

Mass Casualty Ventilator

Models: MCV200 & MCV200-B

Pneumatic and Electrically Powered Ventilator



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Models:

MCV200

Mass Casualty Ventilator Basic Model

MCV200-B

Mass Casualty Ventilator with O₂ Mixing

CAUTION: Federal law restricts this device to sale by or on the order of a physician.

CAUTION: The Mass Casualty Ventilator should not be used on children with a weight of 20 kg (44 lbs) or less.

Each MCV200 (-B) includes the following:

- 1 Ventilator
- 1 Patient Circuit
- 1 Power Cord
- 1 Oxygen Hose
- 2 Straps, Velcro
- 1 Instruction Manual

1. **Product Description:**

The Mass Casualty Ventilator (MCV200) is a multi powered portable ventilator. The MCV200 has the capability of being powered by one of five (4) independent power sources. The power sources are:

- 1) A 50 psi (344 kilopascal, 3.45 bar) oxygen / gas source.
- 2) Internal 12 VDC battery.
- 3) Input Voltage 115 to 230 VAC: 50 to 60 Hz.
- 4) Optional External battery pack.

The MCV200 delivers a time cycled constant flow breath. The breath volume (Tidal Volume) is adjustable from 200 ml to 1200 ml. The inspiratory time has a separate control setting and is available at either 1.0 second or 2.0 seconds. The Breaths per Minute (BPM) also has a separate control setting and is adjustable from 8 to 28. The MCV200 can deliver breaths to the patient using internal compressors as well as an external high pressure (50 psi (344 kilopascal)) gas source.

The MCV200 and MCV200-B are intended to be used on patients weighing greater than 20Kg (44 lbs). The ventilator is intended to be used in the environments associated with emergency medical services (EMS), inter-hospital transport and hospital facility usage. The MCV200 and MCV200-B ventilators are intended to be used as an emergency ventilator, which is designed to provide emergency respiratory support by means of a face mask or tube inserted into the patient's airway.

Biocompatibility testing has proven this unit safe for periods up to 14 days of continuous use. Results beyond this time are not known.

	Warning: The MCV200 and MCV200-B are not MRI compatible.
Caution:	Federal law restricts this device to sale by or on the order of a physician.
Caution:	The MCV200 and MCV200-B should not be used on children with a weight of 20kg (44 lbs) or less.

2. Explanation of Warnings:

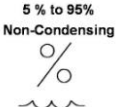
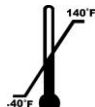
 Warning:	Potential injury to the patient exists.
Caution:	Potential damage to the ventilator, breathing circuit or other equipment may result.

Warnings and cautions should be read and understood before operating this ventilator.

3. Explanation of Abbreviations:

T _v	Tidal Volume
BPM	Breaths per Minute
I _t	Inspiratory Time
Psi	Pounds per Square Inch
cm H ₂ O	Centimeters of Water
Kpa	Kilopascal
ml	Milliliters
LPM	Liters per minute
mm	Millimeters
LED	Light emitting diode
CPR	Cardio Pulmonary Resuscitation
LPA	Low pressure alarm
HPA	High pressure alarm
RH	Relative Humidity

4. Symbols:

	Degree of protection against electric shock: Type BF
	Caution, Consult accompanying documents
	% Relative Humidity: 5 to 95% Non-Condensing
	Temperature Range: 0°F to 122°F Operating -40°F to 140°F Storage
	On/Off

