Achieva

User's Manual

Ventilator with Flow Acceleration Limit and Apnea Backup

For further information, contact your Puritan-Bennett representative, or contact Nellcor Puritan Bennett directly by calling 1.800-NELLCOR

CONTENTS

Contents

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SECTION 1

Safety Information

1.1 Definitions

This manual uses three indicators to highlight information of particular importance. They are:

Warning

Indicates a condition that can endanger the patient or the ventilator operator.

Caution

Indicates a condition that can damage the equipment.

NOTE:

Indicates points of particular emphasis that make operation of the ventilator more efficient or convenient.

1.2 Warnings and Cautions

This section lists general warnings and cautions for your safety and that of the patient.

Warning

- Read all of this manual before using the ventilator.
- Anything that damages the ventilator may cause danger to the patient.
- Do not use your ventilator until you have been properly trained by your clinician and have read and understand this manual.
- Make sure you can hear the ventilator's alarm from other areas of the house, and when you are using appliances such as a vacuum cleaner, dishwasher, clothes dryer, television, or radio.
- Do not use the ventilator if you suspect it may not be working properly. Contact your clinician to have the ventilator tested or replaced.
- If the patient's condition warrants the use of an independent secondary alarm or a back-up means of ventilation, the clinician should prescribe it.
- Wash your hands thoroughly before and after handling patient connectors and other accessories.
- You should always check your ventilator's breath delivery settings before using with a patient. When adjusting settings, special care should be taken to make sure that the new settings are set accurately. Using incorrect settings during ventilation can cause danger to the patient.

Warning

- To avoid a fire hazard, keep matches, lighted cigarettes, and all other sources of ignition (e.g., flammable anesthetics and/or heaters) away from the Achieva ventilator system and oxygen hoses.
- Do not use hoses that are worn, frayed, or contaminated by combustible materials such as grease or oils.
- In case of a burning smell, immediately disconnect the ventilator from the oxygen supply, AC power, and backup power source.

Caution

- Do not attempt to make any repairs or otherwise service the ventilator. Contact an authorized service representative for any service needs.
- Do not use or store this ventilator in the presence of strong electromagnetic fields such as an MRI environment.

SECTION 2

Purpose of the Device

2.1 Intended Use

This device is intended to provide ventilatory support for pediatric and adult patients who require positive pressure mechanical ventilation. Patients should weight no less than 11 lbs (5 kg).This device is for use in home, institutional, and portable settings.

This device is contraindicated for use with anesthetic gases. This device is intended to be used on the order, and under the supervision, of a physician.

2.2 Role of Your Clinician

In this manual, the term *clinician* means the trained health-care professional who is helping you use the Achieva ventilator in your home. This may be a doctor or nurse who is treating your patient, or some other trained health-care professional.

Your clinician will:

- Order a ventilator for use in your home
- Train you to use the ventilator
- Help you to set up the ventilator
- Select appropriate accessories to use with your ventilator
- Show you how to respond to alarms
- Answer your questions about using the ventilator
- Follow up with you on a regular basis to make sure the ventilator is meeting your needs

2.3 How the Ventilator Works

2.3.1 Overview of Ventilation

A ventilator - like the Achieva ventilator you are about to use - is a device that is designed to assist the patient by moving air into their lungs and providing adequate ventilation.

2.3.2 Important Terms

You should be aware of the following terms that will appear frequently throughout this manual.

Mode: The manner or method of ventilatory support provided by the ventilator.

Volume: The amount of air delivered to the patient with each breath.

Pressure: A measure of the pressure required to “push” air into the patient’s lungs.

Respiratory Rate: The number of breaths per minute.

2.3.3 Modes of Ventilation

The following is a general description of the various modes of ventilation available with the Achieva ventilator. It is up to your clinician to determine which modes are appropriate for your patient.

2.3.3.1 Assist/Control (A/C) Mode

In Assist/Control mode, machine-initiated breaths are delivered at a clinician-set volume or pressure, inspiratory time, and rate. If the patient triggers a spontaneous breath between machine breaths, the ventilator will deliver a breath based on the volume or pressure settings. Whether initiated by the patient or the ventilator, all breaths are delivered at the same pre-set volume or pressure.

2.3.3.2 SIMV Mode

In SIMV (Synchronized Intermittent Mandatory Ventilation) Mode, machine-initiated breaths are delivered at a clinician-set volume, inspiratory time and rate. These mandatory breaths are synchronized with patient effort. If the patient triggers a spontaneous breath between machine breaths, the ventilator will deliver a spontaneous breath, which can be pressure-supported. Spontaneous breaths in SIMV do not have a pre-set volume or pressure.

2.3.3.3 Spontaneous (SPON) Mode

In Spontaneous mode, breaths are delivered with a volume, pressure and rate that are determined by the patient. Spontaneous mode is most frequently used with either CPAP (Continuous Positive Airway Pressure) or a combination of PS (Pressure Support) +CPAP.

2.3.3.3.1 CPAP

In CPAP, the ventilator maintains a constant level of pressure in the patient's airway. This can help to improve oxygenation, or the level of oxygen in the patient's blood. If your clinician has prescribed CPAP, you should talk to him or her for a further explanation of how CPAP works.

2.3.3.3.2 PS+CPAP

Like CPAP, PS+CPAP maintains a constant level of pressure in the patient's airway. In addition, the ventilator applies a clinician-set pressure to each of the patient's breaths. This has the same benefits as CPAP, with the additional benefit of assisting the patient in moving air into the lungs.

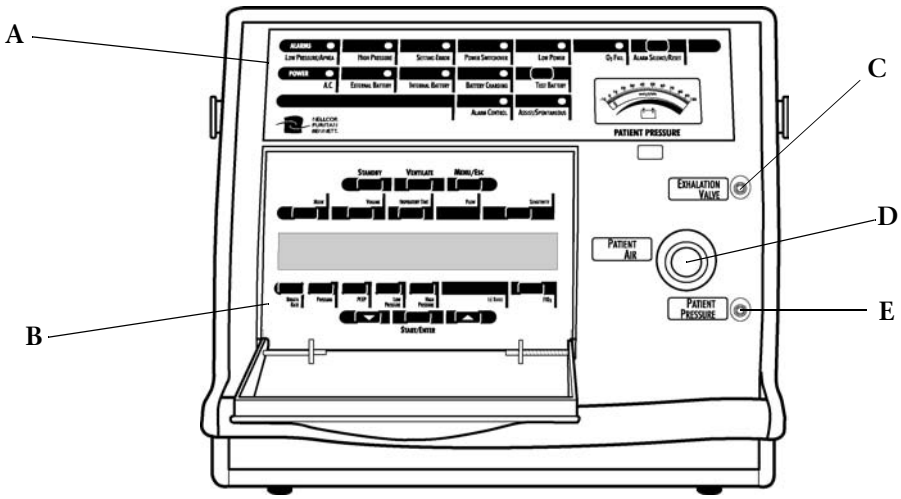
Description

3.1 Your Achieva Model Number

Your Achieva model number is printed on the front door panel. There are certain features described in this manual that only pertain to certain models.

3.2 Front Panel

Figure 3-1. Front Panel



A. Top Panel

B. Door Panel (Display and Controls)

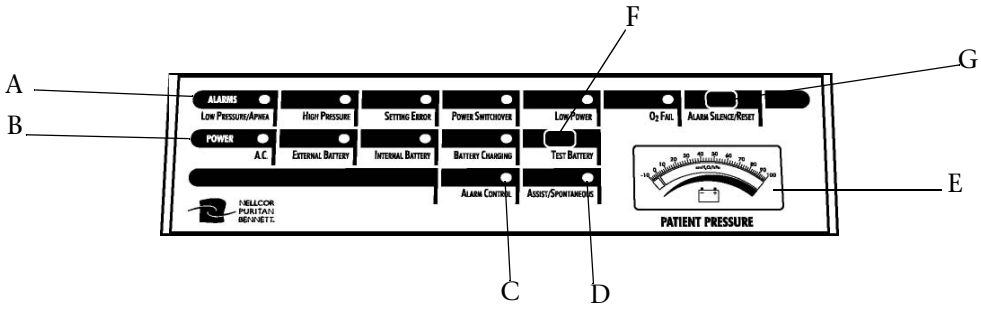
C. Exhalation Valve Port

D. Patient Air Port

E. Patient Pressure Port

3.2.1 Top Panel

Figure 3-2. Top Panel.



A. ALARMS INDICATOR Lights

The ventilator's ALARMS INDICATOR lights will flash when an alarm condition is detected. The lights are turned off only when the condition is corrected, and the ALARM SILENCE/RESET key is pressed. The ALARMS INDICATOR has lights for the following alarm conditions:

- Low Pressure/Apnea
- High Pressure
- Setting Error
- Power Switch-over
- Low Power
- O_2 Fail (Achieva PSO_2 only)

These alarm conditions will be explained later in this manual. For now, be sure to familiarize yourself with the location of the ALARMS INDICATOR lights.

NOTE:

For the Achieva and Achieva PS models, which do not have the oxygen function, the O_2 Fail alarm light position is present, but it has no light or label.

B. POWER INDICATOR Lights

The ventilator's POWER INDICATOR lights indicate which electrical source the ventilator is currently using and if the internal battery is being charged. The POWER INDICATOR has lights for the following power conditions:

- AC
- External Battery
- Internal Battery
- Battery Charging

These power conditions will be explained later in this manual. For now, be sure to familiarize yourself with the location of the POWER INDICATOR Lights.

C. ALARM CONTROL Light

The ALARM CONTROL light flashes when the audible alarm has been presilenced. The ALARM CONTROL light will continuously light when the nonlatching alarm feature is active. You will learn more about pre-silencing alarms later in this manual.

D. ASSIST/SPONTANEOUS Light

This indicator lights when the patient's breathing effort meets or exceeds the ventilator's sensitivity setting.

E. PATIENT PRESSURE Meter

The PATIENT PRESSURE meter shows the level of pressure that is currently in the patient circuit.

F. TEST BATTERY

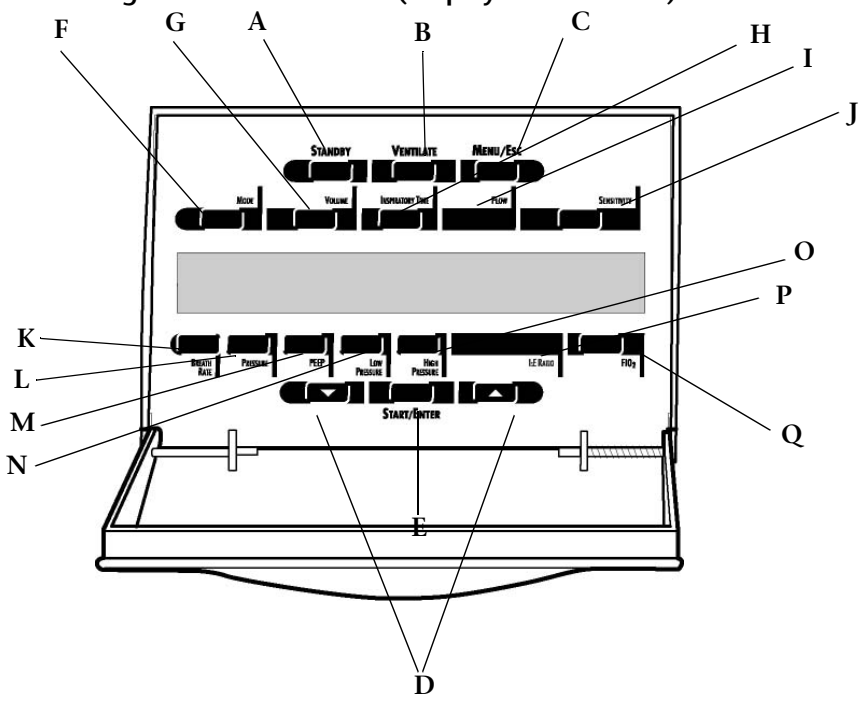
When the TEST BATTERY key is pressed and held, the PATIENT PRESSURE meter shows the charge level of the battery currently in use.

G. ALARM SILENCE/RESET

The ALARM SILENCE./RESET key silences the audible alarm during an alarm condition. The ALARM SILENCE/RESET key can be used to pre-silence the audible alarm for a period of 60 seconds. If an alarm condition occurs while the 60-second pre-silence period is in effect or while ALARM SILENCE/RESET is active, the LCD will display the alarm condition, but the alarm will not sound. This key can also be used to reset an alarm after the alarm condition has been corrected.

3.2.2 Door Panel (Display and Controls)

Figure 3-3. Door Panel (Display and Controls)



The display and control panel is located behind the ventilator's front door panel. This front door panel is magnetically latched to prevent tampering and accidental resetting when closed.

