



LTV[®] Series Ventilators
(LTV[®] 900, 950, and 1000)
Quick Reference Guide



P/N 19819-001

ASSISTANCE

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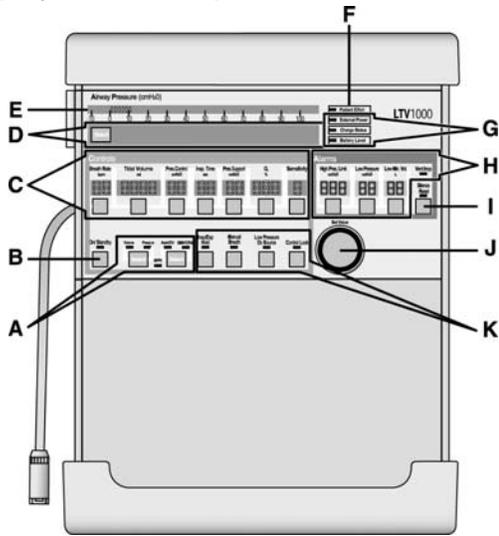
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FRONT AND SIDE PANEL REFERENCE

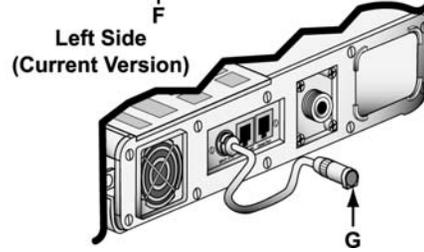
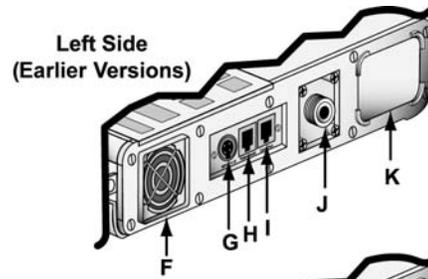
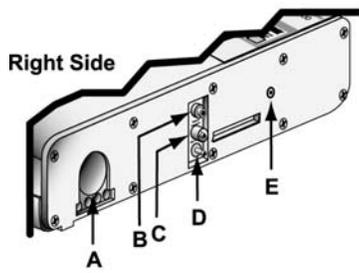
Front Panel Display and Description



- A - **Mode and Breath Selection** – Selects ventilation modes. Selects breath types.
- B - **Power** – Turns ventilator “On” or to “Standby.”
- C - **Variable Control Settings** – Sets ventilation characteristics, such as Tidal Volume and Breath Rate.
- D - **Display Window** – Displays Alarm Messages, Monitored Data, Extended Features menu.
- E - **Airway Pressure Display** – Displays real-time airway circuit pressure.
- F - **Patient Effort Indicator** – LED is lit briefly each time a patient trigger is detected.
- G - **Power Source** – Displays power source and charge levels.
- H - **Variable Alarm Settings** – Sets variable alarm levels.
- I - **Alarm Silence/Reset** – Silences audible alarms. Clears visual alarms.
- J - **Set Value Knob** – Changes variable control settings. Navigates Extended Features menu.
- K - **Special Controls** – Activates special controls such as Manual Breath, Low Pressure O₂ Source, Insp/Exp Hold or Control Lock feature.

FRONT AND SIDE PANEL REFERENCE

Side Panel Descriptions



- A - **22mm Outlet Port** – Patient Breathing Circuit outlet port.
- B - **Flow Xducer** – Flow Transducer high pressure sensing port.
- C - **Flow Xducer** – Flow Transducer low pressure sensing port.
- D - **Exh Valve** – Exhalation Valve drive line port.
- E - **Alarm Sounder Port**
- F - **Cooling Fan**
- G - **DC Input** – External DC power port (earlier version)
or DC power port pigtail connector (current version).
- H - **Patient Assist** – Patient Assist Call jack.
- I - **Comm Port** – Communications port.
- J - **O₂ Inlet** – Oxygen Inlet fitting.
- K - **Filter** – Air Inlet.

TURNING THE VENTILATOR ON AND OFF

Turning the Ventilator On

To turn the LTV[®] ventilator on:

- 1) Connect the ventilator to an external power source:
 - The AC power adapter may be used or the ventilator may be connected to an external battery.
 - **If you do not connect the ventilator to an external power source, it will operate from the internal battery.**
- 2) Press and release the **On/Standby** button. The ventilator will commence operation:
 - The **On/Standby** LED is lit and the Power On Self Tests (POST) are run. During POST;
 - The front panel displays are illuminated.
 - Verify the audible alarm is activated for 1 second (only on ventilators with a  symbol on the back panel label).
 - Verify a confirming audible chirp is activated (only on ventilators with a  symbol on the back panel label).
- 3) Once POST is successfully completed, the ventilator begins operating using the stored control settings.



Turning the Ventilator Off

To turn the LTV[®] ventilator off:

- 1) **Disconnect the patient from the ventilator.**
- 2) Press and hold the **On/Standby** button for 3 seconds. The ventilator ceases operating, the audible alarm sounds continuously and the **Vent Inop** LED is lit. 
- 3) Press the **Silence/Reset** button to silence the audible alarm.
 - Verify a confirming audible chirp is activated immediately after the alarm is silenced (only on ventilators with a  symbol on the back panel label). 
- 4) The ventilator continues to charge the internal battery as long as it is connected to an external power source.

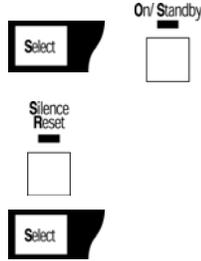
Note: The **Vent Inop** LED will remain lit for a minimum of 5 minutes and does not affect battery life.

VENTILATOR CHECKOUT TESTS

WARNING - Disconnect the patient from the ventilator prior to running the Ventilator Checkout tests and ventilate the patient using an alternative method. The ventilator does not deliver gas during the Ventilator Checkout tests.

To enable the Ventilator Checkout menu:

- 1) Begin with the ventilator in Standby mode (off) and connected to a valid AC power source.
 - Verify that the **External Power** and **Charge Status** LEDs are illuminated.
- 2) Press and hold the Monitor **Select** button. While holding the **Select** button, press the **On/Standby** button.
 - **REMOVE PTNT** alarm message is displayed and an audible alarm is sounded.
- 3) Clear the alarm by pressing the **Silence/Reset** button.
 - Audible alarm is silenced and **VENT CHECK** is displayed.
- 4) Press the **Select** button to move to the first test.
 - The first Ventilator Checkout Test, **ALARM**, is displayed.



Alarm Test

The alarm Test is used to verify that the audible alarm is working correctly.

