



# BDR16 User Manual

287849-ENG R00



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# BDR16 User Manual

**Please read these instructions carefully and completely before operating the chamber.**

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## PREFACE

Welcome to the BDR16 User Manual. This manual describes the features and use of Conviron's BDR16 chamber and is written in a straightforward and minimally technical style.

This manual is designed to provide sufficient detail for the different configurations, including a structured format that provides step-by-step instructions. Clients will find sufficient detail for a typical installation including figures, diagrams, and graphics to operate the chamber without issue. However, given that many installations are specific to each facility and that facilities may have unique requirements, additional information or assistance from Conviron may be required.

This equipment is only to be used by authorized personnel - that is, personnel who have been trained in the proper use of the equipment and who have read this manual.

### Functional Description/Intended Use

This chamber is designed to provide a controlled environment for plant production and scientific experiments including, but not limited to, plant science, biotechnology, and entomology.

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## WEEE and RoHS Compliance Statements

CONVIRON is committed to meeting all requirements of the WEEE directive (2012/19/EU).



Products labeled with the WEEE symbol (a crossed out “waste bin”) indicate that the final user should not discard this product along with other household waste, but that it must be collected and treated separately.

Please contact Conviron, or your Conviron distributor, for proper handling and disposal instructions.

Conviron is committed to meeting all requirements of the RoHS directive (2011/65/EU). The RoHS directive requires that manufacturers eliminate or minimize the use of lead, mercury, hexavalent chromium, cadmium, polybromated biphenyls, and polybromated biphenyl ethers in electrical and electronic equipment sold in the EU after July 1, 2006.

## Document Conventions

Conviron maintains a policy of continual improvement and reserves the right to change the product without prior notice. Therefore, the images used throughout this manual may differ slightly from the actual configuration due to updates and product changes.

- Wherever possible, textual descriptions are accompanied by photographs or line drawings of the chambers to assist the reader in understanding the material.
- Frequent reference is made to left and right sides throughout this manual. Left is considered to be the left hand side while facing the equipment.



The “**PLEASE NOTE**” symbol is used to draw attention to additional information which may assist in the operation of the equipment.

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## SERVICE & TECHNICAL SUPPORT

Before contacting Conviron, please check the following:

- Read this document and the accompanying controller manual in its entirety before attempting to operate the chamber.
- If you are having a problem using your cabinet(s), pay particular attention to the relevant section and the pertinent information in this manual, and use the information to diagnose and correct the problem.
- If the problem persists and/or you require additional assistance please collect the following information prior to contacting Conviron:
  - The serial number of the cabinet, located on the rating plate.
  - The software version of the control system. Instructions for obtaining the software version of your control system are provided in the control system operator manual.
  - A description of the problem.
  - A description of what you were doing before the problem occurred.

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# CONTENTS

<b>1</b>	<b>PRECAUTIONS</b> .....	<b>8</b>
1.1	Hazard Identification Symbols .....	8
1.2	General.....	9
<b>2</b>	<b>CHAMBER FEATURES</b> .....	<b>11</b>
2.1	Control System.....	11
2.2	Airflow.....	11
2.3	Ventilation .....	11
2.4	Barrier Canopy .....	11
2.5	Instrument Ports.....	12
2.6	Communications .....	12
2.7	Levelers.....	12
2.8	Central Management System .....	12
<b>3</b>	<b>PROVIDE ELECTRICAL SERVICE TO CHAMBER</b> .....	<b>13</b>
<b>4</b>	<b>START UP</b> .....	<b>15</b>
4.1	Power ON.....	15
4.1.1	Starting a Chamber with DX Systems .....	15
4.1.2	Starting a Chamber with Direct Cooled (GLY) Systems .....	17
<b>5</b>	<b>OPERATION</b> .....	<b>19</b>
5.1	Fluorescent and Incandescent Combination Lighting.....	19
5.2	Plant Placement.....	19
5.2.1	Unifloor®.....	20
5.2.2	Wire Shelves .....	20
5.3	Instrument Ports.....	21
5.4	Fresh Air Inlet and Exhaust Port .....	22
5.5	Fan Speed Control .....	22
5.6	Airflow.....	23
5.7	CO <sub>2</sub> Control .....	23
5.8	Aspirator .....	24
5.9	Lighting Options .....	25
5.9.1	Fluorescent Lighting .....	25
5.9.2	LED Lighting .....	25

