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Operation and Maintenance Manual

HypoxyCOOL[®]

Media Conditioning Chamber



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INTRODUCTION

Please read this manual carefully before using the HypoxyCOOL® and familiarize yourself with all aspects of using the unit. The Baker Company (Baker) does not accept any responsibility for accidents to personnel or damage to the HypoxyCOOL® unit resulting from incorrect use.

The HypoxyCOOL® has been specifically designed and developed to meet the requirements of all laboratories. The unit is ergonomically laid out to ensure maximum operator comfort and optimization of space for media conditioning. HypoxyCOOL® is designed to give optimum conditions for cell culture in a simple and easily controlled manner.

The system is equipped with a gas control module and an oxygen sensor to allow for constant monitoring of atmosphere. Hypoxic conditions are created using a nitrogen gas mix to effectively, efficiently and sterilely displace oxygen down to desired concentration. User can select a concentration anywhere between 0.5% and 15% O₂.

A refrigeration system maintains the temperature within the chamber between 2°C and 6°C, which is set by the user. The shaker unit can be set between 40 and 120 RPM to aid in efficient gas exchange between the chamber atmosphere and the media.

Many unique features of the HypoxyCOOL® station are covered in detail in this manual. It is recommended that the user be fully conversant with the instructions and procedures, and that the operator familiarizes themselves with all aspects and functions of the system before it is commissioned to maintain optimum performance of the unit.

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Symbols used in this manual



The warning “!” symbol identifies potential hazards associated with the use of this equipment.

SAFETY

Baker does not take any responsibility for damages caused by using the equipment for other purposes than described in this user manual.

- All installation work and adjustments to the unit must be carried out by qualified personnel. Work performed by persons with insufficient technical knowledge may adversely affect the performance of the unit or cause physical injury or damage to the equipment.
- All servicing and repairs must be carried out by a qualified customer service engineer. Only genuine spare parts must be used.
- Ensure that the connecting cable is not squeezed or bent when the unit is being installed or moved.
- Before cleaning or carrying out maintenance work, always switch the machine off and disconnect the main plug. Always pull the plug and never the cable. If the plug is not accessible, switch off at the safety device.
- The unit's cooling system contains refrigerant. Both the unit and the products stored inside can be severely damaged if this system starts to leak. Therefore, make sure that no sharp or pointed objects come into contact with the cooling system.
- This product must be used in the manner described in this manual. Safety protections incorporated in the product may be impaired if the product is not used in the manner specified in this manual.



Asphyxiation Risk

The HypoxyCOOL® releases a controlled volume of nitrogen into the environment. Normally the volume released is inconsequential. In the event of a leak or malfunction this nitrogen release may become excessive. **DO NOT OPERATE** this unit in a **SMALL ENCLOSURE** such as a small room or walk-in closet. An accidental release of nitrogen could create an asphyxiating atmosphere in a small space.

TRANSPORT

- Check for damage when the unit is delivered. If you find that damage has occurred in transit, immediately contact the delivery service or sales representative, submitting the delivery note or proof of purchase.
- Do not operate a unit that has been damaged in transit! If you are unsure, contact your sales representative.
- The unit must be transported in an upright position (maximum tipping of the unit should not exceed 45°).

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PRINCIPLES OF OPERATION

Cell or tissue culture is the maintenance of cell populations *in-vitro*, either a stabilized cell line or by retrieving cells from a primary tissue sample. This typically involves the use of liquid growth media and a CO₂ incubator to keep cells stable and proliferating (e.g. *in vitro* methods to mimic *in vivo* physiology).

Much effort has gone into validating the composition of the growth medium in terms of pH, glucose concentration, growth factors, and the presence of other nutrients. However to date very little attention has been paid to the oxygen concentration within the media, even by users of commercially available hypoxia incubators and workstations.

Baker is the first company to produce a unit that pre-conditions liquid media, the HypoxyCOOL[®]. This allows for efficient and stable conditioning of media to a desired O₂ concentration, with no disruption to media pH. We have shown that using *in-vivo* O₂ levels in media stabilizes cell cultures, increasing viability and transcriptional stability. Conditioned media complements use of a physiologically accurate O₂ level in an oxygen controlled incubator, increasing stability and improving your results.

The HypoxyCOOL[®] is a temperature and atmosphere controlled chamber for use in the preparation or conditioning of cell culture media. The HypoxyCOOL[®] concept represents a combination of oxygen concentration control, temperature control, and media agitation to increase efficiency of gas exchange.

The HypoxyCOOL[®] unit consists of three main parts - an environment controlled compartment, a refrigeration system, and a gas mixer. The controlled compartment is regulated by the refrigeration system and gas mixer, and has a stabilized internal atmosphere with defined temperature and gas concentrations (e.g. oxygen at concentrations lower than the ambient atmosphere).

The user by selects the desired temperature, speed of the shaker plate (RPM) and endpoint O₂ concentration within the chamber. The media bottles are placed in the internal compartment on a shaker tray and the mixer agitates the media to increase gas exchange. Maintaining a low temperature at liquid surface is proven to increase the rate of gas exchange in the cell culture media. Temperature regulated atmosphere is circulated within the unit by a tangential fan mounted at the bottom of the chamber.

Gas input to the conditioning chamber is regulated by a controller. The controller adds gas in a precise manner, so that proper gas levels are maintained within the set point. Maintaining gas levels and temperature is crucial to efficient and stable conditioning of the media. A set of valves is used in conjunction with the gas injection to maintain pressure and gas concentrations. These valves also maintain the internal pressure by releasing excess gas from the system as gas is added by the controller.

Before starting the unit, the user replaces original media bottle caps with special gas permeable caps in a sterile manner. Then the user selects operating parameters, places the media bottles in the shaker tray in the atmosphere controlled chamber, selects a run-time period, and starts the cycle. During the cycle, the temperature and gas composition are maintained at user selected set point. After the time elapses, there is an audio and visual indication that the cycle is complete, and the media bottles are ready to be taken out. The user then takes the media bottles and replaces permeable caps with the original caps. The media is ready for use and is stable for some time at 4°C.

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LOCATION AND HANDLING OF THE HYPOXYCOOL®

Location

The unit is intended for indoor use only. Baker recommends installing the HypoxyCOOL® unit on a suitably constructed flat and level surface, either on or under a laboratory bench that is clear of all obstructions, in order to prevent damage to the enclosure. The minimum distance from the back of the unit to the wall must be at least 4" (100 mm). Do not place any object in front of the units closer than 8" (200 mm). These objects will restrict the condenser air flow and can impair the temperature control.