The following is a brief explanation of what each of the controls may be used for. Further information regarding how and when you should use the controls will be provided later in this manual.

General Controls

A. Standby

When pressed and held for three (3) seconds, the STANDBY key causes the ventilator to stop delivering air.

B. Ventilate

Pressing the VENTILATE key causes the ventilator to begin delivering air.

C. Menu/Esc

Pressing the MENU/ESC key activates the menu options on the ventilator's display.

D. Up and Down Arrow Keys

The up and down arrow keys are typically used to move between values displayed in the ventilator's LCD window. While a ventilator setting is flashing, pressing the up and down arrow keys will increase or decrease the flashing setting's value. While the ventilator's menu options are active, pressing the up and down arrow keys allows you to move between menu levels. If none of the ventilator's settings are flashing, and the menu options are not active, pressing the up or down arrow keys will cause the last alarm message to be displayed in the LCD window.

E. Start/Enter

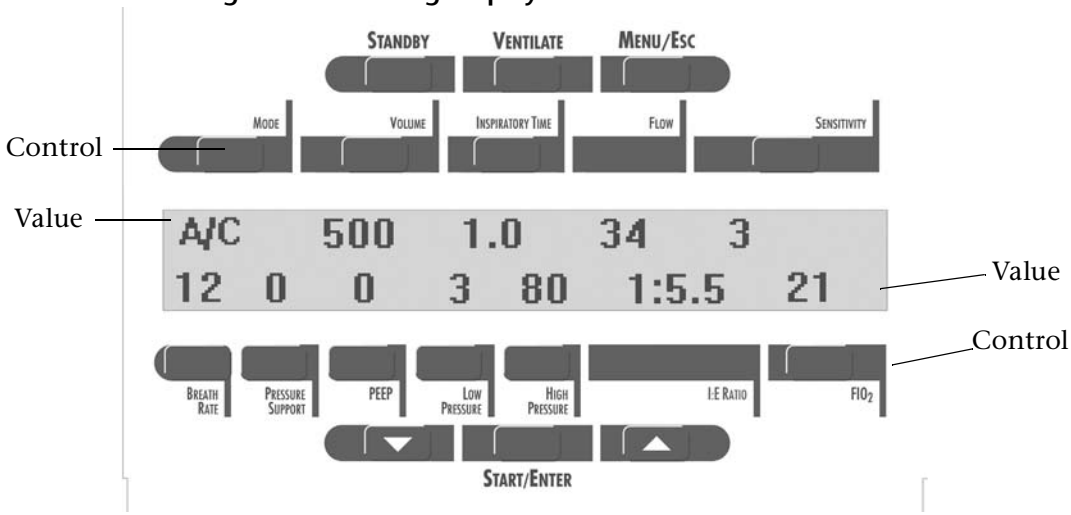
If the ventilator is in Standby, pressing START/ENTER will activate the display in the LCD window. START/ENTER is also used to accept a flashing setting value.

Setting Controls

You can select a setting by pressing the corresponding setting control key. Selecting a setting will cause the current setting value to flash in the display screen, allowing the setting value to be adjusted.

Setting values are displayed in the LCD window. Each setting value displayed in the window corresponds with the control nearest it (above or below.) Values displayed in the top row correspond to the row of controls located directly above the LCD window. Values in the bottom row correspond to the controls directly below the window.

Figure 3-4. Setting Display and Control Correlation



NOTE:

The I:E Ratio and Flow settings do not have keys. These controls are labeled for display purposes only.

F. Mode

G. Volume

H. Inspiratory Time

I. Flow (Display only)

J. Sensitivity

K. Breath Rate

L. Pressure

M. PEEP

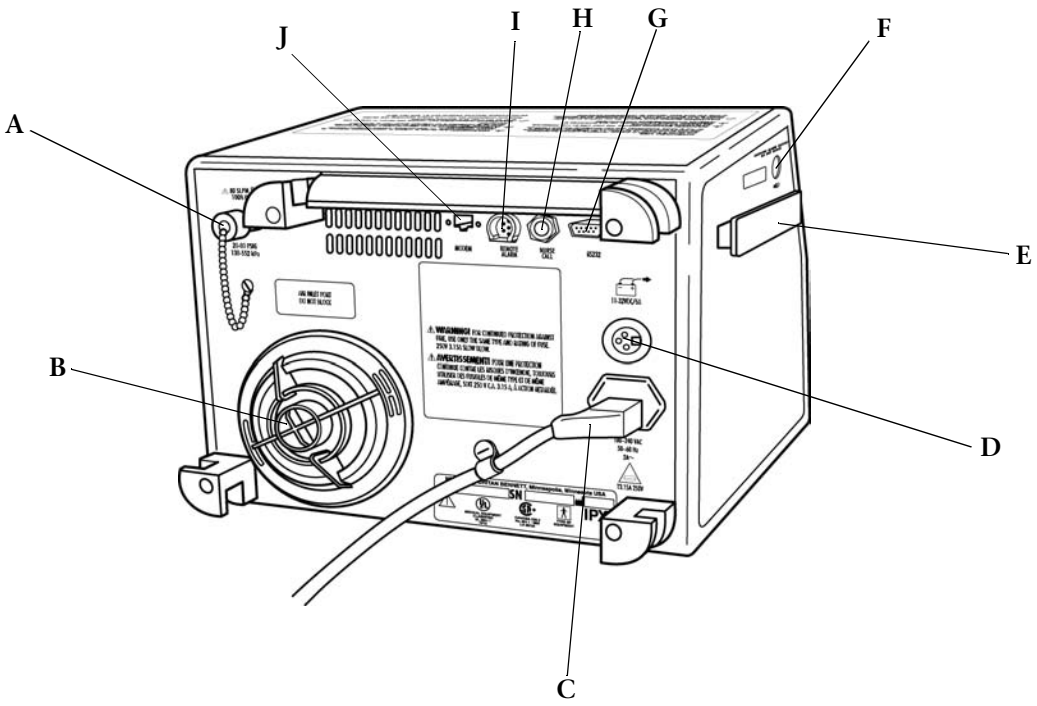
N. Low Pressure

O. High Pressure

P. I:E Ratio (Display only)

Q. FiO_2 (Achieva PSO_2 only)

3.3 Rear and Side Panels



A. **Oxygen Input Connection** (Achieva PSO_2 only)
B. **Inlet Filter**
C. **Power Cord Connector**
D. **External Battery Connector**
E. **Side Rail**
F. **Audible Alarm Port** (on side of ventilator) **DO NOT BLOCK**
G. **Communications Connector**
H. **Nurse Call Output**
I. **Remote Alarm Connector**
J. **Modem Connector** (Achieva PS and PSO_2 only)

3.4 Power Supply

Your Achieva ventilator can use any one of the following power sources:

- AC Power
- External 12 or 24 Volt DC Battery
- Internal Battery

3.4.1 AC Power

NOTE:

- Whenever possible, the ventilator should be plugged in to an AC power outlet. This allows the ventilator to maintain its internal battery charge.
- All three power sources can be connected to the ventilator at the same time; if AC power fails, the ventilator will automatically switch to the next best power source.

When the ventilator is plugged in to a functioning wall outlet, it automatically selects the AC power source. It will operate indefinitely on AC power. While the ventilator is operating from AC power, the AC power light (on the top panel) will be lit.

3.4.2 External Battery

An external battery should be used as a backup power source, in case of AC power failure (i.e. a power outage in your home.) An external battery may also be required when AC power is unavailable (i.e. while the patient is in a wheelchair, car or other vehicle.) While the ventilator is operating from the external battery, the EXTERNAL BATTERY power light (on the top panel) will be lit.

3.4.3 Internal Battery

NOTE:

The internal battery will automatically charge while the ventilator is connected to an AC power source and is operating in any mode, including Standby.

The ventilator has an internal battery that is capable of powering the ventilator for a limited time. The internal battery should only be used if an AC power source or an external battery is not available. You should not rely on the internal battery as the sole backup power source for your ventilator.

The ventilator will automatically switch to its internal battery when other power sources fail or drop below adequate levels. The Power Switch-over alarm signals whenever the ventilator switches from AC or an external battery to its internal battery.

While the ventilator is operating from its internal battery, the INTERNAL BATTERY light (on the top panel) will be lit. As the battery nears depletion, the ventilator will sound one of the following audible alarms to signal that you should provide another power source.

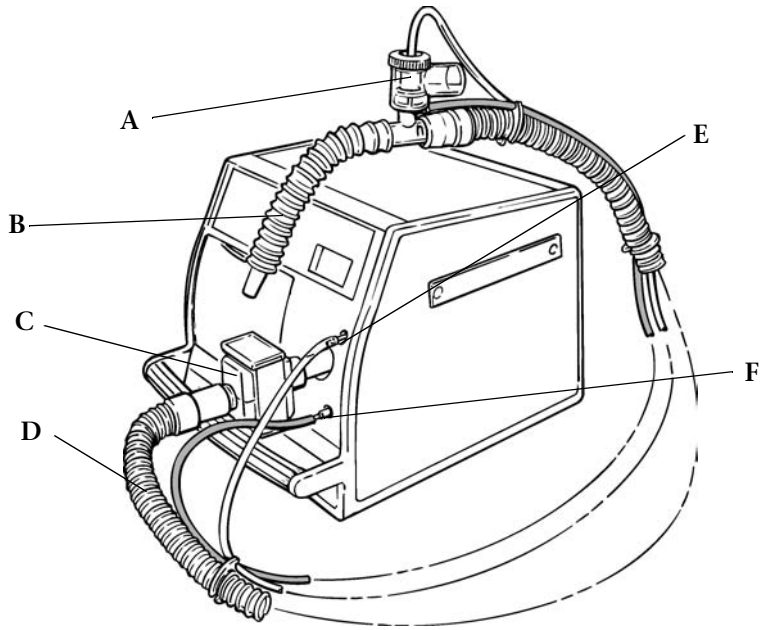
- Low Internal Battery Alarm: When approximately 45 minutes of power remains, the ventilator's alarm will sound a single beep every five minutes.
- Extremely Low Internal Battery Alarm: When approximately 10 minutes of power remains, the LOW POWER light flashes and the alarm sounds 3 pulses. The ventilator continues to sound the alarm until an external power source is connected. You can silence the alarm for five minute intervals by pressing the ALARM SILENCE/RESET key.

- Battery Charge Depleted (ventilator continues to operate): When the internal battery is nearly depleted, the LOW POWER light continues to flash and the alarm sounds 5 pulses. The ventilator will continue to alarm until an external power source is connected. You cannot silence a Battery Charge Depleted alarm until after you connect an alternate power source.

3.5 Patient Circuit

The patient circuit consists of the parts shown in Figure 3-5.

Figure 3-5. Patient Circuit



A. Exhalation Manifold

The exhalation manifold controls the flow of air to and from the patient.

B. Flex Tube

The flex tube connects the patient circuit to the tracheostomy tube. The flex tube is made of flexible material that makes the circuit more comfortable for the patient.

C. Bacteria Filter

The bacteria filter cleans the incoming air before it is delivered to the patient.

D. Patient Air Tube

This is the large tube between the bacteria filter and the exhalation manifold.

E. Patient Pressure Tube

This small tube connects the patient pressure port on the ventilator to the exhalation manifold.

F. Exhalation Tube

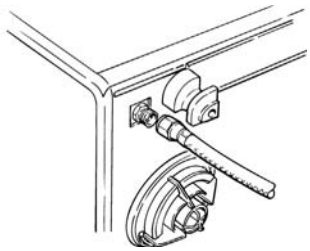
This small tube connects the exhalation valve port to the exhalation manifold.

3.6 Supplemental Oxygen

NOTE:
Your clinician will determine if your patient needs supplemental oxygen and will provide you with specific instructions as necessary.

If you are operating an Achieva model PSO_2 ventilator, your ventilator has an optional internal oxygen blender. This means an external oxygen source can be connected to the oxygen input connector on the back of the ventilator.

Figure 3-6. Connecting Oxygen Supply



Two other methods of delivering supplemental oxygen are available:

- Oxygen Enrichment Kit
- 90° Elbow with Oxygen Fitting

3.6.1 Oxygen Enrichment Kit

Your clinician may prescribe an Oxygen Enrichment Kit (OEK), which can be connected to the air inlet port on the back of the ventilator. The OEK comes with complete instructions for set up and use.