- 1) Press the **Select** button while **ALARM** is displayed. 
- 2) Verify the audible alarm is sounded.
 - If a Patient Assist Call System or Remote Alarm is connected via the ventilator's Patient Assist Port, verify the device also activates (audible/visual), as specified by its manufacturer.
- 3) When the alarm has sounded for at least 2 seconds, press the **Select** button again. 
 - The audible alarm is silenced and the next menu item is displayed.
- 4) For ventilators with an audio sound symbol (🔊) on the back panel label, verify a confirming audible chirp occurs after the alarm is silenced.

Ventilator Checkout Tests

Display Test

The display Test is used to verify that the ventilator displays are working correctly.

To run the Display Test:

- 1) Press the **Select** button while **DISPLAY** is displayed. 
- 2) All segments of the 7-segment control displays, all dots of the dot-matrix window displays and all LEDs are illuminated.
 - The **External Power** and **Charge Status** LEDs are tested and verified when the AC adapter is connected to the ventilator (see page 7).
 - The **Vent Inop** LED is tested and verified during the Vent Inop Alarm Test (see page 12).
- 3) To end the display test, press the **Select** button again and the next menu item is displayed. 

Control Test

The Control Test is used to verify that the ventilator buttons and controls are working correctly.

To run the Control Test:

- 1) Press the **Select** button while **CONTROL** is displayed.
- 2) **SELECT** is displayed in the display windows.
- 3) To test each control, press the button. The name of the button is displayed in the display window. To test the **Set Value** knob, turn it clockwise and counterclockwise. The direction of rotation is displayed in the display window.
- 4) To exit the control test, press the **Select** button again and the next menu item is displayed.



Ventilator Checkout Tests

Leak Test

The Leak Test is used to test the patient circuit for leaks. The patient circuit should be tested with all accessories, such as humidifiers or water traps, in place.

To run the Leak Test:

- 1) Cap or otherwise occlude the patient circuit wye.
- 2) Press the **Select** button while **LEAK** is displayed. 
 - To perform the Leak Test, the ventilator closes the exhalation valve, sets the flow valve to a near-closed state, elevates the turbine motor speed and elevates the circuit pressure.
 - At the conclusion of the test, the display shows **LEAK xx.x pass** or **fail**, where **xx.x** is the measured leak.
- 3) To exit the Leak Test, press the **Select** button again and the next menu item is displayed. 

Vent Inop Alarm Test

The Vent Inop Alarm Test is used to verify that the Inop Alarm is working correctly.

To run the Vent Inop Alarm Test:

- 1) To run the Vent Inop Alarm Test, the ventilator must be on (running) for at least 60 seconds and the Ventilator Checkout menu must be enabled.
- 2) Turn the ventilator off by pressing and holding the **On/Standby** button for a minimum of 3 seconds. **DO NOT** press the **Silence/Reset** button. 
- 3) Observe the ventilator for 15 seconds.
 - Listen for the alarm tone
 - Watch the Vent Inop LED
- 4) For all ventilators, verify that both of the following conditions existed;
 - The alarm tone sounded continuously for the full 15-second duration.
 - The Vent Inop LED illuminated continuously for the full 15-second duration.
- 5) If a Patient Assist Call System or Remote Alarm is connected via the ventilator's Patient Assist Port, verify the device also activates (audible/visual), as specified by its manufacturer.
- 6) Silence the alarm by pressing the **Silence/Reset** button. 
- 7) For ventilators with an audio sound symbol (🎵) on the back panel label, verify the following condition existed;
 - A confirming audible chirp occurred after the alarm was silenced.

Ventilator Checkout Tests

When the Ventilator Checkout Tests have been completed, proceed to **Exit** for instructions to exit the vent check mode, or see below concerning the use of the Set Defaults option.

Set Defaults

The Set Defaults option is used to reset user settable Controls and Extended Features settings to their factory-set default values (see the *LTV[®] Series Ventilators Operator's Manual* for factory-set default values).

To set the default values:

- 1) Turn the **Set Values** knob until **EXIT** is displayed and press the **Select** button. 
 - **VENT CHECK** is displayed
- 2) Turn the **Set Values** knob until **VENT OP** is displayed and press the **Select** button.
- 3) Turn the **Set Values** knob until **DEFAULTS** is displayed and press the **Select** button.
 - **SET DEFAULTS** is displayed.
- 4) Press the **Select** button while **SET DEFAULTS** is displayed. 
 - Except for the Language selected and the Date/Time settings and format, all user settable Controls and Extended Features options are reset to their factory-set default values.
 - A **DEFAULTS SET** alarm will be generated the next time the ventilator is powered up in normal ventilation mode (see **Alarms, DEFAULTS SET** for additional information).

Exit

To return to any of the **VENT CHECK** tests, turn the **Set Value** knob until the desired test is displayed.

To Exit:

1) Press the **Select** button while **EXIT** is displayed, and **VENT CHECK** is displayed.



2) Turn the **Set Value** knob until **EXIT** is displayed again.

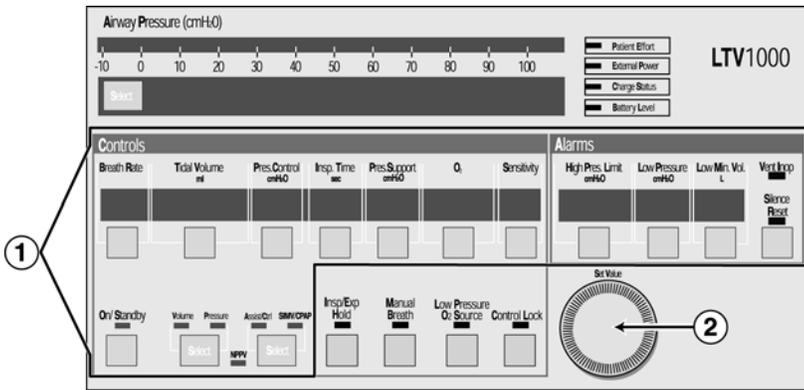


3) Press the **Select** button.



The Ventilator performs a Self Test (POST) and resumes normal operation.

