

Operating Instructions

UNIlab[®]

Glovebox System

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Chapter 2 - Liability, Warranty and Safety

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Edition Information:

Edition June 2005

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Revision Information:

Revision 001

Title

Unilab Operating Instructions

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Publication edited by means of:

Adobe Acrobat[®], Adobe Photoshop[®], Microsoft Word[®]

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Any duplication of this documentation, even in the forms of excerpts, is only permitted after having obtained the manufacturer's information and concession.



Chapter 1

General Information

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ОБЕРЯТІМІ ІНСТРУКЦІОНИ

1.2 Contact Information

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Chapter 2

Liability, Warranty and Safety

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CHAPTER 2: LIABILITY, WARRANTY & SAFETY

2.1 General Information

Prior to installation, initialization and operation of the system, this manual should be read in its entirety and positioned in a suitable area near the system to allow for easy reference. Any persons charged with the transport, storing, installation, commissioning, operating, maintenance and/or service of this system must be familiar with the entire contents of this manual.

To ensure safe operation of the system and to maintain a safe working environment, the information contained within this chapter must be adhered to by all users of the system. Advice contained in this chapter is intended to supplement, not supersede, the safety advice given in other chapters of this manual and the general safety regulations and guidelines prevailing in the user's workplace.

In addition to the guidelines and information contained within this manual all internal and local health, safety and environmental guidelines should be followed.

Safety instructions and pertinent information are marked in the following manner:

	Indicates an imminently hazardous situation which, if not avoided, will result in death, serious injury or serious damage to the system, other equipment or surrounding environment.
	Indicates a potentially hazardous situation which, if not avoided, could result in death, serious injury or serious damage to the system, other equipment or surrounding environment.
	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or damage to the system, other equipment or surrounding environment.
	Indicates additional advice or recommendations for using the system or completing a task.

Please consider all instructions, in particular safety instructions, in order to achieve safe operation of the system.

2.2 Liability

The manufacturer will not take any liability of object, personal or secondary damage caused by improper use or ignoring of safety instructions as well as caused by the owner's manual due to missing updates after the system or its software have been modified, nor will the manufacturer take any liability of damages due to loss of data. In addition, the terms of business that are part of the order/contract will apply.

Our products are continuously modified and improved due to innovation, legal requirements and standards. Consequently, the information given in this documentation may not accurately reflect every detail of the system actually delivered. Please contact the manufacturer in cases of uncertainty.

2.3 Warranty

We guarantee the equipment as stated in the order/contract.

This warranty will expire in case of:

- Interference into or modification of the system without prior consent of the manufacturer;
- Improper use of the system;
- Insufficient maintenance of the system;
- Inappropriate operation of the system;
- Negligence of correct supply requirements;
- Application of third-part components to the system without prior consent of the manufacturer;
- Alteration of program or configuration write-ups without manufacturer's consent.

NOTICE

This applies to a single unit and multi-unit system types.

2.4 Operation Guidelines

MBRAUN glovebox systems are operated using inert gas enabling the user to handle substances which are sensitive to oxygen and/or moisture. It is the responsibility of the user to follow all local health, safety and environmental guidelines with regards to the handling and disposing of substances which may be injurious to health. This also applies to the disposal of vacuum pump oil and all components and filtering devices which come in contact with the gas flow.

DANGER

There is a risk of suffocation when working with high inert gas concentrations.

On request, **MBRAUN** can recommend a personal measuring instrument that alerts the operator to a reduction of oxygen content in the ambient air.

The following general safety guidelines must be considered when working with inert gas concentrations:

- The selected location should have a “room” volume that is significantly larger than the glovebox interior volume.
- The system should be located in a well ventilated area. This is especially important during a purging procedure or when opening an active system (i.e. antechambers, etc.).
- All exhaust fumes should be vented through an adequate disposal/ventilation system.

NOTICE

Contact **MBRAUN** prior to the acquisition of the system if it is not possible to adhere to all the above recommendations. This way the system can be equipped with additional safety devices.

- Prior to performing maintenance or service inside an active system, remove one glove to allow a slow equalization of the glovebox interior atmosphere with the ambient room air.

CAUTION

To better avoid the risk of suffocation, it is necessary for the glovebox atmosphere to be completely replaced with ambient room air prior to servicing the interior of an active glovebox.

WARNING

Standard **MBRAUN** glovebox systems are not designed for the use of strongly poisonous or radioactive substances. Use of these types of materials must be coordinated with **MBRAUN** prior to the acquisition of a system.

2.5 Safety – General Hazards

This system has been designed and manufactured considering all relevant safety regulations. Improper use or operation by persons not qualified accordingly may result in danger to the:

- Life and health of the operator;
- System itself;
- Surroundings of the user;
- Performance and efficiency of the system.

General hazards of the system may arise in the following ways:

- Mechanical hazard caused by squeezing, shearing and cutting, catching and winding, stretching or by freely moving parts;
- Thrust caused by kinetic energy of moving mass;
- Sharp corners and edges;
- Electrical hazard caused by touching live parts (directly or indirectly);
- Thermal hazard causing burns;
- Chemical hazard causing poisoning, corrosion and explosion;
- Toxic hazard due to inhalation of vapours and gases;
- Gases under pressure;
- Liquids under pressure;
- Combination of hazards caused by:
 - faulty installation
 - incorrect loading
 - breakdown of power or media supply
 - breakdown and/or incorrect arrangement of preventive measures
 - combination of escaping media
- Hazards caused by:
 - human misconduct
 - noise
 - allergies, excitations of mucous membrane, unknown effects caused by media
 - ejection of parts
 - disturbance / malfunction of control system
 - leaking of hoses or pipes
 - combination of atmospheres or vapors
 - fire hazard
 - natural hazards e.g. lightning, flooding, environmental catastrophes etc.

2.6 Safety – Mechanical



Freely moving parts may cause squeezing, shearing and cutting, catching and winding, stretching of extremities. Extreme caution should be taken to avoid touching any moving parts of the system during operation.

When handling materials with mechanical, pneumatic or vacuum systems it is possible that materials may be ejected. Extreme caution should be taken to avoid any possible contact with the ejected materials without proper protection.

Only genuine parts supplied by **MBRAUN** should be used in the operation of the system. These parts are constructed in conformance with applicable safety regulations. No liability will be taken by **MBRAUN** in the event of installation of parts manufactured by companies other than **MBRAUN** which may result in additional and unknown hazards.

Simultaneous operation of the system by two or more persons is not recommended as this may cause hazards based on misconduct or mutual misunderstanding. In case of the system being operated by two or more persons, operation should be conducted in such a way as to ensure each individual's respective task does not influence other tasks in any way.

Safety covers, panels, panes, windows or doors may not be removed at any time, unless there is a need for service. The system may not be opened (i.e. antechambers, etc.) during processing or power failures. In the case of any safety deficiencies, the system must be decommissioned and the service personnel informed accordingly. During decommissioning compliance with all local health, safety and environmental guidelines must be followed.

2.7 Safety – Electrical

This system operates under high voltage. Risk of injury caused by high voltages exists anytime the system is connected to the power supply, this includes when the system is powered off. Capacitors within the system may be charged when the system is switched off and disconnected from main power supply.



Interchange of current bearing wires can result in electrical hazards such as shock, involuntary muscle reaction, muscle paralysis, burnt tissues and organs, or death.

Connection to the main power supply must be performed by a qualified electrician according to local area guidelines. All neutral and ground wires must be connected accordingly.

Opening the system or removing parts when the system is powered on, may result in exposure to live electrical connectors. Extreme caution should be taken to avoid directly or indirectly touching live connectors to avoid possible electric shock.



Prior to performing any electrical service work on the system, ensure the system is powered off and disconnected from the power supply.

Service required while the system is in operation should only be performed only by qualified personnel trained in the knowledge and prevention of all potentially dangerous and hazardous situations.

The system must be grounded/earthed at all times. Do not remove or cut off any ground wire for the system or its components. In case of insufficient grounding or damaged ground conductor ensure the system will be inoperable and secure it against unauthorized or unintentional operation.



Insufficient grounding can cause electrostatic charging of plastic parts, hoses or pipes, wiring and/or the system as a whole, which could cause solvents and process chemicals to ignite.

Replacement of fuses should be of the same type and current rating.



Makeshift fuses and/or short circuit fuse holders should never be used in the operation of the system.

2.8 Safety – Handling of Electronic Components

Electrostatic discharges can cause damage to parts. When handling electronic components the following precautions should be observed:

- a) Wear a grounded wrist strap or work on a grounded static-dissipating work surface. If this not possible touch an adjacent earth ground (i.e. central heaters or water pipes) before handling electronic components or printed circuit boards.
- b) Leave electronic components and printed circuit boards in their original packaging until final installation.
- c) Handle electronic components by their body or case, avoid touching of leads.
- d) Keep electronic components and printed circuit boards away from such static generating materials as vinyl, plastic bags, etc.

NOTICE

Maintenance and repair work required, but not listed in this manual, should only be carried out by **MBRAUN** service or by persons of equivalent qualification.

2.9 Safety – Chemicals and Gases

Chemicals used in the system are not supplied by **MBRAUN**. Chemicals are provided and applied by the system user.

Proper handling of chemicals, corrosives and solvents is the user's responsibility. Materials used may be flammable, explosive, toxic.

Below are some guidelines to refer to when handling chemical substances:

- Ensure the all relevant Control of Substance Hazardous to Health (COSHH) guidelines are followed;
- Observe relevant safety regulations as well as material safety data sheets (MSDS) and additional advice provided by the supplier;
- Wear proper protective safety masks, gloves and eyewear whenever working with chemicals, corrosives or solvents;
- Mark all containers and supply lines of chemicals (i.e. containers of media and waste) with appropriate labels and warning signs;
- Ensure proper ventilation and exhaustion of vapours;
- Wear proper breathing protection to avoid the risk of suffocation;
- Keep away from ignition sources;
- Do not smoke;
- Do not ingest food or beverage while working with the chemicals, corrosives or solvents to avoid the risk of poisoning.

CAUTION

Released chemicals may react with each other, leading to unwanted and/or unknown substances, which may cause additional risks.

Proper handling of gases is the user's responsibility. Gases used may be flammable, explosive, toxic. Below are some guidelines to refer to when handling gaseous materials:

- Do not inhale the gas to avoid risk of suffocation.
- Prevent electrostatic charging and beware of ignition sources.
- Do not smoke.

NOTICE

When using corrosive, gassing or noxious materials, the safety of all employees must be ensured by whatever means necessary. Specifically, all employees must be trained in the safe handling of the materials to be used.

2.10 Safety – Symbols Used on the System

The following symbols refer to **MBRAUN** components and parts. However, components and parts of sub-suppliers may show other symbols, not expressly mentioned or referred to in this manual. The following caution and command symbols may be seen on the system:

		
General hazard	Electrical hazard	Fire hazard
		
Toxic hazard	Explosion hazard	Pressurised gas hazard
		
Wear safety mask	Wear safety goggles	Wear protective gloves

NOTICE

The owner of the system is responsible to place adequate danger signals and labels in suitable places. This applies in particular to signals and labels concerning process chemicals used. Regardless of the number of caution symbols and information placed on or around the system, all safety instructions of this manual must be observed!

2.11 Safety – Emergencies

In case of an emergency, please observe the following instructions:

1. Immediately shutdown the system using the main power switch.
2. Disconnect the system from all gas supplies.
3. Refer to the material safety data sheets for information on treating the emergency. Contact the appropriate emergency response personnel in the area and/or listed on the material safety data sheets.

CAUTION

Do not disconnect the water supply for systems containing components requiring a cooling water source.

Prior to restarting, the system must be fully checked for safety, contact the **MBRAUN** Service Department after the emergency has been rectified.

NOTICE

In addition to the information contained in this manual all local health, safety and environmental guidelines must be followed.

2.12 Additional Information

The system is considered to be unsafe for operation if:

- there is any visible damage;
- it fails to perform according to specification;
- it has been subject to prolonged storage under unfavourable conditions;
- it has been subjected to severe transport stress.

If the system meets any or all of the above:

- make it inoperable;
- secure it against any unauthorized or unintentional operation;
- contact the **MBRAUN** Service Department.



Do not perform any service or repair of the system or its components other than described in this manual.

NOTICE

Maintenance, repair and service other than described in this manual may only be performed by **MBRAUN** service personnel or properly trained/qualified individuals.

Chapter 3

Principles of Operation

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CHAPTER 3: PRINCIPLES OF OPERATION

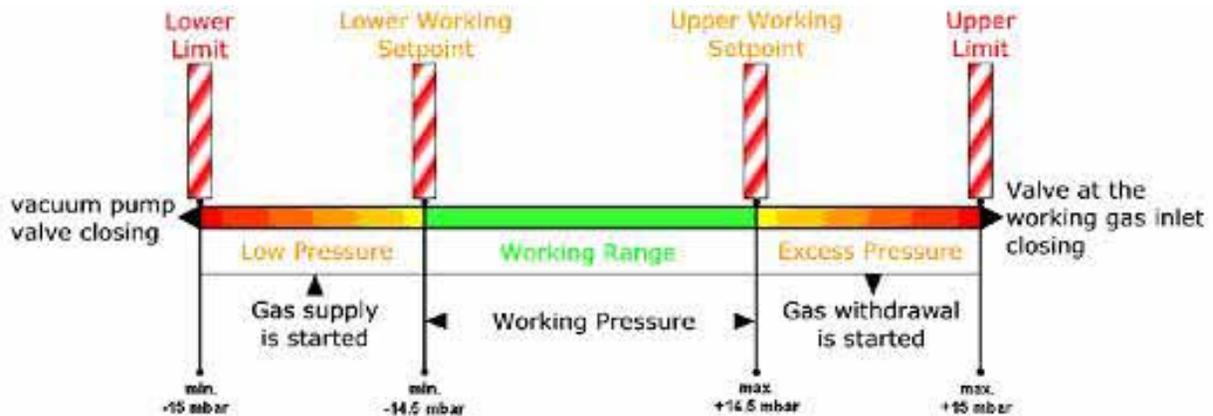
3.1 Description of the System

M.Braun glovebox systems, which are operated using a closed loop circulation method, provide the user with a non-reactive atmosphere of <1ppm moisture and oxygen content. The system has three major functions: Purging, Circulation and Regeneration. Each of these processes is explained in detail in the following sections. For information for operating the system functions, refer to Chapter 9 of this manual.

3.2 Pressure Control System

General Information

The system is equipped with a PLC operated pressure control system which starts automatically when the system is activated. Upper and lower working pressure parameters, which are set by the user, provide a comfortable range for the user to work in. Depending upon the application, the system can be operated in the positive or negative pressure state.



Definition of Terms

Box Pressure	Current pressure within the glovebox.
Working Range	The range within the working setpoints at which the box pressure fluctuates.
Upper Working Setpoint Lower Working Setpoint	Adjustable setpoint parameters used to establish the working range.
Limit Setpoint	The fixed value range between which the working parameters can be set. This is a factory established range which cannot be adjusted.

3.3 Purging the System

Purging the glovebox replaces the ambient air inside the box with the working gas by providing a constant flow of working gas into and out of the box. The purge function can be performed either manually by the user or automatically by the system. The automatic or “quick purge” function is not included with all systems but is an available option that can be purchased at any time after the glovebox has been installed and/or running for any period of time.

As a general guideline a system should be purged when the oxygen level inside the box exceeds 100ppm. Possible reasons for an elevated oxygen level are:

- Initial commissioning of the system;
- Recent service or repair made to the system;
- Room atmosphere entering the box due to improper use;
- Leaks in the system or other damage (e.g. torn gloves, etc.).

The purging process can be performed three (3) different ways:

Reverse Purge	Performed on systems with no manual purge valve or automatic purge function. This can also be performed on systems with either of the mentioned options if the user chooses to do so.
	The Reverse Purge method purges the working gas directly into the user’s room environment, use caution when working in the vicinity of a glovebox undergoing reverse purge.
Manual Purge	Performed on systems with a manual purge valve located on the top of the glovebox system. This valve should be vented to a fume hood or facility exhaust system.
Automatic Purge	Performed on systems with this function incorporated into the PLC program via the VSA valve. This valve should be vented to a fume hood or facility exhaust system.

Both reverse purge and manual purge procedures require the user to enter box pressure setpoints in the PLC prior to beginning operation. The automatic purge function does not require any parameters to be set prior to beginning the operation.

Purge time and gas consumption varies and is based on glovebox volume and the level of purity required in the glovebox.