Avoid placing the unit in the direct sunlight or locating it close to a heat source. The ambient temperature of the location should be from 41°F to 95°F (5°C to 40°C). The relative humidity must not exceed 85% for the temperature of 95°F (35°C). The altitude of the location must not exceed 6,500 ft. (2,000 m).

The power switch is located on the rear of the unit to prevent inadvertent operation. Locate the unit such that the operator can easily access the power switch when necessary.

Handling

If it is necessary to move the HypoxyCOOL® short distances (e.g. onto an adjacent bench) it is recommended that the unit be disconnected from electrical and gas supply and moved by a minimum of two people with the aid of suitably sturdy trolley. Care should be taken to ensure that when lifting the unit, it is supported from underneath on both sides. Make sure that the door is properly latched during the moving process.

CLEANING / DISINFECTING

Clean or disinfect the unit inside and outside before using it. Use only gentle cleaning agents. Never use aggressive or caustic cleaning agents, scouring powder, steel wool, abrasive sponges, or chemical solvents. For disinfecting, we recommend the surface disinfecting agents commonly used within a user's facility and / or recommended by NSF International or other national organizations.

SERVICE REQUIREMENTS

Electrical Requirements

Voltage	115V	230V
Frequency	60HZ	50HZ
Rated Current	10A	4A
Circuit Protection	Maximum overcurrent protective device: 20A	Maximum overcurrent protective device: 16A
Power Inlet	IEC 60320 type C-14 power inlet	

A correct type molded plug is supplied with each unit and is specific to the region of installation. Insure that the power source provides a proper earth (ground) connection.

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Gas Supply Requirements



Warning: Maximum gas pressure must not be exceeded. Excessive pressure could cause hazardous failure of pressure containing components.

Gas	N ₂ (Nitrogen)
Specification	Medical Grade
Supply Pressure	
Min	35 PSI (241.3 kPa)
Max	70 PSI (482.6 kPa)
Typical Flow Rate	1.0 SCFM (30 l/min)

Use a cylinder with 100% medical grade N₂ vapor withdrawal, together with a two-stage regulator for pressure control. It is essential that the correct regulator is used. Nitrogen service regulators are available from your local gas supplier. If there is any doubt or further information is needed please contact Customer Service or your Baker Sales Representative before proceeding with the installation.

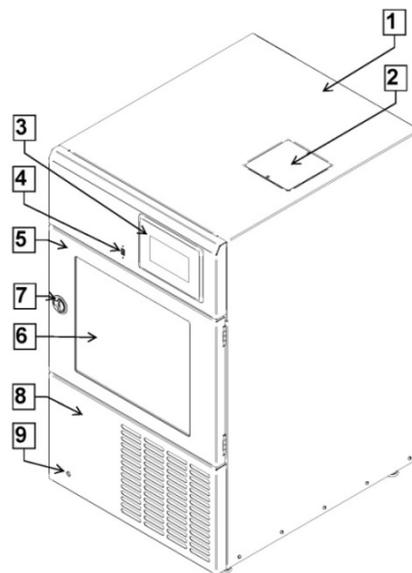
The table summarizing average nitrogen consumption is presented below. The table shows typical numbers for a given oxygen concentration with no door openings in the middle of the cycle.

% O ₂	l/hr	SCFM	SCFH
0.5	218	0.128	7.70
1.0	154	0.091	5.46
2.0	100	0.059	3.54
4.0	68	0.040	2.39
6.0	45	0.027	1.59
10.0	15	0.009	0.55
15.0	8	0.005	0.28

DESCRIPTION OF HYPOXYCOOL®

The HypoxyCOOL® unit consists of three major parts. The gas controller is located in the top part of the unit. The temperature controlled atmosphere chamber with evaporator coil, shaker, and insulated door occupies the middle part of the unit. The refrigeration condensing unit is located at the bottom of HypoxyCOOL®. Exterior isometric view of the HypoxyCOOL® unit:

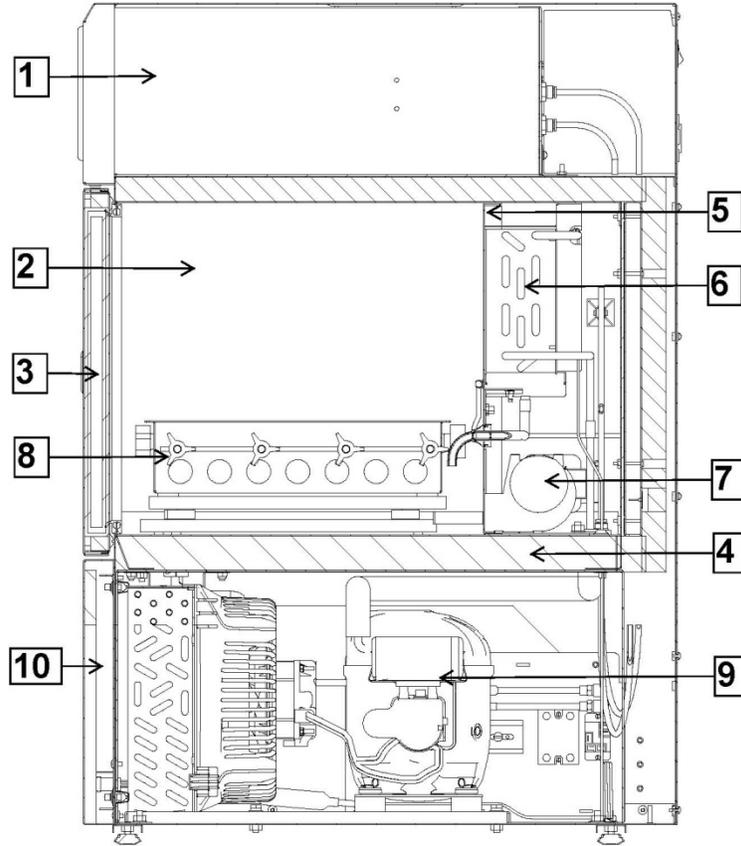
1. Enclosure
2. Oxygen sensor access door
3. Color touch screen
4. USB port for use with USB flash memory device
5. Insulated door
6. Viewing window
7. Door latch
8. Removable condenser panel
9. Indicator light



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Internal View of Components

The internal view of major HypoxyCOOL® components is presented below:



1. Gas controller
2. Temperature controlled atmosphere chamber
3. Insulated door with window
4. Thermal insulation
5. Partition
6. Evaporator coil
7. Recirculating fan
8. Shaker with media tray
9. Refrigeration condensing unit
10. Air filter

In the HypoxyCOOL® unit, temperature is controlled by turning the refrigeration unit ON and OFF depending on the cooling demand. The recirculating fan stays on all the time except when the door is open.

