LP6 Plus Volume Ventilator
-And-
LP10 Volume Ventilator With Pressure Limit
User's Manual

Important Note: Read all of this manual before you use your ventilator. Keep this manual for future reference. Call your doctor or home care dealer if you have any problems using the ventilator.

PURITAN BENNETT

For more information:

Contact your Puritan Bennett representative for information on our full line of medical equipment and related services. Or, you may contact Puritan Bennett directly. Phone: 800.635.5267

Authorized Representative:
Tyco Healthcare UK LTD
154 Fareham Road
Gosport PO13 0AS, U.K.

Contents

Purpose of this Manual

This manual contains valuable information. Remember, your ventilator is an electrical device. It will provide years of useful service with the proper care. This manual tells you how to give it that care.

As you read this manual, you'll notice **Cautions** and **Warnings** in boxes on many pages. Pay very special attention to these boxes. They will tell you what to do and what to avoid as you use your ventilator.

The difference between **Warnings** and **Cautions** is:

A **Warning** contains information about possible hazards to the patient, the care provider, or the service technician.

A **Caution** includes information about how to avoid equipment damage.

Warnings

Always follow the physician's prescription when using the ventilator.

Always operate and store the ventilator according to the specifications and instructions set forth in this manual.

Use only Puritan Bennett-approved accessories and products with the ventilator. The use of other accessories may damage the unit and endanger the patient.

Perform daily and monthly verification of the ventilator's operation as identified in this manual.Always stabilize and verify ventilator performance before connecting the patient to the unit.

All alarms indicate a potential risk to patient safety. When an alarm sounds, provide immediate attention, care, and support to the patient as dictated by the situation.

Do not use in direct sunlight.

.

Caution

Refer any adjustments or procedures exceeding the scope of this manual to your physician, homecare provider, or a Puritan Bennett Service Representative. Refer to the Puritan Bennett Service Policy found on page 54.

CAUTION: Federal Law (U.S.A.) restricts this device to sale or use by or on the order of a licensed physician.

Warnings

The LP6 Plus and LP10 ventilators shall not be used with flammable anesthetic agents.

Symbols and definitions

The following symbols appear on the LP6 Plus and LP10 ventilators.

I	Power switch ON position, connection to mains power
O	Power switch OFF position, disconnection from mains power
	Attention, consult accompanying manual.
	Alternating current
	Direct current
V	Volts
A	Amperes
	Standby mode of operation
	Canadian Standards Association
	Battery test switch
	Alarm silence switch
	Alarm
	Power
	Patient pressure
	External battery connection
	Remote alarm
	Battery test level
	Manual reset

Electrical Interference

Caution Your ventilator is an electronic instrument. Any electronic instrument is subject to electrical interference. Electrical interference in excess of 10 V/m may keep your ventilator from working properly.

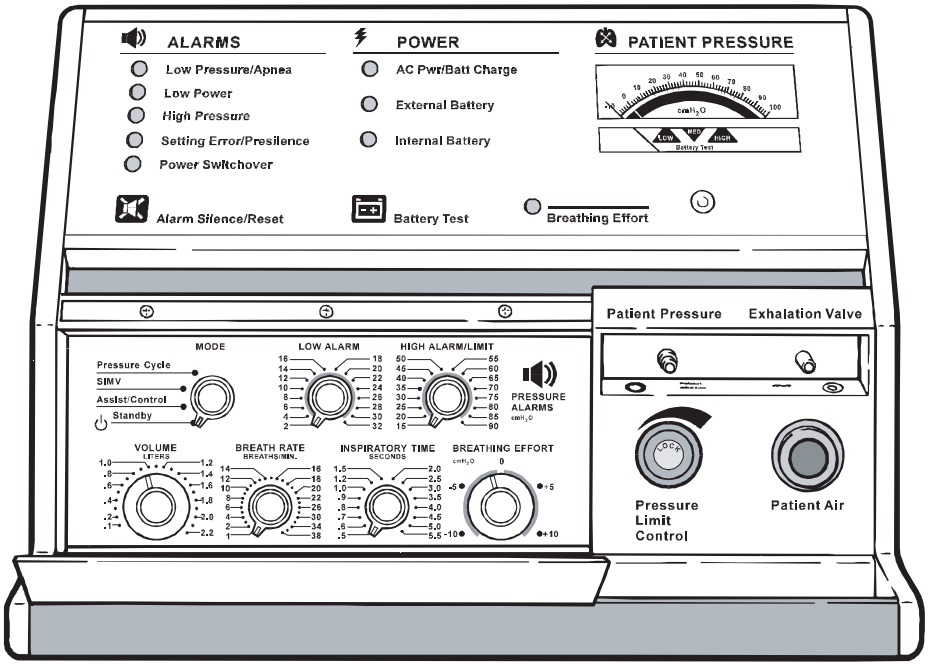
Television sets, cordless or cellular telephones, microwave ovens, air conditioners, food processors, and other appliances can be sources of electrical interference. To avoid electrical interference between your ventilator and these appliances, you must follow these instructions:

- Never place your ventilator near these appliances.
- Never plug the ventilator into the same A.C. electrical outlet as these appliances, nor into electrical outlets on the same circuit as these appliances.
- Never place the cables from ventilator accessories near these appliances.

Warning **Electrical interference may keep your ventilator from working properly, which may create a hazard to the patient.**

Note The ventilator is exempt under Section 15.801 (c)(5) of the no interference regulations adopted by the FCC. If television interference does occur, contact Technical Services at Puritan Bennett or a television repair technician for suggestions. Or, move the television to an A.C. electrical outlet that does not allow interference.

Introduction and Overview



The Puritan Bennett Model LP6 Plus and LP10 Volume Ventilators are intended for use in a non-acute ventilator care environment for pediatrics and adults. They are to be operated in accordance with the product labeling contained in the instruction manuals.

The ventilator is a microprocessor-controlled volume ventilator. It provides continuous respiratory support for patients with respiratory insufficiencies in a home or hospital, or during transport. Because of its compact design and light weight, the unit is highly portable.

The ventilator offers a wide range of delivery volumes, inspiratory times, and breathing rates. The physician or the respiratory therapist can set the appropriate ventilation parameters via the controls located in the recessed front panel. The magnetically latched door panel and the control knobs are designed to help prevent tampering and accidental resetting.

Your doctor has prescribed a ventilator. A ventilator's main purpose is to help you breathe. You need this help because of your medical condition.

Before getting into the ventilator's operation, let's look at how breathing happens. People don't give much thought to breathing, because it's something most of us take for granted.

Air contains oxygen. A person cannot live without oxygen. It's one of the fuels that keeps our bodies going. Oxygen transfers to the blood in the lungs. The blood goes to the heart which then pumps it to all parts of the body. As the blood delivers oxygen to the body's cells, it picks up and returns carbon dioxide to the lungs. Carbon dioxide transfers to the air in the lungs and leaves the body when a person exhales.

People inhale (breathe in) when their diaphragm drops (contracts) and their ribs move out. This motion expands the lungs which then have a negative pressure compared to the surrounding air. As a result, air rushes into the lungs. We call this inspiration.

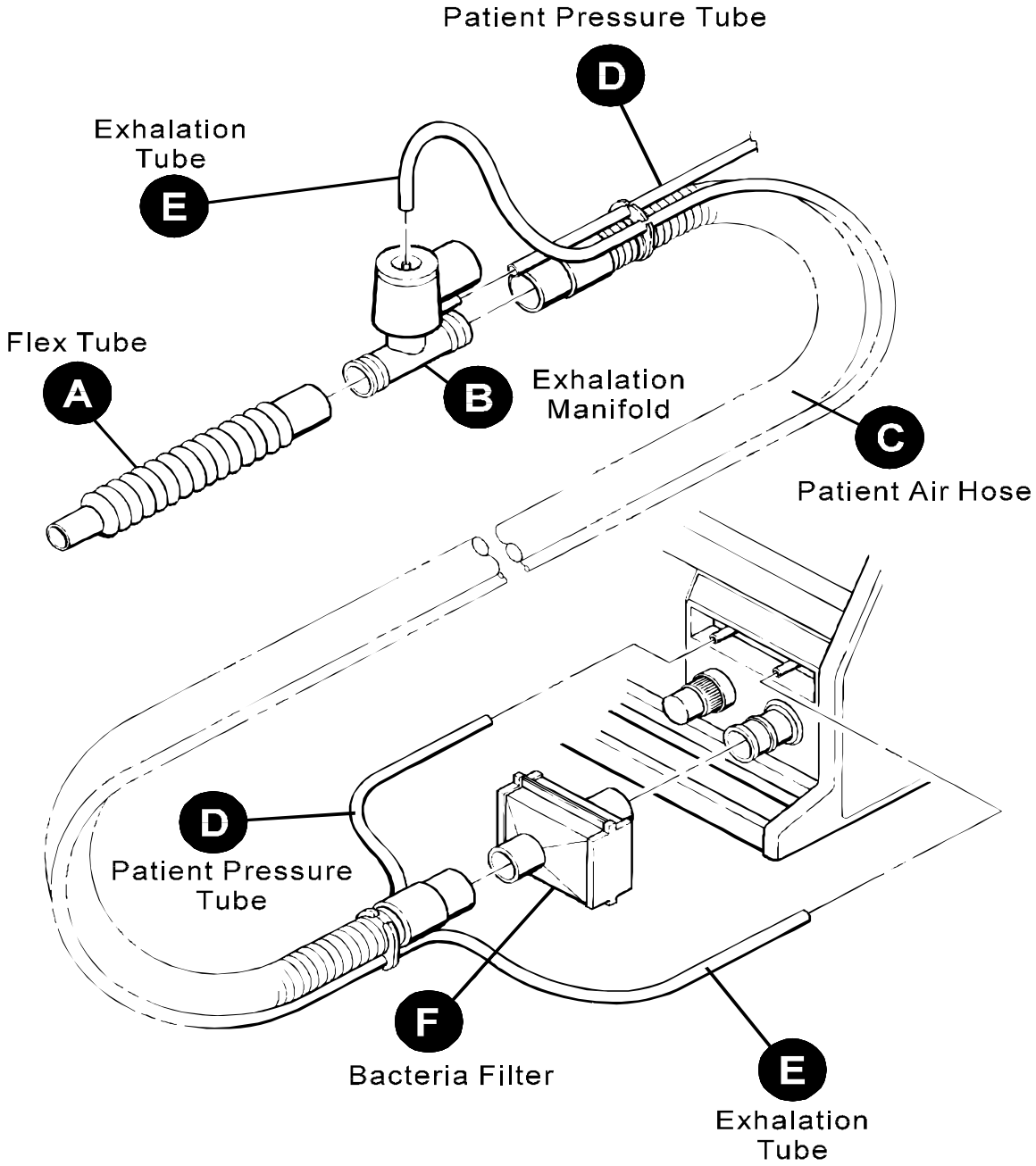
People exhale (breathe out) when they relax their muscles. Their diaphragms move up (relax) and their ribs squeeze in. This motion compresses the lungs and forces out the used air. We call this expiration.

