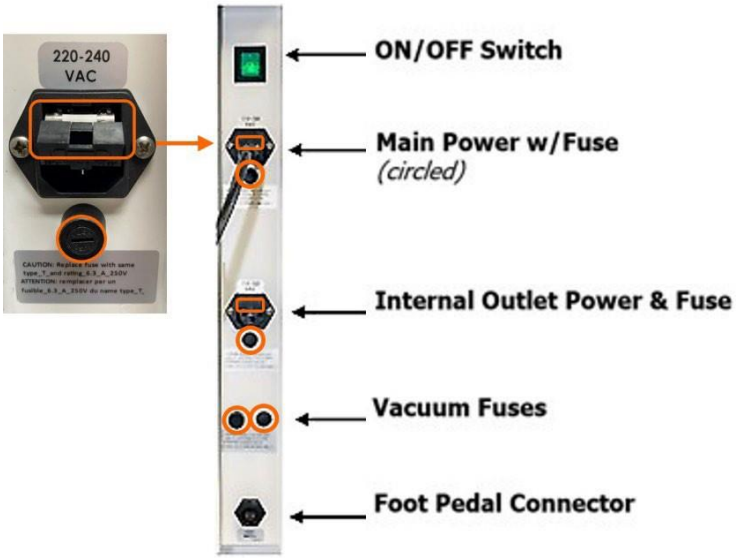
Exterior Petri Dish Slot Closed

BACTRON400HP Power Panel

110 Power Panel and Fuses



220 Power Panel and Fuses



Note: The BACTRON400HP is delivered with all fuses installed. Replace fuses with the same type of fuse. Insert the correct power cords.

Receiving and Inspecting Your BACTRON400HP

Workspace Chamber

RECORD DATA PLATE INFORMATION

The data plate has the incubator **model number, serial number, part number,** and **Part ID number**. Tech Support will need this information during any support call. Record it below for future reference.

- The data plate is in the workspace chamber above the inner airlock door.

Data Plate Information

MODEL NO:	
SERIAL NO:	
PART NO:	
PART ID:	

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INSTALLATION CHECKLIST

Pre-Installation

1. Check that countertop space is sufficient. (page 25). The Bactron dimensions are on page (157). Rolling stands for the BACTRON400HP are available for purchase.
2. Check that the ambient conditions and ventilation spacing requirements are met (page 25).
3. Check for sources of temperature and atmospheric disruption in the environment (page 26).
4. Verify that no damaging UV light sources are present (page 26).
5. Check that a suitable electrical outlet is present (page 28).
6. Procure an AMG gas supply for the BACTRON400HP suitable for your application (page 29).
7. **Optional**: Obtain a nitrogen (N2) supply to reduce AMG usage during airlock cycles (page 30).

Install the BACTRON400HP in a suitable location.

1. Review lifting and handling instructions, page 31
2. Make sure the BACTRON400HP is level, page 31

Set up the BACTRON400HP for use.

1. Connect the gas supply source(s) to the BACTRON400HP, page 32
2. Connect the foot pedal switch to the BACTRON400HP, page 33
3. Fill the manometer in the workspace chamber with water, page 33
4. Clean and disinfect the BACTRON400HP, accessories, and items to be placed in the chamber, page 35
5. Open the incubator doors all the way and leave open, page 36
6. Close and latch both airlock doors, page 36
7. Install the armport doors, page 37

REQUIRED AMBIENT CONDITIONS

The Bactron is designed to be operated indoors. The Bactron has a Pollution degree rating of 2 (PD2).

The installation location's elevation should be between (0 and 6600 ft)/ (0 and 2000 meters). Higher elevations (above 2000 ft / 600 m) may require changes to the Airlock and Armport Vacuum settings to adjust for lower ambient air pressure. See AUTOCYCLE SETTINGS BY ELEVATION page 167.

The room temperature is to be maintained between 15°C and 30°C (59°F and 86°F) and the room temperature should not vary more than +/-1°C per hour. Relative Humidity should be no more than 80% at 25°C / 77°F. Operating the BACTRON400HP outside of these conditions may adversely affect its incubator temperature stability and effective operating range.

For conditions outside of those listed above, please contact your BACTRON400HP distributor to explore other options appropriate for your laboratory or production environment.

SUFFICIENT WORKSPACE

A minimum of 2.5 inches (64mm) for clearance is required for unobstructed airflow and cooling on the top, back, and sides of the unit. Recommended clearance on top of the unit is 13 inches (330mm) to allow for periodic front hatch opening, 12 inches (304mm) in front to allow the airlock door to swing freely, and 6 inches (152mm) on the right side to allow easy single-plate entry use. See pg. 156 for detailed clearance requirements. It is recommended to keep enough room on the left side of the unit so a person can reach behind it to turn it on and off. The power switch is located on the back of the unit.

- Gas Connections: The BACTRON400HP requires continual connections to 1 (AMG) or 2 (Optional: N2) compressed gas sources. Ensure there is sufficient space for these connections.
- The Over-Temperature Limit (OTL) is located on the left-hand side of the Bactron.

Note: Refer to Unit Dimensions (page 157).

ENVIRONMENTAL DISRUPTION SOURCES

Consider proximate environmental factors that can affect the chamber temperature and atmospheric integrity when choosing a location to install the BACTRON:

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

Direct exposure to air-conditioning vents or other sources of cold air, humidity, and other ambient conditions can result in **condensation or fogging** on the acrylic glass panels of the chamber. Prolonged exposure to cold air flows may adversely affect the incubator temperature performance.

ELIMINATE UV LIGHTING

Sustained exposure to direct sunlight, UVC, or UV germicidal lighting around 254nm will cause **rapid aging of BACTRON400HP acrylic glass panels and armport sleeves.** Check to see if your laboratory or workspace contains sources of UV lighting.

Periodic use of long-wave (365nm) UV hand lamps for bacterial identification should not damage the acrylic glass. See *Maintaining the Acrylic Glass Panels* on page _ for more details.

POWER REQUIREMENTS

Ensure the following requirements are satisfied when selecting a location for the BACTRON400HP.

Model	**BACTRON400HP**	**BACTRON400HP-2**
Part ID	BAA400H22	BAA400H22-E
Voltage	110 -120V 50/60Hz	220 - 240V 50/60Hz
Main Power Fuse	One, 5X20MM T12.5A 250V	Two, 5X20MM T6.3A 250V
Accessory Power Outlet	One, 5X20MM T12.5A 250V	Two, 5X20MM T12.5A 250V
Vacuum Fuse	One, 5X20MM T10A 250V	Two, 5X20MM T5.0A 250V
Power Cords	Two, NEMA 5-15P, 9.5 FT	Two, CEE 7/7, 2.5 meters; country specific cords can be requested.
Building Circuit Breaker Minimum Amps	Two, 15-amp circuits • Main Power • Accessory Outlet	Two, 15-amp circuits • Main Power • Accessory Outlet

Internal Power Source: The power source for the BACTRON400HP must match the voltage, and match or exceed the ampere requirements listed on the unit data plate.

Note: Unit may be damaged if the supplied voltage varies by more than 10% from the data plate rating.

- The wall power source must be a protective earth grounded.
- Use a separate circuit to prevent the loss of the unit due to overloading or circuit failure.
- The wall power source must conform to all national and local electrical codes.

Power Cord & Fuses for 110

Section	Voltage	Fuse	Power Cord / Fuse
Main	100-125	T – 12.5, 250 V	9 ft 5 in (2.86m) Power Cords (2)*
Vacuum	100-125	T – 10 250 V	Internally connected
Internal Outlets	100-125	T - 12.5 250 V	9 ft 5 in (2.86m) Power Cords (2)*

Power Cord & Fuses for 220

Section	Voltage	Fuse	Power Cord / Fuse
Main	207-250	T – 6.3, 250 V	CRD 230V 10A DET EURO EU1-16P
Vacuum	207-250	T – 5 250 V	Internally connected
Internal Outlets	207-250	T - 12.5 250 V	9 ft 5 in (2.86m) Power Cords (2)*

CAUTION: The unit must be positioned so that all end-users can quickly unplug the BACTRON400HP if there is an emergency.

Note: Always use this cord or an identical replacement.

GAS SUPPLY REQUIREMENTS

Warning: Never exceed a 5% hydrogen concentration inside the anaerobic workspace chamber. Exceeding 5% creates an explosion and flammability hazard.

Avertissement: La concentration d'hydrogène ne doit pas dépasser 5% dans la chambre anaérobie. Un dépassement de 5% crée un risque d'explosion et d'inflammabilité.

AMG (Anaerobic Mixed Gas) – Required

A supply source of AMG sufficient to conduct the Anaerobic Commissioning Cycle and operate the unit afterward **must** be on hand prior to placing the BACTRON into operation. The Manufacturer strongly recommends keeping a second AMG cylinder on site to ensure a continual supply of AMG.

Anaerobic Mixed Gas is often sold by gas suppliers under the category of *Anaerobic Incubation Mixtures* or *Biological Atmospheres.* Laboratories that are required to be compliant with Good Laboratory Practices may require batch-certified AMG.

Reminder: The recommended BACTRON AMG mix is 5% H_2, 5% CO_2, 90% N_2.

Airgas Part Numbers for AMG: H_2 5%, CO_2 5%, N_2 90%, Size 200, CGA 350:

Z03NI9022000008 – Standard

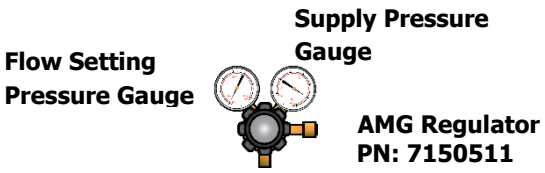
Z03NI9032000041 – Analyzed with Certificate.

Contact your site safety officer and review your institutional safety protocols for handling, storing, and using compressed gases. Follow all local ordinances and national regulations regarding compressed gases in research, clinical, or production environments.

AMG Regulator Requirements

The AMG Regulator that is available to purchase from Sheldon Manufacturing with the BACTRON is compliant with the requirements listed below:

- The regulator for each AMG cylinder must be a **dual-stage regulator** to ensure precise flow rates.
- The AMG regulator **must be rated for hydrogen.**
- **Must** be capable of delivering **50 psi of gas flow** to the BACTRON (345kPa).
- The supply tubing from the gas regulator to the BACTRON must be **3/16-inch ID** (inside dimension).



Nitrogen Option - Dual Gas Configuration

AMG is used to cycle the airlock to create and maintain an anaerobic atmosphere in the workspace chamber. This is a major source of AMG usage; however, AMG is only necessary for the final gas backfill. To reduce AMG consumption, connect a nitrogen (N_2) supply to the BACTRON **N_2 In** gas port. The BACTRON will draw from the **N_2 In** gas port during gas backfills for every iteration of an airlock auto cycle, except the final iteration.

The unit must be connected to both an AMG supply source (**AMG In** port) **and an N2** source for the dual gas configuration to function. See illustrations on Connect To The Gas Supply page 32.

- For dual gas configurations, the manufacturer recommends a cylinder of AMG, along with a cylinder of 100% Nitrogen (N_2).
- The nitrogen must be of medical or food grade. The use of industrial-grade nitrogen risks introducing impurities into the workspace chamber and damaging components.
- The nitrogen regulator must be a dual-stage regulator rated for nitrogen, connected to 3/16" ID gas tubing, and be capable of delivering 50 psi of gas flow to the BACTRON (345kPa).
- The BACTRON will not draw from the nitrogen supply during manual airlock cycles or when cycling the armport sleeves.

Required Gas Pressure Delivery to the BACTRON

Delivery to the BACTRON of less than 50 psi gas flow pressure may slow cycle times. Delivery pressures less than 40 psi will interrupt airlock, sleeve, and commissioning cycles, and prevent the BACTRON from maintaining overpressure in the workspace chamber.

Factors that can reduce gas pressure delivery include:

- The total volume of the delivery system, including:
    - The distance between the BACTRON and the supply source.
    - Incorrectly sized gas tubing.
- The total number of units attached and drawing from a building gas supply system.
- Incorrect regulator settings.

If necessary, gas regulators may set higher than 50 psi gas flow to overcome factors lowering the pressure in the supply system. **Never exceed a gas flow setting of 60 psi.**

LIFTING AND HANDLING

The BACTRON400HP is heavy (See weight page 156). Use an appropriate power-lifting device. Follow these guidelines when lifting and handling the BACTRON:

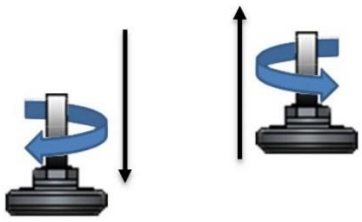
- Lift the BACTRON400HP only by its bottom surface.
- Doors, handles, and knobs are not adequate to lift or stabilize the BACTRON400HP.
- Restrain the BACTRON400HP completely while lifting or transporting so it cannot tip.
- Remove all removable components, such as trays and containers, and secure all doors in the closed position during transfer to prevent shifting and damage.

Note: To prevent damage when moving the BACTRON400HP, turn each of the four leveling feet completely clockwise.

LEVELING

The BACTRON400HP must be level and stable for safe operation.

1. Install the leveling feet included with the BACTRON400HP.
2. Adjust the leveling feet until the BACTRON400HP stands level and solid without rocking.



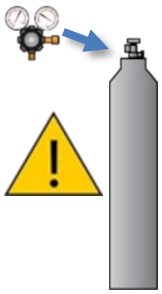
Leveling Feet

INSTALL THE BACTRON400HP

Install the unit in a workspace location that meets the criteria discussed above in the Installation section.

Note: Do not connect the unit to its power source until the BACTRON400HP is level.

ATTACH THE REGULATOR TO THE GAS SUPPLY CYLINDER



Note: Skip this procedure if the BACTRON400HP will be drawing AMG from a building supply system.

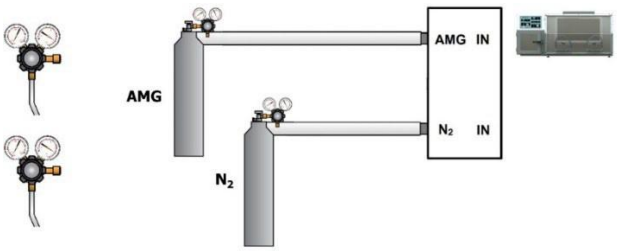
Optional: Attach a nitrogen regulator to a nitrogen supply cylinder now if you will be using the dual-gas configuration.

CONNECT TO THE GAS SUPPLY

Warning: Never exceed a 5% hydrogen concentration inside the anaerobic workspace chamber. Exceeding 5% may create an explosion and flammability hazard.

Single Gas Configuration

Dual Gas Configuration

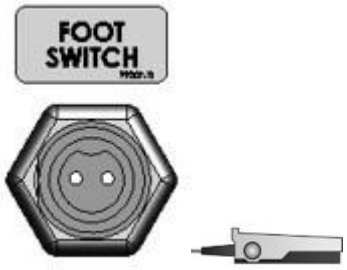


CAUTION: Do not start a flow of gas to the BACTRON400HP at this point for either configuration.

CONNECT THE FOOT PEDAL

The foot pedal switch cycles the armports and attached sleeves.

Connect the foot pedal cable to the two-pin female connection on the power access panel on the back of the BACTRON400HP.



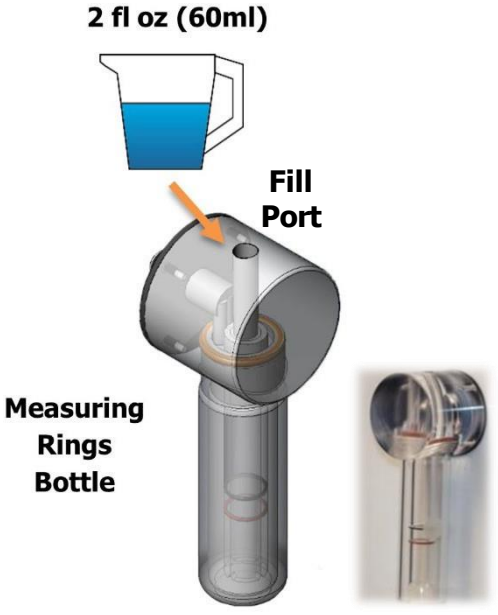
Connector / Foot Switch and Pedal

FILL THE MANOMETER

The manometer acts as a pressure relief check valve and as a visual gauge of atmospheric pressure inside the sealed workspace chamber.

The manometer must be filled with 2 fluid ounces (60 ml) of distilled water. Failure to do so will compromise the chamber's anaerobic atmosphere and cause excessive usage of AMG gas.

- Underfilling or overfilling compromises the manometer's accuracy as a pressure gauge and check valve. Fill with 2 fl oz (60 ml) of water.
  - The water should reach the top (black) measuring ring when the BACTRON400HP is off, and the bottom poppet ring is on.
- To avoid scaling (mineralization build-up), use distilled water. **Never use deionized water**.
- Fill the manometer through the top fill port using a lab wash bottle.



Manometer

Lab Wash Bottle

VACUUM SUPPLY

The BACTRON400HP comes with an internal vacuum pump to evacuate the airlock and the armport sleeves when cycling to remove oxygen. The BACTRON400HP is not designed to connect to an in-house supply system.

INSTALLATION CLEANING AND DISINFECTION

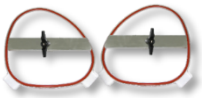
Cleaning and disinfecting the chamber during installation reduces the chance of microbiological contamination. The BACTRON400HP was cleaned, and the workspace chamber disinfected at the factory. However, the BACTRON400HP may have been exposed to contaminants during shipping, or the factory procedure may not meet the standards of your institutional protocols.

Please see the *Cleaning And Disinfecting* entry on page 143 in the User Maintenance section for information on how to clean and disinfect without damaging the chamber.

CAUTION: Never use deionized water to clean or rinse the BACTRON400HP.

1. Remove protective wrappings from unit and accessories prior to cleaning and disinfecting.
2. Remove the armport doors and place them inside the workspace bottom.
3. Slide the 10 latches away from the chamber in the open position, then lift the clear armport door surface panel to gain access to the workspace chamber.
    - Turn Off the Power and AMG gas before accessing the workspace chamber.
    - Open the armport door surface panel by releasing all 10 latches to allow better access to add larger items that won't pass through the pass box.
    - Apply any necessary pressure to lock the latches when closing the armport door surface cover.

Armport Doors placed under Incubator, Petri Dish Rack 2X12



    - Reinstall and securely tighten the 2 armport doors that were set aside in the workspace chamber (pg. 37).
    - Turn On the Power and the AMG gas to ensure the workspace chamber can pressurize.
4. Clean and disinfect the workspace chamber and incubator(s).
    - Armport doors
    - Petri dish racks
    - Place the glass flask or beaker under the plastic condensation tube on the left side of the chamber when clean.
    - Place water-resistant, aerobic-tolerant items into the workspace chamber now. Doing so saves time and AMG usage by eliminating future airlock cycles.

Caution: The manufacturer recommends waiting to introduce electronic devices into the workspace chamber until an anaerobic atmosphere has been established. Condensation may take place in the chamber during the anaerobic commissioning cycle. If the front hatch must be opened to insert the electronic device. Wrap the device to make it airtight during anaerobic commissioning . Once anaerobic, unwrap the device and allow extra time to scrub out O2.

OPEN THE INCUBATOR DOORS

Incubator doors must be open during the commissioning cycle while the BACTRON400HP establishes an anaerobic atmosphere in its workspace chamber.

- The incubator doors must be open and centered to allow optimum circulation.
- Failure to open the incubator doors will leave significant reservoirs of oxygenated atmosphere in the incubator.

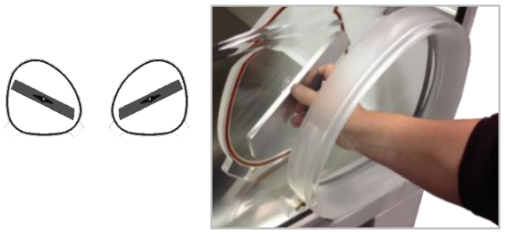
AIRLOCK DOORS – CLOSED

The airlock doors **must** be closed and latched prior to launching a commissioning cycle. The inner door locks when the BACTRON400HP is turned on.

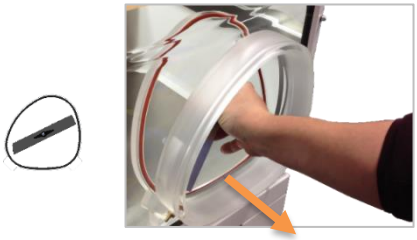
INSTALLING THE ARMPORT DOORS

The armport doors must be installed for the commissioning cycle to successfully establish an anaerobic atmosphere.

- Turn the locking bar on both doors to a roughly 45° position.



- Insert the tabs for one door into the slots on the bottom of its armports.



- Pull the top of the door toward you so that it sits balanced and vertical in the armport.
- Repeat the last two steps for the second door.

- Turn the locking bars on both doors to a horizontal position, one at a time.

- Tighten the wing nut, until it holds the bar in place. Then tighten until the Workspace injection light stays off. Turn the wing nut a maximum of 2 more full revolutions.
- Check that the doors sit snug in the ports.

Warning: Over-tightening the wing nut may damage the door or wing nut.

- Remove your arms from the sleeves and watch the workspace AMG Injection indicator for a few moments to ensure the unit is not frequently injecting.

SYMBOLS

Below is the On/Off Power Switch for the BACTRON400HP, and the Caution indicator which points out potentially hazardous situations.

Interior & Exterior Symbols & Icons	Definitions
	**I/ON O/OFF** The **power switch** can be found on the back of the BACTRON400HP. ***L'interrupteur d'alimentation*** *se trouve à l'arrière du BACTRON400HP.* It controls all power to each chamber and their systems. *Il contrôle tout le pouvoir de chaque chambre et de leurs systèmes.* **I** – Turns BACTRON On. *Allume BACTRON.* **O** – Turns BACTRON Off. *Éteint BACTRON.*
	**CAUTION!** Consult the user manual to address a potentially hazardous situation. *Consultez le manuel d'utilisation pour faire face à une situation potentiellement dangereuse.*
	**CAUTION!** High voltage. *Haute tension.*

Note: Additional Symbols and Icons can be found preceding each relevant section.

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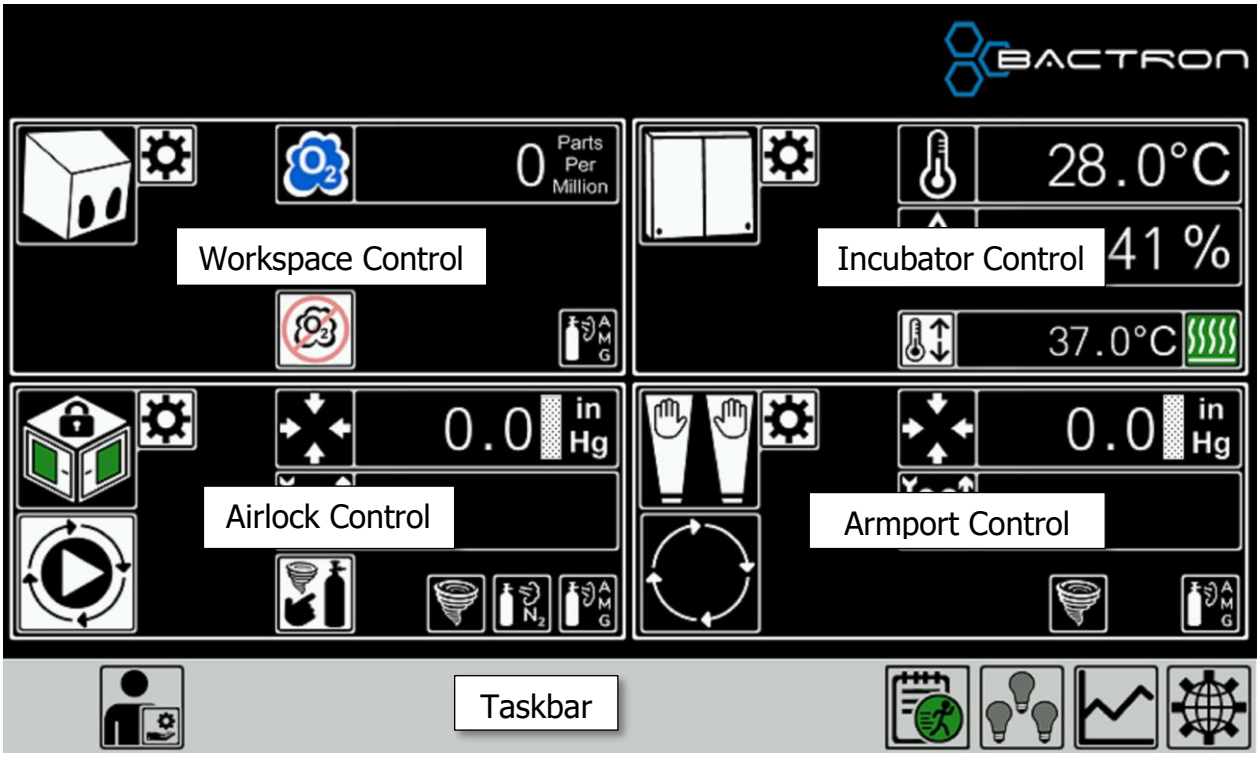
HOME SCREEN

Overview

The Home Screen is divided into five sections: Four control screens and the taskbar.



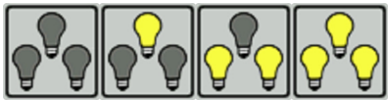
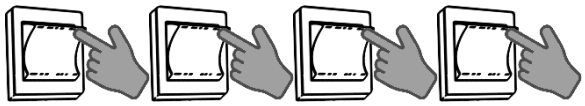
Control Screens

Each of the four controls have:

- **Specific sensor readings** (Such as, O2 ppm, temperature, relative humidity, pressure inHg)
- **Set of indicators** (Such as, Anaerobic Status, heat active, vacuum active, AMG active, N2 active, door status, AMG tank low, N2 Tank low)
- **Buttons** (Such as Settings, manual Airlock functions, Workspace commissioning)
- **Alarms (**Such as Workspace injection issues, over and under temperature, autocycle failed, over-temp limit active)

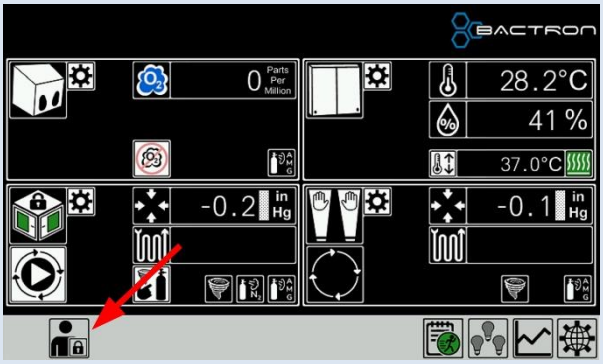
Taskbar

The Home Screen Taskbar has up to six buttons and two alarm indicators:

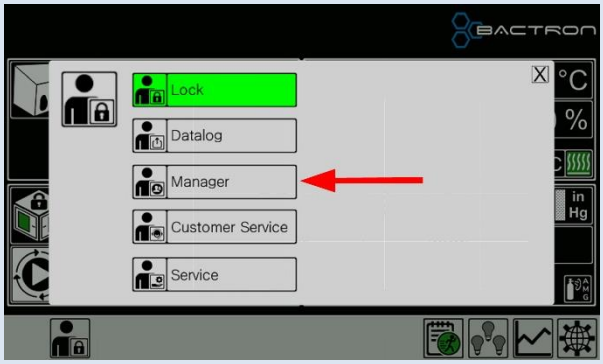
1		**User Login:** Authorized users can access secured functions. Names from left to right. Locked, DataLog, Manager, Customer Service, Service. Always present.
2		**AMG Low:** Present when pressure from tank is too low.
3		**Nitrogen Low:** Present when pressure from tank is too low.
4		**Mute:** Present while buzzer is sounding. Will toggle the sound on and off.
5		**Data Logger:** Present when data logger is enabled. Will be green when it has successfully started logging data.
6		**Light Switch:** Toggles from low, medium, high (1 lit bulb, 2 lit bulbs, 3 lit bulbs) and off. Always present. **Change Brightness while inside Workspace.**  • Tap the black airlock autocycle button four times within 3 seconds. • Wait for the workspace lights to flash two times . • Tap the autocycle button to achieve the desired brightness. The Workspace light change process is active for 5 seconds then flashes two times to indicate the autocycle button has returned to autocycle control.
7		**Data Log Graph:** Graph takes you into the datalog to see readings over time. Always present.
8		**Global options:** Global options go into the Global Options to access About, Calibrations, Change Password, Lo to Sd Card, Date & Time, and Screen Settings. Always present.