The heat removal in the HypoxyCOOL® is done by means of mechanical refrigeration utilizing vapor compression cycle. The refrigeration condensing unit is located in the lower portion of the apparatus

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and is thermally isolated from the media chamber. The evaporator coil is located in the back side of the atmosphere chamber and supplies the cooling needed to lower the temperature to the set point (e.g. the temperature required for the best gas exchange for the cell culture media). The cooled atmosphere is circulated within the chamber providing a high heat transfer rate between the atmosphere and the media.

The reduced O₂ concentration level is achieved by displacement of oxygen with nitrogen gas. The controller reads the oxygen level in the chamber using an oxygen sensor and adds nitrogen gas in the appropriate proportion to achieve the oxygen level set point.

The agitator shakes or agitates the cell culture media to continuously replace the surface of the media and expose it to the controlled atmosphere. The shaker is rotated via the speed controlled stepper motor. The shaker consists of a motor, shaker plates, cams, and rods for holding the media containers on the media tray. The media tray is located on top of the upper shaker plate with soft feet sitting in the mounting holes. The tray can be easily removed from the upper plate for loading and cleaning. The motor drives a cam that creates an oscillation in the upper plate. Other cams help guide the plate in a controlled oscillation.

UTILITIES CONNECTION

Connecting the Gas Supply

The picture below shows typical gas cylinder setup with regulator and flexible gas supply tube.

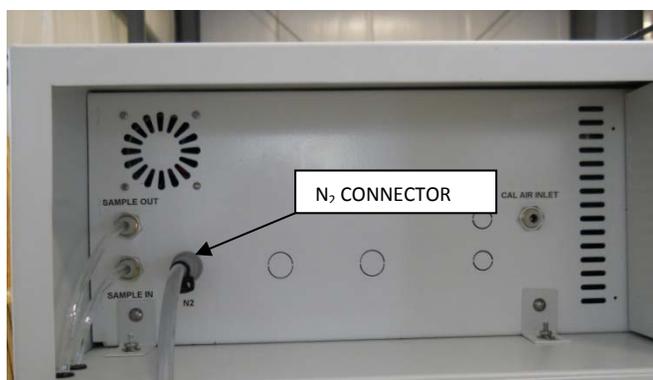


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Each unit is supplied with a barbed push fit connector with push-to-open internal valve.



- Gas push fit connector must be connected to a flexible plastic tube $\frac{1}{4}$ " (6 mm) ID. The tube must be secured with an appropriate tube or hose clamp. Plastic tubes, tube fittings, and clamps can be purchased from any laboratory supply outlet.
- Connect the other end of the tube to the outlet of the gas regulator and secure with the tube or hose clamp. Make sure that the gas line provides free unobstructed gas flow, does not kink, and does not touch sharp objects.
- Make sure the gas bottle is turned to off position.
- Connect a push fit connector into the gas inlet marked N₂ on the back panel of the HypoxyCOOL® unit by pushing it in and turning clockwise $\frac{1}{8}$ of a turn as represented in the picture below.



- Turn the gas cylinder to the on position. The bottle pressure gauge on the two-stage regulator will rise to indicate the amount of pressure remaining in the gas bottle.
- Slowly turn the knob on the two-stage regulator until the output pressure dial starts to rise. Stop when the output pressure reaches approximately 50 psi (345 kPa).
- Perform a leak test around the connections. This can be done with either a gas leak detector or gas leak detection spray. If leakage is found re-tighten the tube clamps until a gas tight seal is achieved.

Note: If you experience any problems with the gas cylinder while connecting the HypoxyCOOL®, please contact the local gas supplier.

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Connecting to the Electrical Supply

An IEC molded power cord is supplied with a molded plug for the appropriate region of installation. Before attempting to connect the power you should first familiarize yourself with the layout of the power entry panel of the HypoxyCOOL®. The power entry panel can be found at the back of the unit in the upper right hand corner. The picture of the panel is shown below.



- Make sure that the power in the electrical outlet corresponds to the power requirements of the HypoxyCOOL® unit installed. Refer to the nameplate and label above the power inlet for the unit power requirement.
- Make sure the area around the rear panel is free from any obstructions and is accessible at all times.
- To plug the power into the HypoxyCOOL® unit insert the male three pin molded receptacle on the IEC power cord into the power inlet shown on the above diagram.
- Do not switch the unit power On/Off switch on at this time!
- Now plug the other end of the supplied cord into the wall socket electricity supply. If the wall supply socket is a switched type, turn on the power supply at this point.

POWERING UP

- Turn the On/Off switch located on the power entry panel to the “On” position.
- A blue light will illuminate on the lower left-hand corner of the HypoxyCOOL® to indicate the power supply is active.

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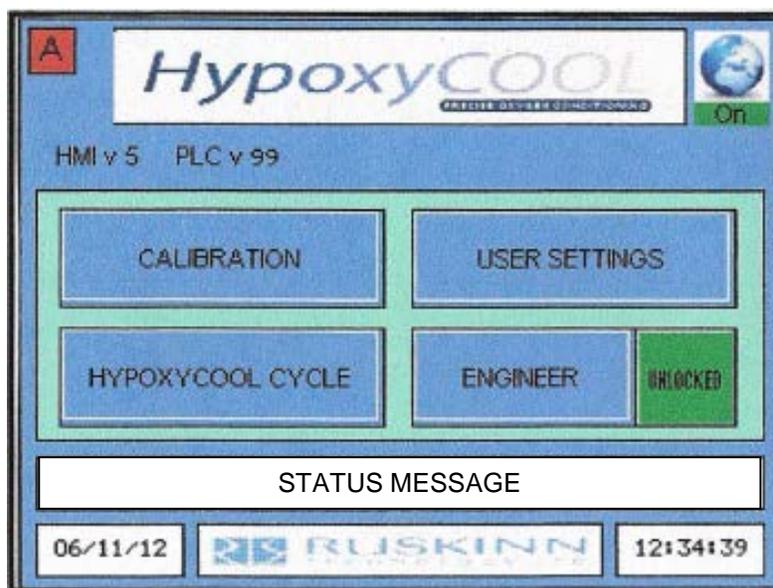
- A blue LED light on the touch screen panel will illuminate to indicate the gas mixer powered state.
- The screen will run through an initial boot-up sequence.
- After a few seconds the screen will display the Main Screen.

