

ventway



Mini-size Turbine EMS & Transport Ventilator

Ventway Sparrow Train the Trainers Course

Targets

1. INOVYTEC Train the Trainers Program will educate, train and qualify trainers upon the VENTWAY SAPARROW.
2. TTP will grant all necessary information for the trainer and will be conducted by Inovytec's professional trainers.

Ventway Sparrow Train the Trainers Course

Scope:

1. Introduction (1 hour)
2. Operation (2 hours)
3. Alerts (1 hour)
4. Parameters and o2 enrichment (1 hour)
5. Ventilation Modes (1 hour)
6. Specs (0.5 hour)
7. Operation- Hands on (1 hour)
8. Ventilation Modes- Hands On (0.5 hour)
9. Hands On Time



Lesson 1

Introduction

Lesson Scope:

- Overview Of System
- Glossary and Abbreviations
- Conditions For Use+ Safety
- System Components

Overview Of System

- The Ventway is an emergency portable ventilator, used for transport, EMS and military applications.
- The situations for which it is intended are characterized by attendance of first responders with limited triage capabilities, requiring a simple yet highly effective ventilator, that is self-sufficient and lightweight.
- The ventilator is suitable for noninvasive ventilation for a full non-vented ventilation face mask or invasive ventilation via an endotracheal tube, tracheostomy and laryngeal mask airway (LMA).

Glossary and Abbreviations

Apnea	Temporary cessation of breathing	PSV	Pressure Support Ventilation
BPM	Breaths Per Minute	SIMV VC PS	Synchronized Intermittent Mechanical Ventilation with Volume Control and Pressure Support
CPAP	Continuous Positive Airway Pressure	T_e	Expiratory Time
lpm	Liters per minute	T_i	Inspiratory Time
Mandatory Breath	Ventilator initiated breath	Tidal Volume	Normal volume of air displaced between normal inhalation and exhalation when extra effort is not applied
MV	Minute Volume	Triggered breath	Patient initiated breath
NIV	Non-Invasive Ventilation	TV_e	Expired Tidal volume
Peak Flow	Maximum volumetric flow	TV_i	Inspired Tidal volume
PEEP	Peak End Expiratory Pressure		
PIP	Peak Inspiratory Pressure		
Pressure support	Preset pressure delivered to the patient, on top of the PEEP, during triggered breath		

Intended Use

The Ventway Sparrow lung ventilator is intended for emergency use and transportation of adult and pediatric patients weighing at least 5 kg (11 lb). It may be used for invasive or noninvasive ventilation presets. The ventilator is a restricted medical device intended for use by qualified, trained personnel under the direction of a physician.

Indications for Use

The Ventway Sparrow ventilator is intended to provide continuous or intermittent ventilatory support for the care of individuals who require mechanical ventilation. Specifically, the ventilator is applicable for adult and pediatric patients weighing at least 5 kg, who require the following types of ventilatory support: SIMV - VC (PS), CPAP.

Contraindications

- See specific patient instructions regarding performing ventilation or any use of life support equipment .
- Acute Pneumothorax

Limitations of Use

Clinical situations potentially affecting accuracy or performance:

- Controlling the flow in the presence of difficult airways, such as severe lung blockage and asymmetric air entrance to the lung
- Low compliance of the airways
- Asynchronization between patient and ventilator
- Barotrauma
- Behavior of the ventilator in case of barotrauma, monitoring and alerting in these cases.

Safety

According to Chapter 4 at the **Ventway Sparrow** User Manual

Unpacking the device

Package contents

1. Ventway Sparrow ventilator
2. User Manual and device documentation
3. Battery pack - Inside ventilator battery compartment
4. Power supply



Ventilator- Front Panel

Front Panel:

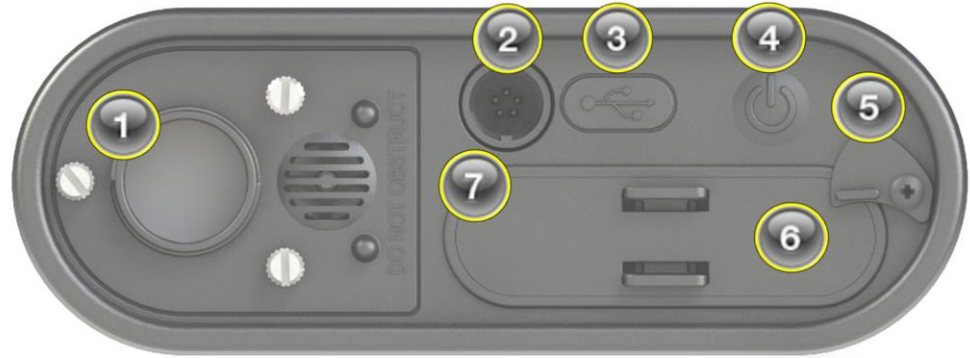
- Control knob,
- Display
- Control and sensing tubes port
- Patient port



Ventilator- Rear Panel

Rear Panel:

1. Air/Low pressure oxygen inlet
2. Power supply connector
3. USB connector
4. Power On/Off button
5. Battery pack lock
6. Battery pack,
7. Filter compartment screws

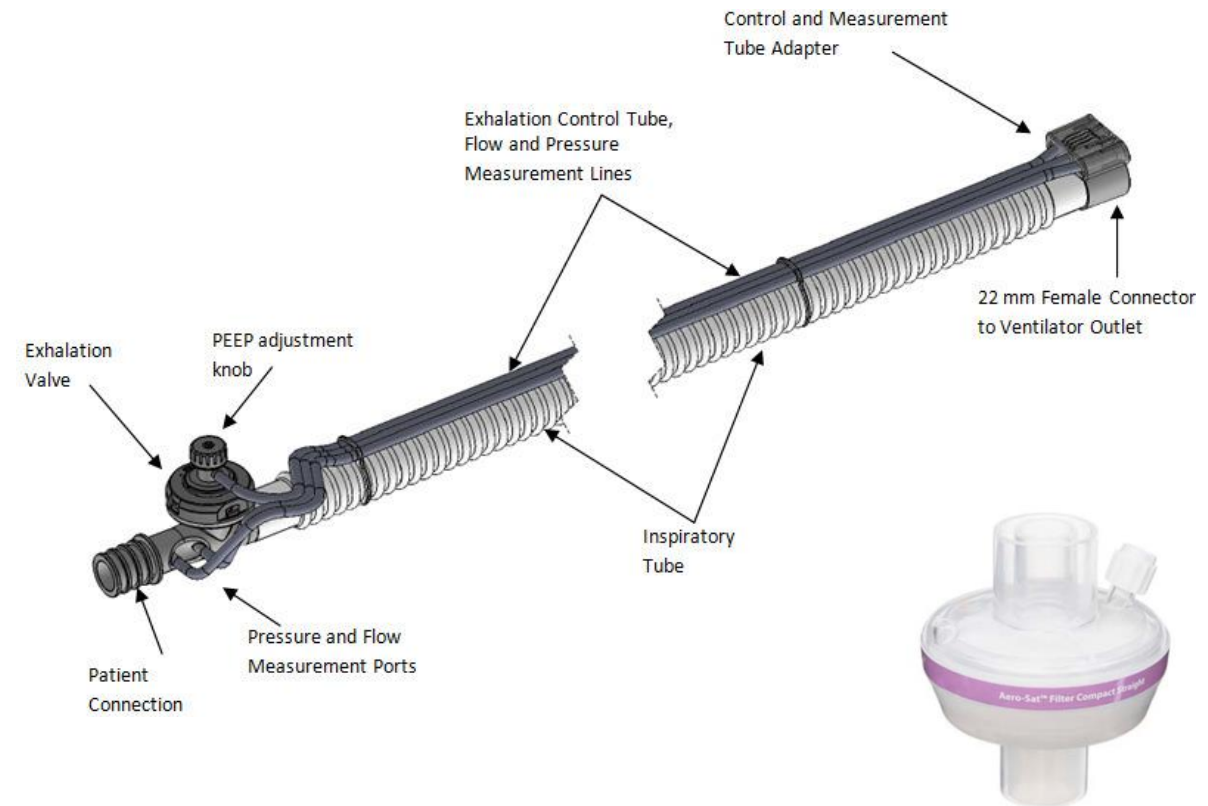


Ventilator- Use Configuration

- ❖ During transport, the ventilator is recommended to be placed in a horizontal position.