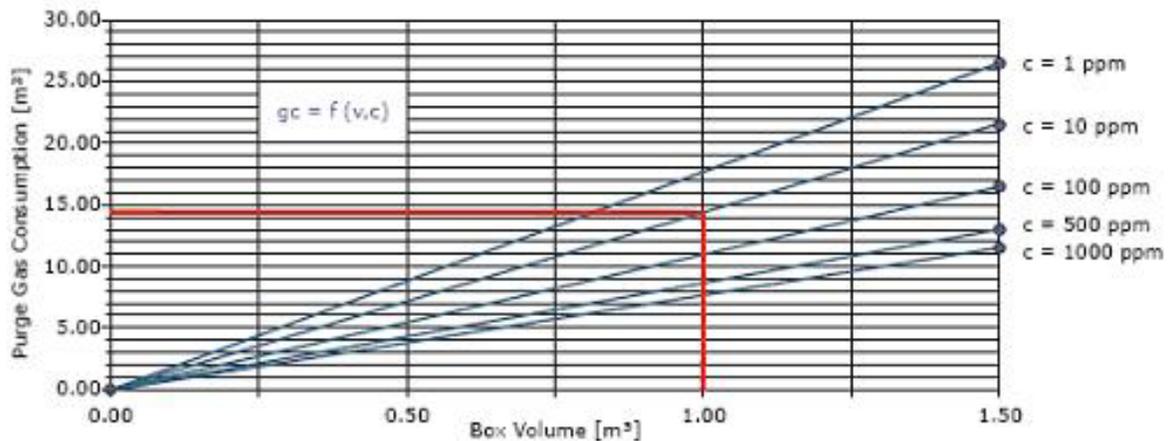


Figure 1 - Purge Gas Consumption

Figure 1 above shows that a desired box atmosphere purity of 10ppm requires approximately 14.5m³ of purge gas per cubic meter of box volume.

Below is the information regarding the glovebox volume for the two different size Unilab Systems. Use this chart to determine the amount of gas required for purging during the commissioning of the system.

System Type & Size (width/depth in mm)	Glovebox Volume (cubic feet/cubic meters)
Unilab 1200/780 	28.38f ³ / .08m ³
Unilab 2000/780 	44.77f ³ / 1.27 m ³

3.4 Circulation Mode

Circulation mode is the normal operation mode for working within the glovebox system. During normal operation working gas is continuously circulated between the glovebox and the gas purification system. As the working gas passes through the filter column the oxygen and moisture content is scrubbed from the gas. This provides the user with a consistent inert glovebox environment in which to work.

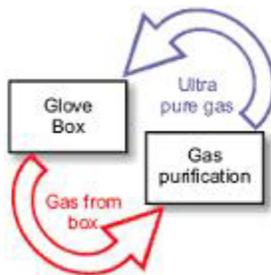


Figure 2 - Principle of Circulation

3.5 Regeneration Mode

When the glovebox is used for an extended period of time, oxygen and moisture begins to accumulate inside the purifier filter column which decreases the effectiveness of the circulation process. Regeneration is the process of removing the excess oxygen and moisture from the filter bed material inside the purifier column. This is a multi-step 16 hour process during which the glovebox cannot be used for normal operation (circulation).



The regeneration procedure should not be interrupted at any time during the process. If for any reason the process is terminated prematurely, do not restart any system processes. Contact the M.Braun Service Department immediately.

3.6 Antechamber Operation

General Information

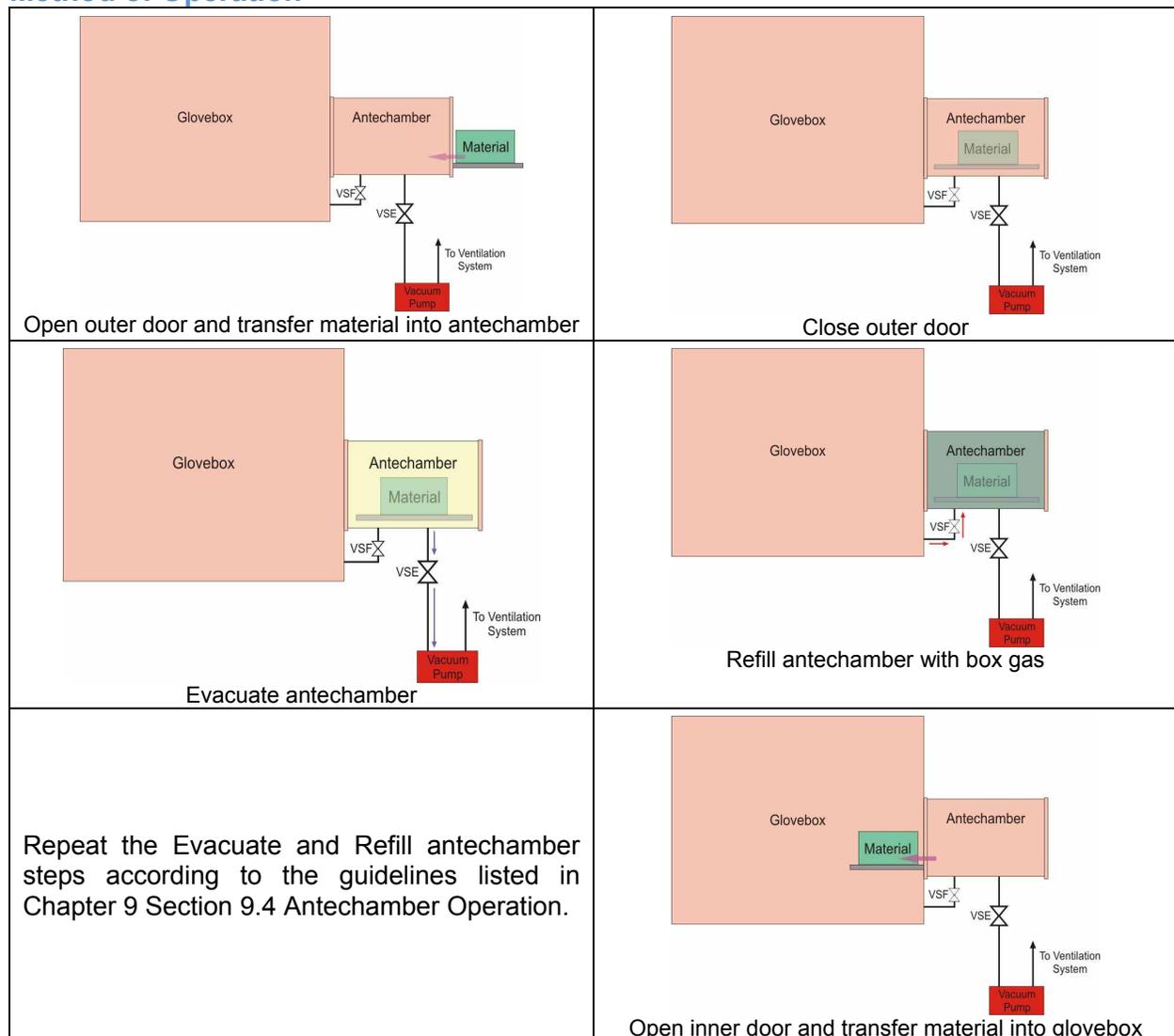
The system is equipped with a large (and/or small) antechamber designed for transferring material into or out of the glovebox without polluting the internal box atmosphere or the room atmosphere. The antechamber(s) is equipped with an inner door, outer door and sliding tray to ease in transferring materials.

Transferring material into and out of the box is a completely manual procedure which utilizes the antechamber components and the touch screen. The chamber undergoes several evacuation/refill cycles to clear the chamber of room or glovebox atmosphere prior to removing the material from the chamber.

NOTICE

- An evacuated chamber cannot be opened. Attempting to open an evacuated antechamber may damage the door locking mechanism.
- Keep both antechamber doors closed when not transferring materials.

Method of Operation



Important Notes



- Never open the inner and outer antechamber doors simultaneously.
- Never open the inner door of an antechamber filled with room atmosphere. This would result in pollution of the box atmosphere which could cause damage to instruments and/or materials inside the box.
- Depending on the materials used inside the glovebox, vapors may be released into the room when material is transferred into or out of the glovebox.



Material transferred between the glovebox and room atmosphere must be able to withstand the pressure difference during the antechamber purge process (e.g. partially filled vessels, etc.). Open the seal slightly (e.g. lids of bottles, etc.) to allow the vessel to be vented to prevent implosion.

3.7 Analyzers

General Information

This section applies only to systems that are equipped with oxygen and/or moisture analyzers. Each analyzer contains a sensor head that is protected with a metal cap and electronics that are used to measure (depending on the analyzer type) the oxygen or moisture content of the working gas inside the glovebox. The analyzers are connected to the PLC via a cable with an RJ45 connector.

While not all systems are equipped with one or both analyzers at the time of initial installation they can be purchased at any time. Please contact the M.Braun Sales or Service Department for further information.

Oxygen Analyzer (MB OX-SE-1[©])

The oxygen analyzer, with a measuring range of 0 – 1,000ppm, monitors the atmosphere inside the glovebox for residual oxygen content. The analyzer is designed to provide exact readings within the range of 0 – 100ppm. An estimated reading of the oxygen content is provided when the oxygen level rises above 100ppm.

The sensor element is a miniaturized Zirconium Dioxide plate operated at elevated temperature that is controlled by a platinum resistor. The electronics are supplied with 24 V DC and deliver a 0 – 10V signal proportional to the concentration of Oxygen. An additional input for the electronics allows the switching on and off of the sensor heating by means of the PLC.¹



Contact with Hydrogen, solvents and other aggressive gaseous substances will cause permanent damage to the sensor.

¹ M.Braun, Inc., Sales Literature, MB OX-SE1[©] Oxygen Probe, (Edition 2/2004)

Moisture Analyzer (MB MO-SE-1[®])

The moisture analyzer, with a measuring range of 0 – 350ppm, monitors the atmosphere inside the glovebox for residual moisture content. The analyzer is designed to provide exact readings within the range of 0 – 50ppm. An estimated reading of the oxygen content is provided when the oxygen level rises above 50ppm.

The sensor element consists of two (2) parallel platinum coils coated with phosphoric acid, and a PT1000 temperature sensor. The electronics are supplied with 24VDC and deliver a 0 – 10V signal in proportion to the concentration of H₂O.²



² M.Braun, Inc., Sales Literature, MB MO-SE1[®] Oxygen Probe, (Edition 2/2004)



Chapter 4

Touch Panel Operation

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CHAPTER 4: TOUCH PANEL OPERATION

4.1 General Information

The Unilab Glovebox System utilizes a Touch Screen Display panel. All functions and/or selections are performed by lightly touching the button or icon on the screen.

NOTICE

An optional protective self adhesive foil is available for the touch screen. This protects the screen from scratches, dirt and grime.

This protective foil also provides a matte surface to reduce glare and can be removed at any time without leaving any residue on the screen.

Do not use any sharp or pointed objects to remove the protective foil as this may result in damage to the touch screen.

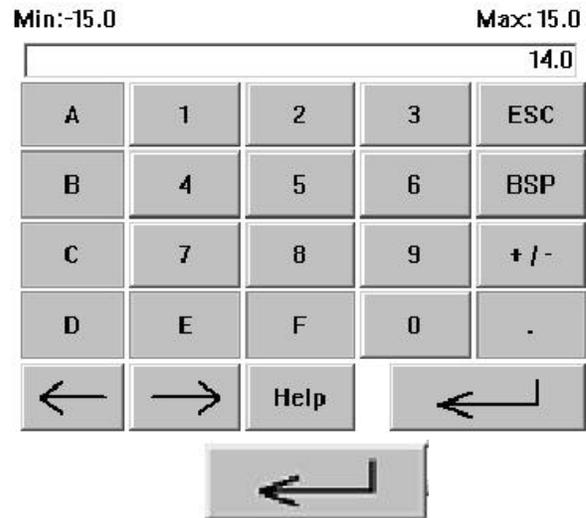
4.2 Input and Password Fields

Input Fields

Certain screens contain information which can be changed by the user. This information is entered using an alphanumeric pad which is displayed when an input field is touched.

When an input field is activated, a keyboard is displayed on the screen.

Using this keyboard, you can enter new values into an input field.



After completing the entry, press the enter key to confirm the value.

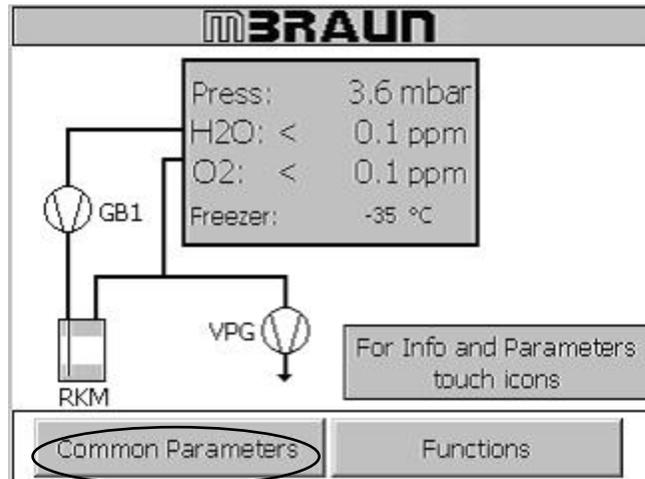
Password Fields

Certain input fields require a user password to be entered. When an input field requiring a password is touched, a password screen is displayed. To enter the password, touch the white area in the screen. Only authorized users can make changes to the input fields.

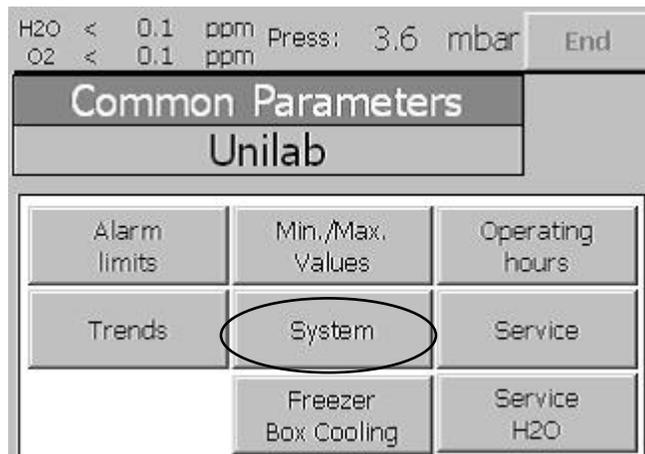


4.3 Displaying the System Information

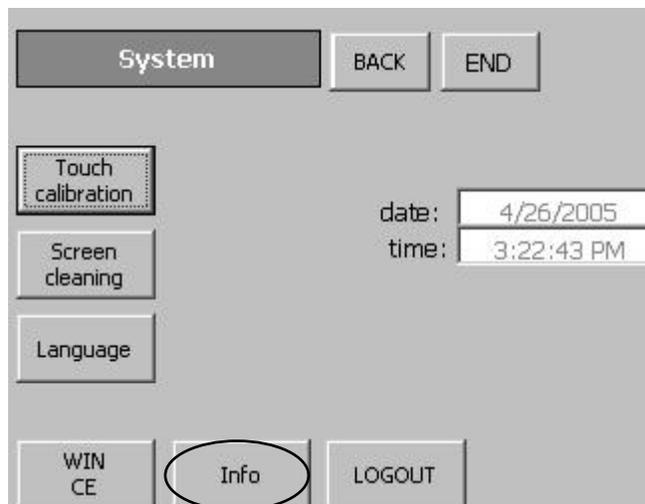
Touch the **Common Parameters** button on the Start Screen.



Touch the **System** button to access the System settings screen.



Touch the **Info** button.



The Information Screen is displayed providing M.Braun contact information and information regarding the project number or serial number for the system.





Chapter 5

System Screens

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CHAPTER 5: SYSTEM SCREENS

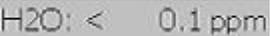
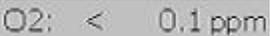
5.1 General Information

The Unilab is operated using a Touch Screen located on the side of the system above the antechamber. This chapter provides an introduction to the various screens that the user will access during operation of the system.

To activate a component or operation touch the corresponding button. To deactivate a component or operation touch the corresponding button again.

Gray buttons represent inactive functions, black buttons represent active functions and white buttons represent functions which are temporarily unavailable.

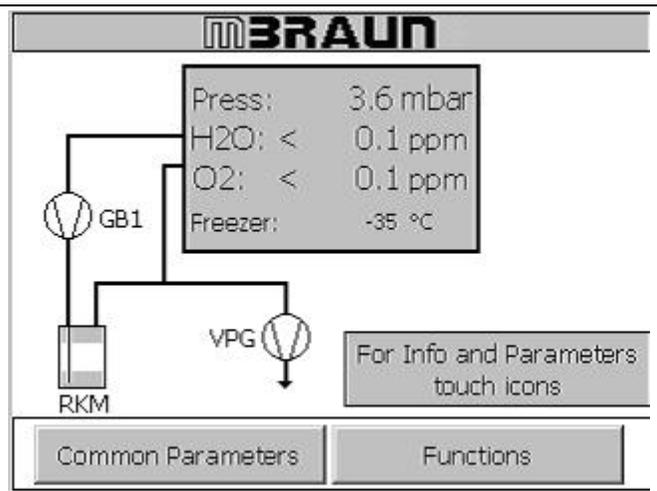
The list below displays the buttons and information fields which are located on multiple screens associated with the system.

Button / Information Field	Description
	Displays the Alarm Screen. Blinks black & gray when an alarm is present.
	Displays the actual glovebox pressure.
	Displays the moisture level inside the glovebox as detected by the analyzer.
	Displays the oxygen level inside the glovebox as detected by the analyzer.
	Displays the previous screen.
	Displays the Start screen.

5.2 Start Screen

Main screen displayed on the touch panel.

