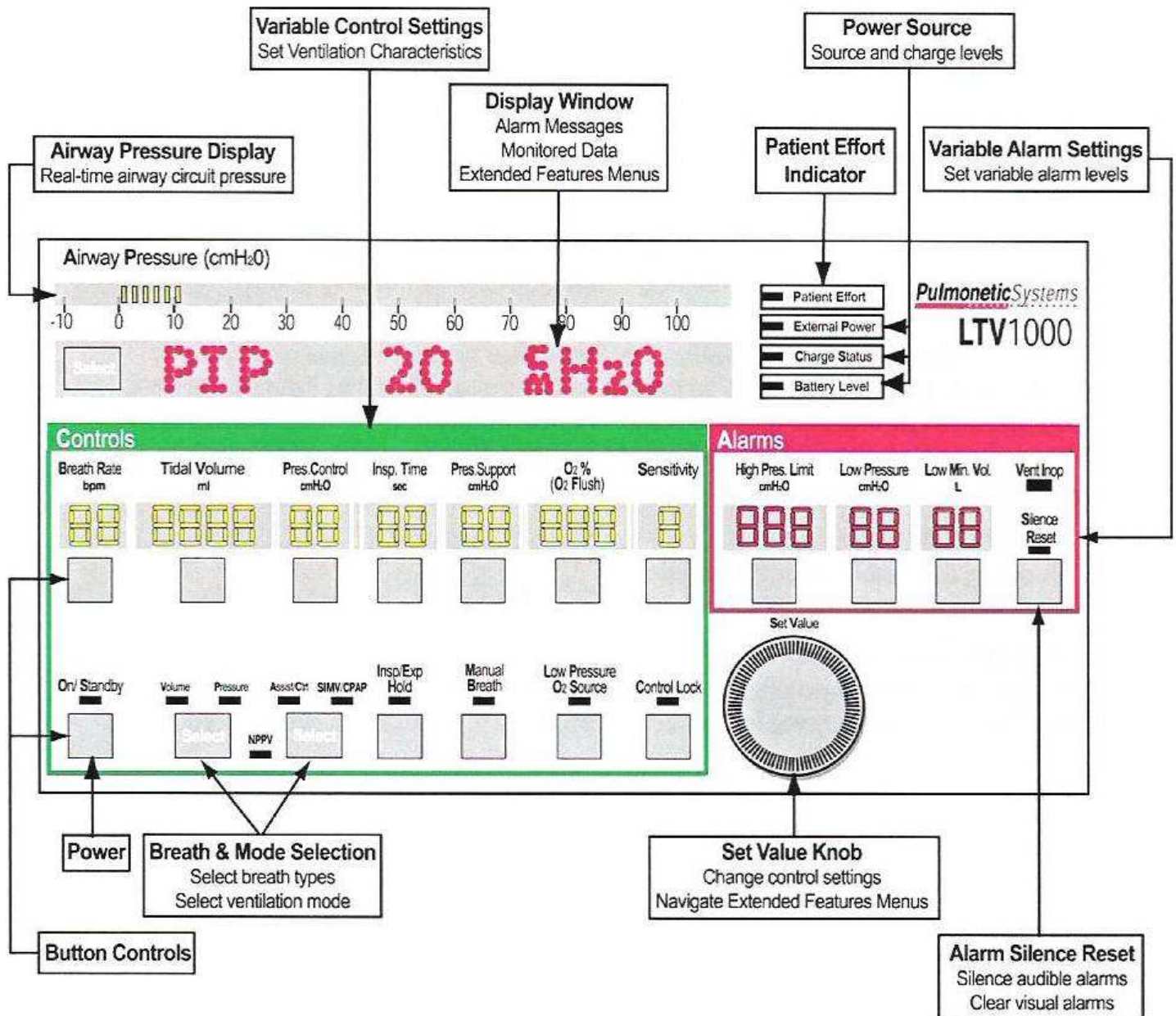


PulmonicSystems®

Innovations For Life



V. Alarms and Alerts

A. Alarm Silence / Reset Button

1. Active Alarm - An alarm that currently exists.
2. Inactive Alarm - An alarm that has occurred, but for which the condition no longer exists.
3. Preemptive Silence - For suctioning, etc.
--The Alarm Silence Reset button will silence alarm for 60 seconds. It will also clear an inactive alarm.

B. Alarms and Alerts

1. Apnea XX bpm - apnea back up ventilation
Apnea Interval: 10 - 60 seconds. Apnea backup ventilation will begin when interval has been exceeded. The LTV 900 will ventilate the patient at the set I time, volume, mode, etc. If RR is <12bpm, then RR defaults to 12. If RR is >12bpm then vent continues to ventilate at the set RR. The patient can cancel the apnea ventilation by initiating two consecutive spontaneous breaths or if the alarm reset is depressed.
2. Batt Empty ~ 7 minutes of battery left.
3. Batt Low ~ 30 minutes of battery left.
4. Defaults (see manual) - default factory settings.
5. *Disc/Sense (see troubleshooting section).
6. *High PEEP (see troubleshooting section).
7. *High Pressure (see troubleshooting section).
8. *High Rate (see troubleshooting section).
9. HW Fault - hardware problem. Contact Norco, move to backup.
10. INOP - unsafe vent condition. Contact Norco, move to backup.
—Vent INOP - will illuminate if:
 - Vent is powered down
 - Internal and external batteries are depleted
 - The vent fails—While in Vent INOP the vent allows the patient to breathe room air.
11. LMV Off - low minute volume alarm is off.
12. LMV/LPPS Off - low minute volume alarm is off or LPP alarm is set to VC/PC only.