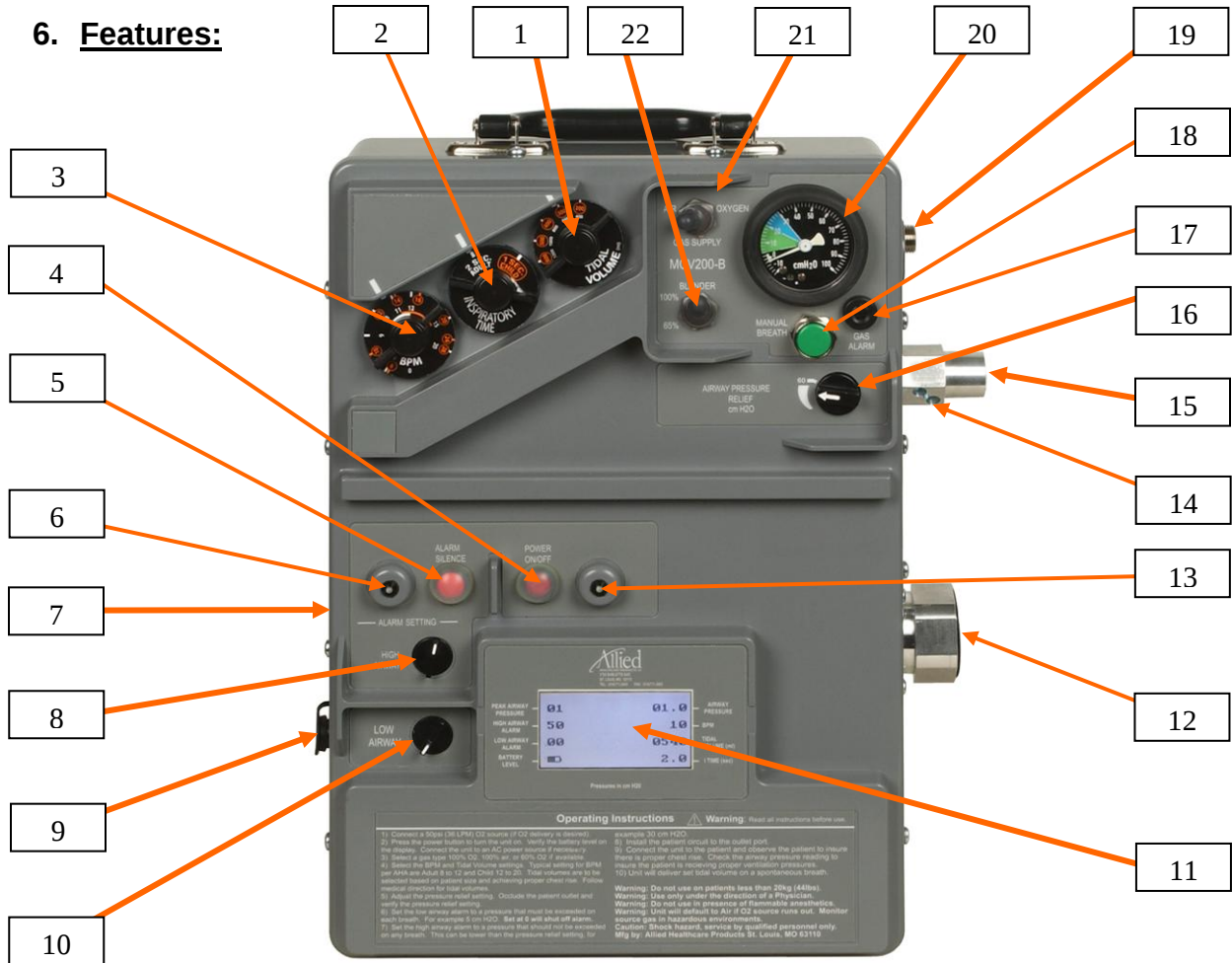
5. **Specifications:**

- A. **Gas Supply Pressure:** Oxygen DISS
40.6 psi to 87.0 psi
280 Kpa to 600 Kpa
2.8 Bar to 6.0 Bar
- B. **Breaths per Minute (BPM):** Accuracy: $\pm 10\%$.
BPM Range: 8 to 20 with 2 second Itime.
BPM Range: 9 to 28 with 1 second Itime.
- C. **Tidal Volume (Tv):** Tidal Volume Range = 200ml to 1200ml.
Accuracy: $\pm 10\%$ with 100% Oxygen, $\pm 12\%$ blended mode (model –B).
 $\pm 10\%$ with 100% Air.
- D. **Inspiratory Time (I_t):** Accuracy: $\pm 10\%$
User adjustable. 1.0 Sec. or 2.0 Sec.
- E. **Airway Pressure Relief:** Adjustable from 5 to 80 cm H₂O $\pm 10\%$. The 60 cm H₂O mark indicates the airway pressure will not exceed 60 cm H₂O regardless of tidal volume setting.
- F. **Low Source Gas Alarm:** Activates at 275 to 248Kpa (40 to 36 psi) source pressure.
- G. **Electronic Alarms:**
High Airway Pressure Alarm Range 15 to 80 cm H₂O.
High Airway Pressure Alarm Accuracy $\pm 5\%$.
High Airway Pressure Alarm activates immediately if tripped.
High Airway Pressure Alarm Sound Level is greater than 60 decibels.
Low Airway Pressure Alarm Range 0 to 30 cm H₂O.
Low Airway Pressure Alarm Accuracy $\pm 5\%$.
Low Airway Pressure Alarm activates 15 seconds after tripped.
Low Airway Pressure Alarm Sound Level is greater than 60 decibels.
- H. **Battery Life:** Run time at room temperature 21°C (70 $\pm$ 5°F), BPM=10, and Tidal Volume=600ml.
a. 100% O₂: (60 hours for display & alarms) Battery not included.
b. 65% O₂: (60 hours for display & alarms) Battery not included.
c. 100% AIR: 7 hours
- I. **Oxygen Inlet Filter:** 65 Micron sintered bronze.
- J. **Burst Pressure:** 145 psi (1000 Kpa) minimum through oxygen inlet.
- K. **Leakage:** The unit shall be designed so that oxygen is not allowed to leak through any seals or fittings.

- L. Gauge:** 0-99 cm H₂O (0 – 9.8 Kpa) accuracy $\pm$ 5%.
- M. Inspiratory and Expiratory Resistance:** 5 cm H₂O (.5Kpa) maximum.
- N. Inadvertent PEEP:** $\leq$ 2 cm H₂O.
- O. Inadvertent Continuing Expiratory Pressure:** $\leq$ 2 cm H₂O.
- P. Dead Space:** $\leq$ 5.5% of minimum tidal volume.
- Q. Peak Inspiratory Flow:** 100 LPM for 2 seconds.
- R. Pressure for Initiation of Spontaneous Breath:** -2 cm H₂O maximum.
- S. Manual Breath:** Delivers one breath per the breath control settings (Vt, Itime, BPM).
- T. Oxygen Blending:** 65% $\pm$ 12% oxygen with bender.
- U. Weight:**
 - a. **MCV200** 7.7 Kg (17.0 Lbs).
 - b. **MCV200-B** 7.8 Kg (17.2 Lbs).
- V. Size:** 88.9 x 261.1 x 368.3 mm (3.5 x 10.3 x 14.5 inches).
- W. Operating Conditions:** -18C to 50°C (0 to 122°F).
5% to 95% non-conducting relative humidity.
- X. Storage Conditions:** -40 to 60°C (-40 to 140°F)
5% to 95% non-conducting relative humidity.
- Y. Shipping Conditions:** -40 to 60°C (-40 to 140°F)
5% to 95% non-conducting relative humidity.
- Z. Electrical Rating:** 115/240 Volt 50/60 Hz 2 amp.
- AA. Connections:** CGA V5 O₂ DISS Input.
ISO 5356 22mm Output.

Latex Free: This product does not contain latex.

6. Features:



Model Shown: MCV200-B

Item #	Description	Item #	Description
1	Tidal Volume Control	12	Air Inlet
2	Inspiratory Time	13	Alarm Module Battery Status LED
3	BPM Control	14	Anti-Suffocation Valve
4	On/Off Switch	15	Patient Circuit Connection
5	Alarm Silence Button	16	Adjustable Airway Pressure Relief
6	Alarm LED Indicator	17	Low Source Gas Indicator Pop-up
7	AC Power Inlet	18	Manual Breath Button
8	High Airway Pressure Alarm Adjustment	19	Oxygen Inlet
9	Auxiliary 12V Power Inlet	20	Manometer
10	Low Airway Pressure Alarm Adjustment	21	Delivery Gas Selection Switch
11	LCD Display	22	O ₂ Concentration selector

7. Operating the MCV200 and MCV200-B:

	Warning: This device should only be operated by qualified personnel under approved medical direction.
	Warning: Use only as directed. Improper usage or unauthorized modification of this product may result in user or patient injury.

The MCV200(-B) is intended to be used as a pneumatically/electrically powered emergency ventilator, which is designed to provide emergency respiratory support by means of a face mask or tube inserted into the patient's airway. The ventilator is intended for use on patients weighing greater than 20kg (44lbs). The ventilator is intended to be used in temperatures of -18°C to 50°C (0°F to 122°F) and 5% to 95% RH non-condensing.

Prior to use, first read and understand the instruction manual and then follow the check out procedure.

Connecting to an Oxygen Source:

Located on the right side of the MCV200 is a **Diameter Index Safety System (DISS)** fitting. Connect a 50 psi (344 kilopascal) oxygen source with a minimum of 40 LPM flow capacity to this fitting.



	Warning: Proper tidal volumes may not be provided with a gas source not meeting the specified requirements. See section 4 Specifications.
	Warning: This device operates with medical gases under pressure, including oxygen. Do not use this device while smoking or near open flames. Do not use on this device or operate near flammable materials.
	Warning: Do not use this device in the presence of flammable anesthetics.
	Warning: Verify that there are no noticeable leaks after connection to the 50 psi (344 kilopascal) Oxygen source.
Caution:	Caution: In order to provide optimal performance, check all gas supplies to assure only medical grade gas is used.

The gas source may also be a high flow air/oxygen blender meeting the flow and pressure requirements. Use only the 100% oxygen setting on the MCV200-B, if using an external blender. This will ensure that the gas delivered from the ventilator has the same oxygen concentration as the gas delivered to it by the external blender.

Connecting the patient breathing circuit:

Located on the right side of the unit is a 22mm connection for a patient breathing circuit. Install the corrugated tubing over the connector so that it fits on securely. The tubing will not pull off easily when properly installed.



Warning: Do not use unapproved patient circuits as loss of performance may result.



Patient Connection

Anti-Suffocation valve
Do not occlude!



Warning: Do not occlude the anti-suffocation valve. This will prevent the patient from getting outside air if spontaneously breathing.