All functions and screens related to the operation of the glovebox and other components are accessed via the Start Screen.



Graphic Reference Key

Icon / Button	Description
	Displays the status of the blower.
	Displays the status of the vacuum pump.
 Purifier Inactive Circulation Active Regeneration Active	Displays the status of the purifier. Used to access the Purifier Layout screen.
	Displays the actual freezer temperature. This field is not displayed when there is no freezer present on the system.

5.3 Common Parameters Screen

<p>Accessed via the Start Screen by touching the Common Parameters button.</p>	<p>H2O < 0.1 ppm Press: 3.6 mbar End O2 < 0.1 ppm</p>

Graphic Reference Key

Button	Description
	Displays the Alarm Setpoints screen.
	Displays the analyzer Min./Max. Values screen.
	Displays the Operating Hours screen.
	Displays the Box Trends screen.
	Displays the System information screen.
	Displays the Service screen.
	Displays the Freezer/Box Cooling parameters screen.
	Displays the Service Moisture Analyzer screen. This button is only present when the actual operating hours of the analyzer reach 2000 hours.

5.4 Alarm Setpoints Screen

Accessed via the Common Parameters screen by touching the **Alarm Limits** button.

Graphic Reference Key

Button	Description
	Used to set the alarm parameter for the moisture analyzer when present on the system.
	Used to set the alarm parameter for the oxygen analyzer when present on the system.
	Used to set the alarm parameter for the freezer when present on the system.
	Used to set the alarm parameter for the box cooling unit when present on the system.

5.5 Min./Max. Values Screen

Accessed via the Common Parameters screen by touching the **Min./Max. Values** button.

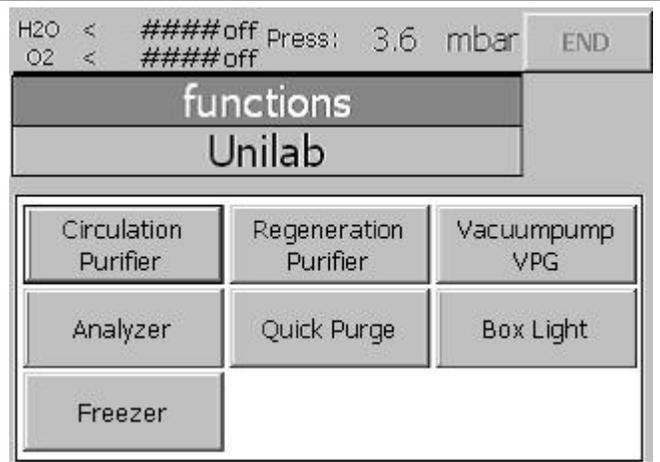
This screen displays the highest and lowest oxygen and moisture levels as detected by the analyzers.

Use the **Reset** button to reset the displayed values to zero.

5.6 Functions Screen

Accessed via the Start Screen by touching the Functions button.

Not all functions shown on this screen are included with every system. In the event of a component or function not being included, the button will not be displayed on this screen.



Graphic Reference Key

Button			Description
			Used to activate and deactivate the circulation process.
			Used to activate the regeneration process.
			Used to activate and deactivate the vacuum pump.
			Used to activate and deactivate the analyzer(s). (This button is grayed out when analyzers are not present on the system.)
			Used to activate the automatic purge process.
			Used to turn the light on and off.
			Used to turn the freezer on and off. (This button is only present when there is a freezer on the system.)

5.7 Box Pressure Parameters Screen

Accessed via the Start Screen by touching the Pressure and Analyzer Details field.

The screenshot shows a control interface for a parameter purifier. At the top, it says 'Parameter purifier' with 'BACK' and 'END' buttons. Below that is the 'Box Pressure' section. It contains two sections for working limits: 'Upper working limit' with a value of 4.0 mbar and 'Lower working limit' with a value of -4.0 mbar. Each has '>' and '<' buttons. To the right are hysteresis settings: 'Hysteresis UWP' and 'Hysteresis LWP', both set to 2.0 mbar. Further right are 'Upper Limit' (15.0 mbar) and 'Lower Limit' (-15.0 mbar). A 'More' button is at the bottom right.

Graphic Reference Key

Information Field/ Button	Description
	Used to enter the upper working box pressure setpoint.
	Used to enter the lower working box pressure setpoint.
	Displays the setpoint at which the box pressure will rise or drop when the actual box pressure reaches the upper or lower working limit.
	Displays the default pressure alarm limits for the system.
	Displays the Freezer/Box Cooling screen.

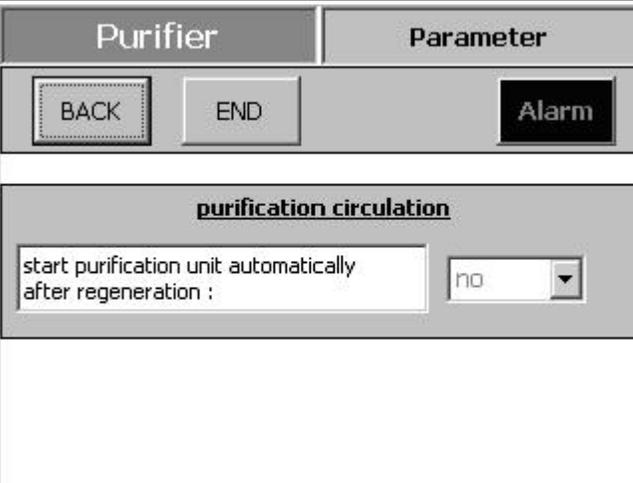
5.8 Purifier Layout Screen

<p>Accessed via the Start Screen by touching the RKM icon.</p> <p>Valve Definitions</p> <p>VSPA - Purge Outlet VSPE - Purge Inlet VHE1 - Purifier Inlet VHA1 - Purifier Outlet VRE1 - Regen. Gas Inlet VRS - Regen. Gas Outlet VS1/2 - Pressure Compensation VG - Working Gas Inlet VRV - Regen. Vacuum VV - Box Vacuum VPG - Vacuum Pump</p>	
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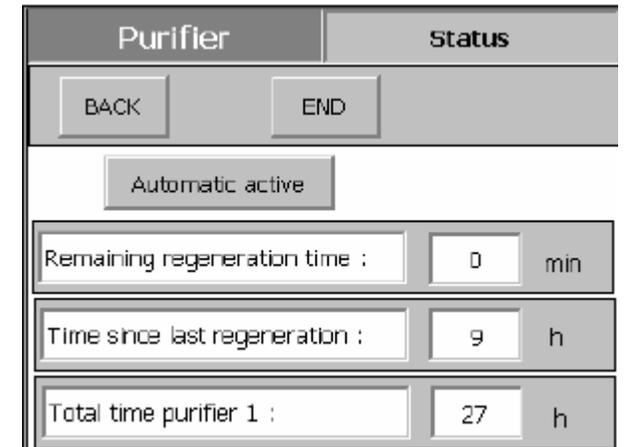
Graphic Reference Key

Information Field / Button / Icon	Description
	Displays the status of the various valves throughout the system.
	Displays the status of the blower.
	Displays the status of the vacuum pump.
<p>Purifier Inactive Circulation Active Regeneration Active</p>	Displays the status of the purifier.
	Displays the active step of the regeneration process.
	Used to activate and deactivate the various components and processes. These buttons work the same as the buttons located on the Functions screen.
	Used to access the purifier parameters screen.
	Used to access the purifier status screen.

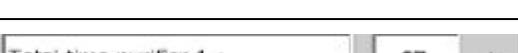
5.9 Purifier Parameter Screen

<p>Accessed via the Purifier Layout screen by touching the Parameter button.</p> <p>Choose Yes to have circulation start automatically after the regeneration process is completed.</p> <p>Choose No to start circulation manually after the regeneration process is completed.</p>	
--	--

5.10 Purifier Status Screen

<p>Accessed via the Purifier Layout screen by touching the Status button.</p>	
--	---

Graphic Reference Key

Information Field / Button	Description
	Displays the current mode being used to operate the system.
	Displays the time remaining until the regeneration process is complete.
	Displays the number of hours the system has been operating in circulation mode since the last regeneration process was performed.
	Displays the total hours the purifier has been in operation.

5.11 Freezer/Box Cooling Parameter Screen

Accessed via the Box Pressure Parameter screen by touching the **More** button.

This screen applies only to systems with a freezer and/or box cooling unit.

Graphic Reference Key

Information Field / Button	Description
	Used to set the freezer operating temperature.
	Displays the actual temperature inside the freezer.
	Used to set the box cooling unit operating temperature.
	Displays the actual temperature inside the glovebox.

5.12 Service Moisture Analyzer Screen

Accessed via the Common Parameters screen by touching the **Service H2O** button.

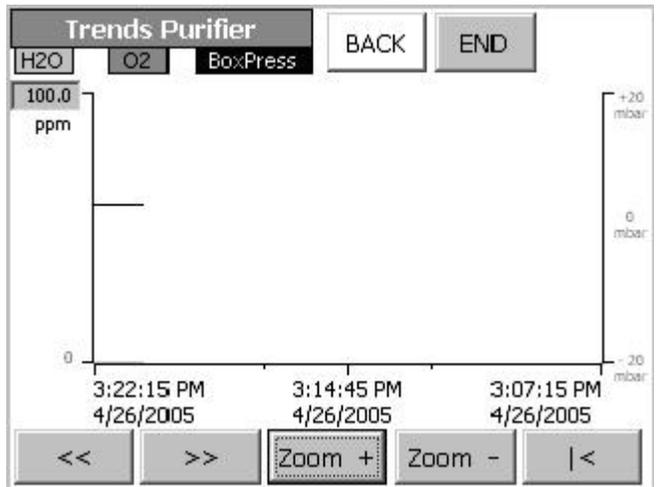
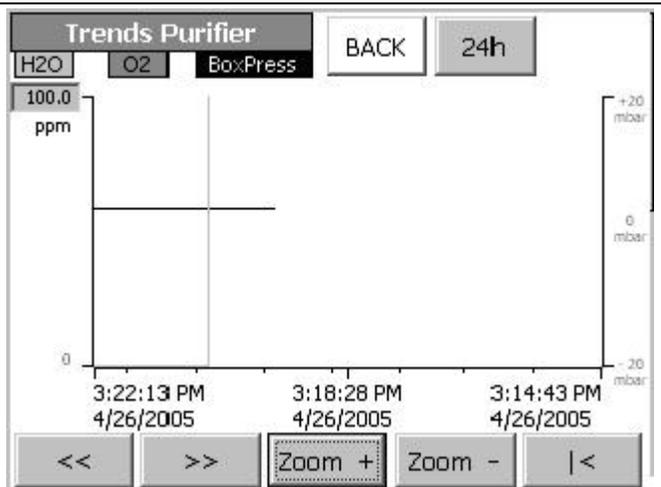
This button is only displayed when the moisture analyzer total operating time reaches 2,000 hours.

5.13 Trends Screen

Accessed via the Common Parameters screen by touching the **Trends** button.

Use the various buttons on the screen to scroll through the designated time period and also to zoom in on a selected range over a 4 hour period.

Touch the 24h button to change the display range to a 24 hour period.



5.14 Operating Hours Screen

Accessed via the Common Parameters screen by touching the **Operating Hours** button.

Displays the number of hours which the components have been running.

The screenshot shows the 'Parameter Purifier' interface. At the top, there are 'BACK' and 'END' buttons. Below them is the title 'Operating Hours'. The main area contains a list of components with their running hours displayed in a table:

Vacuum pump VPG:	0 h
Blower GB1:	0 h
Compressor freezer:	0 h
Compressor box cooling:	0 h

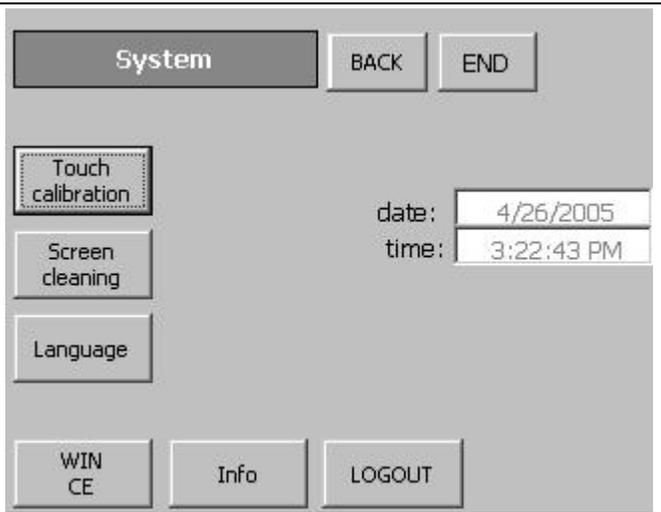
NOTICE

Under normal use the vacuum pump oil should be changed every 3,000 hours per the manufacturer's recommendation.

5.15 System Screen

Accessed via the Common Parameters screen by touching the **System** button.

Used to display system information or perform maintenance on the touch screen.



5.16 Warning Screen

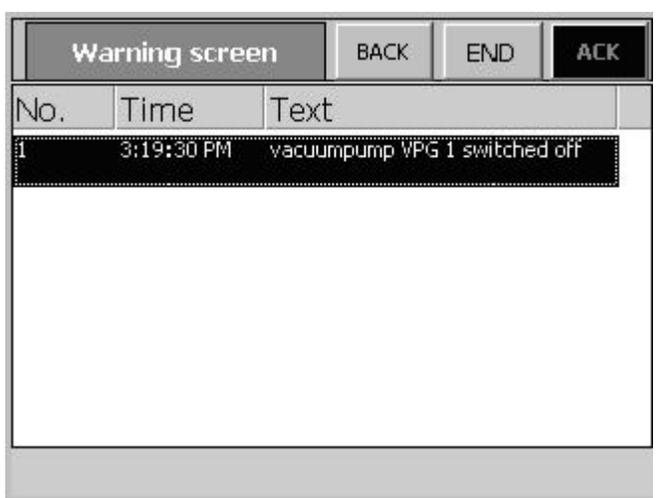
Accessed via any screen by touching the **Alarm** button when displayed.

This screen lists the:

- Warning number;
- Time the error occurred;
- Description of the error.

Depending upon the type of alarm, the message:

- Will disappear upon fixing the error;
- Must be acknowledged by touching the **ACK** button after the error has been fixed before it will disappear.





Chapter 6

Installation
Requirements

6.1 Location....6-1

6.2 Gas Supply and Connection Requirements....6-1

6.3 Venting Requirements....6-2

6.4 Electrical Connection Requirements....6-2

CHAPTER 6: INSTALLATION REQUIREMENTS

6.1 Location

The room in which the glovebox will be used should be dry and well ventilated with a temperature between 59°F and 86°F (15°C to 30°C). The floor should be level and stable enough to support the weight of the glovebox system.

Position the glovebox in an area that allows the user to have adequate working space in and around the system (e.g. gloveports, antechamber(s), etc.). If positioned against or near a wall, the clearance should be a minimum of approximately 24 inches (600 mm) for the rear and side of the glovebox without antechamber(s).

6.2 Gas Supply and Connection Requirements

Working Gas

Use:	To establish and maintain the ultra pure gas atmosphere. Used as the operating gas for electropneumatic valves.
Gas Type:	Nitrogen, Argon, Helium supplied at 80psi.
Purity:	Industrial grade or better; from tanks or other facility gas supply source.
Quantity:	Permanent supply for the system's operation (e.g. pressure compensation, etc.).
Regulator Type:	Two (2) stage with a 0 – 100psi gauge.
Pressure:	80psi
Flow rate:	200 liters/minute
Material:	3/8" Braided Tygon™ hose (supplied with the system).
Connections:	1/4" male NPT to 3/8" O.D. hose barb (connects Tygon™ hose to gas regulator).

Regeneration Gas

Use:	Reprocessing saturated purifier columns.
Gas Type ¹ :	Nitrogen as the Working Gas: 90-97% Nitrogen with 3-10% Hydrogen balance Argon as the Working Gas: 90-97% Argon with 3-10% Hydrogen balance Helium as the Working Gas: 90-97% Helium with 3-10% Hydrogen balance
Quantity:	Approximately 3,500 liters for each regeneration process.
Regulator Type:	Two (2) stage Hydrogen regulator with a 0 – 20psi gauge.
Pressure:	5psi
Flow Rate:	15 – 20 liters/minute
Material:	3/8" Braided Tygon™ hose (supplied with the system).
Connection:	1/4" male NPT to 3/8" O.D. hose barb (connects Tygon™ hose to gas regulator).

¹ Gas combination will vary depending upon the type of working gas used based on user's application.

6.3 Venting Requirements

Venting to the glovebox system and vacuum pump to the facility ventilation exhaust system is not mandatory but is recommended.

Vacuum Pump:	1" inner diameter braided Tygon™ (or similar type) hose.
Regeneration Exhaust Gas:	3/8" inner diameter braided Tygon™ (or similar type) hose.
Purge Valve ^{†‡} :	1¼" inner diameter braided Tygon™ (or similar type) hose.

[†] This is an optional item which is not included with all systems.

[‡]This applies to both automatic and manual purge valve types.