We call this whole process RESPIRATION. Every step of the process is important. RESPIRATORY INSUFFICIENCY or FAILURE occurs when a person cannot complete one or more of these steps.

A person with respiratory insufficiency or failure may need a ventilator. It makes up for a missing step or steps in the respiration process. Your LP6 Plus or LP10 Volume Ventilator helps you breathe by gently moving air into your lungs. It does this in one of two ways. If you are strong enough to start a breath, the ventilator times its action to your efforts. These are assisted breaths. Depending on its settings, the ventilator may assist some or all of your breaths. But, if you cannot start the breathing process, the ventilator will deliver controlled breaths. Your doctor has prescribed how many times a minute you will receive these controlled breaths.

That's the way the ventilator helps you get the oxygen your body needs. As you exhale after every assisted or controlled breath, you rid your body of carbon dioxide.

The pages that follow describe the ventilator in detail. Read all the information carefully. If you don't understand something, ask your doctor, your caregiver, or a service technician to explain it.



Patient Ventilator Circuit

General Description

Patient Ventilator Circuit

The Patient Ventilator Circuit has a long flexible hose and several other parts shown in the diagram. It attaches to the ventilator and is your link to the breaths you need. Inspect it every day to:

- Make sure there are no cracks in the hose.
- Be certain all the connections fit securely to prevent leaks.
- Clean the Exhalation Manifold daily.
- Replace parts regularly before they wear out. Regular replacement is essential for successful ventilation. See the instructions that came with your patient ventilator circuit.

A. **Flex Tube:** Use this tube to connect the Patient Ventilator Circuit to a tube adaptor on your trach tube. The tube's flexibility makes the circuit more comfortable.

B. **Exhalation Manifold**: The Exhalation Manifold directs the flow of gases to and from the patient. Broadly speaking, this assembly consists of a manifold body, a mushroom valve, and a cap. Refer to the manufacturer's instructions. Before using it with the patient, secure all connections and ensure the seating of the mushroom valve.

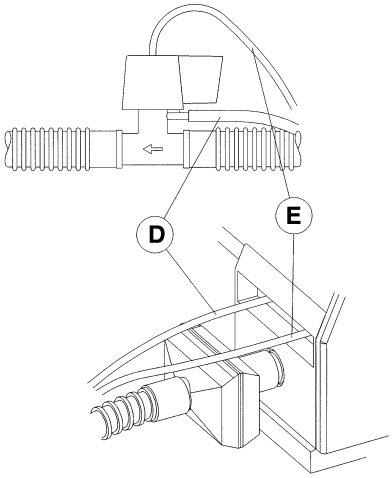
During inhalation, the white mushroom inflates and allows air to enter your lung. During exhalation, the mushroom deflates and allows you to expel air from your lungs.

Make sure this valve prevents the escape of any gases during inspiration and that it releases properly during exhalation.

Note For your safety, upon start-up, the ventilator dumps the first breath through the exhalation manifold. The unit's microprocessor requires one cycle to establish its reference point; that is, the operating mode and settings to use. This operation prevents delivery of incorrect volumes that could result in excessive pressure build-up.

Warning

Ensure the proper connection and operation of the patient ventilator circuit daily. The patient could be at risk if the manifold does not function as intended. Connecting patient pressure and exhalation tubes to the incorrect port prevents proper patient ventilation.



C. Patient Air Hose: This is the large hose between the Bacteria Filter and the Exhalation Manifold.

Re-order part numbers:

Reusable Adult Circuit, metal reinforced Y-6267
Reusable Adult Circuit, plastic reinforced Y-6268
Disposable Adult Circuit Y-6463
Disposable Pediatric Circuit Y-6464.

Obtain replacement parts from your health care provider.

D. Patient Pressure Tube (included with patient air hose): This small tube connects the Patient Pressure port on the ventilator to the Exhalation Manifold.

Re-order part number: Tubing, Replacement Pressure Line, 8' lengths Y-6197

Obtain replacement parts from your health care provider.

E. Exhalation Tube (included with patient air hose): This small tube connects the Exhalation Valve port to the Exhalation Manifold.

Re-order part number: Tubing, Replacement Exhalation Valve, 8' lengths Y-6196

Obtain replacement parts from your health care provider.

F. Bacteria Filter: This filter cleans the incoming air before you inhale it.

Re-order part numbers:

Filter, bacteria L-006197-000

Filter, DAR® Sterivent® 351U5856

Obtain replacement parts from your health care provider.

Other accessories are available. When using any accessory, always follow the manufacturer's recommendations and instructions.

Caution

Adding attachments or other components to the breathing system will increase the inspiratory and expiratory resistance.

Warning

Certain types of ventilators, including the *LP Series*, have a Low Inspiratory Pressure Alarm. The purpose of this alarm is to alert the clinician or caregiver when the pre-set alarm parameters are violated. As set forth in the LP Series Clinician's and User's Manuals, a number of environmental factors and circuit accessories/components can affect the pressure in the breathing circuit. These factors may prevent circuit pressure from violating the low-pressure parameters, even in the event of a circuit being disconnected from the patient. Therefore, it is important for the clinician to consider and monitor these environmental factors when establishing pressure alarm parameters. Depending on the specific clinical situation (e.g., risk of disconnect perceived as high, patient is ventilator dependent) a secondary means of monitoring ventilation (e.g., pulse oximetry) should be considered.

Warnings

Some active humidifiers do not have temperature monitoring or alarm capabilities. Failure to monitor air temperature may allow inspired air to become too hot. Thermal injury to the patient's airway may result. Always follow the recommendation of the humidifier manufacturer.

To ensure the prescribed oxygen concentrations are delivered to the patient, measure the oxygen with a calibrated analyzer.

A ventilator patient is highly susceptible to respiratory infections. Dirty or infected equipment may be a source of infection. Clean equipment and proper use of bacteria filters are essential to reduce the chance of infection.

Always use a Bacteria Filter to minimize the risk of respiratory infection.

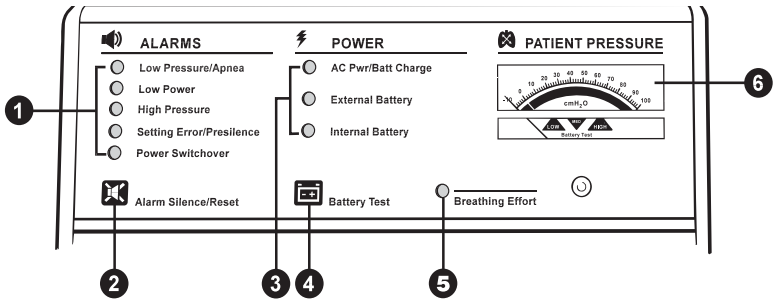
Antistatic or electrically conductive hoses or tubing should not be used.

Front Panel

The Front Panel of the ventilator has three sections:

- The upper section has small lights, two touch button pads, and a meter.
- The lower left section has the operating controls. Your doctor prescribes their setting. To prevent accidental resetting, they are behind a closed panel.
- The lower right section has the pressure limit controls (LP10 only) and the connections for the Patient Circuit.

Upper Section



1. **Alarm Lights:** When flashing or continuously lit, they identify a condition that demands immediate attention. There is also an audible tone when these lights begin flashing.

2. **Alarm Silence/Reset Button:** This has five uses.

- Push to test the alarms.
- Push to silence alarms for 60 seconds.
- Push to reset the alarm after correcting the problem.
- Push simultaneously with the Battery Test Button for operating hours. (See the Scheduled Maintenance portion of the manual, page 42.)
- Use this button with other controls to start the self-test (see page 34).

3. **Power Source Lights:**

- The top light is green when the ventilator is AC powered.
- The middle light is amber when an external battery powers the ventilator.
- The bottom light flashes amber when the ventilator's internal battery is in use. A single tone also beeps every five minutes.

4. **Battery Test Button:** It has four uses.

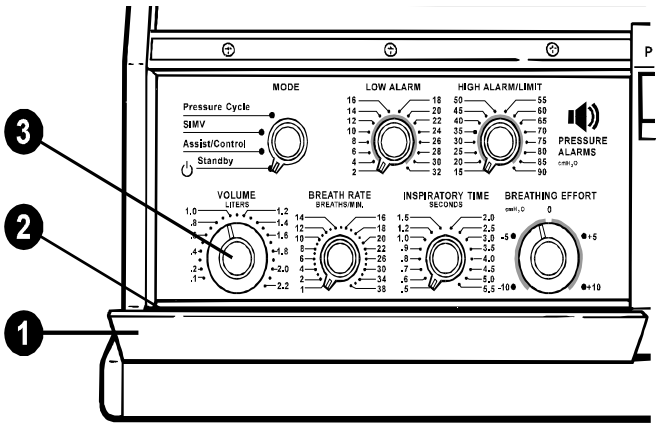
- When pressed, the Pressure Meter displays the charge status of the battery in use (internal or optional external battery) when the ventilator is disconnected from AC power.
- Push simultaneously with the Alarm Silence/Reset button for an indication of operating hours. (See the Scheduled Maintenance portion of this manual, page 42.)
- Press the button to print a report from an attached printer.
- Use this button with other controls to start the self-test (see page 34).

5. **Breathing Effort Light:** This light turns green whenever the ventilator senses your effort to breathe. The Breathing Effort control sets the sensitivity.

6. **Patient Pressure Meter:** The meter displays three pieces of information:

- Pressure at the Exhalation Manifold.
- The number of hours of ventilator operation.
- The charge status of the internal or attached external battery.