3.6.2 90° Elbow with Oxygen Fitting

Warning

If you are using the 90° elbow to deliver supplemental oxygen, care should be taken to securely attach the oxygen line to the elbow's oxygen fitting. If the oxygen tube becomes disconnected from the 90° elbow, the drop in pressure may not be significant enough to sound the ventilator's Low Pressure Alarm. This means that the patient may not receive the prescribed levels of oxygen and the tidal volume may be decreased, but you may not be alerted by the ventilator's audible alarm system. To prevent this, you should push the oxygen line tubing as far down on the elbow's oxygen fitting as possible, to reduce the possibility of inadvertent disconnection.

Your clinician may prescribe the use of a 90° elbow with an oxygen fitting. The 90° elbow releases controlled amounts of oxygen directly into the patient circuit. The elbow should be connected between the bacteria filter and the patient circuit. A low-pressure oxygen line can then be connected to the fitting on the elbow. Your clinician will provide you with complete instructions for using the 90° elbow and the oxygen source.

3.7 Humidification Devices

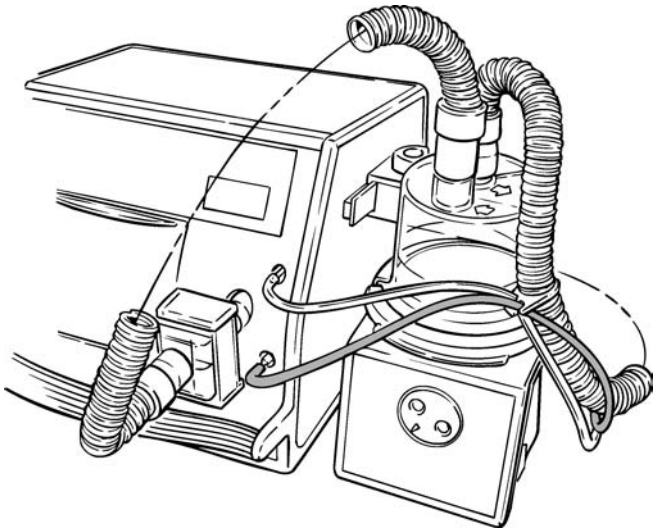
Your clinician may prescribe that the air be humidified before it is delivered to the patient. Air can be humidified by passing it through an HME (heat and moisture exchanger), an "artificial nose" device (used for short term humidification), or a humidifier. You should follow the device manufacturer's instructions for connecting any of these devices to the patient circuit.

Follow these safety guidelines for using a humidification device with your ventilator:

Warning

- Always position a humidification device so that it is lower than the patient.
- Do not place a humidifier on top of, or above the ventilator.
- Using an HME or an "artificial nose" may affect the ventilator's low pressure alarm setting. See "Setting the Low Pressure Alarm" on page 4-8
- If a heated humidifier is used, you should always monitor the temperature of delivered air. Air that becomes too hot may burn the patient's airway.

Figure 3-7. Achieva Ventilator Connected to a Humidifier



When a humidification device is used, condensation may form in the patient circuit over time. You should regularly check the patient circuit for signs of condensation. If you notice moisture in the patient circuit, you should disconnect and drain the circuit or replace it with a dry circuit.

Refer to the humidification device's instruction manual for operating, cleaning, and sterilization instructions.

SECTION 4

Set Up

4.1 Preparing your Ventilator

The Achieva ventilator needs the following items to function properly. Make sure you have these items before proceeding.

- Power Source (AC power outlet or external battery)
- Inspiratory filter
- Patient circuit
- Air inlet filter
- Means of connection to the patient (i.e. endotracheal tube, tracheostomy tube, or mask)

1. Before using your ventilator, inspect the device. Make sure that:
   - The power cord does not have any kinks, breaks or damaged insulation.
   - The connectors, rubber feet, filter housings, etc. are not loose or broken.
   - The outer casing does not have any dents or scratches which may indicate dropping or other damage.
   - All of the labels and markings on the ventilator are clear and legible.

Caution

Contact your clinician if the Achieva ventilator is damaged. Do not use a damaged ventilator.

NOTE:

Visual inspection should be performed each time the ventilator is used after storage as well as periodically during normal use.

2. If necessary, wipe down your ventilator with a mild soap solution. See “Cleaning the Achieva Ventilator” on page 8-1.
3. Check to see if a clean air inlet filter is installed. If the filter is dirty, or if there is no filter in place, install a new one. See “Replacing the Air Inlet Filter” on page 8-2.

4.2 Where to Place the Ventilator

Choose a place in your home to set up the ventilator according to the following safety guidelines:

Warning

- Make sure you can hear the ventilator's alarm from all rooms in the house, and when you are using appliances such as a vacuum cleaner, dishwasher, clothes dryer, television or radio. Do not leave the patient unattended if you cannot hear the ventilator's alarm.
- Do not place the ventilator in a position where a child could reach it and change the controls.
- Do not place the ventilator in any position that might cause it to fall on the patient.
- Place the ventilator where the patient circuit can easily reach the patient. Make sure the tubing hangs loose, without strain, so that the patient can move freely.
- Maintain at least four inches between the air inlet filter (on the back of the ventilator) and the wall. Make sure the rear panel is not close to draperies or other items that could block the air flow into the air inlet filter.
- Do not place anything in front of the ventilator's alarm port (on the side of the ventilator) that could block or decrease the sound of the alarm.
- Do not place anything in front of the ventilator's patient air port (on the front of the ventilator) that could block or decrease the amount of air flowing from the ventilator to the patient.

Caution

- Do not place the ventilator on or near electrical equipment such as a cellular or cordless phone, television, radio, microwave oven, or an electric heater. These may affect the ventilator and cause it to work improperly.
- Do not expose the ventilator to extreme moisture, such as direct exposure to rain. Extreme moisture can cause the ventilator to fail or work improperly.
- Do not place a humidifier above the ventilator. Moisture from the humidifier may condense in the patient circuit and may drain into the ventilator.
- Do not place a container of liquid on or near the ventilator. Liquids spilled on the ventilator may cause it to work improperly.

Follow these instructions to check your ability to hear the ventilator's alarm in the home.

1. Before connecting to the patient, place the ventilator on a flat, sturdy surface in the location where it will be used most frequently.
2. Plug the ventilator into a grounded AC power outlet, See "Connecting the Ventilator to an AC power outlet" on page 4-6.
3. Press the START/ENTER key to turn on the ventilator.
4. Press VENTILATE to start breath delivery. Because the ventilator is not connected to a patient, an alarm condition will sound.
5. Go to various parts of the home to make sure that you can hear the alarm. You should also turn on any device that produces sounds (e.g. radio, television, tools, and household appliances) to make sure that you can still hear the ventilator alarm over the device. If you find that there are certain areas of the home or noisy activities over which you cannot hear the alarm, do not leave the patient alone while you are in those areas or engaging in those activities.

Remote Alarm Accessory

If required, a remote alarm accessory is available. The remote alarm can help you to hear the ventilator's alarm from a remote location. Contact your clinician or a Nellcor Puritan Bennett representative for more information on purchasing and using a remote alarm.

If you are using a remote alarm, follow the procedure above to find the best location for it.

4.2.1 Electrical Interference

The Achieva ventilator may be subject to electrical interference. Electrical interference can come from television sets, cordless or cellular telephones, microwave ovens, air conditioners, food processors, and other appliances. Follow these guidelines to reduce the risk of interference:

- Do not place your ventilator near an appliance.
- Do not plug your ventilator into the electrical outlet or electrical outlet circuit that is used by an appliance.
- Do not place the ventilator cables near an appliance.

If your ventilator causes interference to other devices, follow the guidelines below:

- Turn the antenna on the affected device (e.g., radio, television, cordless phone.)
- Move the device away from the ventilator.
- Connect the ventilator to an outlet which is on a different electrical circuit than the affected device.
- Consult the dealer or an experienced radio/TV technician for help.

4.3 Mounting the Ventilator on a Wheelchair

When using the ventilator on a wheelchair, follow these safety guidelines:

Warning

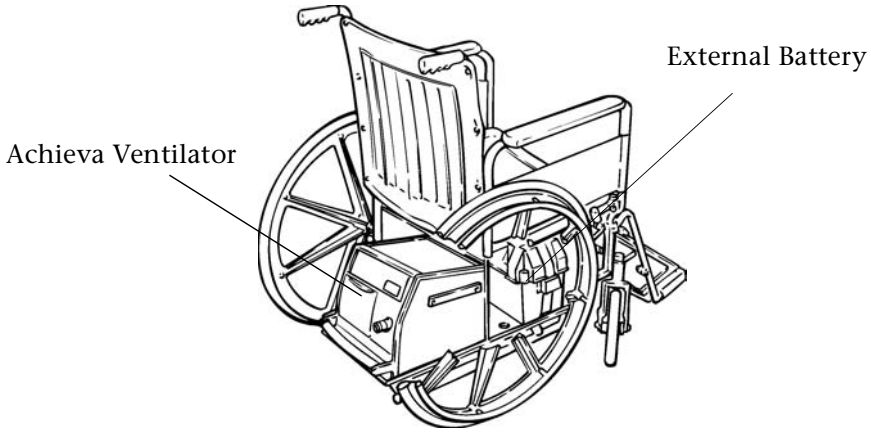
Position the external battery as far away from the ventilator's air inlet port as possible. This will help prevent battery gases from drifting toward the ventilator's air inlet.

Caution

- Always provide an external battery as the power source. Do not rely solely on the ventilator's internal battery to sustain ventilation.
- Do not use the same battery to power both the ventilator and an electric wheelchair.
- Protect the ventilator from extreme moisture, such as direct exposure to rain.
- Check the air inlet filter frequently while the ventilator is mounted on a wheelchair as environmental conditions may cause the air filter to become dirty more rapidly.

Mounting instructions may vary depending on the wheelchair model and manufacturer. Consult the wheelchair supplier or manufacturer for standard wheelchair adaptations. Figure 4-1 illustrates the recommended placement of the ventilator and the external battery.

Figure 4-1. Ventilator and Battery Placement on Wheelchair



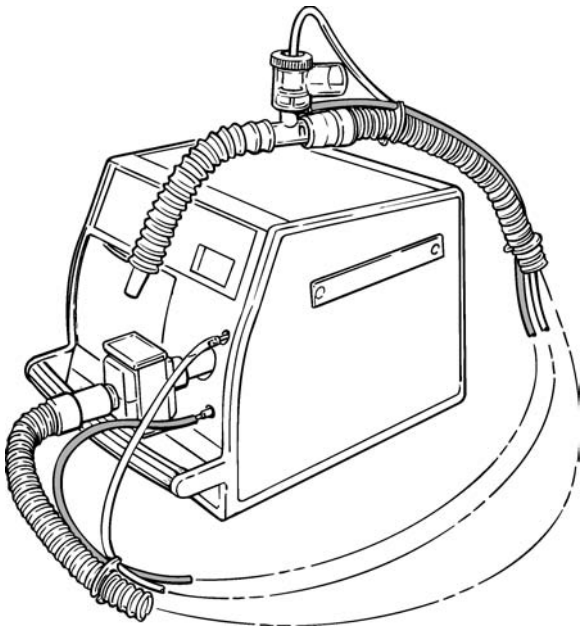
It is a good idea to place a partition between the ventilator and the external battery. This will help to protect the ventilator from battery fluid, in the event of a battery leak. This partition should be at least four inches away from the ventilator's air inlet filter, so that it does not impede the flow of air into the ventilator.

If the ventilator and the battery are in the same tray, holes should be cut into the tray to allow any leaking battery fluid to drain away from the ventilator. Placing the battery in a plastic container may also help to protect the ventilator from leaking battery fluid.

4.4 Connecting the Patient Circuit

Connect the patient circuit according to the circuit manufacturer's instructions. Make sure that all connectors fit snugly. If a connector does not fit properly, contact your clinician for guidance. Do not use the ventilator if any of the connections do not fit properly.

Figure 4-2. Achieva Ventilator with Patient Circuit



4.5 Connecting the Ventilator to an AC power outlet

The ventilator may be operated on AC power, that is, with the power cord plugged into a wall outlet, or it can operate on its internal battery for a limited time. The ventilator may also be operated on an external battery. If you are using an external battery, See "Using an External Battery" on page 4-7.

Warning

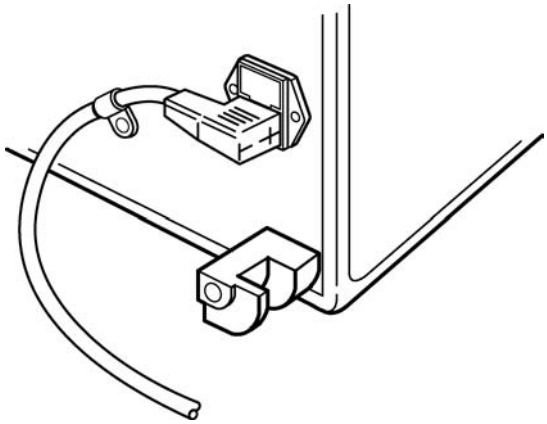
Do not plug the power cord into an electrical outlet controlled by a wall switch because the power may be accidentally turned off.