Patient Circuit

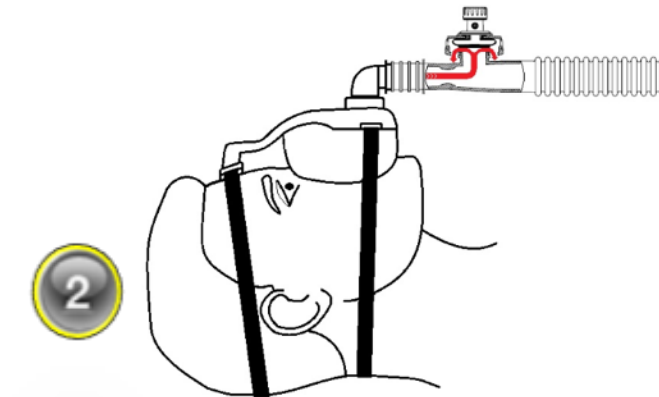
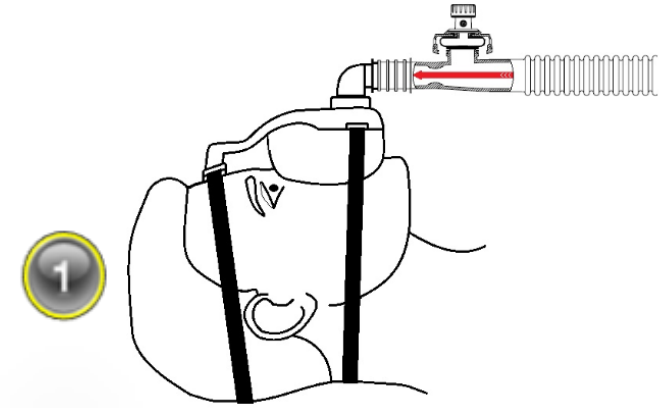
- An authorized HME and anti-bacterial filter must be used at all times, in order to protect both patient and ventilator from infection.
- Assemble the filter between the patient and transducer; if not possible, then between the ventilator outlet and the patient circuit 22 mm connector.



HME Filter

Inspiratory (1) vs. Expiratory (2) cycle

- During the inspiratory cycle, the exhalation valve membrane is closed, allowing the gas from the ventilator to be directed to the patient. Once the inspiration cycle is complete, the membrane opens, allowing the gas from the patient to be exhaled through the exhalation valve.
- The expiratory gas passes through the membrane which is constantly supported by a spring, creating the preset PEEP value. During expiratory flow, a continuous low flow is delivered into the patient circuit, in order to prevent any re-breathing and to compensate for small leaks that may exist in the various circuit components, facemask or LMA (Laryngeal Mask Airway).



ventway



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Lesson 2

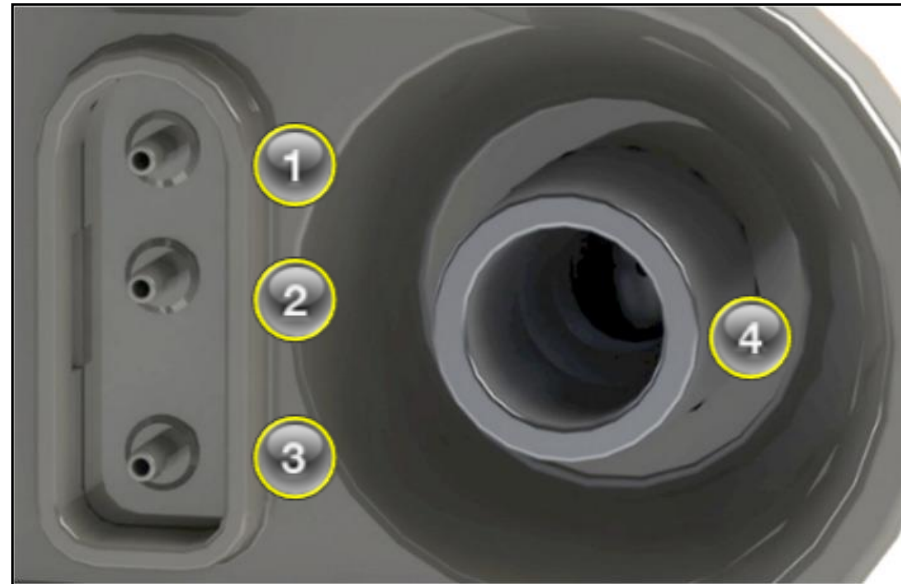
Operation

Lesson Scope:

- Connecting the Vent
- Navigating the GUI
- Getting started
 - Ventilation Parametrs
 - Main Manu

Connecting the Ventilator

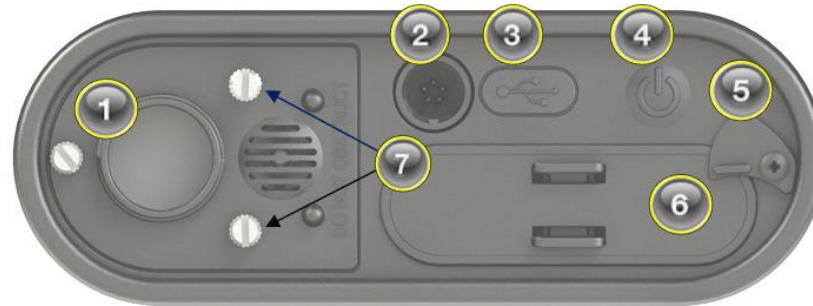
Front Panel



- 1 Pressure and flow measurement port
- 2 Pressure measurement port
- 3 Expiratory valve port – control tube
- 4 Ventilator gas output

Connecting the Ventilator

Rear Panel



- 1. Air inlet/Oxygen supply connector** – Air inlet and oxygen connector to demand valve
- 2. DC Power connector** – Connect power line (AC/DC or DC/DC power supply)
- 3. USB connector** – This connector is intended for technicians who require access to the logbook and device software.
- 4. Power On/Off button**
- 5. Battery safety lock**
- 6. Battery pack**
- 7. Filter compartment screws**

Power On and Display Start-up

- To start the system, press and hold the **Power On** button on the back panel for 3 seconds.



Back panel indicating the Power On button

Power On and Display Start-up

Quick Start

In an emergency situation, Quick Start allows you to start the ventilator immediately, using preset default options. To perform a Quick Start, press and hold the Power On button for ten seconds. The following screen will display:



Quick Start initial screen

Power On and Display Start-up

Quick Start

After you confirm by selecting the check mark and pressing the control knob, specify the Patient Type:



Patient Type screen

Now the ventilator will operate in Backup mode:



Ventilator running after Quick Start

Navigating the GUI Screens

- To navigate between the screen options, turn the knob on the left side of the device. When you have navigated to the desired option, press the knob to select the option.



Navigating the GUI Screens

Editing Fields

While turning the control knob, fields that can be modified are highlighted. To edit a field, press the control knob when positioned on the field. The field will change color. Rotate the control knob to view different values for the field, and press the knob to select a value.