6.4 Electrical Connection Requirements

The power supply for the system will vary according to local area guidelines. Please refer to the system label located on the side of the box in the upper right hand corner above the antechamber for information specific to the system.



Type NEMA 5-20R non GFCI outlet(s) are required for all electrical connections.

6.5 Water Cooling Requirements

The glovebox system includes a heat exchanger which is required to be connected if the box atmosphere is to be cooled.

Temperature:	15°C - 25°C
Flow Rate:	2 liters/minute at 10°C, 5 liters/minute at 15°C
Inlet Pressure:	2.0 – 4.0 bar
Outlet Pressure:	Depressurized (maximum 0.5mbar)
Material:	3/8" Braided Tygon™ (or similar type) hose.

Chapter 7 Installation

- 7.1 General Information....7-1
- 7.2 Tools and Materials Required....7-1
- 7.3 Assembling the Glovebox....7-3



CHAPTER 7: INSTALLATION

7.1 General Information

The M.Braun glovebox has been fully assembled, operated and tested at our production facility. The information binder contains the:

- Glovebox Project Checklist – Displays detailed information regarding the glovebox system
- Test Sheet – displays the various operations and components which were tested during production
- Product Identification and Traceability – Lists all serial numbers for the components included on the system
- Vendor Component Manuals – Operating instructions, etc. for components included on the system which are not manufactured by M.Braun.

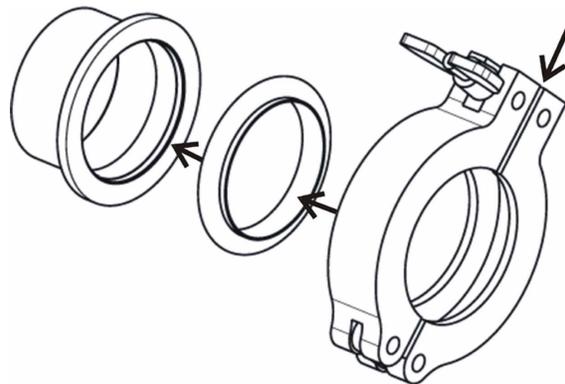
The glovebox and antechamber(s) have been fully tested for leaks under positive and negative pressure. The vacuum level during the regeneration process has also been tested to ensure that the glovebox purifier performs optimally.

This chapter provides information regarding the actual assembly of the glovebox prior to use. All instructions included in this chapter should be strictly adhered to. Any questions that arise during the installation process should be directed to the M.Braun Service Department.

The Unilab system comes complete and ready to assemble. The components, which have been numbered for ease in assembly, should be installed in the order listed in these instructions not in the order which they are numbered.

All clamp and o-ring assemblies used to attach pipes and hoses should be tightened finger tight.

Prior to tightening the clamp onto the flange, ensure the o-ring and other components are seated properly to avoid leaks.



NOTICE

Use care not to cross thread brass to brass connections and stainless steel to stainless steel connections when fitting together and tightening.

7.2 Tools and Materials Required

Tools (not supplied by M.Braun):

- 13mm Wrench
- 19mm Wrench
- Flathead Screwdriver
- 18mm wrench
- Adjustable Wrench

Materials:

The quantity for each material or component listed below will vary depending upon the length of the system (i.e. 1250/780, 2500/1000, etc.). Please refer to the checklist included with the system for exact quantities.



Gloves



KF25 Clamp



KF40 Clamp



Glove O-ring



KF25 O-ring



KF40 O-ring



Electrical Feedthrough



Power Strip



3/8" Braided Tygon® Tubing



KF25 Stainless Steel Flexible Hose



1" Pipe
(copper or stainless steel)



Hose Clamp



Vacuum Pump



Oil Mist Filter
Quantity (1) per vacuum pump



Funnel O-ring
Quantity (1) per vacuum pump



Oil
Quantity (1) bottle per vacuum pump



U-shaped clamp, O-ring,
Bolt and Thumb Screw for
Oil Mist Filter
Quantity (1) each per
vacuum pump



O2 Analyzer
Optional Item



H2O Analyzer
Optional Item



Manual Purge Valve
Optional Item

7.3 Assembling the Glovebox

General Information

A packing checklist has been included with the system. Most components included on this checklist have been packed in the antechamber. Prior to beginning the installation process, unpack, unwrap and identify each component and ensure the appropriate number of items has been included with the shipment as indicated on this checklist. Contact the M.Braun Service Department if any of the items are missing or damaged.

Place all components in an easily accessible location close to the glovebox in an organized manner to ease in the assembly process.

NOTICE

These installation instructions include all possible components for a Unilab system. Please note, not all components are included with every system.

Move the system into the permanent location but allow enough clearance during the installation process to work behind the box and purifier. Below is a rear view of the purifier showing the various components and cables which require connection to the glovebox. Please refer to these pictures when following the instructions.



Figure 1 – Purifier Layout



Figure 2 - Completed Purifier Setup

Purifier Cart

- A. PLC-Touch Screen Panel and Housing
- B. Inlet Hose from Glovebox to Purifier
- C. Outlet Hose from Blower to Glovebox
- D. Lighhood Cable
- E. Pressure Sensor Cable
- F. Ground Wire
- G. Freezer Connection Cable
- H. Purifier Vacuum Hose
- I. Main Power Cable
- J. Foot Pedal

Electrical Feedthrough and Power Strip

There are multiple flanges located on the back of the glovebox which are used to attach feedthroughs to allow components to be used inside the glovebox. Any one of these can be used for the supplied electrical feedthrough.

Select one feedthrough that is close to the main power supply (outlet) and remove the clamp, blank cap and o-ring.



Place the o-ring on the female connector side of the feedthrough.



Place the female connector end of the feedthrough into the flange and feed into the box until the feedthrough flange is flush with the box flange.



Place the clamp around the flange and tighten.



Place the 6 outlet power strip inside the glovebox through one of the gloveports located on the front of the box.



Plug the power strip into the feedthrough.



Connecting the Purifier

NOTICE

After the purifier is attached, it is possible to move the glovebox forward and backward (to allow additional connections to be made) but side to side will be extremely difficult. Therefore, it is recommended that prior to connecting the purifier, the glovebox be moved into the final location where it is to be used.

Roll the purifier cart into place under the antechamber. The recommended distance between the front leg of the stand and the electrical cabinet is 2 ½ “–3”.



Remove the bolt from the black PLC bracket located on the end panel where the antechamber(s) is located.



Place the hinge side of the touch panel enclosure between the openings of the bracket.

Affix the enclosure to the bracket using the bolt, by guiding it down and through the holes in the bracket and hinge.



Secure the hinge by using the 13mm and adjustable wrenches.



Attach the KF40 stainless steel flexible hose (B) from the VHE valve on the filter column to the circulation pipe using a KF40 clamp and o-ring.



Attach the “Out” KF40 stainless steel flexible hose (C) on the blower to the bottom of the heat exchanger using a KF40 clamp and o-ring.



Connecting the Light hood and Pressure Sensor Cables

Remove the cover from the vertical wire track on the rear leg of the stand adjacent to the purifier cart.



Remove the cover from the vertical wire track on the end panel above the section located on the rear leg of the stand.



Run the light hood cable (D) vertically up the inside of lower wire track section.



Run the light hood cable up inside of the upper wire track and place the excess light hood cable on the top of the glovebox.



Replace the wire track covers.



Screw the end of the pressure sensor cable (E) into the pressure sensor located on the underside of the box near the leg of the stand adjacent to the purifier.



Locate the cable with plug leading from the light hood and plug this into the cable from the purifier cart.

Lay the connected plugs on top of the glovebox.



Connecting the Ground Wire

Using the 13mm wrench remove the grounding bolt located on the inside of the rear leg of the stand adjacent to the purifier cart by turning in a counterclockwise motion.



Remove the two bottom washers from the bolt.

Place the end of the ground wire (F) onto the bolt.



Place the washers onto the bolt with the toothed washer teeth pointing towards the leg of the stand.



Screw the bolt back into the leg by turning in a clockwise motion.



Connecting the Freezer and Compressor

Remove the cover from the horizontal wire track located on the rear of the stand.



Run the freezer connection cable (G) along the inside of the wire track.



Place the end of the cable on the stand and replace the wire track cover.

Connect the power supply plug for the compressor.



NOTICE

The connector type will vary from system to system. The picture shown above displays the two possible connector types that will be used. Contact the M.Braun Service Department with any questions.

Connecting the Vacuum Pump

Attach the KF25 stainless steel flexible hose to the end of the 1" pipe with the port using a KF25 clamp and o-ring.



Attach the pipe to the manual hand valve located on the bottom of the large antechamber using a KF25 clamp and o-ring.



Attach the stainless steel flexible hose to the port on the vacuum pump with the funnel shaped o-ring using a KF25 clamp.



Attach the fitting on the purifier vacuum hose (H) to the port on the copper pipe and tighten hand tight.

Using the 19mm and 18mm wrenches Tighten an additional $\frac{3}{4}$ turn.



If system is equipped with a mini antechamber:

Attach the end of the vacuum hose (H) with the elbow to the port located on the rear side of the mini antechamber.



Attaching the Vacuum Pump Oil Mist Filter

Place the black o-ring onto the remaining port on the vacuum pump.



Place the oil mist filter onto the port.



Push the u-shaped clamp onto the port making sure it covers both the port and filter flange.



Turn the clamp so the open ends face out.

Secure in place with the bolt and red thumb screw. Tighten hand tight.



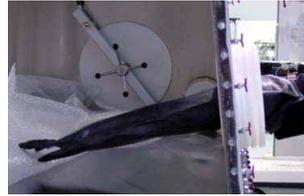
Turn the filter so the label faces the gas ballast on the top of the vacuum pump.

Push the black hose from the pump onto the port on the filter. Secure in place with black plastic clamp.

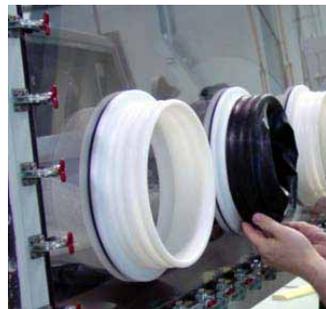
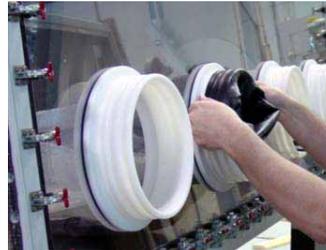


Attaching the Gloves

Slide the glove onto hand and insert arm into the box through the gloveport angling the thumb to a comfortable working position.



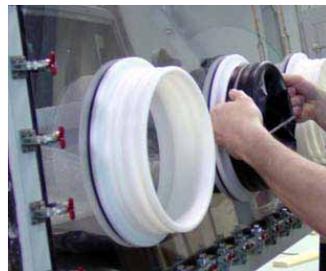
Slide hand out of the glove and work the cuff of the glove into the groove in the gloveport closest to the glass. At this time the thumb position can still be adjusted by rotating the cuff of the glove.



Secure the glove with two o-rings.

Place the o-ring in the top of the second groove from the glass and in one smooth motion pull down across the circumference of the gloveport.

Repeat the process for the remaining glove(s) and o-ring(s).



Attaching the Analyzers

Carefully place a KF40 o-ring on the analyzer port.



Carefully place the sensor end of the analyzer into the corresponding port on the circulation piping running the length of the system on the underside of the glovebox.



H₂O analyzer is positioned on the side of the box opposite the antechamber(s).

O₂ analyzer is positioned on the same side of the box as the antechamber(s).

Secure the analyzer to the pipe using a KF-40 clamp and o-ring.



Repeat this process with the remaining analyzer(s).

Insert the analyzer cable plug into hole on the corresponding analyzer by pushing the plug into the hole gently until it snaps into place.

The **Green** plug attaches to the H₂O Analyzer.

The **Blue** plug attaches to the O₂ Analyzer.



The green plug cable should be wrapped along the circulation pipe and then plugged into the moisture analyzer.

NOTICE



Lowering the Leveling Feet.

Move the system into its permanent location.
Lower each of the leveling feet by hand until they touch the ground.



Using a 13mm wrench continue to lower the leveling feet until the casters are raised off the ground.



Power and Gas Supply

Plug the main power cable (I) on the purifier into the main power supply outlet.

Attach the working gas line from the purifier to the working gas supply.

Attach the regeneration gas line from the purifier to the regeneration gas supply.

Place the foot pedal on the floor in front of the system in an easily accessible location.

The installation is now complete.

Chapter 8 Commissioning the System

- 8.1 General Information....8-1
- 8.2 System Activation....8-2
- 8.3 Static Pressure Leak Test....8-2
- 8.4 Purging the System....8-4



CHAPTER 8: COMMISSIONING THE SYSTEM

8.1 General Information

After completing the installation, the system is ready to be activated. Gas can now be added to the box to prepare for normal operation. The system is equipped with a foot pedal which is used during a pressure leak test or during normal operation of the box to temporarily increase or decrease the pressure inside the glovebox.

While a leak test has been performed during production of the system, after initial installation and gas has been added, it is necessary to perform a static pressure test to check the system for any possible leaks. This is done to ensure all connections made during the installation are tight and seated properly. The static pressure test also checks other components on the system which may have shifted during the shipping process.

After the leak test has been completed, the purge operation must be performed to rid the box of all room air and replace it with the chosen working gas. After the purge procedure is complete, the box can be used for normal operation in circulation mode.

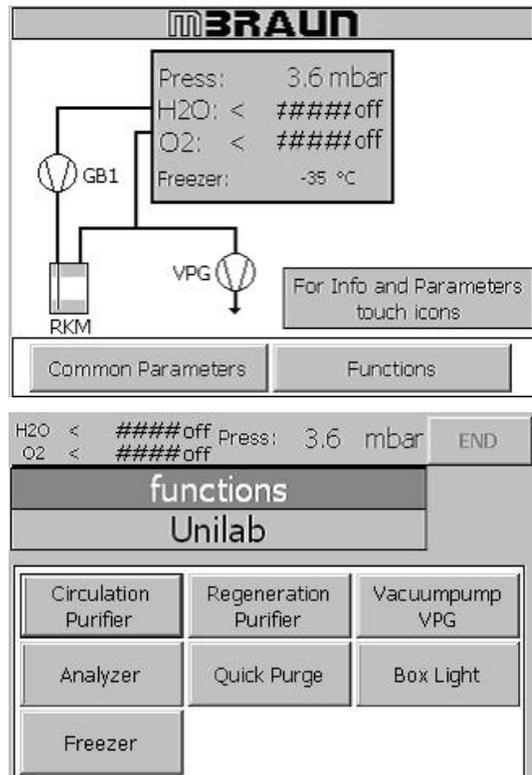
8.3 System Activation

Turn the Main Power switch located on the side of the electrical cabinet on the purifier cart from the **Off** position to the **On** position.



The panel will display a series of screens (program starting up) before the start screen is displayed.

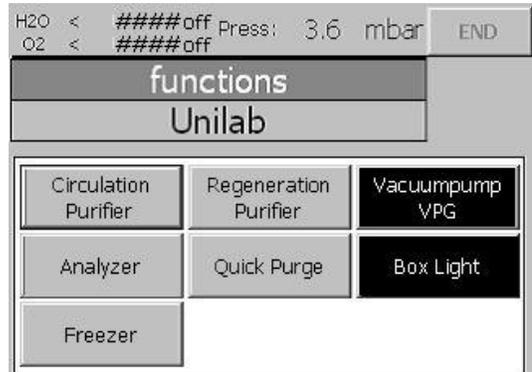
Touch the **Functions** button on the start screen.



Touch the **Vacuum Pump** button to activate the vacuum pump.

Touch the **Box Light** button to turn the light on.

NOTICE The vacuum pump should remain on at all times while the system is in operation.



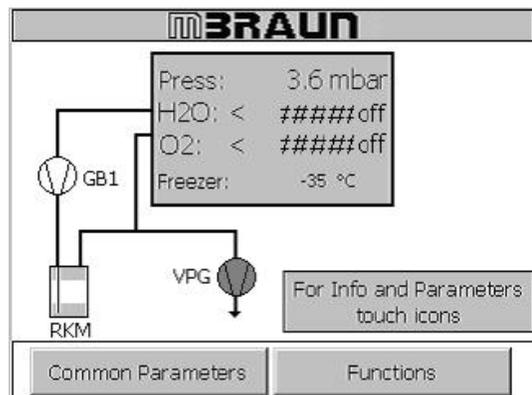
Touch the **End** button to return to the start screen.

Using the regulator, turn on the working gas supply and set the pressure to 80psi.

8.3 Static Pressure Leak Test

The static pressure leak test is performed in both the positive and negative pressure states. The process for running the test in either state is the same with the exception of the parameter setpoints and foot pedal controls.

Touch the **Box Pressure/Analyzer** display box on the start screen.