13. Locked - controls are locked.
14. ***Low Min Volume** (see troubleshooting section).
15. ***Low Press** (see troubleshooting section).
16. LPPS Off - VC/PC only.
—No low-pressure alarms on pressure support breaths.
17. No Cal Data - vent not calibrated. Call Norco, move to backup.
18. Power Lost - when vent moves from external to internal.
19. Power Low - when external power is low.

20. Remove PTNT - used in vent checkout modes.
21. Reset - vent runs more sophisticated post. If post fails Vent INOP occurs.
22. Warm up XX - transducers are not yet functioning at full capacity. When transducers acceptable the warm up XX will disappear.
23. XDCR Fault - go to backup vent and call Norco.

VI. Troubleshooting

A. High Pressure Alarm

1. Mechanical factors:
 - Kinked circuit (including flex tube or trach tube)
 - Stuck exhalation valve
 - Water in circuit
 - Rise time too fast
2. Patient factors:
 - Bronchospasm
 - Coughing
 - Secretions or mucus plug
 - Breathing out of sync
 - Airway closure (atelectasis)
 - Pneumonia

B. Low Minute Volume Alarm Sounds

1. Leak in circuit
2. LMV may occur while suctioning patient.
3. Increasing cuff leak
 - Positional change
 - Relaxed airways (during sleep)
 - Lowered RR (sleep, pain meds)
 - Note: many patients need a daytime and a nighttime low setting.
2. Passy Muir Valve - may cause low min. volume alarm.

C. Low Pressure Alarm Sounds

1. Circuit disconnect
2. Increasing cuff leak
 - Positional change
 - Relaxed airways (during sleep)
 - Patient grew
3. Leak in circuit
4. LPP set to apply to all breaths when patient is breathing spontaneously or when PS is much less than PC.

D. No Low Pressure Alarm Available

1. LPP set to apply to only VC/PC breaths, and you are using Pressure Support or Spontaneous breaths only.
2. You are in NPPV mode

E. High PEEP Alarm Sounds

Will sound when the monitored PEEP level meets or exceeds the High PEEP Alarm setting

- Fast respiratory rates (insufficient exhale times)
- Exhalation valve sticking
- Blockage in circuit

F. High f Alarm Sounds

When the total breath rate exceeds the high breath rate and time period alarm values

- Circuit disconnect
- Anxiety
- Sensitivity is set too low (1 or 2)
- Auto-cycling (unit appears to be auto-cycling)

G. Disc / Sense Alarm Sounds

1. If the sense lines are pinched, blocked, occluded or disconnected.
2. Disc / sense alarms may be the initial response to a patient circuit disconnect. A low-pressure alarm will follow shortly thereafter.

H. Vte Variation

1. Within specs
2. Jetting (high flows across the sense lines on exhalation) add a flex tube, if there isn't any
3. Middle sense line disconnected
4. Moisture in sense lines
5. Loose sense lines
6. Cuff leaks

I. Not Triggering

1. Turn sensitivity down (from 9 towards 1)
2. Add a bit of air to cuff

J. Auto-cycling

1. Time term too short (appears to be auto-cycling)
2. Sense line loose
3. Hole in circuit
4. Sensitivity too low (turn up towards 9)
5. Cuff leak or deflated
6. Position changes
7. Patient opened mouth or is talking
8. Relaxed airway (sleeping, pain meds, bronchodilator)

K. Pressure Overshoot

1. Add a bit of flex tube if there isn't any
2. Slow rise time (move from Profile 1 towards Profile 9)
3. Move flow term up (from 10% towards 40%)
4. Shorten time termination
5. Change from CPAP using just PEEP to PEEP and Pressure Support set the same

L. CO2 Increase on LTV

Forgot that the LTV is not PEEP compensated. When PEEP was added or increased, tidal volume is reduced unless PC and/or PS are also increased.

Clinical FAQs

- **Are the Pulmonetic Systems' reusable breathing circuits UV (ultraviolet) stable?**

No. The material used in Pulmonetic Systems' reusable breathing circuits is not UV (ultraviolet) stable and is not intended for use in direct sunlight

- **Do you offer circuits for heated wire humidifier breathing circuits?**

Yes. Pulmonetic Systems does offer complete heated wire circuits. See your local Pulmonetic Systems' sales representative or call Pulmonetic Systems for more information.

- **Are the Pulmonetic Systems' ventilators and breathing circuits latex free?**

Yes. The Pulmonetic Systems LTV Series ventilators are constructed of material that is latex free.

