

ReVel™ Ventilator

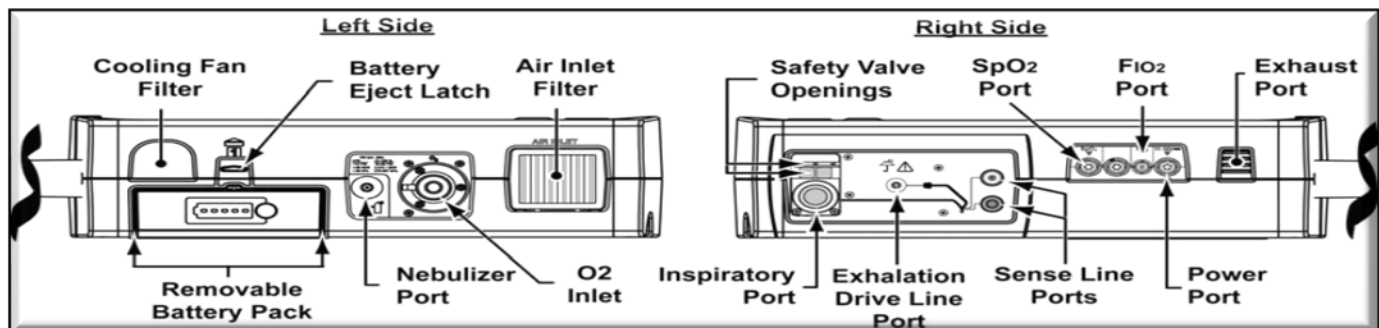
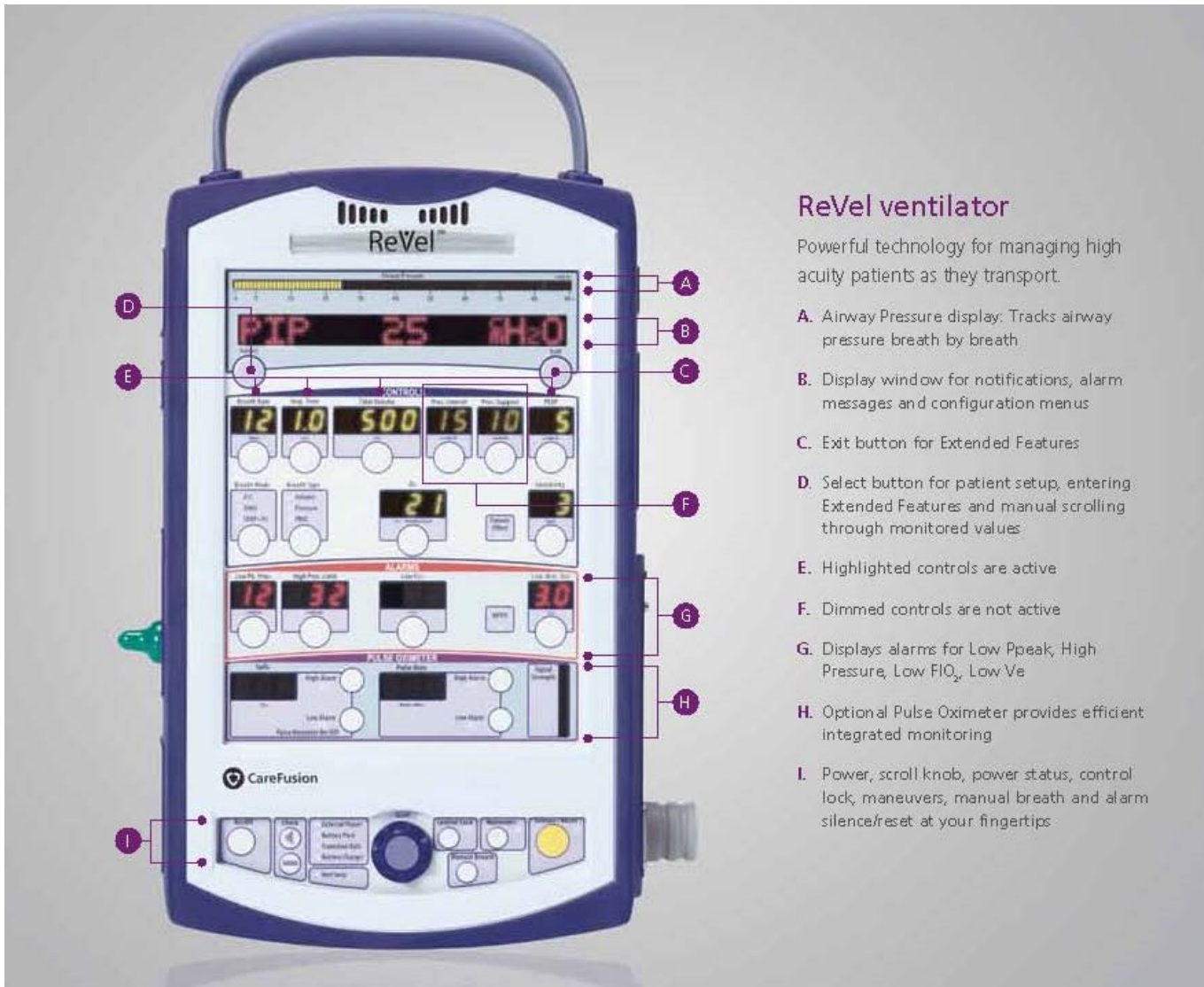
User Quick Guide



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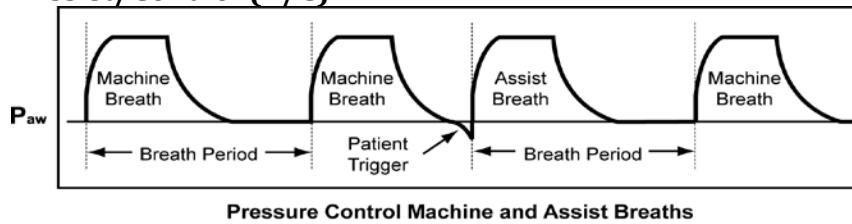
Front Panel navigation



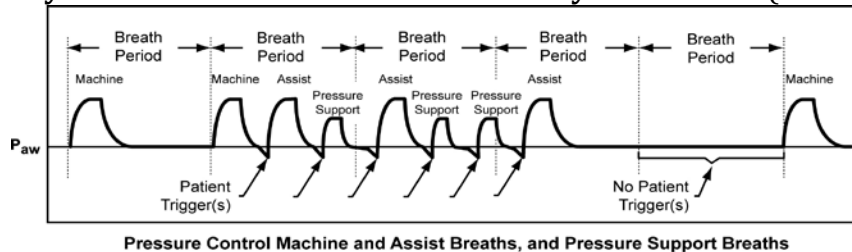
Modes of operation

The Revel™ ventilator provides the following modes of breath delivery:

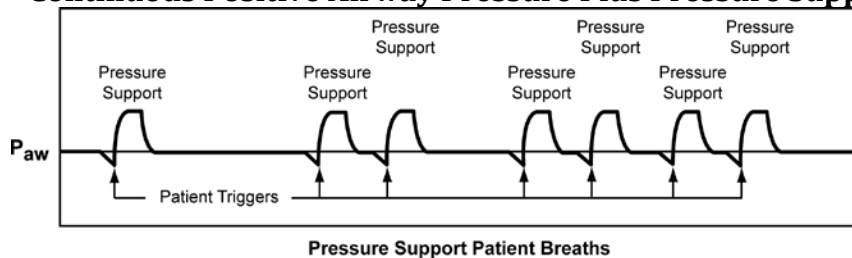
- **Assist/Control (A/C)**



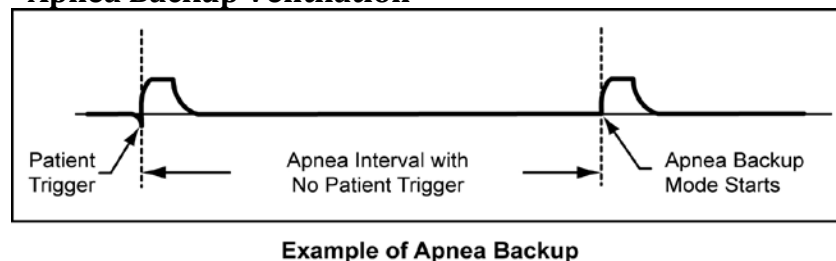
- **Synchronized Intermittent Mandatory Ventilation (SIMV)**



- **Continuous Positive Airway Pressure Plus Pressure Support (CPAP+PS)**



- **Apnea Backup Ventilation**



- **Non-Invasive Positive Pressure Ventilation (NPPV)**

- **NPPV with A/C Mode**

NPPV with A/C breath mode is delivered as a Pressure Control breath.