The HypoxyCOOL® unit is now ready to operate.

SCREENS

The screens are designed in a traditional Windows-like hierarchical structure. Moving from one screen to another is done by touching corresponding area of the screen, referred to as button throughout this manual. From each screen the operator can go back or to the main screen, by selecting Main Menu.

Main Screen



The HypoxyCOOL® Main Screen contains four menu options.

- Calibration
- User Settings
- HypoxyCOOL® Cycle
- Engineer – this option is locked and only accessible by a service engineer.

By selecting one of the four menu option a new corresponding screen is displayed.

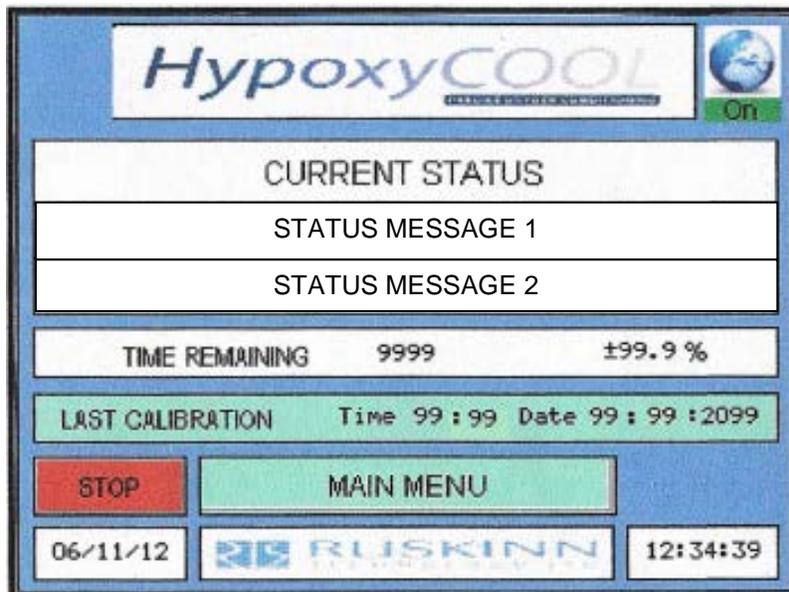
There is also a status message bar below the options and a calendar/clock in the lower corners. Status messages inform the operator about the status of the unit and they are:

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1. STANDARD CYCLE RUNNING
2. USER 1 CYCLE RUNNING
3. USER 2 CYCLE RUNNING
4. USER 3 CYCLE RUNNING
5. USER 4 CYCLE RUNNING
6. USER 5 CYCLE RUNNING
7. STANDARD CYCLE STOPPED
8. USER 1 CYCLE STOPPED
9. USER 2 CYCLE STOPPED
10. USER 3 CYCLE STOPPED
11. USER 4 CYCLE STOPPED
12. USER 5 CYCLE STOPPED
13. START DELAY ACTIVE
14. CYCLE COMPLETE
15. NO GASES CONNECTED

Calibration

Before starting the HypoxyCOOL® for the first time, a calibration of the system oxygen sensor must be performed. Press the CALIBRATION button from Main Menu options. The current status of the oxygen sensor & time & date of last calibration is displayed. Press the START/STOP button and let the calibration cycle to run. The status messages below CURRENT STATUS line will inform the operator about the events and operations taking place at each stage.



STATUS MESSAGE 1:

1. PRESS START TO BEGIN CALIBRATION
2. FLUSHING CHAMBER WITH NITROGEN
3. FLUSHING CHAMBER WITH AIR

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STATUS MESSAGE 2:

1. READY
2. PURGING
3. CALIBRATING AT ZERO
4. SENSOR FAILED AT ZERO
5. CALIBRATING AT ATMOSPHERE
6. SENSOR FAILED AT ATMOSPHERE
7. SENSOR PASSED

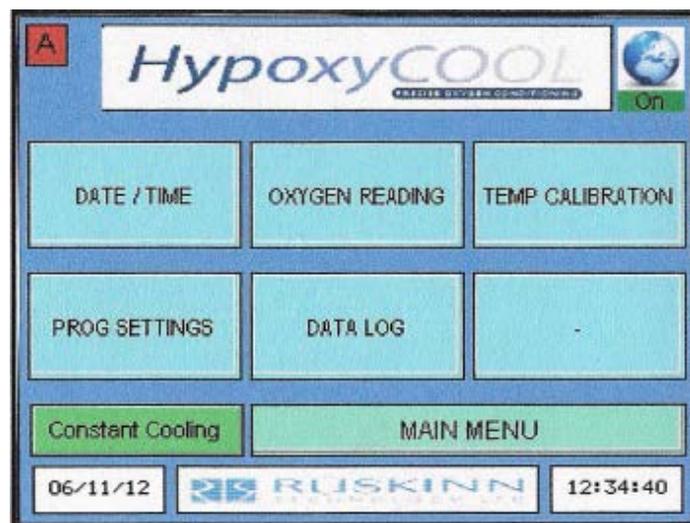
When the sensor fails, a sensor fail message will be shown and include which condition has failed. The oxygen cell will need to be replaced before you can continue to use the HypoxyCOOL®. Once the sensor passes the calibration, the message SENSOR PASSED appears. Press MAIN MENU to return to the main screen and continue to use the HypoxyCOOL®.

Oxygen sensor calibration should be performed at least once a year. The date of last calibration is stored in the memory and when the date of new calibration approaches a reminder message will be generated. If the operator suspects that the unit is out of calibration or sensor produces incorrect reading, it is advisable to perform the calibration at any time.