Use the arrows listed under Upper Working Limit and Lower Working Limit to increase or decrease the box atmosphere pressure setpoint in one tenth decimal intervals.

or

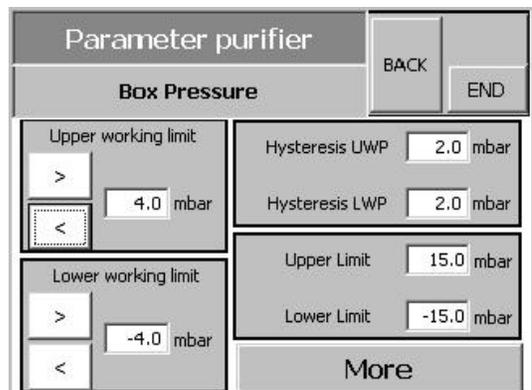
Touch the number field next to the corresponding parameter to display the alphanumeric keypad.

Recommended Positive State Setpoints

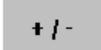
- Upper Working Limit: 14.0mbar
- Lower Working Limit: 0.0mbar

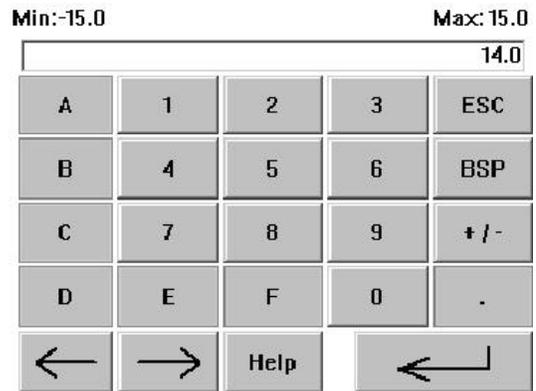
Recommended Negative State Setpoints

- Upper Working Limit: -14.0mbar
- Lower Working Limit: 0.0mbar

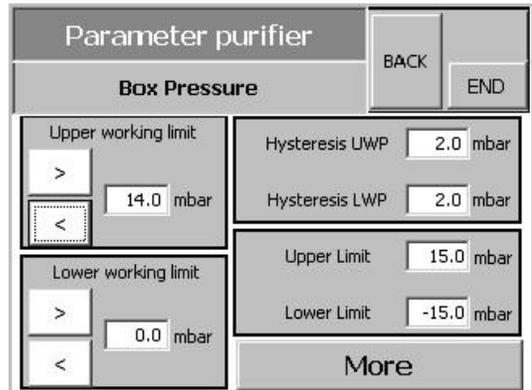


Enter the desired limit and touch the  button to return to the Box pressure screen.

Use the  button to set the parameter to the positive or negative.



Touch the **End** button on the Box Pressure Parameters screen.



Using the foot pedal control, adjust the gas pressure inside the box until the pressure reaches the desired level range.

The pressure will fluctuate until it settles at a fixed level between +/- 10-12mbar.

NOTICE If the pressure drops below +/-10mbar, use the foot pedal to add gas until the pressure reaches the desired level.

Once the pressure settles, monitor the pressure level for five (5) minutes.

NOTICE It is normal for the pressure level to fluctuate slightly during the 5 minute static pressure test. However, a pressure decrease of more than .3mbar indicates there is a leak in the system. Check all connections made during the installation process. If this doesn't fix the problem, refer to the Troubleshooting chapter of this manual or contact the M.Braun Service Department.

After five (5) minutes, if the pressure level has stayed constant, the glovebox can be tested in the opposite pressure state.

After testing the box in both the positive and negative states with no leaks present, the box is ready for purging.

8.4 Purging the System

NOTICE

Systems equipped with freezers or other components that may be protected by covers must be open during the purging process.

If the system has been in use prior to purging, ensure that the freezer(s) is deactivated and is at room temperature before beginning the process.

The instructions below include information regarding glovebox systems equipped with analyzers. The analyzers, which are used to monitor the oxygen and moisture levels inside the glovebox, can be used to determine when the glovebox atmosphere reaches the desired purity level.

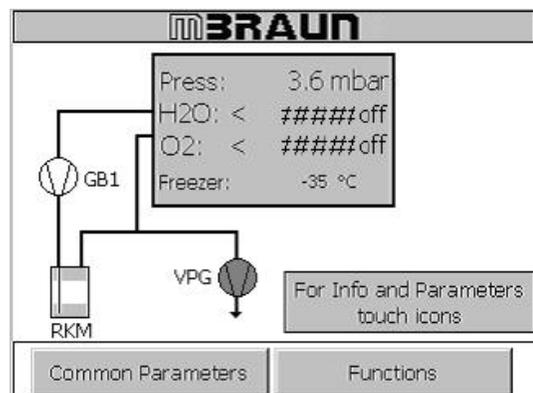
Glovebox systems which are not equipped with analyzers require the gas consumption to be monitored to determine when the glovebox atmosphere reaches the desired purity level. Refer to the Gas Consumption chart in Chapter 3 for more information.

Adjusting the Parameters

NOTICE

Adjusting the parameters is only necessary when using the Reverse or Manual purge methods.

Touch the **Box Pressure/Analyzer** display box on the start screen.



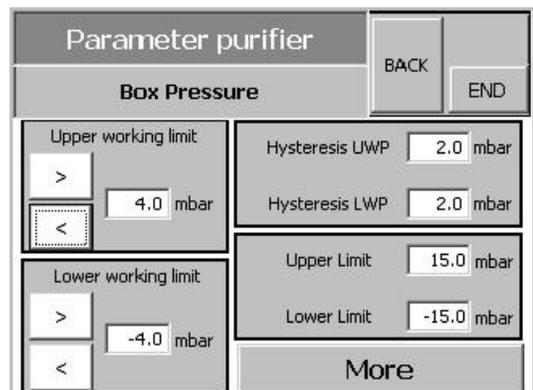
Use the arrows listed under Upper Working Limit and Lower Working Limit to increase or decrease the box atmosphere pressure setpoint in one tenth decimal intervals.

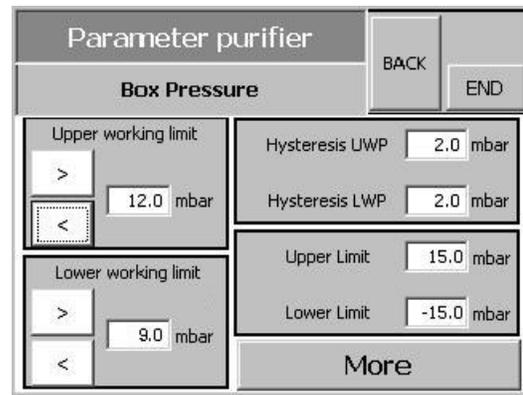
or

Touch the number field next to the corresponding parameter to display the alphanumeric keypad. Use the keypad to adjust the parameters in the same manner as before.

Recommended Setpoints

- Upper Working Limit: 12.0mbar
- Lower Working Limit: 9.0mbar





Touch the **End** button.

Reverse Purge Method (no manual purge valve or quick purge function present)

Open the inner antechamber door.



Very slowly turn the outer antechamber door handle in a counterclockwise motion until the glovebox pressure drops to a level between 1.0mbar and 8.0mbar and the VG valve stays open* providing a constant flow of gas into and out of the box.

**When the valve stops clicking it is open.*

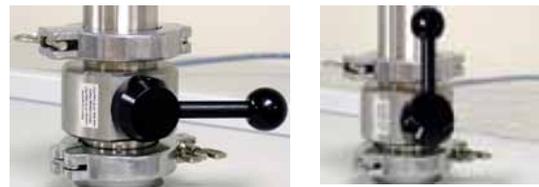


Unilab 1200: Purge for approximately 75 minutes.

Unilab 2000: Purge for approximately 90 minutes.

Manual Purge Method (manual purge valve present)

Open the manual hand valve located on the top of the glovebox.



The VG valve will open and close to allow working gas to flow into the box. Once the pressure inside the box drops to a level between 1.0mbar and 8.0mbar, the valve will stay open* providing a constant flow of gas into and out of the box.

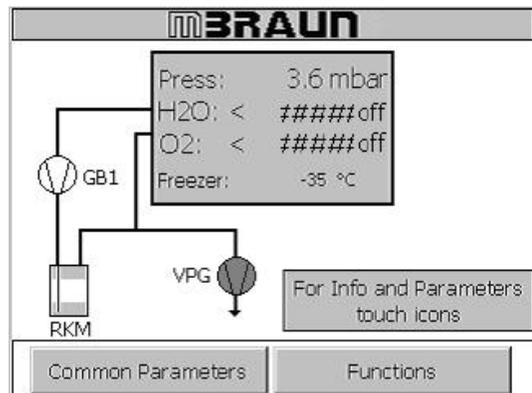
**When the valve stops clicking it is open.*

Unilab 1200: Purge for approximately 75 minutes.

Unilab 2000: Purge for approximately 90 minutes.

Automatic Purge Method (quick purge function present)

Touch the **Functions** button on the start screen.

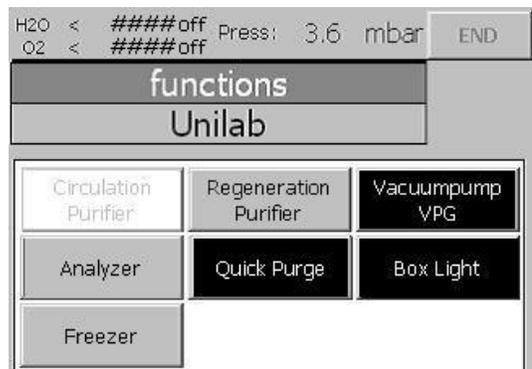


Touch the **Quick Purge** button on the functions screen to activate the purging process.

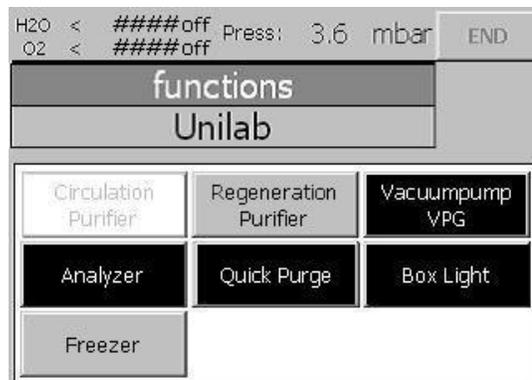
The circulation button is blanked out as this function is unavailable during the purging process.

Continue purging for 45 minutes.

Touch the **Analyzers** button to activate the analyzers.

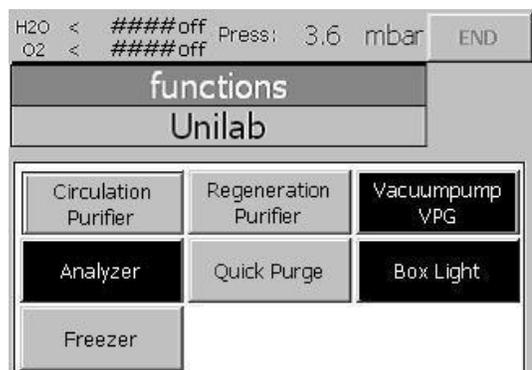


Touch the **End** button to return to the Start Screen.



Continue purging until the oxygen and moisture content inside the box reach the desired ppm levels.

Touch the **Quick Purge** button on the functions screen to deactivate purging once the desired levels have been attained.



Chapter 9

System Operation

- 9.1 General Information....9-1
- 9.2 Circulation....9-1
- 9.3 Analyzers....9-3
- 9.4 Antechamber Operation....9-4
- 9.5 Freezers....9-13
- 9.6 Regeneration....9-15



CHAPTER 9: SYSTEM OPERATION

9.1 General Information

After the system has been fully commissioned, it may now be used for normal operation in circulation mode. Prior to using the glovebox in circulation mode the box pressure parameters can be adjusted for the upper and lower working limits. There are no recommended set parameters, the setpoints are based on user preference.

At any time during use of the box, the foot pedal can be used to add or remove working gas from the box temporarily. This is especially useful when attempting to place hands inside the gloves and into the box when working in the positive pressure state.

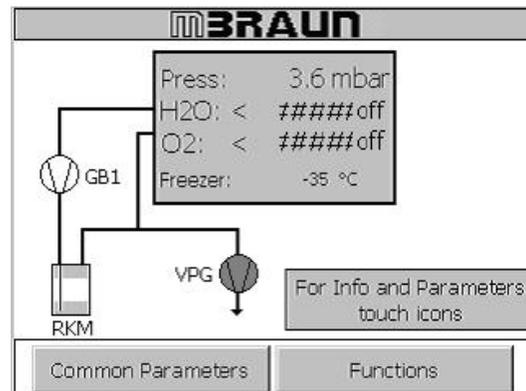
Adjusting the parameters is done in the same manner as was done during the static leak test and purging during the commissioning of the box. Please refer to Chapter 8 of this manual for instructions.

9.2 Circulation Mode

NOTICE

- The circulation process can only be started if all other functions (purge and regeneration) are inactive.
- There are no recommended setpoints for the circulation mode. Upper and lower working pressure limits are based on user preference.
- If the oxygen level in the system rises above 150ppm, deactivate circulation and begin purging. Continue purging until the oxygen level drops below 100ppm.

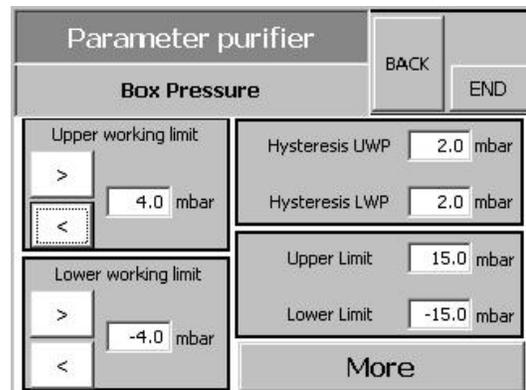
Touch the **Box Pressure/Analyzer** display box on the start screen.



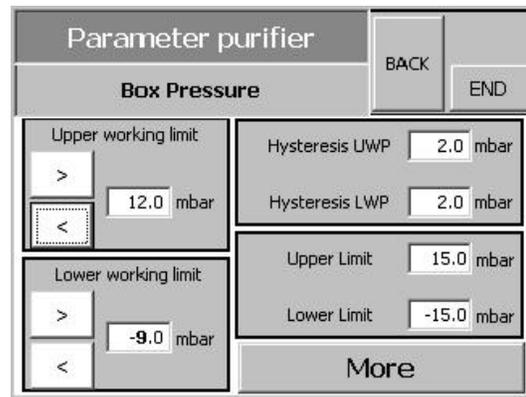
Use the arrows listed under Upper Working Limit and Lower Working Limit to increase or decrease the box atmosphere pressure setpoint in one tenth decimal intervals.

or

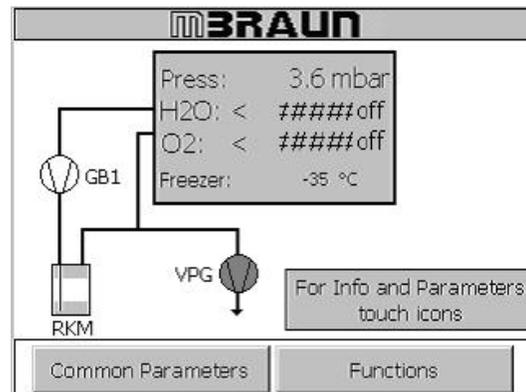
Touch the number field next to the corresponding parameter to display the alphanumeric keypad. Use the keypad to adjust the parameters in the same manner as before.



Touch the **End** button.

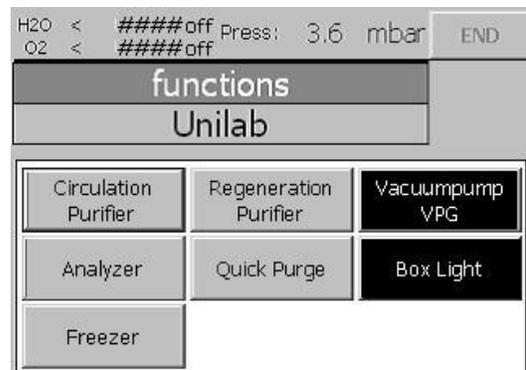


Touch the **Functions** button on the start screen.

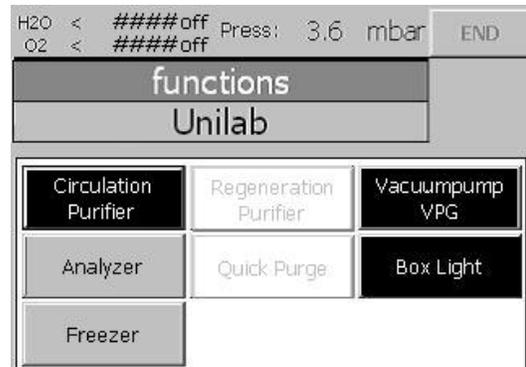


Touch the **Circulation Purifier** button on the functions screen.

The regeneration and quick purge (if existing) buttons are blanked out as these functions are unavailable during the purging process.



Touch the **End** button to return to the Start Screen.



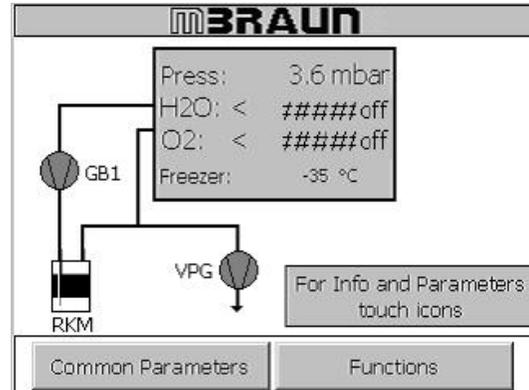
The glovebox will continue to circulate the working gas until the function is deactivated.