- **Select the desired Breaths per Minute (BPM):**

The MCV200 has a BPM range of 8 to 20 or 9 to 28 based on Inspiratory Time. The American Heart Association Guidelines 2005 recommend a BPM rate of 8 to 12 for an adult and 12 to 20 for a child. These are recommendations and you should always follow your physicians or medical directors' instructions. Select the desired BPM by turning the BPM control knob.

For "AIR" mode, turn the BPM control knob until the desired BPM setting is displayed on the LCD screen.

- **Select the desired Inspiratory Time.**

The MCV200 can be set for an Inspiratory Time for either 1 or 2 seconds. Set the desired Inspiratory Time by turning the Inspiratory Time control knob. The set Inspiratory Time will be displayed on the LCD display.

- **Select the desired Tidal Volume:**

The MCV200 provides a Tidal Volume range of 200 – 600 at an Inspiratory Time of 1.0 second and a range of 400 – 1200 at an Inspiratory Time of 2.0 seconds. Select the desired Tidal Volume by turning the Tidal Volume control knob.

For “AIR” mode, turn the Tidal Volume control knob until the desired Tidal Volume setting is displayed on the LCD screen.

	Warning: Should a mechanical problem develop or the patient appears to be experiencing difficulty breathing while connected to the unit, disconnect the unit immediately and ventilate by other means.
	Warning: Units that have been stored at temperatures below 32°F (0°C) may have up to a 20% shift in settings when they are operated at these low temperatures. The readings will return to normal when the unit warms up. Always monitor patients when the unit is used under these conditions.

- **Select the desired gas supply.**

The MCV200 provides the operator with delivering to the patient, either oxygen (if available) or air (provided by on-board compressor pumps). Even if pressurized oxygen is connected to the unit, the operator can select “Air” as the delivery gas. In the “Air” mode, the compressor pumps will deliver the selected Tidal Volume, Inspiratory Time and BPM to the patient using ambient air through the Inlet Filter connection. In the “Oxygen” mode, the unit will use the pressurized oxygen to deliver oxygen (at the set concentration) to the patient at the selected Tidal Volume, Inspiratory Time and BPM.

The MCV200 is designed so that each power source is independently capable of delivering the set breath parameters (Tidal Volume, Inspiratory Time and Breaths per minute) to the patient. For example: With a 50 psi (344 kilopascal) oxygen source connected and the Gas Supply switch in the Oxygen position, the unit does not require any electrical power. The unit will deliver the selected breath parameters (Tidal Volume, Inspiratory Time and Breaths per minute) to the patient. The unit will continue to provide basic alarm features, however, with the electrical power turned off, the added benefit of additional alarm monitoring is disconnected.

During “Oxygen” mode with the electronics turned **OFF**:

The following basic alarm features are active.

1. A High Airway pressure relief. Excess pressure will be vented from the patient airway when the airway pressure exceeds the set Airway Pressure relief setting.
2. An audio High Airway alarm (whistle)
3. A visual Low Source Gas alarm (Red colored Pop-up)
4. An audio Low Source Gas alarm (whistle)

During “Oxygen” mode with the electronics turned **ON**:

In addition to the basic alarm features mentioned above, the following alarms and features are active.

1. Visual read out of the breath parameters via the LED screen.
2. An independent monitoring of High Airway pressure.

3. An independent monitoring of Low Airway pressure.
4. Auto switch feature to Air mode if the oxygen source should run out or be interrupted.

For a full description of the alarms, see Alarms Section of this manual.

- **Select the desired Gas Mixture: (Optional Oxygen Mixing)**

On models equipped with a Oxygen Mixer you can select either 100% or 65% oxygen. Set the Oxygen Mixer Switch to the desired gas concentration. On the 65% oxygen setting, the ventilator uses a venturi blending system draw in ambient air and mix with the medical oxygen source. The ambient air is drawn in through the inlet filter located on the left side of the unit. The resulting Tidal Volume is a mixture of ambient air and oxygen.

Patients with high compliance lungs or excessively restrictive airways may diminish the performance of the venturi thereby altering the actual Tidal Volume being delivered. Under these conditions, the 100% O₂ setting will ensure full Tidal Volume delivery.

This feature is not available if the Gas Selection Switch is in the “Air” mode.



Warning: Do not use the Air or 65% Air/Oxygen mixture in areas where the ambient air is not safe for breathing.

- **Verify the Pressure Relief Setting:**

This unit has an adjustable pressure relief range with a marked setting of 60 cm H₂O. At this setting, the airway pressure will not exceed 60 cm H₂O regardless of vent settings. Adjustment above or below this marked setting will result in a corresponding higher or lower maximum airway pressure. The pressure relief setting will vary slightly with tidal volume setting. Always verify the pressure relief pressure after the vent settings have been selected. To check the actual relief pressure, block the end of the ventilator breathing circuit and observe the reading on the airway pressure gauge. This will be the maximum airway pressure. You should hear an audible alarm as this maximum pressure is reached.



Warning: Preset tidal volumes may not be delivered when the maximum pressure limit is reached. Inspiratory times will remain constant, however no additional tidal volume will be delivered after the pressure limit is reached.

- **Connect the patient breathing circuit to the Patient:**

The patient breathing circuit has been design to fit with an oxygen mask (22mm outside diameter) or endotracheal tube (15mm inside diameter). Follow the established guidelines for maintaining the patient’s airway.

- **Verify the patient is receiving good ventilation:**

Once the patient is connected to the ventilator the patient should be observed to make sure adequate chest rise and fall is achieved. The chest rise should be even and should return to a normal position. If the patient does not have adequate chest rise check the tidal volume setting, patient connections and examine the patient for a possible obstruction of the airway or other injury. The patient should be monitored to make sure they are receiving proper ventilation.

The airway pressure LCD display and the unit manometer should be observed to make sure the patient is receiving adequate positive pressure ventilation. If the LCD display or manometer reading is low during the delivery of a breath and the chest rise is also low, check the tidal volume setting, patient connections and examine the patient for a possible obstruction of the airway or other injury. The LCD display and manometer reading should also be observed to make sure it is not too high. Common numbers used in practice are a maximum of 20 cm H₂O for an unprotected airway and 30 cm H₂O for a protected airway. Higher pressures may be required based on the patient's condition and you should always follow the physician's instructions. A high reading with pressure limit alarm may indicate a blocked airway or a stiff lung.

- **Spontaneous Breathing by the Patient:**

Should the patient begin to breathe spontaneously the MCV200(-B) will sense this breath and deliver the set tidal volume at the set inspiratory time. The breath timing will be reset based on the selected BPM rate. For example, if 10 BPM was selected, the next breath will be delivered 6 seconds after the start of the spontaneous breath.

The gas flow rate to the patient during a spontaneous breath is based on the tidal volume selection as shown in the following table. Should the patient demand exceed the gas flow rate, the additional demand will be supplied by ambient air. Ambient air is pulled in through an anti-suffocation valve located in the breathing circuit connection fitting.

Tidal Volume Setting (ml)	Approx. Flow (LPM)
200	12
400	20
600	25.7
800	30
1000	33.3
1200	36



Warning: Do not occlude the anti-suffocation valve. This will prevent the patient from getting outside air if demand during spontaneous breathing exceeds unit output.