User Setting

The USER SETTING screen provides access to set the various parameters of the HypoxyCOOL®. These parameters are:

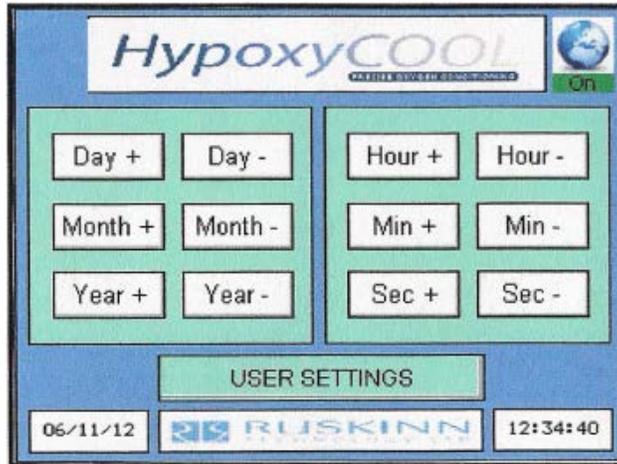
- Date & Time
- User Program Settings
- External Oxygen Level
- Data Log Management
- Temperature Calibration
- Constant or Cycle Only Cooling Options



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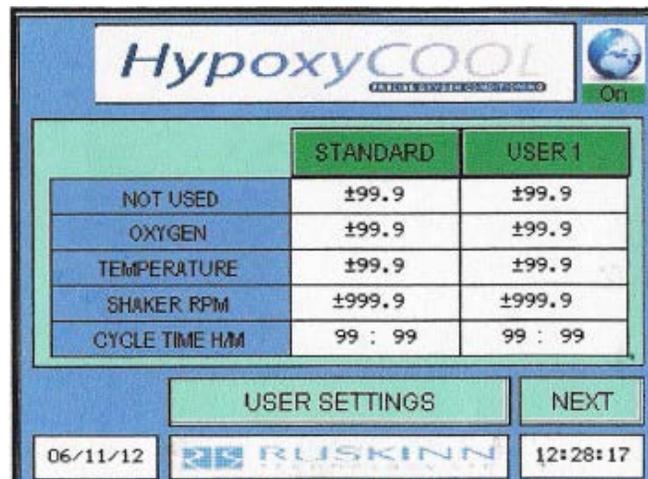
Date / Time

On this screen the system calendar and clock can be adjusted to the specific time zone using the appropriate + / - buttons. The date is represented in the format DAY/MONTH/YEAR, the time is displayed in 24 hours format. Current data and time are displayed in the left and right lower corners of the screen, respectively.



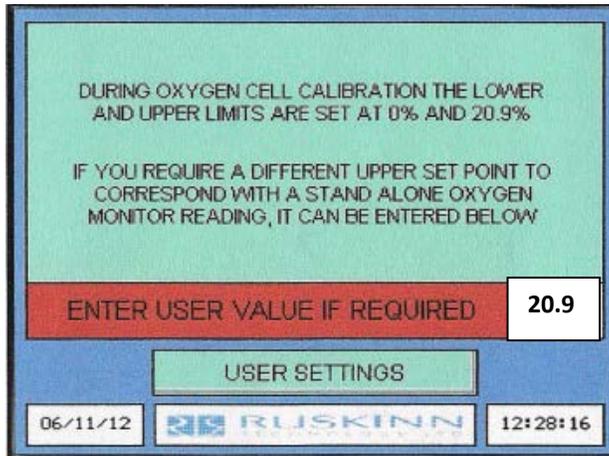
User Program Settings

This screen allows the user to select either the standard program or set up to five custom programs. The current program is highlighted by the green title bar while the others are highlighted in grey. The standard program settings are always displayed for reference, the user programs (USER 1 to USER 5) can be scrolled through using the NEXT / BACK button. The user programs allow the operator to set their own oxygen concentration levels, temperature, shaker RPM, and cycle time by touching the appropriate parameter, and adjusting to the desired set point using the pop up number entry pad. The operator can either select the standard program (STANDARD) or select one of the user programs (USER 1 to USER 5).



External Oxygen Level

During oxygen sensor calibration, the low oxygen concentration limit is 0% and the upper limit is 20.9% (atmospheric O₂ level). During the calibration cycle the upper limit can be changed to match an independently-calibrated oxygen meter reading if required. If adjusted, upon completion it will return to the default value (20.9%). To change the value, push the button showing the oxygen concentration next to “ENTER USER VALUE AS REQUIRED” and when numeric pad appears, enter the value matching the one from the reference instrument.

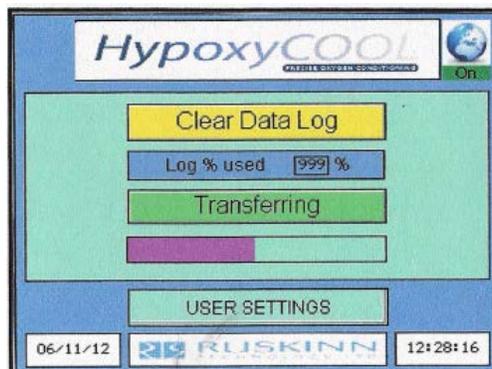


Data Log Management

The DATA LOG screen allows the user to transfer a log of the system’s parameter values during the media conditioning cycles to an external USB drive for analysis on a PC. The file is a .CSV format. Note that the USB port is intended for use ONLY with portable memory devices. It is not to be connected to any other electrical apparatus.

To perform the data transfer insert a USB drive into the USB port located on the front panel. Press the TRANSFER DATA button. When the data transfer starts, the TRANSFER DATA button is replaced with the message TRANSFERRING. The status bar displays transfer progresses. Once complete, the TRANSFER DATA button appears, and the USB drive can be removed. Clear data log by pressing the CLEAR DATA LOG button.

Once the log is full, new data will be written and the oldest data will be lost. The percent used capacity is displayed for reference.



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Constant or Cycle-Only Cooling

The refrigeration system can be set to run constantly or only during cycle operation. Running constantly allows the system to maintain the chamber temperature at the cooling-cycle set point; however, more power is consumed. Running the refrigeration system only during cycles saves power, but the main compartment must be cooled from the ambient temperature to the set point each time a cycle is run. If you only run one or two cycles a day then the cycle-only mode. To run the cooling constantly, the operator should select COOLING ONLY button from the User Setting screen.

HypoxyCOOL® Cycle

The HYPOXYCOOL CYCLE screen displays the parameter information for oxygen, temperature, and shaker tray speed, the program selected to run, cycle time duration, and start delay. The START/STOP button starts or stops the selected cycle, and DATA LOG button will display the data log trend on the screen.

Before starting the cycle, check that the program you intend to run is displayed in the SELECTED PROGRAM field (at the top of the screen) and the set points for the oxygen concentration and temperature match your selection. If you have to delay the start of the cycle you can enter hourly offsets in the start delay box (e.g. if you need to leave the HypoxyCOOL® loaded with media bottles overnight and have the cycle completed by the start of the next day).

Once you are satisfied with the selections, press the START button. When the set points for oxygen concentration and temperature are reached within the chamber, the cycle timer and shaker tray will start. When the cycle timer has counted down the time, the cycle is complete and the media can be removed from the main compartment.

