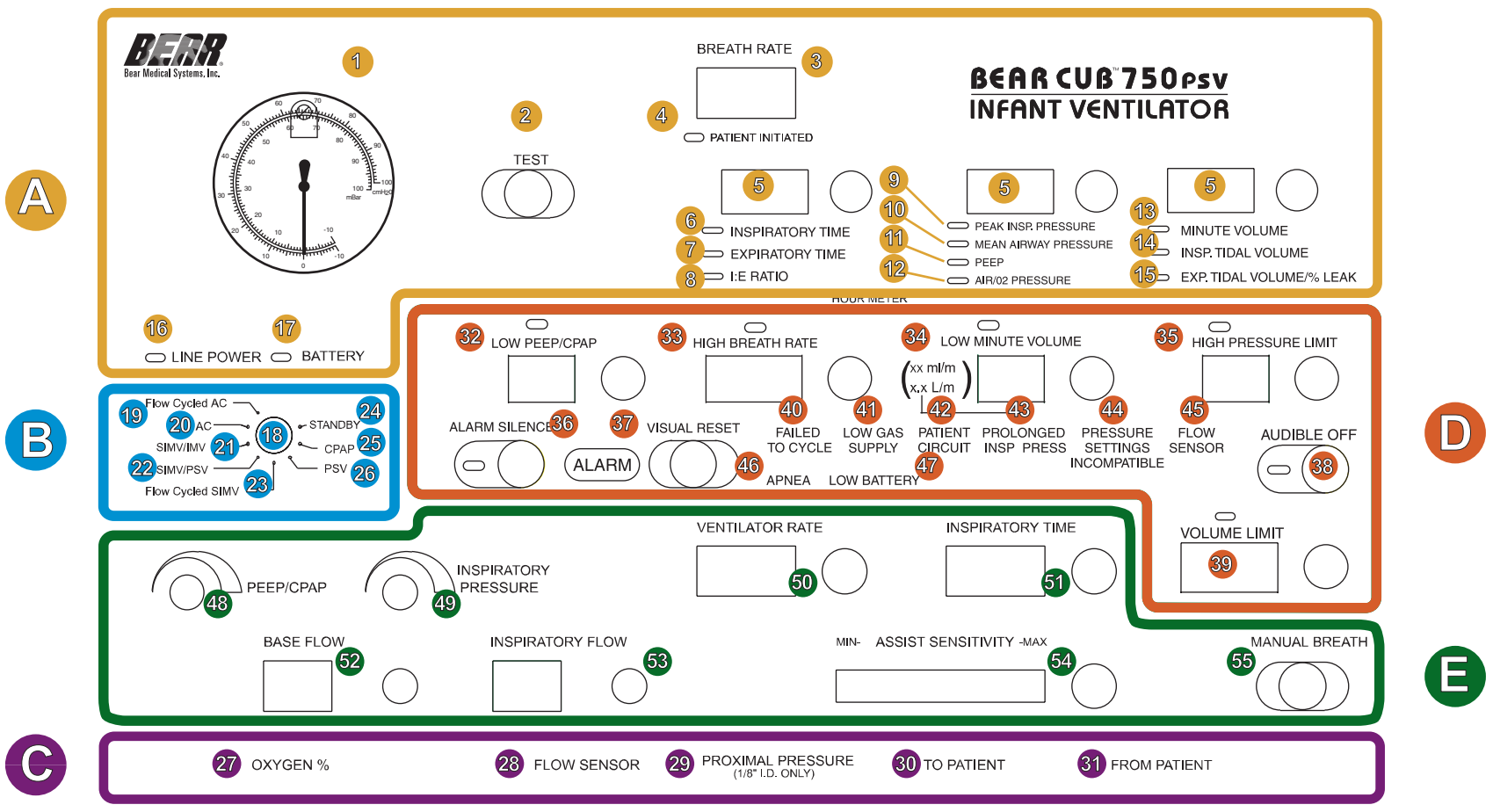


A Monitoring Section

Easy to read monitored values and indicator lights.