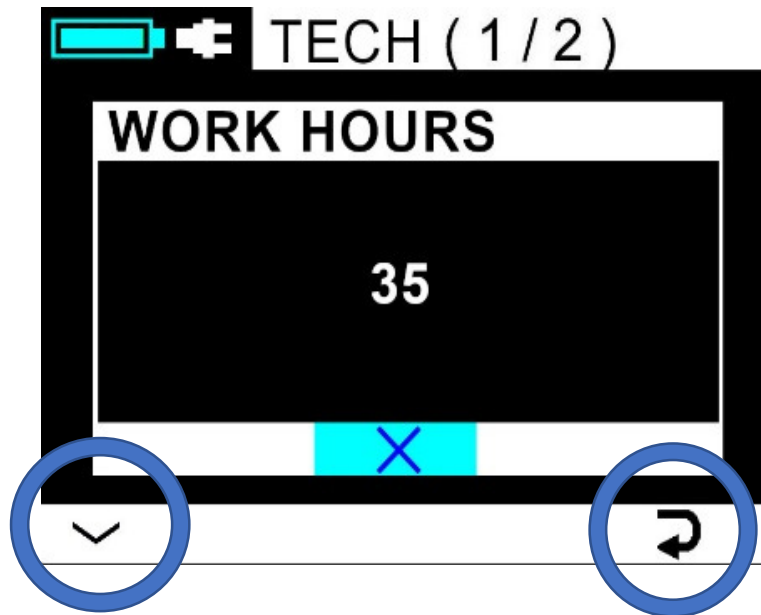


Patient Weight highlighted

Navigating the GUI Screens

Navigating the GUI Screens

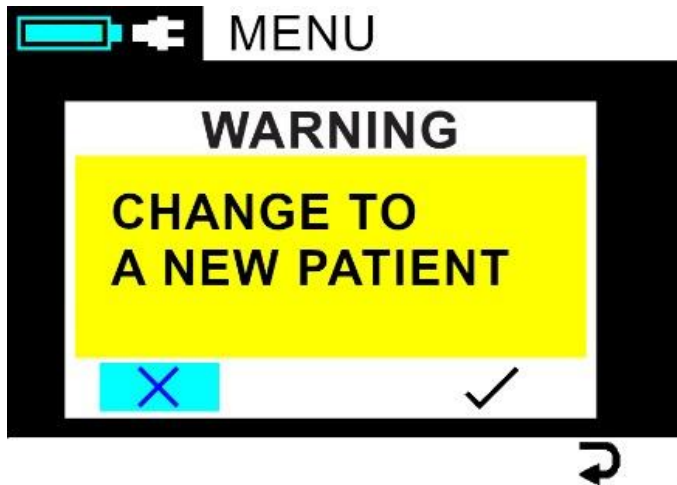
- Press BACK to return to the previous screen
- Press the Next Screen button to return to the previous screen.



Navigating the GUI Screens

Confirming or Cancelling Message

When a message is displayed by the system that allows a confirm or cancel response, press Cancel (X) to reject the action, or press Confirm (v) to accept the action.



Navigating the GUI Screens

Symbols used in the System

	Back
	Next screen
	Language
	Graphs (Flow / Pressure)
	Confirm
	Cancel
	Manual breath
	Main Menu

Navigating the GUI Screens

Battery Status



No battery, external power source used



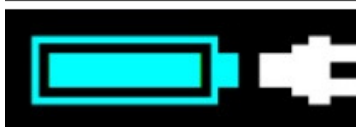
Non-rechargeable battery, no external power source



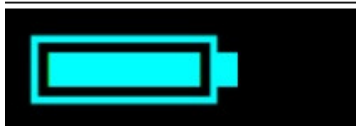
Non-rechargeable battery, external power source connected



Rechargeable battery, external power source connected (charging)



Rechargeable battery, external power source connected (fully charged)



Rechargeable battery, no external power source connected



Rechargeable battery, not charging

Navigating the GUI Screens

Battery Status

Battery charge level is indicated by the following signs :



Battery full



Medium energy level



Low energy level



Battery in critical energy level

Navigating the GUI Screens

Indicators



Patient trigger detected



Pressure sensors are currently being zeroed



Normal operation



Alert is silenced.



Note: While zeroing sensors, the ventilator will not detect patient triggers.



Caution: It is the user's responsibility to ensure that the alerts are working properly. See Section **24. Appendix – Test Alerts** for instructions on testing the alerts.

Navigating the GUI Screens

Indicators



Alert is silenced.



Note: While the alert is silenced (maximum 120 seconds) this indicator is displayed, and the number of active alerts is displayed in parentheses next to the icon.



Note: The icon serves as an activation button. Pressing it will open a list of up to five active alerts ordered by priority.

Getting Started

The initial set of screens allow you to start the ventilator and specify settings such as patient weight, ventilation type, and other basic parameters.



Note: A system alert sound is activated during system startup, indicating a valid Circuit Verification test.



Note: An emergency quick start can be performed if necessary. See Section **7.1. Quick Start**.