VARIABLE CONTROLS



To set a variable control:

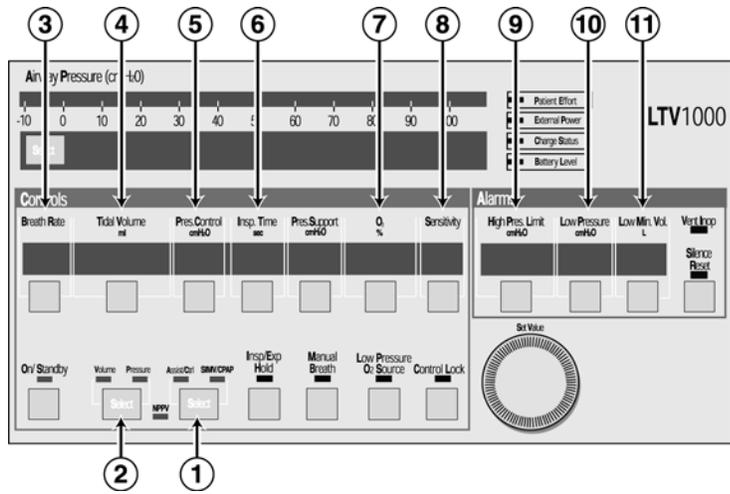
- 1) Select the control by pressing the associated button. The display for the selected control will be displayed at normal brightness and all other control displays will be dimmed.
- 2) Change the control value by rotating the **Set Value Knob**. Rotate clockwise to increase and counter-clockwise to decrease the value. The image shows a circular knob with a textured outer ring and a central dial. Above the knob is the text "Set Value". Two curved arrows at the bottom indicate clockwise and counter-clockwise rotation.
- 3) The new control value goes into effect when the operator:
 - Presses the selected button again, or
 - Selects another control, or
 - Presses the **Control Lock** button, or
 - Waits 5 seconds



All controls will then return to their normal brightness.

SETTING UP MODES OF VENTILATION

Setting Up Control Mode

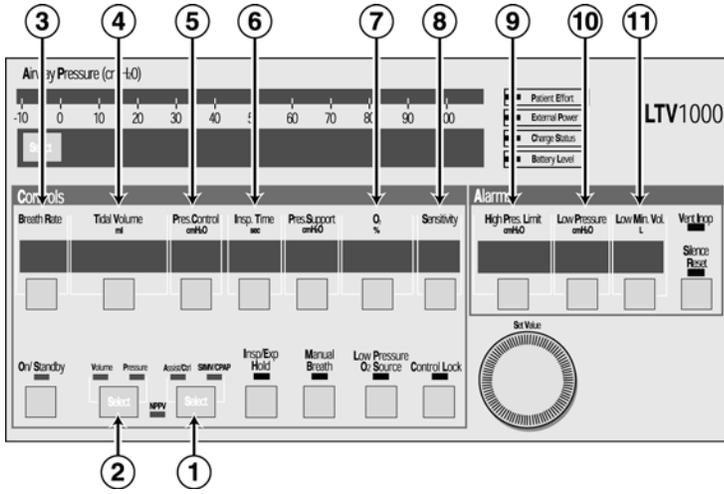


To set the ventilator up in Control mode:

- 1) Press the **Select** button twice to toggle the modes between **Assist/Control** and **SIMV/CPAP**. Select the **Assist/Control** mode.
- 2) Press the **Select** button twice to toggle between **Volume** and **Pressure** ventilation. Select **Volume** or **Pressure**, as desired. (Not available on the LTV[®] 900.)
- 3) Set the **Breath Rate**.
- 4) If **Volume** ventilation is selected, set the **Tidal Volume**. The calculated peak flow **Vcalc** is displayed in the window while **Tidal Volume** is being changed.
- 5) If **Pressure** ventilation is selected, set the **Pressure Control**. (Not available on the LTV[®] 900.)
- 6) Set the **Inspiratory Time**. The calculated peak flow **Vcalc** is displayed in the window while **Inspiratory Time** is being changed. **Vcalc** only applies to volume ventilation.
- 7) Set **O₂%** (LTV[®] 1000 only).
- 8) Set the **Sensitivity** to **Off** (dash "-").
- 9) Set the **High Pressure Limit** alarm.
- 10) Set the **Low Pressure** alarm.
- 11) Set the **Low Minute Volume** alarm.
- 12) Set the **PEEP control** on the exhalation valve.

SETTING UP MODES OF VENTILATION

Setting Up Assist/Control Mode

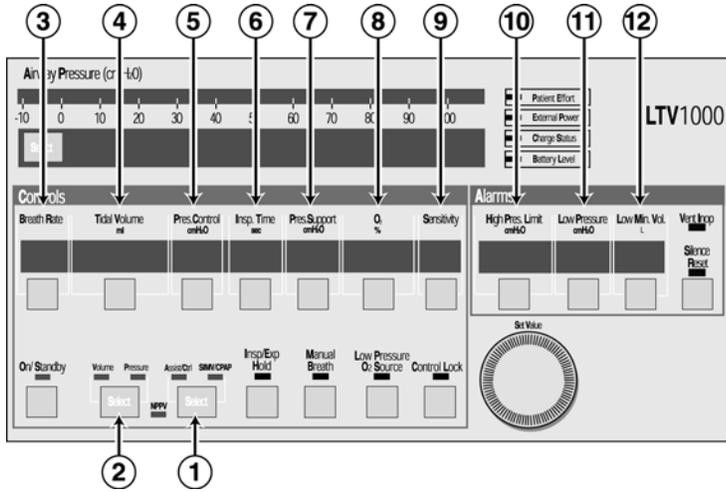


To set the ventilator up in Assist/Control mode:

- 1) Press the **Select** button twice to toggle the modes between **Assist/Control** and **SIMV/CPAP**. Select the **Assist/Control** mode.
- 2) Press the **Select** button twice to toggle between Volume and Pressure ventilation. Select **Volume** or **Pressure**, as desired. (Not available on the LTV[®] 900).
- 3) Set the Breath Rate.
- 4) If Volume ventilation is selected, set the Tidal Volume. The calculated peak flow **Vcalc** is displayed in the window while Tidal Volume is being changed.
- 5) If Pressure ventilation is selected, set the Pressure Control. (Not available on the LTV[®] 900.)
- 6) Set the Inspiratory Time. The calculated peak flow **Vcalc** is displayed in the window while Inspiratory Time is being changed. **Vcalc** only applies to volume ventilation.
- 7) Set O₂%, (LTV[®] 1000 only).
- 8) Set the Sensitivity to a setting from 1 to 9.
- 9) Set the High Pressure Limit alarm.
- 10) Set the Low Pressure alarm.
- 11) Set the Low Minute Volume alarm.
- 12) Set the PEEP control on the exhalation valve.