- **Manual Breaths:**

Manual breaths may be delivered using the manual breath button. Each time this button is pushed the ventilator will deliver one breath with the selected tidal volume. This button can be used to deliver breaths during CPR. The unit will deliver only one breath per the ventilator settings when the button is pushed and released. The button must be released and pushed again to deliver a second breath. The ventilator breath timing is reset when the button is pushed.

This button should be pushed and released as soon as the desired breath starts.

If the button is held down longer than the inspiratory time the tidal volume will be based on the time the button is held down and will exceed the set value. The pressure relief may trigger if this happens.



Caution: Holding the manual breath button down for more than 1 second may trigger multiple breaths or increase the delivered tidal volume.

8. Alarms:

a. Pneumatic

Airway pressure Relief:

The pneumatic Airway Pressure Relief alarm is an audible alarm that is actuated when the set airway pressure is reached. This alarm indicates that the maximum airway pressure relief setting has been exceeded and that gas has been released to prevent the airway pressure from reaching levels above this setting. An audible whistle will activate if this alarm is activated.

	Warning: Preset tidal volumes may not be delivered when the maximum pressure limit is reached. Inspiratory times will remain constant, however no additional tidal volume will be delivered after the pressure limit is reached.
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Pneumatic Low Source Gas alarm:

The Pneumatic Low Source Gas alarm is an audible (whistle), and a visual alarm (red pop-up) that activates when the source gas pressure drops below 40 to 36 psi. This is an indication that the unit will stop functioning soon and may not be delivering proper tidal volumes. The alarm will clear when proper source gas pressure is restored.

b. Electronic Alarms

The electronic alarms will give an audible and visual alert for the following alarms:

- Low Source Gas
- High Airway Pressure
- Low Airway Pressure

Low source gas alarm:

Low source gas alarm is an audible (intermittent tone), and a visual alarm (flashing LED) and an alarm message will appear in the LCD window. The alarm will activate when the source gas pressure drops below 40 to 36 psi. This is an indication that the unit will stop functioning soon and may not be delivering proper tidal volumes. If the source gas continues to fall below 40 to 36 psi, the unit will automatically switch to air mode (if the electronics are turned on). The compressors will then provide breaths based on the current breath control settings.

To clear the alarm, you must press and hold the Silence button until the alarm clears.

	Warning: Preset tidal volumes may not be delivered when the low source gas pressure is reached.
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High airway pressure:

High airway pressure alarm is an adjustable alarm that will immediately activate if the pressure exceeds the selected pressure. This alarm operates independently from the pneumatic pressure relief alarm. This alarm can be set at a pressure of 15 to 80 cm

H₂O. This alarm may be used to monitor a change in the patient's condition such as fluid collecting in the lungs or a partial obstruction of the airway. This alarm is automatically cleared when 12 seconds pass without a high airway pressure being detected. When activated, the alarm LED will blink red, the audible alarm will sound in a continuous tone, and the High Airway Alarm setting on the LCD display will blink.

Low Airway Pressure:

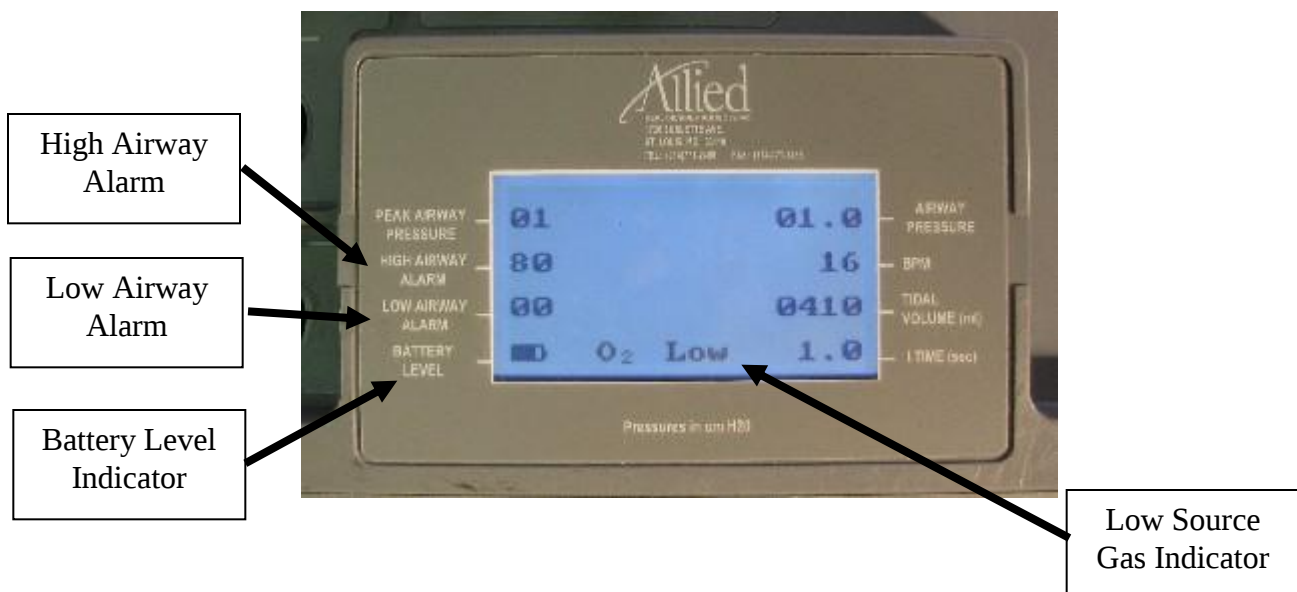
The low airway pressure alarm is an adjustable alarm that will activate if the airway pressure does **not** exceed a minimum value. The alarm can be set at a pressure from 0 to 30 cm H₂O. This alarm may be used to indicate a potentially insufficient tidal volume or a patient disconnect. The airway pressure must exceed the low pressure set point at least once every 15 seconds. When the alarm is activated, the Low Airway Pressure alarm LED will blink RED and the buzzer will sound an intermittent tone or "beep" and the Low Airway setting on the LCD display will blink. The alarm will automatically clear when the airway pressure goes above the set point.

Silence Button: When there is an alarm the user may press the silence button. This will turn off the buzzer for 110 seconds as long as there are no other alarms. Pressing this button will not clear the alarm LED's.

Low Battery Power:

A low battery alarm will be indicated by a continuous red LED light next to the ON/OFF power button. The LED will light green when the unit is turned on and the battery level is sufficient for proper ventilator function. When the battery is critically low, this light will flash red indicating the ventilator may stop functioning soon. The battery level is also indicated on the LCD display. When the low battery indicator is present, the unit needs to be plugged in to an AC source for recharging the internal battery or may be connected to an auxiliary 12 volt power supply battery pack.

See section titled Accessories.



9. Power Connections:



Warning: Grounding reliability can only be assured when the equipment is connected to an equivalent receptacle marked “Hospital Only or Hospital Grade”.

AC Power Connection
with Fuse Holders



Auxiliary Power
Connection
(Battery Pack)

AC POWER INLET AND AUXILIARY BATTERY PACK CONNECTION

An AC power source (115/240 Volt 50/60 Hz) may be connected to the unit using the connector as shown above. The unit has an automatic voltage selecting power supply and does not require any special setting for the voltage or power frequency (Hertz). The unit will automatically charge the internal battery when connected to an AC power source. Plugging in the unit during breath delivery may affect the volume of the breath delivered. Plug the unit in between breaths.