Any patient trigger will receive a Pressure Control breath and the breathing pattern can be terminated by PC Flow Termination.

- **NPPV with CPAP+PS Mode**

NPPV with CPAP+PS breath mode consists of CPAP breathing at the user preset baseline pressure with the option of using Pressure Support as an adjunctive adjustable pressure. The breath will be terminated by PC Flow Termination.

Breath Types

Breaths are defined by how they are initiated (triggered), limited and cycled.

Volume Control

- A set Tidal Volume is delivered over a set Inspiratory Time.
- Flow is delivered in a decelerating waveform.
- Peak flow is calculated based on the **Tidal Volume** and Inspiratory Time (**Insp. Time**)
- Volume Control breath is cycled by time

Pressure Control

- Flow is delivered according to the **Rise Time** setting to elevate the circuit pressure to the Pressure Control (**Pres. Control**) setting (above set **PEEP**)
- Maintains pressure for the set Inspiratory Time (**Insp. Time**)
- A Pressure Control breath can be either flow or time cycled.
- Adjusting the **Rise Time** setting changes the flow and pressure waveforms for Pressure Control breaths

Pressure Regulated Volume Control (PRVC)

- The ventilator delivers pressure breaths at a target pressure which is calculated before each breath.
- The target pressure is the pressure needed to deliver a Tidal Volume equal to the **Tidal Volume** setting.
- The target pressure for the current breath is calculated based on the target pressure and the delivered Tidal Volume of the previous breath (measured at the ventilator) as follows.
- The Target Pressure is at least 5 cmH₂O below the High Airway Pressure alarm (**High Pres**) setting
- Flow is delivered according to the set Inspiratory Rise Time (**Rise Time**)
- Breaths are terminated based on the set Inspiratory Time (**Insp. Time**), or the set Flow Termination (**Flow Term**) level, whichever comes first.

Pressure Support

- Flow is delivered according to the set Rise Time to elevate the circuit pressure to the Pressure Support setting
- Maintains pressure until the flow drops below a pre-set percentage of Peak Flow for that breath, or below 2 lpm
- Pressure Support breaths may also be cycled by the set Time Termination (**Time Term**)

Volume Targeted Pressure Support

Volume Targeted Pressure Support breaths are calculated and delivered the same as PRVC breaths with the following exceptions:

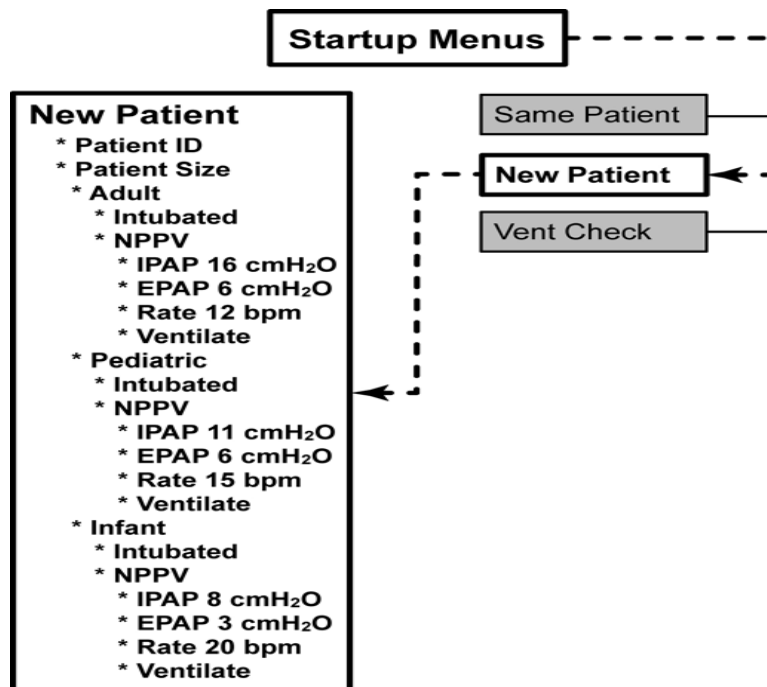
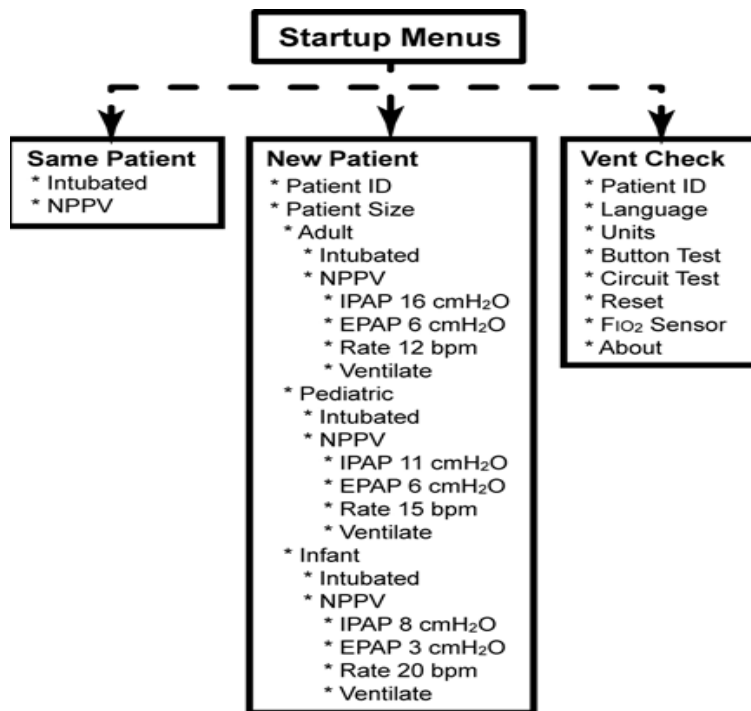
- The breath is terminated when the breath inspiration time exceeds the set inspiration time.
- The breath may also be cycled when the flow drops below the set Flow Termination or 2 lpm, whichever comes first
- The Pressure Support control is inactive when Breath Mode CPAP+PS and Breath Type PRVC are selected