Lower Left Section

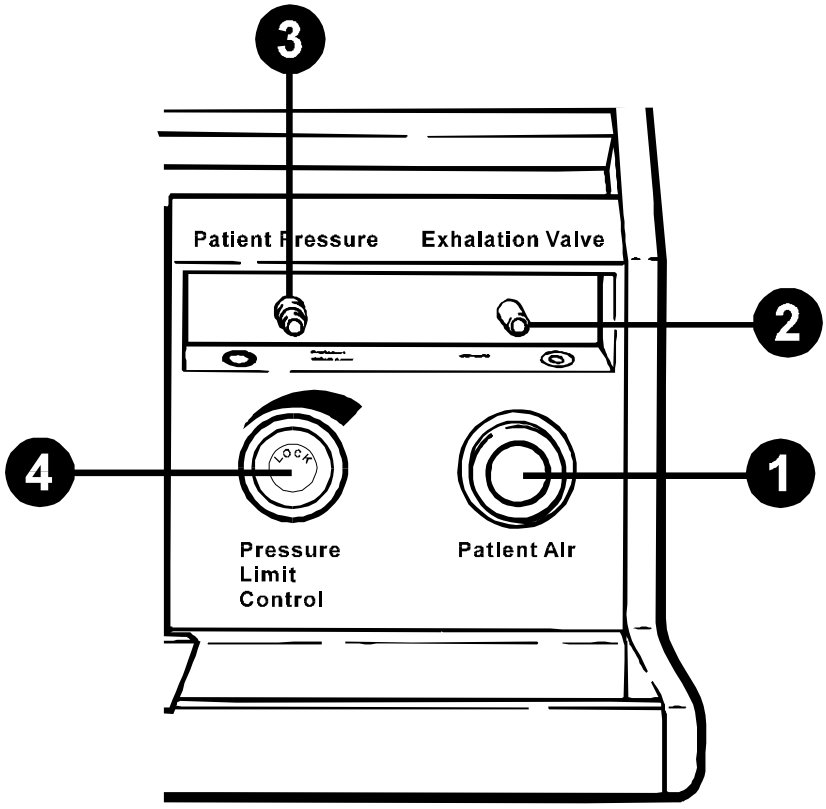


1. **Control Panel Door:** This door is latched magnetically to protect the controls from accidental resetting.

2. **Alarm Reference Guide:** Consult this guide for a summary of alarms and the action you should take. You will find the Guide on the inside of the Control Panel Door.

3. **Control Knobs**: They are behind the closed Control Panel Door. Your doctor prescribes the settings for these controls. See page 25 for details.

Lower Right Section



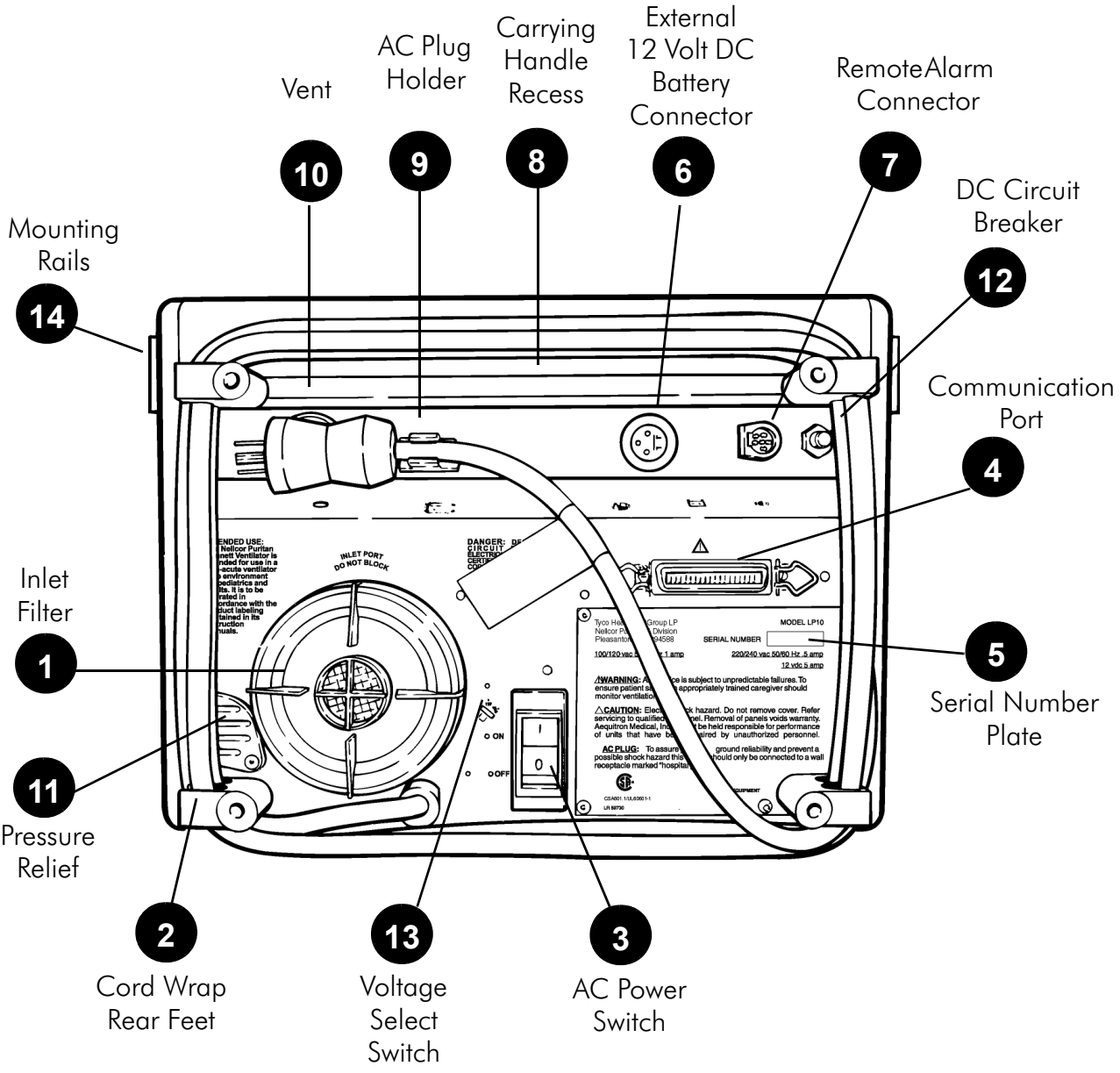
1. **Patient Air Tube:** The Patient air hose connects to this tube. The ventilator delivers air through this tube.

2. **Exhalation Valve Port:** The Exhalation Pressure Tube of the Patient Circuit connects to this port.

3. **Patient Pressure Port:** The Patient Pressure Tube of the Patient Circuit connects to this port.

4. **Pressure Limit Control (LP10 Only):** This control sets the air pressure limit during a breath. For use in Assist/Control or SIMV modes only; use in other modes may not allow effective ventilation.

Rear Panel


Vent
AC Plug Holder
Carrying Handle Recess
External 12 Volt DC Battery Connector
RemoteAlarm Connector
DC Circuit Breaker
Mounting Rails
Communication Port
Inlet Filter
Serial Number Plate
Pressure Relief
Cord Wrap Rear Feet
Voltage Select Switch
AC Power Switch
10
9
8
6
7
12
14
4
1
5
11
2
13
3
INLET PORT DO NOT BLOCK
ON
OFF
MODEL LP10
SERIAL NUMBER

1. **Inlet Filter: The ventilator draws in air through this filter.**

Warning **Do not block the inlet filter port. (Keep away from curtains.)**

2. **Cord Wrap and Rear Feet:** There is a foot at each corner.
3. **AC Power Switch/Circuit Breaker:** This is the ON/OFF switch for AC power. It also has a built-in circuit breaker. 1 is power connected to mains and 0 is power disconnected from mains.
4. **Communications Port:** A special cable fits here and leads to an optional printer.

Note The ventilator and printer should be turned off before connection or disconnection of the printer.

5. **Serial Number Plate:** This has Puritan Bennett's identification number for the ventilator. It also lists the unit's power requirements.
6. **External 12 Volt DC Battery Connector:** This is where you plug in an external battery cable.
7. **Remote Alarm Connection:** A remote alarm (optional) can summon the caregiver when an alarm sounds.
8. **Rear Carrying Handle Recess**
9. **AC Plug Holder**
10. **Vent:** Warm air from the unit's circuitry leaves the ventilator and cool air enters through this vent. This cools the ventilator.

Warning **Do not block rear panel vent**

11. **Pressure Relief:** This prevents the air pressure from exceeding approximately 100 cmH_2O/hPa.

Warning **Do not block the pressure relief valve.**

12. **DC Circuit Breaker:** This circuit breaker protects the ventilator when it is powered by an external battery.

13. **Voltage Select Switch:** This switch selects 110 or 220 volts when it is powered by an external battery

Caution

An incorrect switch setting may damage your ventilator.

14. **Mounting Rails:** These are used to mount and connect accessories to the ventilator.

Installation

Mounting or Positioning

Position the ventilator on a table or nightstand within six feet of an electrical outlet.

Keep the rear panel free of draperies or other items that could impede the air flow to the Inlet Filter port.

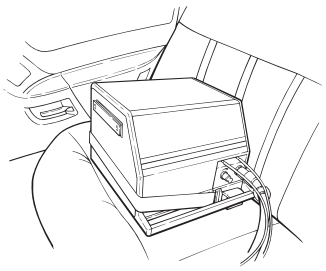
Protect the ventilator from accidental liquid spills. **Never place food or liquids on top of the ventilator.** When used in a humid environment, and when cleaning:

- Take precautions to protect the setting switches.
- Keep the front panel door closed.
- Avoid spilling or allowing liquid to enter the unit.

Allow for the space requirements of additional equipment, e.g., humidification and supplemental oxygen. When in use, keep active humidifiers or the patient circuit at an elevation lower than the patient's trachea. Moreover, keep the humidifier and the circuit lower than the ventilator's Patient Air tube to prevent moisture from entering the ventilator.

Warning

Never allow liquids to contact internal ventilator components under any circumstances. Moisture will damage the ventilator.



During transport in cars and vans, securely position the ventilator and strap it down to avoid inadvertent jarring or damage.

You may connect the ventilator to the car's battery power with an accessory power cable equipped with a cigarette lighter plug. Connect the ventilator to the cigarette lighter cable/plug only after the car's motor is running.

Warning

Do not block the alarm port.

Emergency Vehicle

In an emergency vehicle, employ a deck or mounting bracket to secure the ventilator. Maintain at least four inches between the rear panel Inlet Filter and the vehicle's wall. Position the ventilator to easily view all indicators with ready access to all operating controls.

Warning

AC power sources in ambulances and aircraft are frequently unregulated. As a result, the ventilator may be exposed to high voltage levels that can damage it. Operation of the ventilator on improper power sources voids the warranty and could seriously damage the unit.

Before plugging the ventilator into an unknown power source, check the voltage. If the power source exceeds the proper range at any time, or if the voltage cannot be verified, use a 12 VDC battery, rather than risk damage to the ventilator.