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5.9.3	Closed Loop Dimmable Lighting System .....	26
5.10	Additive Humidification .....	26
5.10.1	Air-assisted Spray Nozzle Humidification (ASNH) .....	26
5.10.2	Ultrasonic Humidification System (USH) .....	27
5.10.3	Bypass Dehumidification .....	27
5.11	Additive Carbon Dioxide Control .....	28
5.11.1	Setting up the Additive CO <sub>2</sub> Control .....	28
5.11.2	Adjusting the CO <sub>2</sub> Control .....	29
5.11.3	CO <sub>2</sub> Scrubber .....	30
5.12	Central Management System .....	30
5.13	Shutdown .....	30
<b>6</b>	<b>ADDITIONAL INFORMATION.....</b>	<b>31</b>
6.1	Terms & Definitions .....	31
6.2	Product Updates .....	32
6.3	Disposal .....	32



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## LIST OF FIGURES

Figure 3-1:	Minimum Circuit Ampacity on Rating Plate .....	13
Figure 3-2:	Wiring Connection Order .....	14
Figure 5-1:	Fluorescent and Incandescent Lamp Combination .....	25
Figure 5-2:	Unifloor .....	20
Figure 5-3:	Instrument Port Locations .....	21
Figure 5-4:	Fresh Air Inlet and Exhaust Port Location .....	22
Figure 5-5:	Inlet/Exhaust Port Close-up .....	22
Figure 5-6:	BDR16 Air Flow .....	23
Figure 5-7:	Aspirator .....	24

## LIST OF TABLES

Table 1-1	Hazard Identification Symbols .....	8
Table 6-1	Terms and Definitions .....	31









# 1 PRECAUTIONS






The equipment is intended to be installed, operated, maintained, and serviced only by trained personnel, following the instructions and precautions described in the manuals provided by Conviron.

The following precautions are intended to help guide users in the safe operation of Conviron chambers.

## 1.1 Hazard Identification Symbols



Table 1-1 Hazard Identification Symbols






Symbol	Description
	The “ <b>HAZARD WARNING</b> ” symbol is used whenever a hazard exists which could cause personal injury or potential equipment damage, and requires correct procedures/practices for prevention.
	The “ <b>IMPORTANT INFORMATION</b> ” symbol is used to identify operating procedures which must be followed to ensure smooth and efficient equipment operation.
	The “ <b>ELECTRICAL SHOCK/ELECTROCUTION</b> ” symbol is used to identify a source of potentially dangerous electrical current.
	The “ <b>ELECTROSTATIC DISCHARGE</b> ” symbol is used to identify equipment which is sensitive to electrostatic discharge.
	The “ <b>BURN HAZARD/HOT SURFACE</b> ” symbol is used to identify surfaces which are hot enough to cause personal injury.
	The “ <b>SLIPPERY SURFACE</b> ” symbol is used to identify a potential hazard caused by a slippery surface.
	The “ <b>ROTATING FAN BLADES</b> ” symbol is used to identify a potential hazard from spinning fans inside the machine compartment.
	The “ <b>HAND CRUSH/FORCE FROM BELOW</b> ” symbol is used to identify a potential hazard from moving parts inside the chamber.

Symbol	Description
	The “ <b>PROTECTIVE EARTH-GROUND-MANDATORY ACTION</b> ” symbol is used to identify the protective earth connection.
	The “ <b>WEAR EYE PROTECTION-MANDATORY ACTION</b> ” symbol is used to identify areas where eye protection is mandatory.
	The “ <b>OPTICAL RADIATION</b> ” symbol is used to identify areas where exposure to ultraviolet (UV) and infrared radiation may be possible.
	The “ <b>FALL HAZARD</b> ” symbol is used to identify a potential hazard of falling from elevated surfaces.
	The “ <b>READ THE OPERATOR MANUAL</b> ” label is intended to remind the user to have a thorough understanding of the equipment before use.

## 1.2 General

These precautions should be read and understood before proceeding with installation, operation, and maintenance.

	<p>Conduct a visual inspection of the equipment and surrounding area by walking around the unit to ensure no debris or obstacles are present that could pose a safety hazard before operating the chamber.</p> <p>Operate your Conviron equipment for a minimum of five days before introducing any research material to ensure proper and stable operation.</p> <p>Avoid direct contact with any broken fluorescent lamps. Fluorescent lamps are extremely fragile and may emit harmful vapors when broken.</p> <p>Follow all applicable local environmental regulations and guidelines for disposal of hazardous material. If in doubt, contact local authorities for proper disposal procedures.</p>
	<p>Do not allow water or liquids to contact any electrical components.</p> <p>Ensure that there are no obstacles in the path of the canopy before moving it.</p>