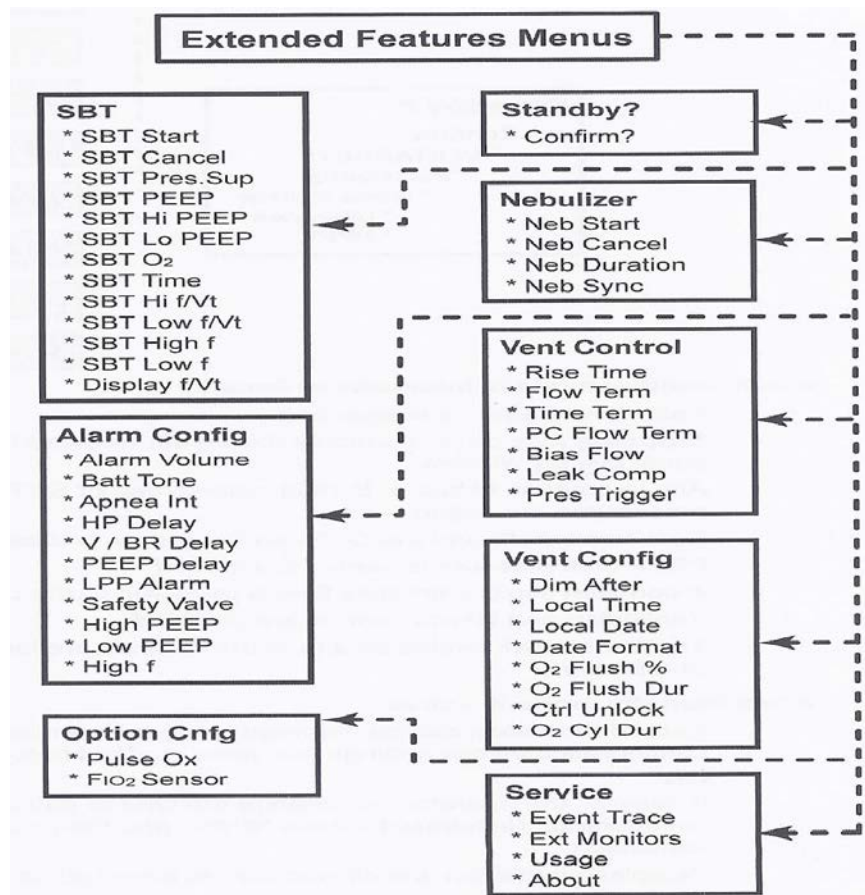
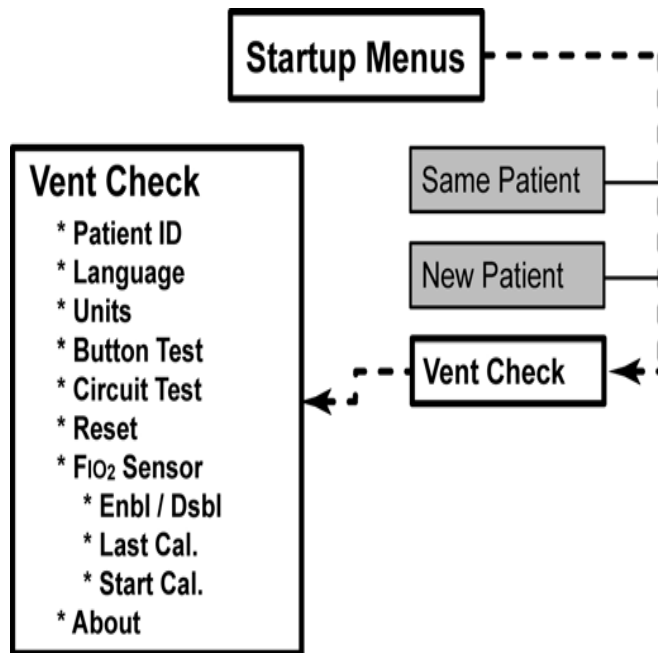
Spontaneous

- Spontaneous breaths are a subset of Pressure Support breaths
- The circuit pressure is elevated to PEEP+1 cmH₂O during inspiration.
- This is achieved when the Pressure Support control (**Pres. Support**) setting is either **1** or “-” (off)

Navigating the menus

Start up

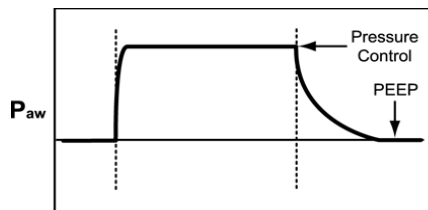




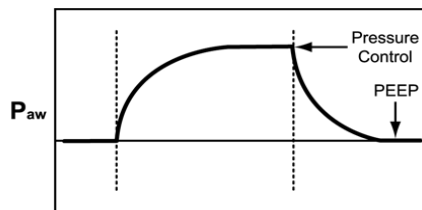
Extended Features

Rise time

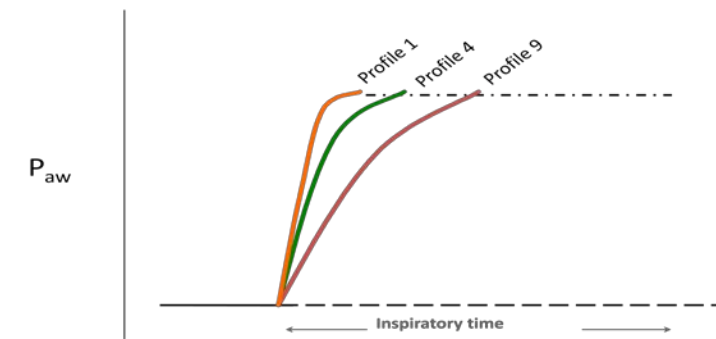
- The rise time profiles are numbered 1 through 9, where 1 is the fastest rise time and 9 is the slowest rise time.
- Starting with the fastest rise time (**Profile 1**), each increment in rise time is approximately 33% longer than the previous one.
- The rise time setting takes effect on the next Pressure Control or Pressure Support breath.



Profile #1 - Faster Rise Time



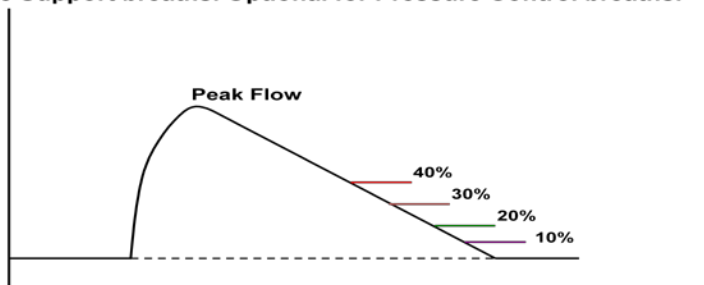
Profile #9 - Slower Rise Time



Variable Flow termination

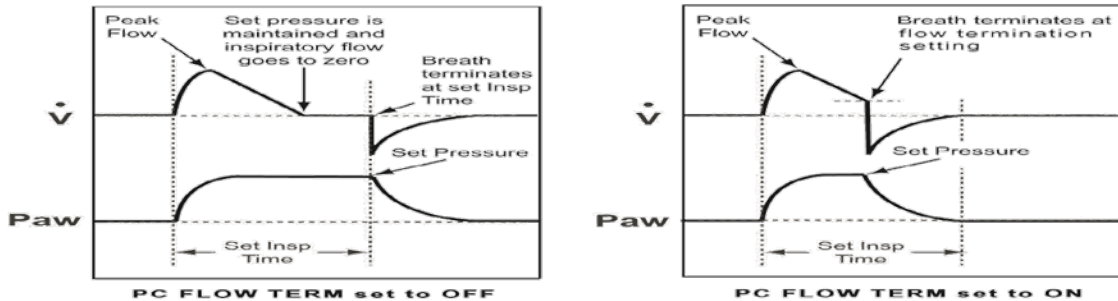
- Used to select the percentage of peak flow for terminating **Pressure Support breaths**
- Can be set from 10% - 40%
- When Pressure Control Flow Termination is enabled, the Variable Flow Termination setting is used for termination of Pressure Control breaths
- Range: 10% - 40%

Pressure Support breaths. Optional for Pressure Control breaths.



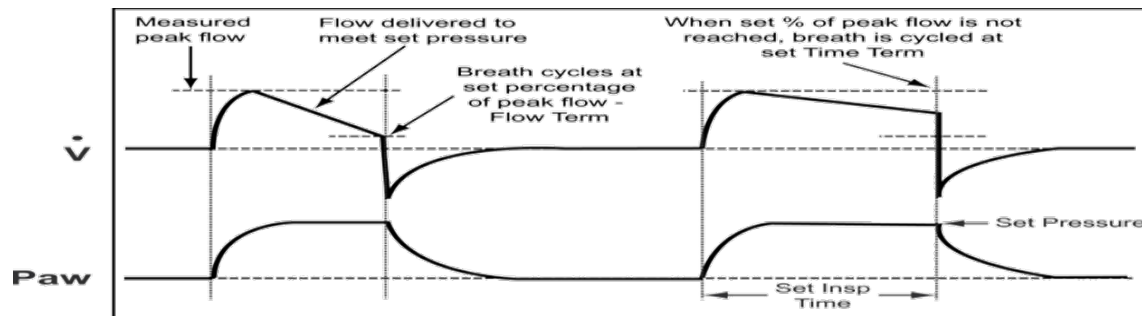
Pressure Control Flow Termination

- Setting is either ON or OFF
- Enables or disables flow termination for Pressure Control breaths
- If PC breaths are flow terminated, the PC display will flash
- Pressure Control breath terminates at the **same percentage** of peak flow as the Pressure Support breaths.



Variable Time Termination

- Used to select the maximum inspiratory time allowed for Pressure Support breaths
- When a PS breath is time terminated, the PS display will flash
- Range: 0.3 – 3.