Login

1. Tap User login button

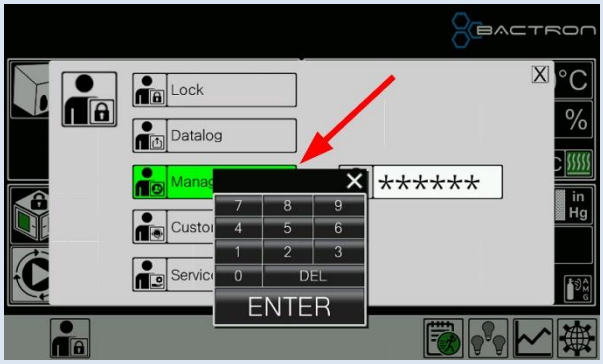


2. Tap the user to log in as

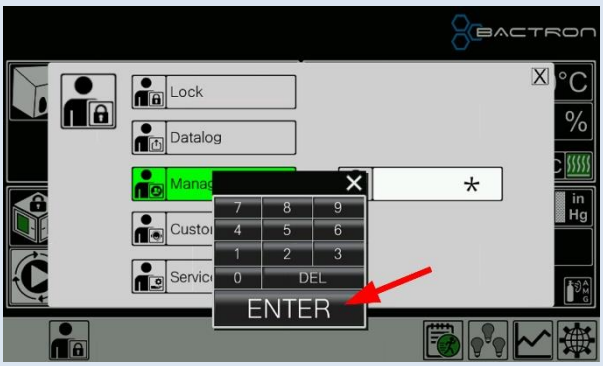


3. Tap password input box

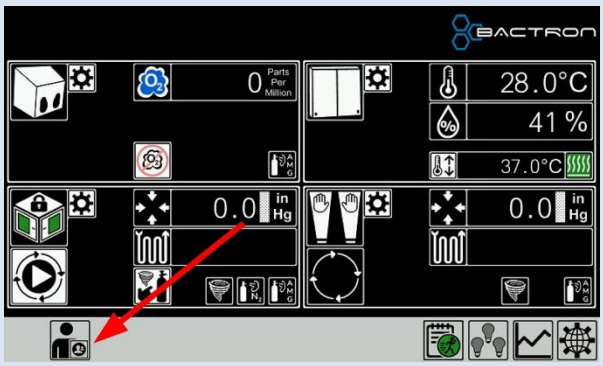
4. Enter Password



5. Tap enter



6. Log in box changes to show new user



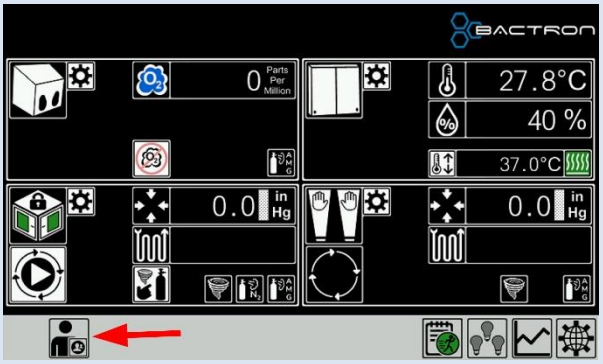
Factory Default Passwords:

- Datalog: Password = 1. (Operator changeable after logged in as Manager.)
- Manager: Password = 2. (Operator changeable after logged in as Manager.)
- Customer Service: Changes daily, must contact customer service for current password.
- Service: Changes daily, must contact customer service for current password.

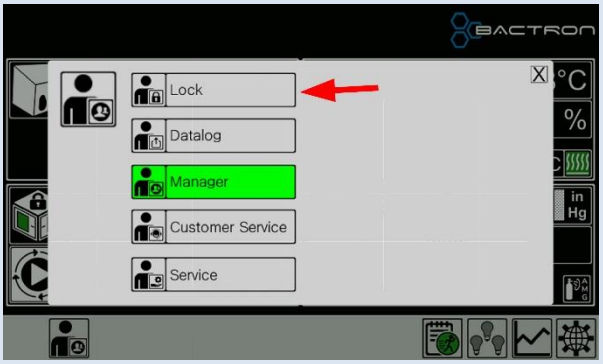
Logout

When the user has completed their task and is ready to log out.

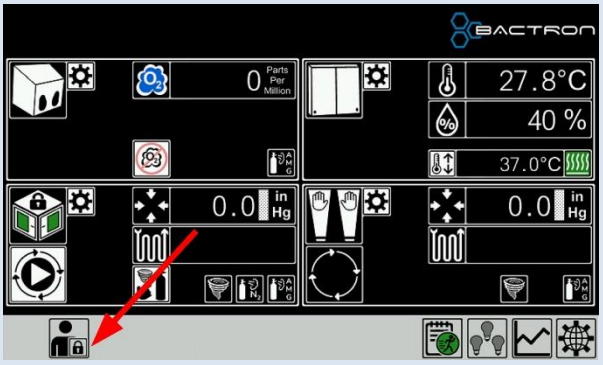
1. Tap User login button



2. Tap Lock

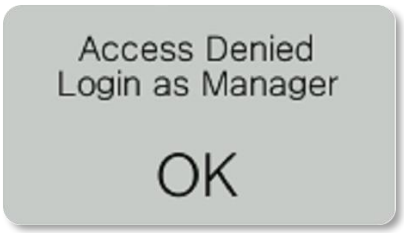


3. Log in box changes to Lock

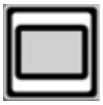


Secure Access

If an operator attempts to access a secured screen and they are not authorized, this message appears.



Secured Access is provided for the following functions:

Icon	Function	Minimum Access
	Workspace Anaerobic Commissioning	Manager
	Control Settings	Manager
	Calibrations	Manager
	Change Passwords	Manager
	Date and Time	Manager
	Screen Settings	Manager
	Log to SD Card	Datalog

The BACTRON400HP offers 5 user states:

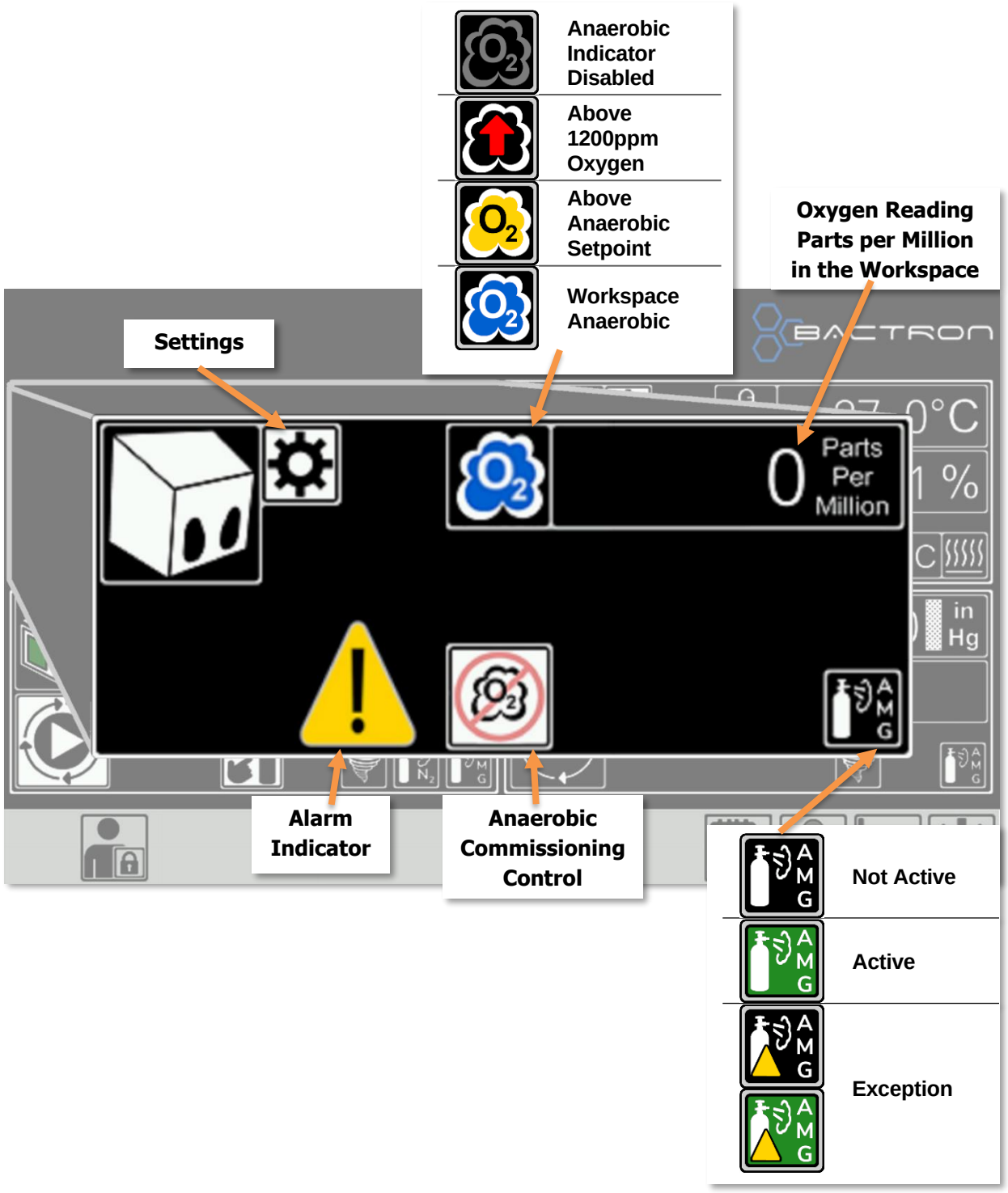
 Locked	Basic operations only. The user login button has a lock on it which indicates no users are currently logged on.
 Datalog	Allow user to start and stop the datalogger to remove SD Card and collect the temperature, oxygen, and humidity logs on a PC.
 Manager	Full operator access.
 CustSrv	Temporary elevated access for Customer service and customer collaboration. Must contact Customer Service to get the temporary password.
 Service	Temporarily elevated access for Service providers. Must contact Customer Service to get the temporary password.

Note: BACTRON400HP does not require users to login for normal operations.

WORKSPACE

Overview

Manages and reports the status of the Workspace.



Reading and Indicators

Oxygen reading - reports in parts per million with a minimum of 0 ppm and maximum of 1,200 ppm (0% to 0.12% oxygen). Ambient air contains around 210,000 ppm of oxygen (21%), well above the sensor's maximum reading when oxygen is not scrubbed from the workspace.

O_2 Indicator (Cloud) - an adjustable indicator (See Workspace Settings on page 50) that allows the operator to set the acceptable level of oxygen to show as anaerobic. It has the following four states:

Anaerobic Indicator Disabled
Sensor may be disabled in workspace settings**.** See Workspace Settings on page 50

Above 1200ppm Oxygen
Oxygen level in workspace is higher that the sensor can read.

Above Anaerobic Setpoint
Oxygen level is less that 1200ppm but higher than the O2 setpoint.

Workspace Anaerobic
Oxygen level is at or below the O2 setpoint.
See Workspace Settings on page 50

AMG Injection Indicator

Not Active
Anaerobic Mixed Gas is **not** injecting into the workspace

Active
Anaerobic Mixed Gas is injecting into the workspace.

Exception

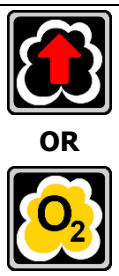
1. Injecting longer time set for Long Injection Alarm. See Workspace Settings on page 50
2. AMG Tank is empty.

Alarms

The Workspace Control has the following alarms **:**

Long Injection Alarm - Occurs when AMG has injected into the workspace longer than the workspace setting.

AMG Low – Pressure is not detected from the AMG tank. Tank may be empty, valve may be shut off (tank side or Bactron side), hose could have come off or been kinked, possible leak on fittings or filters.

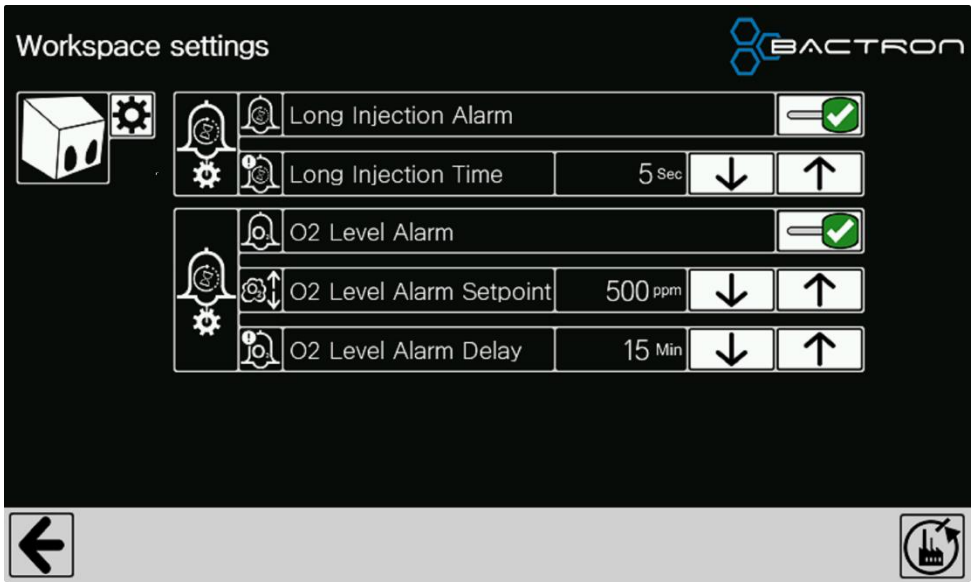


O2 High Alarm – Occurs when the oxygen ppm is above the O2 alarm setpoint for longer than the O2 level alarm delay is set in settings.

Settings

Security: To access, operator must be logged in as manager (refer to the Login section on page 43).

Tap the gear on the Home Screen of the Workspace control. It will open the settings screen below.



	**Long Injection Alarm**	Enable/Disable notification when AMG continuously injects into the workspace.
	**Long Injection Time**	Seconds of continuous injection before notifying.
	**O2 Level Alarm**	Enable/disable notification when O2 Level Indicator, Anaerobic Alarm, and Anaerobic automatic stop base on oxygen reading.
	**O2 Level Alarm Setpoint**	Setpoint that the O2 Level must be above to activate alarm.
	**O2 Level Alarm Delay**	Amount of time in minutes that the O2 Level is above setpoint before notifying.

Factory Reset

All settings screens have a factory reset button at the bottom right-hand corner that allows the operator to set all the settings for selected control back to factory default.

Return Button

Return to previous screen

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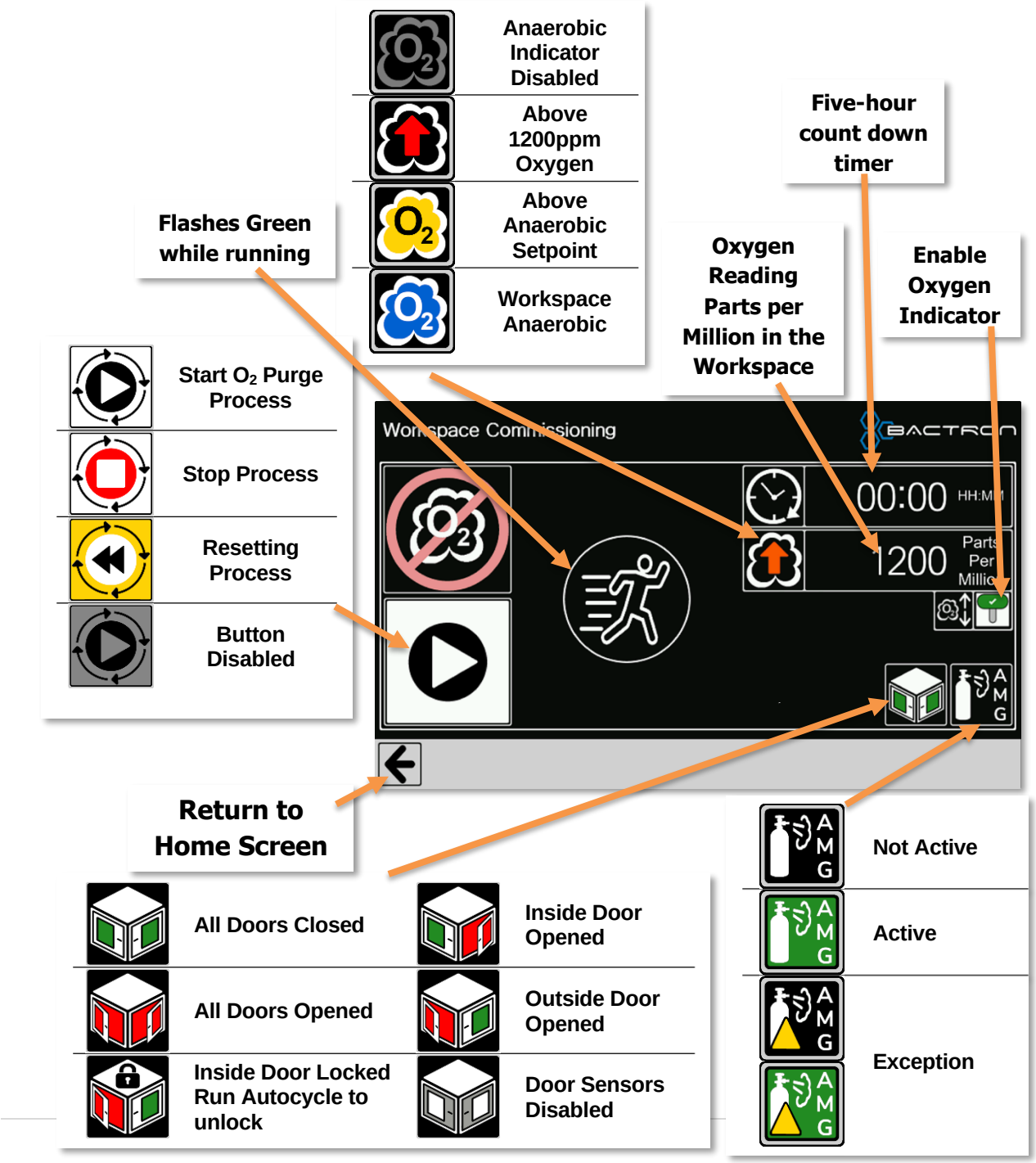
ANAEROBIC COMMISSIONING

Overview

Manages and reports the status of the Anaerobic Commissioning Process.

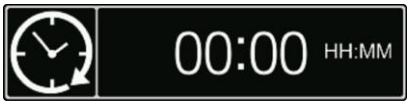
Security: To access, operator must be logged in as manager (refer to the Login section on page 43).

Tap the Anaerobic Commissioning button on the Home Screen of the Workspace control. It will display the screen below.



Readings, Indicators, and Buttons

Count Down Timer – Counts down from Five hours to Zero and ends commissioning cycle. If the Oxygen Sensor is enabled, it normally stops the commissioning cycle in less than five hours.



Oxygen reading - reports in parts per million with a minimum of 0 ppm and maximum of 1,200 ppm (0% to 0.12% oxygen). Ambient air contains around 210,000 ppm of oxygen (21%), well above the sensor's maximum reading when oxygen is not scrubbed from the workspace.

O_2 Indicator (Cloud) - an adjustable indicator (See Workspace Settings on page 50) that allows the operator to set the acceptable level of oxygen to show as anaerobic. It has the following four states:

	**Anaerobic Indicator Disabled** Indicator may be disabled in workspace settings. See Workspace Settings on page 50
	**Above 1200ppm Oxygen** Oxygen level in workspace is higher that the sensor can read.
	**Above Anaerobic Setpoint** Oxygen level is less that 1200ppm but higher than the O2 setpoint.
	**Workspace Anaerobic** The oxygen level is at or below the O2 setpoint. See Workspace Settings on page 50

Enable Oxygen Indicator, Alarm, and Commission cycle stop based on oxygen reading.

When disabled the only cloud indicator shown is  .
The commission cycle will not use the oxygen reading to determine when to stop the cycle. It will run for five hours and shut off.

AMG Injection Indicator

Not Active
Anaerobic Mixed Gas is **not** injecting into the workspace

Active
Anaerobic Mixed Gas is injecting into the workspace.

Exception

1. Injecting longer time set for Long Injection Alarm. See Workspace Settings on page 50

5. AMG Tank is empty.

Running Indicator

Constant

Anaerobic Commission Process is **not** running.

Flashing

Anaerobic Commission Process is running.

Door Indicator

All Doors Closed

Inside Door Opened

All Doors Opened

Outside Door Opened

Inside Door Locked

Door Sensors and inside airlock door lock Disabled

AMG Inject Indicator

	**Not Active**
	**Injecting**
 	**Exception** • AMG Low Indicator active • AMG Continuous Injection active.

Start / Stop Button

	Start Anaerobic Commissioning Process
	Stop Anaerobic Commissioning Process
	Anaerobic Commissioning Process Resetting
	Anaerobic Commissioning Process Disabled • Inside airlock door opened • AMG Low Alarm active • Oxygen reading below 400 ppm and Oxygen Level indicator is enabled.

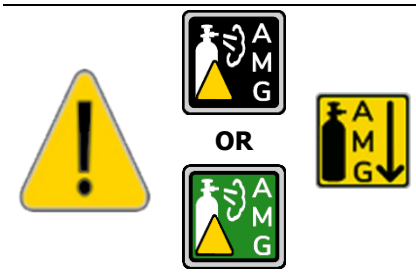
Return Button

	Return to previous screen
	Disabled while Anaerobic Commissioning Process is active. The process must be stopped to exit this screen.

Alarms

The Anaerobic Commission Control has the following alarms **:**

Long Injection Alarm - Occurs when AMG has injected into the workspace longer than the workspace setting (page 50) reports.



AMG Low – Tank may be empty.

O_2 High Alarm – Occurs when the oxygen ppm is above the O_2 alarm setpoint for longer than the O_2 level alarm delay is set in workspace setting page 50.

Aborts

The Anaerobic Commission process will abort by stopping the process for the following reasons:

- AMG Low indicator becomes active.
- The inside airlock door is opened.

Success Screens

When the Anaerobic Commission Process completes it will display one of the following screens and wait for the operator to return the screen back to Home.

Note: The oxygen setpoint that the Anaerobic Commissioning stops at is 400 ppm. This is not adjustable by the operator. However, the Anaerobic Alarm indicator is an adjustable setting.

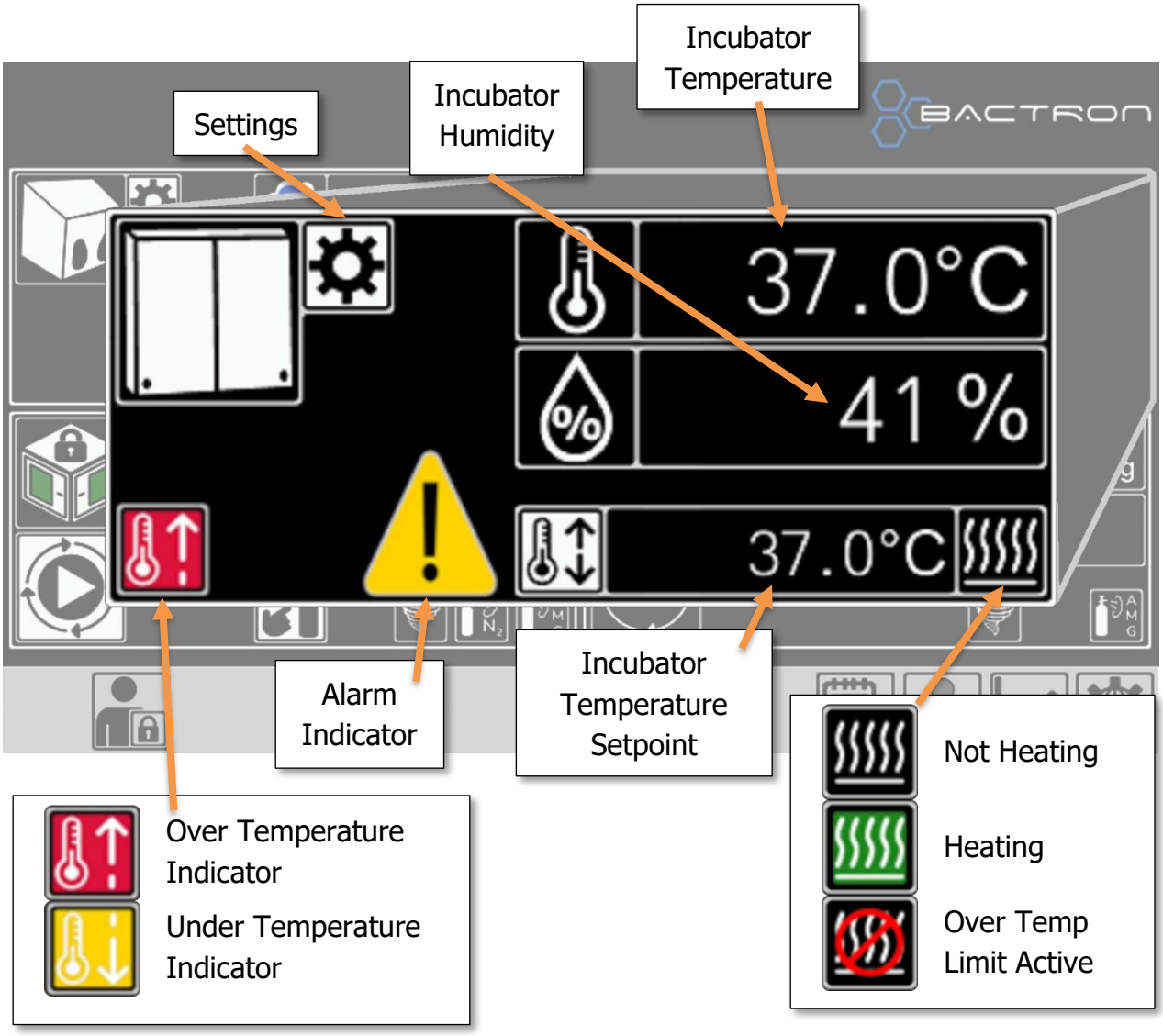
Factory Reset

All settings screens have a factory reset button at the bottom right-hand corner that allows the operator to set all the settings for selected control back to factory default.

INCUBATOR

Overview

Manages and reports the status of the incubator.



Reading and Indicators

Incubator Temperature – Reports the temperature of the incubator.

Relative Humidity – Reports the relative humidity in the incubator. It does not control humidity; the operator must put open containers of water in the incubator to raise the humidity.

Setpoint - Reports the setpoint the incubator is set to achieve. Tapping the setpoint button (Secured operation) will open the settings screen so that the setpoint may be changed.

Heat Activity – Indicates when the incubator is being heated.


Not Heating


Heating


Heating is disabled by the Over Temperature Limit control.

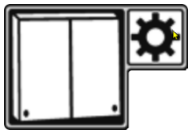
Alarms

The Incubator Control has the following alarms **:**

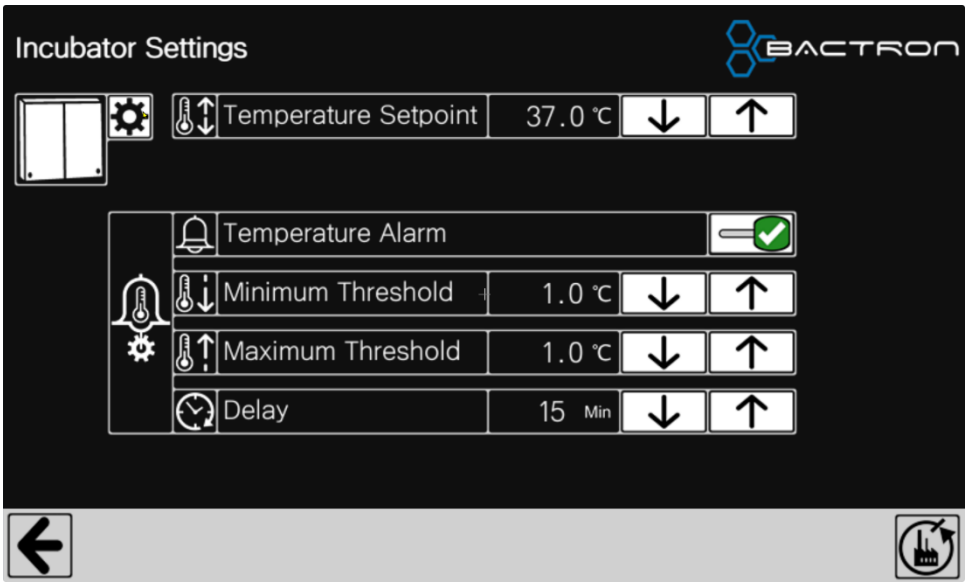
 	**Over Temperature Limit Active** - Over Temperature Limit control prevents the incubator from heating. If the incubator has not achieved setpoint, adjust the over temperature limit control.
 	**Temperature High** – Incubator temperature has been greater than the maximum threshold in settings for longer than the alarm delay in settings.
 	**Temperature Low** - Incubator temperature has been less than the minimum threshold in settings for longer than the alarm delay in settings. The delay is longer, after the unit is first turned on to allow time for the incubator to heat up.