SELECTED PROGRAM --		USER 1	
	Set Point	Present Value	
START DELAY TIME	99	99 : 99	
CYCLE TIME	99 : 99	99 : 99	
- + SPEED	±999.9	±999.9	
TEMPERATURE	±99.9	±99.9	
OXYGEN	±99.9	±99.9	
NOT USED	±99.9	±99.9	
SYSTEM MESSAGE			
STOP	MAIN MENU		DATA LOG
04/10/12	RUSKINN		08:03:43

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As the HypoxyCOOL® cycle is in process, the status is displayed in the SYSTEM MESSAGE filed. The status messages are:

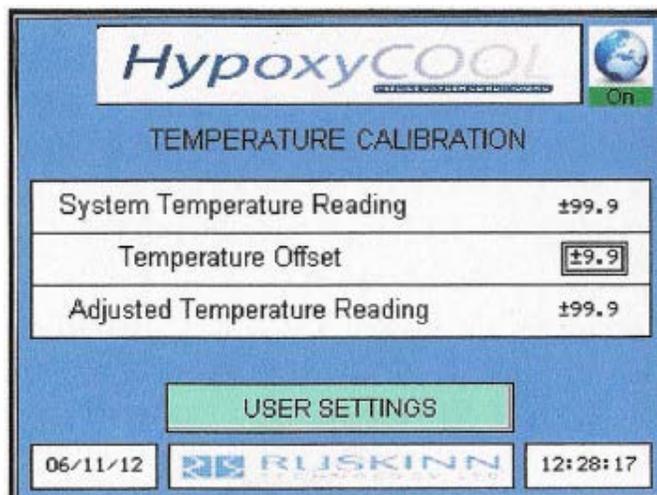
1. NO GAS CONNECTED
2. READY
3. SYSTEM PRE-CONDITIONING
4. CYCLE RUNNING
5. CYCLE COMPLETE

NO GAS CONNECTED is a diagnostic message informing the operator that the gas supply line is not connected or gas supply shut off valve is closed.

Temperature Calibration

If needed, the operator can perform the temperature calibration. It is recommended to perform the temperature calibration annually or when incorrect temperature readings are suspected. To perform temperature calibration the user needs an accurate calibrated temperature measuring device (reference instrument). We recommend using the meter with guaranteed accuracy of not less than $\pm 0.25^{\circ}\text{C}$, i.e. RTD based meter. To perform the temperature calibration:

1. Install the reference instrument inside the HypoxyCOOL chamber.
2. Stabilize the unit at the selected temperature.
3. Subtract the HypoxyCOOL “System Temperature Reading” from reference instrument readings.
4. Enter the Temperature Offset by pushing the rectangle next to “Temperature Offset” tag by using the pop up keypad.
5. Push “Ent”.
6. The new temperature is displayed at “Adjusted Temperature Reading” line.



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Data Log Screen

In addition to downloading the parameter data log to a USB, the user can also access the data log stored in the device memory. The data log trend gives immediate access to the last hour of logged data by scrolling back and forward through the pages. They display the date, time, the required set points for each parameter and the value of each parameter at each logging interval.

Date	Time	O2	N/A	Temp	RPM
		5.0	0.0	4.0	120
13/09/2012	15:35:34	5.0	0.0	3.5	121
13/09/2012	15:36:34	5.2	0.0	4.1	119
13/09/2012	15:37:34	5.0	0.0	4.6	119
13/09/2012	15:38:34	4.8	0.0	3.9	118
13/09/2012	15:39:34	4.9	0.0	3.6	119
13/09/2012	15:40:34	5.1	0.0	4.2	119
13/09/2012	15:41:34	5.3	0.0	4.3	120
13/09/2012	15:42:34	5.1	0.0	3.8	119
13/09/2012	15:43:34	5.0	0.0	3.8	121
13/09/2012	15:44:34	5.0	0.0	4.1	119

Page Back
Scroll Back
Scroll Fwd
Page Fwd

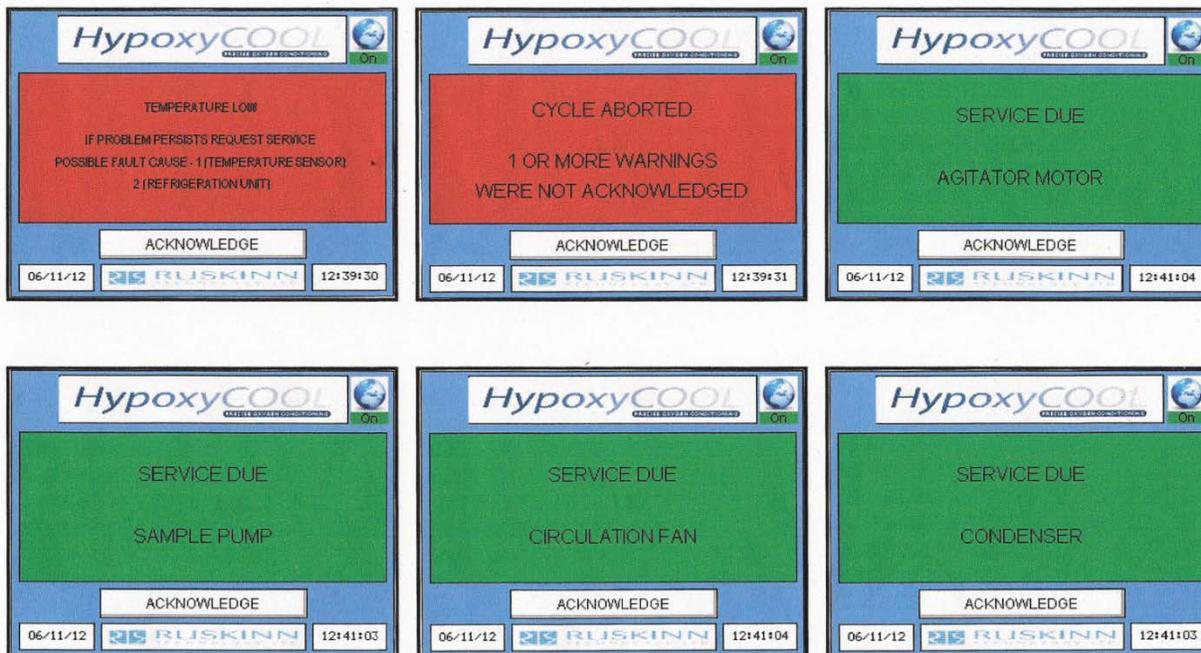
13/09/2012
RETURN
15:44:34

Warning Screens

If an error occurs, a warning screen or service request screen will be displayed with information on the suspected fault and possible causes. If required, contact Baker Customer Service for assistance. The examples of the warning screens are presented below:



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The audible alarm can be silenced by pressing the ACKNOWLEDGE button and will remain silent for a defined time period. The alarms will however re-trigger unless the cause of the alarm is found and the alarm is cleared. A silenced alarm will be indicated on all other screens with a red square containing the letter "A" flashing in the top left corner.