Bias Flow

- The **Bias Flow** menu is used to provide a continuous flow through the patient circuit during the exhalation phase of breaths.
- Bias Flow reduces the work of breathing by providing a flow source for flow triggering.
- Bias Flow not consumed by the patient exits the patient circuit through the exhalation valve.
- **Range: Flow 3 through Flow 10 lpm** in increments of 1

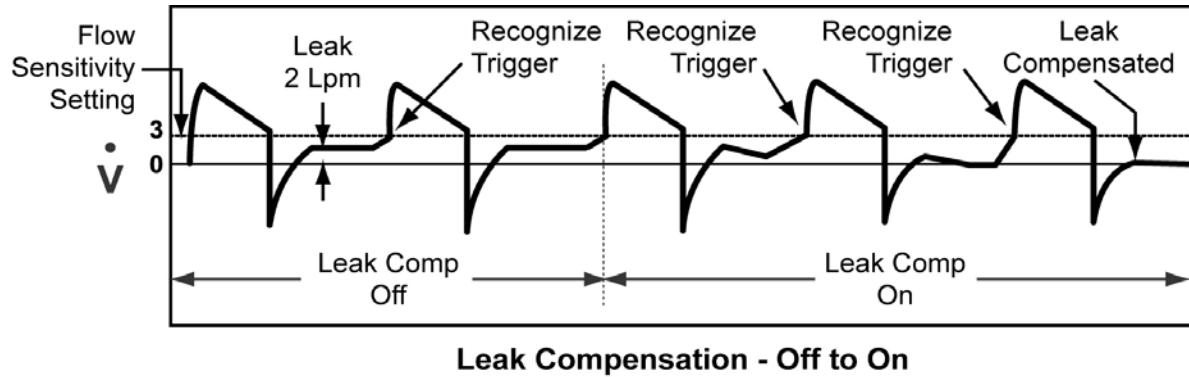
NOTE

When Leak Compensation (**Leak Comp**) is enabled (**L. Comp On**), the Bias Flow is automatically increased by the amount of the measured leak

The Air/O₂ mix of the Bias flow is dependent on the set O₂ control value and therefore affects oxygen consumption.

Leak Compensation

The **Leak Comp** (Leak Compensation) menu is used to enable or disable tracking steady state exhaled flow to improve monitored patient flow accuracy in the presence of a stable circuit leak.



When set to **L. Comp On**, the following measurements are compensated:

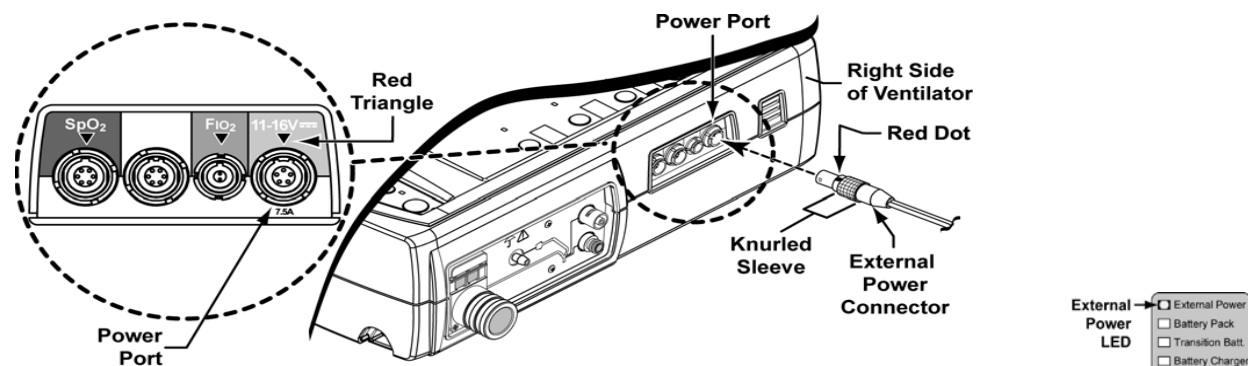
- Flow Triggering
- Exhaled Tidal Volume Monitor (**Vte**)
- Spontaneous Exhaled Tidal Volume Monitor (**SpVte**)
- Inspiratory Tidal Volume Monitor (**Vti**)
- Delivered Bias Flow (leaks up to 30 lpm)

If auto-cycling occurs, it may be helped by the following procedure:

- 1) Set flow **Sensitivity** to a value higher than the leak amount (see *Sensitivity* in Chapter 5 - Controls).
- 2) Set **Leak Comp** to **L. Comp On**.
- 3) Wait for a period of 10 through 15 breaths.
- 4) Reset flow **Sensitivity** to desired level.

Operational Set up

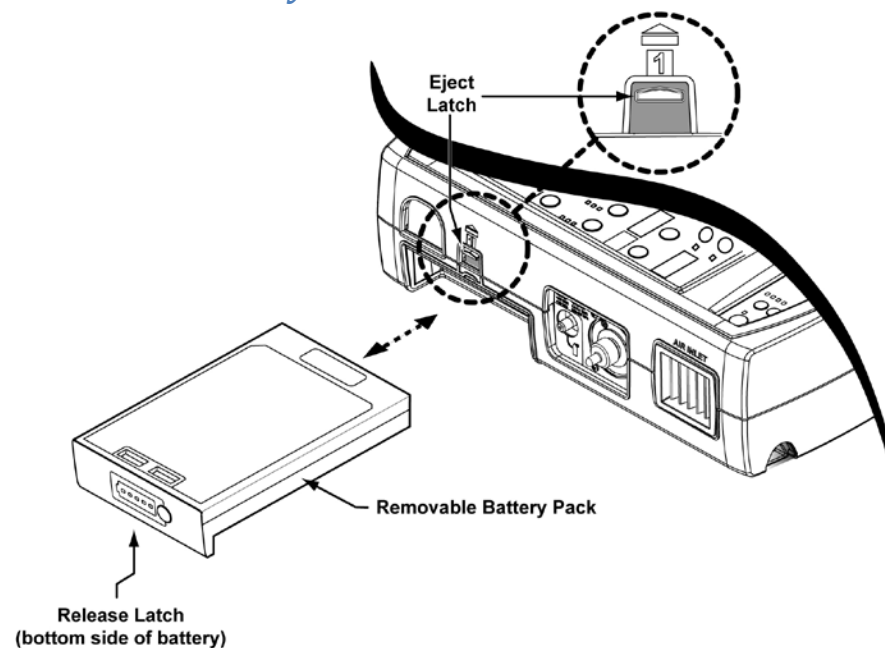
Power connection



The Revel™ ventilator operates on Direct Current (DC) (11 to 16 VDC), which can be supplied by any one of the following sources of power:

- AC Adapter
- Automobile Adapter
- Docking Station
- Removable Battery Pack - Verify the **External Power** LED on the lower interface panel illuminates green. If not, recheck the power supply.

Removable Battery Pack Installation

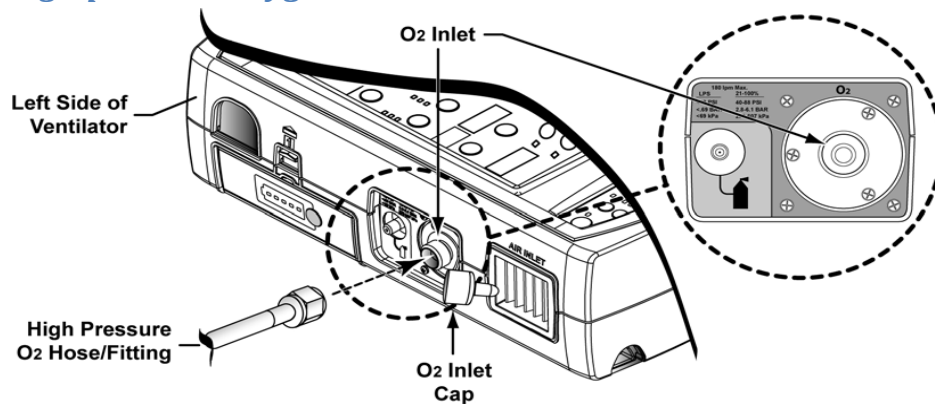


For safety there are two latch mechanisms securing the Removable Battery Pack. The first is above the battery (see illustration). The second is on the underside of the battery at the leading edge. Both will engage when installing the battery and must be sequentially released to safely remove the battery.