1. Airway Pressure Manometer
2. Self Test
3. Breath Rate
4. Patient Initiated
5. Monitor Display Windows
6. Inspiratory Time
7. Expiratory Time
8. I:E Ratio Monitoring
9. PIP Monitoring
10. MAP Monitoring
11. PEEP Monitoring
12. Air/O_2 Monitoring (toggle switch)
13. Minute Volume
14. Inspiratory Tidal Volume
15. Expiratory Tidal Volume (% leak toggle switch)
16. Line Power
17. Battery Power

B Mode Selection Section

The Mode Select knob allows mode selection with the turn of a knob.

18. Mode Selector Switch
19. Flow Cycled Assist Control
20. Assist Control
21. SIMV/IMV
22. SIMV/PSV
23. Flow Cycled SIMV
24. Standby
25. CPAP
26. Pressure Support Ventilation

C Pneumatics Module

27. Percent Oxygen Control
28. Flow Sensor Connection
29. Proximal Pressure Monitoring Port
30. Ventilator Gas Flow Outlet (to humidifier or patient)
31. Exhalation Valve (Receives exhaled gas from patient)

D Alarms & Limit Section

Both variable and preset ventilator alarms and limits with integrated displays.

Variable Set Alarms

32. Low PEEP/CPAP Alarm
33. High Breath Rate Alarm
34. Low Minute Volume Alarm
35. High Pressure Limit
36. Audible Alarm Silence
37. Visual Alarm Reset Switch
38. Audible Alarm Off
39. Volume Limit

Preset Alarms

40. Failed to Cycle
41. Low Gas Supply
42. Patient Circuit
43. Prolonged Inspiratory Pressure
44. Pressure Settings Incompatible
45. Flow Sensor
46. Apnea
47. Low Battery

E Controls Section

Variable ventilator controls with integrated digital displays to set breath characteristics.

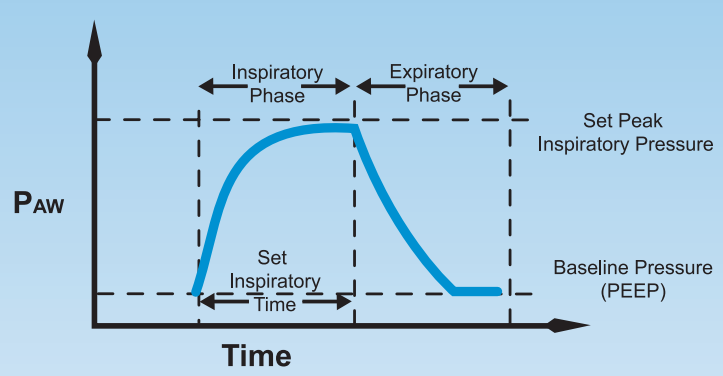
48. PEEP/CPAP
49. Inspiratory Pressure
50. Ventilator Rate
51. Inspiratory Time
52. Base Flow
53. Inspiratory Flow
54. Assist Sensitivity
55. Manual Breath

Bear Cub® 750PSV

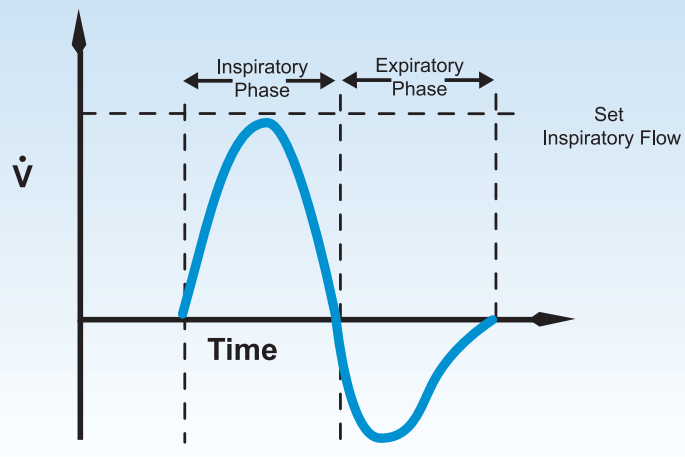
TIME CYCLED PRESSURE LIMITED (TCPL) 18

Machine or assist breaths which utilize a set inspiratory flow to reach a preset inspiratory pressure. Flow then decelerates and pressure is held for the set inspiratory time.