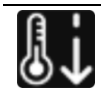
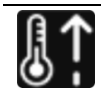
Settings

Security: To access, operator must be logged in as manager (refer to the Login section on page 43).



Tap the gear on the Home Screen of the Incubator control. It will open the settings screen below.



	**Temperature Setpoint**	Adjust the temperature setpoint with the up and down arrows or tapping the temper value and key in the desired temperature.
	**Temperature Alarm**	Enable/ Disable - The alarm will sound if the incubator temperature exceeds the parameters set below.
	**Minimum Threshold**	Acceptable number of degrees below setpoint, that will not trigger alarm.
	**Maximum Threshold**	Acceptable number of degrees above setpoint, that will not trigger alarm.
	**Delay**	Amount of time in minutes that the temperature can be out of range before triggering the alarm after initial warm up.

Note: The delay after the Bactron is initially powered on is longer to allow the incubator to warm up.

Factory Reset

All settings screens have a factory reset button at the bottom right-hand corner that allows the operator to set all the settings for selected control back to factory default.

Return Button

Return to previous screen

Over Temperature Limit

The Over Temperature Limit (OTL) alarm is activated when the incubator temperature is above the OTL setpoint.

When the control is active,  will appear on the heat activated indicator. The system stops heating by switching off the power to the heating elements and the buzzer will sound. For more details, please see ***Over Temperature Limit System page 103*** description in the Theory of Operations.

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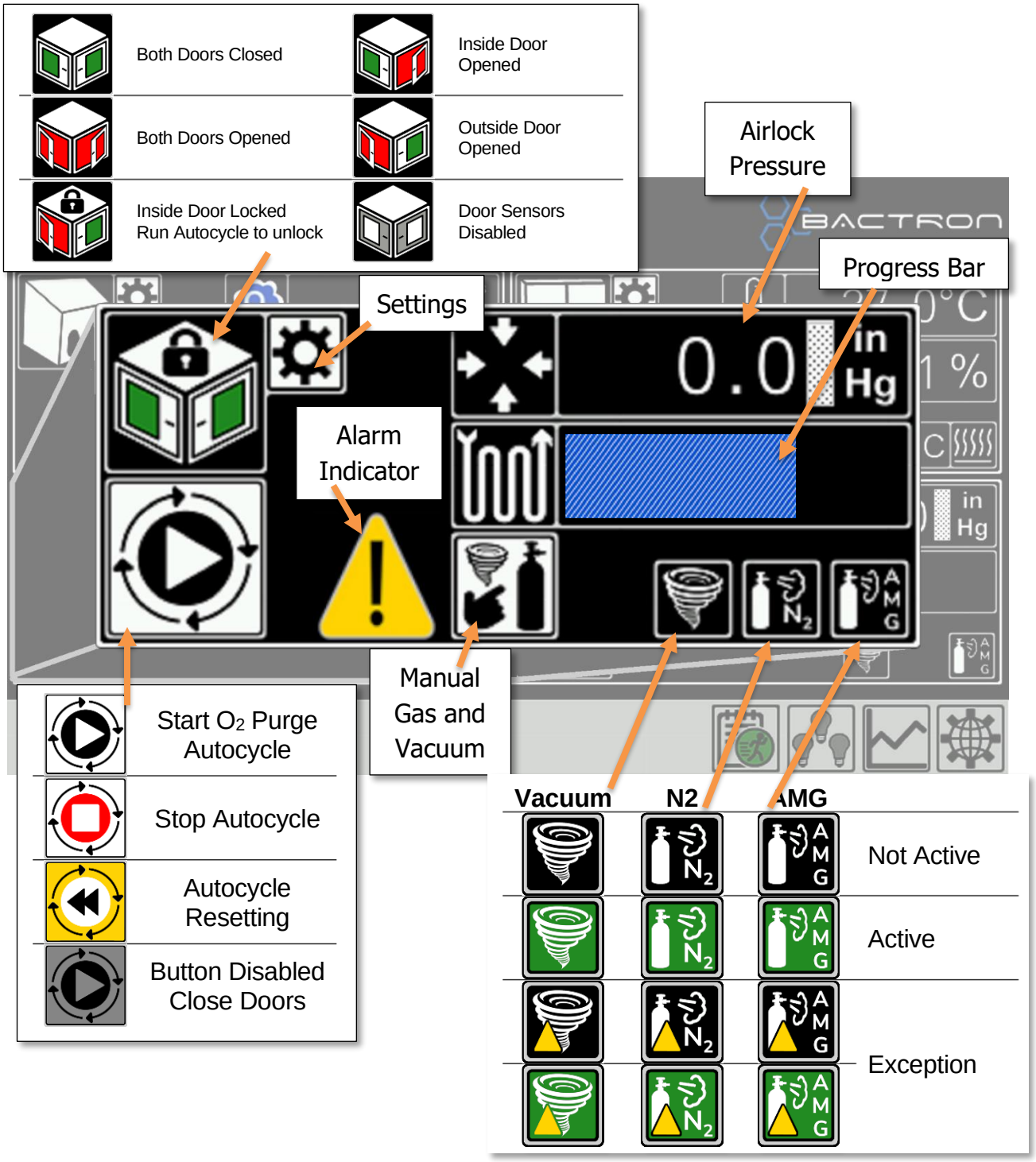
AIRLOCK

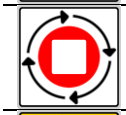
Overview

Manages and reports the status of the Armport pressure and autocycle.

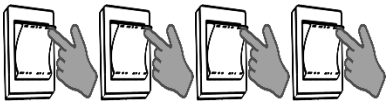


Buttons, Readings, and Indicators

Start / Stop Autocycle Button – The face of the button changes to reflect the next available action. Tapping the button will activate the action.

	**Start O_2 Purge Autocycle –** Starts the Airlock Purge Cycle.
	**Stop Autocycle** – Stops the Airlock Purge Cycle and starts Airlock reset.
	**Autocycle Resetting** – Indicates the autocycle has been aborted and is attempting to gas back to 0 inHg.
	**Autocycle Disabled** – For the button to be active the following conditions must be met: • Both airlock doors must be closed. • AMG Low indicator must <u>not</u> be active. • If using dual gas mode, N2 Low must <u>is not</u> active.

Workspace Autocycle Button (Inside of the workspace above the inner airlock door.)

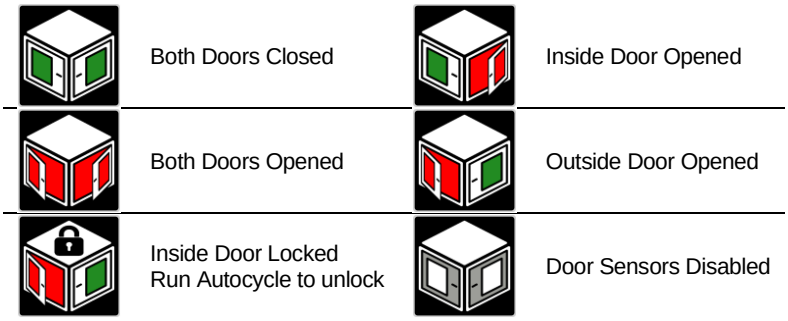
Airlock Autocycle  One tap.	• Tap the black airlock autocycle button **one** time. • The action that is displayed on the Start / Stop button of the Airlock control will initiate.
Workspace Lights  Four taps within 3 seconds.	• Tap the black airlock autocycle button **four** times within 3 seconds. • Wait for the workspace lights to flash two times . • Tap the autocycle button to achieve the desired brightness. • The Workspace light change process is active for 5 seconds then flashes two times to indicate the autocycle button has returned to autocycle control.

Vacuum, N2, and AMG Indicators – These indicators all have 3 states (Not Active, Active, and Exceptions.

Vacuum	N2	AMG	
			Not Active
			Active
			Exception
			

Door and Lock Indicator – Reports:

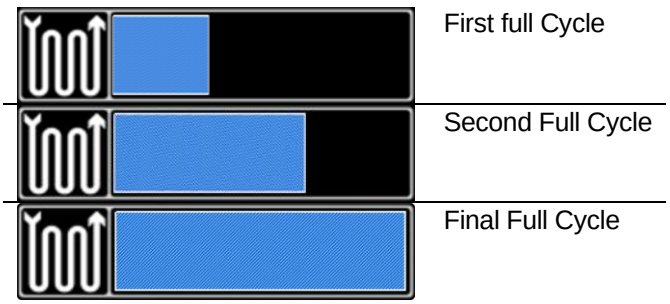
- Current state of doors (Open/Closed).
- The state of the inside door lock (Locked/Unlocked.
- The door sensors state (Enabled/Disabled). Normally the door sensors will be enabled, however, if there were an issue with the door sensor, the operator could temporarily disable the door sensor in settings and run autocycles.



Pressure Reading – Reports the air pressure in the armport sleeves. Ambient pressure will read close to 0 inHg. Fully under vacuum will read about -18 inHg.

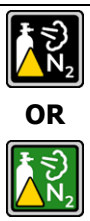
Autocycle Progress Bar – The bar is updated at the completion of each vacuum or gas pass and will be filled with a blue box when the process has been completed. The bar will remain blue until the outside airlock door opens or the Bactron is powered off then on.

If the Airlock Settings “Number of Cycles” is set to the default of 3 the progress would be as follows.



Alarms

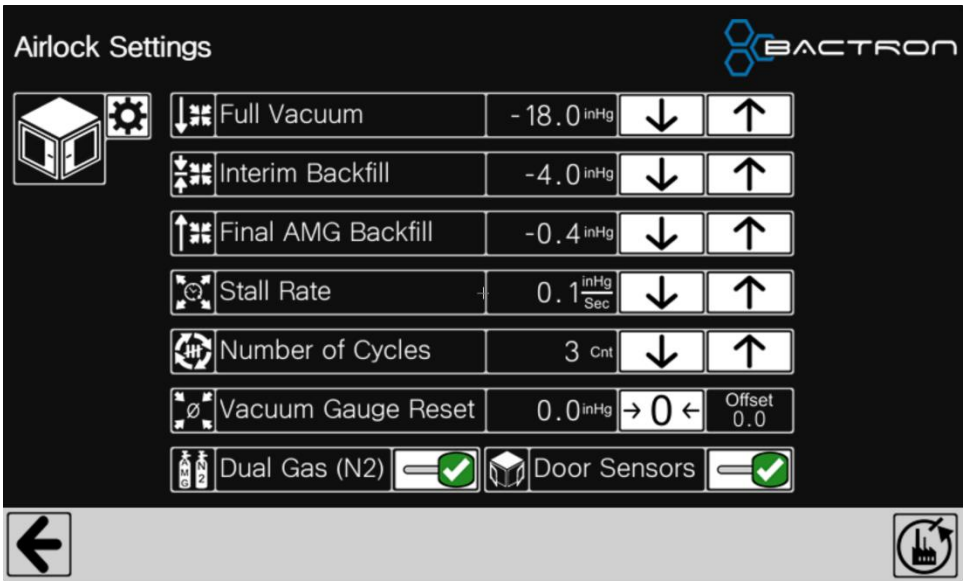
Appears if one of these conditions' triggers while the autocycle is running.

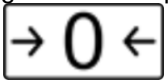
		**AMG Low** – Tank may be empty.
		**N2 Low** – Tank may be empty.
		The current vacuum, N_2 or AMG pass fails to maintain the stall rate (page 69) for more than 4 seconds.
		Any full cycle takes longer than 60 seconds to complete

Settings

Tap the gear on the Home Screen of the Airlock control. It will open the settings screen below.

Security: To access, operator must be logged in as manager (refer to the Login section on page 43).



	**Full Vacuum**	Pressure level in inHg that represents the airlock has achieved full vacuum and switches to gas. Default (-18 inHg), may be set as high as (-10 inHg) for extremely high elevations. See AUTOCYCLE SETTINGS BY ELEVATION page 167.
	**Interim Backfill**	Pressure level in inHg that represents the airlock has achieved interim back fill and switches to vacuum. Default (-4 inHg), may be set higher (-3 inHg) at very high.
	**Final AMG Backfill**	Pressure level in inHg that represents the airlock has achieved final back fill and wraps up autocycle. Default (-0.4 inHg), may be adjusted if autocycle completes and the airlock is still under vacuum and prevents the door from opening.
	**Stall Rate**	The minimum rate of vacuum in inHg per second required. If it is too high, the autocycle will abort for lack of change in vacuum. Default(0.1 inHg/Sec)
	**Number of Cycles**	Number of Vacuum and Gas passes per autocycle. Maximum of 9, Default (3). See AIRLOCK AUTOCYCLE CYCLE COUNT page 167.
	**Vacuum Gauge Reset**	Zeros out the vacuum gauge to ambient pressure. No Default. Open the outside airlock door and press the  button.
	**Dual Gas**	Disabled = AMG only and Enabled = AMG and N2 for airlock autocycles only. Default(Enabled)
	**Door Sensors**	Normally enabled. Can be disabled, to run an autocycle if the door sensor is not reporting the door as closed when it is. Default(Enabled)

Factory Reset

All settings screens have a factory reset button at the bottom right-hand corner that allows the operator to set all the settings for selected control back to factory default.

Return Button

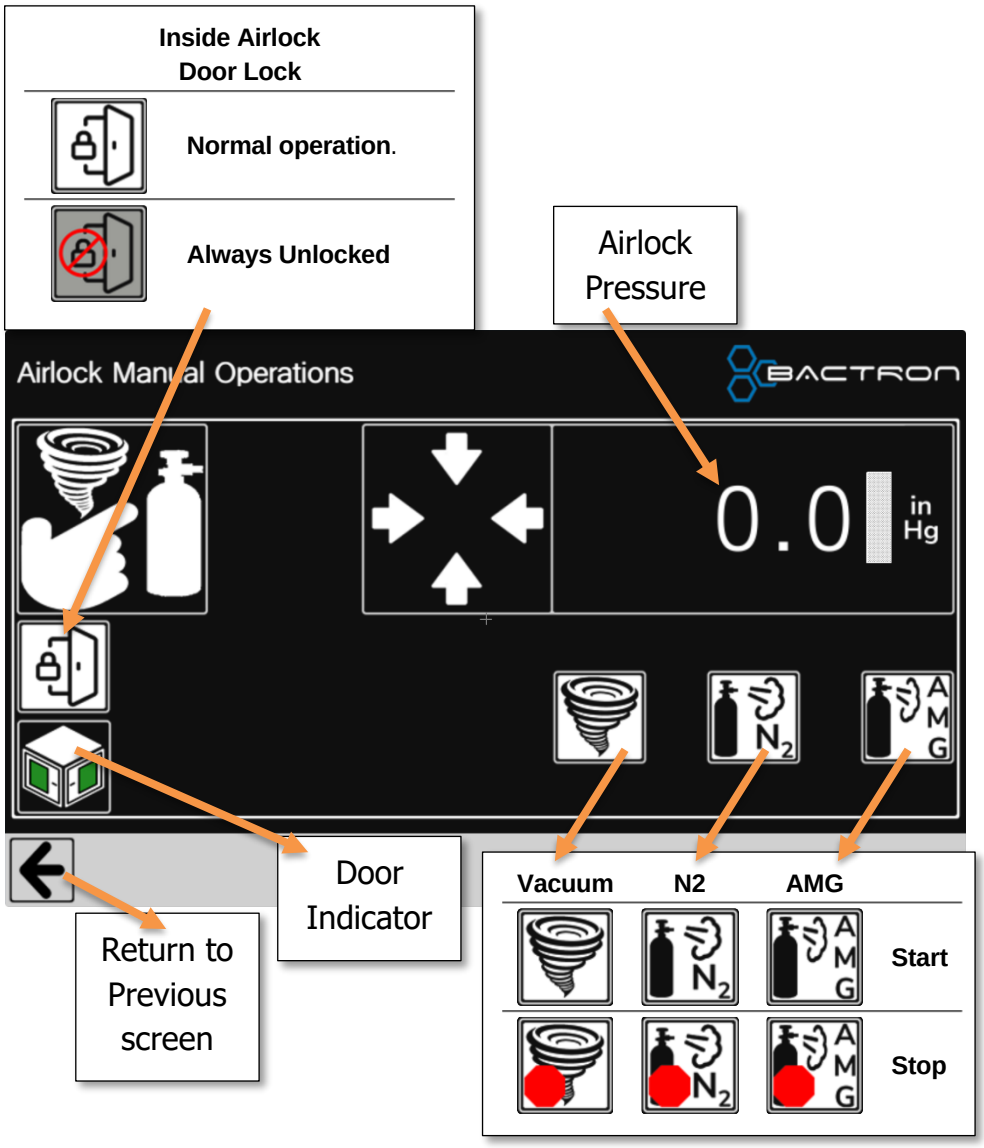
Return to previous screen

AIRLOCK MANUAL OPERATIONS

Overview

Manually apply vacuum or gas in the airlock and door lock override for the inside airlock door.

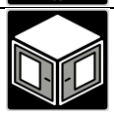
Tap the Manual Operations button on the Home Screen of the Airlock control. It will display the screen below.



Readings and Indicators

Door and Lock Indicator – Reports

- Current state of doors (Open/Closed).
- The state of the inside door lock (Locked/Unlocked.
- The door sensors state (Enabled/Disabled). Normally the door sensors will be enabled, however, if there were an issue with the door sensor, the operator could temporarily disable the door sensor in settings and run autocycles.

	Both Doors Closed		Inside Door Opened
	Both Doors Opened		Outside Door Opened
	Inside Door Locked Run Autocycle to unlock		Door Sensors Disabled

Pressure Reading – Reports the air pressure in the airlock, ambient pressure will read close to 0 inHg while fully under vacuum it will read about -18 inHg

Buttons

Manual Vacuum and Gas

Vacuum	N2	AMG	
			**Start** Will shut off after 30 seconds.
			**Stop** Indicates that the operation is active and can be stopped by taping the button again.

Note: N2 will only appear if the Bactron is set to Dual Gas.

Inside Airlock Door Lock

	**Normal operation**. Locks when outside airlock door is opened.
	**Always Unlocked**

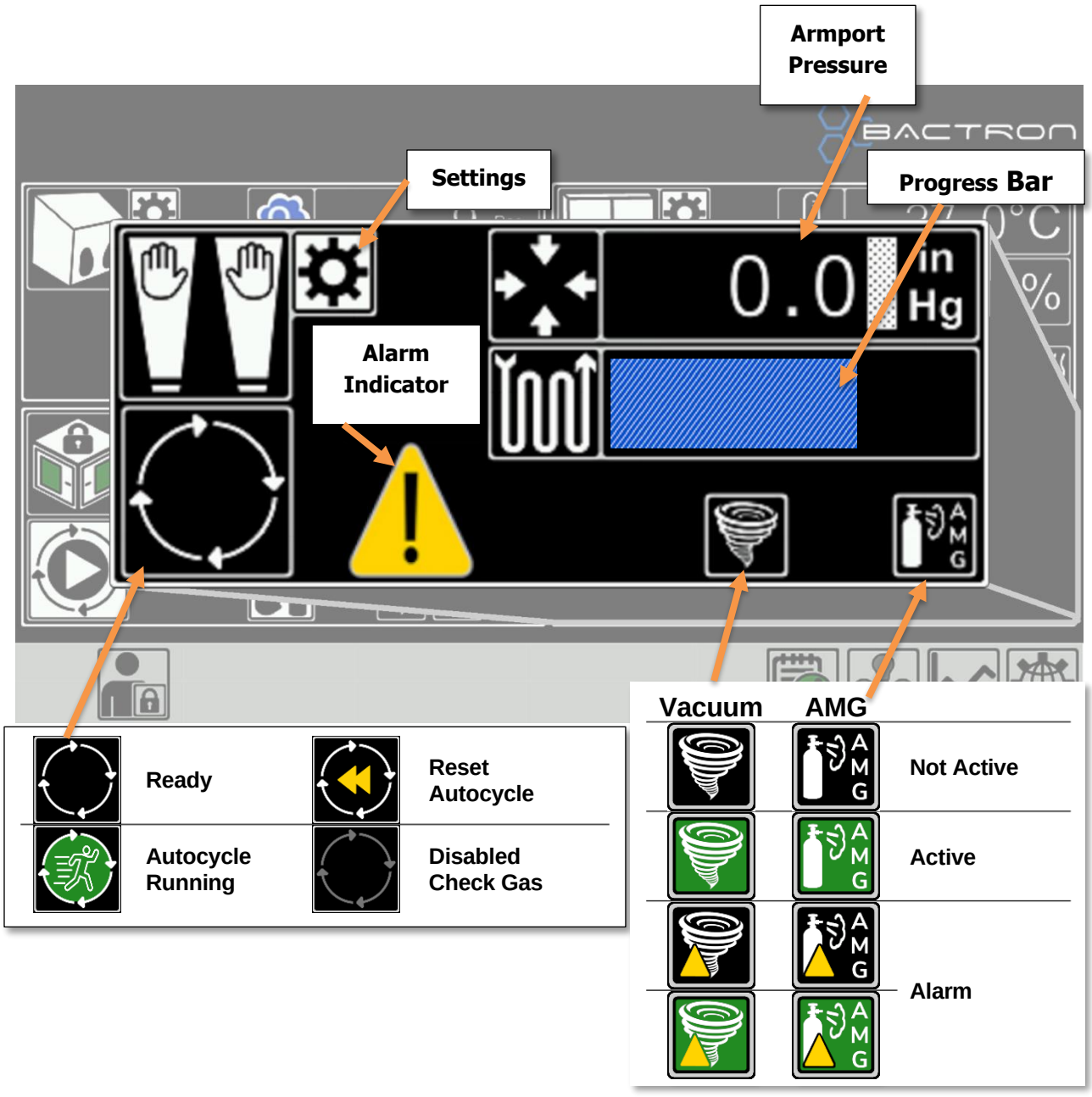
Return to previous screen.

This page is blank.

ARMPORTS

Overview

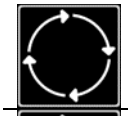
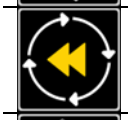
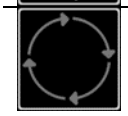
Manages and reports the status of the Armport Sleeve processes. The foot pedal activates the Armport Sleeve autocycle.



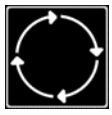
Readings and Indicators

Autocycle Activity Status – The indicator changes to reflect the current action.

Note: This is not a button. Use the foot pedal to activate the Armport Sleeve process.

	**Ready –** Indicates that the armport autocycle can be started.
	**Running** – Indicates that the Bactron is currently running an armport autocycle.
	**Autocycle Resetting** – Indicates the autocycle has aborted and is attempting to inflate the sleeves.
	**Autocycle Disabled** – For the status to be ready the AMG Low indicator must not be active

Foot Pedal – Placed on the floor between the armports. It allows the operator to start and stop the autocycle and backfill the sleeves with AMG. The Foot pedal also allows the operator to lower the pressure in the workspace while pushing their arms into it.

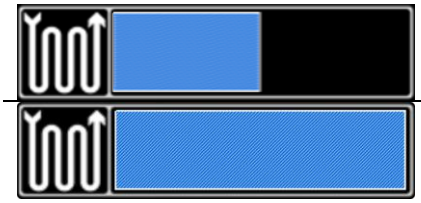
	**Ready**	 One tap	**Start Autocycle**
	**Running**	 One tap	**Stop Autocycle**
	**Ready, Running, or Reset**	 Four taps within 3 seconds	**Force Sleeve Inflation**

The operator can use the foot pedal to draw air out of the workspace while moving their arms into it and tapping the pedal once. The vacuum pump will turn on and the operator can push their arms into the workspace. Once the operator stops pushing into the workspace the vacuum pump will shut off automatically.

Pressure Reading – Reports the air pressure in the armport sleeves. Ambient pressure will read close to 0 inHg. Fully under vacuum will read about -18 inHg.

Autocycle Progress Bar – The bar is updated at the completion of each vacuum or gas pass and will be filled with a blue box when the unit has completed the autocycle. The bar will remain blue for one minute.

If the Armport Settings "Number of Cycles" is set to the default of 2 the progress would be as follows.



First full Cycle

Final Full Cycle

Vacuum, and AMG Indicators – These indicators all have 3 states (Not Active, Active, and Exceptions.

Vacuum	AMG	
		Not Active
		Active
		Exception
		

Alarms

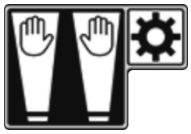
Will appear if one of the conditions below trigger while autocycle is running.


AMG Low. The tank may be empty.


Vacuum or Gas Pass took too long to complete.

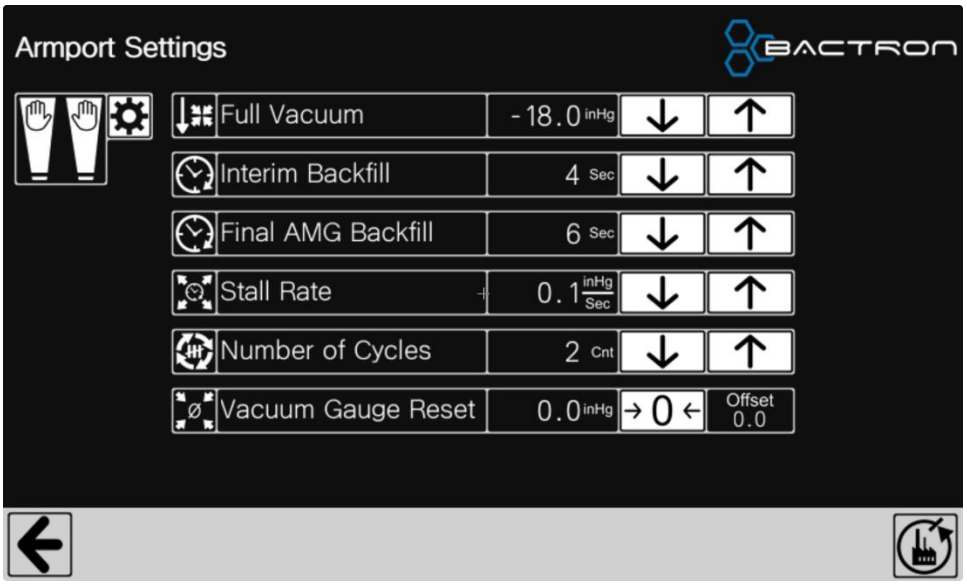

Time to complete Entire cycle took too long.

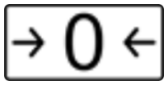
Settings



Tap the gear on the Home Screen of the Armport control. It will open the settings screen below.

Security: To access, operator must be logged in as manager (refer to the Login section on page 43).



	**Full Vacuum**	Pressure level in inHg that represents the armport sleeves have achieved full vacuum and switches to gas. Default (-18 inHg), may be set as high as (-10 inHg) for extremely high elevations. See AUTOCYCLE SETTINGS BY ELEVATION page 167.
	**Interim Backfill**	Time in seconds that the sleeves will be backfilled with AMG and switches to vacuum. Default (4 seconds).
	**Final AMG Backfill**	Time in seconds that the sleeves will be backfilled with AMG and switches to vacuum. Default (6 seconds).
	**Stall Rate**	The minimum rate of vacuum in inHg per second that must be maintained. If it is too high, the autocycle will abort for lack of change in vacuum. Default(0.1 inHg/Sec)
	**Number of Cycles**	Number of Vacuum and Gas passes per autocycle. Maximum of 9, Default (3). See ARMPORT AUTOCYCLE CYCLE COUNT page 168.
	**Vacuum Gauge Reset**	Zeros out the vacuum gauge to ambient pressure. No Default. While the operator's arms are not in the sleeve, press the  button.