Connecting the auxiliary power source is done by first aligning the keyed connector with the keyed inlet on the unit and then inserting the connector into the inlet. To remove the auxiliary power supply, twist the connector counterclockwise and then pull the connector straight out of the socket. Contact manufacturer for approved auxiliary power source.



Warning: The MCV200 unit may reset when connecting or disconnecting the auxiliary power. If this occurs, the MCV200 will quickly and automatically return to normal operation.



Warning: Auxiliary power connection is keyed. Make sure that connectors are properly aligned before insertion, do not force.

10. **Battery Charging:**

If the internal battery has run down and the unit stops operating, the unit may be connected to AC to restore operation. The unit will charge automatically when connected to an AC power source. The unit will charge the battery only when necessary and can be left plugged in at all times. **To keep the battery at full capacity, it is recommended to leave the unit plugged in at all times.** If the auxiliary battery is plugged in the unit will only charge the auxiliary battery. The recharge time for the internal battery is less than 5 hours when the unit is OFF (the recharge time is approximately 10 hours when in use).

11. **Cleaning:**

The MCV200(-B) should be cleaned after each use. When cleaning the MCV200, keep the gas supply hose on the unit to prevent contamination of the oxygen circuit.



Warning: Cleaning procedures should be performed in an environment free of oil and petroleum based products.

The MCV200(-B) has been designed to be water resistant but the unit cannot be submerged or sprayed down for cleaning.

Wipe the unit down with a damp towel containing a mild detergent to remove any residue from the surface. Once the residue has been removed the unit should be wiped with isopropyl alcohol or a cold disinfecting solution to kill bacteria. The unit should then be wiped down with water to remove any film left by the cold disinfecting solution. Make sure the unit is dry before putting the unit away. The following is a list of tested cleaning solutions:

- | | |
|-----------------------|--|
| 1. Isopropyl Alcohol: | 70% IPA |
| 2. Alconox | 1 Tablespoon Alconox to 1 Gallon H ₂ O |
| 3. Cetylcide: | 2 Tablespoons Cetylcide to 1 Gallon H ₂ O |
| 4. Bleach: | 10% Bleach in H ₂ O |



Warning: Do not attempt to clean and re-use single patient ventilation circuits as loss of performance may occur.

Dispose of single patient use items per local biohazard standards.

12. **Check out Procedure:**

1. Set the MCV200(-B) to the following settings:
 - BPM = 10 (White number).
 - Inspiratory Time = 2 Sec (White Letters).
 - Tidal Volume = 800 ml (White Numbers).
 - Gas Supply = Oxygen.
 - Oxygen Mixer (if equipped) = 100% O₂.
 - Airway Pressure Relief = Turned full clockwise.
 - Do not turn on the electronics at this time.
2. Visually inspect the anti-suffocation valve in the Patient Connection outlet fitting to verify that it is laying flat against the inside of the fitting.
3. Connect a 50 psi (344 kilopascal) oxygen source to the unit, turn the gas supply on and the ventilator should begin to cycle.
4. Using a watch, count the number of complete ventilator cycles delivered in 1 minute. The unit should deliver 10 breath cycles. The inspiratory time will be 2.0 seconds and the expiratory time will be 4.0 seconds.
5. Set the airway pressure relief to 60 cm H₂O and occlude the Patient Circuit connection fitting. The pressure on the manometer / gauge cannot exceed 60 cm H₂O. You should also hear an audible whistle to signal the pressure relief has actuated.
6. Push and release the manual breath button between breath cycles and a breath should be triggered. The breath cycle will be reset to the current expiratory time.
7. Turn on the electronics by pushing and release the Power On/Off button.
 - a. Set the Alarm Settings as follows:
 - i. High Airway to maximum setting (full clockwise).
 - ii. Low Airway to minimum setting (full counter-clockwise).
 - b. Both LED lights should momentarily blink RED then the power LED should stay on as GREEN. The Alarm LED should turn off.
 - c. The LCD display should turn on and display all of the parameters on the LCD label.
8. With the gas supply switch in the "Oxygen" position, turn the source gas off.
 - a. The low gas indicator (next to the Manual Breath button) will pop up red.
 - b. An audible whistle will sound.
 - c. A "O₂ Low" message will appear on the LCD display.
 - d. The ALARM LED will flash.
 - e. The on-board pumps will automatically turn on and continue the breath cycle.
 - f. Press and hold the silence button until the "O₂ Low" alarm message disappears from the LCD.

9. Set the Low Airway alarm to 10 cm H₂O (as shown on the LCD display).
 - a. Ensure the Patient Connection port has no obstructions.
 - b. The Low Airway alarm will sound and the Alarm LED will flash in about 15 seconds.
 - c. Press the Silence button and the alarm will silence.
 - d. Turn the Low Airway alarm setting full counter-clockwise (to zero) and the alarm will cancel.
10. Set the High Airway alarm to 30 cm H₂O (as shown on the LCD display).
 - a. Occlude the Patient Connection fitting.
 - b. The High Airway alarm will immediately sound during breath delivery and the Alarm LED will flash.
 - c. Press the Silence button and the alarm will silence.
 - d. Turn the High Airway alarm setting full clockwise and the alarm will cancel.
11. Turn off the unit by pressing the On/Off button.
12. Clean the unit after each use.

Should the unit fail any of the tests contact Allied Healthcare Products, Inc. Technical Support Center at 800-441-5136.

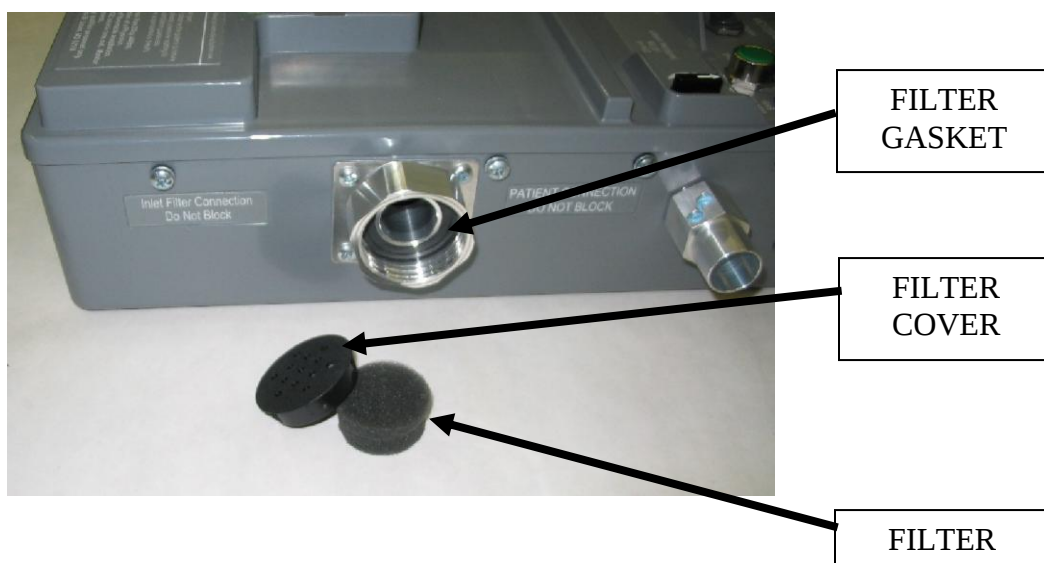
Always store the ventilator in a clean dry place.