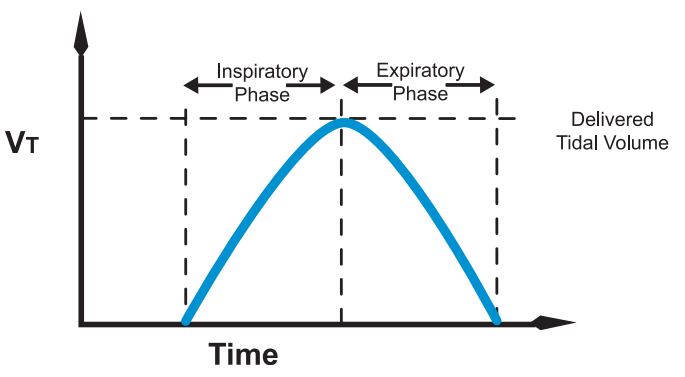
Pressure rises until target pressure is reached and is maintained for the set inspiratory time. At end inspiration, breath cycles to exhalation and returns to baseline.



Set inspiratory flow is delivered then decelerates as pressure equilibrates in the lungs.



As flow is delivered, lung volume increases. The breath cycles to exhalation at the end of inspiratory time period.

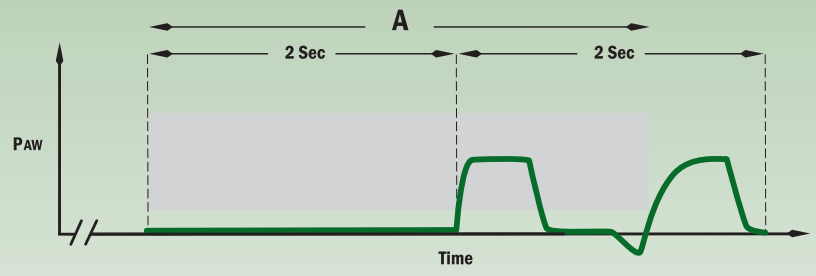


SIMV MODE 21 22 23

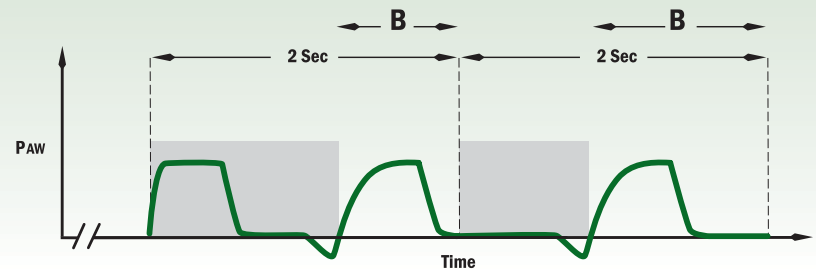
SIMV ensures that spontaneously breathing patients receive a minmum number of machine breaths and allows for unassisted spontaneous breaths between these machine breaths. Blended gas for spontaneous breaths is supplied by the base flow. (Up to 30 L/min of flow)

If the patient has a period of apnea, a mandatory breath will be delivered at the beginning of the next breath time interval. Mandatory breaths will continue according to the set ventilator rate until the next inspiratory effort from the patient is sensed.

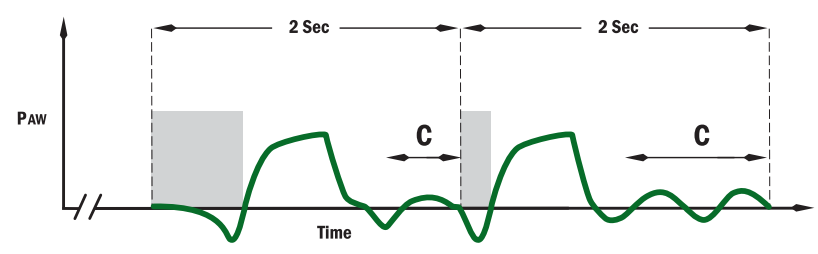
The concept of an "assist window" is very useful when describing the fundamentals of SIMV operation.



A When a machine breath is due, the assist window opens and waits for the patient's inspiratory effort. If the ventilator does not detect an inspiratory effort a mandatory breath will be delivered at the beginning of the next breath time period.