NOTE:

Keep the ventilator plugged in to AC power whenever possible. This allows the ventilator to charge the internal battery.

1. Plug the socket end of the power cord into the power cord connector on the back of the ventilator

Figure 4-3. Connecting the Power Cord.



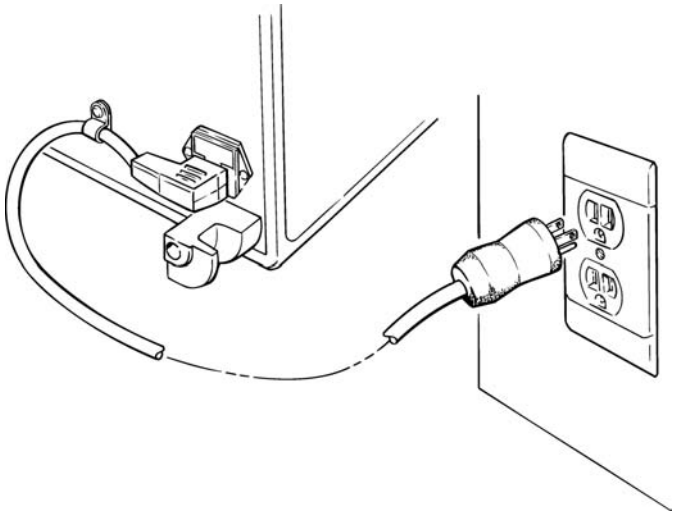
2. Plug the other end of the cord (the end with three prongs) into an AC power outlet. The outlet must be properly grounded - that is, it must have three slots. Contact your clinician or a qualified electrician if you do not have a suitable outlet.

   When you plug in the ventilator, the BATTERY CHARGING and AC POWER lights will light at the same time.

NOTE:

The power plug may not be compatible with outlets in some countries. If you encounter an outlet that is not compatible, contact your clinician for guidance. He or she will be able to recommend a suitable adaptor or replace your plug with one that is compatible with your outlets.

Figure 4-4. Connecting to an AC Outlet



3. Verify that the BATTERY CHARGING and A.C. lights are lit.

Warning

If the BATTERY CHARGING or AC light does not light up, do not use the ventilator. Call your clinician immediately.

4.6 Using an External Battery

When AC power is unavailable, the ventilator can operate from an external 12 or 24 Volt DC battery.

NOTE:

For optimal performance, a 24 Volt battery is recommended. Although a 12 Volt battery can be used, a Setting Error alarm is more likely to occur as the 12 Volt battery discharges.

Follow these safety guidelines when using an external battery:

Warning

- Position the external battery as far away from the ventilator's air inlet port as possible. This will help prevent battery gases from drifting toward the ventilator's air inlet.
- If the EXTERNAL BATTERY indicator does not light once the battery is connected, do not use the external battery. Connect your ventilator to AC power and contact your clinician.

Caution

- Do not place a battery above or on top of the ventilator.
- Use only Puritan-Bennett approved cables and batteries.

Follow the instructions included with your battery to connect it to your ventilator. Once the battery is connected, check to make sure that the ventilator's EXTERNAL BATTERY indicator light is lit. This light signals that your ventilator is properly connected and is using the external battery.

4.7 Setting the Low Pressure Alarm

The low pressure alarm will notify you if the air pressure in the patient circuit drops below a prescribed limit. Follow these safety guidelines when setting the low pressure alarm.

Warning

- Do not set the low pressure alarm while the ventilator is connected to the patient. Provide an alternate means of ventilation.
- Under certain conditions, the patient's breathing effort may cause continuous low pressure alarms, even when the Low Pressure Alarm is carefully set. If this occurs, contact your clinician immediately for guidance.
- Repeat the low pressure alarm setting procedure whenever you change, replace, remove or reconnect components of the patient circuit, or when you change the ventilator's parameters.
- If you are using an HME with your ventilator, you must periodically re-adjust the low pressure alarm setting. Contact your clinician to determine the appropriate interval.
- Some patient circuit components may inhibit low pressure alarms when the low pressure limit is not carefully set.

Follow these instructions for setting the low pressure alarm:

1. Check to make sure that the patient circuit is assembled exactly as it will be used by the patient. Attach all accessories, including the HME and inner cannula of the tracheostomy tube.
2. Verify that all of the ventilator's parameters are set to the prescribed values. Adjust them if necessary. See "Adjusting Setting Parameters" on page 6-1.
3. Press VENTILATE to start breath delivery.
4. Press START/ENTER to display current settings.
5. Press LOW PRESSURE to select the low pressure parameter.
6. Adjust the LOW PRESSURE setting by pressing the up or down arrow on the control panel.
7. After each adjustment, allow the ventilator to complete two breath cycles. It takes two breath cycles for the alarm to sound.
   If you do not hear the low pressure alarm (5 audible pulses), repeat steps 6-7.
8. Stop adjusting the LOW PRESSURE setting when you hear the low pressure alarm. The low pressure alarm is set.

4.8 Configuring for Assist/Control Ventilation

Warning

- **Risk of change from Assist/Control Volume Ventilation to Assist/Control Pressure ventilation:** If the ventilator is operating in Assist/Control Volume ventilation and the MODE key is pressed, the setting display will show "Assist/Control Pressure" using whatever the last pressure support value setting was (such as the Pressure Support value set for SIMV or SPONT.) If the START/ENTER key is pressed while this Assist/Control Pressure display is present, the ventilator will switch to operating in Assist/Control Pressure. Therefore, **do not** press START/ENTER unless you intend to change to A/C Pressure ventilation and you have verified that the ventilator is set to the correct pressure.
- To eliminate the possibility of an accidental change in ventilator parameters by an inadvertent START/ENTER entry, you should set the Pressure Support values to zero ("0") before placing the ventilator into the Assist/Control Volume ventilation mode. Follow the instructions below.

1. Press the MODE key.
2. Press UP or DOWN arrow key to scroll to the SPONT mode. (10 BPM back-up rate will be displayed.) Press START/ENTER.
3. If Pressure Support is present, use the arrow keys to set it to zero ("0"). Press START/ENTER to accept the setting.
4. Press MODE.
5. Press UP or DOWN arrow key to scroll to the SIMV mode. Press START/ENTER.
6. If Pressure Support is present, use the arrow keys to set it to zero ("0"). Press START/ENTER to accept the setting.
7. Press MODE.
8. Press UP or DOWN arrow key to scroll to the A/C mode. Press START/ENTER.
9. If a pressure value is present, use the arrow keys to set the pressure to zero ("0"), then press START/ENTER.

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Check - Out

5.1 Completing the User Self Test

Before connecting the patient, it is important to test your ventilator to make sure that it is working properly. It is recommended that the User Self Test be conducted:

- Before initial use
- Once per month
- Each time you remove or replace the patient circuit

Warning

- Do not conduct this test while the patient is connected to the ventilator. Switch the patient to an alternate means of ventilation before conducting this test.
- To reduce the risk of infection, be sure to wash your hands thoroughly before and after handling the ventilator or its accessories.

NOTE:

Nellcor Puritan Bennett recommends that you run the User Self Test before initial use, once per month while the ventilator is in use, and each time you remove or replace the patient circuit. Nellcor Puritan Bennett recognizes that the protocol for running the User Self Test varies widely among health care providers. It is not possible for Nellcor Puritan Bennett to specify or require specific practices that will meet all needs, or to be responsible for the effectiveness of those practices.

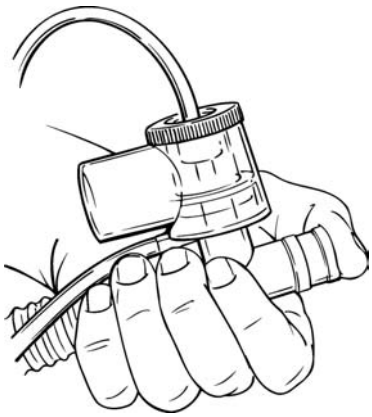
1. Press and hold the STANDBY key for three (3) seconds. The ventilator will switch to Standby mode and will stop delivering air.
2. Press the MENU/ESC key. The following text will appear in the display:

   Press ENTER to begin User Self Test.
3. Press the START/ENTER key. The following text will appear in the display:

   Occlude patient end of breathing circuit.
4. Block the part of the exhalation manifold that connects to the patient, as illustrated in Figure 5-1. Make sure that you have a tight seal and do not let any air escape. The following message will be displayed:

   Press ENTER when ready to begin test.

Figure 5-1. Blocking the Exhalation Manifold



5. Keep your seal on the exhalation manifold and press the START/ENTER key. The ventilator will push air into the circuit as it runs the test.

   Once the test is completed, you will see one of four messages in the display window. Refer to Table 5-2 for a listing of the display messages and appropriate responses.

Table 5-2: User Self Test Results

If the ventilator displays...	It Means...	Do this...
TEST PASSED. ENTER: repeat ESC: exit	The ventilator passed the User Self Test.	• Press START/ENTER if you wish to repeat the test. • Press MENU/ESC to end the test. The ventilator will switch to Standby mode.
Test ERROR. Refer to MANUAL.	The test was not conducted properly.	• Press ALARM SILENCE/RESET to cancel the test. The display will indicate that the test failed. • Check all connections in the patient circuit. Press START/ENTER to repeat the test.
Leak Test FAILED. Refer to MANUAL	There is a leak in the patient circuit between the patient air port and the exhalation manifold.	• Press ALARM SILENCE/RESET to cancel the test. The display will indicate that the test failed. • Press START/ENTER to repeat the test. • If the ventilator fails the test again, connect a new patient circuit and retry. • If the ventilator fails after connecting a new patient circuit, contact your clinician.
Relief Valve Test FAILED. Refer to MANUAL	The ventilator's relief valve is not functioning properly.	• Press ALARM SILENCE/RESET to cancel the test. The display will indicate that the test failed. • Press START/ENTER to repeat the test. • If the ventilator fails the test again, contact your clinician.

Warning

If the ventilator fails the User Self Test, do not use it. Contact your clinician.

5.2 Testing the Ventilator's Alarms

Before connecting to the patient, conduct the following tests to make sure the ventilator's alarm functions are working properly.

Warning

- Do not attempt to conduct ventilator alarm tests while the patient is connected to the ventilator. Provide an alternate means of ventilation during testing.
- If the ventilator fails the alarm test or if you cannot complete the test, refer to the Troubleshooting section of this manual or call your clinician, the equipment supplier, or Nellcor Puritan Bennett technical support.

While the ventilator is in Standby, press START/ENTER to check the ventilator's settings. The initial settings for these tests are:

Breath Rate: 12 BPM (breaths per minute)

High Pressure: 80 cm H_2O

Low Pressure: 3 cm H_2O

Volume: 500 ml

Inspiratory Time: 1.0 seconds

FIO_2: 21 percent

Ventilation Mode: Assist/Control

Make sure your ventilator is set to these settings before proceeding with the alarm tests.

NOTE:

Unless otherwise stated, you should put the ventilator in Standby mode before beginning each of these tests.

Most of these tests require that an approved patient circuit be connected to the ventilator. Make sure your patient circuit is properly connected prior to conducting these tests.

5.2.1 Low Pressure Test

1. Adjust the Volume setting to 500 ml, Inspiratory Time to 0.4 seconds, and the Low Pressure Alarm to 5 cm H_2O.
2. Keeping the patient end of the breathing circuit open, allow the ventilator to deliver three (3) consecutive breaths. At the beginning of the inspiration of the third breath, verify that:
   - the LED for the low pressure alarm lights up,
   - the LCD display indicates that a Low Pressure Alarm has occurred,
   - the audible alarm sounds.
3. Press and hold the STANDBY key for three (3) seconds. The ventilator will switch to Standby mode.
4. Press ALARM/RESET to reset the alarm.

5.2.2 Apnea Test

1. Adjust the Volume setting to 500 ml, Inspiratory Time to 0.5 seconds, and the Breath Rate to 5 BPM.
2. Press and hold the VENTILATE key for one (1) second to begin ventilation. The ventilator will deliver a mandatory breath.
3. Before the second mandatory breath is delivered, verify that:
   - the LED for the low pressure alarm lights up,
   - the LCD display indicates that an Apnea Alarm has occurred,
   - the audible alarm sounds.
4. Press and hold the STANDBY key for three (3) seconds. The ventilator will switch to Standby mode.
5. Press ALARM/RESET to reset the alarm.

5.2.3 Power Failure Test

NOTE:
If the ventilator is operating on either the external or internal battery, you must plug it in to an AC power source before beginning this test.