SETTING UP MODES OF VENTILATION

Setting Up SIMV Mode

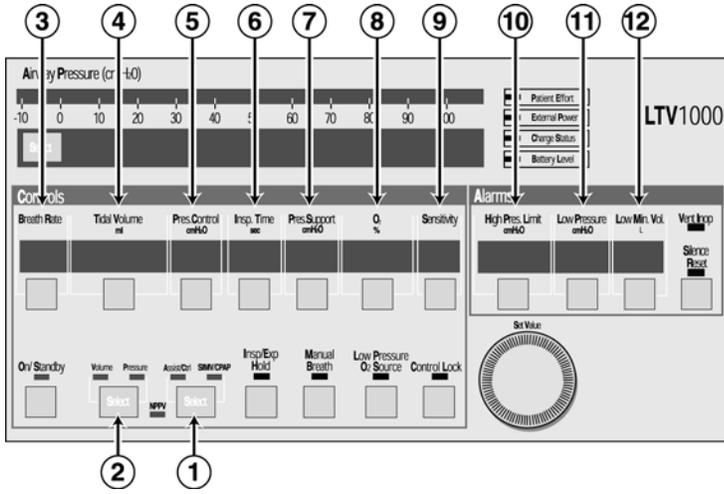


To set the Ventilator up in SIMV mode:

- 1) Press the **Select** button twice to toggle the modes between **Assist/Control** and **SIMV/CPAP**. Select the **SIMV/CPAP** mode.
- 2) Press the **Select** button to toggle between **Volume** and **Pressure** ventilation. Select **Volume** or **Pressure**, as desired. (Not available on the LTV[®] 900).
- 3) Set the **Breath Rate**.
- 4) If **Volume** ventilation is selected, set the **Tidal Volume**. The calculated peak flow **Vcalc** is displayed in the window while **Tidal Volume** is being changed.
- 5) If **Pressure** ventilation is selected, set the **Pressure Control**. (Not available on the LTV[®] 900.)
- 6) Set the **Inspiratory Time**. The calculated peak flow **Vcalc** is displayed in the window while **Inspiratory Time** is being changed. **Vcalc** only applies to volume ventilation.
- 7) Set the **Pressure Support**, if desired.
- 8) Set **O₂%** (LTV[®] 1000 only).
- 9) Set the **Sensitivity** to a setting from 1 to 9.
- 10) Set the **High Pressure Limit** alarm.
- 11) Set the **Low Pressure** alarm.
- 12) Set the **Low Minute Volume** alarm.
- 13) Set the **PEEP** control on the exhalation valve.

SETTING UP MODES OF VENTILATION

Setting Up CPAP Mode



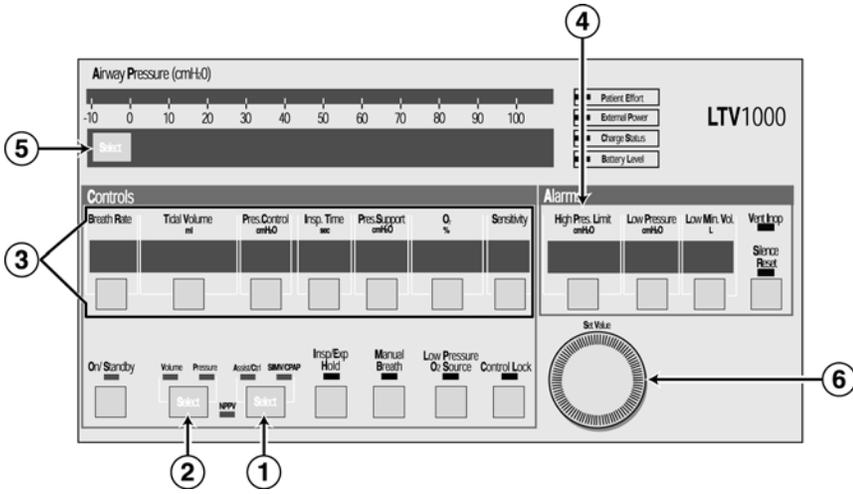
To set the ventilator up in CPAP mode:

- 1) Press the **Select** button twice to toggle the modes between **Assist/Control** and **SIMV/CPAP**. Select the **SIMV/CPAP** mode.
- 2) Press the **Select** button twice to toggle between **Volume** and **Pressure** ventilation for Apnea backup. Select **Volume** or **Pressure** for Apnea backup. (Not available on the LTV[®] 900).
- 3) Set the **Breath Rate** to **Off** (dashes "- -").
- 4) If **Volume** ventilation is selected, set the **Tidal Volume** for Apnea backup. The calculated peak flow **Vcalc** is displayed in the window while **Tidal Volume** is being changed.
- 5) If **Pressure** ventilation is selected, set the **Pressure Control** for Apnea backup. (Not available on the LTV[®] 900.)
- 6) Set the **Inspiratory Time** for Apnea backup. The calculated peak flow **Vcalc** is displayed in the window while **Inspiratory Time** is being changed. **Vcalc** only applies to volume ventilation.
- 7) Set the **Pressure Support**, if desired.
- 8) Set **O₂%** (LTV[®] 1000 only).
- 9) Set the **Sensitivity** to a setting from 1 to 9.
- 10) Set the **High Pressure Limit** alarm.
- 11) Set the **Low Pressure** alarm for Apnea backup.
- 12) Set the **Low Minute Volume** alarm.
- 13) Set the **PEEP** control on the exhalation valve.

NOTE: Although **Tidal Volume**, **Pressure Control** and **Insp Time** are dimmed, they should be set to clinically appropriate levels as the ventilator uses these settings for Apnea back-up ventilation.

SETTING UP MODES OF VENTILATION

Setting Up NPPV Mode



To set the Ventilator up in NPPV mode:

- 1) Set the ventilator controls for Control, Assist/Control, SIMV, or CPAP mode, as described in the preceding section.
- 2) Set the ventilator controls for **V**olume or **P**ressure ventilation, as described in the preceding section.
- 3) Set all other ventilation parameters, as described in the previous section.
- 4) Set the High Pressure Limit alarm.
- 5) Enter Extended Features by pressing and holding the Monitor **S**elect button for 3 seconds.
- 6) Turn the **S**et **V**alue knob until **VENT OP** is displayed.
- 7) Press the Monitor **S**elect button.
- 8) Turn the **S**et **V**alue knob until **NPPV Mode** is displayed.
- 9) Press the Monitor **S**elect button.
- 10) Turn the **S**et **V**alue knob until **NPPV On** is displayed.
- 11) Press Monitor **S**elect button.
- 12) The NPPV LED will be illuminated.
- 13) Exit the Extended Features menus by turning the **S**et **V**alue knob until **Exit** is displayed, and pressing **S**elect button until monitored data is displayed in the window.

MONITORED DATA

The monitored data displays may be automatically scrolled or manually scrolled. To cycle through the available monitored data automatically from a halted scan, press the Monitor **Select** button twice. Pressing the **Select** button once while scan is active shall halt scanning and the currently display monitor shall remain in the display window. Each time you press the button once; the next data item in the list will be displayed. To resume scan, press the scan button twice. The monitored data is displayed in the following order.