	<p>Do not touch the lamps. Fluorescent lamps operate at high temperatures and present a burn hazard.</p> <p>Do not touch the lamp holders. The heated metal and glass presents a burn hazard. Ceramic metal halide and high pressure sodium lamps operate at very high temperatures.</p> <p>Do not touch the heaters. The hot surface presents a burn hazard.</p>
	<p>Keep all body parts out of the path of any canopy in motion.</p>
	<p>Alert service personnel immediately if a slip hazard is detected.</p>
	<p>Ensure that appropriate fall protection equipment and fall arrest system is in place before starting work above the chamber.</p>
	<p>Do not look directly at the lamps while in operation.</p> <p>Use adequate UV eye protection when working under HID lamps. Also wear protective clothing and gloves.</p>

## 2 CHAMBER FEATURES

### 2.1 Control System

The control system provides advanced programming capabilities, allowing ramping or stepping of environmental conditions to match research requirements. User programmable “set and forget” alarms track the chamber’s operation relative to user-defined set points. Visual and audible notifications provide a further level of protection. For remote monitoring and control, the chamber comes ready to communicate with Conviron’s Central Management™.

Refer to the included Central Management manual for complete instructions.

Alternatively, you may have an Argus control system. The Argus system brings together all monitoring and control of research compartments, greenhouses, growth chambers, and related areas under a unified central command complete with intelligent integration of shared resources such as water and energy systems. The technology provides a unique mix of advanced climate control, irrigation, and nutrient management capabilities to support agricultural and horticultural research activities.

Refer to the included control system manual for complete instructions.



Read and understand all included user manuals completely before attempting to operate this equipment.

### 2.2 Airflow

Fresh air intake and exhaust ports are adjustable to allow up to 30 ft<sup>3</sup>/min (0.84 m<sup>3</sup>/min) of air exchange.

### 2.3 Ventilation

The standard chamber configuration exhausts air to ambient, with no additional connection required.

### 2.4 Barrier Canopy

The unit comes with a tempered glass or acrylic barrier that, in combination with separate cooling coils located within the lamp loft, helps prevent heat from entering the chamber from the lamp loft.

## **2.5 Instrument Ports**

Two 1" (25mm) access ports with light-tight caps are provided in the front wall of the chamber. These ports allow small instruments and monitor leads to be inserted into the chamber without opening the front door, and without significantly changing the environment within the chamber.

## **2.6 Communications**

An RJ45 connection port is included for connection to the facility network. In an Argus system, communication between the chamber and the control system is established using Aquaseal wiring.

## **2.7 Levelers**

The unit is supplied with leveling feet.

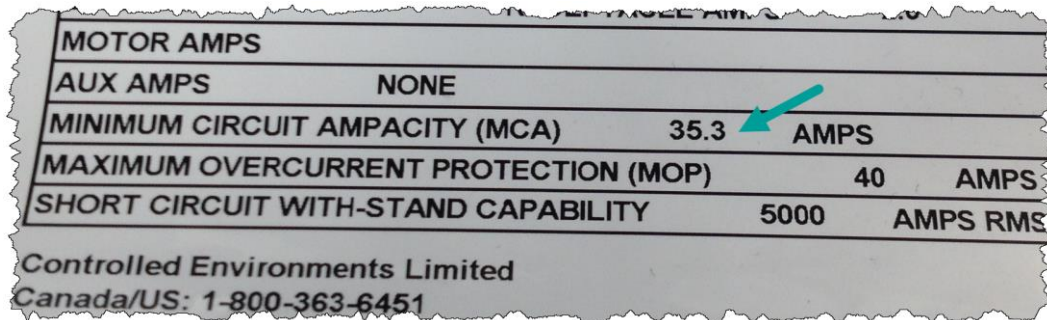
## **2.8 Central Management System**

For use in conjunction with the 6000 series controllers, the Conviron Central Management™ (CM) system provides a comprehensive suite of time-saving, value-added features for remote control and monitoring of chambers, such as:

- A dashboard view displaying the status of all chambers with remote access/control of all chambers from anywhere with Internet access.
- Experiment protection by alerting designated personnel when an alarm is triggered.
- Risk management through auto backup and restore, including system protection, disaster recovery, and file restoration.
- Data collection, storage and management capabilities, and multi-chamber account management.

### 3 PROVIDE ELECTRICAL SERVICE TO CHAMBER

1. Install the electrical supply following local code using the “Minimum Circuit Ampacity” information found on the rating plate.



MOTOR AMPS		
AUX AMPS	NONE	
MINIMUM CIRCUIT AMPACITY (MCA)	35.3	AMPS
MAXIMUM OVERCURRENT PROTECTION (MOP)	40	AMPS
SHORT CIRCUIT WITH-STAND CAPABILITY	5000	AMPS RMS
Controlled Environments Limited		
Canada/US: 1-800-363-6451		

Figure 3-1: Minimum Circuit Ampacity on Rating Plate

2. Punch out one of the knock outs in the control panel located close to the top-right corner.
3. Using knock-out cutters to prevent metal filings, enlarge the hole to the size required by the supply connector.
4. Install the supply connector and supply wiring (3PH, N, PE).
5. Route the wiring to the terminal lugs leaving space between the supply wiring and the other wiring in the control panel.