- **Why doesn't my control panel unlock when I press Control Lock?**

You may have the HARD Unlock feature selected. The LTV offers two unlock methods:

- EASY - press and release the Control Lock button,
- HARD - press and hold the Control Lock button for 3 seconds.

The EASY method should be used in well-supervised environments and the HARD method may be more appropriate in settings where there are children or less supervision. See your LTV Operator's manual for more information on using the CTRL UNLOCK feature.

- **What size of patient is the LTV Series Ventilator approved for?**

The LTV Series Ventilator is intended for use on patients that are 5kg (11lbs) or larger.

- **Can the ventilator be used non-invasively?**

Yes, the LTV Series Ventilator can be used invasively or non-invasively (mask ventilation).

- **What is Rise Time and how does it work?**

Rise Time affects the inspiratory side of the flow curve by determining how quickly flow will be delivered to the patient within either the set inspiratory time (Pressure Control mode) or the patient demand (Pressure Support). The faster the Rise Time the steeper the inspiratory side of the flow curve (square wave), and the more time the patient is being ventilated at the set pressure. The slower the Rise Time the more tapered the flow curve and the less time the patient is being ventilated at the set pressure.

- **What is the optimal setting for Rise Time?**

An optimal Rise Time setting is patient specific - there is no magic number that will work for every patient. But there is an "optimal" Rise Time setting for each patient. It is usually best to start the adult patient at a Rise Time profile of 4, then working your way up or down depending on that particular patient's response. Remember though, a profile setting of 1 is the "fastest," whereas, a profile setting of 9 is the "slowest." Often patients who have very rapid spontaneous respiratory rates, or those with significant leaks around the endotracheal or tracheostomy tube, will require a lower (faster) profile setting (< 4). A higher (slower) Rise Time profile setting (> 4) is more commonly utilized with noninvasive ventilation.

- **How will I know if I have the Rise Time set too fast?**

If the Rise Time is too fast (too rapid) "pressure overshoot" may result. This is evidenced as a PIP reading above the set pressure. A fast Rise Time may also "startle" the patient (especially neonates) as is evidenced by the patient appearing to jump or twitch at each ventilator delivered breath.

- **How will I know if I have the Rise Time set too slow?** If the Rise Time is too slow the result may be dysynchrony between the patient and the ventilator. This usually results in increased work of breathing for the patient. Patients may complain of "not getting enough air". If you are using the LTM (Lap Top Monitor), you may notice "scooped" out flow waveforms.
- **What does HIGH f OFF mean?**

This is an informational message stating that the High f (frequency / breath rate) alarm has been inactivated. This setting can be changed within the ALARM OP submenu of the Extended Features menu.

- **What does HIGH PEEP OFF mean?**

This is an informational message stating that the High PEEP alarm has been inactivated. This setting can be changed within the ALARM OP submenu of the Extended Features menu.

- **Why doesn't the PIP increase when the PEEP is increased?**

The LTV ventilator is designed to deliver absolute pressure according to the settings displayed on the front panel. Inspiratory pressure is not PEEP-compensated.

On some other ventilators, the set PIP and set PEEP are added together to generate the target inspiratory pressure. For example, a Pressure of 20 and a PEEP of 5 would give an inspiratory pressure of 25 cmH₂O and an expiratory pressure of 5 cmH₂O. If the PEEP is increased to 10, the inspiratory pressure would increase to 30 cmH₂O and the expiratory pressure would increase to 10 cmH₂O.

On the LTV, the pressure selected using the Pressure Control or Pressure Support settings is the pressure that will be delivered during inspiration. The PEEP is set independently and does not affect the PIP. For example, if Pressure Control is set to 20 and PEEP is set to 5, the inspiratory pressure is 20 cmH₂O and the expiratory pressure is 5 cmH₂O. If the PEEP is increased to 10, the inspiratory pressure would still be 20 cmH₂O and the expiratory pressure would be increased to 10 cmH₂O.

- **Why doesn't the DISC/SENSE alarm sound on some disconnects?**

The LTV offers a DISC/SENSE alarm that will detect a disconnect of the high side pressure sense line (closest to the patient). This alarm will detect some but not all circuit disconnect conditions. To protect against circuit disconnects, set the Low Minute Volume and Low Pressure alarms to appropriate levels.

- **Why does my Pressure Support display flash?**

Pressure support breaths are normally terminated at a set percentage of the peak flow seen during inspiration. This percentage can be set using the Variable Flow Termination feature. However, pressure support breaths will be terminated at a set time if the flow hasn't dropped to the termination level before the time elapses. When a pressure support breath terminates by time, the Pressure Support display will flash briefly. The termination time can be set using the Variable Time Termination feature.

- **Why do I get a HIGH PRES alarm message but no audible alarm?**

The LTV has a High Pressure Delay feature that decreases the number of nuisance alarms from coughing. When the HP Delay is on, the audible portion of the HIGH PRES alarm remains silent until 2 or 3 consecutive high pressure conditions have occurred. The HIGH PRES message is always posted on the first high pressure breath and will remain displayed until it is cleared with the Reset button. See your LTV Operator's Manual for more information on using the HP Delay feature.