1. Press and hold the VENTILATE key to begin ventilation.
2. Unplug the ventilator. Verify that:
   - the Power Switch-over LED lights up,
   - the LCD display indicates that the AC power source is not powering the ventilator,
   - the LED power-source indicator also indicates that the ventilator is not receiving AC power,
   - the audible alarm sounds.
3. Press and hold the STANDBY key for three (3) seconds. The ventilator will switch to Standby mode.
4. Press ALARM/RESET to reset the alarm.

5.2.4 Continuing Pressure (Valley) Test

1. Adjust the Volume setting to 200 ml and Inspiratory Time to 0.5 seconds.
2. Connect the patient-end of the patient circuit to a 1-liter elastic bag. (Verify that the pressure tube of the patient circuit is properly connected to the appropriate fitting on both the ventilator and the proximal pressure port.)
3. Block the exhalation port of the breathing circuit's exhalation valve. See Figure 5-1.
4. Press and hold the VENTILATE key for one (1) second to begin ventilation.
5. Allow the ventilator to deliver four (4) consecutive breaths. At the beginning of the fourth breath, verify that:
   - the LED for the Low Pressure Alarm lights up,
   - the LCD display indicates that a Valley Alarm has occurred,
   - the audible alarm sounds.
6. Unblock the exhalation port.
7. Press and hold the STANDBY key for three (3) seconds to switch the ventilator to Standby mode.
8. Press ALARM/RESET to reset the alarm.

5.2.5 High Pressure Test

1. Adjust the Volume setting to 500 ml, Inspiratory Time to 0.4 seconds, and the Low Pressure Alarm to 50 cm H_2O.
2. Press and hold the VENTILATE key for one (1) second to begin ventilation.
3. Keeping the patient end of the breathing circuit open, allow the ventilator to deliver one (1) breath.
4. During the inspiratory phase of the next breath, block the patient end of the breathing circuit. Verify that:
   - the LED for the high pressure alarm lights up,
   - the LCD display indicates that a High Pressure Alarm has occurred,
   - the audible alarm sounds.
5. Unblock the exhalation port.
6. Press and hold the STANDBY key for three (3) seconds to switch the ventilator to Standby mode.
7. Press ALARM/RESET to reset the alarm.

This concludes the monthly safety check.

5.3 Testing the Battery

The ventilator is capable of testing the power of the battery it is currently using. You can determine which power source the ventilator is using by checking the power indicator, located on the top panel. The indicator light will be lit to indicate which power source is currently being used.

NOTE:
The TEST BATTERY key does not operate when the ventilator is powered by AC.

To test the battery, press and hold the TEST BATTERY key. The needle on the PATIENT PRESSURE meter will indicate the battery charge status for the battery it is currently using.

A fully charged battery, in good condition, will register approximately 100% on the patient pressure meter's scale.

5.4 Monthly Safety Check

You should perform the following safety check before using the ventilator with the patient, and monthly while the ventilator is in use, to make sure that your ventilator is operating properly. This safety check takes approximately ten minutes to complete.

Warning

- Do not conduct this test while the patient is connected to the ventilator. You should use an alternate means of ventilation while you are conducting this test.
- If the ventilator fails the monthly safety check or if you cannot complete this check, refer to the Troubleshooting section of this manual or call your clinician, the equipment supplier, or Nellcor Puritan Bennett technical support.
- To reduce the risk of infection, be sure to wash your hands thoroughly before and after handling the ventilator or its accessories.

NOTE:
Nellcor Puritan Bennett recommends that you run the Monthly Safety Check once per month while the ventilator is in use. Nellcor Puritan Bennett recognizes that the protocol for running the Monthly Safety Check varies widely among health care providers. It is not possible for Nellcor Puritan Bennett to specify or require specific practices that will meet all needs, or to be responsible for the effectiveness of those practices.

1. **Visual Inspection**

   Inspect the device. Make sure that:

   – The power cord does not have any kinks, breaks or damaged insulation.

   – The connectors, rubber feet, filter housings, etc. are not loose or broken.

   – The outer casing does not have any dents or scratches which may indicate dropping or other damage.

   – All of the labels and markings on the ventilator are clear and legible.

2. **User Self Test**

   See "Completing the User Self Test" on page 5-1.

3. **General Alarm Test**

   Press and hold the ALARM SILENCE/RESET key for five (5) seconds. You should see all of the alarm indicators light up and hear an alarm tone. If not, the ventilator is in need of repair. Do not use the ventilator until the problem has been corrected.

4. **High/Low Pressure Alarm Test**

   a. Set the ventilator mode to ASSIST/CONTROL (A/C). Press VENTILATE.

   b. Block the patient end of the patient circuit. It is important that you make a tight seal and do not let any air escape. This will force the air pressure to build up in the patient circuit, causing a high pressure alarm.
   At the next breath, the ventilator should sound a high pressure alarm. You will hear three (3) pulses of the alarm tone and will see the HIGH PRESSURE indicator light flash.

   c. Unblock the end of the patient circuit. Press ALARM SILENCE/RESET to reset the high pressure alarm.

   d. Allow the ventilator to complete two to three (2 - 3) breath cycles. A low pressure alarm should occur. You will hear five (5) pulses of the alarm tone and will see the LOW PRESSURE indicator light flash.
   Press ALARM SILENCE/RESET to reset the low pressure/apnea alarm.

   e. Press and hold STANDBY for three (3) seconds to put the ventilator in Standby mode. This concludes the monthly safety check.

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SECTION 6

Operating the Ventilator

6.1 Turning on the Ventilator

Open the front door panel. Press the START/ENTER key. You will see the current parameters displayed in the LCD screen. The ventilator will be in Standby Mode.

Check the parameters to make sure they agree with the prescribed settings. If the parameters are incorrectly set, you should adjust them at this time. See "Adjusting Setting Parameters" on page 6-1

6.2 Displaying Settings

While the ventilator is in Standby Mode - that is, while it is not ventilating - you can display settings by pressing START/ENTER.

While the ventilator is ventilating, the LCD window will display the actual values of the breaths being delivered. To check the settings during ventilation, press START/ENTER. The setting values will be displayed in the LCD window for approximately four to five (4 - 5) breath cycles. After this interval, the LCD will revert to displaying actual patient values.

NOTE:

Certain settings, such as low pressure and high pressure alarm settings, do not have an actual value and dashes (---) are displayed instead.

6.3 Adjusting Setting Parameters

Warning

- Never press the START/ENTER key without verifying that the settings are adjusted appropriately. Using incorrect settings during ventilation can cause danger to the patient.
- Your clinician will provide you with the prescribed setting parameters for your patient. Always follow your clinician's instructions when setting the ventilator's parameters.

1. Open the front door panel. Press the START/ENTER key to display the current settings.
2. Press the parameter key for the setting you wish to change. The current setting for that parameter will begin to flash in the LCD screen.
3. Use the up or down arrow key to adjust the setting's value.
4. When the setting's value matches the prescribed value, press START/ENTER to accept the setting.

6.4 Starting Ventilation

Warning

You must start the ventilator and allow it to complete one full breath cycle prior to connecting the patient. Do not connect the patient before this cycle completes.

NOTE:

If you are powering the ventilator with the external battery or the ventilator's internal battery, the ventilator will require a warm-up period (approximately seven (7) seconds) before starting ventilation. You must wait until the ventilator's LCD displays the settings; this indicates the ventilator is ready. Pressing VENTILATE prior to the completion of this warm-up period will cause the ventilator to power down.

Press VENTILATE to start ventilation. You will hear the piston inside of the ventilator begin to move.

As ventilation begins, check the following:

- The lights on the ventilator's display become lit and the alarm sounds. If this does not occur, the ventilator needs repair. Do not use the ventilator; contact your clinician for assistance.
- The pressure trigger and altitude settings agree with the prescribed settings.

Allow the ventilator to complete one full breath cycle before connecting the patient. This cycle establishes the ventilator's reference point and is important for proper breath delivery. Each time you hear the ventilator's piston begin to move, it is the beginning of a breath cycle. When the piston becomes silent, it is the end of a breath cycle.

6.5 Stopping Ventilation

Disconnect the ventilator from the patient. Press and hold the STANDBY key for at least three (3) seconds. You will hear a beep and ventilation will stop. The following text will appear in the display:

STANDBY: Press ENTER to view parameters

NOTE:

The ventilator can be kept in Standby mode indefinitely while connected to AC power. While on Standby, the ventilator charges the internal battery, and the power indicators (AC and Battery Charging) are lit. When powered from a battery, the ventilator will remain in Standby for 30 seconds and then switch automatically to a low power mode. Press the START/ENTER key to bring the ventilator out of low power mode.

SECTION 7

Alarms and Alerts

Alarms are used to let you know when a condition exists that is dangerous for the patient and requires your immediate attention. Alarms are accompanied by an audible tone.

Alerts let you know when a condition exists that is not a direct risk to the patient, but still requires your attention. The ventilator does not sound an audible tone during an alert condition.

This section of the manual describes what you will see and hear and steps you should take during an alarm or alert. It also describes how you can use the ventilator's alarm related controls to:

- Adjust the alarm limits for your patient
- Adjust the latching mode of the ventilator's alarms

Warning

- If an alarm occurs, attend to the patient first. Switch to an alternate means of ventilation if necessary.
- This manual tells you how to respond to the ventilator when it alarms. It does NOT tell you how to respond to the patient when the ventilator alarms. Your clinician will tell you how to respond to your patient in an alarm condition.
- Any device is subject to unpredictable failures. To ensure patient safety, an appropriately trained caregiver should monitor ventilation.
- If the patient's condition warrants the use of an independent secondary alarm or other external monitoring device, the clinician should prescribe it. The clinician should also determine to what level the patient may require an alternate means of ventilation in the event of ventilator failure.

7.1 Alarm/Alert Conditions

Table 7-1 lists the alarm or alert conditions that may occur, describes what you will see and hear, and provides you with general instructions for addressing these alarms. For detailed technical information about the different alarms and alerts, see "Alarm Conditions" on page 9-6.

Table 7-1: Alarm and Alert Conditions

If you Hear...	And See...	It means...	Do This:
Repeating burst of 5 alarm pulses	Flashing LOW PRESSURE/ APNEA indicator	The pressure in the patient circuit has dropped below the Low Pressure setting.	1. **Attend to the patient first**, as instructed by your clinician. If the patient is not in danger, continue to step 2. 2. Check the patient circuit for kinks or loose connections. Fix or replace the patient circuit if necessary. 3. Inspect for and remove water from small tubing. 4. Check the ventilator's settings. Verify that the ventilator settings are set according to the prescription. 5. If the alarm condition persists, discontinue use of the ventilator and contact your clinician for guidance.
	Flashing SETTING ERROR indicator	The ventilator has detected an equipment failure.	1. **Attend to the patient first**, as instructed by your clinician. 2. Switch to an alternate means of ventilation. 3. Press the STANDBY key. If this corrects the error, resume normal ventilation. If not, proceed to step 4. 4. Unplug the ventilator from AC power and wait 30 seconds. Plug the ventilator into AC power and resume ventilation. If the alarm has not cleared, proceed to step 5. 5. Unplug the ventilator from AC power, press and hold STANDBY for 3 or more seconds. Plug the ventilator into AC power and resume ventilation. If the alarm has not cleared, contact your clinician.
	Flashing LOW POWER indicator	The internal battery charge is depleted	1. Disconnect the ventilator from the patient 2. Press and hold the STANDBY key for 3 seconds 3. Connect the ventilator to an external power supply. • If using AC, it will automatically begin to charge the internal battery. Press VENTILATE to resume ventilation. • If using a charged external battery, you must press START/ENTER to restart. Wait 7 seconds, then press VENTILATE to begin charging the battery and resume ventilation. 4. Operate ventilator on AC power for at least 4 hours to recharge the internal battery.