SERVICE INSTRUCTIONS

Condensate Removal

During the operation of the HypoxyCOOL® unit a condensate is formed on the evaporator coil surface. The condensate is collected and drained into a condensate container located in the bottom rear right corner of the atmosphere chamber, and must be emptied periodically. The frequency of this operation is determined by the temperature and relative humidity of the lab and the schedule of the operation. It can vary from days, weeks or months.

The condensate container is made out of semi-transparent plastic so the level of liquid in the container is clearly visible. Baker recommends daily inspection of the container. If required, use a flash light to inspect the container. If the container is approximately 1/3 to 1/2 full, it needs to be emptied. To empty the container:

- Remove the media tray and put it aside.
- Remove the condensate container by lifting it from the retaining bracket.
- Empty the container and rinse it with 70% alcohol solution for disinfecting.
- Put the container back in place, with the condensate tube in the container opening.
- Install the media tray.

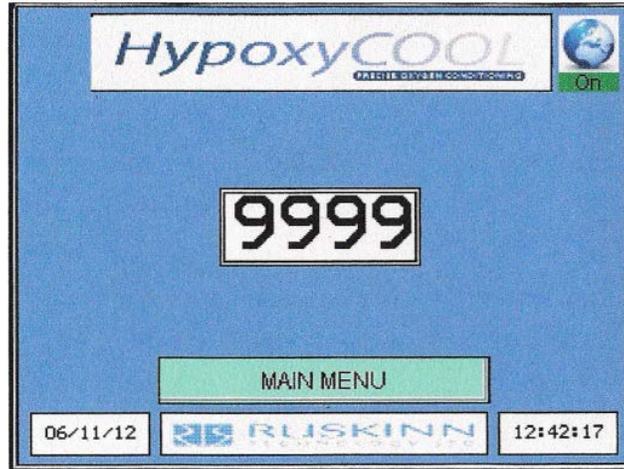


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Engineer Screen

The ENGINEER screen should be accessed by a service engineer or factory-trained personnel only. An access code is required to unlock this screen. To obtain the Access Code, contact the Baker Customer Service Department and provide them with the model number.

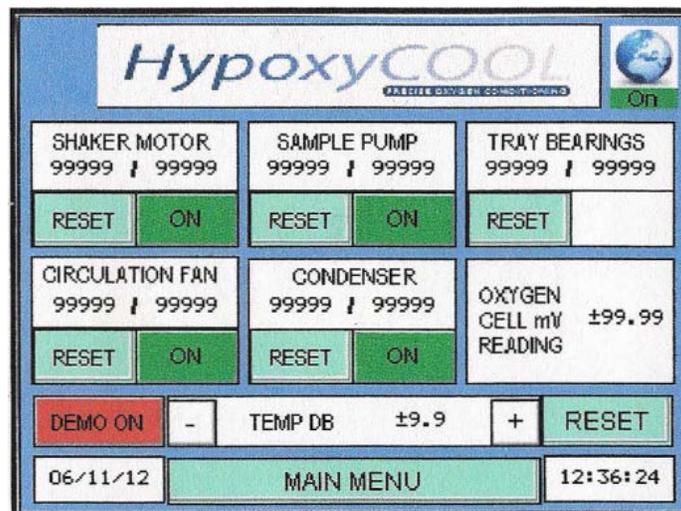
To unlock the ENGINEER button, push LOCKED button and enter the access code on the next screen.



Return to the Main Screen by pushing MAIN MENU button.

The ENGINEER screen now shows as UNLOCKED, and can be accessed by pushing the ENGINEER button.

Service hours for the SHAKER MOTOR, SAMPLE PUMP, CIRCULATION FAN, and TRAY BEARINGS are displayed. Total hours are shown on the right and hours since the component replacement are shown on the left. After component replacement press and hold the RESET button for 2 seconds to reset the display to zero. To test the functionality of the shaker motor, sample pump, and circulation fan, push ON/OFF button. The selected components will run until the ON/OFF button is pressed again.



The service engineer can change the value of the temperature dead band (DB) or hysteresis. The smaller DB value allows tighter temperature control, but more frequent condensing unit cycling; a larger value

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leads to larger temperature swings with less frequent cycling (this increases the life expectancy for the condensing unit). It is recommended to keep the DB at 2.0°C. The DB display shows the current value and + / - buttons. The value of the DB can be decreased or increased in 0.1°C increments by pressing the + / - buttons.

Note: Baker does not recommend reducing the temperature DB value below 2.0°C because it increases the compressor short cycling and reduces the life expectancy of the condensing unit.

The screen also shows the voltage reading from the oxygen sensor cell. This value should be used as a troubleshooting and diagnostics tool when servicing the oxygen sensor.

The button DEMO ON/OFF turns demonstration mode on or off. This mode is intended for exhibition or training purposes only. The DEMO mode allows the unit to run without gas, and forces the current gas level reading to mirror the set point.

To return the unit to factory settings, push FACTORY SETTINGS button.