9.3 Analyzers

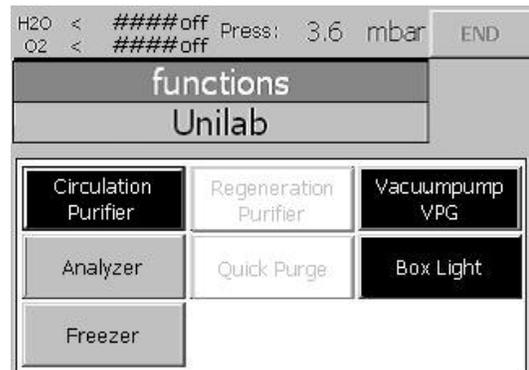
General Information

This section applies only to systems that are equipped with moisture and/or oxygen analyzers.

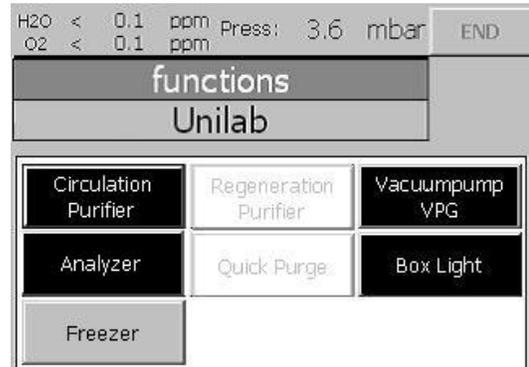
Touch the **Functions** button on the Start screen.



Touch the **Analyzers** button to activate the analyzer(s).



Touch the **End** button to return to the Start Screen.



Follow the steps above to deactivate the analyzer(s).

9.4 Antechamber Operation

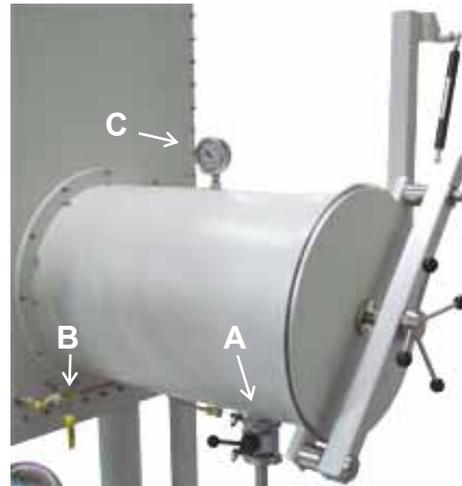
Transferring Material into the Glovebox – Large Antechamber

Follow the steps below to perform a transfer of materials from room environment into the glovebox using the large antechamber.

Before opening the outside antechamber door, verify:

- The inner antechamber door is closed;
- The evacuate hand valve (A) is in the closed position;
- The refill hand valve (B) is in the closed position;
- The antechamber is not under vacuum (gauge (C) should read zero).

The picture to the right displays the correct hand valve position and the reading on the gauge at the zero position.



Turn the handle on the outer antechamber door in a counterclockwise direction to open it.



Carefully open the antechamber door by lifting it in an upward direction.



Let go of the door handle and allow the door to rise completely.



Gently pull out the sliding tray.



Place the materials to be used on the tray and slide the tray back into the antechamber.



Gently push the sliding tray back into the antechamber.



Close the outer door by pulling it down until groove at the end of the arm rests on the spindle.



Place four fingers, two each on opposite spindles, on the door handle and gently turn in a clockwise motion until the door touches the chamber.

Tighten $\frac{1}{4}$ turn more.



Evacuate the antechamber by turning the evacuation hand valve to the **open** position.



Wait for the gauge to settle at the **negative** position and continue to evacuate for:

Non-porous Material: 5 minutes

Porous Material: 12 hours



Turn the evacuation valve to the **closed** position.



Refill the antechamber by turning the refill valve to the **open** position.



Non-porous Material
Wait for the gauge to settle at the **halfway** mark on the gauge.

Porous Material
Wait for the gauge to settle at **zero (0)**.



Turn the refill valve to the **closed** position.



Repeat this process as necessary according the following recommended guidelines:

Non-porous Material

Evacuation (3 total cycles)

- *2 Additional Cycles – 5 minutes each*

Refill (3 total cycles – 2 intermediate, 1 final)

- *1 Intermediate Cycle – refill chamber halfway*
- *1 Final Cycle – refill chamber to atmosphere (or zero on the gauge).*

Porous Material

Evacuation

- *1 Cycle – 12 hours*

Refill

- *1 Cycle – refill chamber to atmosphere (or zero on the gauge).*

Grasp the door handle with two fingers in a counterclockwise motion.



Carefully open the antechamber door by lifting it in an upward direction and guiding it until it stops.



Gently pull out the tray and transfer the material into the glovebox.

At this time, materials to be transferred out of the box may be placed on the tray.



After all materials are transferred into the glovebox, grasp the door handle and gently pull the door down until it rests on the door stop.



Grasp the door handle with two fingers in a clockwise motion.



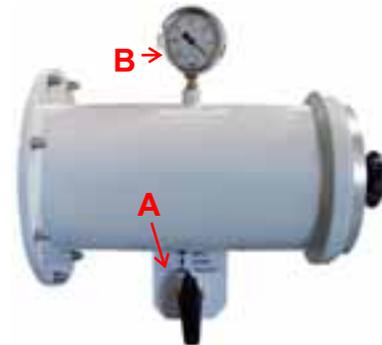
Transferring Material into the Glovebox – Mini Antechamber

Follow the steps below to perform a transfer of materials from room environment into the glovebox using the large antechamber.

Before opening the outside antechamber door, verify:

- The inner antechamber door is closed;
- The hand valve (A) is in the closed position;
- The antechamber is not under vacuum (gauge (B) should read zero).

The picture to the right displays the correct hand valve position and the reading on the gauge at the zero position.



Turn the handle on the outer antechamber door in a counterclockwise direction to open it.



Remove the door.



Gently pull out the sliding tray.



Place the materials to be used on the tray and slide the tray back into the antechamber. Replace the cover and lock into place by turning in a clockwise motion.

Evacuate the antechamber by turning the hand valve to the **Evacuate** position.



Wait for the gauge to settle at the **negative** position and continue to evacuate for:

Non-porous Material: 3 minutes
Porous Material: 12 hours



Refill the antechamber by turning the valve to the **Refill** position.



Non-porous Material
Wait for the gauge to settle at the **halfway** mark on the gauge.

Porous Material
Wait for the gauge to settle at **zero (0)**.



Repeat this process as necessary according the following recommended guidelines:

Non-porous Material

Evacuation (3 total cycles)

- 2 Additional Cycles – 3 minutes each

Refill (3 total cycles – 2 intermediate, 1 final)

- 1 Intermediate Cycle – refill chamber halfway
- 1 Final Cycle – refill chamber to atmosphere (or zero on the gauge).

Porous Material

Evacuation

- 1 Cycle – 12 hours

Refill

- 1 Cycle – refill chamber to atmosphere (or zero on the gauge).

Turn the hand valve to the **Closed** position.



Turn the handle on the inner antechamber door in a counterclockwise direction to open it.



Remove the door.



Gently pull out the sliding tray.



Remove the materials to be used from the tray and slide the tray back into the antechamber.
Replace the cover and lock into place by turning in a clockwise motion.

Transferring Material out of the Glovebox

Transferring material out of the box is also a completely manual procedure. Follow the above steps in reverse to transfer materials out of the glovebox into room environment.

9.5 Freezers

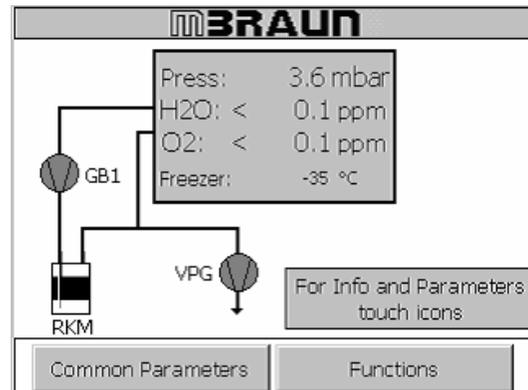
General Information

NOTICE

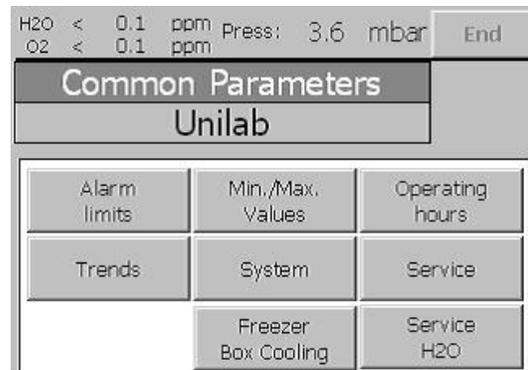
The actual temperature inside the freezer will always be displayed even if the freezer is inactive.

This section applies only to systems that are equipped with freezers.

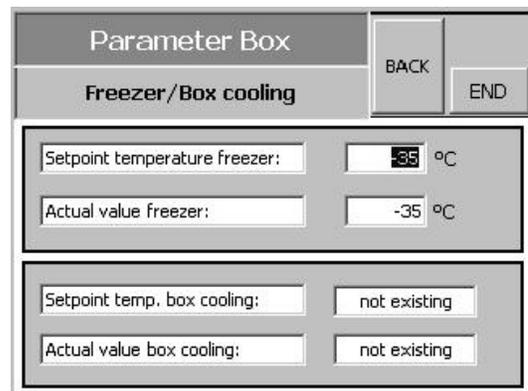
Touch the **Common Parameters** button on the Start screen.



Touch the **Freezer/Box Cooling** button on the parameters screen to display the Freezer/Box Cooling parameters screen.



Touch the number field next to the **Setpoint Temperature Freezer** to display the alphanumeric keypad. Use the keypad to adjust the parameters in the same manner as before.

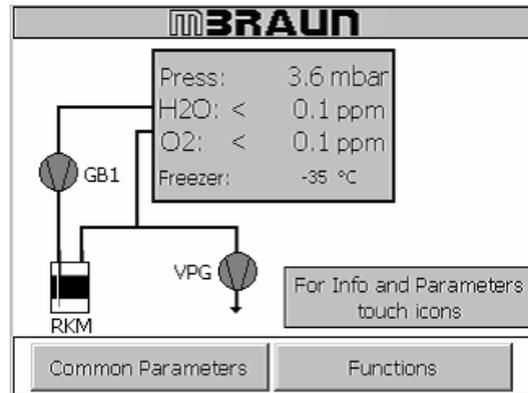


NOTICE

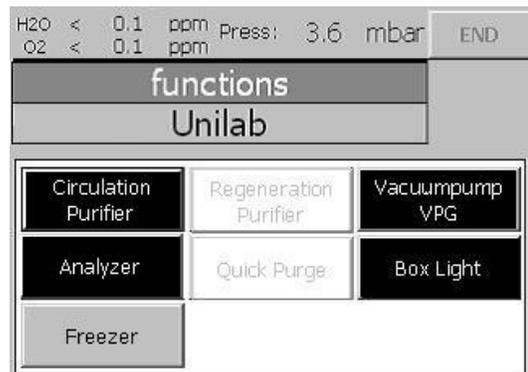
The default setpoint is -35°C however, the freezer parameters can be set at any temperature between -10°C and -35°C.

Touch the **End** button to return to the start screen.

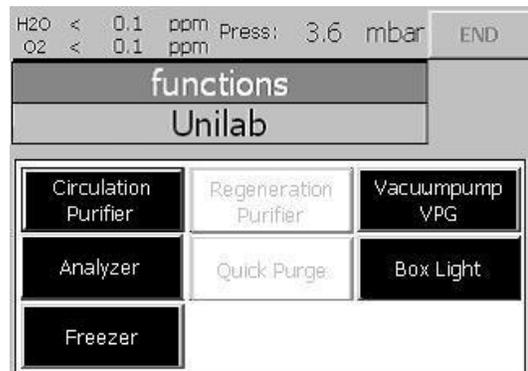
Touch the **Functions** button to display the functions screen.



Touch the **Freezer** button to activate the freezer.



Touch the **End** button to return to the start screen.



9.6 Regeneration Mode

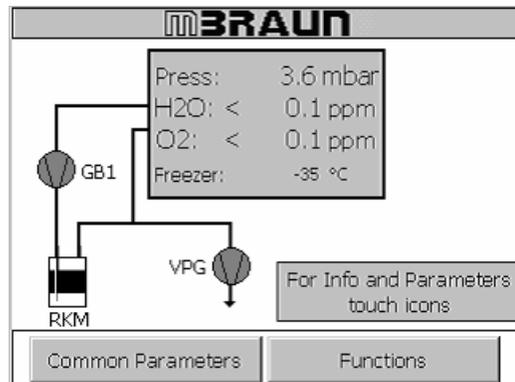
NOTICE

The regeneration process can only be started if the circulation process is inactive.

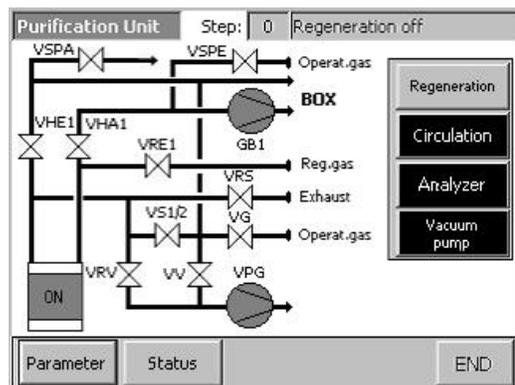
Circulation Auto Start

If desired, the circulation process can be started automatically following the end of the regeneration procedure. Follow the steps below to have circulation start automatically after the regeneration procedure is completed. Skip this step to restart the circulation process manually after the regeneration procedure is completed.

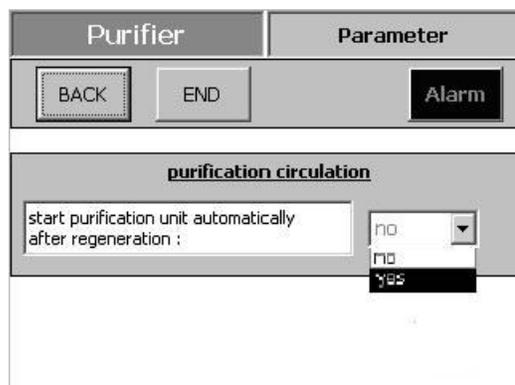
Touch the **RKM (Purifier)** icon on the start screen.



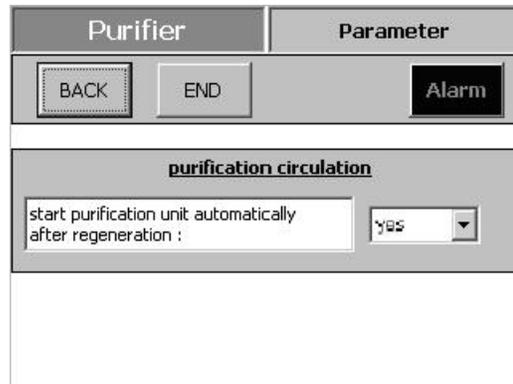
Touch the **Parameter** button on the purifier layout screen.



Select **Yes** from the drop down menu.



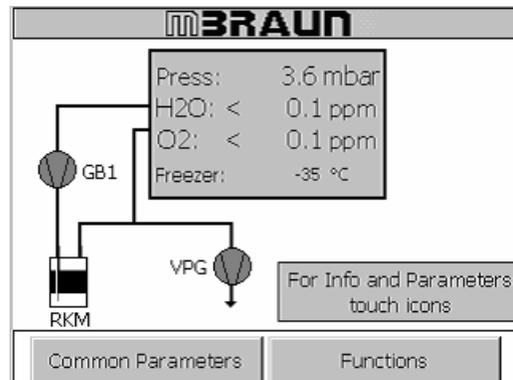
Touch the **End** button to return to the start screen.



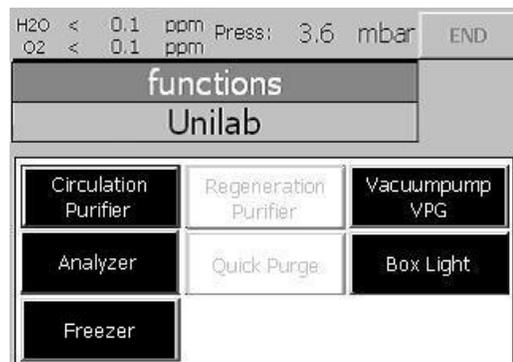
Regeneration

Follow the steps below to start the regeneration process.

Touch the **Functions** button on the start screen.