Display	Description
PIP	Displays the Peak Inspiratory Pressure measured during the inspiratory phase. PIP is not updated for spontaneous breaths.
MAP	Displays a running average of the airway pressure for the last 60 seconds.
PEEP	Displays the pressure in the airway circuit at the end of exhalation.
f	Displays the breaths per minute and includes all breath types.
Vte	Displays the exhaled tidal volume as measured at the patient wye.

Display	Description
VE	Displays the exhaled tidal volume for the last 60 seconds as calculated from the last 8 breaths.
I:E	Displays the ratio between measured inspiratory time and measured exhalation time. Both normal and inverse I:E Ratios are displayed.
Vcalc	Is based on the Tidal Volume and Inspiratory Time settings. Displayed when selected and whenever Tidal Volume or Inspiratory Time is selected for change.

EXTENDED FEATURES

Navigating the Extended Features Menus:

To enter the Extended Features menu (in normal ventilation mode), press and hold the Monitor **Select** button for three seconds.



To view the next item in a menu, turn the **Set Value** knob clockwise.



To view the previous item, turn the **Set Value** knob counterclockwise.

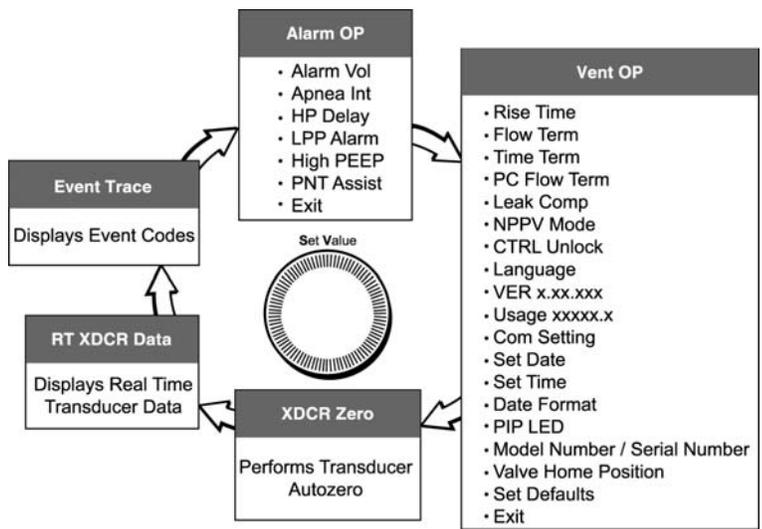


To enter a menu item or select a setting, press the **Select** button.



To exit a menu, turn the **Set Value** knob until the **EXIT** option is displayed, then press the **Select** button or press **Control Lock**.





EXTENDED FEATURES

Alarm Operations

Alarm Volume

After accessing Extended Features, **ALARM OP** is displayed. Press the **Select** button and **ALARM VOL** is displayed.

- 1) Press the **Select** button.



- 2) **VOL xx dBA** is displayed, where **xx** is the currently set volume.

- 3) Turn the **Set Value** knob until the desired setting is displayed.



- 4) Press the **Select** button.



Alarm Operations

Apnea Interval

After accessing Extended Features, **ALARM OP** is displayed. Press the **Select** button and **ALARM VOL** is displayed. Turn the **Set Value** knob until **APNEA INT** is displayed.

- 1) Press the **Select** button. 
- 2) **APNEA xx sec** is displayed, where **xx** is the currently set Apnea interval.
- 3) Turn the **Set Value** knob until the desired setting is displayed. 
- 4) Press the **Select** button. 

EXTENDED FEATURES

Alarm Operations

High Pressure Alarm Delay

This menu item is used to select immediate or delayed audible notification for High Pressure alarms.

After accessing Extended Features, **ALARM OP** is displayed. Press the **Select** button and **ALARM VOL** is displayed. Turn the **Set Value** knob until **HP DELAY** is displayed.

- 1) Press the **Select** button.



- 2) Turn the **Set Value** knob until the desired setting is displayed, **NO DELAY**, **DELAY 1 BRTH**, or **DELAY 2 BRTH**.



- 3) Press the **Select** button.



Alarm Operations

Low Peak Pressure Alarm

This item is used to select the type of breaths that the Low Pressure Alarm applies to.

After accessing Extended Features, **ALARM OP** is displayed. Press the **Select** button and **ALARM VOL** is displayed. Turn the **Set Value** knob until **LPP ALARM** is displayed.

- 1) Press the **Select** button. 
- 2) Turn the **Set Value** knob until the desired setting is displayed, **ALL BREATHS, VC/PC ONLY**.
- 3) Press the **Select** button. 



EXTENDED FEATURES

Alarm Operations

High PEEP Alarm¹

This menu item is used to set a high PEEP alarm value. When the current PEEP value exceeds the set high PEEP alarm value, an audible alarm will be sounded and a flashing **HIGH PEEP** message will be displayed.

After accessing Extended Features, **ALARM OP** is displayed. Press the **Select** button and **ALARM VOL** is displayed. Turn the **Set Value** knob until **HIGH PEEP** is displayed.

1) Press the **Select** button.



2) Turn the **Set Value** knob until the desired setting is displayed, **HI PEEP OFF** or **PEEP xx cmH₂O**.



3) Turn the **Set Value** knob until the desired setting is displayed.

4) Press the **Select** button.



¹ The HIGH PEEP alarm is only available on ventilators with software version 3.15 or higher installed.

Alarm Operations

PNT Assist²

This menu item is used to configure the patient Assist Port output signal to be generated for use with remote alarm systems.

After accessing Extended Features, **ALARM OP** is displayed. Press the **Select** button and **ALARM VOL** is displayed. Turn the **Set Value** knob until **PNT ASSIST** is displayed.

1) Press the **Select** button.



2) Turn the **Set Value** knob until the desired setting is displayed, **NORMAL** or **PULSE**.



3) Press the **Select** button.



² The PNT ASSIST option is only available on ventilators with software version 3.15 or higher installed.

EXTENDED FEATURES

Alarm Operations

Exit

To return to the top of the **ALARM OP** menu:

- 1) Turn the **Set Value** knob until **EXIT** is displayed.
- 2) Press the **Select** button while **EXIT** is displayed



Ventilator Operations

Variable Rise Time

The variable Rise Time option is used to select the rise time profile for Pressure Control and Pressure Support breaths. The rise time profiles are numbered 1 through 9, where 1 is the fastest rise time and 9 is the slowest rise time.

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button, and **RISE TIME** is displayed.

- 1) Press the **Select** button.



- 2) **PROFILE x** is displayed, where **x** is the currently set value.

- 3) Turn the **Set Value** knob until the desired Rise Time Profile is displayed.



- 4) Press the **Select** button.