6. Insert wiring in the following order:
  - a. Ground wire into the ground lug.
  - b. Neutral wire into the neutral lug.
  - c. Hot wire into each of the L1, L2, and L3 lugs.



Figure 3-2: Wiring Connection Order



Ensure that the size of the wire matches the rating marked on each lug.



## 4 START UP

Once the cabinet is assembled, leveled, and all connections have been made, the cabinet can be powered on. Verify that the cabinet is operating properly before introducing any research material.

### 4.1 Power ON

Before powering on the system:

- Ensure all mechanical, fluid, and electrical connections are secure.
- Ensure all local, municipal, and facility inspections are complete.
- Ensure no service personnel are performing work on the cabinet.

All chambers using a direct expansion (DX) refrigeration system are equipped with scroll compressors with crankcase heaters. Crankcase heaters help avoid compressor damage caused by condensation of refrigerant in the compressor crankcase when the unit is off.



It is critical that the crankcase heater be allowed to run for a minimum of two hours before running a program and powering ON the compressor.

The crankcase heater is active whenever the main disconnect switch is turned to ON and the chamber is not running.

#### 4.1.1 Starting a Chamber with DX Systems

Perform these checks before starting the chamber.

##### 4.1.1.1 Before Starting the Unit

1. Check that the proper electrical power is connected to the main terminals, identified with the MAIN SERVICE CONNECTION label. See Figure 3-2: Wiring Connection Order on page 14.
2. Ensure that all breakers are ON.

#### 4.1.1.2 Visual Checks

1. Check that all lights function when turned on and that the doors are light tight.
2. Inspect the doors with interior lights on, in a darkened room.
3. Check the evaporator fan for free movement. Some chambers have a separate breaker for fans.



Ensure that the main disconnect switch is set to OFF before checking the evaporator fans for free movement.



Never check the evaporator fans for free movement while the power remains ON. Contact with moving fan blades could cause serious injury.



Do not touch the heater. Contact with the hot surface of the heaters presents a burn hazard.

#### 4.1.1.3 Start-Up Procedure

1. Ensure that all drain lines, water lines, or refrigerant lines on units with a remote air cooled condenser are connected.
2. The chamber is shipped with the refrigerant valves closed. Remove the cap and open the valves.



Severe damage to the refrigeration system will occur if the chamber is started without first removing the cap and opening the valves.

3. For a water cooled condensing unit, open the manual bypass valve for constant flow supply, close the bypass valve for variable flow supply, or adjust the bypass valve as required during water system balancing.
4. Turn main electrical disconnect switch to ON.



Do not turn the control system off during boot up.

5. With the control system powered up, set and run a program. Refer to the supplied control system manual for further details.



Operate your Conviron equipment for a few days before introducing any plant material. This acquaints you with the equipment's operation and ensures the equipment meets the requirements for your experiments.

#### 4.1.2 Starting a Chamber with Direct Cooled (GLY) Systems

Perform these checks before starting the chamber.

##### 4.1.2.1 Before Starting the Unit

1. Check that the proper electrical power is connected to the main terminals, identified with the *Main Service Connection* label.
2. Ensure that all breakers are ON.
3. Open all hand valves on the pump stand.
4. Open all manual air vents.
5. Fill the system main lines with glycol.
6. Close all manual air vents after the system is filled.

#### 4.1.2.2 Visual Checks

Check the evaporator fan for free movement. Some chambers have a separate breaker for fans.



Ensure that the main disconnect switch is set to OFF before checking the evaporator fans for free movement.



Never check the evaporator fans for free movement while the power remains ON. Contact with moving fan blades could cause serious injury.



Do not touch the heater. Contact with the hot surface of the heaters presents a burn hazard.

#### 4.1.2.3 Start-up Procedure

1. Ensure that all drain lines and water lines are connected.
2. Turn main electrical disconnect switch to ON.
3. With the control system powered up, set and run a program. Refer to the supplied control system manual for further details.
4. Purge air from the pump and gradually open the valve to the coil. Purge air from the coil using the air vent located on the back of the coil housing.
5. Check that all lights function when turned on and that the doors are light tight. Inspect the doors with interior lights on, in a darkened room.



Operate your Conviron equipment for a few days before introducing any plant material. This acquaints you with the equipment's operation and ensures the equipment meets the requirements for your experiments.

## 5 OPERATION

The following sections provide an overview of the basic operation of the chamber.

### 5.1 Fluorescent and Incandescent Combination Lighting

A typical lamp loft includes fluorescent and incandescent lamps. However, other types of lamp configurations are available. Fluorescent lamps should be changed regularly, as intensity diminishes with use.