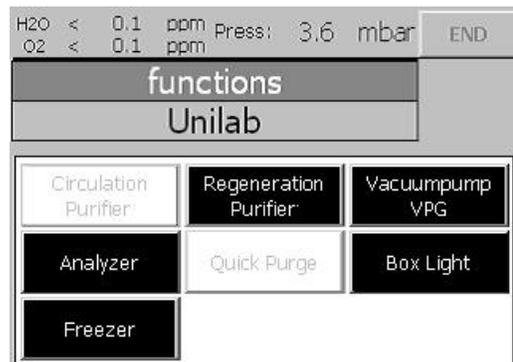


Deactivate the circulation process, if active, by touching the **Circulation Purifier** button.



Touch the **Regeneration Purifier** button on the functions screen.

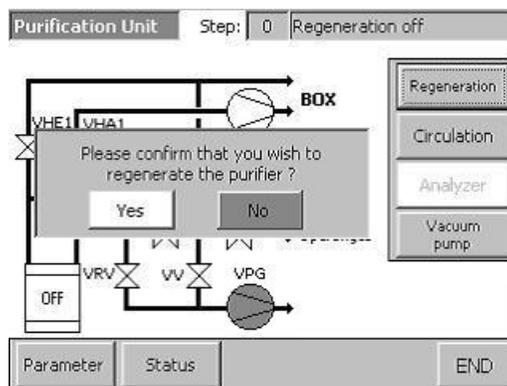
The circulation button is blanked out as this function is unavailable during the purging process.



The purifier layout screen is displayed with the following message.

Please confirm that you wish to regenerate the purifier?

This message must be acknowledged (yes or no) before regeneration will initialize.

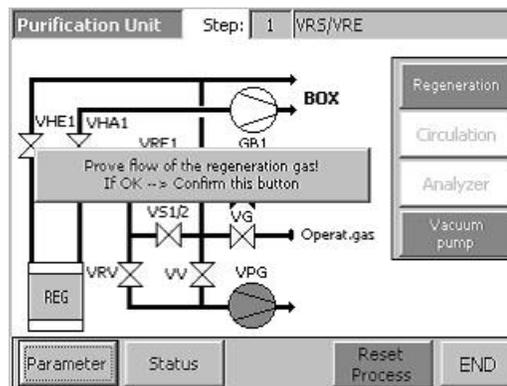


Using the regulator, turn on the regeneration gas supply and set the pressure to 5psi. Place the end of the regeneration vent line running from the VRS valve on the valve block located on the back of the purifier to a 100ml (minimum size) collection vessel. Vent the line and vessel to fume hood or other facility ventilation system.

A second message is displayed:

Prove flow of the regeneration gas! If OK → Confirm this button

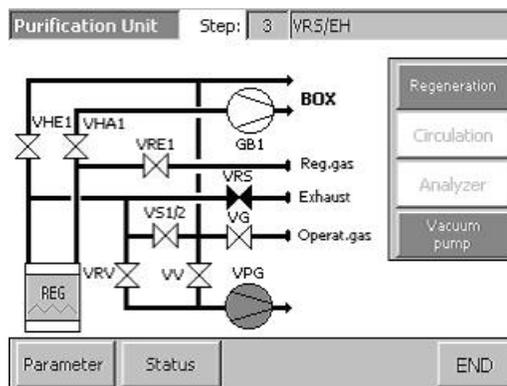
This message must also be acknowledged before regeneration will initialize. Touch the message on the screen after confirming the flow is correct according to the above information.



After acknowledging the second message the purifier layout screen can remain displayed. This screen will display the active step in the regeneration process.

or

Touch the **End** button to display the start screen. To display the purifier layout screen at any time during the regeneration process touch the **RKM** icon on the start screen.



NOTICE	<ul style="list-style-type: none"> • After completing a regeneration process, the vacuum pump oil should be changed. Refer to vendor supplied manuals for instructions on changing the oil. • Used oil should be disposed of in accordance with all facility, local and federal guidelines.
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Chapter 10 Maintenance & Troubleshooting

- 10.1 General Information....10-1
- 10.2 Maintenance Requirements....10-1
- 10.3 Touch Panel Maintenance....10-2
- 10.4 Replacing the Gloves....10-5
- 10.5 Moisture Analyzer Maintenance....10-6
- 10.6 Alarms....10-13

CHAPTER 10: MAINTENANCE & TROUBLESHOOTING

10.1 General Information

This chapter provides general information for general maintenance of the Unilab Glovebox system and troubleshooting various problems which may be encountered during operation of the system. For information regarding troubleshooting of vendor manufactured components, please consult the vendor supplied user manuals.

NOTICE

Contact the M.Braun Service Department with questions regarding any of the troubleshooting steps listed below.

10.2 Maintenance Requirements

Daily Maintenance and Service

Windows:	<p>Clean the exterior with a mild solution of soap or detergent and lukewarm water.</p> <p>Using a soft lint free cloth or sponge, gently wash the sheet to loosen dirt and grime and rinse well with clean water.</p> <p>To prevent water spotting, thoroughly dry with chamois or cellulose sponge.</p> <p>Avoid the use of abrasive cleaners, squeegees and/or other cleaning implements that may mar or gouge the coating.</p> <p>Compatible Cleaning Agents:</p> <p>Aqueous Solutions of Soaps and Detergents</p> <p>Windex¹ Top Job² Joy² Mr. Clean² Fantastik³ Formula 409⁴</p> <p><small>1 Registered Trademark of Drackett Products Co. 2 Registered Trademark of Procter & Gamble 3 Registered Trademark of Texize, Division of Norton Norwich Products Inc. 4 Registered Trademark of Clorox Co.</small></p> <p>Organic Solvents</p> <p>Butyl Cellosolve Hexcel, F.O. 554 Kerosene Neleco–Placer Naphtha (VM&P) grade Turco 5042</p> <p>Alcohols</p> <p>Methanol and Isopropyl Alcohol</p>
Gloves:	<p>Check all gloves for damage.</p> <p>The surface of the gloves in which the user's hands are placed should be coated lightly with talcum powder to prevent drying and brittleness.</p> <p>Replace gloves immediately if any signs of damage or wear are detected. Never attempt to repair gloves.</p>
Antechamber:	<p>Check antechamber door seals for damage and/or debris. Coat lightly, as needed, with high vacuum grease.</p> <p>If the antechamber doors are difficult to open or close, apply a light coating of white lithium grease or other lubricant to the pivot points and/or door spindle.</p>
Connections:	<p>Check all connections to ensure they are seated properly and are leak free.</p>
Components:	<p>Observe the maintenance instructions of the third-party manufactured components as directed in supplied manuals.</p>

Quarterly and Annual Maintenance and Service

Quarterly	Annually
<ul style="list-style-type: none"> • Inspect the gloves and glove ports, replace as needed. • Inspect the fluorescent box lights, replace as needed. • Inspect the solenoid valves, replace as needed. • Leakage test. • Test of the functions. • Inspect box filters, replace as needed. 	<ul style="list-style-type: none"> • Replace the gloves. • Inspect the glove ports, replace as needed. • Inspect the fluorescent box lights, replace as needed. • Inspect the solenoid valves, replace as needed. • Leakage test. • Test of the functions. • Replace box filters. • Calibrate oxygen and moisture analyzers.

10.3 Touch Panel Maintenance

General Information

By accessing the System Screen the user can:

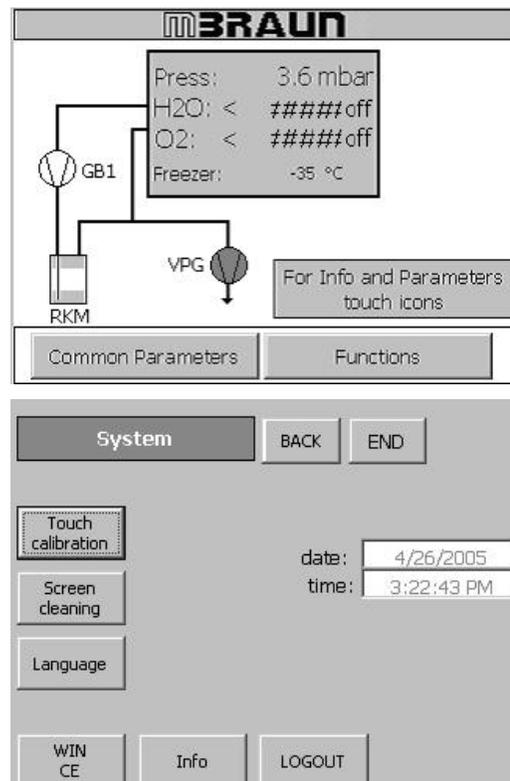
- Calibrate the touch panel screen
- Clean the touch panel screen
- Adjust the date & time settings

Below are instructions for each function.

Screen Calibration

Touch the **System** button on the Start Screen to access the System Settings Screen.

Touch the **Touch Calibration** button to activate the calibration process.



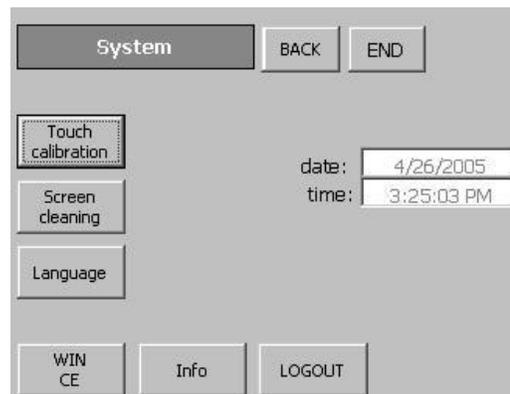
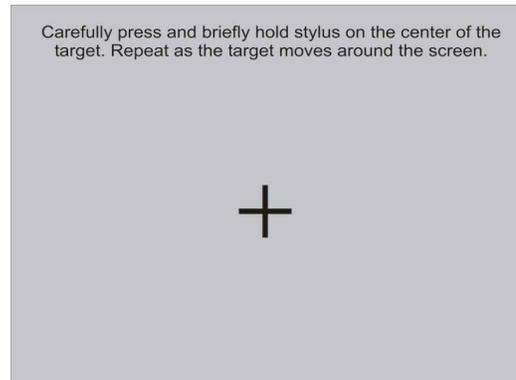
Five calibration crosses are displayed in succession at random points on the screen.

Follow the instructions displayed on the screen and touch each calibration cross as it is displayed.

To accept the changes made during the calibration process touch the screen at any time.

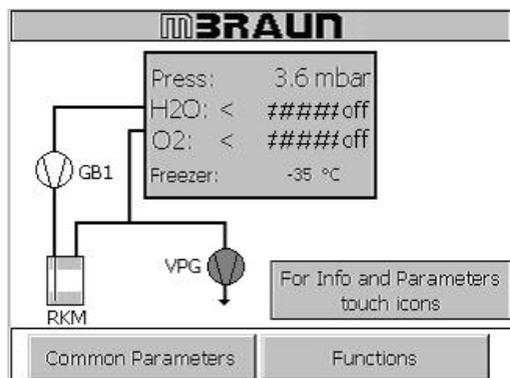
To reject the changes made during calibration wait for 30 seconds until the overlaid timer bar has reached zero. The system will revert back to the default settings.

Upon completion of the calibration procedure, touch the **Main** or **Back** buttons to access the Start Screen and resume normal operation.

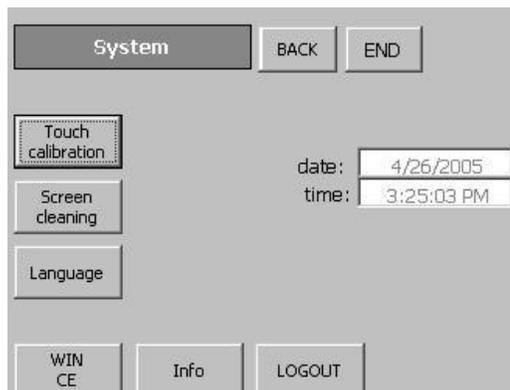


Screen Cleaning

Touch the **System** button on the Start Screen to access the System Settings Screen.



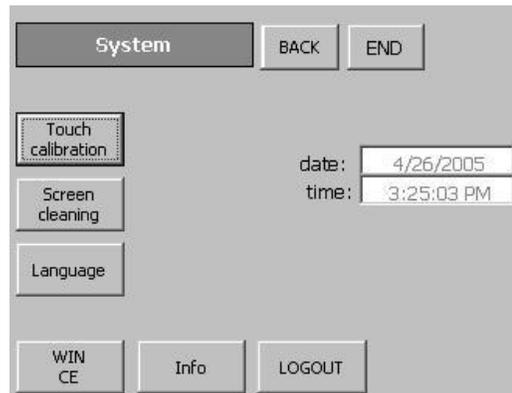
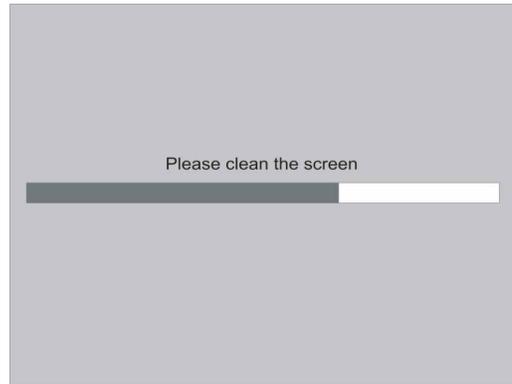
Touch the **Screen Cleaning** button.



All system functions are locked out for 30 seconds while a screen with a timer bar is displayed to allow the user to clean the screen without interfering with system processes.

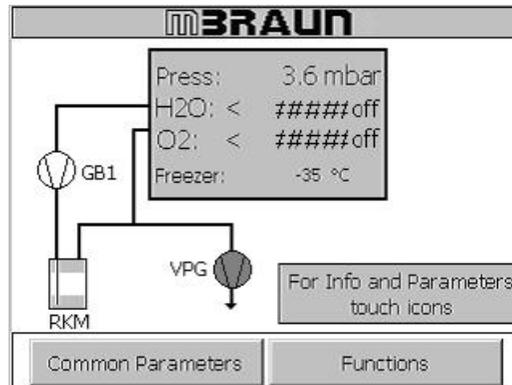
Clean the screen by applying a small amount of non-abrasive cleanser directly to a soft lint free cloth and gently wipe the screen. Do not apply the cleanser directly to the screen!

Upon completion of the cleaning procedure, touch the **Main** or **Back** buttons to access the Start Screen and resume normal operation.



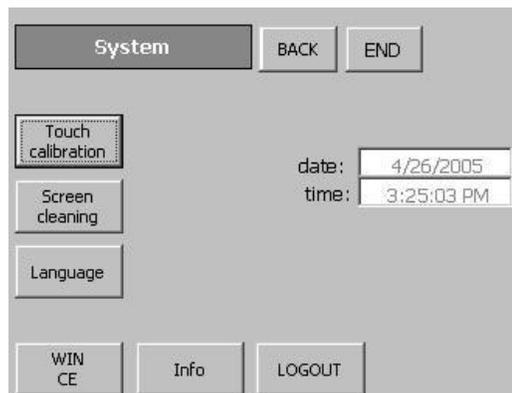
Setting the Date and Time

Touch the **System** button on the Start Screen to access the System Settings Screen.

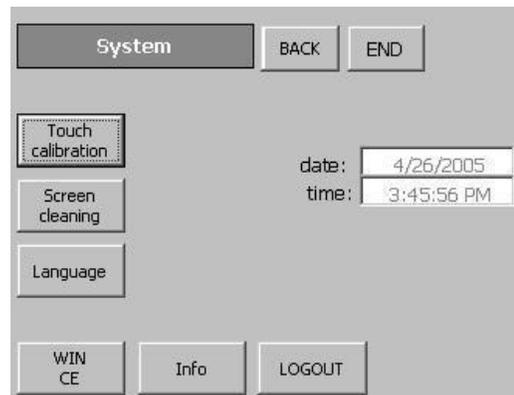


Touch the input field for the date and/or time to display an alphanumeric pad.

Enter the correct information according to the instructions detailed at the beginning of Chapter 4.



After making the appropriate changes, touch the **Main** or **Back** buttons to access the Start Screen and resume normal operation.



10.4 Replacing the Gloves

General Information

M.Braun recommends replacing the gloves at regular intervals. The gloves must be changed upon signs of wear and tear that may or have caused a leak.



Before replacing the gloves ensure that the glovebox is atmosphere is safe to breathe. If necessary purge the glovebox to fill it with ambient air prior to changing the gloves.

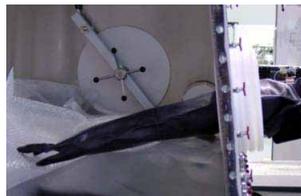
Carefully remove the two o-rings securing the glove in place.



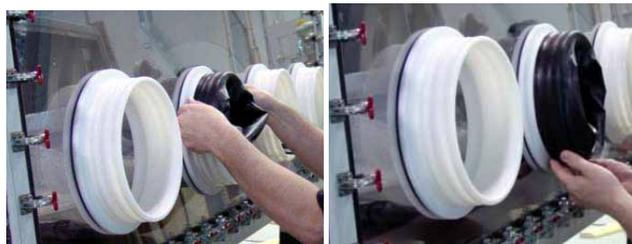
Carefully remove the glove from the gloveport.



Slide the glove onto hand and insert arm into the box through the gloveport angling the thumb to a comfortable working position.