To remove the battery, pull the Eject Latch up. The battery will partially eject. Push the Release button located on the bottom of Removable Battery Pack and pull the battery out of

the battery slot

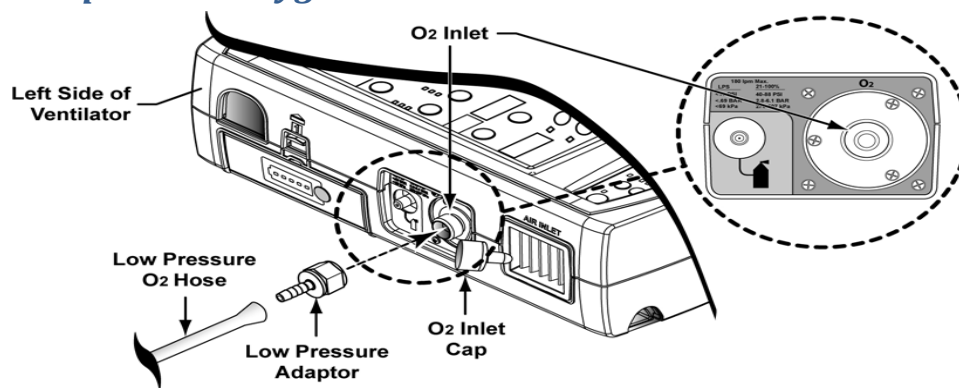
High pressure oxygen source



For operation from a high pressure oxygen source, connect a compatible oxygen hose/fitting to the DISS O₂ inlet port on the left side of the ventilator.

- The O₂ inlet port is labeled **O₂**

Low pressure oxygen source LPS



For operation from a low pressure (less than 10 PSIG, .69 BAR or 69 kPa) oxygen source such as a flow meter:

- Attach a DISS4 Low Pressure Adapter⁵ to the DISS O₂ Inlet port on the left side of the ventilator.
- The O₂ Inlet port is labeled **O₂**
 - Attach the oxygen supply hose to the hose barb on the adapter.
 - Set the **O₂** control on the front panel to **LPS** (Low Pressure Source)
 - Adjust the flow of the low pressure O₂ source as appropriate for the patient

When the O₂% control is set to LPS, the following conditions are applicable:

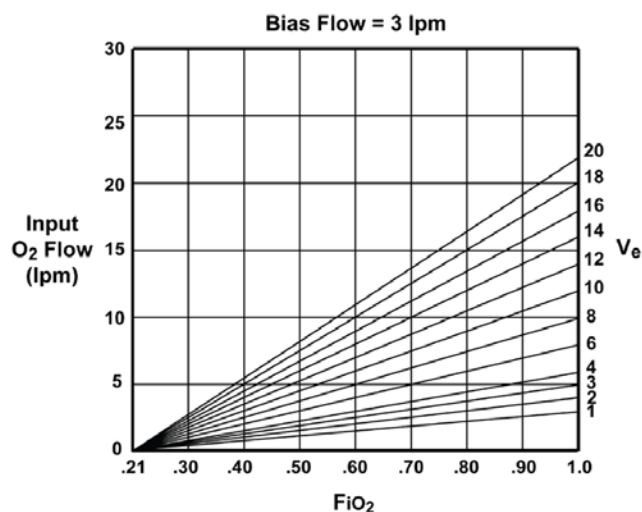
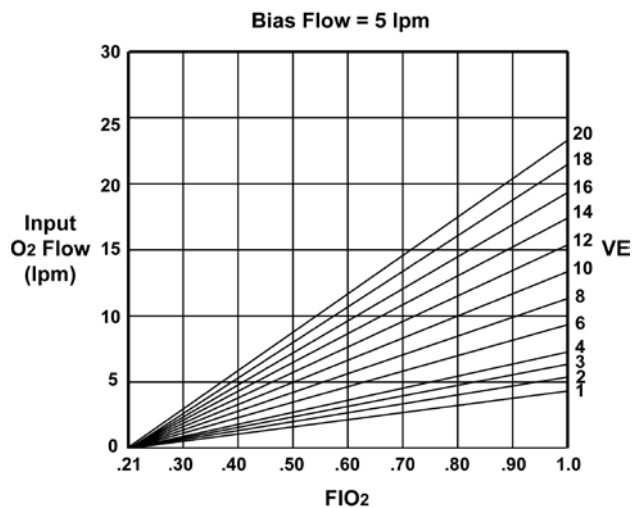
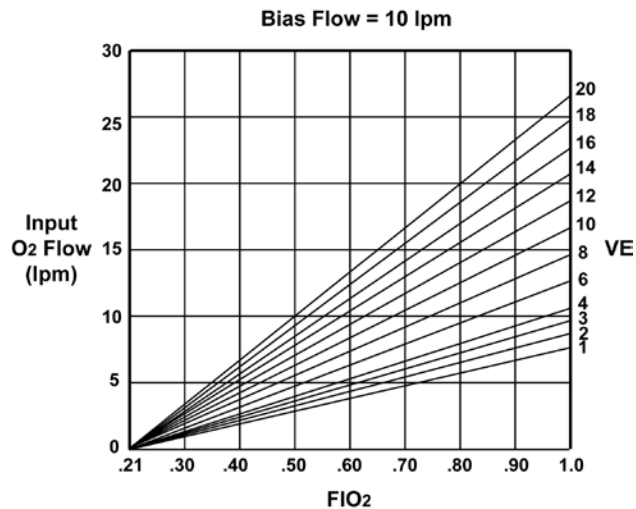
- The O₂ inlet flow must be set to obtain the desired oxygen percentage
 - The Low O₂ Inlet Pressure (**Low O₂ Pres**) alarm is inactive
 - The High O₂ Inlet Pressure (**Hi O₂ Pres**) alarm activates at 10 PSI (69 BAR, 69 kPa)
- When the **O₂%** control is set greater than 21% (**22 - 100%**), the following conditions are applicable:
- The Low O₂ Inlet Pressure (Low O₂ Pres) alarm activates at 39 PSI (2.69 BAR, 269 kPa)

WARNING

Inspired Oxygen (FIO₂) Concentration - Minute Volume fluctuates if a patient has a variable respiratory rate. If *exact concentrations* of inspired oxygen (FIO₂) must be delivered to the patient, it is recommended that the optional FIO₂ Sensor or a separate oxygen analyzer with alarms be used. If using the optional FIO₂ Sensor set the ventilator Low FIO₂ alarm appropriately (see *Low FIO₂ alarm* in Chapter 8 –Ventilator Alarms for additional information).

Determine the Required O₂ Input Flow:

Select the appropriate chart based on the **Bias Flow** setting.



Identify the desired FIO₂ (bottom of chart).

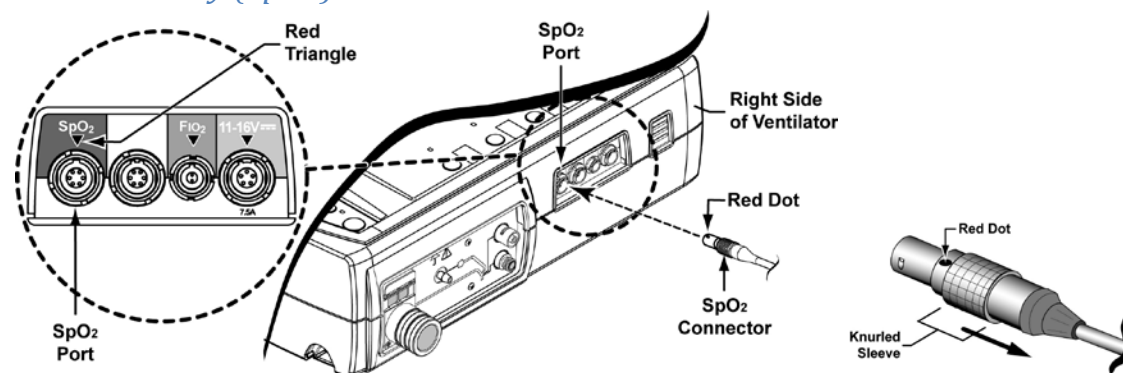
Calculate the patient's Minute Volume (VE)
Locate the Minute Volume reading (right side of chart).

Follow the vertical FIO₂ line up to the applicable slanted VE (Minute Volume) line.

From where they intersect, read across horizontally to the left side of chart to the required Input O₂ Flow (lpm).

Optional Use Accessories Connection

Pulse Oximetry (SpO₂)



Position the module connector with the red dot on the connector aligned with the red triangle on the ventilator port labeled **SpO₂** (on a blue background). Insert as shown in the illustration.