Factory Reset

All settings screens have a factory reset button at the bottom right-hand corner that allows the operator to set all the settings for selected control back to factory default.

Return Button

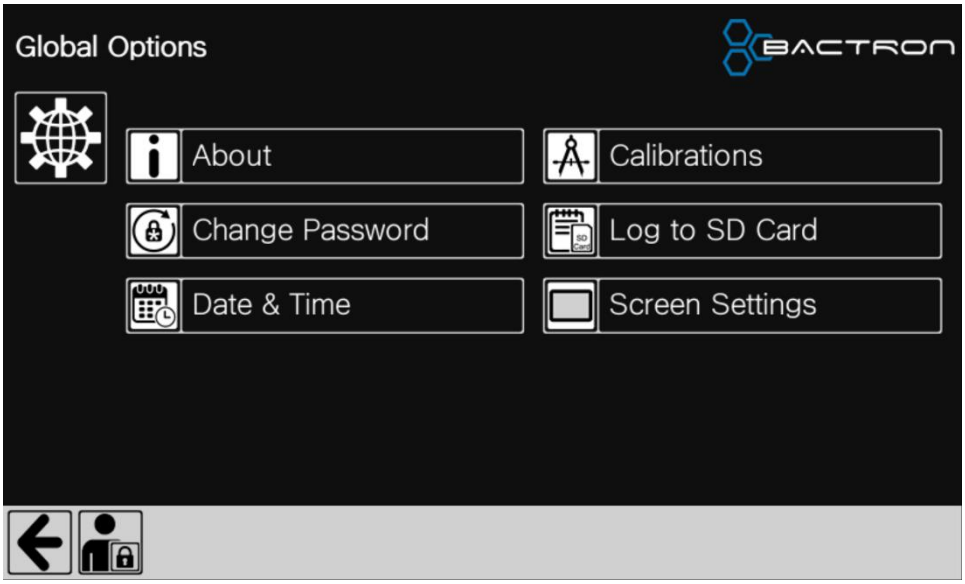
Return to previous screen

GLOBAL OPTIONS

Overview

Provides access to a menu of miscellaneous options for the Bactron.

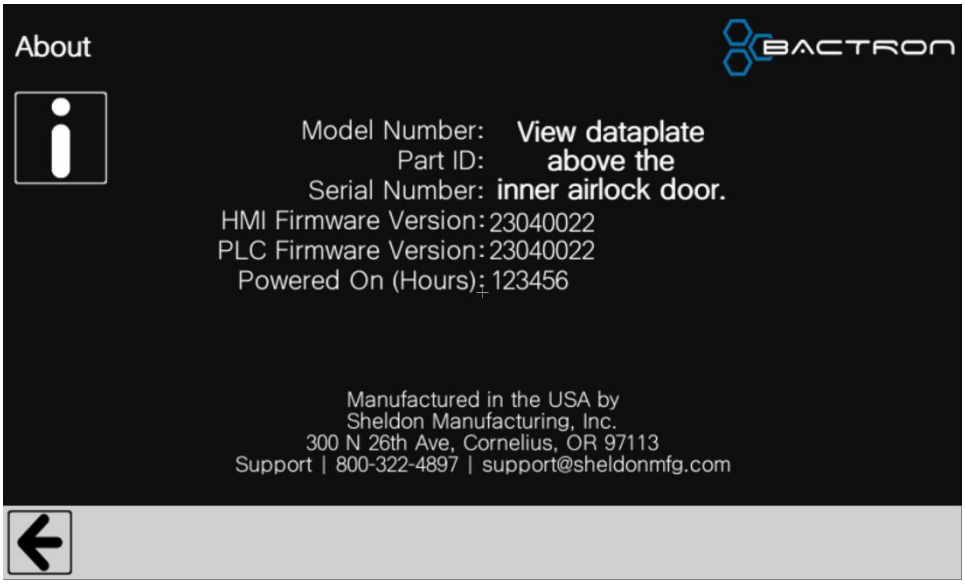
Tap the Global Options button on the Home Screen Taskbar. It will display the screen below.



About

Tap the About button on Global Options. It will display the screen below.

The About screen reports the firmware versions and hours that the unit has been powered on.

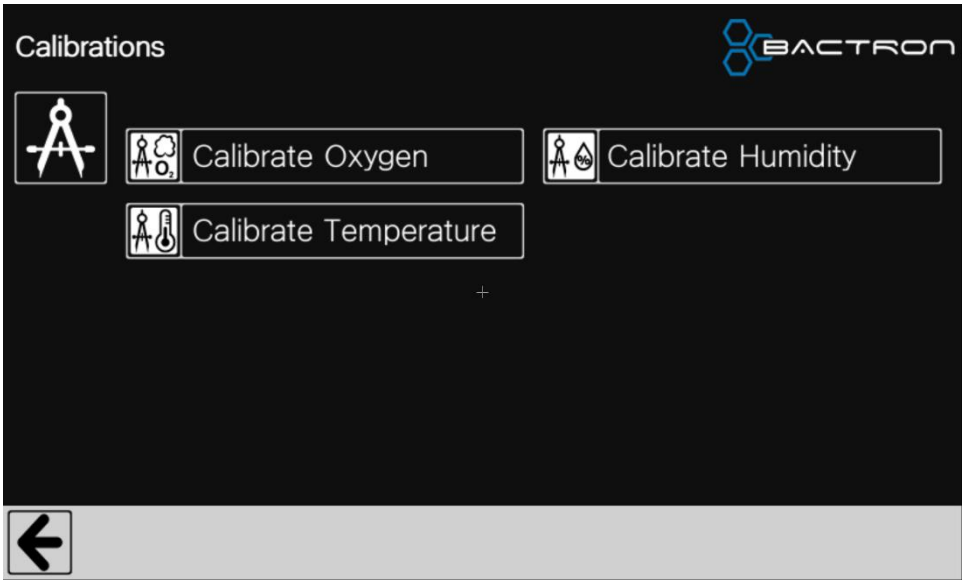


Calibrations

Tap the Calibrations button on Global Options. It will display the screen below.

The Calibrations screen allows the operator to adjust the offset of the Oxygen, Humidity and Temperature sensors.

Security: To access, operator must be logged in as manager (refer to the Login section on page 43).

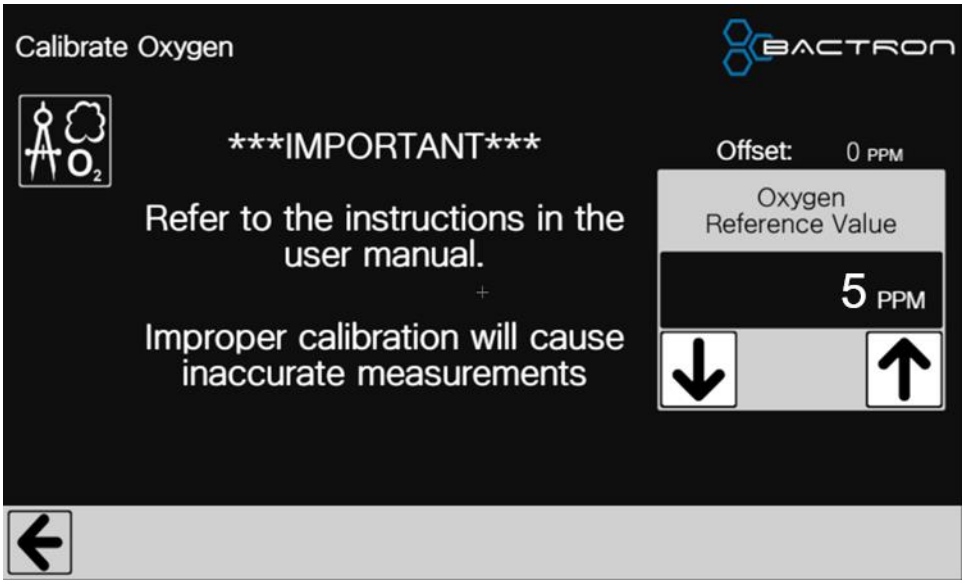


Oxygen Calibration

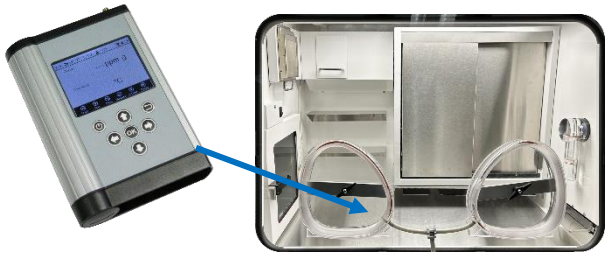
Tap the Calibrate Oxygen button on the Calibration screen. It will display the screen below.

Note: This is a single calibrated sensor. It should be calibrated while the chamber is anaerobic.

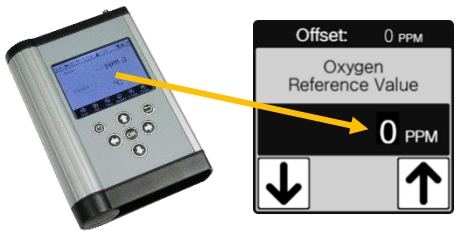
The Calibrate Oxygen screen allows the operator to adjust the offset of the Oxygen sensor.



Calibration Process



Insert the sensor for the reference device that measures oxygen into workspace and allow workspace oxygen reading to settle for at least one hour after the reading has stabilized.



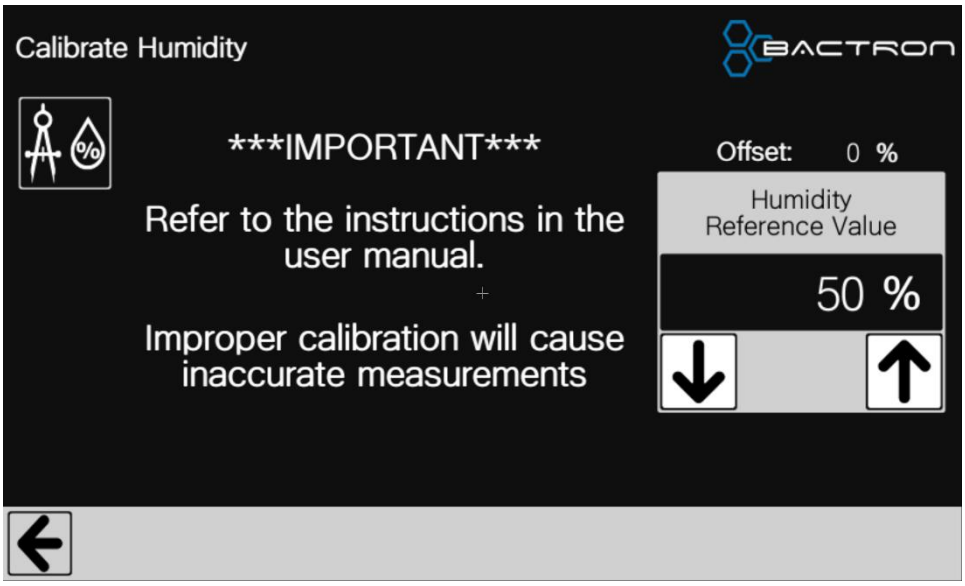
Change the Reference Value to match the Reference Device reading.

Wait at least one hour, then repeat the process above until the value does not need to be changed. It may take up to three or four attempts to achieve a stable calibration.

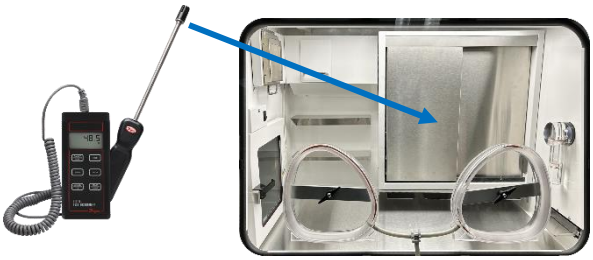
Relative Humidity Calibration

Tap the Calibrate Humidity button on the Calibration screen. It will display the screen below.

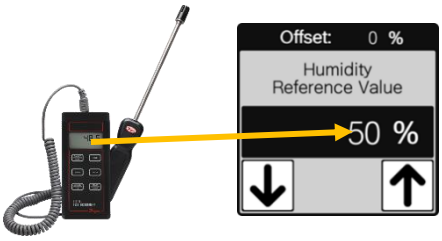
The Calibrate Humidity screen allows the operator to adjust the offset of the Humidity sensor.



Calibration Process



Insert the sensor for the reference device that measures relative humidity into incubator and allow incubator relative humidity reading to settle for at least one hour after the reading has stabilized.



Change the Reference Value to match the Reference Device reading.

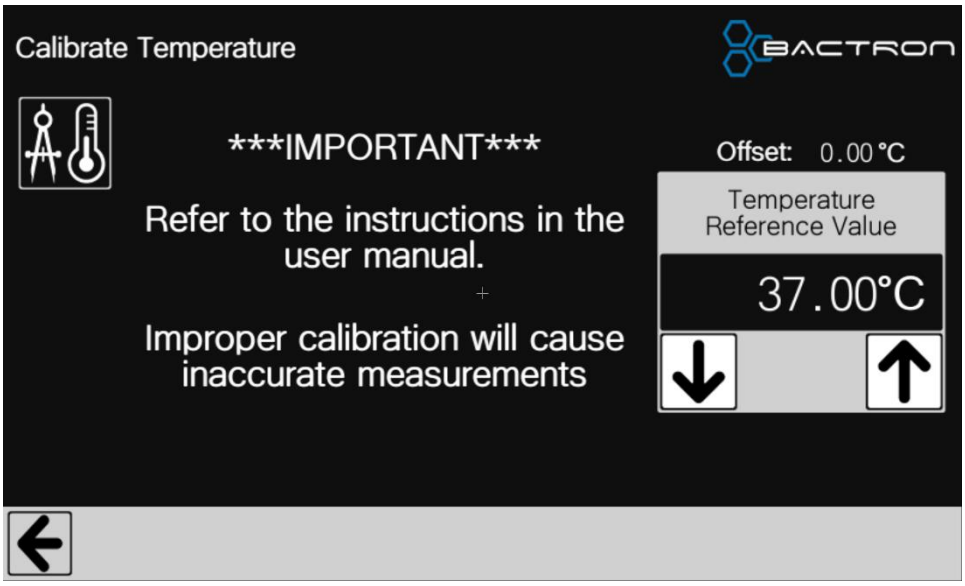
Wait at least one hour, then repeat the process above until the value does not need to be changed. It may take up to three or four attempts to achieve a stable calibration.

Temperature Calibration

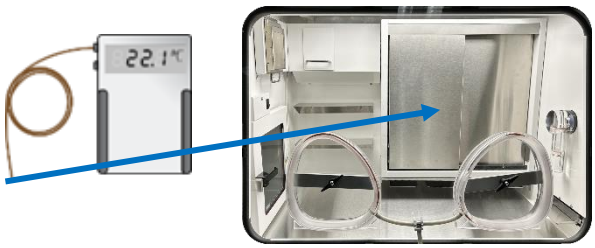
Tap the Calibrate Temperature button on the Calibration screen. It will display the screen below.

Note: This is a single setpoint calibrated control. It should be calibrated to the setpoint temperature.

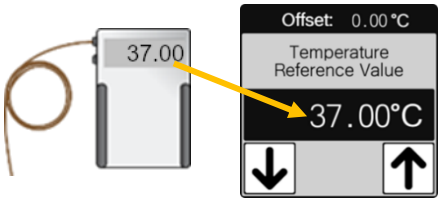
The Calibrate Temperature screen allows the operator to adjust the offset of the Temperature sensor.



Calibration Process



Insert the sensor for the reference device that measures temperature into incubator and allow incubator temperature reading to settle for at least one hour after the reading has stabilized.



Change the Reference Value to match the Reference Device reading.

Wait at least one hour, then repeat the process above until the value does not need to be changed. It may take up to three or four attempts to achieve a stable calibration.

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Change Password

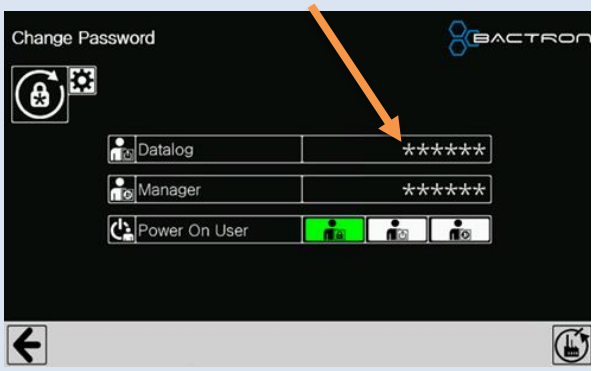
Tap the Change Password button on Global Options.

The Change Password screen allows the operator to change the passwords for Datalog and Manager. The operator can also select the default user that the Bactron will log into when powered on.

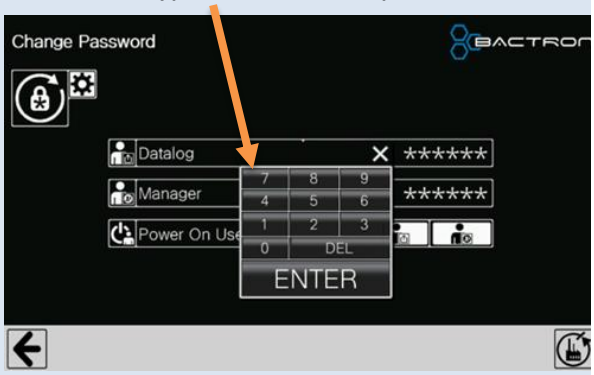
Security: To access, operator must be logged in as manager (refer to the Login section on page 43).

Change Datalog Password.

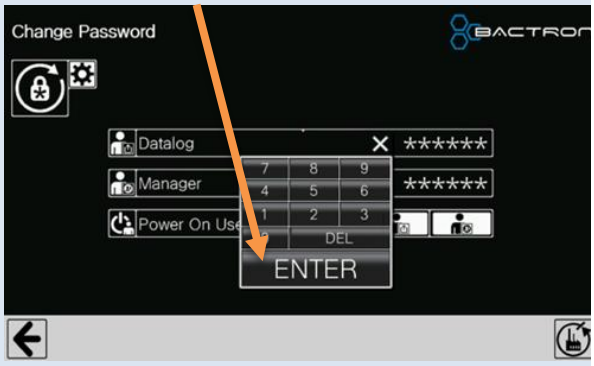
Tap Datalog password box.



Use keypad to enter new password.

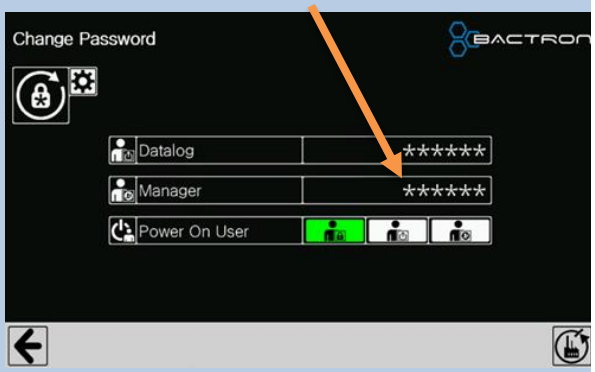


Press enter on keypad to finish.

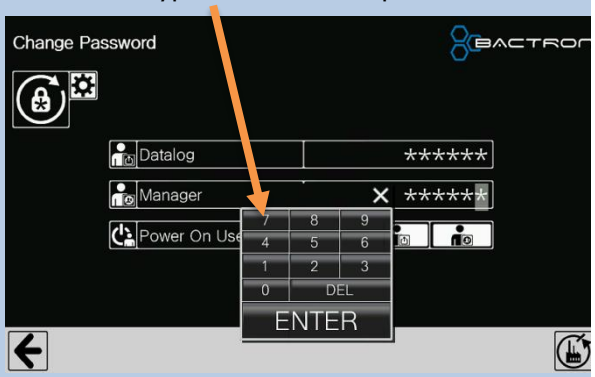


Change Manager Password.

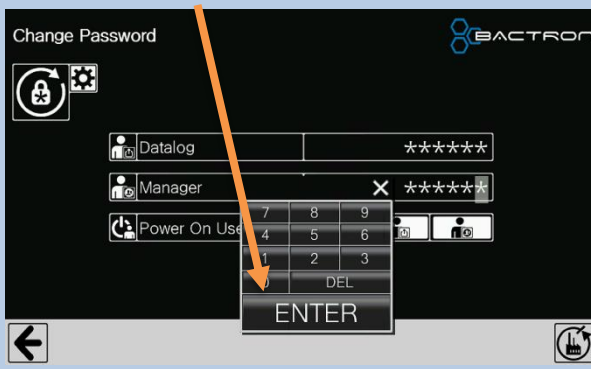
Tap Datalog password box.



Use keypad to enter new password.



Press enter on keypad to finish.



Set default power on user.

 **Locked**	When the Bactron is powered on, all the secured functions will require authorization.
 **Datalog**	When the Bactron is powered on, Datalog functions **<u>will not</u>** require authorization. Manager functions will require authorization
 **Manager**	When the Bactron is powered on, none of the secured operator functions will require authorization.

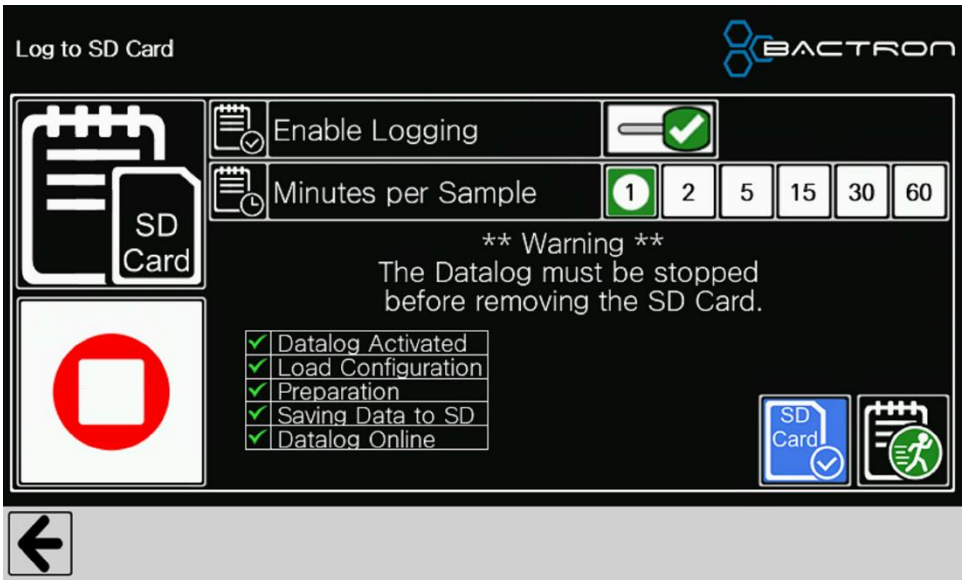
Log to SD Card

Tap the Log to SD Card button on the Global Options screen.

The Log to SD Card screen allows the operator to enable or disable the datalogger, stop the datalogger to remove the SD Card, start the datalogger, set the logging interval from the predefined list of minutes.

Security: To access, operator must be logged in as Datalog or Manager (refer to the Login section on page 43).

Warning: Datalogger must be stopped before removing SD Card. Failure to do so may corrupt the data on the SD Card. If this happens there is no way to recover the lost data.



Enable / Disable Button

Enabled:

- The Start / Stop button is enabled.
- The Datalog icon is present on the Home screen taskbar. 

Disabled:

- The Start / Stop button is disabled.
- The Datalog icon is **NOT** present on the Home screen taskbar.

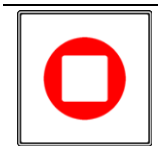
Minutes per Sample

Sets the number of minutes between logged samples.

Start / Stop Button

Play

Starts Datalogger.



Stop

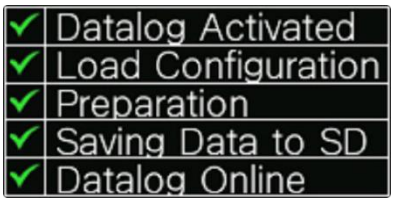
Stops Datalogger

Disabled

The Start / Stop button will be disabled if:

- Enable / Disable button is Disabled.
- No SD Card is detected.

Datalog start up status



After the Datalogger is started it must complete these processes to be fully operational. If any of them fail, the error icon  will appear and will require investigation to solve the issue.

SD Card Ready

	No SD card detected
	SD card detected and ready to be used by the logger.

Datalog Indicator

	**Datalogger not active.**
	**Datalogger initializing.**
	**Datalogger Running.**
	**Datalogger Error.**

Copy SD Datalog to a PC.

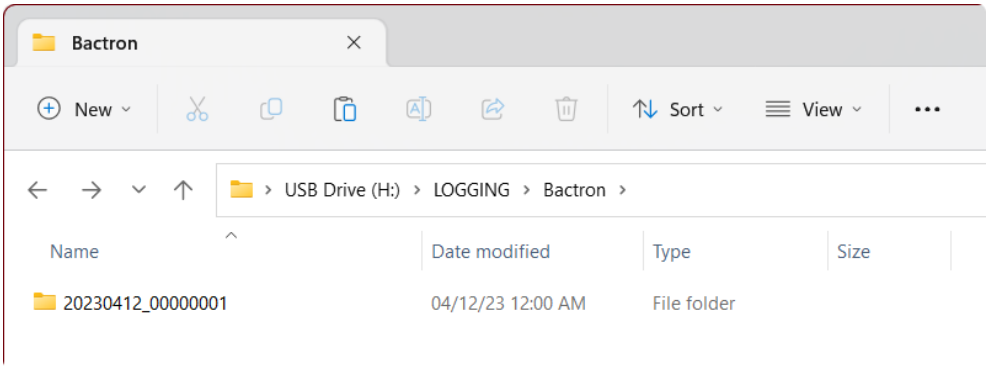
Stop Datalogger

Remove SD Card from the Bactron

Insert SD card into card reader on a PC

Open Card reader drive on PC using the path below as a model.

<your drive letter>:\LOGGING\Bactron



Find the newest folder. At this point you can copy the folder from the SD Card to your hard drive or open the folder and copy individual csv files to your hard drive.

Each comma separated log file will contain up to 24 hours of data. If the datalogger is stopped and started or the Bactron is turned off then on, the datalogger starts a new comma separated log file.

When you are done coping the data, remove the SD Card from the card reader.

Insert the SD Card into the Bactron.

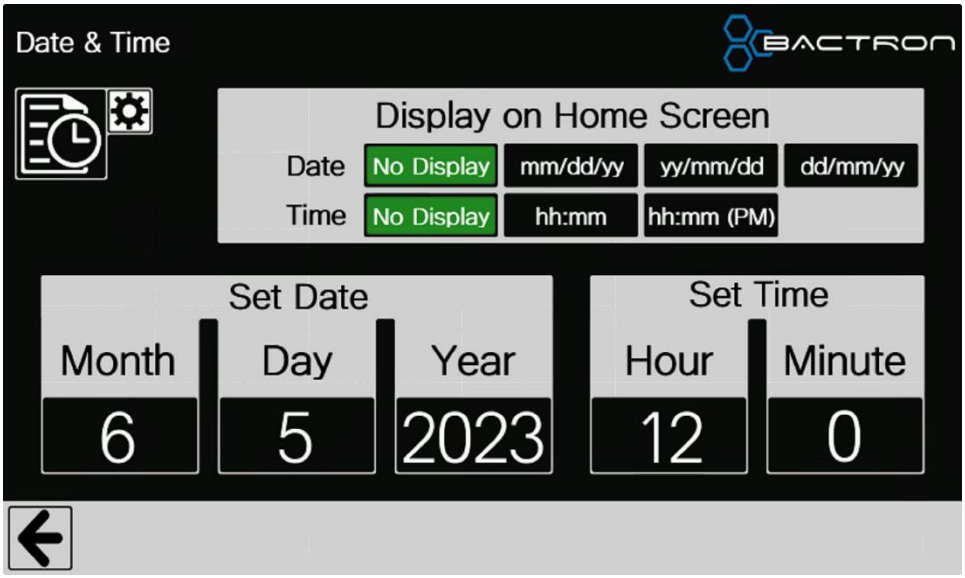
Start the Datalogger.

Date & Time

Tap the Date & Time button on the Global Options screen.

The Date & Time screen allows the operator to set the date and time on the Bactron and turn the home screen date and/or time display on or off.