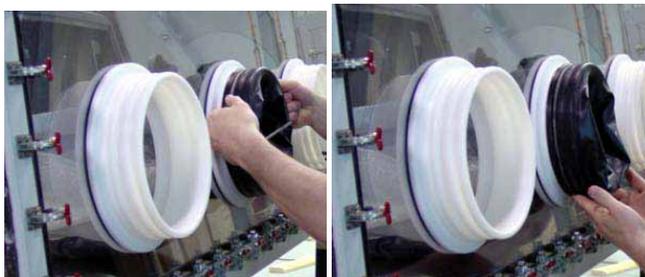
Slide hand out of the glove and work the cuff of the glove into the groove in the gloveport closest to the glass. At this time the thumb position can still be adjusted by rotating the cuff of the glove.



Secure the glove with two o-rings.

Place the o-ring in the top of the second groove from the glass and in one smooth motion pull down across the circumference of the gloveport.

Repeat the process for the remaining glove(s) and o-ring(s).



NOTICE

After replacing gloves, purge the glovebox to remove any undesired oxygen and/or moisture. (Refer to Chapter 8 Commissioning the System, Section 8.4 Purging)

Gloveport Covers

M.Braun gloveport covers, which are used to assist in replacing gloves or to block off an unused gloveport, are made for standard round glove ports and are available for either interior or exterior use.

Internal gloveport covers allow the user to replace gloves without contaminating the glovebox atmosphere with room air.

External gloveport covers allow the user to remove a glove(s) and continuing working within a glovebox without contaminating the glovebox atmosphere with room air.

Contact the Service Department for further information regarding price and availability of the gloveport covers.

CAUTION

Do not seal off all gloveports at the same time. Sealing off all gloveports simultaneously could cause pressure to build up inside the glovebox which could cause the window to crack or rupture.

10.5 Moisture Analyzer Maintenance

General Information

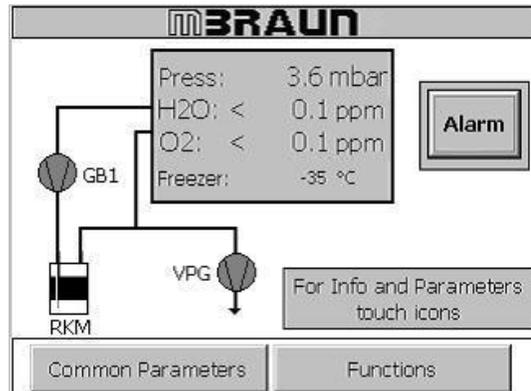
When the moisture analyzer reaches the 2,000 operating hours a button is displayed on the Common Parameters Screen. The Alarm icon will also be displayed until acknowledged. When these are displayed it is necessary to clean the probe on the analyzer. Follow the instructions carefully to avoid damaging the sensor probe.

Materials Required

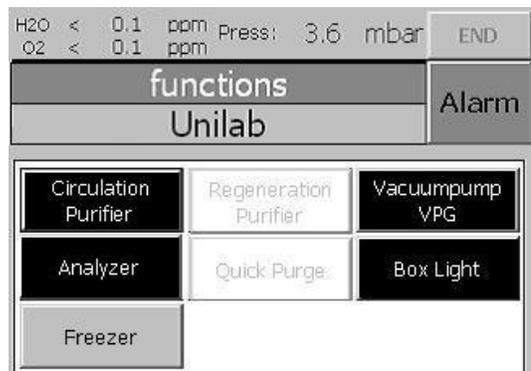
- Soft absorbent lint free cloth
- Phosphoric Acid
- Distilled Water
- Personal Protective Equipment (gloves, goggles, apron)

Instructions

Touch the **Functions** button on the Start Screen.



Touch the **Analyzers** button to deactivate the analyzers.



Remove the RJ45 plug connector from the analyzer.



Remove clamp and analyzer.



Place a blank KF40 cap over the pipe and secure in place with the clamp.



Separate the protective cover on the probe by turning in a counter clockwise direction.

Slowly and carefully remove the cover from the probe.



Place an absorbent lint free cloth under the probe and moisten the probe with distilled water.



Wrap the moistened cloth around the probe. Gently spin the cloth in a clockwise direction to clean the probe.



Dry the probe in the same manner with a dry lint free cloth.

Place an absorbent lint free cloth under the probe and moisten the probe with Phosphoric Acid.



Carefully replace the protective cover and secure in place by turning a clockwise direction.



Remove KF40 clamp and blank cap.



Carefully place the sensor end of the analyzer into the port on the circulation piping.



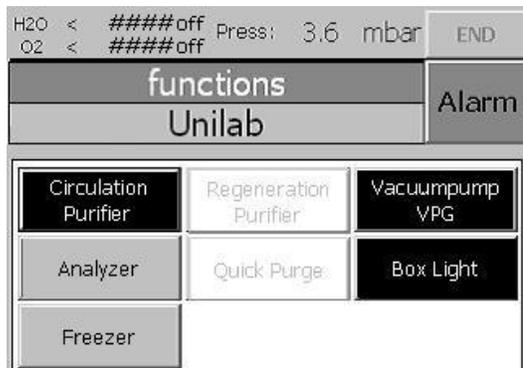
Secure in place with the KF40 clamp.



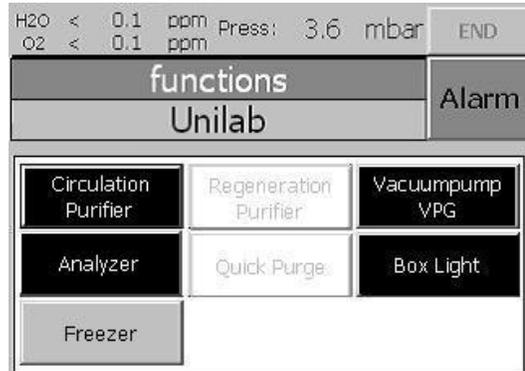
Insert the analyzer cable plug into the hole on the analyzer by pushing the plug into the hole gently until it snaps into place.



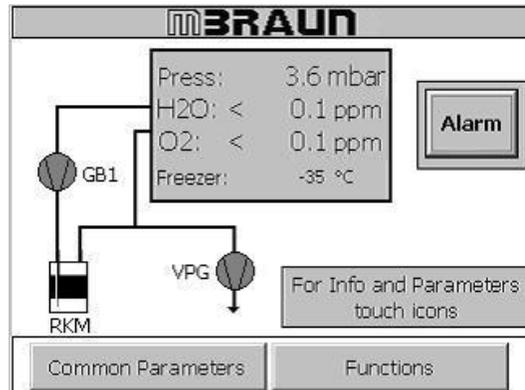
Touch the **Analyzers** button on the Functions screen to reactivate the analyzers.



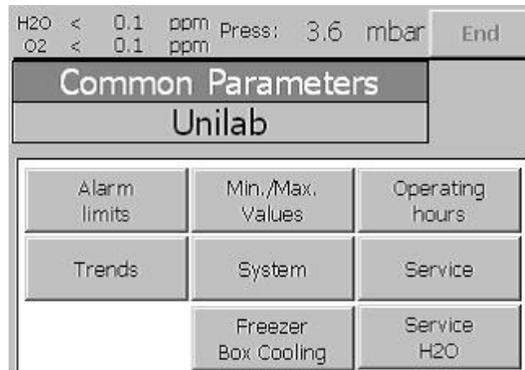
Touch the **End** button to return to the Start Screen.



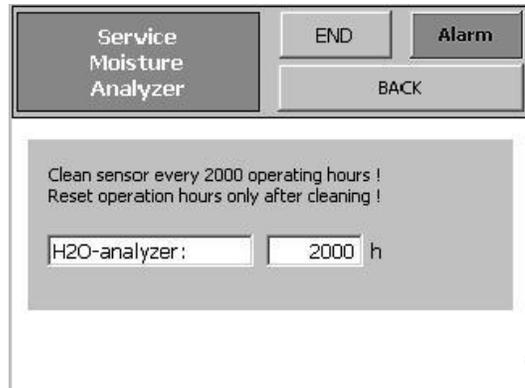
Touch the **Common Parameters** button on the Start Screen.



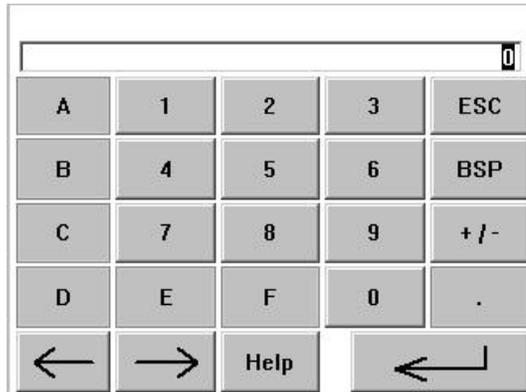
Touch the **Service H2O** button on the Common Parameters screen.



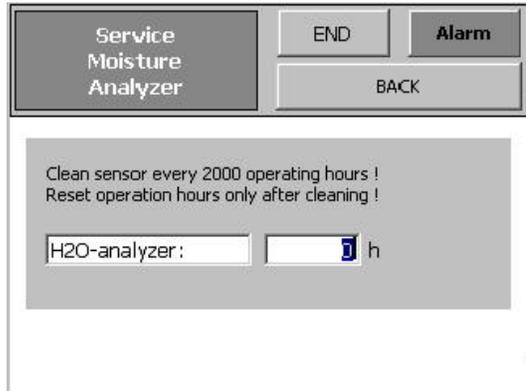
Touch the operating hours field to display the alphanumeric keypad.



Enter a value of **Zero (0)** and touch the  key to return to the Service Moisture Analyzer screen.



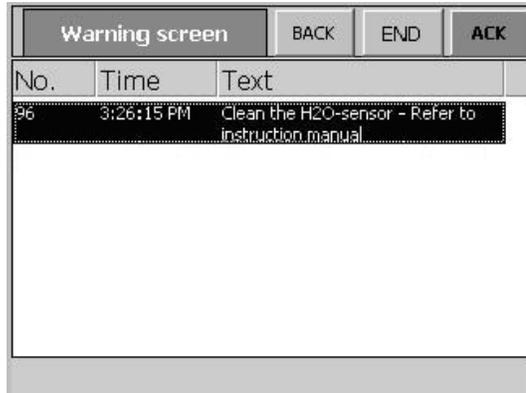
Touch the **Alarm** button to display the Warnings screen.



Highlight the alarm and touch the **ACK** button to delete the warning and acknowledge the alarm.

This will cause the **Service H2O** and **Alarm** buttons to disappear.

Touch the **End** button to return to the Start Screen and continue with normal operation.



10.6 Alarms

General Information

The following troubleshooting guidelines address the possible alarm warnings that the user may encounter during operation of the system.



Contact MBRAUN directly with any questions that arise while attempting to troubleshoot the system or if an alarm message is displayed that is not included below. Do not attempt to resolve the problem.

Circulation Gas Flow

There is no gas flow to the experiment during circulation process.

Check the gas supply line. Is there gas from the main supply line into the system?	Yes – proceed to next step. No – turn on gas supply and continue normal operation. Proceed to next step if there is still no gas flow to the experiment.
Check the valve activation gas supply for correct flow rate (between 50 and 80psi) and adjust, if necessary. Did this correct the problem?	Yes – continue normal operation. No – Proceed to next step.
Check the connector plug on each VHA & VHE valve to ensure it is securely tightened to the valve body. Did the valve open?	Yes – continue normal operation No – contact M.Braun Service Department.

Regeneration Gas Flow

There is no gas flow through the system during regeneration process.

Check the gas supply line. Is there gas from the main supply line into the system?	Yes – proceed to next step. No – turn on gas supply and continue normal operation. Proceed to next step if there is still no gas through the system.
Check the gas supply for correct flow rate (between 5 and 10psi) and adjust, if necessary. Did this correct the problem?	Yes – continue normal operation. No – Proceed to next step.
Check the connector plug on each VRE and VRS valve to ensure it is securely tightened to the valve body. Did the valve open?	Yes – continue normal operation No – proceed to next step
Check each VRE and VRS valve on the active filter for a yellow LED which indicates there is a signal being sent to the valve from the PLC. Is the light on?	Yes, the light is on but the valve is not open and there is no flow to the experiment. – contact M.Braun Service Department. No – contact M.Braun Service Department.

Power Supply

The Main Power switch on the front of the system is set to the **On** position but the system is not functioning.

Is the system plugged into the main power supply?	Yes – proceed to next step No – Turn the main power switch to the Off position and plug the system in. Turn the switch to the On position and resume normal operation. Proceed to next step if this does not fix the problem.
Open the electrical cabinet located inside the system. Check main power breakers F1 . Reset the blown breaker.	Did this correct the problem? Yes – continue normal operation No – contact M.Braun Service Department.

NOTICE

If a breaker that has been reset blows again, contact the M.Braun Service Department.

Purifier Inlet/Outlet Not Open

One or both of the valves controlling circulation flow to and from the purifier bed fails to open. Possible reasons for failure are:

- The gas pressure required to open the valve is too low;
- The gas supply tanks are empty.

Reset the regulator on the gas supply to 80psi. Did the valve open?	Yes – continue normal operation No – contact the M.Braun Service Department.
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Vacuum Pump VPG1: Motor Protective Switch Activated

The vacuum pump controlling antechamber evacuation is drawing too much current. Possible reasons for failure are:

- Debris in the vacuum pump;
- Vacuum pump oil is low or degraded;
- Vacuum pump is defective.

Check the vacuum pump oil level using the sight glass. Top off the oil level as needed. Did this fix the problem?	Yes – continue normal operation No – proceed to the next step.
Check the vacuum pump oil color using the sight glass, it should be clear. Change the oil in the vacuum pump. Did this fix the problem?	Yes – continue normal operation No – proceed to the next step.
Open the electrical cabinet and check the F4 breaker. Reset it if it is blown. Did this fix the problem?	Yes – continue normal operation No – contact the M.Braun Service Department.

Blower GB1: Motor Protective Switch Activated

The blower has exceeded current draw limit. Possible reasons for failure are:

- The filter(s) is clogged;
- The blower is drawing too much amperage;
- A power outage or power surge;
- System restart;
- The blower is defective.

Check the inlet and outlet filters inside the glovebox. Replace or clean as needed. Did this fix the problem?	Yes – continue normal operation No – proceed to the next step.
Open the electrical cabinet and check the F3 breaker. Reset it if it is blown. Did this fix the problem?	Yes – continue normal operation No – proceed to the next step.
Deactivate circulation via the Functions menu. Push the Fn button on the frequency converter to reset it. Reactivate circulation. Did this fix the problem?	Yes – continue normal operation No – contact the M.Braun Service Department.

Box Pressure Too Low Vacuum Pump VPG1 Switched Off

The glovebox pressure has dropped to a level below -15mbar. Possible reasons for failure are:

- The antechamber evacuation valve is open and the inner door is not sealed properly;
- An open auxiliary vacuum source inside the glovebox not controlled by the PLC.

Turn the antechamber evacuation valves to the closed position. Verify the inner door is sealed completely. Did this fix the problem?	Yes – continue normal operation No – proceed to the next step.
Check auxiliary vacuum sources located within the glovebox. Ensure all seals are seated properly and securely. Fix the connections as needed. Did this fix the problem?	Yes – continue normal operation No – contact the M.Braun Service Department.

Box Pressure Too High

The glovebox pressure has risen to a level above +15mbar. Possible reasons for failure are:

- Entering the glovebox, using the gloves, too quickly;
- Upper working setpoint parameter is too close to the upper working limit;
- Auxiliary gas supply is open.

Check the upper working setpoint parameter. Adjust as necessary to a limit of 10mbar or below. Did this fix the problem?	Yes – continue normal operation No – proceed to the next step.
Turn off any unused auxiliary gas supply. Did this fix the problem?	Yes – continue normal operation No – contact the M.Braun Service Department.

Sensor Box Pressure Defective

The main pressure sensor for the system has failed causing circulation, analyzers, gas in and gas out to be deactivated. Contact the M.Braun Service Department to obtain a replacement sensor.

O2 or H2O Sensor Defective

The oxygen or moisture analyzer is not displaying a numerical reading on the PLC screen. Possible reasons for failure are:

- The cable is damaged;
- The RJ45 connector is not inserted correctly;
- The sensor head is damaged or defective.

Check the RJ45 connector to ensure it is plugged into the analyzer properly. Adjust as necessary. Did this fix the problem?	Yes – continue normal operation No – proceed to the next step.
Unplug the RJ45 connector. Inspect the cable and plug for damage. Reinsert the connector back into the analyzer. Did this fix the problem?	Yes – continue normal operation No – contact the M.Braun Service Department.

Freezer Motor Protective Switch Activated Box Cooling Motor Protective Switch Activated

The compressor used to operate the freezer or box cooling unit has exceeded current draw limit. Possible reasons for failure are:

- The compressor is drawing too much amperage;
- A power outage or power surge;
- System restart;
- The compressor is defective.

Open the electrical cabinet and check the F7 breaker (freezer) or F8 breaker (box cooling). Reset it if it is blown. Did this fix the problem?	Yes – continue normal operation No – contact the M.Braun Service Department.
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