13. Maintenance:

The following section provides information on basic maintenance as well as annual maintenance schedules and procedures for stockpiled ventilators. If this ventilator is to be used regularly, we recommend performing the “Verification of Calibration and Function” annually.

Particle Filter Replacement:

The MCV200(-B) contains a particle filter located inside the air inlet on the side of the unit. This filter cleans the ambient air drawn in by the compressors and also cleans the air used in the function of the Oxygen Mixer. This filter should be checked every 4 months and changed / cleaned if dirty. To replace the filter, remove the protective screen by prying off with a dull flat tool. Once the screen is removed the filter can be removed cleaned or replaced. Clean by rinsing in clean water and allow to dry.



Battery Maintenance:

The MCV200(-B) battery level should be checked every 4 months to insure proper function. If not kept on a continuous charge, charge the battery at this time. If the battery does not reach full charge within a maximum of 5 hours, the battery should be replaced at that time. Every 3 years, the battery in the unit should be replaced. This battery must be disposed of as required by local ordinances.

Comprehensive Maintenance:

Every six years, the units should be sent to a qualified service center for a comprehensive maintenance.

If problems are noted with this product, contact the Allied Healthcare Products, Inc. Technical Support Center for assistance at 800-411-5136.

Maintenance Requirements For Stock Piled MCV200(-B) Ventilators

4 Months: Charge Battery (This 4 month battery charge protocol is only necessary if the ventilator is stored without continuous charging.)

8 Months: Charge Battery

Year 1 Maintenance Check List

Yearly Verification of Calibration and Function	30 MINUTES
Charge Battery	

1 Year 4 Months: Charge Battery

1 Year 8 Months: Charge Battery

Year 2 Maintenance Check List

Yearly Verification of Calibration and Function	30 MINUTES
Charge Battery	

2 Year 4 Months: Charge Battery

2 Year 8 Months: Charge Battery

Year 3 Maintenance Check List

Manufacturer Maintenance • Replace Battery & Charge • Calibrate Unit	Contact the Allied Healthcare Products Inc. technical support center for assistance at 800-411-5136
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3 Year 4 Months: Charge Battery

3 Year 8 Months: Charge Battery

Year 4 Maintenance Check List

Yearly Verification of Calibration and Function	30 MINUTES
Charge Battery	

4 Year 4 Months: Charge Battery

4 Year 8 Months: Charge Battery

Year 5 Maintenance Check List

Yearly Verification of Calibration and Function	30 MINUTES
Charge Battery	

5 Year 4 Months: Charge Battery

5 Year 8 Months: Charge Battery

Year 6 Comprehensive Maintenance Check List

Manufacturer Maintenance • Replace Seals • Calibrate Unit • Replace Battery	Contact the Allied Healthcare Products Inc. technical support center for assistance at 800-411-5136
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- **Yearly Verification of Calibration and Function:**

Equipment Required

- Respical RT200 or equivalent ventilator calibrator
- 50 psi regulated Oxygen source
- 110 VAC, 60 Hz
- Power Cord
- Corrugated tubing

Procedure

- Connect a 50 psi Oxygen source to the MCV200.
- Use the power cord and connect the unit to 110 VAC, 60 Hz power source.
- Connect the corrugated tubing the MCV200 outlet and the Respical high flow inlet.
- Set the tidal volume to 600 setting and turn the MCV200 on.
- Set the Gas Supply selection to Oxygen.
- Adjust the BPM rate per the following table and note acceptable range:

BPM	Acceptable Range
10	9 to 11
12	10.8 to 13.2
18	16.2 to 19.8
20	18 to 22

- Set the BPM to 10 and the Tidal Volumes per the following table:

Tidal Volume	Acceptable Range
200	180 to 220
400	360 to 440
600	540 to 660
800	720 to 880
1200	1080 to 1320

- Set the Gas Supply to Air. Retest the tidal volumes per the above table.
- Set the gas selector to 65% O₂ (Model MCV200-B only). Retest the tidal volumes per the above table.
- To test the pressure relief, set the selector knob on 60 cm H₂O. Remove the corrugated tubing from the outlet and close the outlet fitting with the palm of your hand. The airway pressure should not exceed 60 cm H₂O and the audible alarm should sound.
- To test the high airway pressure alarm, set the alarm to 40 cm H₂O. The alarm LED and the buzzer should turn on and the HPA setting should flash on the LCD. To silence the alarm hold the Alarm Silence button down for 3 seconds.
- To test the low pressure/breath delivery alarm, set the alarm to 5 cm H₂O. Open the patient outlet and the alarm/light will turn on in about 15 seconds.
- Turn off the gas supply and the low gas alarm/light will turn on and the pumps will automatically activate in one minute.

If problems are noted with this product, contact the Allied Healthcare Products, Inc. technical support center for assistance at 800-411-5136.

The following is a sample log that may be used for recording test records during Yearly Verification of Calibration and Function.

Test Log

Test Date:

BPM	Acceptable Range	Reading
10	9 to 11	
12	10.8 to 13.2	
18	16.2 to 19.8	
20	18 to 22	
Tidal Volume 100% O2	Acceptable Range	
200	180 to 220	
400	360 to 440	
800	720 to 880	
1200	720 to 880	
Tidal Volume 100% Air	Acceptable Range	
200	180 to 220	
400	360 to 440	
800	720 to 880	
1200	720 to 880	
Tidal Volume 65% O2 (MCV200-B ONLY)	Acceptable Range	
200	180 to 220	
400	360 to 440	
800	720 to 880	
1200	720 to 880	
Pressure Relief (60 cm Set Point) High Pressure Alarm	NO higher than 60 cmH2O Light Buzzer	
High Airway Pressure Alarm	Light Buzzer	
Low Pressure Breath Delivery Alarm	Light Buzzer	
Low Source Gas	Light Buzzer	