Security: To access, operator must be logged in as manager (refer to the Login section on page 43).



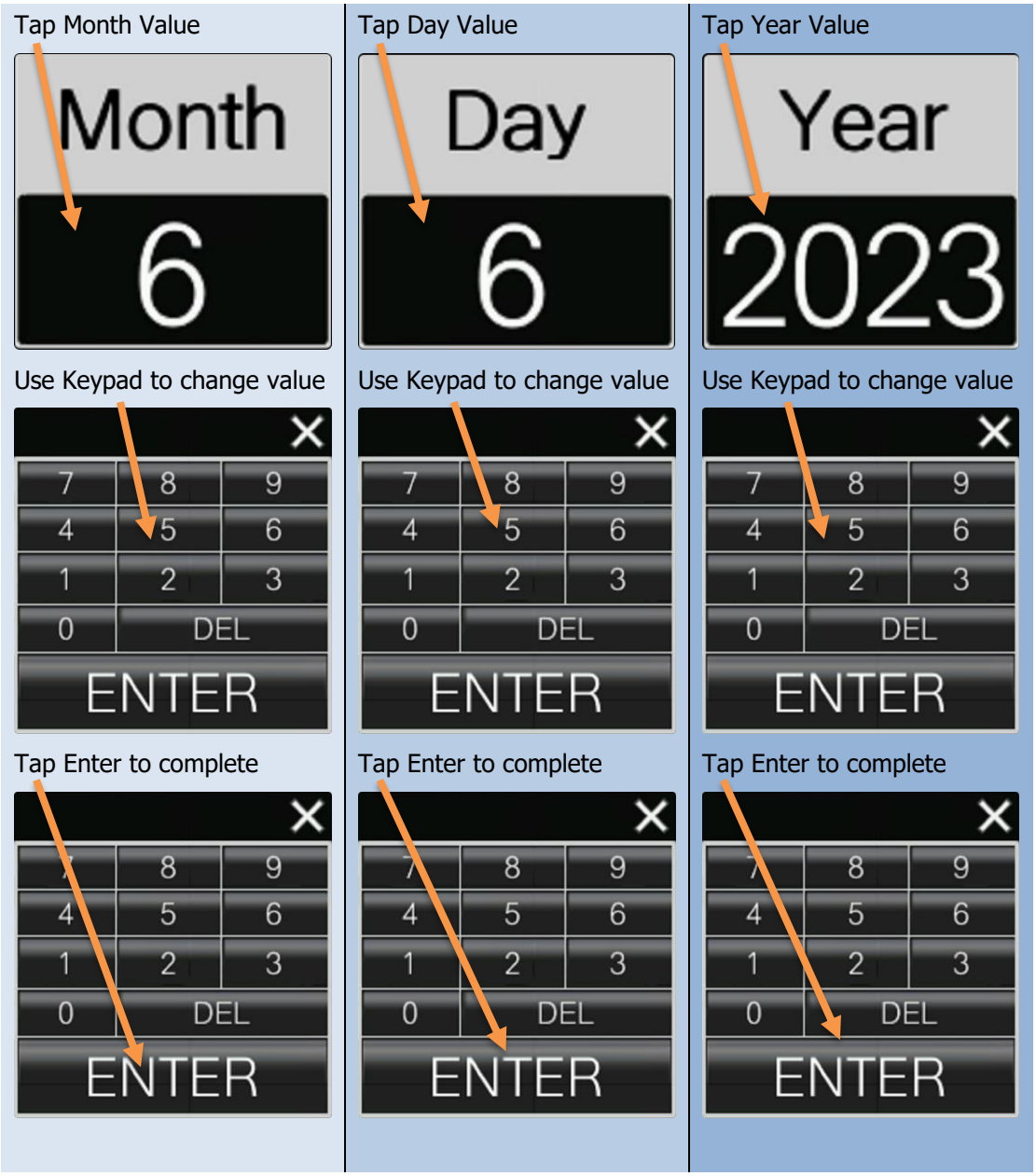
Display on Home Screen

Allows operator to view the Bactron's Date and time on the Home Screen.

Tap the date or time format to be displayed on the home screen. If it is not desired to show the date and time tap "No Display ".

Set Date

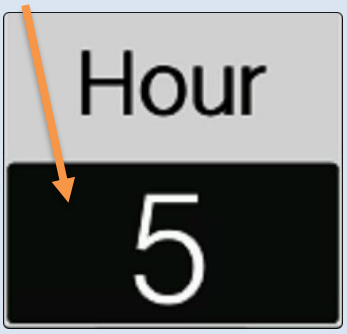
Changes the Bactron's month, day, and year.



Set Time

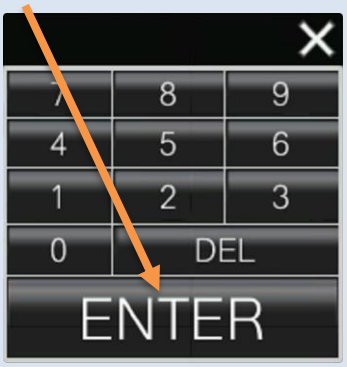
Changes the Bactron's hour and minute.

Tap Hour Value

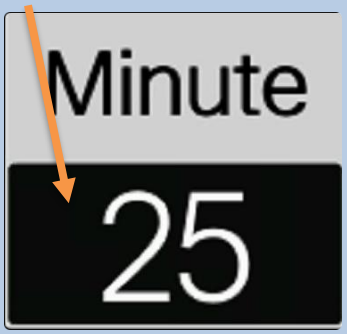


Use Keypad to change value

Tap Enter to complete



Tap Minute Value



Use Keypad to change value

Tap Enter to complete

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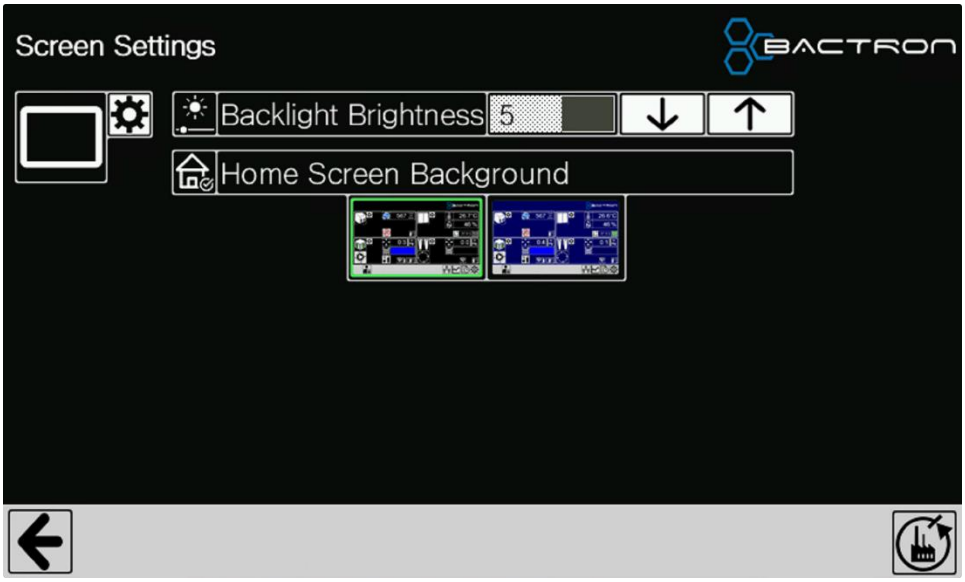
Screen Settings

Tap the Screen Settings button on the Global Options screen.

The Screens Settings screen allows the operator to set the brightness and Home Screen Background.

Security: To access, operator must be logged in as manager (refer to the Login section on page 43).



Backlight Brightness

Use the up and down arrows to brighten or dim the display.

Home Screen Background

Changes the background color of the Home Screen.

Set Home Screen background to black.
Tap the black Home Screen

Set Home Screen background to blue.
Tap the blue Home Screen

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GRAPHS

Overview

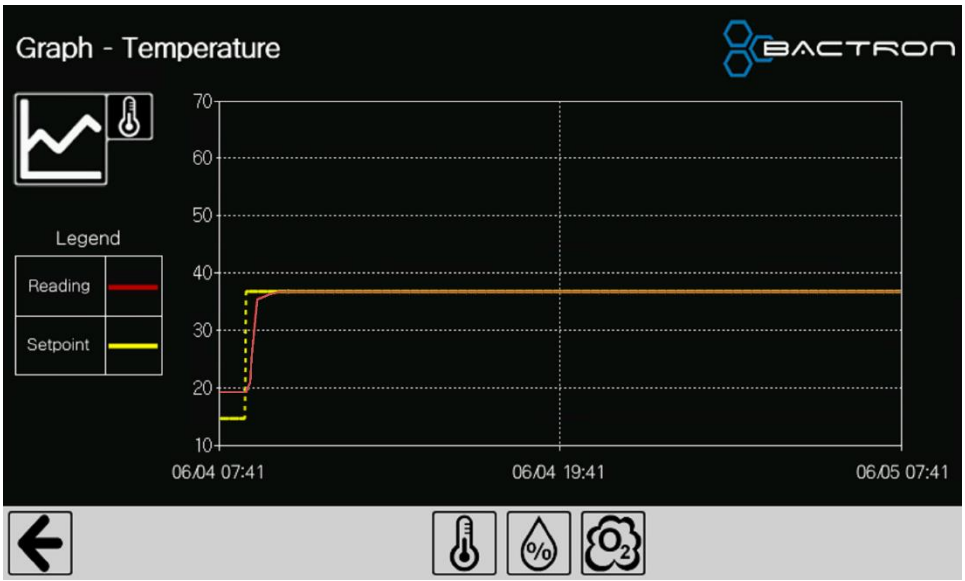
Presents graphs of readings for last 24 hours of Temperature, Relative Humidity, and Oxygen.

Tap the Graph button on the Home Screen Taskbar. It will display the Temperature Graph.

The Graph button always displays the Temperature. Use the three buttons on the taskbar to switch between graphs.

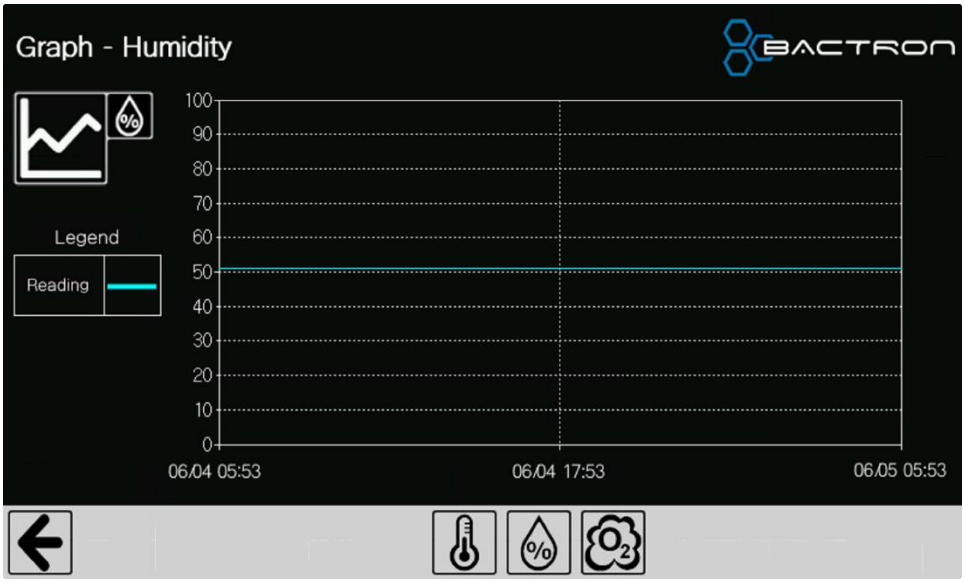
Temperature

Displays the incubator's temperature and setpoint history for the last 24 hours.



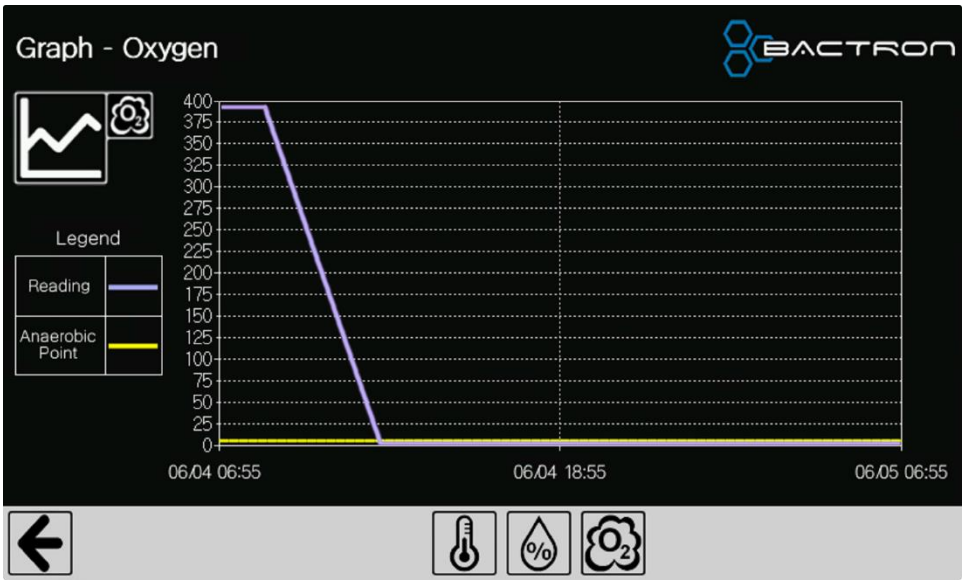
Relative Humidity

Displays the incubator's relative humidity history for the last 24 hours. The humidity is not controlled and does not have a setpoint. Humidity may be increased by placing containers of water on the incubator shelves.



Oxygen

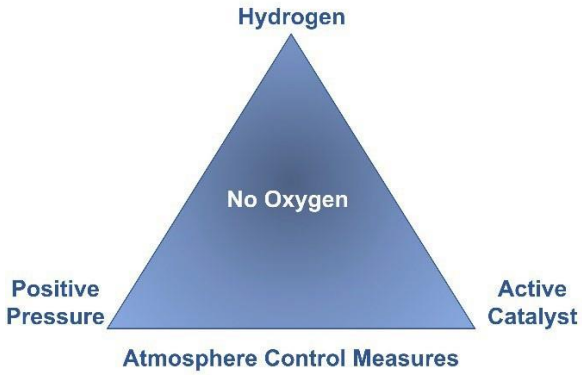
Displays the workspace oxygen level and anaerobic point history for the last 24 hours. Anaerobic point can be set in Workspace settings > O2 Level Alarm Setpoint page 50



c

THEORY OF OPERATION

Achieving Anaerobic Conditions



The BACTRON400HP is designed to create and maintain an anaerobic workspace chamber atmosphere suitable for clinical cultivation of anaerobic bacteria. The anaerobic atmosphere is initially achieved by purging the chamber with pulses of anaerobic mixed gas (AMG) as part of an auto-commissioning cycle. The AMG purge pushes standard (free) atmosphere out through a solenoid vent controlled by the cycle.

In addition to the AMG pulses, an O_2 scrubber inside the chamber captures oxygen through a catalytic reaction between the AMG hydrogen, any free oxygen, and the palladium-coated pellets in the scrubber cartridge. This reaction forms water vapor (H_2O). The catalysis is an exothermic process, and the scrubber cartridge body will grow hot to the touch in the presence of free oxygen and hydrogen.

After the auto-commissioning cycle completes, the O_2 scrubber keeps the anaerobic atmosphere in the chamber. Each O_2 scrubber must be removed after 24 hours of use and reactivated by baking the cartridge at 200°C for 8 hours to remove buildup of hydrogen sulfides and fatty acids from the palladium surfaces of the scrubber pellets.

A mild overpressure in the chamber is created with AMG injections to prevent the infiltration of any external aerobic atmosphere, including the diffusion of molecular oxygen through seals.

A digital oxygen detector is available to purchase for real-time readings and logging.

Condensate Management

Evaporation from Petri dish sample media and water vapor from the catalytic scrubber reaction are captured on the cold plate of a Peltier-effect condensate chiller located behind the O2 scrubber cartridge. This condensed moisture is 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-effect condensate chiller eliminates the need to use chemical desiccants which can retain condensate and dry out culture media.

Accessing the Workspace Chamber

The BACTRON400HP features an airlock system designed for the safe introduction and removal of sample containers and laboratory equipment from its workspace chamber. This airlock operates by creating a nearly anaerobic environment, achieved through a series of partial vacuum evacuations and subsequent backfills with anaerobic gas. Each evacuation lowers the airlock's pressure to -18 inches of mercury (Hg), effectively reducing the oxygen content by about 60% while maintaining sufficient pressure to prevent the boiling of sample media. Users have the flexibility to set the number of evacuation-backfill cycles between 2 and 9. More cycles lead to a lower residual oxygen level in the airlock but require more time and gas.

After the final cycle and opening of the inner airlock door, any remaining oxygen is removed by an O2-scrubber. The airlock's manual control can be accessed through its dedicated control screen.

Additionally, the BACTRON400HP allows for glove-free access and operation within the anaerobic workspace chamber, thanks to its armports and attached sleeves on the front. Users can wear the sleeves, initiating a purging cycle by pressing the foot pedal switch once. Upon completing the cycle, they can open the armport doors and insert their arms into the chamber. These armport cycles, adjustable from 2 to 9 vacuum/anaerobic gas (AMG Gas) purges, ensure an anaerobic environment within the sleeves. Effective use of these sleeves requires direct skin contact between the user's forearms and the cuff ring for a secure seal. Users can introduce small, smooth items into the workspace through these sleeves, and the sleeves are also compatible with exam gloves for handling pathogenic samples.

Incubator

The BACTRON400HP features a sophisticated cabinet-style incubator within its workspace chamber. This incubator's temperature is meticulously regulated by a microprocessor, which is connected to a solid-state temperature sensor probe affixed to the incubator's body. The system also includes heating elements for temperature adjustment. The microprocessor utilizes a Proportional-Integral-Derivative (PID) feedback loop to precisely measure and control the chamber's air temperature. This PID system adjusts the intensity and duration of heating pulses based on the difference between the actual chamber temperature and the user-set desired temperature (setpoint). As the actual temperature approaches the setpoint, the integral component of the PID function reduces the pulse rate to prevent overshooting the set temperature.

This PID regulation is crucial for optimizing the incubator's warming rates, particularly when adapting to varying environmental temperatures. Should the BACTRON400HP be relocated to an area with a significantly different ambient temperature, the incubator may require up to 24 hours of operation for the processor to fully adjust to the new thermal conditions. To ensure accuracy of the temperature display, it's recommended that the incubator be run at the intended setpoint for 24 hours before loading any samples. Additionally, prolonged opening of the incubator doors may affect the temperature regulation, potentially causing temporary temperature overshoots as the controller adjusts to what it perceives as a cooler environment.

For cooling, each incubator relies on natural heat radiation. The lowest cooling temperature achievable by the incubator is 5°C above the ambient room temperature, ensuring a stable and controlled environment for a variety of applications.

The Over Temperature Limit System

Every incubator is equipped with an Over Temperature Limit System (OTL), a safety feature designed as a backup heating cutoff thermostat, operating independently from the incubator's microprocessor controller. The primary role of the OTL is to protect samples by averting overheating that could result from either a malfunction in the microprocessor controller or an unexpected external heat surge. This system is linked to an internal temperature sensor within the incubator, which users are advised to set roughly 1°C higher than the incubator's current operational temperature setpoint.

In situations where the temperature inside the incubator exceeds the set cutoff point of the OTL, the system reacts by diverting power away from the incubator's heating elements. This diversion continues as long as the internal air temperature remains above the OTL's set threshold. During the period when the OTL is actively redirecting power, the heat activation indicator displays a distinctive red circle with a line through it. Additionally, an alarm will sound continuously until the OTL ceases its intervention or until the mute button is pressed. This mechanism ensures an added layer of safety, keeping the incubator's environment stable and secure for sensitive samples.

Volatile Compound Scrubber

The BACTRON400HP comes equipped with an activated carbon scrubber media, a key component for maintaining a clean and efficient workspace. This scrubber is strategically mounted alongside the O2 catalyst, positioned above the inner airlock door within the workspace. Its primary function is to absorb volatile fatty acids (VFAs) and volatile sulfur compounds (VSCs), which are common byproducts of sample cultivation. By effectively scrubbing these volatiles from the air, the activated carbon scrubber plays a crucial role in reducing unpleasant odors and minimizing filmy residues on chamber surfaces. Additionally, this process significantly extends the lifespan of the O2 scrubber, especially during cultivation processes that generate substantial amounts of VFAs or VSCs. This feature ensures a more controlled and cleaner environment within the BACTRON400HP, enhancing the overall quality and effectiveness of the cultivation process.

Workspace HEPA Air Filtering

The BACTRON400HP features a state-of-the-art HEPA air filtering system, designed to purify the air within the workspace. HEPA, standing for "High Efficiency Particulate Air [filter]," is a highly efficient type of mechanical air filter, as defined by the U.S. Department of Energy. This advanced filter is capable of eliminating at least 99.97% of various airborne contaminants, including dust, pollen, mold, bacteria, and any particles as small as 0.3 microns (μm) in diameter. The 0.3-micron size is particularly significant as it represents the most challenging particle size to capture, known as the most penetrating particle size (MPPS). Interestingly, particles that are either larger or smaller than this size are filtered with even greater efficiency. Therefore, using the 0.3-micron standard ensures that the filter's efficiency rating is at its lowest possible level, meaning it performs even better for all other particle sizes.

It's important to note that for optimal performance, all air cleaners, including those with HEPA filters, require regular maintenance. This includes periodic cleaning and filter replacement. In comparison to MERV 16 filters, HEPA filters offer superior air cleaning capabilities.

Manometer Pressure Gauge and Check Valve

The workspace chamber of the BACTRON is equipped with a water-filled manometer, serving two essential functions: as a visual indicator of pressure levels and as a dynamic venting mechanism in case of excessive pressure. Under normal conditions, with the chamber unpowered and at room pressure, the manometer is filled to its top reference ring. Once the BACTRON is activated and pressure builds up in the chamber, the water level in the manometer is pushed down to about 0.5 inch above the bottom reference ring. If the pressure in the chamber increases further, the water is driven even lower into the manometer bottle. In situations of excessive pressure, the water begins to bubble, indicating that the chamber's atmosphere is being released through the manometer, effectively venting outside the chamber. This feature is crucial for protecting the chamber's gaskets and acrylic glass panels from damage.

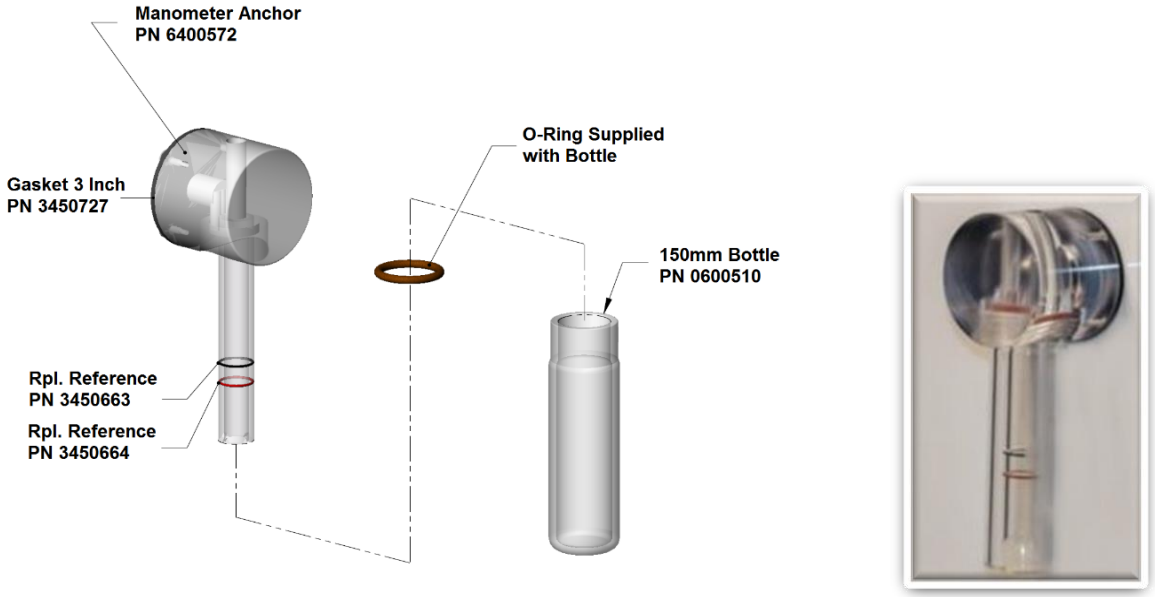


Figure 9: Chamber Manometer

Additionally, the manometer includes an exhaust vent, comprising a tube and a black O-ring, situated on the back right side of the BACTRON. The system also incorporates an armport sleeve solenoid for enhanced venting. This solenoid is activated by tapping the foot pedal once. Venting is automatically halted if the workspace injects gas twice consecutively, ensuring a controlled and safe pressure environment within the BACTRON chamber.

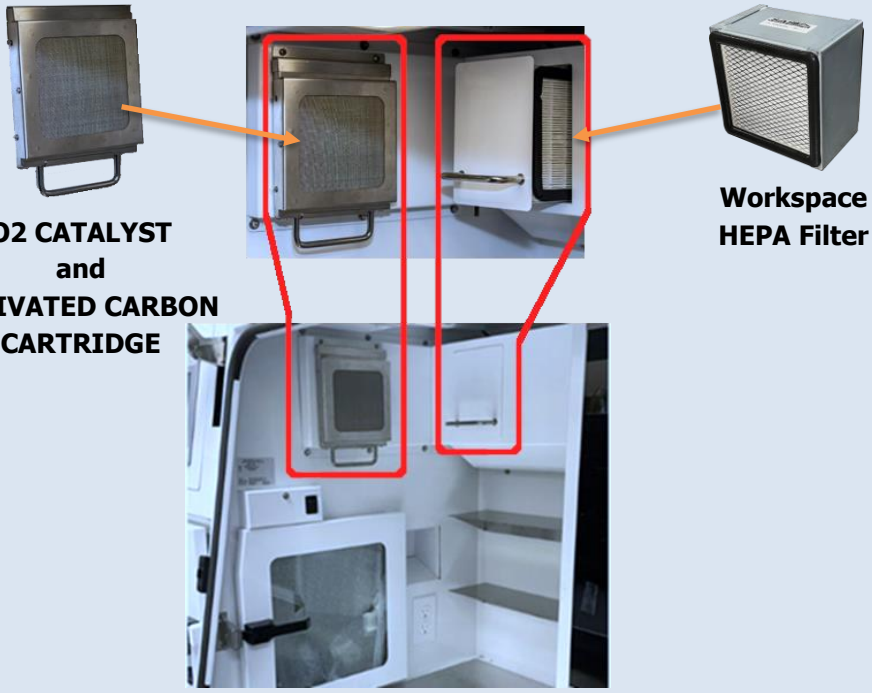
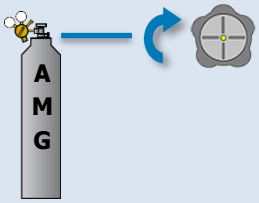
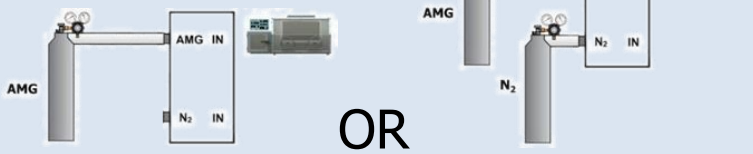
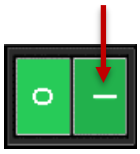
PUT THE BACTRON INTO OPERATION

Note: Once in operation, the BACTRON should run for **24 hours** prior to loading samples. This ensures the stability of both the anaerobic atmosphere and incubator air temperature.

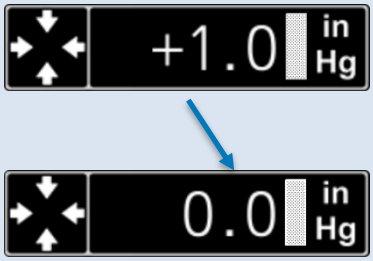
After installation in a new workspace environment, check the following items prior to placing the unit into operation.