Refer to the lamp manufacturer's specifications for more detailed information.

All lighting control outputs are logged to determine how long the lights have been on. Operators can set a "warning" message to pop up at the controller as a reminder.

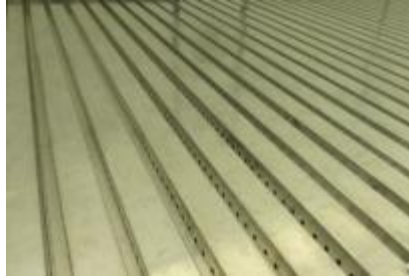
Refer to the supplied control system manual for a complete description and operating instructions.

### 5.2 Plant Placement

Depending on the chamber configuration, a wide variety of plant growth area is available, from seed to full maturity, and for short to medium and tall height plant species.

### 5.2.1 Unifloor®

Plant materials, in pots or trays, are placed directly on the Unifloor and do not need to be moved during the experiment. Excess irrigation water will drain into the drain pan below the Unifloor and then be channeled out of the chamber to the floor drain.



**Figure 5-1: Unifloor**



To ensure proper airflow and water drainage, keep the vents and drain channels in the Unifloor clear of debris.

### 5.2.2 Wire Shelves

Plant pots or trays are placed directly on the wire shelves.



Ensure the clips are firmly seated into the slots in the pilaster and that the shelf is secure before loading it.

The capacity of each wire shelf is a maximum of 50 pounds (22.7 kilograms). Ensure the weight load is evenly distributed when placing material on the shelves.

### 5.3 Instrument Ports

The instrument ports with threaded closures are located in the wall of the chamber (Figure 5-2). The ports enable instrument probes, and small hoses, etc. to be passed through the wall of the cabinet for connection to equipment within the cabinet growth environment.



The instrument ports are intended for low-voltage wires only. Conviron does not recommend the use of extensions cords inside the chamber.

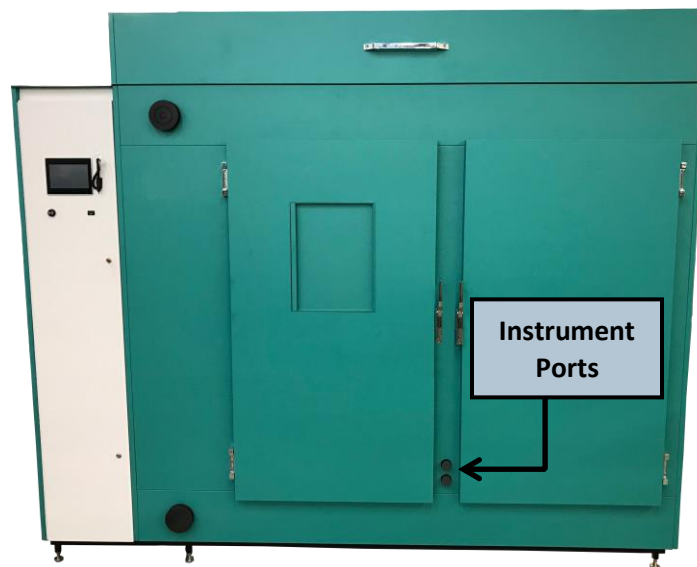


Figure 5-2: Instrument Port Locations

## 5.4 Fresh Air Inlet and Exhaust Port

The fresh air inlet allows the operator to manually adjust the rate at which fresh air is introduced into the chamber. The threaded collar is located on the front of the machine compartment and can be adjusted from fully closed (no fresh air) to fully open to allow up to 30 ft<sup>3</sup>/min (0.84m<sup>3</sup>/min) of air exchange.

The fresh air inlet assembly contains a foam filter to help prevent dust and larger particulate matter from entering the growth area. This filter should be cleaned monthly to prevent a build-up of foreign material that could restrict airflow.

Fresh air is drawn into the front of the chamber through the inlet port by the chamber's fan located in the machine compartment, and then the chamber air is exhausted through the exhaust port (Figure 5-3).