Warnings

Do not use a power converter as a power source for the ventilator.

Stabilize and verify proper ventilator performance before connecting the patient to the ventilator.

Wheelchair

Mounting instructions vary from chair to chair. Consult the wheelchair manufacturer for standard wheelchair adaptations.

Here are some general guidelines to consider when using the ventilator in a wheelchair.

- When using a tray, place a partition between the battery and ventilator.
- Insert a partition in the tray mount between the ventilator and battery. Locate this partition as far as possible from the ventilator's Inlet Filter. If the ventilator and battery are in the same tray, cut drain holes in the tray to prevent any leaking battery fluid from reaching the ventilator. Place the battery in a plastic container to help insulate the ventilator from battery fluid.
- Always provide an external battery as the power source.
- Never use the same battery to power a motorized wheelchair and the ventilator at the same time.
- Protect the ventilator from spills and water seepage during bad weather or other conditions when using the unit on a wheelchair.
- Check the Air Inlet Filter frequently when using the ventilator outdoors, especially when the Air Inlet is pointed toward the ground.
- To maintain a full charge on the internal battery, you must routinely connect any ventilator mounted on a wheelchair to AC power while the wheelchair is not in use. You must connect the ventilator to AC power as soon as possible after internal battery operation, no matter how short a time the ventilator operated on internal battery.

Warnings

Always place the external battery as far away from the ventilator as possible. The distance will help prevent battery gases from drifting toward the ventilator's air inlet.

Never place an external battery above the ventilator. Use separate batteries to simultaneously power an electric wheelchair and the ventilator.

Power Sources

Any one of three power sources can power the ventilator.

- External AC,
- External 12 VDC battery, or
- Internal 12 VDC battery.

When plugged into a functioning wall outlet with the AC power switch ON, the ventilator automatically selects the AC power source. It will operate indefinitely on AC. All three sources may be connected to the ventilator at the same time. If the AC power fails, the ventilator automatically switches to the next best power source.

When used at home or in the hospital, plug the ventilator into a convenient wall socket. If you use the ventilator in a wheelchair or in a car, connect it to an external 12 Volt DC battery. Your ventilator has an internal battery. Use the internal battery for short-term emergencies only, for example, when moving from one power source to another. Make sure you recharge the internal battery **immediately** after each use.

Warning

The batteries contain toxic chemicals and no attempt to remove or replace the batteries should be made by any one other than the home care dealer or an authorized service center.

AC Power

Plug the ventilator into the appropriate AC grounded wall outlet.

Warning

The ventilator must be set to the proper AC line voltage before plugging it into the AC outlet.

The ventilator automatically operates from AC power when you plug it in. Make sure that you plug the cord into a properly grounded outlet.

Warning

Where the integrity of the external protective conductor (earth ground) in the installation is in doubt, equipment shall be operated from its internal electrical power source. This should be considered an emergency situation, and a suitable AC or DC power source should be found immediately. The ventilator must be properly grounded when operating on AC power. If you have any doubts about the outlet's ground connection, have a qualified electrician examine the outlets.

The ventilator requires 1 amp at 110 VAC. If the voltage select switch is set to 110 V, the supplied voltage must be between 100 and 120 VAC.

The ventilator requires 0.5 amps at 220 VAC. If the voltage select switch is set to 220 V, the supplied voltage must be between 220 and 240 VAC.

Your ventilator automatically recharges its internal battery whenever it is:

- plugged into an AC outlet, and
- the AC Power Switch is ON (1)

You can also recharge an external battery that is properly connected to your ventilator. (See pages 20 through 22.)

When traveling to another country (or to a region with a different power system), you may encounter two problems. First, the nominal voltage may be different. Note the ranges given above for 110 and 220 VAC respectively.

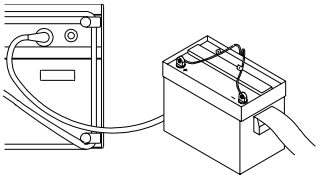
The second problem you may encounter is the plug itself. It may not fit into the outlet. There are two solutions. First, have a qualified electrician remove and replace the ventilator's plug with one designed for the local outlets. Second, you may use an adaptor. Make certain that the adaptor has no active electronic components and that it is not a power converter.

Caution

If you have any questions about the power system or how the ventilator will operate, contact a qualified electrician and/or Puritan Bennett.

External Battery 12 Volt DC

If you are away from an AC power outlet, you can operate your ventilator from a 12 Volt DC battery. Puritan Bennett recommends the use of a deep-cycle, gel-cell battery.



Carefully connect the 12 Volt DC battery to the ventilator. Use only Puritan Bennett battery cables. Follow the instructions included with the battery cable to ensure proper connection.

Caution

Do not use the ventilator with a 24 VDC external battery.

A Power Switchover alarm sounds whenever the ventilator starts using power from an attached external battery.

Check to see if the ventilator's External Battery light is lit. This light signals that your ventilator is properly connected and is using the external battery.

Note Do not reverse the positive and negative cables when connecting a battery to your ventilator. If you accidentally reverse the connections, a protective fuse in the battery cable or the ventilator's DC circuit breaker opens. The cable will not provide power to the ventilator. You must first correct the connections and install a correct replacement fuse in the cable. Reset the DC circuit breaker on the ventilator. Only then will the external battery power the ventilator.

You may order batteries and connecting cables from Puritan Bennett. These accessories come with specific instructions for connection and use. The battery and case provided by Puritan Bennett have a cable with a 3-pin connector. When properly used, this cable/connector ensures against reversing the connections between the battery and ventilator. Use of other cables may damage the ventilator or make it inoperable when the cable connections are accidentally reversed.

Warning

Always place the external battery as far away from the ventilator as possible. The distance will help prevent battery gases from drifting toward the ventilator's air inlet.

Using a Car Battery

The ventilator will operate from a car battery. Connect the ventilator to the car with a cigarette plug cable from Puritan Bennett. Make sure the vehicle is running when the ventilator is drawing power. Otherwise, the ventilator may run down the car's battery.

Caution

Always start the vehicle before connecting the ventilator to the car battery. Starting a vehicle when the ventilator is connected may damage the ventilator and void the warranty.

Battery Performance

As they age and due to their chemical make-up, batteries lose their capacity to retain an electrical charge. Typically lead-acid batteries lose 7% of their capacity each year. For best performance, follow the manufacturer's instructions.

The following affect the life of the battery:

- Ambient temperature,
- Charge level,
- Storage conditions,
- Time, and
- The number of "deep cycles."

For maximum efficiency, operate or store the battery at room temperatures. It will charge and discharge most efficiently in such an environment.

To ensure maximum running time of the ventilator on any external battery, keep the battery fully charged. Some batteries need to be discharged and recharged monthly. Recharge any external battery immediately after use. Refer to the battery manufacturer's instructions. The time required to recharge a battery varies. Generally, with a 10 amp standard charger, there is a 1:1 ratio (one hour of recharge for each hour of use).

Cautions

Recharge an external battery immediately after use. You must use a standard battery charger to recharge external batteries used for extended periods of time. Do not use the ventilator's internal charger to recharge deeply discharged batteries.

First connect the battery to the standard charger. Then connect the charger to AC power.

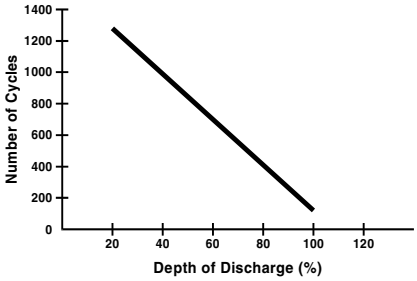
NEVER connect a battery charger to an external battery while the battery is connected to the ventilator.

A 30 to 40 amp hour battery, in good condition can power the ventilator for about 10 hours without recharging. A 75 to 80 amp hour battery provides power for about 20 hours between charges.

Testing the Batteries

Make sure that the external or internal battery is powering the ventilator before testing the battery condition. To run the test, press and hold the Battery Test button. The needle on Patient Pressure Meter registers the battery status in the window below. A fully charged battery in good condition will register in the Normal/High range.

Note The Battery Test meter is only a relative indicator of the remaining battery charge. An older battery may register a high charge level, but discharge more rapidly. Carefully monitor battery power sources. Always have a back-up power source available.



The total life expectancy of any battery is affected by the number of times it is deep cycled, i.e., nearly 100% discharged.

The percentage of discharge relates directly to the number of cycles the battery can deliver. As a battery ages, its ability to power the ventilator decreases. Take this into account in all applications, but especially in portable applications where another power source may not be readily available.

The graph displays the relative impact of deep discharge on battery life.

Special Precautions for External Battery

Place the battery as far away as possible from the ventilator's Inlet Filter (located on the rear panel).

Warning **NEVER place the battery above or on top of the ventilator.**

Using an external battery has nothing to do with the emergency internal battery. An external battery neither recharges nor maintains the charge of the internal battery.

You may use some gel-cell, spill-proof batteries aboard commercial aircraft. Follow these regulations:

- F.A.A.: Title 49 C.F.R., parts 100 - 199, paragraphs 173.250A and 170.260D.
- C.A.B.: Air Transport of Restricted Articles, Circular No. 6D, page 57, Article # 1924.
- I.A.T.A.: Restricted Articles Regulations, Article # 1924, Packaging Note 802, Section VI p. 149 and Section X p. 207.

Note Dispose of batteries according to your local environmental regulations.

Internal Battery 12 Volt DC

The ventilator has an internal 12 volt DC battery. The ventilator automatically switches to the internal battery when the AC power and an attached external battery fail.

A fully charged internal battery will power the ventilator approximately 30 to 60 minutes. An audible tone sounds every five minutes. When about five minutes of power remains, a Low Power alarm sounds. **Immediately** switch to another power source.

If the internal battery has not been used, exercise it every four to six weeks. That is, run the ventilator on its internal battery until the low power alarm sounds. Immediately switch to AC power and recharge the internal battery for at least three hours.

Note An external battery **cannot** recharge the internal battery.

Use the Internal 12 VDC battery for emergency use only. It requires no special connections. The ventilator switches to the internal battery when other power sources fail or drop below adequate levels. The Power Switchover alarm signals whenever the ventilator switches from AC or an external DC battery to its internal emergency battery.