Table 7-1: Alarm and Alert Conditions

If you Hear...	And See...	It means...	Do This:
Repeating burst of 3 pulses	Flashing LOW POWER indicator	The internal battery charge is extremely low (approximately 10 minutes of power remaining.)	1. Immediately connect the ventilator to adequate power supply. 2. Operate ventilator on AC power for at least 4 hours to recharge the internal battery.
	Flashing HIGH PRESSURE indicator	The pressure in the patient circuit is higher than the High Pressure setting.	1. **Attend to the patient first**, as instructed by your clinician. 2. Check the patient circuit for kinks or obstructions. Fix or replace the patient circuit if necessary. 3. Check the ventilator's settings. Verify that the ventilator settings are set according to the prescription. 4. If the alarm condition persists, discontinue use of the ventilator and contact your clinician for guidance.
			5.
	Flashing O_2 FAIL indicator	The O_2 source or the ventilator's oxygen blender has failed. (Achieva PSO_2 only)	1. **Attend to the patient first**, as instructed by your clinician. 2. Supply another oxygen source. Monitor the delivered oxygen. 3. If the alarm condition persists, discontinue use of the ventilator and contact your clinician for guidance.
Single beep, repeated every 5 minutes	Flashing SETTING ERROR indicator	There is a conflict with one or more of the setting values.	1. **Attend to the patient first**, as instructed by your clinician. 2. Check the ventilator's settings. Verify that the ventilator settings are set according to the prescription. 3. If the alarm condition persists, discontinue use of the ventilator and contact your clinician for guidance.
	Flashing LOW POWER indicator	The internal battery charge is low (approximately 45 minutes of power remaining.)	1. Immediately connect the ventilator to adequate power supply. 2. Operate ventilator on AC power for at least 4 hours to recharge the internal battery.
Single beep, repeated every 30 minutes	Flashing SETTING ERROR indicator	The ventilator has detected an equipment failure (minor fault condition.)	1. **Attend to the patient first**, as instructed by your clinician. 2. Check the patient circuit and accessory equipment. Make sure that all equipment is in good condition and properly connected. Replace if necessary. 3. If the ventilator will not start ventilation, continues alarming at the current rate, or the rate of the alarm's beeping increases, discontinue use of the ventilator and contact your clinician for guidance.
Single beep, repeated every 15 minutes	Flashing SETTING ERROR indicator	The ventilator has detected an equipment failure (serious fault condition) during ventilation.	
Single three second tone	Flashing SETTING ERROR indicator	The ventilator has detected a serious fault condition while in Standby mode. The ventilator is not ventilating.	

Table 7-1: Alarm and Alert Conditions

If you Hear...	And See...	It means...	Do This:
Steady alarm tone		The ventilator has detected a microprocessor error.	1. **Attend to the patient first**, as instructed by your clinician. 2. Contact your clinician. Do not use the ventilator. Provide a backup means of ventilation.
Repeated single beep	Flashing POWER SWITCHOVER indicator	The ventilator has switched to another power source.	1. Acknowledge the power switchover by pressing ALARM SILENCE/RESET. 2. If the ventilator has switched to its internal battery, monitor ventilation or provide an alternate power source as soon as possible.
None	Flashing SETTING ERROR indicator	The ventilator has detected an error with either the volume or inspiratory settings. (Alert status.)	1. **Attend to the patient first**, as instructed by your clinician. 2. Check the ventilator's settings. Verify that the ventilator settings are set according to the prescription. 3. If the alert condition persists, discontinue use of the ventilator and contact your clinician for guidance.

7.2 Resetting Alarms

After you have corrected the alarm condition, press ALARM SILENCE/RESET to reset the alarms and deactivate the indicator lights on the Alarms panel.

7.3 Alarm Latching

Some of the ventilator's low pressure alarms can operate in either a latching or non-latching mode.

- A non-latching alarm does not require you to press ALARM SILENCE/RESET to stop the audible alarm when the condition has been corrected. It will automatically turn off the audible alarm, but the visual indicator on the Alarms panel will still light. This lets you know that an alarm event occurred and was corrected.
- A latching alarm will not stop the audible alarm unless the condition has been corrected AND the ALARM SILENCE/RESET key has been pressed. Pressing the ALARM SILENCE/RESET key lets the ventilator know that you have responded to the alarm.

To set the latching mode of the alarms:

1. Press MENU/ESC.
2. Press the UP or DOWN arrows until the display screen reads: Press ENTER to change Alarm Latching Status.
3. Press START/ENTER. The display will indicate the alarm's latching mode and will provide further instructions.
4. Follow the displayed instructions to change the alarm's latching mode.
5. After making your change, press START/ENTER to save or ESC to exit without saving.

NOTE:
If you exit without saving, changes to the alarm latching mode will not be saved.

7.4 Pre-Silencing Audible Alarms

There may be situations in which you wish to silence an anticipated alarm for a brief period. The ventilator allows you to "pre-silence" the audible alarms for up to sixty seconds.

To pre-silence the audible alarm, press ALARM SILENCE/RESET. This will silence any audible alarms for up to sixty seconds. During this period, the lights on the alarm display panel will still light to indicate an alarm condition, but the alarm will not sound.

To stop pre-silencing of audible alarms, press ALARM SILENCE/RESET.

NOTE:

If an alarm condition occurs and has been corrected during the pre-silence period, pressing ALARM SILENCE/RESET will reset the alarms and deactivate the indicator lights.

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SECTION 8

Cleaning and Maintenance

This section contains instructions for cleaning and maintaining your Achieva ventilator. You should refer to manufacturer's instructions for specific instructions for cleaning your ventilator's accessories.

Warning

To reduce the risk of infection, be sure to wash your hands thoroughly before and after cleaning or handling the ventilator or its accessories.

8.1 Cleaning the Achieva Ventilator

Warning

Do not spray, pour or spill any liquid on the ventilator, its accessories, connectors, switches, or openings in the casing.

Caution

- Do not use chemical agents (i.e. alcohol, MEK, trichloroethylene, or ethylene oxide) or steam to clean the ventilator. Use of chemical agents or steam may cause damage to the ventilator.
- Keep the front panel door closed while cleaning your ventilator.

Follow these instructions for cleaning the surface of your ventilator:

1. Dip a clean, soft cloth into a mixture of mild soap and water.
2. Squeeze the cloth thoroughly to remove excess liquid.
3. Wipe the ventilator's external casing, taking care not to allow excess moisture to enter openings on the ventilator's surface.
4. Dry the ventilator's surface with a clean, soft cloth.

8.2 Cleaning your Accessories

Follow your accessory manufacturer's instructions for cleaning your ventilator's accessories.

8.3 Recharging the Internal Battery

Caution

You should recharge the ventilator's internal battery after each use, to retain electrical charge.

While connected to AC power, the ventilator will automatically recharge the internal battery in any mode, including Standby.

If you are using the external battery to power the ventilator, the internal battery will only be charged while the ventilator is ventilating. The battery will not be charged while the ventilator is in Standby.

NOTE:

Charging the ventilator's internal battery from the external battery will reduce the amount of charge left in the external battery.

8.4 Cycling Internal and External Batteries

Every four to six weeks, the ventilator's batteries need to be fully discharged and recharged to optimize battery performance. Follow these instructions to discharge and recharge your battery.

8.4.1 External Battery

Use the external battery to power the ventilator until it switches to the internal battery (which signals that the external battery's charge is depleted.) Immediately disconnect the external battery and connect the ventilator to an AC power source. Follow the battery manufacturer's instructions for recharging the external battery.

8.4.2 Internal Battery

Use the internal battery to power the ventilator until the low power alarm sounds. Immediately connect the ventilator to AC power to begin recharging the battery. Keep the ventilator connected to AC power and allow the internal battery to at least twelve (12) hours.

8.5 Home Maintenance

8.5.1 Replacing the Air Inlet Filter

The ventilator uses the model Y-1609 Inlet Filter (Flatpak) to filter the air that is delivered to the patient. You should inspect the filter regularly to check for signs of discoloration, as this indicates that it is time to replace.

Caution

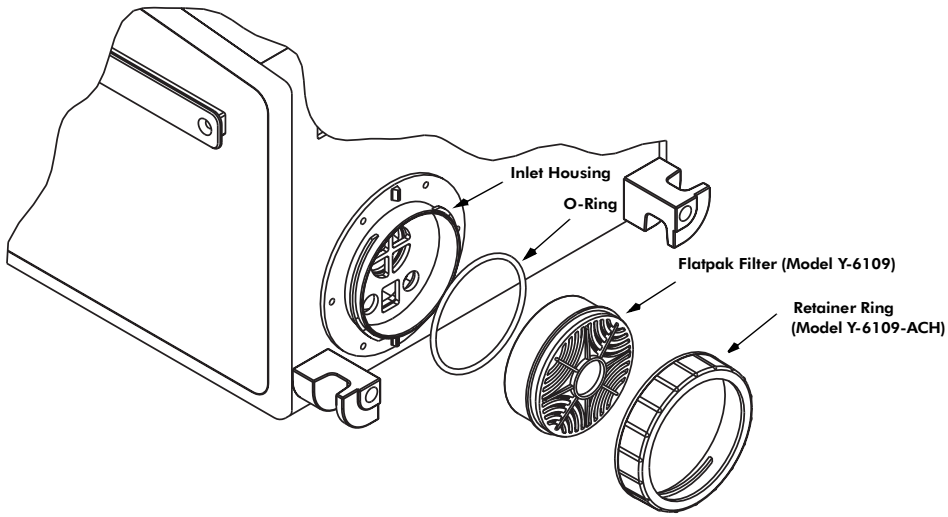
- Failing to change a dirty filter, or operating the ventilator without a filter in place, can cause serious damage to the ventilator.
- The air inlet filter is not reusable; do not attempt to wash, clean, or reuse it.

If the ventilator is used indoors, the air inlet filter should be checked monthly. If the ventilator is used outdoors, in transport, or in a dusty atmosphere, the filter may need to be changed more frequently. If using the ventilator in these conditions, you should check the filter weekly and replace as necessary.

If the filter is discolored, follow these instructions to replace it.

1. Twist off the retainer ring from the back panel of the ventilator.
2. Replace the old air inlet filter cartridge with the new cartridge. Discard the old cartridge.
3. Re-assemble the O-ring, filter and retainer ring as shown in Figure 8.1.
4. Twist the retainer ring to secure it, taking care not to overtighten.

Figure 8-1. Air Inlet Filter Assembly



8.5.2 Changing the Ventilator's Fuse

If the ventilator is plugged in to an AC outlet but the battery charging LCD is not lit, a fuse may need to be replaced. The fuses for the ventilator are rated at 250 V, 3.15A, 5 x 20 mm, slow blow.

Warning

To reduce the risk of electrical shock. disconnect the ventilator from AC power before attempting to change the fuse.

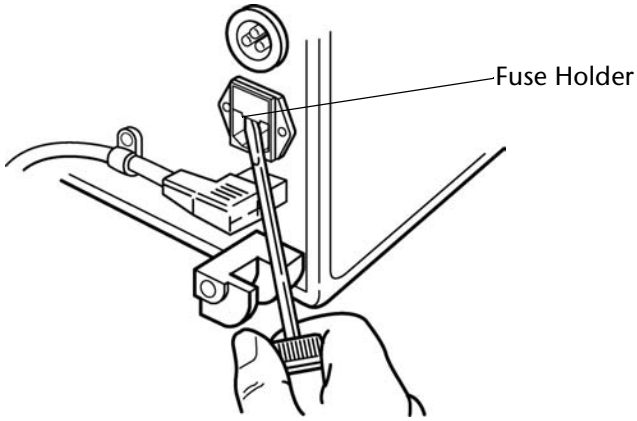
Caution

To prevent fire hazard, replace only with identically rated fuses.

Follow these steps to replace the ventilator's fuse.

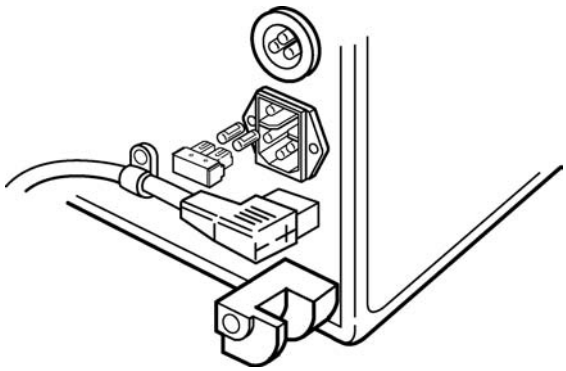
1. Unplug the ventilator.

Figure 8-2. Removing the fuse holder



2. Insert a small screwdriver under the tab on the bottom of the fuse holder.
3. Pull the screwdriver upward and outward until the fuse holder pops out slightly.
4. Pull the fuse holder out.
5. Remove the old fuses from the fuse holder.

Figure 8-3. Fuse assembly



6. Place the new fuses into the fuse holder.
7. Return the fuse holder to its original position and press it into place. You should hear a click, which indicates it is securely positioned.
8. Reconnect the ventilator's power cord.

8.6 Preventive Maintenance

Preventive Maintenance must be performed by qualified personnel every 6000 operating hours, or recertification every twelve (12) months, whichever occurs first.

Warning

Do not try to repair or otherwise service the ventilator yourself. Doing so might endanger the patient, cause damage to the ventilator, and/or void your warranty.

You can check to see how much time has elapsed since maintenance was last performed by following these instructions:

1. Press the MENU/ESC key.
2. Press the up or down arrow key until the display screen says:

   "Ventilating hours since last maintenance: XXXXX."