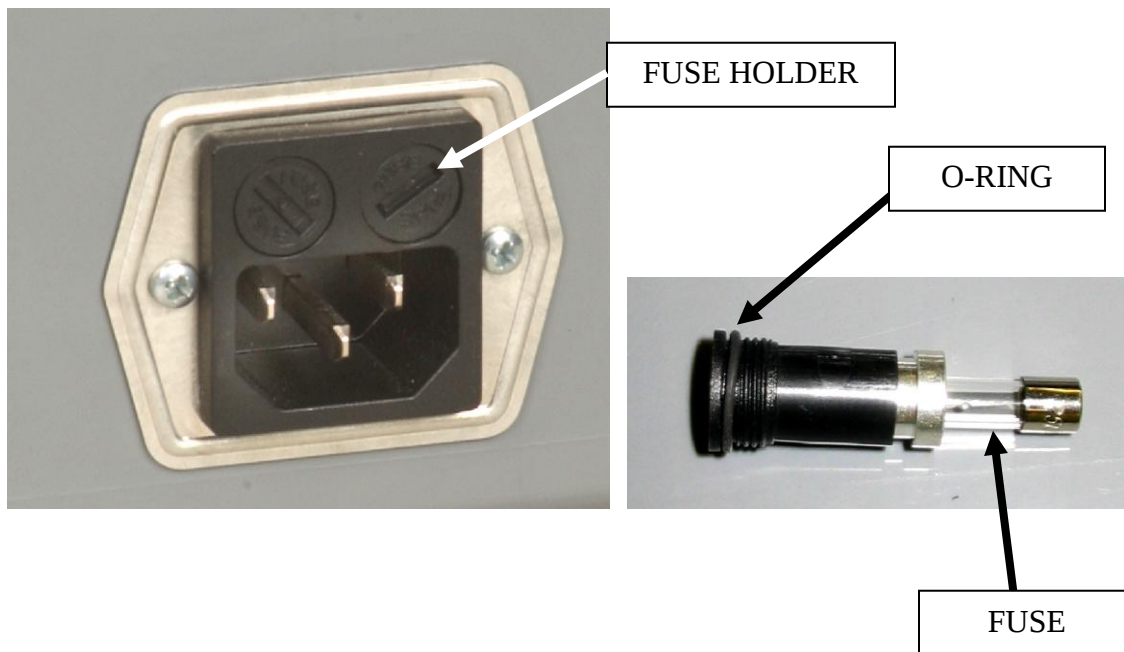
14. Fuses:

The MCV200 uses:

- Two 2 amp 5mm x 20mm fuses in the main AC inlet connection.

Fuse Replacement:

1. Remove the A/C power cord from the ventilator and ensure the unit is turned OFF.
2. The fuses (2) are located on the A/C power inlet connection.
3. Insert a small screwdriver into the fuse holder slot and unscrew the fuse holder from the housing.
4. Carefully remove the fuse holder and fuse.
5. Remove the fuse from the fuse holder by gently pulling the fuse out of the holder. No tools are required to remove the fuse from the fuse holder.
6. Insert a new fuse and reassemble the fuse holder assembly into the housing. Torque snug. Do not over tighten.



15. Accessories:

Part Number	Description	Qty per Package
L599-180	3' Vent Circuit, with Swivel	10
L599-190	3' Vent Circuit, with swivel, exhalation filter	10
L599-130	3' Vent Circuit , with swivel, adult mask	10
L599-140	3' Vent Circuit, with swivel, adult mask, exhalation filter	10
L595161-10	Disposable Cuffed Oxygen Mask, Adult	10
L595162-10	Disposable Cuffed Oxygen Mask, Child	10
MCM-001	Three Channel Oxygen Manifold	1
MCH-001	10 Ft. Oxygen Manifold Extension	1
L270-220	Oxygen Regulator	1
MCV-115V-CORD	Replacement Power Cord w/ 115v plug	1
MCV-STRAP	Replacement Kit, Velcro Straps	2
L535026	Replacement Oxygen Hose 6ft W/ DISS	1
MCV-FILTER	Replacement Particle Filter	3

Velcro Hang Straps:

Two Velcro hang straps have been included with your MCV200. The Velcro straps can be used to hang the ventilator from a horizontal support such as a bed rail. To attach the straps, simply insert the end of the strap through the handle hinges with the Velcro side down (Fig 1), loop the strap around a horizontal support and through the white buckle, and affix the Velcro strap to itself. Two straps should be used when hanging the MCV200 as shown below (Fig 2).



Fig 1



Fig 2

**NBR (Nuclear Biological Radiological)
Hazardous Environment Filter (not included):**

The air inlet fitting on the MCV200 has an internal 40 mm threaded connection per EN 148-1:1999. This is the standard thread connection for respiratory protective devices typically used by industry, law enforcement, and the military. This connection will accept air filters used in hazardous environments. To install, remove the air inlet screen and dust filter. The MCV200 will perform within manufacturer's specifications when used with filters that are in compliance with requirements as specified in NIOSH-42 CFR Part 84. Refer to filter manufacturer's specifications for gas type, filter life, and all other properties of the filter. Filter model FR-15-CBRN manufactured by 3M has been tested with this ventilator.

	Warning: Use of any filter with flow capacity of less than 40 LPM can degrade performance of the ventilator and may not provide filtration against the toxic environment for its intended use. Refer to manufacturer specifications for filter life.
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	Warning: Tighten filter in place securely to insure that the seal is air tight. Failure to tighten the filter may allow dangerous chemicals into the patient's lungs.
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16. Oxygen Cylinder Depletion Times:

These times are approximate and assume full cylinder capacity and .5 liters per minute usage for the pneumatic module. Always monitor the cylinder pressure and low pressure alarm to make sure you do not run out of oxygen.

**E Cylinder Capacity = 682 Liters Oxygen Capacity
(4.6 Liters Water Capacity)**

Breaths per Minute

Tidal Volume	8	9	10	12	14	15	18	20	22	24	26	28
1200	67	60	54	46	39	37						
1000	80	72	65	54	47	44						
800	98	88	80	67	58	54						
600	127	115	104	88	76	72	60	54	50	46	42	39
500	149	135	123	104	90	85	72	65	59	54	50	47
400	180	163	149	127	111	104	88	80	73	67	62	58
300	225	206	189	163	143	135	115	104	96	88	82	76
200	293	274	256	225	200	189	163	149	137	127	119	111

**Jumbo D Cylinder Capacity = 637 Liters Oxygen Capacity
(4.0 Liters Water Capacity)**

Breaths per Minute

Tidal Volume	8	9	10	12	14	15	18	20	22	24	26	28
1200	63	56	51	43	37	34						
1000	75	67	61	51	44	41						
800	92	82	75	63	54	51						
600	119	107	97	82	71	67	56	51	46	43	40	37
500	139	126	115	97	85	79	67	61	55	51	47	44
400	168	152	139	119	104	97	82	75	68	63	58	54
300	210	192	177	152	134	126	107	97	89	82	76	71
200	274	256	239	210	187	177	152	139	128	119	111	104

**D Cylinder Capacity = 414.6 Liters Oxygen Capacity
(2.8 Liters Water Capacity)**

Breaths per Minute

Tidal Volume	8	9	10	12	14	15	18	20	22	24	26	28
1200	41	37	33	28	24	22						
1000	49	44	39	33	29	27						
800	60	54	49	41	35	33						
600	77	70	63	54	46	44	37	33	30	28	26	24
500	91	82	75	63	55	52	44	39	36	33	31	29
400	109	99	91	77	67	63	54	49	44	41	38	35
300	137	125	115	99	87	82	70	63	58	54	50	46
200	178	166	155	137	122	115	99	91	84	77	72	67