B Upon sensing the patient's inpiratory effort, a TCPL breath based on the preset inspiratory Pressure at the preset Inspiratory Time is delivered. As soon as this breath has been triggered, the assist window closes.

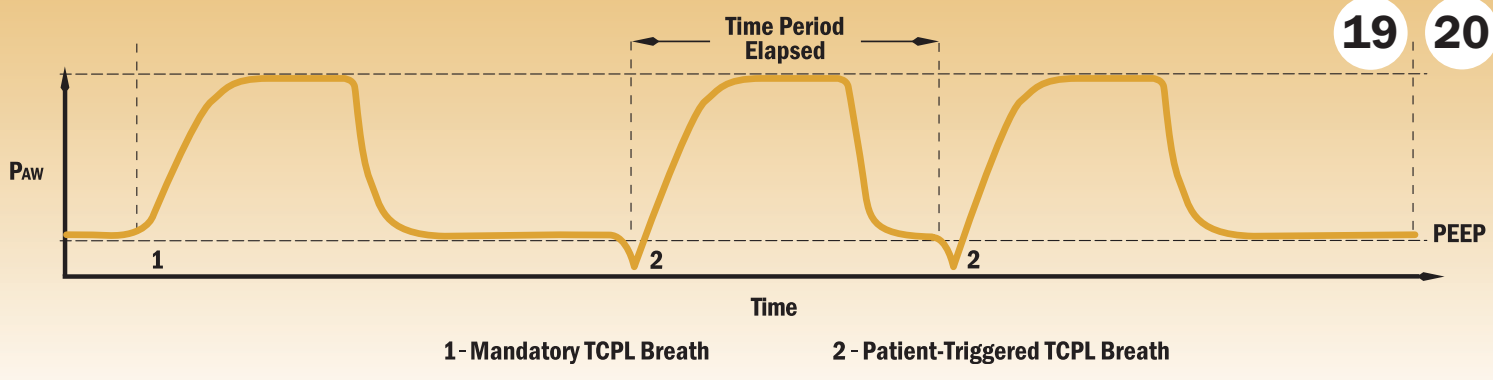


C Once the TCPL breath has been delivered, subsequent patient effort results in spontaneous breaths until the next mandatory breath is due.

ASSIST CONTROL MODE 19 20

A time cycled pressure limited (TCPL) breath is delivered when a breath time period elapses, as determined by the ventilator rate control setting, or when the patient activates the assist trigger.

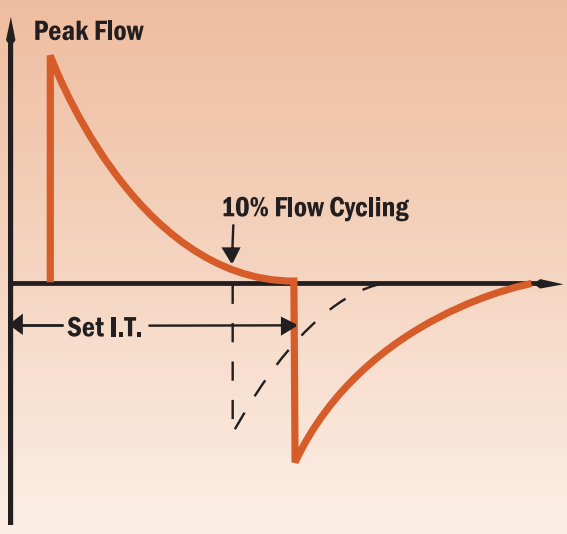
Provided the set assist sensitivity threshold is met, the patient may trigger every breath if their ventilatory demand exceeds the set ventilator rate. The result is a synchronization of mechanical breaths with patient demand. If the patient does not trigger a breath before the breath time period elapses, the ventilator will deliver a mandatory TCPL breath according to the clinician-selected inspiratory pressure, ventilator rate, inspiratory flow and inpiratory time. All spontaneous inspiratory efforts recognized by the ventilator will be fully supported according to these preset ventilator settings.