* The connector is keyed to fit in only one position (when the red dot aligns with the red triangle) and will lock into place when properly inserted

To Configure Pulse Oximetry (SpO₂) Monitoring

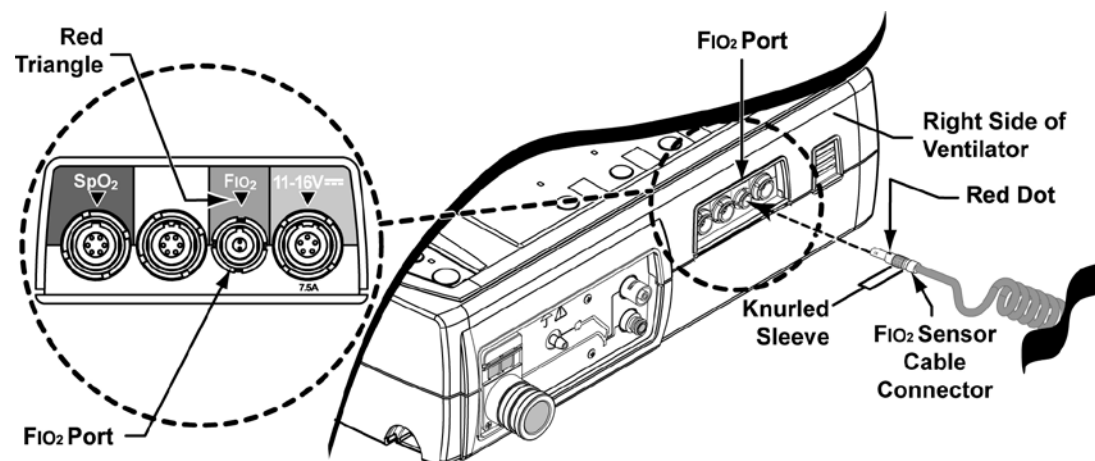
Pulse Oximetry monitoring is enabled/disabled and alarm limits are set using front panel controls.

Pulse Oximetry average interval and pulse tone volume configuration values are set using the Extended Features menus.

NOTE

If the sensor is not on a patient when SpO₂ is enabled, an alarm will sound.

FIO₂ Sensor



Position the FIO₂ Sensor connector with the red dot on the connector aligned with the red triangle on the ventilator port labeled **FIO₂** (on a green background). Insert as shown in the illustration.

*The connector is keyed to fit in only one position (when the red dot aligns with the red triangle) and will lock into place when properly inserted

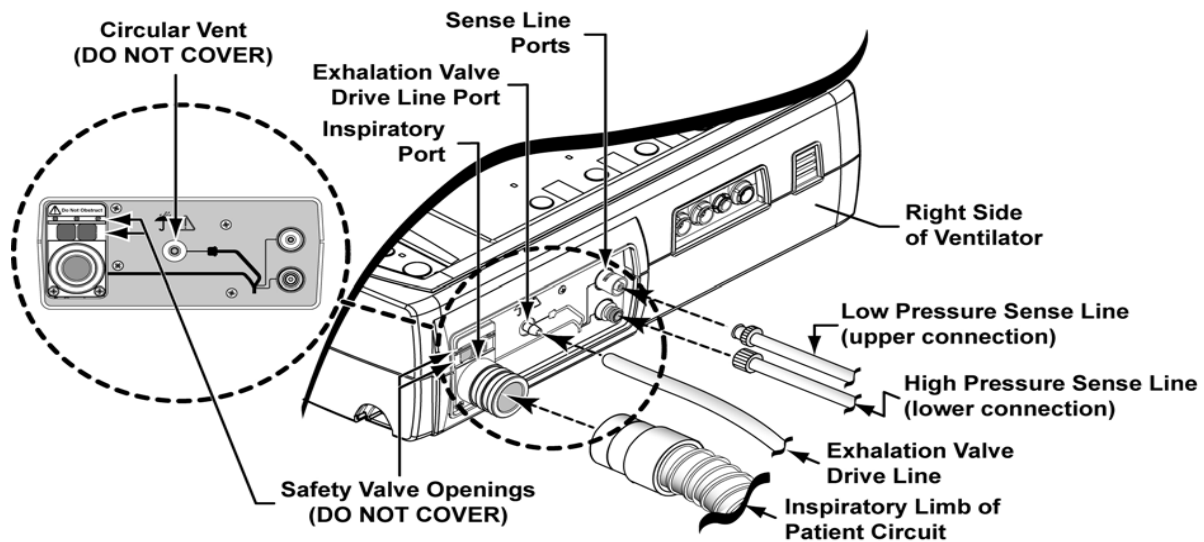
To Configure FIO₂ Monitoring

FIO₂ monitoring is enabled/disabled and calibrated while the ventilator is in Startup mode.

Once setup, enabled and calibrated, FIO₂ sensor may be enabled/disabled in the Extended Features menus. The Low FIO₂ alarm limit is set using the front panel while the ventilator is operating in a normal ventilation mode.

Off Patient Calibration - All sensor calibration is performed with the ventilator off the patient and in the Startup mode of operation.

Connecting the Patient Circuit



ReVel Circuit options

14858-001	Patient Circuit , Adu, Dry Circuit, SPU, Qty 10
14859-001	Patient Circuit , Ped, Dry Circuit, SPU, Qty 10
15091-102	Patient Circuit, Adu, Dual Heated Wire, F&P, SPU, Qty 10
15091-104	Patient Circuit, Ped, Dual Heated Wire, F&P, SPU, Qty 10
18855-001	Patient Circuit, Adu, Dual Heated Wire, Teleflex, SPU, Qty 10
18856-001	Patient Circuit, Ped, Dual Heated Wire, Teleflex, SPU, Qty 10
14863-001	Patient Circuit, Adu, Reusable, Ea
14862-001	Patient Circuit, Ped, Reusable Ea

Presets Values for Ventilation Controls

Controls	Infant (5-10 kg)	Pediatric (10-40 kg)	Adult (>40 kg)
Bias Flow	3 lpm	5 lpm	5 lpm
Breath Mode	Assist/Control	Assist/Control	Assist/Control
Breath Rate	20 bpm	15 bpm	12 bpm
Breath Type (Intubated)	Pressure ¹⁸	Pressure ¹⁸	Volume ¹⁸
Breath Type (NPPV)	Pressure ¹⁹	Pressure ¹⁹	Pressure ¹⁹
EPAP (NPPV Only)	3 cmH ₂ O	6 cmH ₂ O	6 cmH ₂ O
Flow Term	35 %	25 %	25 %
Insp. Time	0.3 sec	0.7 sec	1.0 sec
IPAP (NPPV Only)	8 cmH ₂ O	11 cmH ₂ O	16 cmH ₂ O
Leak Comp	On	On	On
O ₂	21 %	21 %	21 %
O ₂ Flush %	+20 %	+79 %	+79 %
O ₂ Flush Dur	2 min	3 min	3 min
PC Flow Term	Off	Off	Off
PEEP	3 cmH ₂ O	6 cmH ₂ O	6 cmH ₂ O
Pres. Control	15 cmH ₂ O	15 cmH ₂ O	15 cmH ₂ O
Pres. Support	5 cmH ₂ O	5 cmH ₂ O	10 cmH ₂ O
Pres Trigger	3 cmH ₂ O	3 cmH ₂ O	3 cmH ₂ O
Rise Time	5	3	4
SBT O ₂	21 %	21 %	21 %
SBT PEEP	3 cmH ₂ O	6 cmH ₂ O	6 cmH ₂ O
SBT Pres.Sup	10 cmH ₂ O	5 cmH ₂ O	10 cmH ₂ O
SBT Time	20 min	20 min	20 min
Sensitivity	2 lpm	2 lpm	2 lpm
Tidal Volume	50 ml	250 ml	500 ml
Time Term	0.5 sec	1.0 sec	2.0 sec

Trouble Shooting

Symptoms	Possible causes	Suggested action
Ventilator is auto cycling, monitored volumes are very small, negative flows exhibited during exhalation and positive flows during inspiration.	Sense lines are reversed.	The sense lines are not designed to be removed from either the Wye or the luer fittings. If the sense lines have been removed and replaced incorrectly, they may not seal correctly when replaced. Replace the complete patient Wye / sense lines assembly with a known good assembly.
	There is water in the sense lines.	Clean or replace the Patient Wye sense lines assembly.
	Internal problem with the ventilator.	Contact CareFusion or a service technician certified by CareFusion
Set Insp. Pres. not reached.	Insp. Pres. setting is too slow for the set Insp. Time.	Adjust Insp. Rise setting.
	Patient circuit leak.	Perform circuit test.
Monitored Vte is high.	Very small ET tube connected directly to Wye.	A very small ET tube connected directly to the Wye may cause turbulence that causes the flow differential to be read incorrectly. To reduce this turbulence, add a short larger bore extension or swivel fitting between the ET tube and Wye. In this case, the monitored volume is high, but the delivered volume is accurate.