1. Verify all Installation procedures have been carried out.
2. Verify enough AMG is on hand to commission and sustain an anaerobic atmosphere. We suggest using a new tank when reasonable, otherwise make certain that the tank pressure reads at least 1000psi on a 5 foot cylinder.
3. Verify water has been added to the manometer page 33.
4. Verify that an active O2 CATALYST and ACTIVATED CARBON CARTRIDGE are ready to install in the workspace chamber.
    - The O_2 catalyst (scrubbers) come from the factory activated and ready for use.
    - If the cartridge(s) has been stored for 6 months or longer, bake out the catalyst cartridge for at least 8 hours at 200°C to reactivate the catalytic palladium and Activated Carbon.
5. Verify HEPA filter is unpacked and ready to install in the workspace chamber.

Perform the following procedures and steps

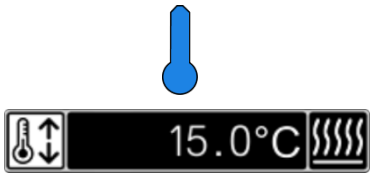
1	**Install the O_2 Scrubber, Activated Carbon, and HEPA Filter** (procedure on page 109)  **O2 CATALYST and ACTIVATED CARBON CARTRIDGE** **Workspace HEPA Filter** **Workspace**	
2		**Plug in the BACTRON** procedure on page 110.
3		**Supply Gas** to the **BACTRON** procedure on page 111. 
4		Place the power switch on the Back Panel in the On (|) position. The switch and control panel displays will illuminate. **Note**: Check the workspace AMG Injection indicator to make certain it is not continuously injecting gas.

5



Zero the Pressure Displays This sets the pressure gauges to local conditions. See page 48.

6



Set incubator temperature to 15C

It is recommend that the operator set the the incubator to 15C to avoid it heating during the anaerobic commission process.

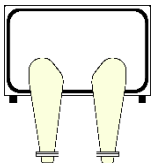
See the **Set the Incubator Temperature** on page 57 for how to set an incubator to OFF.

7

Commissioning Cycle

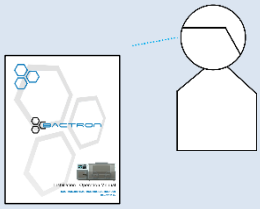
Launch the Anaerobic Commissioning Cycle procedure on page 49. The cycle takes approximately **5 hours** to complete for the BACTRON.

8



Attach the Sleeves to the armports, page 113.

9



Read

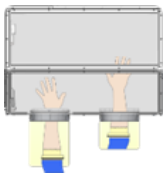
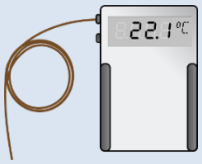
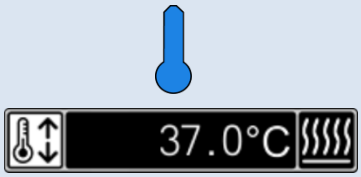
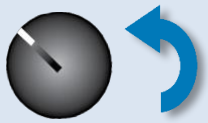
Review the following procedures while the commissioning cycle establishes an anaerobic atmosphere. The user's hands will be occupied in the sleeves while working in the chamber after the cycle is complete.

Enter the Chamber page 51
Moving in the Chamber page 53
Anaerobic Monitoring page 119
Troubleshooting O_2 in the Chamber page 55
Exit The Chamber page 121

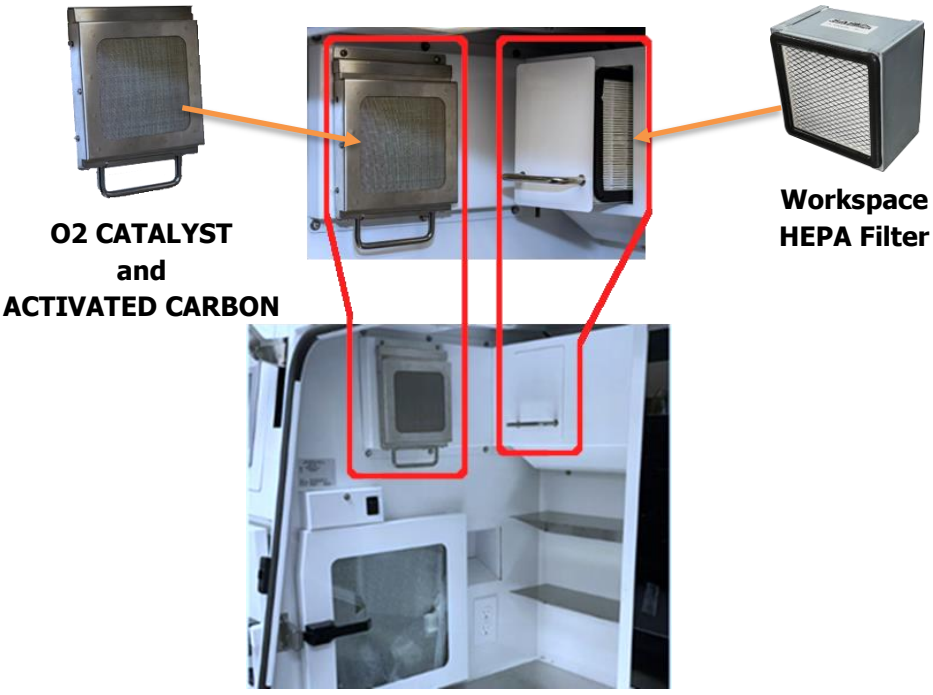
10

Commissioning Cycle Finishes

The Commissioning cycle will show the Commission Cycle Completed Successfully and wait for the operator to return to the home screen.

11		**Verify the Anaerobic Atmosphere,** page 120. If the chamber is not fully anaerobic perform the **Troubleshooting O_2 in the Chamber,** page 150.
12		**Enter the Chamber** after the commissioning cycle has finished, page 116.
13		**Optional**: If you are required to verify the accuracy of the incubator temperature display(s), set up the verification equipment now. See the suggested calibration setup and the first two steps of the suggested **calibration procedure** on page 147.
14		Close the incubator doors. If you have set up temperature probes in the incubator(s) to run a verification or calibration, make sure any gaps created by the probe wires are covered.
15		Set the incubator to your application temperature. Please see the **Set the Incubator Temperature** procedure on page 123.
16	 **24 Hours Required**	Allow the BACTRON to run 24 hours prior to: **Loading Samples**, page 130 Verifying or calibrating the accuracy of the incubator temperature display.
17		**Set the Over Temperature Limit** heating cutoff temperature on page 124. **BACTRON:** The OTL system for the incubator must be set separately.

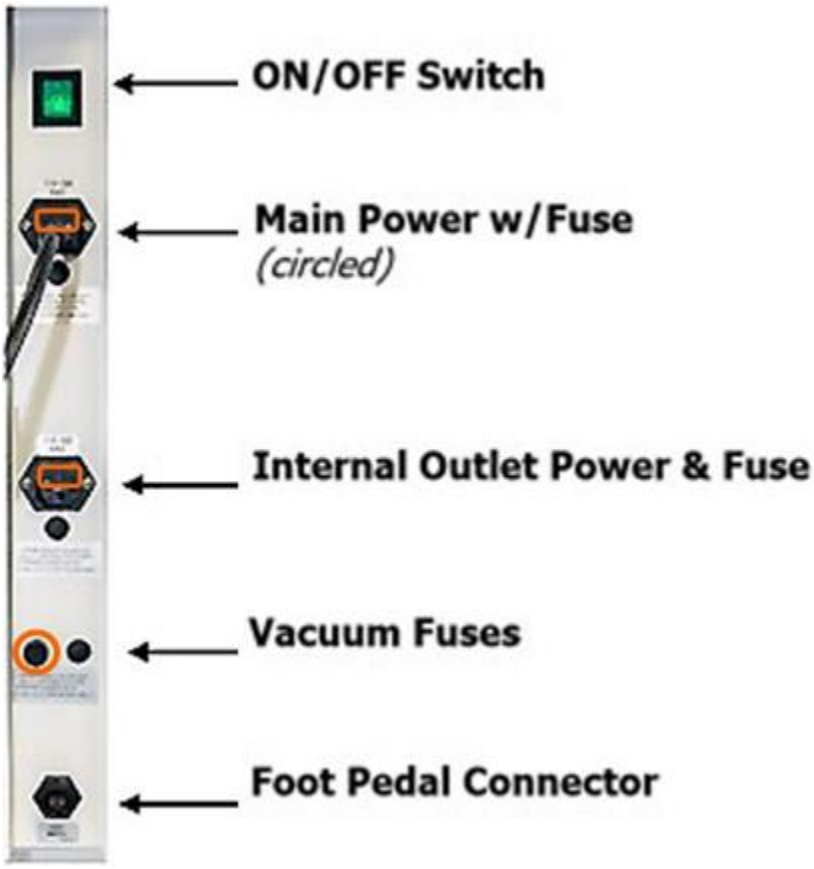
INSTALL O_2 CATALYST / ACTIVATED CARBON CARTRIDGE AND HEPA FILTER



- Open the left armport door.
- Install one O_2 Catalyst and Activated Carbon cartridge.
- Install the Workspace HEPA filter into the filter holder (pull on silver handle). The filter will have an arrow on it to show the airflow direction. The arrow should be pointing toward the incubator.
- Close and latch the armport door.

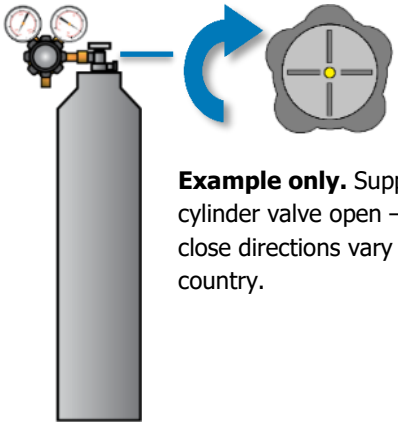
See page 37 for instructions on **Properly Closing and Latching the Armport Door**.
Whenever the chamber is anaerobic, scrubbers should be introduced and removed through the airlock.

PLUG IN THE BACTRON

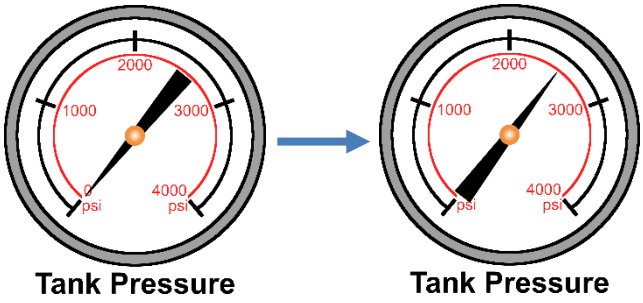


SUPPLY GAS TO THE BACTRON

1. Open the supply cylinder valve.



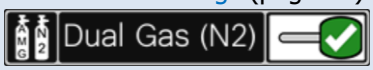
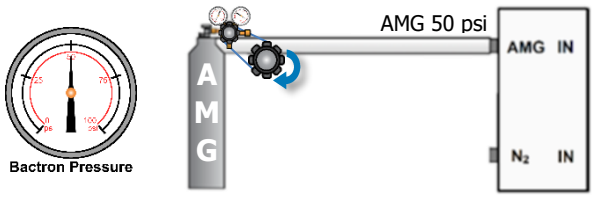
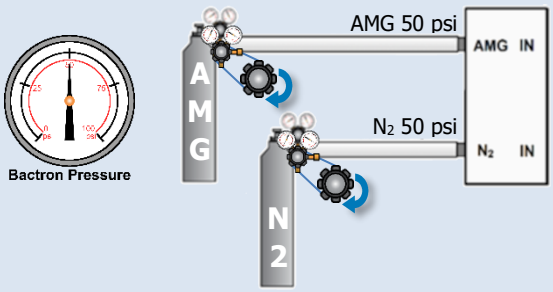
Example only. Supply cylinder valve open – close directions vary by country.



The supply gauge (right) will jump from zero (0) to showing the current gas supply pressure level.

2. Open the Regulator Flow Valve to supply an AMG flow of 50 psi to the BACTRON.

3. If configured for Dual Gas, open the Regulator Flow Valve to supply an N_2 flow of 50 psi to the BACTRON.

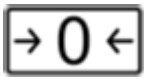
AMG Only (Single Gas)	**AMG and N_2 (Dual Gas)**
Disable Dual Gas. See Airlock Settings (page 69) 	**Enable Dual Gas.** See Airlock Settings (page 69) 
Turn on gas to the Bactron. 	**Turn on gas to the Bactron.** 

ZERO THE PRESSURE DISPLAYS

Function: The Airlock and Sleeve Pressure Displays on the main control panel should each show 0 (zero) when exposed to room atmosphere pressure. The gauges help restore the airlock and sleeves to near room pressure when completing a cycle. The gauges were originally zeroed near sea level.

Sleeve Pressure Display

Zero the Sleeve display if the display shows a reading other than 0 **when the sleeves are attached to the armports but not being used.**

- The sleeves must not be in use when performing a zero reset on the sensor.
- Enter Armports Settings from the Home Screen
- Tap the 

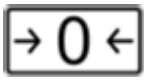
button a few times.
- 

should read +/- 0.1 of 0 inHg.

Airlock Pressure Display

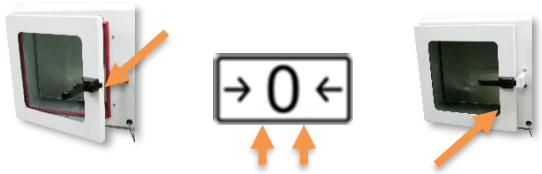
Zero the Airlock display **<u>if</u>** the display shows a reading other than 0 **when the outer airlock door is open**, exposing the airlock chamber to room pressure atmosphere.

Note: Open the outer airlock door.

- Enter Airlock Settings from the Home Screen
- Tap the 

button a few times.
- 

should read +/- 0.1 of 0 inHg.
- Close and latch the door after zeroing the display.

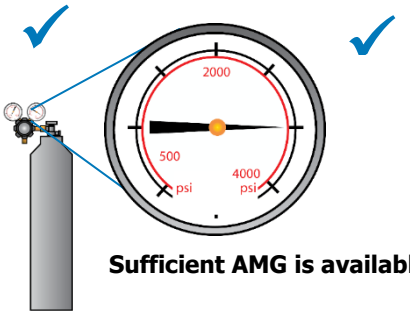


LAUNCH THE ANAEROBIC COMMISSIONING CYCLE

The cycle establishes an anaerobic atmosphere in the workspace chamber over the course of several hours.

Note: Commissioning cycles will not initiate while a sleeve cycle or an airlock cycle is active.

Prior to launching the cycle, verify that:



Sufficient AMG is available.

Incubator is set to **15C**

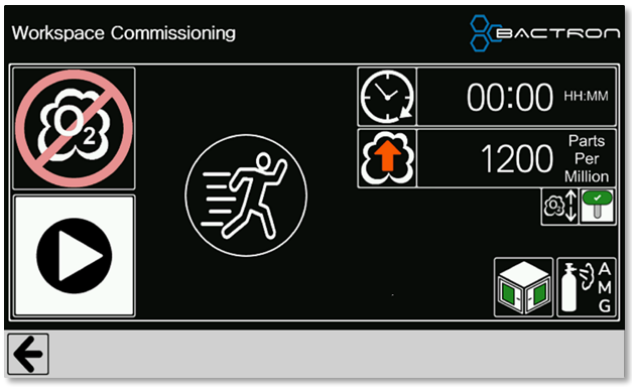
Incubator door is open

Both airlock doors are closed and latched

Armport doors are closed and latched.

Launch the Commissioning Cycle:

On the Home Screen, Workspace Control, tap the  Anaerobic Commissioning button.



Enable the Oxygen Indicator

Tap the start button.

While the Anaerobic Commission process is running the running-man icon will flash green.

Flashing

Anaerobic Commission Process is running.

The process may take as long as 5 hours to complete, it is normally faster as it uses the concentration of oxygen to stop the process at 400ppm. The Bactron will continue scrub out the remaining oxygen in a short period of time.

During the cycle, extended AMG injections force aerobic chamber atmosphere out through a one-way commissioning vent valve. This purge and the O2 capture provided by the oxygen scrubber removes O2 from the chamber atmosphere.

Sleeve cycles and airlock cycles will not initiate while commissioning is active.

When the process has completed successfully, one of the following screens will appear and stay present until the operator taps the return button.

Or

The commissioning vent valve closes automatically.

Fogging and Humidity. Mild or heavy condensation may take place inside the chamber during the cycle. This is due in part to the formation of water vapor as the catalytic O2 scrubber removes large amounts of oxygen. High ambient humidity and cool room temperatures also contribute. The condensate should dissipate by the end of the cycle as oxygen decreases and as the condensate controller removes water vapor from the chamber atmosphere.

Aborting the Commissioning Cycle

Tap the stop button to prematurely stop the Anaerobic Commissioning Process.

ATTACH THE SLEEVES

Attach and secure both sleeves to the armports. This allows reach-in access to the chamber through the ports without introducing an aerobic ambient atmosphere.

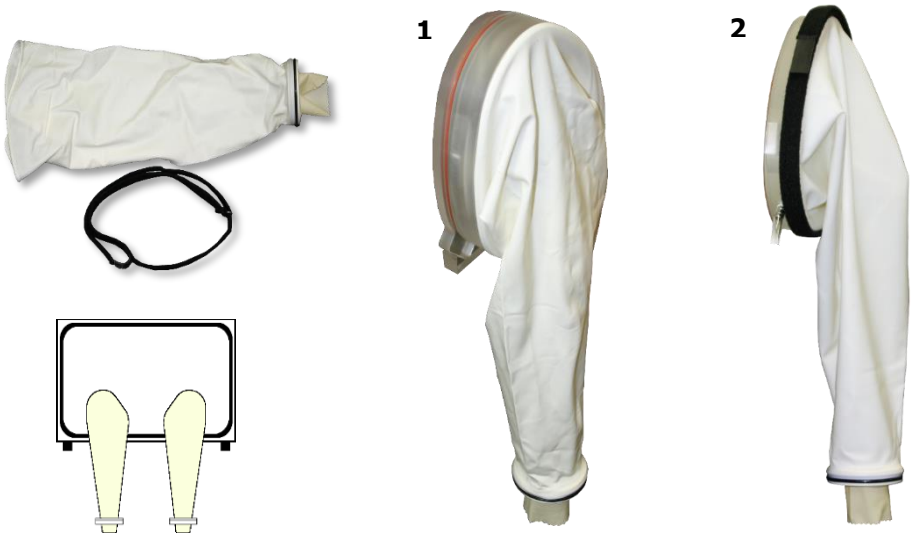


Figure 9: Sleeve

Begin with either Armport

1. Unroll the large opening of a sleeve over the lip of the armport door. Beginning from the bottom of the armport is typically the easiest approach.

- Place the ring on the large end of the sleeve inside the groove on the armport.
- Make sure none of the sleeve material is trapped or pinched between the ring and the seating groove.

2. Secure the sleeve to the armport using the 48 inch (121 cm) self-gripping strap included with the sleeve.

- Exercise caution when placing the strap next to the armport gas lines.

3. Repeat the process for the second sleeve and armport.

Watch Video
https://youtu.be/xr64VXiBOCE

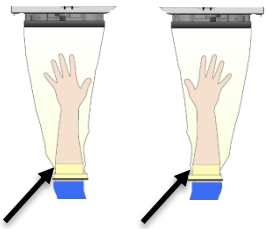
Note: Sleeves may remain attached to the BACTRON when not in use.

ENTER THE CHAMBER

Prior to entry, read the **Exiting the Chamber procedure** (page 121) for how to withdraw your arms from the chamber without compromising the anaerobic atmosphere.

1. Don the Sleeves

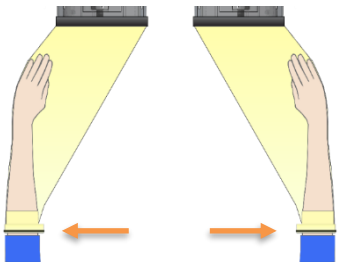
Note: Sleeves come with mid-sized, size 8 cuffs. Please see the Parts List on page 160 for other cuff sizes.



Snug contact, sleeve cuff and bare skin at the widest part of the forearm.

Remove rings and watches. Sharp objects will damage the sleeves.

2. Position and hold your hands approximately 4 – 6 inches (10 cm – 15 cm) away from the arm port doors, to either side.



This position prevents the collapsing sleeves from pulling your hands into the arm port doors during the vacuum down cycle phases. It also keeps the sleeve material tight, helping to obtain a complete evacuation of the sleeves.

3. Cycle the Sleeves

1. Press and release the foot pedal.

- Both sleeves will vacuum down then partly fill with AMG for the number of cycles set in Armport Settings. The default is two.

Cancelling the Sleeve Cycle: Press the foot pedal at any time to stop an active sleeve cycle.

Force Sleeve inflation: Tap the foot pedal 4 consecutive times within 3 seconds.

Abort Signal: The Auto Abort Signal is an audio alarm buzzer.

Abort 1: The cycle will abort if a vacuum down phase fails to achieve -18inHg within 25 seconds. Check the sleeves for leaks and ensure that the sleeves are properly attached.

Abort 2: The cycle aborts if the cycle injects AMG into the workspace chamber twice during a sleeve cycle vacuum phase. Check that the arm port doors are properly sealed and latched to prevent the sleeve cycle from vacuuming the atmosphere out of the chamber.

4. Open the Armport Doors

Watch Video

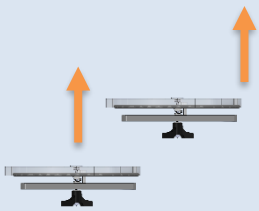
https://youtu.be/JhCl85Fzdes

a. 

When the cycle has finished, loosen both armport doorknobs by two or three turns.

b. 

Rotate the locking bars to roughly 45°.

c. 

Slowly push one door into the chamber, then slowly push the other door into the chamber.

Pushing both doors in simultaneously will create a significant displacement of the pressurized chamber atmosphere, resulting in active venting.

5. Store the Arm Port Doors

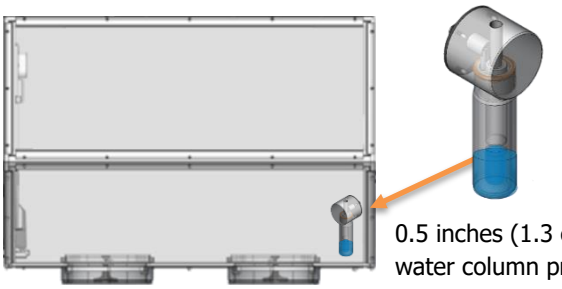
Leave doors open for commissioning cycle
(Doors should be centered)

Arm Port Doors and Storage

MOVING IN THE PRESSURIZED CHAMBER

Undisturbed Overpressure

When sealed and sitting undisturbed, the BACTRON maintains a positive 0.5 inches (1cm) of water column pressure in the workspace chamber to prevent infiltration by external atmosphere.



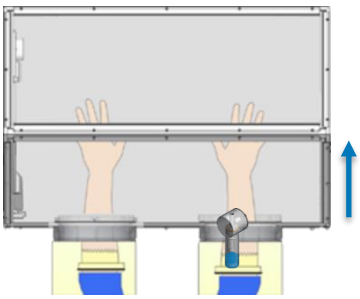
0.5 inches (1.3 cm)
water column pressure

Pressure Increase

Introducing hands and objects into the sealed chamber displaces the atmosphere, further increasing the pressure.

The BACTRON will vent atmosphere through the manometer. However, if there is sudden and significant air displacement in the workspace the manometer will bubble which should be avoided, when possible.

While the operator is in the workspace they may tap the foot pedal once, while pushing their hands into the workspace. This will start the vacuum pump and it will draw air out of the workspace to make room for the operators hands. When the operator stops pushing into the workspace the vacuum pump will automatically stop or the operator can tap the foot pedal again and the pump will stop.



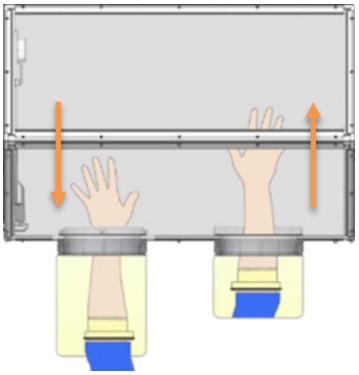
Manometer will start bubbling if the air displacement changes suddenly.
Bubbling should be avoided.

Reminder: Approximate volume of displaced chamber atmosphere is equivalent to inserted arms.

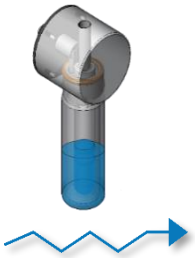
All vented atmospheres will be replaced with injected AMG after the displacement ends. This drives up the overall AMG usage and associated operating costs.

Pressure Management

Use a swimming motion, withdrawing one arm while reaching in with the other. Slow movements avoid spiking the chamber pressure and venting anaerobic atmosphere.



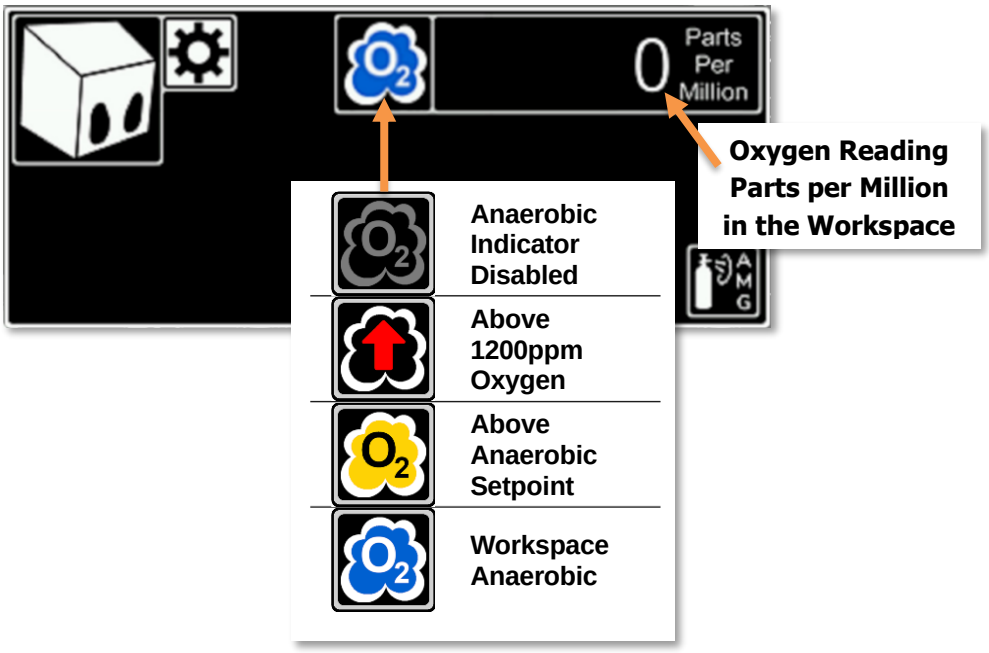
- Slow, deliberate, simultaneous movements balancing out one another.
- No atmosphere vented.



ANAEROBIC MONITORING

The BACTRON400HP is equipped with an oxygen sensor to monitor the oxygen concentration in the chamber. The results are displayed on the Home screen > Workspace control and the Anaerobic Commissioning Screen.

Note: The Anaerobic Commissioning Process reports complete when the oxygen concentration drops to 400 ppm. It will continue to scrub out the remaining oxygen within 60 minutes.



The operator can change the O_2 ppm that turns the cloud indicator blue by entering Workspace Setup and changing the O2 Level Alarm Setpoint to the desired parts per million of O_2.

EXIT THE CHAMBER

Pressure in the chamber drops when a user withdraws their arms. If done too quickly, this can draw in outside air through the sleeve cuffs or manometer. Use the following steps to exit the chamber without pulling in aerobic atmosphere.

Watch Video

https://youtu.be/JhCl85Fzdes

1. Check that both airlock doors are closed and latched to avoid drawing aerobic atmosphere in through the airlock.
    1. One at a time, remove armport doors from storage and place them on the chamber floor in front of the ports.
    2. Close and latch the armport doors.
        1. See the **Install the Armport Doors** procedure on page 37 for how to correctly latch the armport doors.
    3. Withdraw your arms from the sleeves one at a time.

Do not over-tighten Armport Knobs.