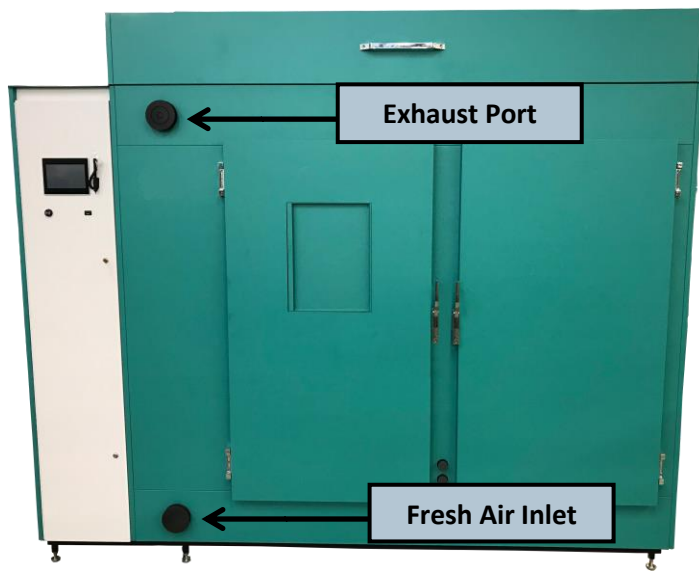


Figure 5-3: Fresh Air Inlet and Exhaust Port Location



Figure 5-4: Inlet/Exhaust Port Close-up

## 5.5 Fan Speed Control

Typically, the chamber uses a fixed fan speed. However, this optional feature allows for user-adjustable fan speeds between the factory preset minimum and the maximum allowable fan RPM.

### ***To adjust the fan speed:***

Refer to the supplied control system manual for a complete description and operating instructions.



## 5.6 Airflow

Continuous airflow is critical to the efficient operation of the chamber.

A circulating loop of conditioned air can be established to maintain precise environmental conditions within the chamber. Air is drawn over the refrigeration coil or heaters and circulated throughout the chamber. Fresh air may also be introduced, if required.

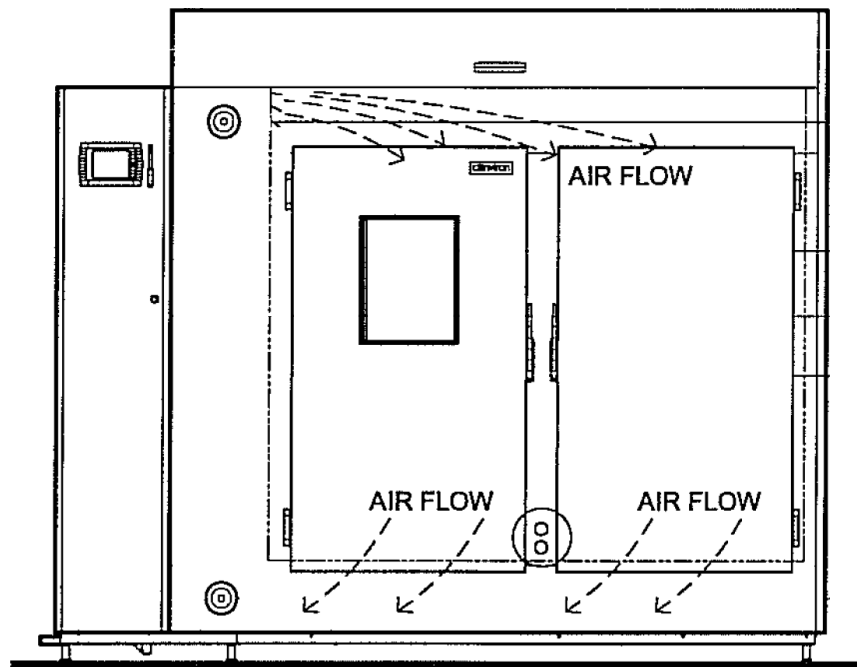


Figure 5-5 BDR16 Air Flow

## 5.7 CO<sub>2</sub> Control

CO<sub>2</sub> exhaust is adjusted using the exhaust damper control in one of the following three modes:

1. Automatic: The position of the exhaust damper is based on the CO<sub>2</sub> setpoint.
2. Open (override): The damper remains open.
3. Closed (override): The damper is closed.

### *To adjust the CO<sub>2</sub> control*

Refer to the supplied control system manual for a complete description and operating instructions.

## 5.8 Aspirator

Located in the growth area, the portable aspirator houses the sensors used to monitor temperature and humidity levels within the chamber. The aspirator receives an air sample from the room to measure and control conditions and provides shielding from the chamber lighting to prevent false readings caused by radiant energy.



Figure 5-6 Aspirator



This graphic is used only for illustration purposes. The actual aspirator may differ from the graphic used in this section.

Place the aspirator in the growth area with the sensors located at plant-canopy height by hanging it from one of the two crossbars. The aspirator should be moved, by adjusting the length of the chain, to remain at canopy height as the plants mature and grow taller.



Depending on the configuration, the aspirator may be mounted to the back wall.

## 5.9 Lighting Options

The chamber can be equipped with many different lighting configurations. Programmable ranges depend on the light type selection and choice of dimming or levels control.