Warning

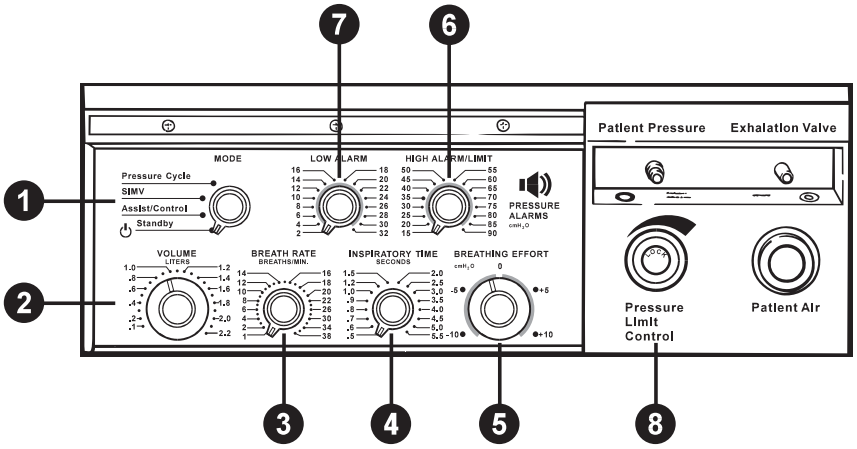
If your health or safety would be jeopardized by a long-term power failure, a reliable backup power source is mandatory. Do not regard the internal battery as a long-term backup power source.

To prevent shortened longevity, recharge the internal battery for at least three hours after each use. Always recharge the internal battery before turning off AC power to the ventilator.

Keep the internal battery fully charged at all times. The ventilator charges the internal battery when it is connected to an AC power source and is in any operating mode **including Standby**.

After using the ventilator on external battery for a long period, you must connect the ventilator to AC power. This will maintain the charge of the internal battery.

Operating Controls



These controls determine how your ventilator supports your breathing. They match the ventilator's operation to your individual needs.

Your doctor prescribes the settings for these controls. Keep a record of these settings. Verify all settings before connecting and using the ventilator.

Warning

Periodically check the control settings to be sure they are at the prescribed settings. Always verify that the controls are set correctly before connecting and using the ventilator. Do not change them without your doctor's orders.

1. **Mode**: This control selects the operating mode for the ventilator.

2. **Volume**: This sets the amount of air you receive for each breath. To change the setting, push in the control and then turn it to the selected setting. Any change made during operation results in a maximum change of 100 milliliters from breath to breath until the new volume is reached.

Note For more precise accuracy in setting the volume control (indicator), the use of an external volume measuring device is recommended.

3. **Breath Rate:** This setting controls the minimum number of breaths per minute (BPM) delivered by the ventilator.

4. **Inspiratory Time:** This sets the time it takes for the ventilator to deliver a breath.

5. **Breathing Effort:** This adjusts the ventilator's sensitivity to your breathing effort. When your effort reaches the setting, the Breathing Effort light turns on and the ventilator delivers a breath. You must push in the control knob to change the setting.

6. **High Alarm/Limit:** This sets the highest allowable pressure for a delivered breath. If a breath exceeds this limit, the High Pressure alarm sounds (except in the Pressure Cycle mode). Delivery of this breath stops after the pressure reaches this limit. The audible alarm is automatically silenced if the following breath does not exceed the setting.

7. **Low Alarm:** This establishes the minimum acceptable pressure for each controlled or assisted breath. The alarm turns on only when two consecutive breaths do not reach the selected limit, or if the limit is reached but the pressure fails to return to a level below the limit. Normally, the setting is just below the pressure you need for proper ventilation.

Note Some circuit components will prevent a Low Pressure alarm by keeping the pressure in the circuit above the alarm limit. Examples of these components include hydrated heat and moisture exchangers (HMEs) and tracheostomy tubes. If the patient circuit is disconnected from the patient, but still connected to these components, a Low Pressure alarm may not sound.

Where such disconnections from a ventilator-dependent patient are possible, you must set the Low Pressure alarm to a level that permits an alarm to sound. To do this, simulate the disconnection; if a Low Pressure/Apnea alarm does not sound after two breath cycles, increase the alarm limit until an alarm sounds.

8. **Pressure Limit (LP10 only):** This limits the maximum pressure developed for each breath. For use with Assist/Control or SIMV modes only. See Operating Modes section for details.

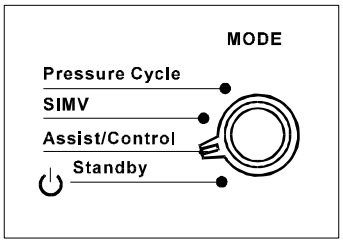
Operating Modes

The Mode control determines how your ventilator will deliver breaths. Your doctor prescribes the delivery mode (Assist/Control, SIMV, or Pressure Cycle) and tailors it to your special needs via the Operating Controls.

Standby

The ventilator will not deliver breaths in this mode. It will, however, charge the internal or connected external battery, but only when the AC Power Switch is ON. You may breathe through the patient circuit in this mode.

Assist/Control



In this mode, if your breathing effort is strong enough to trigger the Breathing Effort light, the ventilator assists your breathing. The ventilator delivers the selected volume of air. If you make no effort to breathe and, thus, fail to activate the Breathing Effort light, the ventilator takes control. It delivers breaths at the selected rate.

Breath Rate set at 1 - 5 BPM

If you do not start a breath on your own for 10 seconds, the Apnea alarm sounds and alerts your caregiver. Meanwhile, the ventilator delivers breaths at 10 BPM at the selected volume.

Breath Rate set at 6 BPM or more

No alarms sound if you fail to start a breath. Your ventilator continues to deliver breaths at the selected rate and volume.

Assist/Control with Pressure Limit (LP10 Only)

The ventilator functions as described under the Assist/Control mode. The only difference is that the ventilator will limit the pressure during a delivered breath. Since the pressure limit function bleeds off air to limit pressure, the volume of air delivered will be less than the set value.

SIMV (Synchronized Intermittent Mandatory Ventilation)

In this mode, you can breathe unassisted and on your own between ventilator delivered breaths. The ventilator monitors these spontaneous breaths.

The ability to breathe unassisted and on your own is the hallmark of the SIMV mode. When you make an effort to breathe faster than the selected rate, you may do so.

If your effort is not strong enough to turn on the Breathing Effort light or you make no effort, the ventilator delivers a controlled breath. All this depends on the breath rate setting:

Breath Rate set at 1 - 5 BPM

If you do not start a breath on your own for 20 seconds, the Apnea alarm sounds and alerts your caregiver. Meanwhile, the ventilator delivers breaths at 10 BPM at the selected volume.

Breath Rate set at 6 BPM or more

No alarms sound if you fail to start a breath. Your ventilator continues to deliver breaths at the selected rate and volume.

SIMV with Pressure Limit (LP10 Only)

The ventilator functions as described under the SIMV mode. The only difference is that the ventilator will limit the pressure during a delivered breath.

Pressure Cycle

In this mode, the ventilator assists or controls your breathing as it does in the Assist/Control mode. But, there's a difference. If the air pressure exceeds the level set on the High Alarm/Limit, the high pressure alarm does not sound. The high pressure alarm sounds only if the air pressure happens to exceed the High Alarm/Limit by 10 cmH_2O/hPa. Expiration begins if and when the High Alarm/Limit is reached.

Breath Rate set at 1 - 5 BPM

If you do not start a breath on your own for 10 seconds, the Apnea alarm sounds and alerts your caregiver. Meanwhile, the ventilator delivers breaths at 10 BPM at the selected volume.

Breath Rate set at 6 BPM or more

No alarms sound if you fail to start a breath. Your ventilator continues to deliver breaths at the selected rate and volume.

Pressure Limit (LP10 Only)

The pressure limit valve is a mechanical pressure valve located behind the Patient Air tube. The ventilator's microprocessor does not control this valve.

Note **Pressure limit control ventilation is intended for use with uncuffed tracheostomy tubes, or in other circuit configurations which ensure an intentional airway leak.**

The Pressure Limit control limits the pressure in the airway during inspiration. Inspiration continues after reaching the preset high pressure level and lasts until the Inspiratory Time expires.

Use the following instructions to activate and adjust the Pressure Limit Control.

To set the Pressure Limit level on the LP10:

1. Disconnect the patient from the ventilator. Provide another means of ventilation.

2. Turn the Pressure Limit Control counterclockwise until it stops.

Note The outside ring of the knob must be pushed in before the center adjustment knob can be moved.

3. Set all controls to the prescribed settings.

4. Block the Exhalation manifold at the port that connects to the patient.

Warning **Wash hands thoroughly. Do not introduce germs or contaminants into the patient circuit while performing this task.**

5. Watch the needle on the Patient Pressure Meter. Note the highest pressure achieved during a machine-delivered breath. This should be a very low pressure reading.

6. Turn the Pressure Limit Control clockwise in small increments until the meter needle reaches, but does not exceed, the pressure value prescribed by the physician.

7. When the prescribed Pressure Limit is reached, allow the machine to cycle for several breaths to verify stable operation.

8. Reconnect the patient to the ventilator.

9. When you first connect the patient to the ventilator, the value of the limited pressure may drop slightly. Watch the needle on the Patient Pressure Meter. Slight increases in the Pressure Limit setting may be required to increase the maximum pressure to the prescribed limit. Allow the machine to cycle for several breaths to verify stable operation.

10. Check to ensure that all settings are in agreement with the physician's prescription.

11. Monitor the patient and the ventilator closely.

Note Reset any alarms and monitor the ventilator and patient for a few minutes. If no pressure alarm sounds and if the needle continues to attain the prescribed Pressure Limit, then the Pressure Limit control is set correctly.

Note Use a printer during setup and routine safety checks to confirm precise opening pressure of the Pressure Limit Control.

Warning

The normal operation of the Pressure Limit Control may not allow a High Pressure alarm to occur, even when the tracheostomy tube or the patient circuit is blocked.

Routine Safety Check

Note Use this information along with instructions from the patient's physician. The procedure takes about ten minutes to complete and can be performed by a trained caregiver.

Warnings

Disconnect the patient from the ventilator and provide another means of ventilation before starting these tests.

ALWAYS complete a routine safety check BEFORE connecting the patient to the ventilator.

1. Check the Low Pressure Alarm.

- If the patient is not connected to the ventilator, connect a patient circuit and test lung to the ventilator. Then turn the ventilator on and switch it to an operating mode.
- Disconnect the patient pressure tube from its port near the bacteria filter. Wait for two or three breaths.
- The Low Pressure/Apnea light should start flashing and the audible alarm should sound.
- Push the Alarm Silence/Reset button to silence the alarm.
- Reconnect the pressure tube to the ventilator. The Low Pressure/Apnea light should stop flashing after a breath or two.