   (Where XXXXX is the total number of operating hours.)

When this number nears 6000, contact a trained service representative to schedule your ventilator's service.

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Technical Reference

9.1 Introduction

This section is intended for the clinician who is assisting the user in the homecare environment.

9.2 Ventilator Specifications

Power	
Power Line	100 to 240 VAC, 50 to 60 Hz, 2 Amps
External DC Power	11.6 to 32.0 VDC (24 VDC optimal)
	Operating time: At least 19 hours under normal load, and 5 hours 30 minutes under heavy load* 24 V DC (or 12 V DC, 32 Ah)
Internal Battery	24 VDC (nominal)
	Operating time: At least 4 hours under normal load, and 1 hour under heavy load*
	Gel cell, sealed Lead Acid, backup power
	Lithium Battery, Memory power
Standard Power Converters	90 to 200 VAC
Fuses	250 V, 3.15A, 5X20 mm, slow blow
Power Usage	
Maximum	Absolute maximum is 75W
Minimum	10 W
Type	Positive Pressure Volume ventilator
Motor	3-Phase Brushless Motor
Pump	Piston, 50ml to 2200ml tidal volume capability
Protection against electrical shock	Type of protection: Class I Degree of protection: Type BF

*Normal Load: Mode = Assist/Control, Volume = 1000 ml, Breath Rate = 10 BPM, Inspiratory Time = 1.5 sec., F_IO_2 = 21%, Sensitivity = 5 LPM, PEEP = 0 cmH_2O/hPa, Vent pres.=30 cmH_2O/hPa
Heavy Load: Mode = Assist/Control, Volume = 1500 ml, Breath Rate = 20 BPM, Inspiratory Time = 1.0 sec., F_IO_2 = 100%, Sensitivity = 5 LPM, PEEP = 20 cmH_2O/hPa, Vent pres.=60 cmH_2O/hPa

Indicators	
Normal Events	
Patient Pressure Meter	Displays patient pressure, -10 to + 100 cmH_2O/hPa; also displays battery charge when TEST BATTERY key is pressed.
Alphanumeric Display	Shows current operating parameters and ventilator information.
Power	Green LEDs indicate operating power source: AC, External Battery, Internal Battery.
Battery Charging	Green LED indicates the unit is charging the internal battery.
Assist/Spontaneous	Green LED indicates that the patient's effort exceeds the sensitivity setting.
Alarm Control	Red LED flashes at 1 second intervals during a presilence condition and continuously when the non-latching alarm feature is active.
Alarms	Flashing red LEDs: Low Pressure/Apnea, Low Power, High Pressure, Setting Error, Power Switchover, O_2 Fail (O_2 Fail available only on Achieva PSO_2).
Audible Alarms	
One Second Beep	Relief Valve Test Failure, User Self Test Error, Leak Test Failure
Repeated Single Beep	Power Switchover.
Repeated Three Pulses	Extremely Low Internal Battery, High Pressure, Invalid I:E Ratio, High Pres<Low Pres, Volume Error, Rate Error, Inspiratory Error, Oxygen Alarm, Pressure Differential Error
Repeated Five Pulses	Low Pressure, Valley, Exhale Fail, Apnea, Battery Charge Depleted, Vent Inop
Continuous Tone	Microprocessor failure
Single Beep Every Five Minutes	Low internal battery.
One Second Beep Every Thirty Minutes	Minor Fault.
One Beep Every Fifteen Minutes	Ventilator is ventilating and serious fault is detected.
Three Second Tone	Ventilator is in standby mode and a serious fault is detected.
Alarm Volume	85 db or 70 db at a distance of 1 meter

Controls	
Alarm Silence/Reset	1. Silences audible alarms during an alarm condition. 2. Silences an alarm before a known alarm condition occurs. 3. Used to reset an alarm after the alarm condition has been corrected.
Test Battery	1. When the test battery switch is pressed, the Patient Pressure Meter shows the charge level of the battery currently in use. 2. Starts printer output activation.
Standby	Used to place the ventilator in the Non-ventilate State, disabling the delivery of air.
Ventilate	Enables the ventilator to deliver air to the patient.
Mode	Causes the current ventilatory mode on the display to flash and allows the mode to be changed.
Setting Switches	Volume, Inspiratory Time, Sensitivity, Breath Rate, Pressure, PEEP, Low Pressure, High Pressure, FIO_2 (Achieva PSO_2 only).
Menu/Esc	Activates and deactivates the menu on the ventilator's display.
START/ENTER	Used to accept the currently flashing parameter as the new setting. Activates display.
Up and Down Arrow Keys	Increases or decreases the parameter settings or menu levels. Pressing when the sub menu is not active and a parameter has not been selected will cause the last alarm message to be displayed.
Settings	
Volume	50ml to 2200ml in 10 ml steps. For SIMV 50ml to 1750 ml in 10 ml steps. Accurate to ± 10 ml for 50-100 ml and ± 10% (max 75 ml) for 100-2200 ml.
Inspiratory Time	0.2 to 5.0 seconds in increments of 0.1 seconds. Accurate to ±10%.
Sensitivity	Flow: 3 to 25 LPM in 1 LPM increments. Accurate to ±2.0 LPM. Pressure: Off, 1 to 15 cmH_2O/hPa in 1 cmH_2O/hPa increments. Accurate to ±2.5 cmH_2O/hPa.
Breath Rate	1 BPM to 80 BPM in steps of 1BPM. Accurate to ±10% or 1 BPM which ever is greater.
Pressure	0 to 50 cmH_2O/hPa in 1 cmH_2O/hPa increments. Accurate to ±2.5 cmH_2O/hPa of the setting once the pressure reaches the setting. Pressure support settings below 3 cmH_2O/hPa default to 3 cmH_2O/hPa.
PEEP	0 and 3 to 20 cmH_2O/hPa in 1 cmH_2O/hPa increments. Accurate to ±2.5 cmH_2O/hPa.
Flow Acceleration	OFF or ON (Inspiratory flow ≤ 180 lpm)
Expiratory Trigger	15% to 55% in 10% increments. Accurate to ±15% at 15%, ±5% from 25% - 55%.
Low Pressure	1 to 59 cmH_2O/hPa in increments of 1 cmH_2O/hPa. Activates within ±2.5 cmH_2O/hPa.
High Pressure	2 to 80 cmH_2O/hPa in increments of 1 cmH_2O/hPa. Activates within ±2.5 cmH_2O/hPa.

O_2 Level (Achieva PSO_2 Only)	21% to 100% for tidal volumes greater than or equal to 100 ml, 21% to 70% for tidal volumes less than 100 ml in 1% increments. Accuracy: 50 to 90 ml, 02 settings < = 70% ± 10% 02; 100 to 2200 ml, O2 settings <50%, ± 5% O2, all other O2 settings, ± 10% of settings. Supply pressures of less than 45 PSIG may result in reduced O2 performance at some settings. Optimum performance is achieved at 65 PSIG O2 supply pressure. It may take several minutes for the oxygen concentration to stabilize. The capacity of the O2 blender is a function of tidal volume and inspiratory time, which in combination influence peak flow. As peak flows increases (i.e. large tidal volumes combined with short inspiratory times), the limit of the O2 flow capacity is approached. The set O2 concentration cannot be delivered if the flow capacity of the O2 blender has been exceeded. To ensure the prescribed oxygen concentration is delivered to the patient, measure the delivered gases with a calibrated oxygen analyzer at all times.
Altitude	0 to 4500 meters in increments of 100 meters (or 0 to 14,760 feet in increments of 328 feet).
Connectors	
Modem Jack (Achieva PS or Achieva PSO_2)	RJ 11 phone connector to connect the optional internal modem to telephone lines.
Communications Port	RS-232 connector for Achieva Report generator computer, printer or external modem.
O_2 Inlet (Achieva PSO_2)	9/16 - 18, DISS 1240 THD
External Battery Connector	3 pin male receptacle for 24 Volt DC input.
Power Entry Module	EIA dual fuse power entry module.
	Provides connections for hot, neutral and grounded conductors.
	The receptacle incorporates fuses in the hot and neutral lines.
Inlet Filter	Intake for patient air. Screw off cap for filter change. 98% efficient at 0.3 microns.
Patient Pressure Port	Port for connection to the proximal pressure line of the patient circuit. For 3/16" I.D. tube.
Remote Alarm Connector	Connector for remote alarm.
Nurse Call Connector	Connector for Nurse Call Station.
Patient Air	22mm O.D./15 mm I.D. ISO Fitting
Exhalation Valve Port	Port for connection to the exhalation valve of the patient circuit. For 1/8" I.D. tube.

Environment	
Operating	5°C to 40°C (41°F to 104°F), 10% to 90% RH.
Storage	-20°C to 50°C (-4°F to 140°F), 10% to 90% RH.
	When moving the ventilator from a non-operating to an operating environment, allow a minimum of one hour temperature stabilization before use.
	When storing the ventilator, the battery must be recharged every thirty days. Storage above or below specified operating temperatures may affect battery life.
Miscellaneous	
Maintenance	Preventative maintenance must be performed by qualified personnel every 6000 operating hours or recertification every twelve (12) months, whichever occurs first.
Dimensions	10.75" X 13.30" X 15.60" (27.3 X 33.8 X 39.6 cm)
Weight	Less than 32lbs.
Resistance Factor	Maximum of 4.5 cmH_2O/hPa @60 LPM
Compliance Factor	1.25 mL/hPa for A/C breaths 2.50 mL/hPa for Pressure Support breaths
Emergency Pressure Relief	90 ± 10 cm H_2O
Response time	75 milliseconds (under the following conditions): Resistance = 5 $cmH_2O/hPa/L/sec.$; Compliance = 50 $ml/cmH_2O/hPa$; Breath Rate = 20 BPM; Volume = 1500 ml; Pressure Support = 10 cmH_2O/hPa; PEEP = 5 cmH_2O/hPa. Response time varies inversely with the displayed flow rate, and directly with the selected trigger level.
Flow (average)	2.0 LPM to 180 LPM

The ventilator is intended to operate within its specifications if it is properly maintained and the service schedule is followed.

The ventilator is protected against electrostatic contact discharge of up to eight kilovolts (8 kV). Electrostatic discharge greater than eight kilovolts may damage the ventilator.

Standard compliance

The ventilator complies with the following international agency standards:

- *IEC 601-1 Medical Electrical Equipment, 1988 Part 1: General Requirements for Safety
- IEC 601-1-2 Medical Electrical Equipment, Part 1: General Requirements for Safety, Part 2: Collateral Standard - Electromagnetic Compatibility Requirements and Tests
- *CAN/CSA-C22.2 No.601.1-M90 Medical Electrical Equipment Part 1: General Requirements for Safety
- *UL2601-1 Medical Electrical Equipment, Part I: General Requirements for Safety (1994)

*Classified as Class I and internally powered; Type BF; drip proof, not suitable for use in the presence of flammable anesthetics, continuous operation.