Watch Video

https://youtu.be/80H93lmY_uo

ARMPORT SEAL CHECK

Checking the Armport Door seal requires having the sleeve installed. The process is:

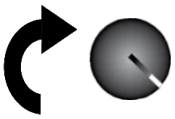
	Twist off the sleeve near the cuff to make it airtight.
	Plug the air/vacuum hole on the other armport.
 Tap foot pedal four consecutive times within three seconds.	Inflates the sleeve.
	Push on the ballooned sleeve while watching the manometer to see if the water level changes. • If the manometer water level changes, air is leaking past the door and needs attention. • If not, the door is sealed well.

- **Do not physically press on the armport doors to test the seals!** Doing so routinely may warp the acrylic glass front panel or damage the doors and armports.
- If the armport doors are not correctly sealed, run the Armport autocylce, then reseat and relatch the doors.

INCUBATOR TEMPERATURE SETPOINT

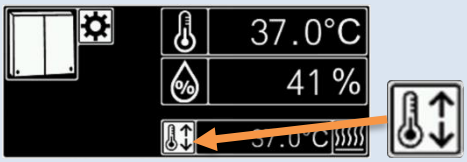
Close the incubator doors prior to setting a temperature setpoint. Heating the incubator with the door(s) open for longer than a few moments may result in temperature instability and overshoots once the doors are closed.

1. **Set OTL control to its maximum setting,** if not already set to max.



Turning the OTL all the way to the right (clockwise) prevents the heating cutoff system from interfering with this procedure.

2. Set Incubator Temperature Setpoint



Home Screen > Incubator Control >
Tap the Setpoint button.

The operator may use the up and down arrows or tap the temperature value to open the number pad and type in the whole number for the temperature desired.

Buttons: Use the up and down arrows to change the setpoint.

--OR--

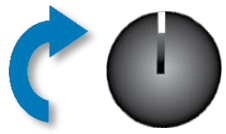
Number Pad: Tap the current setpoint value. The number pad opens. Input the desired setpoint and press Enter on the keypad to set.

Tap return button on Incubator settings to return to the Home Screen.

1. Test the OTL heating cutoff system at least once each year for functionality.

SET THE OVER TEMPERATURE LIMIT

The incubator must be operating at your incubation application temperature and must be stable for at least 1 hour prior to setting the OTL. The incubator OTL must be set independently on the BACTRON.

1. Set OTL control to its maximum setting, if not already set to max.

2. Turn the dial counterclockwise until the red Over Temperature Limit Indicator illuminates.

3. Slowly turn the dial clockwise until just after the OTL Activated light turns off.
 The Over Temperature Limit is now set approximately 1°C above the current incubator air temperature.
4. Leave the OTL dial set just above the activation point.


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

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

SET THE AIRLOCK CYCLE ITERATIONS

Optional: The BACTRON comes from the factory set to run a 3-iteration auto cycle. The airlock can be set to run from two through nine cycles. Each cycle consists of a vacuum down air purge phase followed by a gas backfill of the airlock chamber. More cycles decrease the amount of O_2 left in the airlock chamber upon cycle completion but increase gas usage and cycle run times.

To change the number of cycles, Open Airlock Settings directions on page 69.

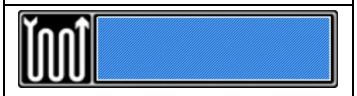
Use the up and down arrow keys to change the number of cycles.

Airlock Autocycle Completion Times:

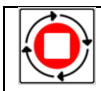
Number of Cycles	Airlock Minutes
2 cycles	0:01:51
3 cycles	0:02:35
4 cycles	0:03:19
5 cycles	0:04:03
6 cycles	0:04:47
7 cycles	0:05:31
8 cycles	0:06:15
9 cycles	0:06:59

CYCLING THE AIRLOCK

Airlock Control Overview can be found on page 65.

		Cycle the airlock prior to opening the inner airlock door whenever the Airlock Progess Indicator is not 100% textured blue.
		Close and latch both the inner and outer airlock doors to enable the autocycle button.
 --OR-- 		Tap the Airlock Auto Cycle start button on the Home Screen Airlock Control. --OR-- Use the Airlock Auto Cycle start button inside the workspace above the inside airlock door.
	 First full Cycle  Second Full Cycle  Final Full Cycle	The airlock evacuates down to -18inHg then backfills with gas to -4 inHg during the interim cycles. The final backfill will stop around ambient air pressure. If the Bactron is configured for dual gas, N_2 will be used for interim backfill on the airlock. The final pass always backfills with AMG. After the final gas backfill is completed, the Airlock Anaerobic progress bar will be 100% textured blue and the inside airlock door will unlock until the outside airlock door is opened. When the outside airlock door is opened the inner airlock door locks automatically and the Airlock Progress Bar changes to blank.

Aborting an Active Auto Cycle

		If the autocycle is active and the operator needs to stop it, tap the stop button on the Airlock Control of the Home Screen or the button in the workspace.
		The button will change to rewind while it backfills the airlock.
		When the abort is complete the play button will show again.

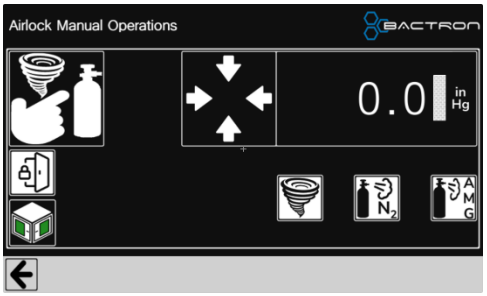
Airlock and Armport Autocycles can be running at the same time. The Airlock vacuum pass will stop and wait for the Armport vacuum pass to complete and then continue.

MANUALLY CYCLING THE AIRLOCK

Airlock Manual Vacuum / Gas Control Overview can be found on page 71.

This control is intended as a backup for the airlock autocycle system. It can also be used to carry out custom cycles or low-pressure applications down to -18inHg in the airlock chamber.

Tap the Manual Operations button on the Home Screen of the Airlock control. It will display the screen below.



Manual Vacuum and Gas

Tapping the buttons will cause the action to run for up to 30 seconds and then shut off.

The operator may choose to stop the action sooner by tapping the same button or a different button to switch actions.

Vacuum	N2	AMG	
			**Start** Will shut off after 30 seconds.
			**Stop**

Manual Vacuum and Gas Process

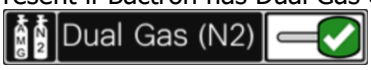
Tap the Manual Cycle switch for Vacuum.

The airlock will draw down 30 seconds unless the operator presses the button again. If the pressure is not low enough when the pump shuts off, tap the button again.

Manually stop the vacuum when the pressure hits -18 inHg.

Stop the vacuum draw down immediately if the water in the manometer gauge bubbles or the AMG Injecting light illuminates frequently indicating there may be a leak along the inner airlock door

Note: Present if Bactron has Dual Gas enabled. See Airlock Settings (page 69).



Tap the N_2 button to backfill the airlock. It will gas for 30 seconds unless the operator presses the button again. If the pressure is not high enough when the gas shuts off, tap the button again.

Should only be used on interim cycles the final cycle before opening the inside airlock should always be AMG.

Tap to stop backfill.

Manually stop at -4 inHg for interim cycles and -0.4 inHg for final cycles.

Tap the AMG button to backfill the airlock. It will gas for 30 seconds unless the operator presses the button again. If the pressure is not high enough when the gas shuts off, tap the button again.

The final cycle before opening the inside airlock should always be AMG.

Tap to stop backfill.

Manually stop at -4 inHg for interim cycles and -0.4 inHg for final cycles.

Repeat It is best to do 3 cycles of the manual process before opening the inside airlock door.

Inside Airlock Door Lock

Home Screen > Airlock Control > Manual Vacuum and Gas.

If the operator manually cycles the airlock the progress bar will not show 100% textured blue. The inside airlock door will not automatically unlock. This function will enable the operator to open the inside airlock door, anyway.

Normal operation.
Locks when outside airlock door is opened.

Always Unlocked

Airlock Abort Events

In the event of an aborted auto cycle, the buzzer will sound, and the icons above will appear on the Airlock Control.


AMG Low – Tank may be empty.


N2 Low – Tank may be empty.


The current vacuum, N_2 or AMG pass fails to maintain the stall rate (page 69) for more than 4 seconds.


Any full cycle takes longer than 60 seconds to complete

LOADING SAMPLES

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

Containers

Airtight containers can introduce significant amounts of oxygen into the anaerobic environment of the BACTRON.

1. Whenever possible, closed containers placed in the airlock should be loose-capped or ventilated to allow the airlock cycles to draw oxygen from the containers.

2. Caps on empty syringes should be loosened if permitted by your laboratory or production protocol.

Sliding Shelf Transport

The airlock sliding shelf can hold and transport up to 216 plates.

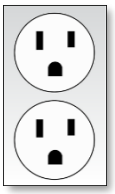
Incubator Sample Placement

- Even spacing. Place samples and other media containers as evenly spaced as possible on the incubator shelves to allow for atmosphere circulation and better temperature uniformity.
- Humidifying. Placing an open beaker of water on the bottom shelf of the workspace incubator in the BACTRON will help prevent samples from drying prematurely.
- If anaerobes sensitive to heat are being cultivated, it may be necessary to place an empty Petri plate at the bottom of each stack of the workspace incubator.

This concludes *Putting the BACTRON into Operation* portion of the Operation Section.

HUMIDIFYING THE INCUBATORS

Placing a small number of Petri dishes or other 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.



CHAMBER ACCESSORY POWER OUTLETS

BACTRONs are provided with two accessory outlets located inside the workspace chamber on the left wall. It has a separate detachable power cord that connects to the power panel (page 20) on the back of the Bactron. Your accessory equipment should not exceed 12 amp combined current draw.

Waste Heat

Accessory equipment may heat the workspace chamber. This can affect the temperature performance of the incubator and may increase pressure in the sealed chamber through thermal expansion of the chamber atmosphere. Monitor the chamber pressure using the manometer and the incubator performance when using powered accessories inside the workspace chamber.

VOLATILE COMPOUND SCRUBBER AND REJUVENATION CYCLE

The BACTRON400HP is equipped with an activated carbon scrubber as a standard feature, enhancing its functionality. This scrubber, which is attached to the O2 catalyst, is strategically placed in the workspace area above the inner airlock door. Its primary function is to absorb volatile fatty acids (VFAs) and volatile sulfur compounds (VSCs), which are commonly produced during the cultivation of samples. By effectively removing these volatile compounds, the activated carbon scrubber plays a vital role in minimizing odors and preventing the accumulation of filmy residues on the chamber's surfaces. Additionally, this scrubbing process significantly extends the lifespan of the O2 scrubber, especially valuable during processes that generate high levels of VFAs or VSCs, thereby maintaining a cleaner and more efficient working environment within the BACTRON400HP.

Please see the **Accessories section** on page 162 for information on scrubber media recommended by the manufacturer.

Use

- Install the O2 CATALYST / ACTIVATED CARBON CARTRIDGE (page 109).

Rejuvenating the Carbon Media:

1. Regular Replacement: Change the carbon media samples every 24 hours when in use within the workspace chamber to maintain efficiency.

2. Reactivation Process: To reinvigorate the carbon media, it must be baked.

3. Combined Baking: The O2 Catalyst and Activated Carbon Cartridge can be baked together without the need for disassembly, simplifying the process.

4. Baking Guidelines: Set the oven to a temperature of 180°C (or higher) and bake for a minimum of 8 hours to ensure thorough reactivation.

5. Long-Term Maintenance: Utilize the carbon scrubber media for a period of up to 6 months. After this duration, it is recommended to replace the old activated carbon with new material in the activated carbon cartridge(s) to ensure consistent performance.

CONDENSATION AND THE DEW POINT

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

Condensate will appear whenever 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 a chamber, condensate will first appear on surfaces cooler than the air temperature. Near the dew point, condensate forms on any item or exposed surface that is even slightly cooler than the air. When the dew point is reached, condensate forms on nearly all exposed surfaces.

Mild condensate may be present in BACTRON units fully loaded or loaded to near capacity with breathable media plates, depending on ambient temperature and humidity. Cold air blowing on the exterior of the BACTRON may contribute to 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: Rising or falling air pressure from the 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 condensate 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 BACTRON.
- Does the ambient humidity in the room exceed the stated BACTRON operating range of 80% relative humidity? If so, lower the room humidity.
- Do the number of media containers in the BACTRON exceed its rating? Reduce the number of sample containers.
- Remove or cap open containers of water or media. Drain the condensate controller vessel frequently. **Do not drain the manometer**.

DEIONIZED AND DISTILLED WATER

Warning: Do not use deionized water for cleaning or humidifying the BACTRON!

Although deionized water is readily found in laboratory settings, it is a potent solvent that can corrode metal surfaces. Accordingly, using deionized water in a BACTRON is discouraged as it not only risks damaging the unit but also voids the warranty against manufacturing defects. Instead, the manufacturer advises using distilled water for cleaning and humidifying purposes within the BACTRON. The recommended specifications for this distilled water are a resistance range between 50K Ohm/cm and 1M Ohm/cm or a conductivity range from 20.0 uS/cm to 1.0 uS/cm. This ensures safe and effective maintenance of the unit while preserving its integrity and warranty.

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CHAMBER QUALITY CONTROL CHECK SHEET

Month: _____

Day	AMG Tank Pressure Reading	N_2 Tank Pressure Reading	Workspace Oxygen Reading	Incubator Temperature Reading	O_2 Scrubber Swapped	Condensate Drained	Door Gaskets Inspected	Sleeves Inspected	Manometer Inspected	Workspace Cleaned
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
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31										

You may copy this sheet for institutional use.

DAILY MAINTENANCE

1. Replace the used O2 Catalyst / Activated Carbon Cartridge in the chamber with one that has been reactivated, ensuring continuous scrubbing efficiency.

2. Perform a 'bake out' process on the O2 Catalyst / Activated Carbon Cartridge you've removed from the workspace chamber to reactivate it for future use.

3. Regularly empty the condensate collection container as required to maintain optimal chamber conditions.

4. Check the airlock gaskets to ensure they are properly positioned. If you notice any foreign material or debris on the gaskets, clean them following your laboratory's specific cleaning procedures.

5. Examine the sleeve cuffs for any signs of damage such as holes, tears, or wear that could impact their effectiveness. Replace them if they are found to be compromised.

6. Confirm that the incubator is set to the correct temperature as per your experimental needs.

7. Record the readings from the gas regulator supply. This is important for preventing gas shortages and for identifying potential leaks in the gas system over time.

8. Monitor the water levels in the manometer. When the chamber is operating at its standard overpressure of 0.5 inch, the water levels should align with the lower of the two reference rings, which are typically marked in red.

9. Clean and disinfect the workspace chamber. This should be done in alignment with the protocols of your laboratory or production facility, or as required by regulatory standards, to maintain a hygienic and safe working environment.

NORMAL GAS CONSUMPTION

A sealed and undisturbed BACTRON400HP will typically run for more than 30 minutes between gas injections into the workspace chamber. The AMG Injecting light will illuminate while pulsing gas into the workspace chamber, accompanied by a pair of audible clicks from the gas solenoid opening and closing.

Airlock cycles, entering or exiting the armports, and working in the workspace chamber will temporarily increase the frequency of gas injections.

When the BACTRON400HP is sitting sealed and undisturbed, AMG injections every 20 – 30 minutes **may** indicate a small leak. Injections every 10 – 30 seconds in an undisturbed BACTRON400HP indicate a major leak. Large fluctuations of ambient temperature may cause AMG injections to occur more frequently.

Door Gasket Maintenance And Usage

BACTRON400HP door gaskets are subject to significant compression during airlock cycles. Users cycling the airlock more than 15 times per day will need to replace the door gaskets every 3 to 6 months. Heavy institutional users may wish to keep a pair of spare door gaskets on hand. Please see the parts list on page 160.

Cleaning: Spilling sample media on door gaskets or the interior surfaces of airlock doors may cause the gaskets to stick to the doors. This can compromise the atmospheric integrity of the airlock. Gaskets can be cleaned with dish soap and warm water per laboratory or production protocols.

Sleeve Maintenance And Usage

To maintain cleanliness and comply with laboratory or production protocols, it's important to regularly clean the sleeves of the BACTRON400HP with dish soap and warm water. This practice ensures the sleeves are properly disinfected. For institutions where multiple users operate the same BACTRON400HP, it is advisable to have an assortment of sleeves in various sizes - small, medium, and large - readily available. Alternatively, assigning a specific pair of sleeves to each user can be an effective strategy to ensure hygiene and personalization in shared use environments.

CAUTION: The O_2 Catalyst Cartridge temperature may become hot in the presence of oxygen and AMG. **Use caution when touching the O2 Catalyst.**

O2 Catalyst/Activated Carbon Cartridge: Test In The Airlock

Tests to confirm the O_2 Catalyst cartridge is functioning properly.

- Place the baked O_2 Catalyst/ Activated Carbon cartridge in the airlock.
- Run the Airlock Autocycle (page 126)
- Open the outside airlock door and remove the O_2 Catalyst Cartridge.
    - If the O_2 Catalyst side of the cartridge is warm when your fingers are near but not touching, it is working properly.
    - If the scrubber is cool or only slightly warm, reactivate by baking for a minimum of 8 hours. Please see the **Reactivating O_2 Catalyst/Activated Carbon Cartridges** procedure (page 139).

Reactivating O_2 Catalyst/Activated Carbon Cartridges

Reactivate each cartridge after 24-hours of use in the workspace chamber. Failure to do so leaves the O_2 Catalyst/Activated Carbon cartridge unable to remove free oxygen from the workspace chamber atmosphere.

- Bake the O2 Catalyst / Activated Carbon Cartridge at 200°C for a minimum of 8 hours.
- Use the proper Personal Protective Equipment (PPE) to prevent burns.
- Reactivating helps remove buildups of volatiles that would otherwise prevent the oxygen and the hydrogen from contacting the palladium surfaces of the O2 Catalyst cartridge.

QUALITY CONTROL TEST – SCRUBBER CARTRIDGES

Perform a quality control test on each O_2 scrubber cartridge once per month.

- Place a reactivated O_2 scrubber cartridge in the airlock with an aerobic atmosphere and Run the Airlock Autocycle (page 126)
    - The palladium-coated pellets inside the catalyst cartridge should grow warm in the presence of oxygen and hydrogen which shows that the cartridge is ready for use.
- If the cartridge is not hot after the auto cycle, bake the cartridge at 200°C for at least 8 hours. Perform CLEANING THE O2 SCRUBBER CARTRIDGE process (page 140).

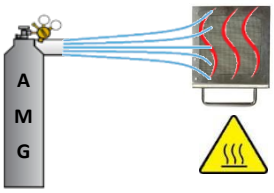
CLEANING THE O_2 SCRUBBER CARTRIDGE

- Separate the O2 Scrubber from the Activated Carbon cartridge.
- Bake the cartridge at 200°C for at least eight hours.

Note: The next step may produce **smoke** from the O2 Scrubber. Please use a well-ventilated area or an exhaust hood.

The cartridge will be extremely hot so please use heat pads to handle it.

- While the scrubber is still hot from the oven, start from the side of the cartridge that is normally covered by the Activated Carbon Filter. Flow AMG over the O_2 scrubber cartridge in the aerobic air of the room. Use proper personal protective equipment.
    - The AMG gas may burn off buildup of hydrogen sulfides and other contaminants that interfere with cartridge effectiveness. Continue to spay until the burn off stops. Then spray the other side.

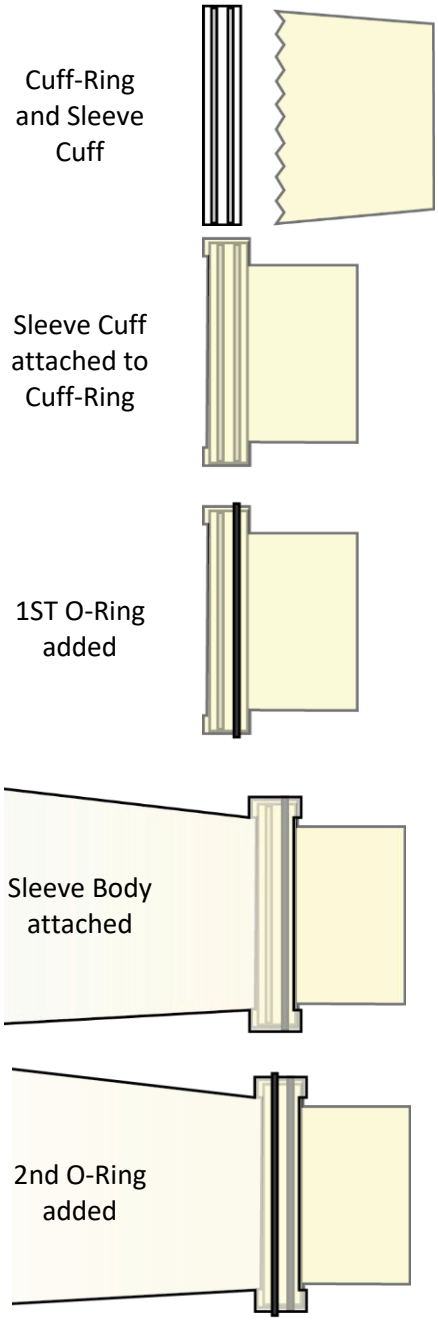


- Allow the cartridge to cool after flowing AMG over it.
- Retest by following QUALITY CONTROL TEST – SCRUBBER CARTRIDGES (page 140)

AMG CONSERVATION METHODS

- Minimize the number of airlock cycles per day.
- Use the dual AMG - N_2 gas configuration for auto cycling the airlock.
- Use the single petri dish entry slot if you have just a few dishes to put into the chamber.
- Move many items through the airlock in one transport to reduce the volume of AMG used cycling the airlock. A greater volume of solids reduces the gas backfill volume.
- When transporting a small number of items, place a large solid object in the airlock. This reduces the volume of gas utilized.
- Introduce small, individual items such as sealed microplates or transport tubes, into the workspace chamber through the sleeve assemblies rather than the airlock.
- Employ proper sleeve techniques when entering and exiting the workspace chamber.
- Avoid fast or large movements while working in the chamber. Use a swimming motion, partially withdrawing one arm from the armport while reaching in with the other.

REASSEMBLING THE SLEEVE ASSEMBLY



Perform the following steps to **disassemble** the sleeve assembly:

- Roll the black O-ring from the sleeve.
- Pull the sleeve cuff and cuff-ring from the sleeve body.
- Remove the second black O-ring.
- Remove the sleeve cuff from the cuff-ring.
- Inspect all components for brittleness, dryness, holes, or cracks. Replace as needed.
- The cuffs have the fastest rate of wear.

Reassemble the **sleeve assembly**:

- Pull the wide, fringed side of the sleeve cuff over the cuff-ring.
- Roll an O-ring onto the cuff-ring and over the sleeve cuff. Place the ring into the groove opposite the fringed side of the cuff.
- Pull the narrow end of the sleeve body over the sleeve cuff and cuff-ring. The fringed end of the sleeve cuff should be inside the sleeve body, and the body of the cuff should protrude from the sleeve.
- Roll on the second O-ring. Place the O-ring into the unoccupied cuff-ring groove.

Warning: Disconnect the power cord from the power supply before performing any maintenance or cleaning of this unit.

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

CLEANING AND DISINFECTING

- The BACTRON400HP should be cleaned and disinfected prior to first use.
- Periodic cleaning and disinfection are required to prevent microbiological contamination.
- **Do not** use spray-on cleaners or disinfectants. These can leak through openings and coat electrical components.
- **Do not** use cleaners or disinfectants that contain solvents capable of harming paint coatings, acrylic glass, or stainless-steel surfaces. **Do not use chlorine-based bleaches or abrasives—these will damage the chamber liner.**
- Consult with the manufacturer or their agent if you have any doubts about the compatibility of decontamination or cleaning agents with parts or materials contained within the equipment.

Warning: Never clean the unit using alcohol or flammable cleaners!

Keep the following in mind when cleaning the BACTRON400HP interior.

- Remove and clean the sleeve assemblies and all removable workspace chamber accessory items, except the currently installed O_2 Catalyst/Activated Carbon cartridge.
    - **Do not clean the Catalytic O_2 Catalyst/Activated Carbon using water, cleaning agents, or disinfectants.** Clean the catalyst cartridge using heat and AMG as described in CLEANING THE O2 SCRUBBER CARTRIDGE process (page 140).
    - Customer must remove the O_2 Catalyst/Activated Carbon cartridge to perform the cleaning process.
- Wash the armport doors, sample dish racks, shelf spacers, airlock gaskets, and sleeve assemblies with a mild soap and water solution.
- Clean the workspace chamber, incubator, and airlock interiors with a mild soap and water solution, including all corners.
    - Be particularly careful when cleaning around chamber power outlets to prevent damage. **Do not** clean the airlock door alarm sensors (see page XX).
    - **Do not** use chloride-based cleaners except Zephiran benzalkonium chloride solution. Other types may have adverse effects on microbiological samples.
- Rinse with distilled water and wipe dry with a soft cloth. **Do not** use deionized water. Please see page 134 for more information on deionized water.
- Wipe down the interior surfaces with Zephiran. Allow the Zephiran to evaporate naturally; **do not wipe it off.**

Disinfecting

Keep the following points in mind when carrying out your laboratory, clinical, or production space disinfection protocol:

- Turn off the BACTRON400HP to safeguard against electrical shocks.
- Disinfect the BACTRON400HP using commercially available disinfectants that are
- non-corrosive, non-abrasive, and suitable for use on stainless steel, painted surfaces, and acrylic (front hatch). Contact your local Site Safety Officer for detailed information on the disinfectants compatible with your cultivation or culturing applications.
- Do not use overtly volatile disinfecting agents. Chlorines, amphyls, and quaternary ammonias will evaporate into the chamber environment. Concentration in the chamber atmosphere will increase over time, potentially leading to inhibited growth or metabolic symptoms in sample populations.
- Open all the BACTRON400HP doors to facilitate disinfection, ventilation of disinfectants, and drying.
- If possible, remove all interior accessories (shelf spacers, Petri dish racks, and other non-attached items) from the chamber when disinfecting.
- Disinfect all corners of the workspace chamber, the incubator interior(s), and the airlock interior.
- Take particular care not to damage the armport door gaskets or the airlock door gaskets.
- The manometer glass water bottle can be autoclaved.
- After completing the institutional protocol, allow all disinfectants to evaporate completely. Wipe down all surfaces, except the door sensors, with distilled water and Zephiran until the BACTRON400HP no longer has a volatile odor.
- Use nonabrasive wipes.

Maintaining The Acrylic Glass Panels

Cleaning and Scratches

The manufacturer recommends using Novus brand acrylic glass cleaner and scratch remover for cleaning and maintaining acrylic glass surfaces on the BACTRON. Please see the **Accessories section** (page 163). Alcohol or alcohol-based solvents and other aggressive solvents should never be used to clean the BACTRON400HP and may damage the acrylic glass panels.

Ultraviolet Lighting

Never expose the BACTRON400HP to sustained ultraviolet (UV) light. Prolonged exposure to UV light 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 which will result in a rapid loss of elasticity.

The BACTRON400HP should not be exposed to direct sunlight.

Damage from exposure to UV light is not covered by the manufacturing defect warranty.

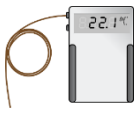
Disable or redirect laboratory disinfection UV lighting away from the BACTRON. Verify that your laboratory or workspace environment does not use UV disinfection lighting at night. This type of light is usually referred to as short-wave UVC or germicidal UV light and operates at roughly 254nm.

Periodic use of long-wave (365nm) UV hand lamps used for bacterial identification should not damage any surfaces.

Electrical Components

Electrical components do not require maintenance. If the electrical systems fail to operate as specified, please contact your BACTRON400HP distributor or technical support for assistance.

CALIBRATE THE TEMPERATURE DISPLAY

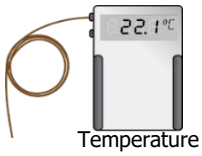


Note: Performing a temperature display calibration requires a temperature reference device. Please see the **Temperature Reference Device entry** on page 15 for the device requirements.

Temperature calibrations are performed to match an incubator temperature display to the actual air temperature inside the incubator which is supplied by a calibrated reference device.

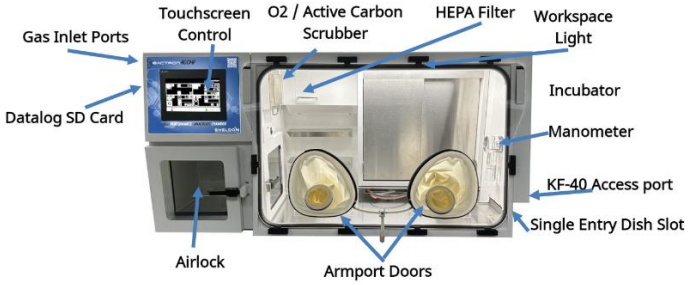
Calibrate as often as required by your laboratory or production protocol, or regulatory compliance schedule. Always calibrate to the industry standards and use the calibration setup required by your laboratory protocol.