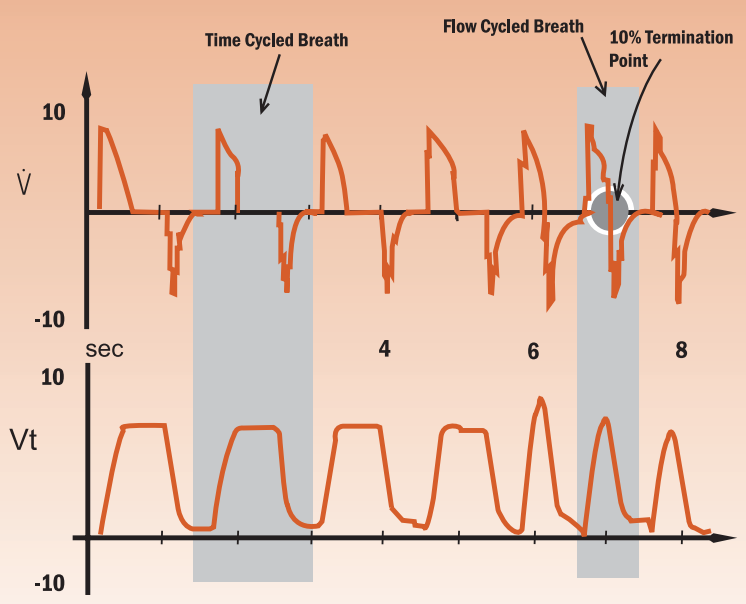


1 - Mandatory TCPL Breath 2 - Patient-Triggered TCPL Breath

FLOW CYCLE

Flow Cycle ventilation provides for breath synchrony by allowing the infant to terminate the breath based on flow at the proximal airway.





In any of the flow cycled modes a mandatory or patient initiated breath may be terminated by flow when the flow decrease to 10% of the peak inspiratory flow. The termination criterion is fixed at 10%.

The advantages of flow cycling are improved synchrony, inspiratory times that do not exceed what is necessary for complete lung inflation and lower risk of air trapping, especially at high respiratory rates.

FLOW CYCLED ASSIST CONTROL MODE 19

A pressure limited breath is delivered to the patient at the preset inspiratory pressure and is flow cycled when the inspiratory flow falls to 10% of the peak inspiratory flow rate.

If the preset Inspiratory Time is reached before inspiratory flow falls to 10% the breath will be time cycled. The breath will be volume cycled if the set Volume Limit is reached first. The Inspiratory Time Display will flash if the breath is terminated based on time rather than flow.

FLOW CYCLED SIMV MODE 20

In Flow Cycled SIMV, all mandatory pressure limited breaths are delivered to the patient at the preset Inspiratory Pressure and are flow cycled when the inspiratory flow falls to 10% of the peak inspiratory flow rate.

If the preset Inspiratory Time is reached before inspiratory flow falls to 10% the breath will be time cycled. The breath will be volume cycled if the set Volume Limit is reached first. The Inspiratory Time Display will flash breath is terminated based on time rather than flow.

SIMV/PSV

SIMV/PSV allows for a combination of mechanical and spontaneous breath types. Mechanical breaths are delivered at the set ventilator rate while all other breaths are spontaneous.

Mechanical breaths will be time cycled at the preset Inspiratory Time or volume cycled when the Volume Limit is reached, whichever occurs first.

All spontaneous breaths will be supported by the ventilator to the preset Inspiratory Pressure and flow cycled when the inspiratory flow falls to 10% of the peak Inspiratory flow rate. These breaths may also be time cycled at the preset Inspiratory Time or volume cycle when the Volume Limit is reached, whichever occurs first. The Inspiratory Time Display will flash if the breath is terminated based on time rather than flow.

PSV

When PSV is selected all spontaneous breaths will be supported to the preset Inspiratory Pressure and flow cycled when the inspiratory flow falls to 10% of the peak inspiratory flow rate. These breaths can also be time cycled at the preset Inspiratory Time, or volume cycled when the Volume Limit is reached, whichever occurs first. The Inspiratory Time Display will flash if the breath is terminated based on time rather than flow. There is no mandatory breath rate in this mode.

VOLUME LIMIT

Volume Limit is a feature that limits the maximum tidal volume of all breaths delivered by the ventilator. It can be enabled in all modes including CPAP and PSV providing an added measure of patient safety. The range is 5 to 300 ml.