### 5.9.1 Fluorescent Lighting

The standard lighting configuration consists of a combination of fluorescent and halogen incandescent lamps (Figure 5-7) to provide a balanced spectrum for plant growth. Both lighting types are independently programmable in steps.

The fluorescent tubes and halogen incandescent lamps are individually replaceable, as required.



Figure 5-7: Fluorescent and Incandescent Lamp Combination

### 5.9.2 LED Lighting

LED lighting offers significant advantages over the fluorescent lighting packages, including:

- Decreased wattage consumption, which yields significant energy savings.
- Reduced overall maintenance costs due to the longer life of LEDs.
- Reduced heat production during operation, which reduces demand on the cooling system and allows the light to be closer to the plants.
- Reduced sensitivity to temperature variations.



Contact Conviron for LED bar replacement.

### 5.9.3 Closed Loop Dimmable Lighting System

Lamp canopies incorporate dimmable ballasts. Automatic adjustment of the light intensity can be set within the programmed range for as low as 10% for fluorescent, 10% for LED, or 30% with HID lamps, to the maximum intensity. Incandescent lamps are controlled in light levels.

Prior to operating dimmable fluorescent lamps, run the lamps at full intensity for a period of 100 hours to burn off impurities on the filament ends of the lamps left during the manufacturing process.



Failure to burn-in the fluorescent lamps before dimming will significantly reduce the life of the tubes.

### 5.10 Additive Humidification

#### 5.10.1 Air-assisted Spray Nozzle Humidification (ASNH)

This optional additive humidification uses the pressure from the water supply to atomise the water through a small orifice in the spray nozzle. The spray nozzles are located within the air handling system of the chamber and the water is directly injected into the air stream before it is introduced to the chamber.

A minimum of 50 psi (3.5 bar) is required to operate spray nozzles. If this water pressure is not available, the CPSNH option is required to achieve the required pressure.

A 3/8" compression OD quick-connect fitting is supplied on the chamber for connection to the building's purified water supply.

The humidification system needs reverse osmosis filter



Do not add potentially irritating disinfectants or anticorrosive compounds to the water. Do not use well water, industrial water, cooling circuit water, or any potentially chemically or bacteriologically contaminated water.

The ASNH controls the relative humidity inside the cabinet when the operator-selected relative humidity setpoint is above the actual relative humidity level displayed by the control system, within the following parameters:

- A relative humidity setpoint of 0 will turn OFF humidification/dehumidification devices.
- The highest achievable relative humidity setpoint is determined by two factors:
  - Resultant of ambient conditions moisture load within the cabinet from plant transpiration and watering or misting.
  - Capabilities of the ASNH.

Complete product specifications are available upon request.

***To adjust the ASNH:***

Refer to the supplied control system manual for a complete description and operating instructions.



A psychotropic chart showing the operation envelope of the chamber may be beneficial during normal operations. Contact Conviron for more information.

### **5.10.2 Ultrasonic Humidification System (USH)**

This optional additive humidification uses vibrating discs to generate soundwaves underneath the surface of the water, forming a fine mist of vapor that is absorbed by the flow of air. The amount of humidity depends on volume of water inside the tank, water temperature, and the distribution of air. Ultrasonic humidifiers control relative humidity to  $\pm 3\%$  on the set point.

***To adjust the USH:***

Refer to the supplied control system manual for a complete description and operating instructions.

### **5.10.3 Bypass Dehumidification**

The Bypass Dehumidification (BDH) is an optional dehumidification system used to achieve relative humidity set points below the resultant of ambient conditions and moisture load in the cabinet. A precisely controlled volume of chamber air bypasses the heat exchanger by means of a proportionally controlled air damper. Using excess capacity in the cooling system, moisture is removed from the remaining air by cooling and reheating.

***To adjust the BDH:***

Refer to the supplied control system manual for a complete description and operating instructions.

### 5.11 Additive Carbon Dioxide Control

The Carbon Dioxide control option provides additive control of CO<sub>2</sub>. The option is available for most models. It includes a sensor connected to the control system and a solenoid controlled injection system to elevate CO<sub>2</sub> in the chamber.

The placement of the module and probe varies according to the machine and options.

The level of CO<sub>2</sub> in the chamber is displayed in parts per million (ppm) on the control screen and is programmed the same way as temperature and humidity. CO<sub>2</sub> is monitored continuously as long as the control system is active.

#### 5.11.1 Setting up the Additive CO<sub>2</sub> Control

CO<sub>2</sub> control requires a high-pressure and a low-pressure regulator. In most chambers, the low-pressure regulator and the solenoid assembly are located in the machine compartment and are factory set at two (2) pounds per square inch (psi).



Do not adjust this setting.