SERVICE AND MAINTENANCE

There are no user serviceable parts inside the HypoxyCOOL® unit. Routine service interaction with the internal components (if required) is limited to:

1. Replacing the PLC battery
2. Replacing the oxygen sensor
3. Cleaning or replacing the condenser filter

Replacing the PLC battery

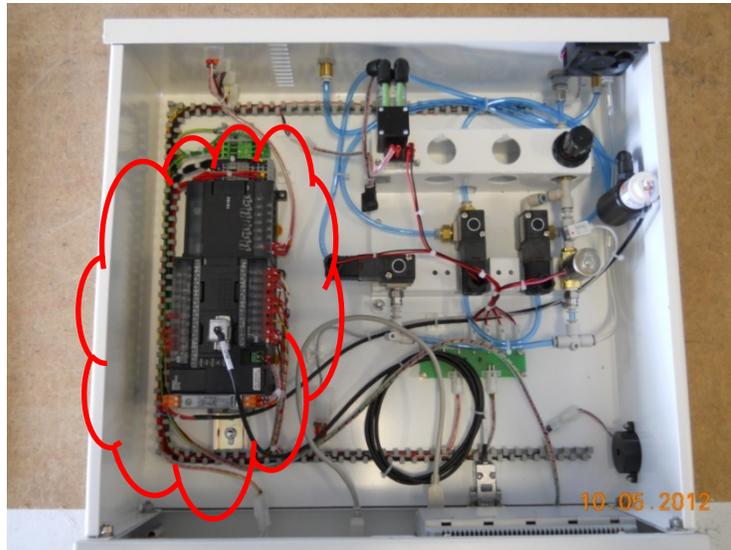
Some values in the PLC memory are stored in the volatile memory and protected by the battery; however, these values can be erased when the HypoxyCOOL® is disconnected from the power supply and battery is not charged. To prevent this from happening, the battery should be replaced at regular intervals of 4 years or less. According to the manufacturer's data, the PLC battery service life expectancy is 5 years at 25°C.

The PLC unit is located in the gas controller module in the top part of the unit. To access the PLC, disconnect the three cables at the back, unscrew the screws that attach the gas controller to the back panel, and push the gas controller half-way out. The back panel with cable connections is shown to the right.

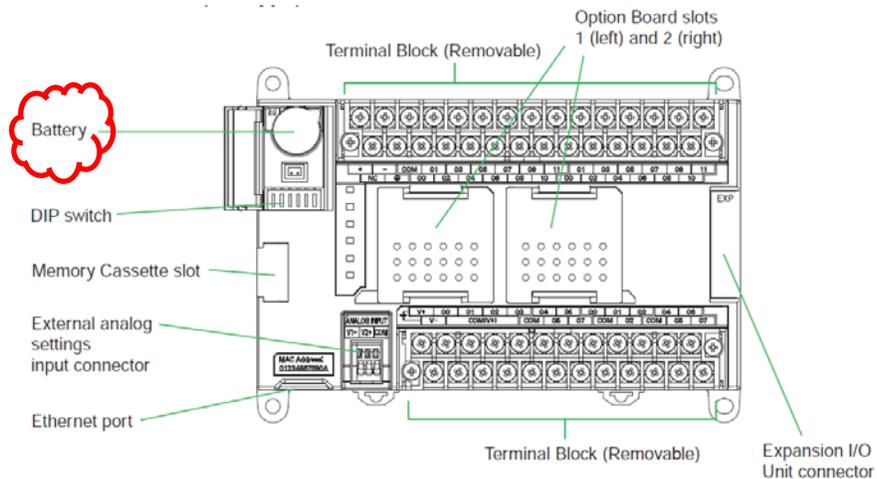


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The gas controller with the PLC module (clouded) is shown in the picture below.



The PLC battery can be purchased from an Omron dealer or from Baker (Omron Part# CJ1W-BAT01).



To replace the battery:

- Locate the battery compartment in the top left corner (see clouded caption above).
- Open the battery compartment door using a flat screw driver.
- Remove the battery from the compartment.
- Pull the wires to disconnect the plug.
- Install the battery in the reverse order.

Note: A new battery has to be replaced within one minute after disconnecting the old one, or there is a risk of erasing a volatile memory.

Replacing the Oxygen Sensor

Baker recommends replacing the oxygen sensor every year. It can be purchased from Baker (City Technology Limited, In-Q-OX MediceL[®] Part# RUS.260-546).



To replace the sensor:

1. Open the sensor access hatch on top of the HypoxyCOOL[®] unit by removing two screws.
2. Locate the oxygen sensor.
3. Carefully disconnect the oxygen sensor cable from the top of the oxygen sensor.
4. Using one hand carefully turn the oxygen sensor counter-clockwise until the sensor releases out of the thread.
5. Remove the new sensor from its atmosphere-protective packing.
6. Measure the millivolts from the new sensor before it is placed into the gas mixer to ensure the cell is of good quality.
 - a. Set a multimeter to read millivolts (mV) DC.
 - b. Connect the multimeter to the opposite pins (1 and 3) of the sensor (middle pin not to be connected).
 - c. The multimeter should now display a reading from the sensor. This should be around 10 to 12 mv. If the sensor is below 10 mv then the sensor is defective.
7. Install the sensor into place by carefully turning it clockwise until it is finger tight. Care must be taken to ensure that it is not cross threaded. Do not over tighten the sensor because it might damage the thread and the O-ring.
8. The male end of the sensor cable should now be re-inserted into the female jack socket.

When the sensor is reconnected, the gas mixer must be recalibrated to ensure sensor accuracy. For sensor recalibration procedure, refer to CALIBRATION chapter.

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Cleaning and Replacing the Condenser Filter

Baker recommends inspecting the condenser filter at least twice a year. If the unit operates in a dusty environment, the inspection should be performed more often.



To access the condenser filter:

- Remove the lower front panel by carefully pulling the panel out.
- Carefully remove the foam filter from the retaining frame.
- Clean the filter using the vacuum cleaner. Do not wash the filter.
- If the filter appears worn, has protruding holes, or looks too dirty, it should be replaced.
- Install the filter in the reverse order.

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ALARM RELAY CONNECTION AND OPERATION

An optional alarm relay provides an opportunity for remote detection of fault conditions in the HypoxyCool. This is an option that is not installed on all units.

The relay contact circuit is isolated from internal circuits and from the chassis ground. A chassis ground connection is available at the relay connector.

Connection

A four terminal connector is provided at the rear panel near the power switch and power inlet.

The four connections are:

C	relay common terminal
NC	relay normally closed terminal
NO	relay normally open terminal
G	chassis (grounding) terminal

The connector is Phoenix Contact part number 1829361, (also identified as DFK-MC 1,5/ 4-GF-3,81). The mating connector is Phoenix Contact part number 1828362, (also identified as MCVR 1,5/ 4-STF-3,81). This is available from Baker as Baker part number 42860.

Circuit ratings

The circuit connected to the relay must not exceed these ratings:

Voltage:	24VDC or 24VAC. The voltage source shall be ground referenced.
Current:	1A
Load:	resistive or pilot duty

Operation

The alarm relay will be in its de-energized (normal) condition when power is OFF.

The alarm relay will be in its energized condition when power is ON and no operating faults exist.

The alarm relay will be in its de-energized (normal) condition when power is ON and an operating fault exists.