The Volume Limit LED will display dashes if the flow sensor is absent or disabled. Silent and Audible modes are available.

Silent Mode

In this mode, all breaths will be limited to the set maximum tidal volume. A visual indicator will show when breaths have been limited.

Audible Mode

In this mode, an audible tone will be delivered after 5 consecutive volume limited breaths. For each subsequent volume limited breath, an audible tone will be delivered.

ASSIST SENSITIVITY

The Assist Sensitivity control determines the amount of inspiratory effort the patient must exert to trigger an Assist/Control breath, SIMV breath or to have spontaneous breaths counted and displayed in the breath rate window. The Assist Sensitivity feature has an adjustable range of 0.2 lpm to 5.0 L/min.

To correctly set the Assist Sensitivity and determine if a leak is present, turn the sensitivity knob to the right and note if a Leak Detection LED bar is present to the left of the Assist Sensitivity LED.

If no Leak Detection LED bar is detected the Assist Sensitivity LED should be positioned at the minimum setting. If a Leak Detection LED bar is present, showing the presence of a leak, set the Assist Sensitivity LED to the right of this bar. Optimizing the sensitivity while compensating for leaks may prevent auto cycling.

CPAP

While in CPAP, only the base flow is active, all breaths are spontaneous and unassisted. When CPAP is being delivered through an artificial airway (flow sensor must be attached), the sensitivity must be appropriately set in order that spontaneous breaths are counted and displayed in the Breath Rate display window. Constant airway pressure is maintained throughout the breath cycle based on the set PEEP/CPAP level.

Setup:

1. **Select CPAP mode.**
2. **Set desired flow rate.**
3. **Set desired PEEP/CPAP level**
4. **Adjust the Over Pressure Relief Valve per instructions in User Manual**
5. **Set Inspiratory Pressure**
6. **Set High Pressure Limit Alarm**
7. **Set Low PEEP/CPAP Alarm**
8. **Set High Breath Rate Alarm**

Ventilator controls must be set to appropriate settings for the patient. They are active when the manual breath button is pushed, or if the apnea alarm threshold is reached.

SETTINGS INCOMPATIBLE ALARM

The Settings Incompatible Alarm will activate if a control setting or group of settings is incompatible with one another.

Inspiratory Time and Ventilator Rate

If the Inspiratory Time display and Ventilator Rate display is flashing, the set Inspiratory Time is incompatible with the Ventilator rate. In this situation the set Inspiratory Time will change in order to maintain breath delivery at the set rate.

Base Flow and Inspiratory Flow

The Base Flow and Inspiratory Flow displays will flash when the Base Flow has been set to more that 2 times the Set Inspiratory Flow. The flow control solenoid will not cycle and Base Flow will be utilized continuously.

Volume Limit flashes E. FI.

The Volume Limit LED will flash alternating with the message "E. FI" (Error Flow) if the Inspiratory Flow setting is too high for the Volume Limit Setting.

Volume Limit flashes E. PI.

The Volume Limit LED will flash alternating with the message "E. PI." (Error Pressure) if the Inspiratory Pressure is too high for the Volume Limit Setting.

Pressure Settings Incompatible

If the Inspiratory Pressure setting is less than the PEEP/CPAP setting the pressure control solenoid will not cycle. Only PEEP/CPAP will be delivered.

APNEA BACKUP

Should the patient become apneic, the ventilator will wait for one apnea delay period (as set on the back of the machine) then deliver 2 TCPL breaths at the set inspiratory time and pressure with maximum delay of 10 seconds between breaths. Both visual and audible alarms will be activated.

The apnea alarm remains active until spontaneous breathing resumes, at which time the apnea alarm resets. When this happens the audible alarm will be silenced but the visual indicator will remain lit until the visual reset button is pushed. This alerts the clinician that an apnea event has occurred.

If the ventilator recognizes a spontaneous breath before the initiation of the second mechanical breath the above alarm conditions will occur and the second breath will not be delivered.