EXTENDED FEATURES

Ventilator Operations

Variable Flow Termination

The Variable Flow Termination is used to select the percentage of peak flow used for cycling Pressure Support breaths. Pressure Support breaths are cycled from inspiration to exhalation when the flow reaches the set percentage of the peak flow, or when flow goes below 2 lpm.

When Pressure Control Flow Termination is enabled, the Variable Flow Termination setting is used for flow termination of Pressure Control breaths as well.

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

- 1) Turn the **Set Value** knob until **FLOW TERM** is displayed. 
- 2) Press the **Select** button. 
- 3) **% OF PEAK xx** is displayed, where **xx** is the current Flow Termination setting.
- 4) Turn the **Set Value** knob until the desired Flow Termination percentage is displayed. 
- 5) Press the **Select** button. 

Ventilator Operations

Variable Time Termination

The Variable Time Termination is used to select maximum inspiratory time for cycling Pressure Support breaths. Pressure Support breaths are cycled from inspiration to exhalation, if this time is reached before the flow reaches the set percentage of the peak flow. When a breath is cycled based on the time setting, the Pressure Support display is flashed briefly.

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

- 1) Turn the **Set Value** knob until **TIME TERM** is displayed. 
- 2) Press the **Select** button. 
- 3) **TERM x.x sec** is displayed, where **xx** is the current Time Termination setting.
- 4) Turn the **Set Value** knob until the desired Time Termination is displayed. 
- 5) Press the **Select** button. 

EXTENDED FEATURES

Ventilator Operations

Pressure Control Flow Termination

The Pressure Control Flow Termination option is used to enable or disable flow termination for Pressure Control breaths.

When this option is on, Pressure Control breaths are cycled at the set percentage of peak flow, if it is reached before the set Inspiratory Time elapses. The percentage of peak flow is set in the Variable Flow Termination option.

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

1) Turn the **Set Value** knob until **PC FLOW TERM** is displayed.

2) Press the **Select** button.



3) **PC FLOW ON** or **PC FLOW OFF** is displayed.

4) Turn the **Set Value** knob until the desired state is displayed.

5) Press the **Select** button.



Ventilator Operations

Leak Compensation

Use the Leak Compensation option to enable or disable tracking of the Baseline Flow to improve triggering when a circuit leak is present.

When Leak Compensation is on, the system is gradually adjusted to maintain set sensitivity, if the leak is stable and there is no auto cycling.

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

1) Turn the **Set Value** knob until **LEAK COMP** is displayed.

2) Press the **Select** button.



3) **LEAK COMP ON** or **LEAK COMP OFF** is displayed.

4) Turn the **Set Value** knob until the desired state is displayed.

5) Press the **Select** button.



EXTENDED FEATURES

Ventilator Operations

NPPV Mode

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

1) Turn the **Set Value** knob until the **NPPV MODE** is displayed.



2) Press the **Select** button.



3) **NPPV MODE ON** or **NPPV MODE OFF** is displayed.

4) Turn the **Set Value** knob until the desired state is displayed.



5) Press the **Select** button.



Ventilator Operations

Control Unlock

When the Easy method is selected, unlock the controls by pressing and releasing the **Control Lock** button.

When the Hard method is selected, unlock the controls by pressing and holding the **Control Lock** button for 3 seconds.

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

- 1) Turn the **Set Value** knob until **CTRL UNLOCK** is displayed.
- 2) Press the **Select** button. 
- 3) **UNLOCK EASY** or **UNLOCK HARD** is displayed.
- 4) Turn the **Set Value** knob until the desired setting is displayed.
- 5) Press the **Select** button. 



EXTENDED FEATURES

Ventilator Operations

Language Selection

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

1) Turn the **Set Value** knob until **LANGUAGE** is displayed.

2) Press the **Select** button.



3) **ENGLISH** or the currently selected language is displayed.

4) Turn the **Set Value** knob until the desired language is displayed.

5) Press the **Select** button.



Ventilator Operations

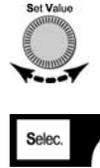
Software Versions

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button. Turn the **Set Value** knob until **VER xx.xx.xx** is displayed, where **xx.xx.xx** is the current software version.



Usage Meter

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button. Turn the **Set Value** knob until **USAGE xxxxx.x** is displayed, where **xxxxx.x** is the current number of hours the ventilator has been in operation.



EXTENDED FEATURES

Ventilator Operations

Communications Setting

The ventilator may be connected to printer, a graphics monitor, or a modem. The Communications Setting option is used to select the communications protocol for data transmission.

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

- 1) Turn the **Set Value** knob until **COM SETTING** is displayed.
- 2) Press the **Select** button. 
- 3) **MONITOR** or the currently selected protocol is displayed.
- 4) Turn the **Set Value** knob until the desired protocol is displayed.
- 5) Press the **Select** button. 



Ventilator Operations

Set Date

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

- 1) Turn the **Set Value** knob until **SET DATE** is displayed.
- 2) Press the **Select** button.
- 3) The current date is displayed in the currently selected date format.
- 4) Press the **Control Lock** button to exit, or continue to modify the Date.



To modify the Date:

- 1) Press the **Select** button, **YEAR xxxx** is displayed.
- 2) Turn the **Set Value** knob until the desired year is displayed.
- 3) Press the **Select** button, **MONTH xx** is displayed.
- 4) Turn the **Set Value** knob until the desired month is displayed.
- 5) Press the **Select** button, **DAY xx** is displayed.
- 6) Turn the **Set Value** knob until the desired day is displayed.
- 7) Press the **Select** button to accept the new date.



EXTENDED FEATURES

Ventilator Operations

Set Time

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

1) Turn the **Set Value** knob until **SET TIME** is displayed.



2) Press the **Select** button.



3) The current time is displayed.

4) Press the **Control Lock** button to exit, or



To modify the Time:

1) Press the **Select** button, **HOUR xx** is displayed.



2) Turn the **Set Value** knob until the desired hour is displayed.



3) Press the **Select** button, **MIN xx** is displayed.

4) Turn the **Set Value** knob until the desired minute is displayed.

5) Press the **Select** button to accept the new time. The seconds are automatically reset to **00**.

Ventilator Operations

Date Format

The Date Format option is used to select the display format for the current date.

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

1) Turn the **Set Value** knob until **DATE FORMAT** is displayed.



2) Press the **Select** button.



3) **MM/DD/YYYY** or the currently selected date format is displayed.

4) Turn the **Set Value** knob until the desired format is displayed.



5) Press the **Select** button.



EXTENDED FEATURES

Ventilator Operations

PIP LED

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

1) Turn the **Set Value** knob until **PIP LED** is displayed.



2) Press the **Select** button.