Symptoms	Possible causes	Suggested action
Monitored Vte is high.	Low Pressure sense line or elbow at patient Wye loose or leaking.	Check high and low pressure sense lines to be sure they are correctly attached and securely seated at both the ventilator and Wye ends. Check the luer fitting connections for leaks. Check the elbow connectors at the Wye to be sure they have not loosened or been broken loose.
	High or low pressure sense lines are occluded. High or low pressure sense line ports in the Wye are occluded.	Verify lines are not occluded or pinched.
	Sense lines are reversed.	The sense lines are not designed to be removed from either the Wye or the luer fittings. If the sense lines have been removed and replaced incorrectly, they may not seal correctly when replaced. Replace the patient Wye and sense lines with a known good assembly.
Monitored Vte is high.	Failed calibration or internal problem with the ventilator.	Contact CareFusion or a service technician certified by CareFusion.
Delivered Vti is low.	Circuit leak.	Perform a circuit test and reseal or replace the leaking parts or connections.
Symptoms	Possible causes	Suggested action
Delivered Vti is low.	Exhalation valve leaking during inspiration.	Verify the exhalation valve is not leaking during inspiration. If it is leaking, remove the exhalation port, clean and reseal the diaphragm or replace if damaged then reinstall the exhalation port.

Symptoms	Possible causes	Suggested action
Monitored Vte is low.	High or low pressure sense line or elbow at patient Wye loose or leaking.	Check high and low pressure sense lines to be sure they are correctly attached and securely seated at both the ventilator and Wye ends. Check the luer fitting connections for leaks. Check the elbow connectors at the Wye to be sure they have not loosened or been broken loose.
	High or low pressure sense lines are occluded. High or low pressure sense line ports in the Wye are occluded.	Verify lines are not occluded or pinched.
	Sense lines are reversed.	The sense lines are not designed to be removed from either the Wye or the luer fittings. If the sense lines have been removed and replaced incorrectly, they may not seal correctly when replaced. Replace the patient Wye and sense lines with a known good assembly.
Monitored Vte is low.	Leak Compensation is not on.	Verify that Leak Comp is set to On in the Main screen, Controls page.
	Failed calibration or internal problem with the ventilator.	Contact CareFusion or a service technician certified by CareFusion.
Delivered Paw, Ppeak or Pmean is high. Monitored Paw, Ppeak or Pmean is high.	Diaphragm is incorrectly seated in exhalation valve.	Open the exhalation valve and remove the diaphragm. Clean and reseat the diaphragm and replace the exhalation port.
	High or low pressure sense lines are occluded. High or low pressure sense line ports in the Wye are occluded.	Check high and low pressure sense lines to be sure they are correctly attached and free of obstructions or kinks.
	Patient circuit leak.	Check the elbow connectors at the Wye to be sure they have not loosened or been broken loose. Verify lines are not occluded or pinched. Perform a circuit test.
	Failed calibration or internal problem with the ventilator.	Contact CareFusion or a service technician certified by CareFusion.
Symptoms	Possible causes	Suggested action
Delivered PIFR is high or low.	Leaks in the patient circuit.	Perform a circuit test in Startup mode, EST screen. Replace leaking circuit or components if necessary.
Monitored Vte is low.	Failed calibration or internal problem with the ventilator.	Contact CareFusion or a service technician certified by CareFusion.
Flow Trigger does not appear to be accurate. Ventilator is auto cycling.	Circuit leak.	Perform a circuit test and reseat or replace the leaking parts or connections.
	Sense lines are reversed.	The sense lines are not designed to be removed from either the Wye or the luer fittings. If the sense lines have been removed and replaced incorrectly, they may not seal correctly when replaced. Replace the patient Wye and sense lines with a known good assembly.
	High or low pressure sense line or elbow at patient Wye loose or leaking.	Check high and low pressure sense lines to be sure they are correctly attached and securely seated at both the ventilator and Wye ends. Check the luer fitting connections for leaks. Check the elbow connectors at the Wye to be sure they have not loosened or been broken loose.
Flow Trigger does not appear to be accurate. Ventilator is auto cycling.	High or low pressure sense lines are occluded. High or low pressure sense line ports in the Wye are occluded.	Verify lines are not occluded or pinched.
	Leak Compensation is not on.	Verify that the Leak Comp control is set to On in the Main screen, Controls page.

Symptoms	Possible causes	Suggested action
	Failed calibration or internal problem with the ventilator.	Open the exhalation valve and remove the diaphragm. Reseat the diaphragm and replace the exhalation port.
FiO2% is high.	O2 inlet pressure too high when Low O2 Source selected. O2 inlet flow too high when Low O2 Source selected.	Verify the low pressure O2 inlet has been correctly calculated and set using the Input O2 Flow Chart. CareFusion recommends the use of an O2 monitor to verify delivered O2%. Adjust the entrained O2 flow so the monitored value shows the desired FiO2.
Delivered Paw, Pmean, Ppeak or PEEP is low. Monitored Paw, Pmean or Ppeak is low.	Circuit leak.	Perform a circuit test and reseat or replace the leaking parts or connections.
Symptoms	Possible causes	Suggested action
(Continued)Delivered Paw, Pmean, Ppeak or PEEP is low. Monitored Paw, Pmean or Ppeak is low.	High or low pressure sense line or elbow at patient Wye loose or leaking.	Check high and low pressure sense lines to be sure they are correctly attached and securely seated at both the ventilator and Wye ends. Check the luer fitting connections for leaks. Check the elbow connectors at the Wye to be sure they have not loosened or been broken loose.
	High or low pressure sense lines are occluded. High or low pressure sense line ports in the Wye are occluded.	Verify lines are not occluded or pinched.
	Exhalation valve leaking during inspiration.	Verify the exhalation valve is not leaking during inspiration (perform circuit test). If it is leaking, unscrew the exhalation port and clean and reseat the diaphragm. If necessary, replace the exhalation diaphragm with a new one.
	Sense lines are reversed.	The sense lines are not designed to be removed from either the Wye or the luer fittings. If the sense lines have been removed and replaced incorrectly, they may not seal correctly when replaced. Replace the patient Wye and sense lines with a known good assembly.
Delivered Paw, Pmean, Ppeak or PEEP is low. Monitored Paw, Pmean or Ppeak is low.	Leak Compensation is not on.	Verify that the Leak Comp control is set to On in the Main screen, Controls page.
	Failed calibration or internal problem with the ventilator.	Contact CareFusion or a service technician certified by CareFusion.
Ventilator is auto cycling.	Leak Compensation is not on.	Verify that the Leak Comp control is set to On in the Main screen, Controls page.
	There is a leak between patient circuit Wye and the patient.	Adjust the Flow Trigger control to compensate or identify and eliminate the source of the leak.
	The exhalation diaphragm is not properly seated.	Remove the exhalation port and clean and reseat the diaphragm. If necessary, replace the exhalation diaphragm with a new one.
FiO2% is high.	Low O2 Source incorrectly selected.	Verify that the ventilator FiO2 is set to LPS when using a low flow, low pressure source and to a percentage when connected to high pressure O2.
	Failed calibration or internal problem with the ventilator.	Contact CareFusion or a service technician certified by CareFusion.
Symptoms	Possible causes	Suggested action