17. Approximate Tidal Volume settings based on Height:

APPROXIMATE SETTINGS BASED ON PATIENT HEIGHT

9	I:E (1 TO -)	5.7	5.7	5.7	5.7	5.7					
10	I:E (1 TO -)	5.0	5.0	5.0	5.0	5.0					
12	I:E (1 TO -)	4.0	4.0	4.0	4.0	4.0					
14	I:E (1 TO -)	3.3	3.3	3.3	3.3	3.3					
16	I:E (1 TO -)	2.8	2.8	2.8	2.8	2.8					
20	I:E (1 TO -)	2.0	2.0	2.0	2.0	2.0					
24	I:E (1 TO -)	1.5	1.5	1.5	1.5	1.5					
28	I:E (1 TO -)	1.1	1.1	1.1	1.1	1.1					
8	I:E (1 TO -)						2.8	2.8	2.8	2.8	2.8
9	I:E (1 TO -)						2.3	2.3	2.3	2.3	2.3
10	I:E (1 TO -)						2.0	2.0	2.0	2.0	2.0
11	I:E (1 TO -)						1.7	1.7	1.7	1.7	1.7
12	I:E (1 TO -)						1.5	1.5	1.5	1.5	1.5
15	I:E (1 TO -)						1.0	1.0	1.0	1.0	1.0
20	I:E (1 TO -)						0.5	0.5	0.5	0.5	0.5
inches	Height - Male =((IBW-50)/2.3)+60	47	51	56	60	64	69	73	77	82	90
(cm)		(119.4)	(129.5)	(142.2)	(152.4)	(162.6)	(175.3)	(185.4)	(195.6)	(208.3)	(228.6)
feet		3' 11"	4' 3"	4' 8"	5' 0"	5' 4"	5' 9"	6' 1"	6' 5"	6' 10"	7' 6"
	Ideal Body Weight (kg) @ 10 ml/kg	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0	120.0
	Ideal Body Weight (lb) @ 10 ml/kg	44.1	66.1	88.2	110.2	132.3	154.3	176.4	198.4	220.5	264.6
inches	Height - Female =((IBW-45.5)/2.3)+60	49	53	58	62	66	71	75	79	84	92
(cm)		(124.5)	(134.6)	(147.3)	(157.5)	(167.6)	(180.3)	(190.5)	(200.7)	(213.4)	(233.7)
feet		4' 1"	4' 5"	4' 10"	5' 2"	5' 6"	5' 11"	6' 3"	6' 7"	7' 0"	7' 8"
	Ideal Body Weight (kg) @ 10 ml/kg	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0	120.0
	Ideal Body Weight (lb) @ 10 ml/kg	44.1	66.1	88.2	110.2	132.3	154.3	176.4	198.4	220.5	264.6

18. Altitude Conversion Chart

MCV200 Altitude Conversion Chart											
Altitude		Tidal Volume Setting (ml)									
(m)	(ft)	193	289	385	482	578	674	771	867	963	1156
0	0	200	300	400	500	600	700	800	900	1000	1200
500	1,640	212	318	424	530	636	742	848	954	1060	1272
1000	3,280	226	339	452	656	678	791	904	1017	1130	1356
1500	4,920	240	360	480	500	720	840	960	1080	1200	1440
2000	6,556	254	381	508	635	762	889	1016	1143	1270	1524
2500	8,200	272	408	544	680	816	952	1088	1224	1360	1632
3050	10,000	288	432	576	720	864	1008	1152	1296	1440	1728

The above table represents changes in delivered Tidal Volume associated with changes in altitude. This table applies only to the ventilator when compressed gas is used. When the 100% Air option is used, the above table does not apply. When the 100% Air option is used, the changes in delivered Tidal Volume due to altitude is minimal.

When using compressed gas, the settings for breath control must be adjusted, to compensate for the change in ambient air pressure associated with local altitude. Example: If the ventilator is to be used at an elevation of 1500 meters (4920 ft) and the required Tidal Volume was 600 ml. The Tidal Volume control knob would need to be set to the 500 ml position. The ventilator will actually deliver 600 ml.



At all altitudes, always monitor the patient for proper chest rise and insure that proper ventilation is being delivered.

19. Warranty:

Limited One (1) Year Warranty

LSP warrants this product to be free from defects in material and workmanship for a period of one (1) year from the date of manufacture. This Warranty is expressly conditioned on compliance with all inspection and preventative maintenance requirements as set by applicable government agencies and as specified by LSP.

This Warranty is extended by LSP only to the first purchaser of this product from either LSP or from an authorized LSP distributor.

LSP'S OBLIGATIONS AND PURCHASER'S REMEDIES UNDER THIS WARRANTY ARE LIMITED AS FOLLOWS: In the event of a defect, malfunction or failure to conform to this Warranty, purchaser shall return this product to LSP, with shipping charges prepaid, within a reasonable time after discovery of such defect, malfunction or failure to conform. LSP shall repair or replace (at LSP's option) this product if it is defective, malfunctions or fails to conform to this Warranty, and shall return it to purchaser with shipping charges prepaid and without any additional charges due to costs of repair or replacement.

In the event the product returned by purchaser is not defective, has not malfunctioned and does conform to this Warranty, LSP shall not be obligated to repair or replace the product and shall not be obligated for shipping charges for return of the product to the purchaser.

LSP shall in no event be liable for any consequential damages, not for loss, damages or expenses directly or indirectly arising from the use of this product.

Disclaimer of Other Warranties

THIS WARRANTY IS IN PLACE AND IN LIEU OF ALL OTHER WARRANTIES OR REPRESENTATIONS, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A SPECIFIC PURPOSE, BY OPERATION OF LAW OR OTHERWISE.

This Warranty does not apply to malfunction or damage resulting from accident, alteration, misuse, abuse of the product, improper preventative maintenance, storage at extreme temperatures or extreme environments beyond design limits, or where appropriate, improper use of the product by untrained persons. This Warranty does not apply to any plastic or rubber components since they can be affected adversely by undue exposures to heat, sun, water, ozone, or to other deteriorate elements.

LSP has not authorized any other firm or person to make any representations concerning this product nor to assume on LSP's behalf any liability in any way connected with the sale or use of this product.

This Warranty becomes void immediately should any repairs of, or alternations to this warranted product be made without authorization by LSP.



1720 Sublette Avenue
St. Louis, Missouri 63110-1968

20. Applicable Standards:

This equipment has been tested and found to comply with the EMC limits for the Medical Device Directive 93/42/ECN (EN 55011 and EN 60601-1-2). These limits are designed to provide reasonable protection against harmful interference in a typical medical installation. There is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference with other devices, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving device*
- *Increase the separation between the equipment*

Consult the manufacturer or field service technician for help

The MCV 200(-B) is intended to provide emergency respiratory support for children and adults. The product is intended to meet the following safety and performance standards:

Performance and Safety Requirements

- ASTM F920 – Performance and Safety Requirements for Resuscitators Intended for Use with Humans

Electrical Safety Requirements

- IEC 60601-1

Electromagnetic Compatibility

- IEC 60601-1,-2

Biocompatibility Requirements

- ISO 10993 – Physiochemical Tests for Plastics
- US Pharmacopoeia – Class VI
- ISO 10993-1

Transport and Storage Requirements

- MIL-STD-810E – Shock, Vibration, and Storage Requirements
- IEC 60068-2-27 – Shock, Vibration, and Storage Requirements
- IEC 60068-2-6 – Shock, Vibration, and Storage Requirements
- IEC 60068-2-34 – Shock, Vibration, and Storage Requirements

The above listing of standards is not intended to be a complete listing of standards reviewed and tested during the development of this product. It may also not reflect latest versions as standards change. Allied Healthcare Products, Inc. regularly reviews the standards and updates the products to ensure compliance as necessary.

For the latest revision of the instruction manual, please refer to the company website at www.alliedhpi.com

This manual is also available in other languages. Please call 314-771-2400 for more information on obtaining this manual in other languages.