3) **PIP LED ON** or **PIP LED OFF** is displayed.

4) Turn the **Set Value** knob until the desired setting is displayed.



5) Press the **Select** button.



Ventilator Operations

Model Number / Serial Number

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

To view the LTV[®] model number:

Turn the **Set Value** knob until **LTV XXXX** is displayed, where **XXXX** is the model of the ventilator.



To view the LTV[®] serial number:

- 1) Press the **Select** button while **LTV XXXX** is displayed.
 - The serial number is displayed on the left side of the display area as **XXXXXX**, where **XXXXXX** is the serial number of the ventilator.
- 2) Press the **Select** button to return to the model number option.



To view LTM[™] compatibility:

- 1) Press the **Select** button while **LTV XXXX** is displayed.
 - **LTM** will be displayed if software and internal hardware in the LTV[®] Ventilator are LTM[™] compatible.
- 2) Press the **Select** button to return to the model number.



EXTENDED FEATURES

Ventilator Operations

Valve Home Position

After accessing Extended Features, **ALARM OP** is displayed. Turn the **Set Value** knob until **VENT OP** is displayed. Press the **Select** button.

To view the valve home position:

Turn the **Set Value** knob until **Vhome XXX** is displayed, where **XXX** is the home position for the flow valve installed in the ventilator.



Set Defaults

The Set Defaults option is only displayed and accessed through the **VENT CHECK** and **VENT MTNCE** menus and is used to reset user settable Controls and Extended Features settings to their factory-set default values. See *Ventilator Checkout Tests*, *Set Defaults* for instructions on how to set default values and the *LTV[®] Series Ventilators Operator's Manual* for factory-set default values.

Ventilator Operations

Exit

To return to the top of the VENT OP menu:

- 1) Turn the **Set Value** knob until **EXIT** is displayed.
- 2) Press the **Select** button.



XDCR ZERO

This item is used to view the Transducer Autozero results and schedule the Transducer Autozero to be run (see the LTV[®] Series Operator's Manual for more information).

EXTENDED FEATURES

Ventilator Operations

RT XDCR DATA

This menu displays the Real Time Transducer Data (please see the Service Manual for more information).

EVENT TRACE

This menu displays the Events Codes stored by the ventilator (see the LTV[®] Series Service Manual for more information).

Ventilator Operations

Exiting Extended Features

To return to Monitored Parameters:

- 1) Turn the **Set Value** knob until **EXIT** is displayed.
- 2) Press the **Select** button. 
- 3) Repeat Steps 1 and 2 until the Monitored Parameters are displayed.

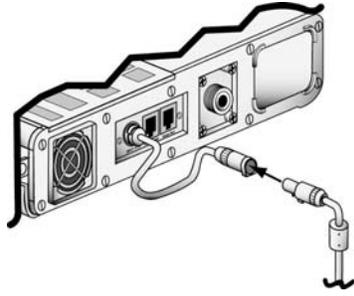


USING AC/DC POWER

Using the AC Adapter

To run the ventilator from an external AC power source.

- 1) Connect the power jack (straight or 90°) from the AC adapter to the power port (earlier version ventilators) or power port pigtail connector (current version ventilators) on the left side of the ventilator.
- 2) Connect the proper AC power cable (110 or 220 V plug) to the AC power adapter.
- 3) Connect the 110 or 220 V power cable to a suitable power source.



While the ventilator is plugged in, the internal battery is continuously charged.

CAUTION: Release Button – To avoid damaging the ventilator or the power connector, press the release button on the connector before removing it from the ventilator power port pigtail connector.

Using an External DC Power Source

To run the ventilator from an external DC power source.

- 1) Connect the power port of the external DC power adapter cable to the power port on the left side of the ventilator (earlier version ventilators), or the power port pigtail connector (current version ventilators).
- 2) Connect the DC jack to the DC power source.

POWER DISPLAYS AND INDICATORS

Indicators

Battery Level 

The Battery Level indicator shows the level of available internal battery power while running from the internal battery.

LED Color	Battery Level	Approximate Battery Time @ nominal settings
Green	Internal battery level is acceptable	45 minutes
Amber	Internal battery level is low	10 minutes
Red	Internal battery level is critically low	5 minutes
Off	Ventilator is running on AC or External Battery	

Indicators

Charge Status



When the ventilator is plugged into an External Power source, it automatically charges the internal battery.

LED Color	Charge Status
Flashing Amber	The ventilator is performing pre-charge qualification testing of the battery prior to starting the charge process. This happens when external power is first applied to the ventilator. The qualification process normally takes a few seconds but may take up to an hour on a deeply discharged battery.
Green	The internal battery is charged to full level.
Amber	The battery has not reached a full charge level and is still charging.
Red	The ventilator has detected a charge fault or internal battery fault. The internal battery cannot be charged. Contact your CareFusion Certified Service Technician.

POWER DISPLAYS AND INDICATORS

Indicators

External Power



The External Power indicator shows the level of external power while the ventilator is operating from an external power source. When the ventilator is running from the internal battery, the External Power indicator is off. When running from external power, the indicator shows the following levels.

LED Color	Power Level
Green	External Power level is acceptable
Amber	External Power level is low

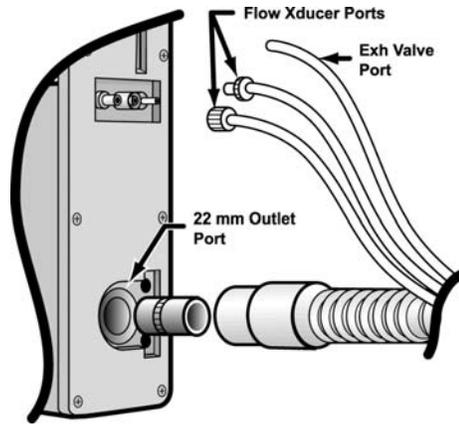
External power may be provided by connecting the ventilator to an external battery or to an external AC power source.

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ATTACHING A BREATHING CIRCUIT

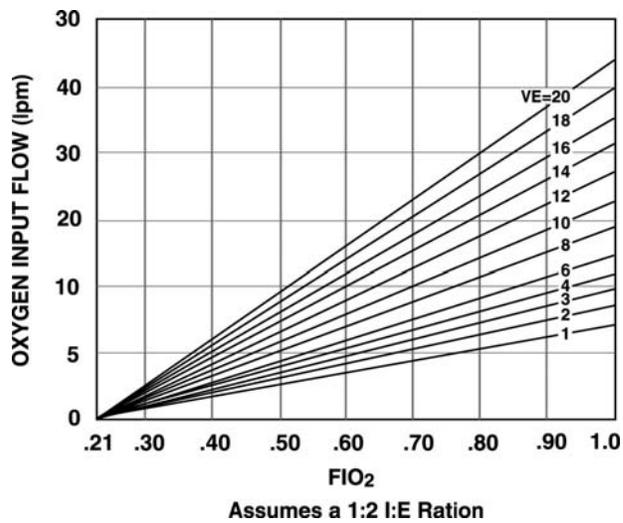
How to attach a patient breathing circuit.