The high-pressure regulator is located on the customer supplied CO<sub>2</sub> line. This regulator comes in two styles of flow meters, a dial gauge or a glass tube and ball style. In North America, Conviron provides the high-pressure regulator. Outside North America, the customer supplies the high-pressure regulator due to different thread size on the CO<sub>2</sub> line.



Do not adjust the regulator on the CO<sub>2</sub> tank once it has been set up.

Close the main valve on the CO<sub>2</sub> tank when it's not in use.

### 5.11.2 Adjusting the CO<sub>2</sub> Control

There are two variables to consider: programming desired CO<sub>2</sub> concentration and control of air flow through the chamber.

Programming the CO<sub>2</sub> setpoint is as easy as programming temperature or relative humidity. Values are entered in parts per million (ppm) in the CO<sub>2</sub> zone on the *Main Status Program Screen*. The Vaisala™ CO<sub>2</sub> monitor operates in two ranges, up to 2000 ppm and up to 3000 ppm.



Customized ranges are available upon written request. Contact Conviron for more information.

Ambient CO<sub>2</sub> levels are usually at least 350 ppm and can be higher, depending on proximity to other CO<sub>2</sub> sources such as human beings or automobiles. Basic CO<sub>2</sub> control is additive only. The CO<sub>2</sub> concentration in the chamber can never be less than ambient without the CO<sub>2</sub> scrubber option.



The exhaust damper also serves to purge CO<sub>2</sub> in the event of a high level CO<sub>2</sub> alarm. If the high CO<sub>2</sub> limit is set below the CO<sub>2</sub> setpoint, the exhaust damper will open to purge CO<sub>2</sub> to the surrounding space.

Closing fresh air into and exhausting air out of the chamber is important to achieving desired CO<sub>2</sub> concentrations. Failure to consider this will lead to undesired results. Most chambers with CO<sub>2</sub> control are equipped with an automated damper to control airflow. These units will also typically have a manual fresh air inlet and exhaust outlet for running programs without CO<sub>2</sub> control. Some chambers are only equipped with the manual inlet and outlet.



Manual dampers should be set closed when running CO<sub>2</sub> so that the chamber can be controlled with automatic dampers only.

For 6000 series control systems, the CO<sub>2</sub> Exhaust Damper option allows the automatic or manual control of an exhaust damper. The exhaust damper option comes pre-configured automatically from the factory.

#### **To adjust the CO<sub>2</sub> control:**

Refer to the supplied control system manual for a complete description and operating instructions.

### **5.11.3 CO<sub>2</sub> Scrubber**

The CO<sub>2</sub> Scrubber system is a standalone device for controlling CO<sub>2</sub> concentration levels below resultant conditions down to below ambient ppm levels. Chamber air is passed over an absorbing media thereby removing CO<sub>2</sub> content from within the controlled environment.

### **5.12 Central Management System**

Refer to the supplied central management manual for a complete description and operating instructions.

### **5.13 Shutdown**

In the event that the chamber will not be used for a period of up to two (2) weeks or less, it is best to keep it running, with the temperature at or near ambient and only the fans running.

If experiments will not be run for a period of longer than two weeks, to minimize unnecessary electricity consumption, ensure all plants and soil are removed from growth area, clean the unit as described in the *Chambers Maintenance & Troubleshooting Manual*, and leave the chamber and observation doors slightly open to reduce moisture buildup.



## 6 ADDITIONAL INFORMATION

### 6.1 Terms & Definitions

Table 6-1 lists the terms and their definitions used throughout this manual.

**Table 6-1 Terms and Definitions**

<b>Term</b>	<b>Definition</b>
ASNH	Assisted Spray Nozzle Humidification
BDH	Bypass Dehumidification
DX	Direct Expansion
EU	European Union
OD	Outside Diameter
PPM	Parts Per Million
PSI	Pounds Per Square Inch
RoHS	Restriction of Hazardous Substances Directive
USH	Ultra Sonic Humidification
WEEE	Waste Electrical and Electronic Equipment

## 6.2 Product Updates

Product Lifecycle is a key development consideration at Conviron, whereby products are developed using high quality materials and component parts. Consequently, Conviron has developed a reputation for product longevity where products in excess of 30 years old remain fully active. Efforts taken to extend the life of the product include developing retrofit systems to replace old, inefficient and aging components, and working with clients to upgrade components rather than decommissioning the equipment. Conviron also provides retrofit systems for competitive products. For example, Conviron offers a control system retrofit that is compatible with competitive products and that, once installed, works with Conviron's Central Management System (CMS).

Contact Conviron for more information.

## 6.3 Disposal



The chamber is made up of metal and plastic parts, fluids, and electronic components. In compliance to the European Union directive 2012/19/EC issued on July 4<sup>th</sup>, 2012, please contact Conviron, or your Conviron distributor for proper handling and disposal instructions.



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