Symptoms	Possible causes	Suggested action
FiO2% is low.	O2 inlet flow too low when Low O2 Source selected.	Verify the low pressure O2 inlet has been correctly calculated and set using the Input FiO2 Flow Chart. CareFusion recommends the use of an O2 monitor to verify delivered O2%. Adjust the entrained O2 flow so the monitored value shows the desired FiO2.
	Failed calibration or internal problem with the ventilator.	Contact CareFusion or a service technician certified by CareFusion.
PEEP not working. PEEP low. PEEP sags during exhalation.	Circuit leak.	Perform a circuit test and reseal or replace the leaking parts or connections.
	Diaphragm incorrectly seated in exhalation valve.	Remove the exhalation port and clean and reseal the diaphragm. If necessary, replace the diaphragm with a new one.
	High Pressure sense line or elbow at patient Wye loose or leaking.	Check high and low pressure sense lines to be sure they are correctly attached and securely seated at both the ventilator and Wye ends. Check the luer fitting connections for leaks. Check the elbow connectors at the Wye to be sure they have not loosened or been broken loose.
PEEP not working. PEEP low. PEEP sags during exhalation.	High or low pressure sense lines are occluded.	Verify lines are not occluded or pinched.
	Leak Compensation is not on.	Verify that the Leak Comp control is set to On in the Main screen, Controls Page.
	Failed calibration or internal problem with the ventilator.	Contact CareFusion or a service technician certified by CareFusion.
PEEP is too high.	Diaphragm incorrectly seated in exhalation valve.	Remove the exhalation port and clean and reseal the diaphragm. If necessary, replace the diaphragm with a new one.
	High pressure sense line or elbow at patient Wye loose or leaking.	Check high and low pressure sense lines to be sure they are correctly attached and securely seated at both the ventilator and Wye ends. Check the luer fitting connections for leaks. Check the elbow connectors at the Wye to be sure they have not loosened or been broken loose.
Ventilator won't trigger at Flow Trigger setting of 1 L/min.	Patient effort inadequate.	Some very small patients and patients with very weak inspiratory efforts may not be able to generate a 1 L/min effort. Review ventilator settings.
	Leak Compensation is not on.	Verify that the Leak Comp control is set to On in the Main screen, Controls page.
	Failed calibration or internal problem with the ventilator.	Contact CareFusion or a service technician certified by CareFusion.
Condensation in sense lines.	High or low pressure sense lines are occluded. High or low pressure sense line ports in the Wye are occluded. Sense lines are oriented down in the circuit.	Verify lines are not occluded or pinched and/or clear the lines with a low flow (less than 10 L/min) gas source. Verify that the sense lines are oriented up; see the Instructions for Use included with your patient circuit.
	Defective purge solenoids.	Contact CareFusion or a service technician certified by CareFusion.
Ventilator is on, gas is not delivered and blower is running.	Ventilator detected a disconnected patient circuit.	Perform a circuit test. Resolve leaks beyond the patient Wye.
Symptoms	Possible causes	Suggested action
Ventilator is on, gas is not delivered, blower is running.	Failed calibration or internal problem with the ventilator.	Contact CareFusion or a service technician certified by CareFusion.

National and International Standards

The Revel™ ventilator is designed to comply with the following standards:

Number Title

ASTM F1100-90	Ventilators Intended for User in Critical Care
ASTM F1246-91	Electrically Powered Home Care Ventilators
ASTM F1463-93	Alarm Signals in Medical Equipment Used in Anesthesia and Respiratory Care
CGA V-5	Specifications for DISS Connections
EN 865:1997	Pulse Oximeters – Particular Requirements
FDA Ventilator Guidance	Draft Reviewer Guidance For Ventilators July 1995
FDA Guidance	Reviewer Guidance For Pre Market Notification Submissions November 1993
IEC 529:1989	Degrees of Protection Provided by Enclosures
IEC 60601-1:2005	Medical Electrical Equipment, General Requirements for Safety
IEC 60601-1-2:2001(E)	Medical Electrical Equipment: General Requirements for Safety, Electromagnetic
IEC 60601-1-4:1996+A1:1999	Compatibility Requirements and Tests General Requirements for Safety for Programmable Electrical Medical Systems.
IEC 60601-2-12:2001(E)	Medical Electrical Equipment: Particular requirements for the safety of lung ventilators – Critical care ventilators
CEI/IEC 68-2-6:1985	Basic Environmental Testing Procedures – Vibration
CEI/IEC 68-2-27:1987	Basic Environmental Testing Procedures – Shock
CEI/IEC 68-2-29:1987	Basic Environmental Testing Procedures – Bump
CEI/IEC 68-2-32:1975	Basic Environmental Testing Procedures – Free Fall
CEI/IEC 68-2-34:1991	Basic Environmental Testing Procedures – Random Vibration Wide Band
ISO 5356-1:2004(E)	Anesthetic and respiratory equipment – Conical Connectors
ISO 7767:1997(E)	Oxygen Monitors for Monitoring Patient Breathing Mixtures – Safety Requirements
ISO 9703-1:1992(E) alarm signals	Anesthesia and respiratory care alarm signals Part 1: Visual
ISO 9703-2:1994(E) alarm signals	Anesthesia and respiratory care alarm signals Part 2: Auditory
ISO 9703-3:1998(E)	Anesthesia and respiratory care alarm signals Part 3: Guidance on application of alarms
MDD EEC/93/42	Medical Device Directives, European Council Directive Concerning Medical Devices 1993
MIL-STD-810G	Shock, Ground Transport and Helicopter Transport Vibration. Category 24, General integrity for Helicopters, per Figure 514.6 E-2
prEN 13718-1	Air, Water, and difficult terrain ambulances – Medical device interference requirements for the continuity of patient care.
RTCA/DO-160F	Environmental conditions and test procedures for airborne equipment. 48 C Category U2 – Random Test Curves for Helicopters Fuselage per Figure 8-7 Curve F

Service and Contract Options

CareFusion's Extended Care programs are designed to deliver a variety of service support options, which ensure maximum system uptime necessary for continuous patient care, while also providing aggressive cost control protection.

The ReVel ventilator is supported with a **standard two (2) year manufacturer's warranty**. This warranty includes all replacement parts for the term plus labor and travel required for on-site emergency service support. This warranty does not include Preventive Maintenance. Batteries, O2 Cells and sensors will carry a ninety-day (90) warranty.

The following is an explanation of our Extended Warranty / Service Contract options for the **ReVel Ventilator**:

Five Years – Total Care Coverage: Provides for all replacement repair parts plus labor, travel and expenses for an unlimited number of on-site repairs and all factory required Preventive Maintenance (PM's) during years three thru five of the product life. Annual PM's are not a factory requirement and therefore are not included. However, an on-site Operational Verification Procedure (OVP) can be provided once per year, at customer request, to ensure the ventilator is operating to factory specs. Batteries and O2 cells are not included.

Five Years – Fixed Call Coverage: Provides for all replacement repair parts plus labor, travel and expenses for three service calls per year and all factory required PM's during years three thru five of the product life. Annual PM's are not a factory requirement and therefore are not included. However, an on-site OVP can be provided once per year, at customer request, to ensure the vent is operating to factory specs. Batteries and O2 cells are not included.

Five Years – Parts Only coverage: Includes all replacement parts needed to support the product during years three through five. This option would also PM Kits as needed based on hours of use. Batteries and O2 cells are not included.

Five Years – PM Only coverage: Provides for all PM kits plus labor and travel as required to complete PM's at recommended intervals. Annual PM's are not a factory requirement for this product and therefore are not included. However, an on-site OVP can be provided once per year, at customer request, to ensure the vent is operating to factory specs. Batteries and O2 cells are not included.

Transport Warranty – *a transport warranty is in the process of being developed for the ReVel.*

Preventive Maintenance - recommended based on the hours of use on each vent:

3 years or 15,000 hours of use – whichever comes first
6 years or 30,000 hours of use – whichever comes first

Additional Features - each of the options listed above would also include:

Freight charges for all repair / exchange parts to and from the customer location.
Preferred Technical Support - Available 24 hours/day, seven-days/ week
Labor and travel hourly rates - **discounted 25%** for any on-site service that is not covered by the contract.
10% discount – on batteries and O2 cells.

Benefits to purchasing the Extended Care option up front with the equipment:

- **Save up to 20%** off pricing which would be applicable at warranty expiration.
 - The pricing is fixed and guaranteed for the term. There is no annual increase factored in.
 - The pricing is not "zoned". Additional expenses for travel time to and from your location are not included.
 - In comparison, prices applicable at warranty expiration are based on zones.
- Multi-system discounts** – are available based on the number of systems covered.

Five-Year Extended Care Options ReVel Ventilator