Suggested Calibration Setup



Temperature Reference Device

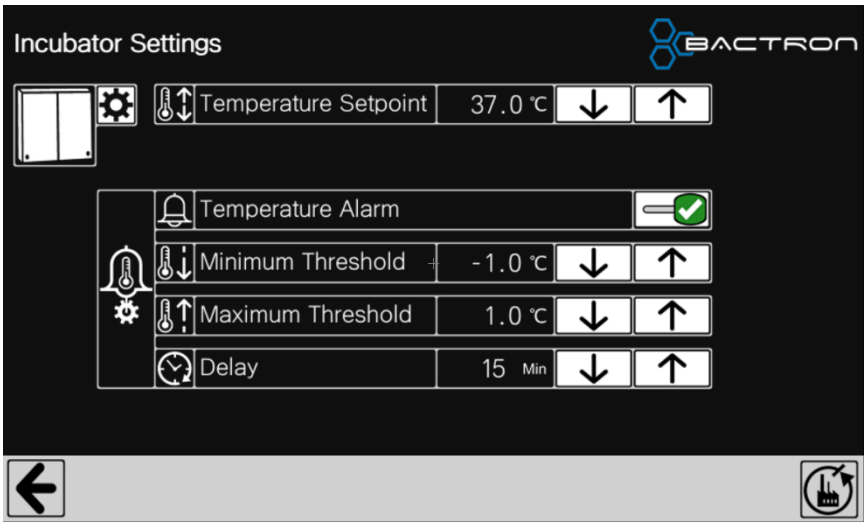
- Use the airlock to introduce the Temperature Reference Device into the workspace chamber. Cycle the airlock.
- Introduce the sensor probes into the incubator through an open incubator door.



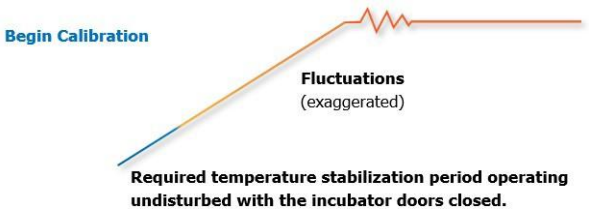
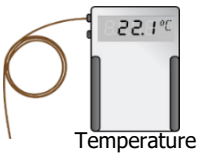
Painter's tape or other non-stick tape recommended

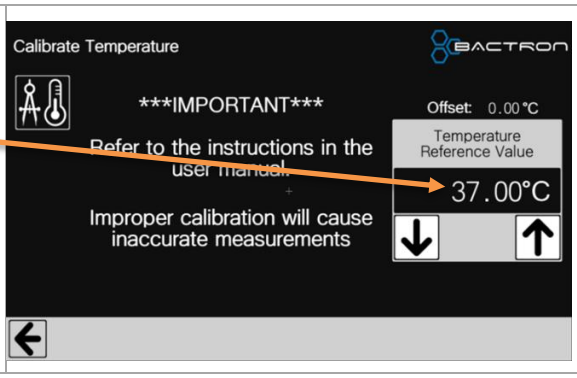
- Position the sensor head at least 2 inches (50 mm) from the shelf surface and as close as possible to the geometric center of the chamber. This ensures the air temperature is being measured. Secure the sensor head to the shelving with non-marking tape.
- Close the incubator doors. Seal any gaps along the side of the doors using non-stick tape. **Do not seal the finger holes on the workspace incubator door.**

Temperature Stabilization and Calibration



Incubator Settings

1	To perform an accurate temperature calibration, the incubator air temperature must be stabilized. To be considered stabilized, the incubator chamber must operate at your calibration temperature for **at least 1 hour with fluctuations of less than or equal to ±0.2°C**	
2	To stabilize the incubation chamber: Allow the incubator to operate at the desired setpoint and undisturbed with the doors shut for **at least 24-hours.** when first putting the BACTRON400HP into operation in a new environment. Operating **8 hours** undisturbed with the doors shut will suffice for a BACTRON400HP that has been in operation for at least 1 day. Failure to wait until the incubator is fully stabilized will result in an inaccurate reading.	
3	A calibrated temperature reference device is needed to calibrate the BACTRON400HP incubator temperature displays. Reference devices must be accurate to at least 0.1°C: Minimum Threshold = -1.0°C Maximum Threshold = 1.0°C This device should be regularly calibrated, preferably by a third party.	 Temperature Reference Device

4	Using Calibration (page 82), adjust the current display temperature value until it matches the temperature reference device temperature reading. Use the up/down arrows to adjust.	
5	After matching the current display temperature to the temperature reference device, return to the main screen. The incubator will begin heating or passively cooling to reach the setpoint with the corrected display value.	
6	Compare the temperature reference device reading with the chamber temperature display again. If the temperature reference device and the chamber temperature display readings are the same or the difference falls within the range of your protocol, the incubator is now calibrated for temperature. - OR - See the next step if the readings fail to match or fall outside your protocol range.	
7	If the two readings are not the same, and the difference still falls outside the acceptable range of your protocol, repeat steps 3 – 7 as many as two more times. Three calibration attempts may be required to successfully calibrate units that are more than ±2°C out of calibration.	
8	If the temperature readings of the incubator temperature display and the temperature reference device still falls outside of your protocol after three calibration attempts, contact your BACTRON400HP distributor or **Technical Support** for assistance.	

PERSISTENT OXYGEN IN THE CHAMBER

1. Ensure the armport doors are correctly installed (pages 27) and sleeve assemblies are correctly attached (page).
2. Verify proper sleeve donning, and armport entry (page 116) and exit procedures have been used (page 121).
3. Inspect samples and closed containers to ensure they have not been improperly introduced into the chamber (page 130).
   - Samples and containers should not be introduced until the BACTRON400HP has run with an anaerobic atmosphere in the chamber for at least 24 hours.
4. Verify the manometer is filled with 2 fl oz (60 ml) water (page 33).
5. If the manometer water bottle was removed for filling, verify the bottle has been properly screwed back into the manometer body.
   - An improperly threaded bottle allows chamber atmosphere to leak directly through the manometer body, bypassing the pressure containment of the manometer water airlock.
6. Verify the AMG cylinder or in-house supply regulator is set to at least 50 psi to ensure adequate pressure is delivered to the BACTRON.
7. Verify the O_2/activated carbon media scrubber is activated.
   - See **Testing the O_2 Scrubber Cartridges** procedure (page 139).
8. Set the airlock cycle to greater than 3 iterations to reduce post-cycle oxygen in the airlock chamber.

Manometer

Note: The airlock should not be used until the BACTRON400HP has run with an anaerobic atmosphere in the workspace chamber for at least 24 hours, except as a diagnostic.

LEAK DIAGNOSTIC

Unit In Use Procedure

Perform this procedure to check for leaks in and around the workspace chamber when the BACTRON400HP is loaded with samples and cannot be taken out of use. Leaks can result from damage, long-term wear on BACTRON400HP components, or user error.

Establish a Baseline

A baseline of AMG usage should be set before trying to determine if the chamber is leaking. Because AMG usage increases when users access and work in the workspace chamber, the baseline should be set for when the unit is sitting undisturbed.

1. Record the gas cylinder supply level at the end of the workday. Note the gauge level the next morning. Read the **Normal Gas Consumption** description (page 137).
2. If the BACTRON is using a significant amount of AMG overnight while sitting undisturbed, a gas leak is likely. Review the AMG cylinder readings recorded in the maintenance log to see if a period of increased usage or loss has occurred.
3. If the BACTRON is injecting AMG more often than every 30 minutes after sitting undisturbed overnight, there is probably a leak.
4. A normal injection rate of every 30 minutes or more sustains the chamber overpressure.

Verify Chamber Overpressure

Verify that the manometer has been refilled or topped off as part of daily maintenance. If filled correctly, the water in the manometer should be even with the bottom measuring ring of the manometer while the BACTRON is on and automatically maintaining overpressure in the chamber.

Manometer 0.5 inch (10m) water column pressure

1. If the manometer is (**a)** correctly filled, and (**b)** the water level is not depressed to the lower reference ring, and (**c)** the BACTRON400HP is not injecting AMG often, the unit may not be injecting the required amount of gas to maintain the chamber overpressure.
2. If the manometer water level is not depressed and the BACTRON400HP is injecting AMG often, there is probably a significant leak.

Check the Airlock

Verify the integrity of the airlock if the previous steps indicate a leak.

1. Check the airlock door gaskets to ensure there is no brittleness or dryness, and no cracks.
2. Check that both gaskets are securely seated on the mounting frames. Sample media is sticky, and if spilled, can cause an airlock door to pull a gasket off the mounting frame.
    - Airlock door windows should sit flush against the door gaskets when the doors are closed.
3. Confirm users close the inner airlock door after transferring items in/out of the workspace chamber.

Check the Armport Doors

Failure to correctly close and latch the armport doors can result in the chamber leaking anaerobic atmosphere and increasing the rate of gas injections while sitting undisturbed.

1. Inspect the door ring-seals for signs of damage or excessive wear. Replace the rings if there are obvious signs of damage or wear.
2. Ensure the armport doors are sealed and secure when not in use.
    - The locking bars should be in a horizontal position.
    - The knobs should be tightened clockwise **using only wrist strength**. Tightening the knobs too tight can damage the doors. This can result in a leak of chamber atmosphere around the threaded post the knob is mounted on.
    - The door should sit snugly in the port when correctly sealed. **Use finger strength only** to verify that the door does not rock in the port.

Locating Leaks

A gas leak detector capable of detecting hydrogen (Part Number 4600501) can be used to locate leaks along the sealed edges of the acrylic glass front hatch, armport doors, outer airlock door, back panel, and single-plate entry door.

The manometer exhaust port on the back of the BACTRON400HP will register as a leak under normal operating conditions. Some hydrogen gas naturally diffuses through the water-filled manometer. **Do not seal or otherwise obstruct the manometer exhaust port.** Doing so compromises the BACTRON overpressure and gas regulation system and voids the manufacturing defect warranty.

Fixing a Leak

Contact your institutional maintenance department or Technical Support for assistance if a leak is confirmed, or if increased gas usage is not restricted to periods when users are working in the BACTRON.

Excessive AMG Usage During Work Hours

Check the following items if AMG usage is excessive when users are working in the BACTRON.

- Confirm that users operate the airlock correctly.
- Ensure that users employ correct sleeve donning, entry, and exit procedures.
- Check the integrity of the sleeves and sleeve components.
- Read the **AMG Conservation Methods** entry (page 141) for ways to reduce AMG usage.

Unit Empty Procedure

Use this comprehensive procedure to check the atmospheric integrity of the workspace chamber when the BACTRON has been taken out of operation. All samples should be removed from the chamber before performing this procedure since an aerobic atmosphere will be present in the chamber.

This procedure places the unit at a steady-state temperature and atmospheric pressure before performing a set of leak checks.

1. Turn off the BACTRON.
2. Remove the left armport sleeve and open the left armport door.
3. Remove the O_2 scrubber cartridge from the BACTRON to prevent its presence from interfering with the leak check.
    - The catalytic production of water vapor reduces the volume and pressure of the chamber atmosphere. This can interfere with a leak check.
4. Verify the manometer is filled with water up to the top reference ring (the fill line).
5. Check the integrity of the airlock door gaskets.
6. Replace the gasket if brittleness, dryness, or cracks are present.
7. Clean the gaskets with warm water and soap if sticky or dirty. Dry and seat securely in the airlock mounting frames.
8. Close and latch both airlock doors.
9. Verify that the window panel of each airlock door sits flush against the door gasket.
10. Check the armport door ring seals for signs of damage or wear.
11. Close and secure the left armport.
12. Check that both the armport doors are correctly latched, with the locking bars in the horizontal position, and the knobs snugly tightened clockwise using wrist strength.
13. Check that the AMG gas regulator is set to 50 psi.
14. Open the gas cylinder valve all the way on if not already opened.
15. Turn on the BACTRON.
    - The AMG Injecting light should illuminate.
    - The manometer water level should be forced down to the bottom of the two measuring rings (the red one).

Continued next page

16. Set the incubator(s) to Off to prevent heating.
    - An incubator actively heating from room temperature to achieve a setpoint increases air pressure in the chamber due to thermal expansion of the chamber atmosphere. This can interfere with performing an accurate leak check.
17. Monitor the BACTRON for 40 minutes. After the first 10 minutes, the unit should only be injected once every 30 minutes.
    - If there is a leak, the AMG Injecting light will illuminate more frequently than every 30 minutes.
    - AMG chamber injections every 10 to 20 minutes are indicative of a large leak.
    - Failure to obtain 0.5 inch of chamber overpressure as indicated by the manometer is indicative of a leak. Check to see if the chamber atmospheric pressure switch that sets the overpressure level needs to be adjusted. Adjusting the chamber pressure switch is a service-level procedure.

Locating Leaks

See the **Locating Leaks entry** on (page 152) for instructions on using a hydrogen leak detector to pinpoint or find the leak. The hydrogen detector only finds leaks if AMG is present in the chamber.

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UNIT SPECIFICATIONS

The BACTRON400HP units are either 110 – 120-volt units or 220 – 240-volt units. Please refer to the unit 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 nominal voltage. The temperatures specified are determined in accordance with the 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.

POWER

Model	AC Voltage	Amperage	Frequency
BACTRON400HP	110 – 120	9.0	50/60 Hz
BACTRON400HP-2	220 – 240	5.5	50/60 Hz

OXYGEN

When sitting undisturbed in a steady state, the BACTRON400HP typically rests at less than **4.7 parts per million oxygen** in the workspace chamber.

AIR QUALITY

The BACTRON400HP platform features an advanced HEPA filtration system, integrating a 92 CFM circulation fan with a HEPA filter for constant air recirculation through the filter. This design ensures the removal of 99.7% of particles that are 0.3 micrometers (µm) or larger from the work area. When the workspace is exposed to external air—such as during the opening of the front hatch for cleaning or initial setup—it will require a period to effectively clear these particles. To safeguard samples that are sensitive to such contamination, it is advisable to wait a minimum of 12 hours after sealing the workspace before introducing samples, ensuring the area is thoroughly filtered.

WEIGHT

Model w/o Stand	Shipping Weight	Net Weight
BACTRON400HP	664 lbs / 301 kg	416 lbs / 189 kg

DIMENSIONS

Unit (Inches)

Model	Exterior W × D × H	Workspace Chamber W × D × H
BACTRON400HP	64.0 x 32.4 x 32.6 in	19.8 cu.ft./560L; 42.5 x 28.9 x 25.0 in

Unit (Millimeters)

Model	Exterior W × D × H	Workspace Chamber W × D × H
BACTRON400HP	1625.6 x 823 x 32.6 mm	1059 x 734 x 635 mm

Stand

Model	Inches W × D × H	Millimeters W × D × H
BACTRON400HP	61.5 x 30 x 30 in	156.0 x 76.2 x 76.2 cm

Airlock (Interior)

Model	Inches W × D × H	Millimeters W × D × H	Volume	Capacity
BACTRON400HP	16 x 10 x 11.5	406.4 x 254 x 292.1	0.9 cu.ft. / 26 L	216 Plates

Incubator

Model	Inches W × D × H	Millimeters W × D × H	Capacity
BACTRON400HP	23.6 x 8.6 x 21.9	599.44 x 218.44 x 556.26	400 Plates

Clearances

Model	Left	Right	Top	Front
BACTRON400HP	3 in (76 mm)	6 in (152 mm)	13 in (330 mm)	12 in (304 mm)

VOLUMES AND CAPACITY

Workspace Chamber Volume

Model	Cubic Feet	Liters
BACTRON400HP	19.8	560.0

Incubator Volume

Model	Cubic Feet	Liters
BACTRON400HP	1.6	45.3

Airlock Volume

Model	Cubic Feet	Liters
BACTRON400HP	1.6	45.3

Plate Capacity

Model	Airlock	Incubator
BACTRON400HP	216	400

INCUBATOR TEMPERATURE

Range

Model	Range
BACTRON400HP	Ambient +5°C to 70°C

Temperature Uniformity

Model	Workspace Incubator
BACTRON400HP	±1.0°C @ 37°C

Temperature Stability

Model	Workspace Incubator
BACTRON400HP	Mid-range 0.2°C @ 37°C

Parts List

Part Number	Description	Parts Number	Description
 **9990953**	**O2 Catalyst/Activated Carbon Cartridge Assembly**	 **1800510**	**Power Cord (2)*** 7.5 feet (2.29m), detachable used with 120 and 220
 **3450507**	**Airlock Door Gasket, 1 Each** 12in x 12in (burgundy)	 **9830516**	**Foot Pedal Control**
 **9900699**	**Armport Door Left**	 **3300520**	**Fuse**, Power Cord Inlet, Type T, 12.5 Amp, 250V, 5x20mm
 **9900698**	**Armport Door Right**	 **3300516**	**Fuses**, Vacuum Pump, Type T 10Amp, 250V, 5x20mm
 **6000509**	**Armport Door O-Ring**	 **8500527**	**Gas Tubing** white**,** 3/16ID, 5/16OD, 1 foot in length. Order by feet for an unbroken length.
 **2700506**	**Leveling Foot**	 **9740560**	**Gas Regulator Kit, Anaerobic Mixed Gas** Includes gas tubing and T-adaptor
 **2800562**	**Workspace HEPA Filter**	 **2800568**	**Workspace HEPA Filter Certified**

Parts Number	Description	Parts Number	Description
 **5111228**	**Petri Dish Rack,** 2 stacks of 12 Petri plates, 2X12	 **9990774**	**Sleeve Cuffs Latex, Size 6.5** (for extra small sleeve assembly)
 **9990738XS**	**Sleeve Assembly Size 6.5**, Extra Small (2 cuffs, 2 cuff-rings, 4 0-rings, 2 sleeve bodies, 2 self- gripping straps)	 **3600500**	**Sleeve Cuffs Latex, Size 7** (for Small sleeve assembly)
 **9990738S**	**Sleeve Assembly Size 7,** Small (2 cuffs, 2 cuff-rings, 4 O-rings, 2 sleeve bodies, 2 self-gripping straps)	 **3600501**	**Sleeve Cuffs Latex, Size 8** (for Medium sleeve assembly)
 **9990738M**	**Sleeve Assembly Size 8,** Medium (2 cuffs, 2 cuff-rings, 4 O-rings, 2 sleeve bodies, 2 self- gripping straps)	 **3600502**	**Sleeve Cuffs Latex, Size 9** (for Large sleeve assembly)
 **9990738L**	**Sleeve Assembly Size 9,** Large (2 cuffs, 2 cuff-rings, 4 O-rings, 2 sleeve bodies, 2 self-gripping straps)	 **3600525**	**Sleeve Cuffs Nitrile, Size 7** (for Small sleeve assembly)
 **6400590**	**Sleeve Cuff-Ring 4 Inches,** interior diameter (for Small, Medium, and Large)	 **3600526**	**Sleeve Cuffs Nitrile, Size 8** (for Medium sleeve assembly)
 **6000504**	**Sleeve Cuff O-Ring, Black, 4 Inches** (For the 4-inch Sleeve Cuff Ring. Two O-rings are required).	 **3600527**	**Sleeve Cuffs Nitrile, Size 9** (for Large sleeve assembly)
 **6400619**	**Sleeve Cuff-Ring 3.5 Inches,** interior diameter (for extra-small sleeve assembly)	 **9990775**	**Sleeve, Extra Small (10in to 3.5in dia.)** (for XS sleeve assembly)
 **6000503**	**Sleeve Cuff O-Ring, 3.5 inches**, (For extra-small sleeve assembly. Only one is required.)	 **3600521**	**Sleeve, Standard (10in to 4.0in dia.)** (for S, M, L sleeve assemblies)

Ordering Parts And Consumables

Accessories and replacement parts can be ordered from Sheldon Manufacturing at

parts.sheldonmfg.com.

If the required item is not listed online, or if you require assistance in determining which part or accessory you need, contact the BACTRON400HP manufacturer by emailing parts@sheldonmfg.com or by calling 1-800-322-4897 ext. 4 or (503) 640-3000 ext. 4.

Please have the **model, serial,** and **part** numbers, and **Part ID** of the BACTRON400HP unit ready. Tech Support needs this information to match your unit to the correct part.

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ACCESSORIES

Activated Carbon Media (2 lbs / 0.9 kgs)

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

Part Number 1060500

Acrylic Glass Cleaner (2oz / 59.2ml)

Novus brand acrylic glass cleaner.

Part Number 1060503

Acrylic Glass Scratch Remover (2oz / 59.2ml)

Helps to remove visible scratches and nicks from acrylic glass.

Part Number 1060504

Anaerobic Chamber Start-Up Kit

Includes a spare 12 X 12-inch airlock door gasket, carbon volatile compounds scrubber media, chamber cleaner (benzalkonium chloride solution), Novus acrylic glass cleaner and scratch remover, 2 pairs of spare latex cuffs (sizes 7 and 9), and a spare sleeve O-ring.

Part Number 9490600

BACTRON Rolling Stand

A rolling stand with cabinet.

29.3 inches high by 61.5 inches wide (74cm high by 156cm wide)

Part Number BACSTAND-MD22

Leak Detector

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

Part Number 4600501

Nitrogen Regulator Kit

Delivery gauge range of 2 – 60 PSIG. Includes barbed adaptor fitting and 16 feet (4.9 meters) of flexible tubing.

Part Number 9740567

Oxygen Sensor, PreSens Fibox Trace 4

A hand-held O2 sensor for real-time O2 monitoring or sampling in the BACTRON workspace chamber. 0 - 4.2% oxygen concentration detection with a low-end threshold of 0.002%. The unit can also display readings in parts per million. Additional features include a barcode reader, 4GB of memory, and a USB port for data export to Windows platforms. Comes with supporting software.

Part Number – 9902223

UV Viewing Lamp

A handheld UV lamp for use with BACTRONs.
Part Number 9490507

Zephiran Benzalkonium Chloride Chamber Cleaner 1 Gallon, 0.133%.
Part Number 1060501

AMG USAGE

- **All values are approximate** and affected by ambient temperatures.
- All values are for automated cycles using the BACTRON400HP factory default settings.
- Gas usage during manual cycles is dependent on the unit operator.

Automated Commissioning Cycles

Model	Standard Cubic Feet	Standard Liters
All Units	55.6 scf	1575 sl

Displayed supply gauge pressure: The BACTRON400HP will have approximately 400 psi of gauge pressure from a size 300 cu.ft. gas cylinder.

Airlock Auto Cycles

These usage figures are for BACTRON using a **supplementary nitrogen supply** (the dual gas configuration), AMG is only used during the final backfill of the airlock. Without the nitrogen supply, three cycles use approximately three times more AMG. Four cycles consume around four times more, and so on.

Model	Standard Cubic Feet	Standard Liters
All Units	1.2 scf	33 sl

Sleeve Auto Cycles

Model	Standard Cubic Feet	Standard Liters
All Units	0.8 scf	22 sl

Resting State

When a BACTRON400HP is sitting sealed and undisturbed, it uses **approximately 4 - 15 standard liters per day of supplementary nitrogen supply** (0.15 – 0.53 standard cubic feet per day).

AUTOCYCLE SETTINGS BY ELEVATION

Ambient pressure lowers as the elevation increases. As a result, the Airlock Full Vacuum, Airlock Interim Vacuum, and the Armport Full Vacuum settings may require adjustment. The table below shows recommendations for given elevations. Your results may vary and require adjusting the value a few points in either direction to achieve reliable switching points for the autocycles.

Recommended settings

Elevation feet	Elevation meters	Airlock Full Vacuum	Airlock Interim Backfill	Armport Full Vacuum
0	**0**	-18	-4	-18
1000	**305**	-18	-4	-18
2000	**610**	-18	-4	-18
3000	**914**	-17	-4	-17
4000	**1219**	-16	-4	-16
5000	**1524**	-15	-3	-15
6000	**1829**	-14	-3	-14

AIRLOCK AUTOCYCLE CYCLE COUNT

It may be necessary to increase the number of cycles per autocycle in the airlock settings, to improve the oxygen purging at higher elevations. To test the effect of the number of cycles

- The workspace must be anaerobic.
- The test
    - Run the Airlock Autocycle.
    - Enter the workspace through the armports after running an armport autocycle.
    - Allow the oxygen reading to stabilize.
    - Open the inside airlock door and note the peek increase of the oxygen reading.
- Continue incrementing the count and testing until
    - The change in oxygen reading is insignificant from test to test
    - Or you find the increase in oxygen reading acceptable for your processes.

ARMPORT AUTOCYCLE CYCLE COUNT

It may be necessary to increase the number of cycles per autocycle in the armport settings, to improve the oxygen purging at higher elevations. To test the effect of the number of cycles

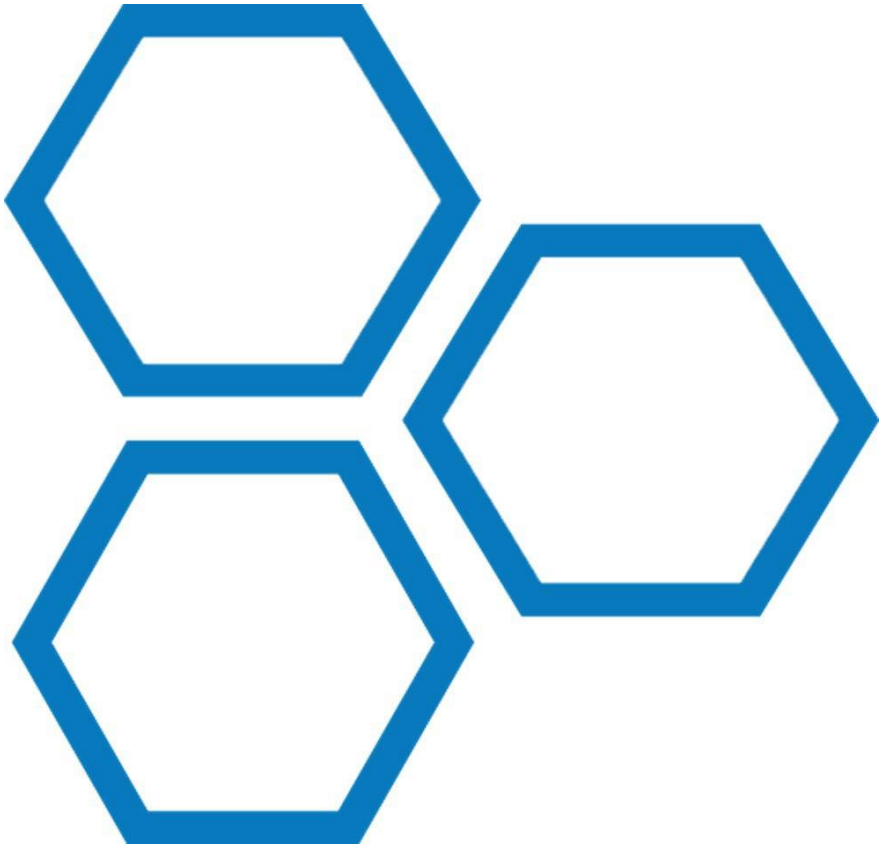
- The workspace must be anaerobic.
- The test
    - Enter the workspace through the armports after running an armport autocycle.
    - Allow the oxygen reading to stabilize and note the peek increase of the oxygen reading.
- Continue incrementing the count and testing until
    - The change in oxygen reading is insignificant from test to test
    - Or you find the increase in oxygen reading acceptable for your processes.

AUTOCYCLE COMPLETION TIMES

Autocycle completion times start when the autocycle activation button is pressed and stops with the autocycle completes. This time can vary significantly based on the elevation of the building, the full vacuum settings of the related control for the airlock or the armports, or the quality of seal on the doors.

Autocycle Completion Times

Number of Cycles	Airlock Minutes	Armport Minutes
2 cycles	0:01:51	0:00:33
3 cycles	0:02:35	0:00:41
4 cycles	0:03:19	0:00:49
5 cycles	0:04:03	0:00:58
6 cycles	0:04:47	0:01:06
7 cycles	0:05:31	0:01:15
8 cycles	0:06:15	0:01:23
9 cycles	0:06:59	0:01:32



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