- 1) Connect the main breathing tube to the 22 mm outlet port on the right side of the ventilator.
- 2) Connect the two exhalation flow transducer sense lines to the ports marked **Flow Xducer** on the right side of the ventilator. These are non-interchangeable Luer fittings.
- 3) Connect the Exhalation Valve driver line to the port marked **Exh Valve** on the right side of the ventilator.



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OXYGEN COMPUTER CHART



Oxygen Computer Chart

To determine O₂ Input Flow:

- 1) Find the desired FIO₂ on the horizontal axis.
- 2) Project up to the minute volume.
- 3) Project horizontally to the left vertical axis and read the oxygen flow.

To determine O₂ Concentration:

- 1) Find the O₂ input flow on the vertical axis.
- 2) Project horizontally right to the minute volume.
- 3) Project vertically down to the horizontal axis and read the FIO₂.

ALARMS

How to Silence and Reset Alarms

To silence an alarm, press the **Silence Reset** button.

To reset an alarm that has been corrected, press the **Silence Reset** button again.



Alarm	Cause	Solution
APNEA XX bpm	Occurs when the time since the last breath start exceeds the set Apnea Interval. When an Apnea alarm occurs, the ventilator will enter Apnea Back up ventilation mode.	Reevaluate the patient's condition. Reevaluate ventilator settings.
APNEA	An Apnea alarm has occurred and cleared. The ventilator is no longer in Apnea Back-up mode.	Reevaluate the patient's condition. Reevaluate ventilator settings.

Alarm	Cause	Solution
BAT EMPTY	Occurs when the ventilator is operating from the internal battery power and the batter charge level is critically low. This alarm can be temporarily silenced but cannot be cleared.	Attach the ventilator to external AC or DC power.
BATTERY LOW	Occurs when the ventilator is operating from internal battery power and the battery charge level is low.	Attach the ventilator to external AC or DC power. Reevaluate power requirements.
DEFAULTS	Occurs during POST when the ventilator detects an invalid setting stored in non-volatile memory.	Push the Silence/Reset button twice to reset alarm. Reevaluate ventilator settings.
DEFAULTS SET	Occurs when the ventilator is first powered up after the SET DEFAULTS option has been used to reset all controls and extended features settings to their factory-set default values.	Push the Silence/Reset button twice to reset alarm. Reevaluate ventilator settings.

Alarms

Alarm	Cause	Solution
DISC/SENSE	Occurs when the ventilator detects one of the following conditions: <ul style="list-style-type: none">• The patient circuit or proximal pressure sense line has become disconnected.• The low side exhalation flow transducer sense line has become disconnected.• The proximal pressure sense line is pinched or occluded.	Check Patient Circuit assembly for disconnects. Check pressure sensing lines for occlusions.
HIGH O₂ PRES	Occurs when the average oxygen inlet pressure exceeds the acceptable limit for the type of oxygen source.	Reduce O ₂ inlet pressure.

Alarm	Cause	Solution
HIGH PEEP³	Occurs when the ventilator detects one of the following conditions: <ul style="list-style-type: none"> • The patient circuit positive end expiratory pressure (PEEP) exceeds the High PEEP alarm setting. • Patient Circuit, Exhalation valve and/or PEEP valve occluded. 	Reevaluate ventilator settings. Disassemble, clean and reassemble the Patient Circuit, Exhalation Valve and PEEP Valve.
HIGH PRES	Occurs when the circuit pressure exceeds the set High Pressure Limit setting.	Reevaluate ventilator settings. Inspect Patient Circuit for occlusions or kinks. Reevaluate patient.
HW Fault	Occurs when the ventilator detects a problem with the ventilator hardware.	If alarm reoccurs, contact your Service Rep or CareFusion.

³ The **HIGH PEEP** alarm is only available on ventilators with software version 3.15 or higher installed.

Alarms

Alarm	Cause	Solution
INOP Vent Inop ■	A ventilator INOP occurs when: <ul style="list-style-type: none">• The ventilator is switched from On to Standby.• The ventilator detects any condition that is deemed to make the ventilator unsafe.	If an INOP alarm occurs during operation, remove ventilator from service and contact your Service Rep.
LOCKED	The LOCKED message is displayed when a button is pressed while the controls are locked. No audible alarm is given.	Press the Control Lock button. If locked alert continues, press and hold the Control Lock button for three seconds.
LOW MIN VOL	Occurs when the exhaled minute volume is less than the set Low Minute Volume.	Examine Exhalation Valve body for disconnects. Reevaluate patient.

Alarm	Cause	Solution
LOW O₂ PRES	Occurs when the average oxygen inlet pressure is less than the minimum acceptable inlet pressure of 35 PSIG.	Increase O ₂ inlet pressure. If using O ₂ cylinder, replace used cylinder with a new one.
LOW PRES	Occurs when the peak inspiratory pressure for a machine or assist breath is less than the Low Pressure setting.	Examine Patient Circuit for disconnect. Reevaluate ventilator settings. Reevaluate patient.
NO CAL DATA, NO CAL	Occurs when the ventilator detects invalid or missing calibration records on power up.	Remove ventilator from service, perform Calibration procedure.
POWER LOST	Occurs when the ventilator is operating on external power and the voltage drops below the useable level and switches to internal battery operation.	Evaluate power requirements. Attach ventilator to an external AC or DC power source.

Alarms

Alarm	Cause	Solution
POWER LOW	Occurs when the ventilator is operating on external power and the voltage drops to the low level.	Evaluate power requirements.
REMOVE PTNT	Occurs when the ventilator is powered up in the Ventilator Checkout or Ventilator Maintenance modes. The ventilator is not delivering gas.	Ensure patient is disconnected from ventilator and is being ventilated by alternative means.
RESET	A RESET alarm occurs if the ventilator restarts following a condition other than being shut down by pressing the On/Standby button.	May be caused by Internal Battery depletion during operation ⁴ or ESD. If the problem reoccurs, remove from service and contact your Service Rep or CareFusion

⁴ Only available on ventilators with software version 3.13 or higher installed.

Alarm	Cause	Solution
XDCR FAULT	Occurs when a transducer autozero test fails.	Press Silence/Reset button twice to reset alarm. If problem occurs frequently, remove from service and contact your Service Rep. or CareFusion.



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