2. Check all the settings.

- Compare the current settings to your written record of the prescribed settings. Your equipment supplier may give you a checklist with these settings.
- Make sure that all seven controls (located behind the front panel door) are set to the doctor's prescription.

3. Check the patient circuit.

- Check every connection in the circuit you are using or plan to use. Make sure that the tubing is routed correctly, that all connections are tight, and that there are no leaks.
- Check every part of the circuit for cracks and water. Each part must be in good condition. There should be no water in any part of the circuit.

4. Check all the alarm signals.

- Turn the Mode switch to Standby.
- Wait one second and turn the Mode switch to Assist/Control.
- All nine lights (on the top section of the front panel) should turn on and the audible alarm should sound for two seconds.

Note If the ventilator is not plugged in or if the AC power switch is off, only eight lights will turn on. (The AC Power/Battery Charge light will not turn on.)

- Any connected accessories that signal an alarm (such as a remote alarm) will also test their alarms.
- If the Power Switchover alarm is on, push the Alarm Silence/Reset button to turn it off.
- Push the Alarm Silence/Reset button.
- All nine (or eight) lights should turn on and the alarms should sound for one second. The accessories also signal their alarms for one second.

5. Perform a battery test.

Note If you do **not** have an external battery connected to the ventilator, **ignore** the part of this test printed in *italics*.

- Make sure the ventilator is operating on AC power and the green AC Power/Battery Charge light is on.
- Turn off the AC power by pushing the 0 on the AC power switch located on the back panel.
- Make sure that the Power Switchover light starts flashing and the alarm begins to sound. Push the Alarm Silence/Reset button to turn it off.
- *The External Battery light should be on.*
- *Press and hold the Battery Test button. The needle on the Patient Pressure Meter will point to low, medium, or high (within the lower window). If the needle points to low, recharge your external battery. See pages 22 through 23 for directions.*
- *Disconnect the external battery.*
- *Ensure the Power Switchover light starts flashing and the alarm sounds. Push the Alarm Silence/Reset button to turn them off.*
- The Internal Battery light should be flashing.
- Press and hold the Battery Test button. The needle in the Patient Pressure Meter will point to low, medium, or high (within the lower window). If the needle points to low, recharge the internal battery **immediately** after completing the daily safety check. See page 23. Perform battery test after 3 hours of recharging.
- *Connect a fully charged external battery to the ventilator. Verify that the External Battery light on the front panel turns on.*
- Turn the AC power on. Make sure that the green AC Power/Battery Charge light (located on the front panel) turns on.

Warning

If the ventilator does not pass the daily safety check or you cannot complete this check, call your homecare dealer or a Puritan Bennett Service Representative immediately.

Monthly Safety Check

Note Use this information along with instructions from the patient's physician. The tests take about ten minutes to complete.

Warning **Disconnect the patient from the ventilator and provide another means of ventilation before starting these tests.**

1. With the ventilator turned off, confirm that the pressure meter is resting at -10 (±1.0) cmH_2O/hPa.

2. Unplug the AC power cord. Visually inspect the plug and cord for damage or exposed wires which could cause a shock hazard.

3. Check the High Pressure and Low Pressure alarms.

- Plug the ventilator into AC power.
- Connect the patient circuit to the ventilator.
- Use your thumb to block the part of the Exhalation Manifold that connects to the patient. Make sure no air comes out.

Warning **Wash hands thoroughly. Do not introduce germs or contaminants into the circuit while performing this test**

Note If you are using the LP6 Plus, **ignore** the steps marked with an asterisk.

- Turn the ventilator on and set the mode to Assist/Control.
- *Observe the Patient Pressure Meter. The maximum pressure displayed should be only a few cmH_2O/hPa above the pressure limit prescribed by your doctor.
- *Change the High Alarm/Limit setting to 15 cmH_2O/hPa.
- At the next attempt to deliver a breath, the High Pressure light should flash and the alarm should sound.
- The Exhalation Manifold should make a soft popping noise. Air should also come out of the large opening at the top of the Exhalation Manifold.
- *Change the High Alarm/Limit control back to the setting prescribed by your doctor.

- Remove your thumb from the opening in the Exhalation Manifold.
- Make sure the Low Pressure/Apnea light starts flashing after two or three breaths and that the alarm sounds.
- Push the Alarm Silence/Reset button to silence the audible alarm.
- Connect a test lung to the Exhalation Manifold. The Low Pressure/Apnea light should stop flashing after a breath or two.

4. Use the built in Self Test.

Note Self Test will not function properly with pressure limit in use.

- Turn the Mode switch to Standby.
- Connect a patient circuit to the ventilator.
- Block the end of the circuit completely. Allow no air to escape.
- Press and hold the Alarm Silence/Reset and Battery Test buttons simultaneously. While holding these buttons, switch to the Assist/Control mode. Release the two buttons.
- The ventilator will test itself. Some lights will turn ON and OFF and the needle on the Patient Pressure Meter will move back and forth.
- If the self test is satisfactory, no red alarm lights will be lit. To use the ventilator, turn the mode switch to Standby. Then, perform the Routine Safety Check.
- If the ventilator fails the self test, one of the alarm lights will flash and an audible alarm will sound. Call your homecare dealer or a Puritan Bennett Service Representative **immediately**.

Warnings

If the ventilator fails the monthly safety check or if you cannot complete this monthly check, refer to your Troubleshooting Guide on page 37 or page 38, and/or call your homecare dealer or a Puritan Bennett Service Representative immediately.

With the AC power cord unplugged, visually check the AC power cord for damage or exposed wires that could cause a shock hazard.

Responding To Alarms

The ventilator has visual and audible alarms. The audible alarm is usually a pulsating tone. Both the ventilator and the remote alarm emit these tones. Flashing or steady light(s) on the ventilator indicate the source of the problem. These alarms alert you or your caregiver that the ventilator requires attention. These are the types of alarms.

A Pulsating Audible Alarm and Flashing Light(s)

The Low Pressure/Apnea, Low Power, High Pressure, Setting Error, and Power Switchover alarms all use this type of alert signal.

A Steady Audible Alarm and Steady Lights

This combination indicates a detected microprocessor error in the ventilator.

Single Reminder Tone

A single tone sounds every five minutes when the internal battery powers the ventilator.

Warnings

All alarms indicate a potential risk to patient safety. When an alarm sounds, provide immediate attention and support to the patient as dictated by the situation.

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 a secondary, remote alarm, or another external monitoring device the physician should prescribe it. The physician should also determine to what level the patient may require an alternate means of ventilation.

When any alarm sounds:

First, attend to the patient immediately. Then, check the flashing or steady light(s) on the ventilator to identify the source of the problem.

You may press the Alarm Silence/Reset button to silence the alarm. This silences the audible signal for one minute. If the alarm condition is corrected during that minute, the alarm light will turn off.

A microprocessor error cannot be silenced. You cannot silence an alarm before it occurs.

Note If a High Pressure or Setting Error alarm condition is corrected before you press Alarm Silence/Reset, the audible alarm will stop but the light will continue to flash. Press Alarm Silence/Reset to turn off the light.

If a Low Pressure/Apnea, Low Power, or Power Switchover alarm condition is corrected before you press Alarm Silence/Reset, both the audible and visual alarms will continue. You must press Alarm Silence/Reset to turn off the audible alarm and the light.

Warning **If alarms continue to sound, provide another means of ventilation and contact your homecare dealer.**

Troubleshooting Guide

Conditions	Probable Cause	Solution
All lights turn on and audible alarm sounds	Normal condition. Alarms test when unit is turned on.	Alarms will stop in two seconds.
	Normal; manual alarm test.	Alarms will stop in one second.
	Microprocessor error.	Turn vent off and set mode to Standby. Wait a few seconds. Return switches to prescribed settings. If alarm persists, provide another means of ventilation.
Low Pressure/Apnea Alarm: Pulsating audible tone with flashing light	The patient is not breathing.	Check the patient for breathing effort and stimulate if necessary.
	Water in small-bore tubing.	Inspect and remove water from small-bore tubing.
	Patient speech or other activities lower patient airway pressure.	Low pressure alarm sounds whenever low pressure limit is not reached for two consecutive breaths. Review the section on alarms.
	Crimped small-bore tubing.	Uncrimp the small-bore tubing.
	PEEP pressure set higher than the Low Alarm control setting.	Set Low Alarm control setting higher than the PEEP pressure.
	Leaks or loose connections in the patient circuit.	Check connection of the patient circuit to the ventilator; check all connections for leaks and tightness, especially at the humidifier, trach tube, and exhalation valve.
	The patient's breathing effort is less than the Breathing Effort control setting.	Set Breathing Effort so the patient's breathing effort turns on the Breathing Effort light.
	Low alarm setting is higher than Pressure limit setting **(LP10 only)**.	Correct to the prescribed value.
	Volume set below patient's tidal volume.	Reset the Volume to the prescribed value.
	Pressure Limit level is set too low **(LP10 only)**	Correct to the prescribed value.
	Incorrect control settings.	Reset all controls to the prescribed values.
	Leaks or obstructions in the patient circuit.	Check for leaks or crimped tubing.
	Other causes.	Notify your physician and your homecare dealer

Conditions	Probable Cause	Solution
Low Power Alarm: Pulsating audible tone with flashing light	Failure to recharge the Internal battery.	Operate the ventilator on AC power for at least three hours. (or) Place ventilator in Standby Mode while on AC power
High Pressure Alarm:	Water in the tubing.	Remove water from tubing.
Pulsating audible tone with flashing light		
	Crimped tubing.	Straighten crimped 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.
	A sticky Pressure Limit control.	Occlude the end of the patient circuit to free the valve.
	Airway obstruction	Check for trach obstruction or for a condition in which the patient requires suctioning.
	Malfunction in the exhalation manifold.	See the manifold manufacturer's instructions.
	Pressure Limit setting is higher than the High Alarm setting **(LP10 only)**.	Reset both to the prescribed values.
Setting Error Alarm	Inappropriate setting or settings beyond the capabilities of the machine.	Readjust settings to the physician's prescription.
Internal Battery light flashes.	Unit has not switched to external battery.	Check for unconnected or misconnected battery cable. Check for blown fuse in the battery cable. Use another external battery.
	DC circuit breaker is open.	Reset by pushing in protruding rod. Use another external battery.
Single tone	Unit is operating on internal battery.	Check for unconnected or misconnected battery cable. Check for blown fuse in the battery cable.
Green AC Power light does not glow	AC circuit breaker is open.	Turn it back ON.
	AC power cord is not connected.	Plug in the cord.
	No power at the wall outlet., Use an active outlet.	Use an active outlet.