PERFORMANCE CHARACTERISTICS AND SPECIFICATIONS

CONTROLS

Mode	Flow Cycle AC, AC, SIMV/IMV, SIMV/PSV, Flow Cycled SIMV CPAP/PSV
Rate	1 to 150 bpm
Inspiratory Time	0.1 to 3.0 sec.
PEEP	0 to 30 cmH_2O
Inspiratory Pressure	0 to 72 cmH_2O
Manual Breath	x1
Assist Sensitivity	0.02 to 5.0 L/min
Over Pressure Relief	15 to 75 cmH_2O
% O_2	21 to 100%
Apnea Alarm (selectable)	5, 10, 20 or 30 sec.

MONITORS

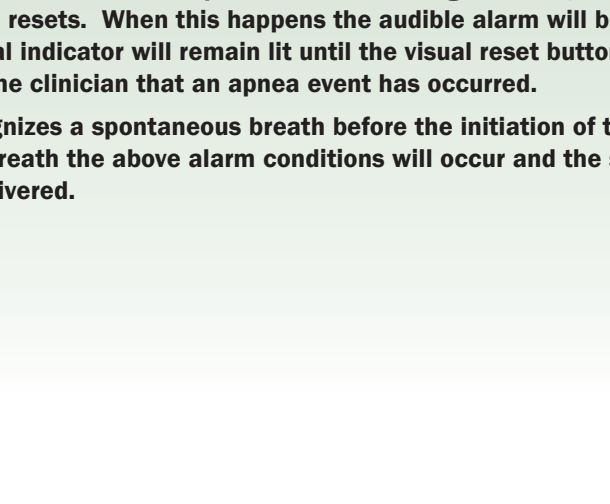
Breath Rate	0 to 255 bpm
Patient Initiated Indicator	LED
Minute Volume	0 to 30.0 L/min
Tidal Volume (Inspired and Expired)	0 to 500 ml
%Tube Leak	0 to 100%
Inspiratory Time	0.1 to 3.10 sec.
Expiratory Time	0 to 99.9 sec.
I:E Ratio	9.9.1 to 1:9.9
Peak Inspiratory Pressure	0 to 99 cmH_2O
Mean Airway Pressure	0 to 75.0 cmH_2O
PEEP	0 to 30.0 cmH_2O
Air Pressure	0 to 100 psig
O_2 Pressure	0 to 100 psig
Proximal Airway Pressure (Gauge)	-10 to 100 cmH_2O
Hourmeter	0 to 99,999 hours
Test	Push button

ALARMS/LIMITS

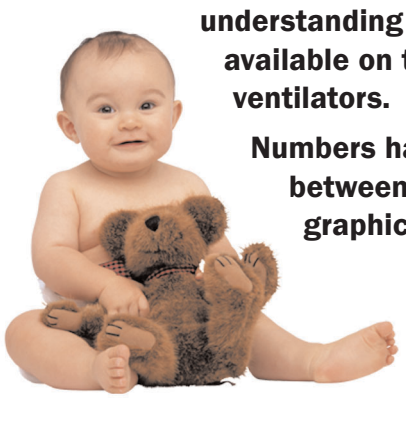
High Breath Rate	3 to 255 bpm
Low PEEP/CPAP	- 5 to 30 cmH_2O
Low Inspiratory Pressure	0.25 (High Pressure Limit - Low PEEP/CPAP) + Low PEEP/CPAP
Patient Circuit	LED On/Off
Failed to Cycle	LED On/Off
Low Gas Supply	LED On/Off
Apnea	LED On/Off
Pressure Settings Incompatible	LED On/Off
Prolonged Inspiratory Pressure	LED On/Off
Flow Sensor	LED On/Off
Low Battery	LED On/Off
Alarm Silence	60 sec.
Visual Reset	Push Button
High Pressure Limit	10 to 75 cmH_2O
Line Power	Green/Red LED

Bear Cub® 750PSV

Controls, Modes and Waveforms



This training aid has been designed to assist the clinician in the understanding and use of the features and options available on the Bear Cub® 750PSV Infant/Pediatric ventilators.



Numbers have been used for easy cross-reference between faceplate information, waveform graphics, and breath mode explanations.

CAUTION: Prior to using this training aid, read and understand the *Bear Cub750PSV Operator's Manual L1522.*

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