9.3 Alarm Conditions

Low Pressure/Apnea Alarms	
Low Pressure Alarm	
Visual Indicator	Low Pressure/Apnea light will flash
Audible Alarm Tone	Five pulses
Display screen	WARNING: Low Pressure. Attend to patient.
Cause	A low pressure alarm condition exists if the proximal pressure does not rise above the low pressure setting during the last two consecutive breath cycles. The exception is in SIMV mode when the Low Pressure setting is higher than the Pressure setting. Then the Low Pressure alarm will occur if the peak proximal pressure of the last two consecutive breaths never rises above the Low Pressure setting.
Latching Status	Latching/Non-Latching
Valley Pressure Alarm	
Visual Indicator	Low Pressure/Apnea light will flash
Audible Alarm Tone	Five pulses
Display screen	WARNING: Valley Pressure Alarm. Attend to patient.
Cause	A valley pressure alarm condition exists if the proximal pressure does not drop below the low pressure setting during the last two consecutive machine breaths.
Latching Status	Latching/Non-Latching
Exhale Fail Alarm	
Visual Indicator	Low Pressure/Apnea light will flash
Audible Alarm Tone	Five pulses
Display screen	WARNING: Exhale Fail Alarm. Check exhalation valve.
Cause	An Exhale fail alarm condition exists when, at the start of the inspiratory cycle, the pressure in the patient's circuit is greater than or equal to the high pressure alarm setting.
Latching Status	Latching/Non-Latching

Apnea Alarm	
Visual Indicator	Low Pressure/Apnea light will flash
Audible Alarm Tone	Five pulses
Display screen	WARNING: Apnea Alarm. Check SENS setting.
Cause	An apnea alarm condition exists when there is no patient breathing effort or machine cycle for 10 seconds while in Assist/Control Mode or 20 seconds in SIMV or Spontaneous modes.
Latching Status	Latching/Non-Latching
User Self Test Error	
Visual Indicator	Low Pressure/Apnea light will flash
Audible Alarm Tone	Five pulses
Display screen	Test ERROR. Refer to USER'S MANUAL
Cause	A user self- test error condition exists if during the User Self Test the pressure in the patient circuit does not reach a sufficient level to perform the test.
Latching Status	Non-Latching
Leak Test Failure Alarm	
Visual Indicator	Low Pressure/Apnea light will flash.
Audible Alarm Tone	Five pulses
Display screen	Leak test FAILED. Refer to USER'S MANUAL.
Cause	A leak test failure alarm condition exists when the patient circuit does not maintain the appropriate pressure or the exhalation valve fails to open and reduce the pressure in the patient circuit.
Latching Status	Non-Latching

High Pressure Alarms	
High Pressure Alarm	
Visual Indicator	High Pressure light will flash
Audible Alarm Tone	Three pulses
Display screen	WARNING: High Pressure Alarm. Attend to patient.
Cause	The pressure in the patient circuit exceeds the high pressure limit setting.
Latching Status	Non-Latching
Relief Valve Test Failure	
Visual Indicator	High pressure light will flash
Audible Alarm Tone	Three pulses
Display screen	Relief valve test FAILED. Refer to USER'S MANUAL
Cause	The relief valve failed to open while the pressure was above the relief valve threshold pressure.
Latching Status	Non-Latching

Setting Error Alarms	
Invalid I:E Ratio Alarm	
Visual Indicator	The Setting Error light will flash.
Audible Alarm Tone	Three pulses
Display screen	WARNING: Invalid I:E ratio. Check settings
Cause	A combination of settings (breath rate and inspiratory time) resulting in an inspiratory time that exceeds the expiratory time.
Latching Status	Non-Latching
High Pres < Low Pres Alarm	
Visual Indicator	The Setting Error light will flash.
Audible Alarm Tone	Three pulses
Display screen	SETTING ERROR: High Pres < Low Pres setting
Latching Status	Non-Latching
Cause	The low pressure limit setting is the same or higher than the high pressure setting.
Volume Error Alarm	
Visual Indicator	The Setting Error light will flash.
Audible Alarm Tone	Three pulses
Display screen	WARNING: Volume error. Attend to patient.
Latching Status	Non-Latching
Cause	With a volume breath the ventilator delivered a volume ±12% from the set volume.
Volume Error Alert	
Visual Indicator	The Setting Error light will flash.
Audible Alarm Tone	No audible alarm tone
Display screen	WARNING: Volume error. Attend to patient.
Latching Status	Non-Latching
Cause	With a pressure support breath the last two breaths did not stop within three seconds or,
	For a pressure control breath or a pressure support breath the piston reached the end of travel on the last two breaths.

Rate Error	
Visual Indicator	The Setting Error light will flash.
Audible Alarm Tone	Three pulses
Display screen	WARNING: Breath rate error. Attend to patient.
Cause	In Assist/Control Mode, the last measured breath rate is 12% lower than the set breath rate, or
	If the breath is a mandatory breath (SIMV mode), the time since the last breath is 12% greater than the Breath Rate setting, or
	If the breath is an assisted breath (SIMV mode), the time since the last breath is 12% greater than two times the Breath Rate setting.
Latching Status	Non-Latching
Pressure Differential Error Alarm	
Visual Indicator	The Setting Error light will flash.
Audible Alarm Tone	Three pulses
Display screen	Pressure Differential Error. Refer to manual.
Latching Status	Non-Latching
Cause	The pressure levels detected by two independent sensors differ by more than 15 cmH_2O.
Inspiratory Error Alarm	
Visual Indicator	The Setting Error light will flash.
Audible Alarm Tone	Three pulses
Display screen	WARNING: Inspiratory error. Attend to patient.
Cause	During volume breath delivery the last measured inspiratory time differed by ±12% from the inspiratory setting.
Latching Status	Non-Latching
Inspiratory Error Alert	
Visual Indicator	The Setting Error light will flash.
Audible Alarm Tone	No audible alarm tone
Display screen	WARNING: Inspiratory error. Attend to patient.
Cause	During pressure-controlled breath delivery the measured inspiratory time differed by ±12% from the inspiratory setting for the last two consecutive breaths.
Latching Status	Non-Latching

Equipment Alarm	
Visual Indicator	The Setting Error light will flash.
Audible Alarm Tone	The alarm will beep for one second every 30 minutes during a minor fault.
	The alarm will beep once every fifteen minutes if the ventilator is currently ventilating and a serious fault is detected.
	The alarm will sound for three seconds if the ventilator is not ventilating and a serious fault is detected.
Display screen	Check Patient Circuit and Equipment
Cause	An Equipment failure has been detected.
Latching Status	Non-Latching
Vent Inop Alarm	
Visual Indicator	The Setting Error light will flash.
Audible Alarm Tone	Five pulses
Display screen	WARNING: Equipment error. Refer to manual.
Cause	An Equipment failure has been detected.
Latching Status	Latching

Oxygen Alarm (PSO_2 Only)

Oxygen Alarm	
Visual Indicator	O_2 Fail light will flash.
Audible Alarm Tone	Three pulses
Display screen	WARNING: Oxygen error. Attend to patient.
Cause	The O2 Fail alarm will sound if the ventilator does not detect a flow source at the oxygen connector.
Latching Status	Non-Latching

Power Switchover Alarm	
AC Source to External Battery Alarm	
Visual Indicator	Power Switchover light will flash.
Audible Alarm Tone	Repeated single beep
Display screen	Power source is now the external battery
Cause	Power is switched from the AC power source to the external battery source.
Latching Status	Non-Latching
AC Source to Internal Battery Alarm	
Visual Indicator	Power Switchover light will flash.
Audible Alarm Tone	Repeated single beep
Display screen	Power source is now the internal battery
Cause	The ventilator switches from an AC power source to the internal battery.
Latching Status	Non-Latching
External Battery to Internal Battery Alarm	
Visual Indicator	Power Switchover light will flash.
Audible Alarm Tone	Repeated single beep
Display screen	Power source is now the internal battery
Cause	The ventilator switches from an external battery to the internal battery.
Latching Status	Non-Latching

NOTE:

During Low Power conditions, other alarms (such as Setting Error) can occur when the ventilator is unable to deliver gases at the selected parameters.

Low Power Alarms

Low Internal Battery Power	
Visual Indicator	Low Power light will flash.
Audible Alarm Tone	Single beep every five minutes
Display screen	WARNING: Low Internal Battery Power
Cause	The ventilator is powered from the internal battery and can provide approximately 45 minutes of operation with the current settings.
Latching Status	Non-Latching
Extremely Low Internal Battery Power	
Visual Indicator	Low Power light will flash.
Audible Alarm Tone	Three pulses. This tone can be silenced for five minutes by pressing the Alarm Silence/ Reset switch.
Display screen	WARNING: Extremely Low Internal Battery Power
Cause	The ventilator is powered from the internal battery and can provide approximately 10 minutes of operation with the current settings.
Latching Status	Latching
Battery Charge Depleted	
Visual Indicator	Low Power light will flash.
Audible Alarm Tone	Five pulses that cannot be reset or silenced.
Display screen	WARNING: Battery charge depleted.
Cause	The ventilator is powered from the internal battery and the internal battery's charge is depleted.
Latching Status	Latching

9.4 Troubleshooting

Warning

- If you suspect a problem with the ventilator or accessories, attend to the patient first. If necessary, provide an alternate means of ventilation before attempting to troubleshoot the problem.
- If you cannot determine the cause of the problem, contact your equipment supplier. Do not use the ventilator until the problem has been corrected.

What you see and hear...	Why this might happen...	What you should do...
All lights turn on and audible alarm sounds	The ventilator automatically self-tests the alarms each time it is turned on.	You do not need to do anything. The alarms should stop within two seconds.
	The ventilator is responding to a manual alarm test you are conducting.	You do not need to do anything. The alarms should stop within two seconds.
	Microprocessor error	1. Unplug the ventilator from external power. 2. Press and hold STANDBY for 3 seconds or more. 3. Reconnect external power. If the unit is connected to AC, it will automatically exit low power standby mode and begin to charge the internal battery. Press VENTILATE to resume ventilation. If the unit is connected to a charged external battery, press the START/ENTER switch to restart. The internal battery will not begin to recharge until the ventilator is put into the ventilate mode. Press START/ENTER and check parameter settings for accuracy. Press VENTILATE. If alarm persists, unplug the ventilator and provide another means of ventilation.

What you see and hear...	Why this might happen...	What you should do...
Low Pressure/Apnea Alarm	The patient is not breathing.	Check the patient for breathing effort and stimulate if necessary.
	There is water in the small-bore tubing.	Disconnect the small-bore tubing and remove the water per the manufacturer's instructions.
	Patient speech or other activities lower patient circuit pressure.	Low pressure alarm sounds whenever low pressure limit is not reached for two consecutive breaths. Review the section on alarms.
	There is a kink in the small-bore tubing.	Unkink and straighten the small-bore tubing.
	PEEP pressure is set higher than the Low Alarm control setting.	Set Low Alarm control setting higher than the PEEP pressure.
	There is a leak or loose connection in the large bore tubing of the patient circuit.	Check connection of the patient circuit to the ventilator; check all connections for leaks and tightness, especially at the humidifier, tracheal tube, and exhalation valve.
	The patient's breathing effort is less than the Sensitivity control setting.	Set the sensitivity so the patient's breathing effort turns on the Assist/ Spontaneous light and call your clinician.
	The ventilator's Volume setting is set below patient's tidal volume.	Reset the Volume to the prescribed value. If values are correct, call your clinician.
	Incorrect control settings	Reset all controls to the prescribed values. If values are correct, call physician.
	Obstructions in the patient pressure tube	Check for leaks or kinks in the patient tubing.
	Other causes.	Notify your physician and your equipment supplier.
Low Power alarm	Failure to recharge the internal battery.	Plug ventilator into AC power.
		Plug ventilator into a charged external battery.
High Pressure Alarm	Water in the tubing.	Remove water from tubing.
	Crimped tubing	Uncrimp tubing.
	Coughing or other high-flow expiratory efforts	Treat patient's cough. The alarm is appropriate for these conditions.
	Patient inspiratory resistance or compliance changes	Have physician determine new ventilator settings.
	Airway obstruction	Check for tracheal obstruction or for a condition in which the patient requires sectioning.
	Malfunction in the exhalation manifold	Replace the exhalation manifold.

What you see and hear...	Why this might happen...	What you should do...
Setting Error Alarm	Inappropriate setting or settings beyond the capabilities of the machine	Readjust settings to the clinician's prescription. If the settings are correct and the alarm persists, consult your clinician.
	Low battery power	Connect external power supply.
	See the Alarm Section of this manual for more details.	
Green AC Power light does not glow	AC power cord is not connected.	Plug in the cord.
	The ventilator has blown a fuse.	Replace the fuse.
	No power to the wall outlet	Switch to an active outlet.
Unit will not operate on external battery power	Connection problem	Check all connections.
	Fuse(s) in battery system blown.	Replace blown fuse(s).
	Fuse inside vent is blown.	Return ventilator for service.
O_2 Fail Alarm	Low O_2 source pressure O_2 source disconnected O_2 source empty	Increase O_2 source pressure. Connect an O_2 source. Replace O_2 source.

SECTION 10

Warranty Information

10.1 Limited Warranty

Puritan-Bennett Corporation. warrants to the owner that the Achieva ventilators, exclusive of expendable parts and other accessories, shall be free from defects in material and workmanship for twenty-four months from the original date of sale. Puritan-Bennett's. sole obligation, with respect to any such defect, is limited to the repair or, at Puritan-Bennett's option, replacement of the ventilator. Purchaser pays return freight charges.

This warranty is made on the condition that prompt notification of a defect is given to Puritan-Bennett within the warranty period, and that Puritan-Bennett has the sole right to determine whether a defect exists.

This warranty is conditional on the performance of Preventive Maintenance at a minimum of once every 6000 operating hours, or recertification every twelve (12) months (whichever occurs first) by service personnel qualified by Puritan-Bennett. The warranty does not apply to ventilators that have been partially or completely disassembled; altered; subjected to misuse, negligence, or accident; or operated other than in accordance with the instructions provided by Puritan-Bennett. This includes repair by trained personnel.

This warranty represents the exclusive obligation of Puritan-Bennett and the exclusive remedy of the purchaser regarding defects in the ventilator.

THIS WARRANTY IS GIVEN IN LIEU OF ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

No person is authorized to modify, in any manner, Puritan-Bennett's obligation as described above.

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INDEX

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U

V

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