Warning If the problems continue, provide another means of ventilation and contact your homecare dealers.

Cleaning and Maintenance

This section contains instructions for maintaining and cleaning your ventilator. You must also consult such instructions for the various accessories used with the ventilator.

Note Use the information in this and the accessories sections, as well as established procedure and your homecare dealer's instructions, to clean your ventilator.

Warnings

A ventilator patient is highly susceptible to respiratory infections. Dirty or infected equipment may be a source of infection. Clean equipment is essential for successful ventilation. Be sure to wash your hands thoroughly before and after cleaning the ventilator or accessories.

Do not sterilize the ventilator with ethylene oxide (ETO) or steam.

Caution

Do not use MEK, trichloroethylene, or alcohol to clean the ventilator. Their use may damage the unit's surface.

Patient Circuit and Humidifier

Follow the cleaning instructions recommended by the humidifier manufacturer.

Warnings

After reassembling the patient circuit, check to see if the exhalation manifold is operating properly. Always follow the manufacturer's instruction.

Condensation forms in the Patient Circuit over time. Periodically check for moisture in the Patient Circuit. When present, remove the moisture. Before attempting to dry the circuit, disconnect it from the ventilator. Never subject the internal ventilator components to moisture or high pressure. Doing so may damage the ventilator and endanger the patient.

Caution Do NOT use compressed gas to clear moisture from the pressure line when connected to the patient or the ventilator.

Inlet Air Filter

Frequency

Check the filter weekly; daily when the ventilator is used during transport or outdoors. Replace the filter when it becomes dirty. A blocked inlet filter may cause a setting error alarm. Failure to change the filter may cause serious damage to the ventilator.

A bacteria filter may be used in place of the Inlet Air Filter. The use of a bacteria filter further isolates you from bacteria in the environment. A bacteria filter may be mandatory when the caregiver or others in your home are ill.

Warning **Do not operate the ventilator without an inlet air filter. Using the ventilator without a filter may damage the ventilator and endanger the patient. Use only filters supplied by Puritan Bennett.**

Procedure

1. Twist off the plastic cover over the inlet filter.
2. Remove the two particle screens that sandwich the air filter. Periodically wash the screens in a mild soap solution. Discard the old filter.
3. Place the new filter between the particle screens. Position the new filter with the printed side toward the ventilator.
4. Place the assembly into position. Twist the plastic cover into place over the filter assembly.

Note Do NOT reuse filters. Discard them after removal.

Re-order part number: Filter, inlet L-002917-000

Obtain replacement parts from your health care provider.

Ventilator Surface

Frequency

Clean as often as the surface becomes soiled.

Supplies

Use a mild soap solution and a damp cloth.

Procedure

1. Clean with a mild soap solution and a damp cloth. Squeeze the cloth thoroughly before applying it to the unit's surface.

2. DO NOT allow liquids to enter the ventilator.

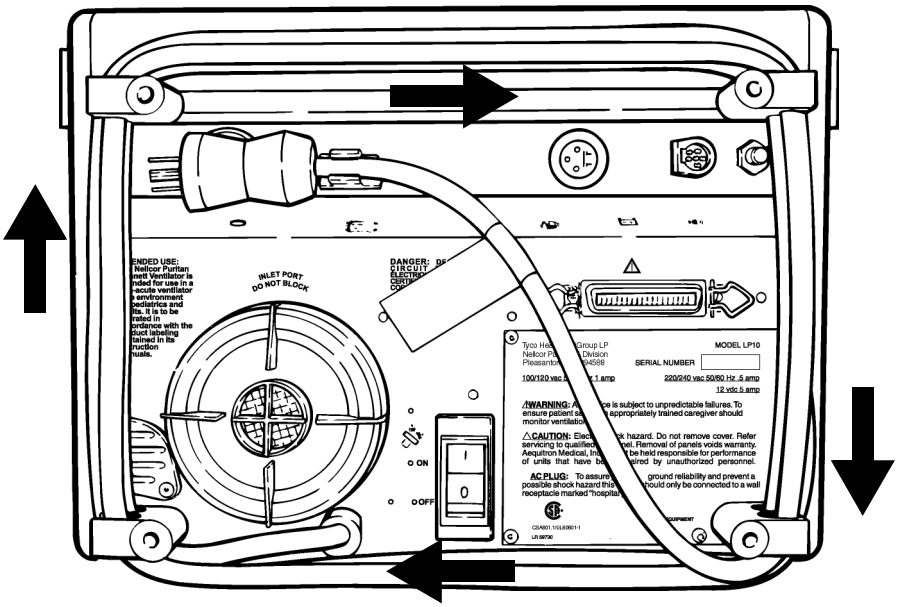
Warning

Never allow liquids to contact internal ventilator components under any circumstances. Moisture will damage the ventilator.

We recommend you use a ventilator cover to protect against liquids getting into your ventilator.

Storage of the Ventilator

When not in use, the ventilator may be stored away. Wrap the AC power cord around the Cord Wrap/Rear Feet. Begin the wrap by placing the cord in the lower left foot. Use the inner groove. Continue to the



upper left, upper right, and lower right feet. Keep the first and second wraps in the inner groove. At the start of the third wrap, place the cord

in the outer groove of the lower left foot. Place the plug in the holder located at the top of the rear panel.

Scheduled Maintenance

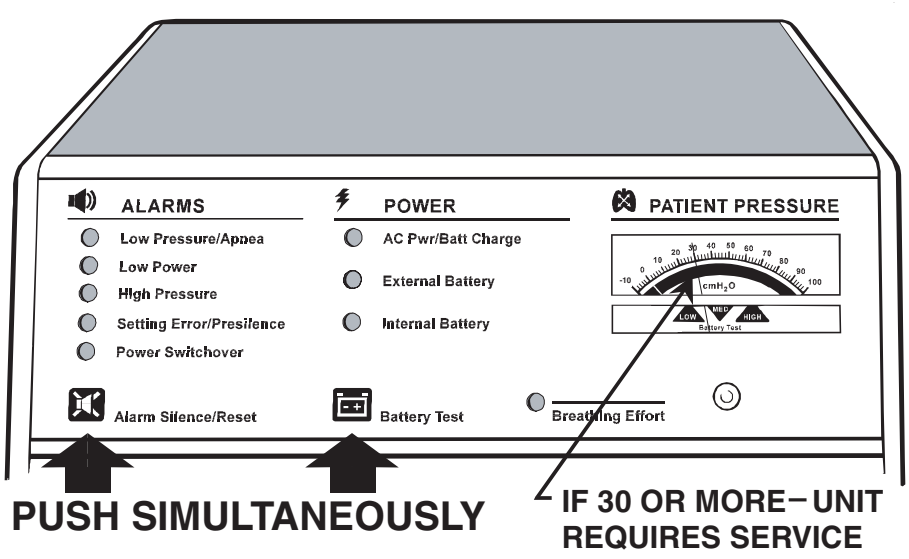
Your ventilator needs periodic maintenance, just like your car does. Follow the schedule below to ensure peak performance from your ventilator.

Maintenance	Interval	Action Required
Change the Inlet Air Filter	As Needed	See page 40
Preventive Maintenance	Every twelve (12) months, or 6000 operating hours, whichever occurs first.	Contact your dealer
Battery Discharge/Recharge	Monthly	See pages 20 and 22

You can check the total operating time on the Patient Pressure meter. To do so, press the Alarm Silence/Reset and Battery Test buttons simultaneously.

When the needle points to 30 or more, contact your homecare dealer for service.

Warning **The ventilator must be serviced yearly by authorized personnel to ensure proper performance.**


ALARMS
Low Pressure/Apnea
Low Power
High Pressure
Setting Error/Presilence
Power Switchover
POWER
AC Pwr/Batt Charge
External Battery
Internal Battery
PATIENT PRESSURE
-10
0
10
20
30
40
50
60
70
80
90
100
cmH2O
LOW
MED
HIGH
Battery Test
Alarm Silence/Reset
Battery Test
Breathing Effort
PUSH SIMULTANEOUSLY
IF 30 OR MORE– UNIT
REQUIRES SERVICE

Specifications

LP6 Plus and LP10 Volume Ventilators

IEC/EN 60601-1 classification:	Protection class I, Type BF, internally powered, continuous operation
Power Line	110 VAC range (100-120 VAC),1 Ampere or 220 VAC range (220-240 VAC), 0.5 Ampere, 50/60 Hz., external voltage selector switch.
Power Usage	
Maximum:	630 kw hours per year.
Nominal:	315 kw hours per year.
Extension Cord Gauge:	Use 3-conductor harmonized cord only; up to 49' use 18 gauge cord; up to 99', use 16 gauge cord; up to 200', use 14 gauge cord.
External Battery:	12 VDC, 5 Amperes. Approximately 20 hrs. operation with 75-80 Amp-hour 12 VDC deep-cycle, gel-cell battery. Approximately 10 hrs operation with 35-40 Amp-hour 12 VDC deep-cycle, gel-cell battery.
Internal Battery:	Approximately 1 hour operation.
Type:	Volume ventilator.
Motor:	Brushless induction.
Pump:	Piston, 100 to 2200 ml tidal volume capability.
Front Panel Controls:	
Alarm Silence/Reset:	Push button to silence alarms during events or reset after events; used with Battery Test button to read machine operating hours on Patient Pressure meter.
Battery Test:	Push button to show battery charge level on the lower window of Patient Pressure meter.
Mode:	Rotary switch to set ventilator operating mode: Standby, Assist/Control, SIMV, or Pressure Cycle.
Low Alarm:	Rotary switch to set limit for Low Pressure alarm: 2 to 32 cmH_2O/hPa in increments of 2 cmH_2O/hPa
High Alarm Limit:	Rotary switch to set limit for High Pressure alarm {Assist/Control, SIMV modes} or limit for Pressure Cycle mode: 15 to 90 cmH_2O/hPa in increments of 5 cmH_2O/hPa
Volume:	Push-to-turn knob to set volume: continuously adjustable from 100 to 2200 ml.
Breath Rate:	Rotary switch to set breathing rate: 120 BPM in increments of 1 BPM and 2238 BPM in increments of 2 BPM.
Inspiratory Time:	Rotary switch to set time for delivery of set volume: 0.5 to 1.0 sec. in increments of 0.1 sec.; 1.2 sec.; and 1.5 to 5.5 sec. in increments of 0.5 sec.
Breathing Effort:	Push-to-turn knob to set pressure level for detecting breathing effort; continuously adjustable from -10 to +10 cmH_2O/hPa
Pressure Limit (LP10 Only):	Locking knob sets pressure limit level from 15 to 50 cmH_2O/hPa or closes off the pressure limit feature.
Input	
Patient Pressure:	Port for connection to the proximal pressure line of the patient circuit.

Outputs

Patient Air:	22 mm tube for connection to the bacteria filter.
Exhalation Valve:	Port for connection to the exhalation valve of the patient circuit.

Indicators

Normal Events	
Patient Pressure Meter:	Displays patient pressure, -10 to +100 cmH_2O/hPa; also displays battery charge and machine hours of operation when appropriate buttons are pressed.
Breathing Effort:	Green LED activated by adequate patient breathing effort.
Power:	LEDs indicate operating power source: green AC Pwr/Batt Charge, amber External Battery, flashing amber Internal Battery.
Alarms:	Flashing red LEDs: Low pressure /Apnea, Low Power, High Pressure, Setting Error, Power Switchover.
Audible Alarms	
Pulsating Tone:	Low Pressure/Apnea, Low Power, High Pressure, Setting Error, Power Switchover.
Steady Tone:	Loss of microprocessor control.
Reminder Tone:	Every five minutes when powered by Internal battery, each time accessory printer generates a report.

Rear Panel Controls

AC Circuit Breaker	Internal to the AC Power Switch (1 for ON; 0 for OFF), 1 Ampere
Inputs	
Inlet Filter:	Intake for patient air. Screw off cap for filter change.
External Battery:	Connection for 12 VDC battery.
Communications Port	Calibration information during service procedure.
Outputs	
Vent:	Cooling vent for internal ventilator components
Remote Alarm	Connection for optional alarm accessories.
Communications Port	Connector for optional printer

Environment:	Do not use or store in the presence of strong electromagnetic fields.
Operating:	5° C to 40°C (41°F to 104° F), 10% to 90% RH.
Storage:	-20°C to 50°C (5° F to 104°F), 10% to 90% RH; when moving the LP6 Plus or LP10 Ventilator from a non-operating to an operating environment, allow a minimum of one hour temperature stabilization before use.
Maintenance:	Preventative maintenance must be performed by qualified personnel every twelve (12) months or 6000 operating hours, whichever occurs first.
Dimensions:	9.75" X 14.5" X 13.25" (24.6 X 36.8 X 33.6 cm)
Weight:	Approximately 34 pounds (15.5 kg)
Emergency Pressure Relief:	100 cmH_2O/hPa (approximately)
Flow:	20-100 LPM

Manufacturer's Declaration

The following tables contain the manufacturer's declarations for the *LP6/LP10 Ventilator System* electromagnetic emissions, electromagnetic immunity, recommended separation distances between ventilator and portable and mobile RF communications equipment, and a list of compliant cables.

Warning

Portable and mobile RF communications equipment can affect the performance of the *LP6/LP10 Ventilator System*. Install and use this device according to the information contained in this manual.

Warning

The *LP6/LP10 Ventilator System* should not be used adjacent to or stacked with other equipment, except as specified elsewhere in this manual. If adjacent or stacked use is necessary, the *LP6/LP10 Ventilator System* should be observed to verify normal operation in the configurations in which it will be used

Table 1: Electromagnetic Emissions

The *LP6/LP10 Ventilator System* is intended for use in the electromagnetic environment specified below. The customer or the user of the *LP6/LP10 Ventilator System* should assure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic environment–guidance
RF emissions CISPR 11	Group 1	The *LP6/LP10 Ventilator System* uses RF energy only for its internal functions. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The *LP6/LP10 Ventilator System* is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class D	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Table 2: Electromagnetic Immunity

The *LP6/LP10 Ventilator System* is intended for use in the electromagnetic environment specified below. The customer or the user of the *LP6/LP10 Ventilator System* should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment–guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	± 2 kV for power supply lines ± 1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.

Table 2: Electromagnetic Immunity (Continued)

The *LP6/LP10 Ventilator System* is intended for use in the electromagnetic environment specified below. The customer or the user of the *LP6/LP10 Ventilator System* should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment–guidance
Surge IEC 61000-4-5	± 1 kV differential mode ± 2 kV common mode	± 1 kV differential mode ± 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5% U_T (> 95% dip in U_T for 0.5 cycle) 40% U_T (60% dip in U_T for 5 cycles) 70% U_T (30% dip in U_T for 25 cycles) < 5% U_T (> 95% dip in U_T for 5 s)	< 5% U_T (> 95% dip in U_T for 0.5 cycle) 40% U_T (60% dip in U_T for 5 cycles) 70% U_T (30% dip in U_T for 25 cycles) < 5% U_T (> 95% dip in U_T for 5 s)	Mains power quality should be that of a typical commercial or hospital environment. If the user of the *LP6/LP10 Ventilator System* requires continued operation during power mains interruptions, it is recommended that the *LP6/LP10 Ventilator System* be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	10 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Note: U_T is the AC mains voltage prior to application of the test level.

Table 3: Electromagnetic immunity–conducted and radiated RF

The *LP6/LP10 Ventilator System* is intended for use in the electromagnetic environment specified below. The customer or the user of the *LP6/LP10 Ventilator System* should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment–guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the *LP6/LP10 Ventilator System*, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	10 Vrms 150 kHz to 80	$d = 0.35\sqrt{P}$
Radiated RF IEC 61000-4-3	3V/m 80 MHz to 2.5 GHz	10 V/m 80 MHz to 2.5 GHz	$d = 0.35\sqrt{P}$ 80 MHz to 800 MHz $d = 0.7\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[a], should be less than the compliance level in each frequency range[b]. Interference may occur in the vicinity of equipment marked with the following symbol: 

Table 3: Electromagnetic immunity–conducted and radiated RF (Continued)

The *LP6/LP10 Ventilator System* is intended for use in the electromagnetic environment specified below. The customer or the user of the *LP6/LP10 Ventilator System* should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment–guidance

Notes:

- At 80 MHz and 800 MHz, the higher frequency range applies.
- These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the *LP6/LP10 Ventilator System* is used exceeds the applicable RF compliance level above, the *LP6/LP10 Ventilator System* should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the *LP6/LP10 Ventilator System*.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 10 V/m.

Table 4: Recommended separation distances between portable and mobile RF communications equipment and the *LP6/LP10 Ventilator System*

The *LP6/LP10 Ventilator System* is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the *LP6/LP10 Ventilator System* can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the *LP6/LP10 Ventilator System* as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (W)	Separation distance according to frequency of transmitter (m)		
	150 kHz to 80 MHz $d = 0.35\sqrt{P}$	80 MHz to 800 MHz $d = 0.35\sqrt{P}$	800 MHz to 2.5 GHz $d = 0.7\sqrt{P}$
0.01	0.035	0.035	0.07
0.1	0.11	0.11	0.22
1	.35	.35	0.7

Table 4: Recommended separation distances between portable and mobile RF communications equipment and the *LP6/LP10 Ventilator System* (Continued)

The *LP6/LP10 Ventilator System* is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the *LP6/LP10 Ventilator System* can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the *LP6/LP10 Ventilator System* as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (W)	Separation distance according to frequency of transmitter (m)		
	150 kHz to 80 MHz $d = 0.35\sqrt{P}$	80 MHz to 800 MHz $d = 0.35\sqrt{P}$	800 MHz to 2.5 GHz $d = 0.7\sqrt{P}$
10	1.1	1.1	2.2
100	3.5	3.5	7

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be determined using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Notes:

- At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.
- These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Table 5: Compliant cables

The listed cables and accessories comply with the following standards:

•RF emissions, CISPR 11 Group 1, Class B

•EN 60601-1-2: 2001

Warning

The use of accessories and cables other than those specified, with the exception of parts sold by Puritan Bennett as replacements for internal components, may result in increased emissions or decreased immunity of the *LP6/ LP10 Ventilator System*.

Cable or Accessory	Maximum length
Y-101748-00A Power cord	10 ft (3 m)
L-007916-000 Power Cord, international	10 ft (3 m)
Y-CG1111 Cable, battery, right angle	7 ft (2.1 m)
Y-CG1113 Cable, battery, straight	7 ft (2.1 m)
Y-CG1655 Cable, adapter	22 in (56 cm)
Y-CG1719 Cable, battery, right angle	4 ft (1.2 m)
Y-CG2133 Cable, adapter	18 in (46 cm)
L-005367-000 Cable, interface	10 ft (3 m)

Caution

Use Puritan Bennett-approved accessories in conjunction with the ventilator. The use of other accessories may prevent proper operation of the ventilator or may damage the unit.

Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC standards (e.g. IEC 60950 for data processing equipment and IEC 60601-1 for medical equipment). Furthermore, all configurations shall comply with the system standard IEC 60601-1-1. Any person who connects additional equipment to the signal input part or signal output part configures a medical system, and is therefore responsible for ensuring that the system complies with the requirements of the system standard IEC 60601-1-1. If in doubt, consult Puritan Bennett Technical Services at 1.800.255.6774 or your local representative.

Service Policy

The LP6 Plus and LP10 Volume Ventilators are warranted against defects in workmanship and materials. The full warranty on page 55 provides details. Do not make any service repairs on this equipment during the stated warranty period. Any unauthorized work immediately voids the warranty. If you need information or assistance, or if the information in this manual is insufficient, contact Puritan Bennett at:

800.635.5267

In Europe contact:

Tyco Healthcare UK LTD
154 Fareham Road
Gosport PO13 0AS, U.K.

Puritan Bennett does not recognize the owner of a ventilator as an authorized service representative. Puritan Bennett will not be liable for any repairs attempted by the owner. Any such attempted repairs other than specified non-warranty repairs voids the warranty. Parts and labor costs incurred by the owner will not be reimbursed by Puritan Bennett.

Puritan Bennett will make available on request diagrams, component parts lists, descriptions, calibration procedures and instructions to assist in the repair of parts classified by Puritan Bennett as repairable.

Before returning any device to Puritan Bennett, you must get a Return Authorization Number by calling Puritan Bennett at one of the numbers given above.

Limited Warranty

Puritan Bennett warrants to the owner that the LP6 Plus or LP10 Volume Ventilator, exclusive of expendable parts and other accessories, shall be free from defects in material and workmanship for twenty-four (24) 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 performance of Preventive Maintenance at a minimum of once every twelve (12) months 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 unauthorized 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.

Keyword Index

Tyco Healthcare Group LP
Nellcor Puritan Bennett Division
4280 Hacienda Drive
Pleasanton, CA 94588
Toll Free: 1.800.635.5267

Rx ONLY