Getting Started

1. Logo Screen

The first screen that appears with the logo allows you to identify whether the display is working properly:



Logo screen

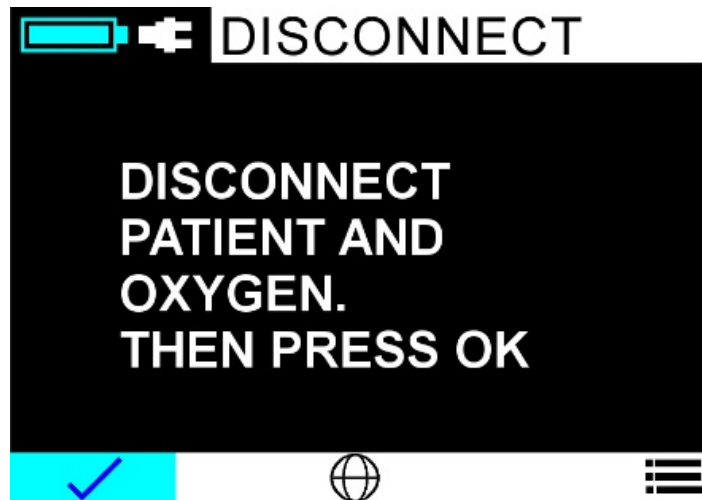
Getting Started

2. Disconnect Patient Screen

Normal procedure after turning on the ventilator is to verify that the patient is disconnected , then press OK on this initial screen.

The system will activate the blower to verify the correct operation of the device and various components (e.g. patient circuit, sensors and electrical components).

The self test screen will display for about 8 seconds.



Initial screen



Self Test screen

Getting Started

2. Disconnect Patient Screen



Note: If the Main Menu is selected instead of **OK**, the **START** option will be unavailable, since the weight of the patient is unknown and ventilation parameters are not set. For details on the Main Menu option, see Section **10. Main Menu**.

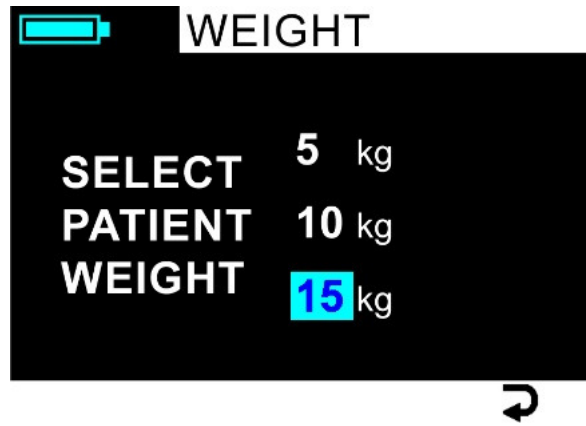
If the self test fails, the user is advised to check the following:

- No oxygen demand valve connected to the ventilator
- No oxygen reservoir
- Dirty/obstructed inlet filter
- Pressure and control tube connected properly (kinks, disconnection or rupture of the tubes)
- No HME or filter are connected to the exhalation valve
- Patient is not connected

Getting Started

3. Weight Screen

Rotate the scroll knob to select the weight of the patient:



Pediatric and adult weight selection screens

Getting Started

4. Ventilation Mode

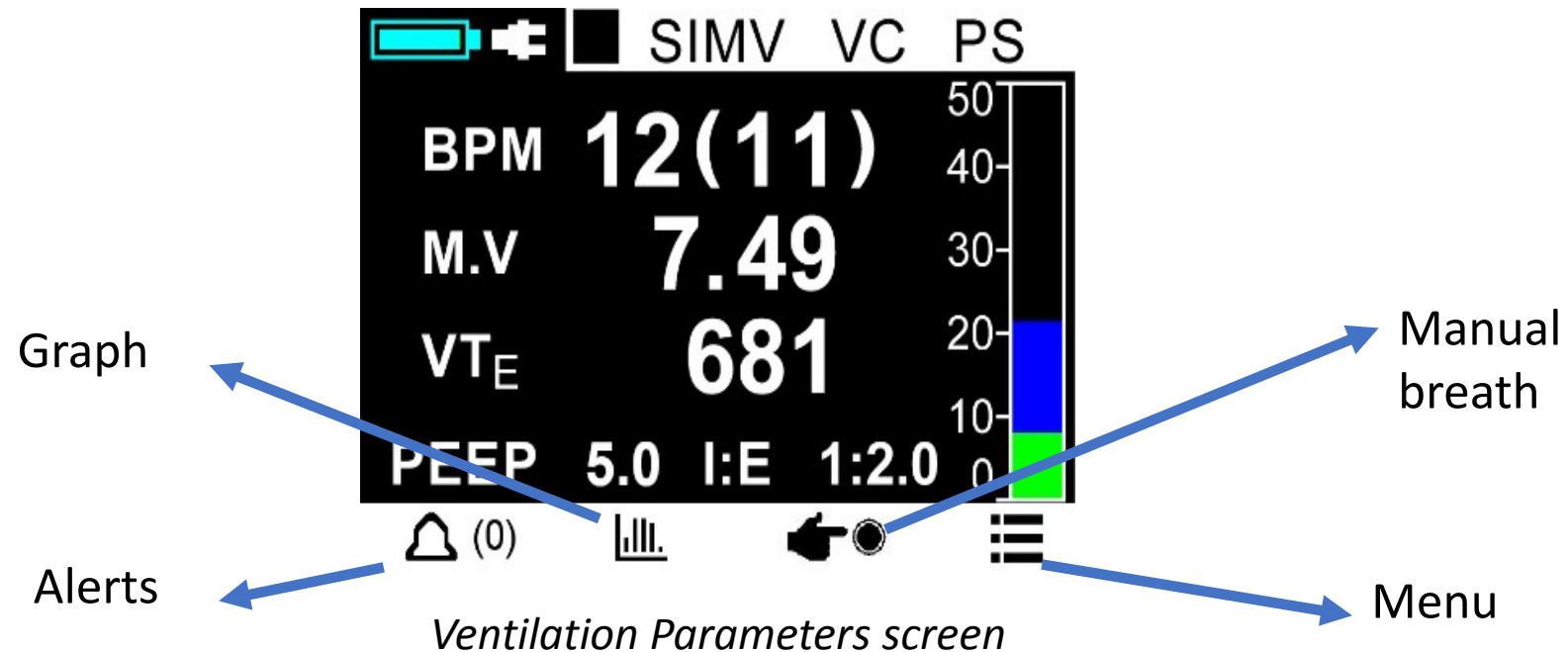
1. Select the initial choice of ventilation mode. This can be changed later.
2. Ventilation Methods for details about each ventilation mode.
3. After ventilation mode is selected, select Invasive or Non-Invasive Mode.
4. The last stage prior to initiating ventilation is connecting the patient



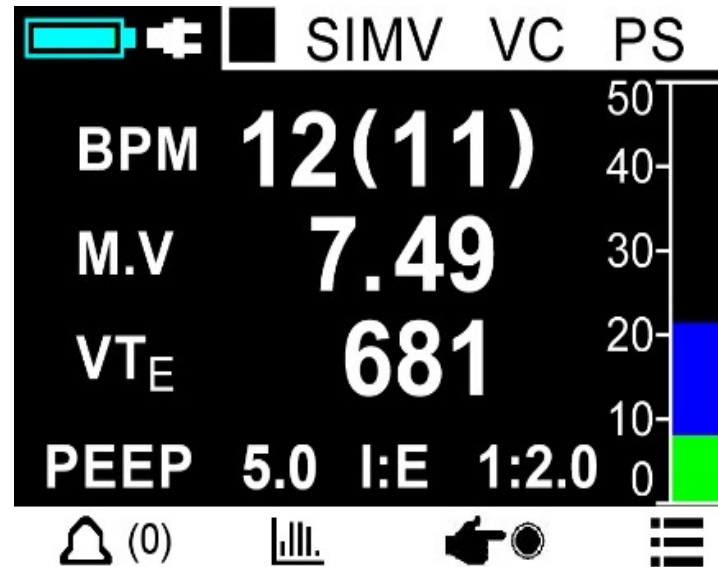
Ventilation Mode screens

Ventilation Parameters

The Ventilation Parameters screen shows the relevant information for the patient, updated on a real-time basis:



Ventilation Parameters



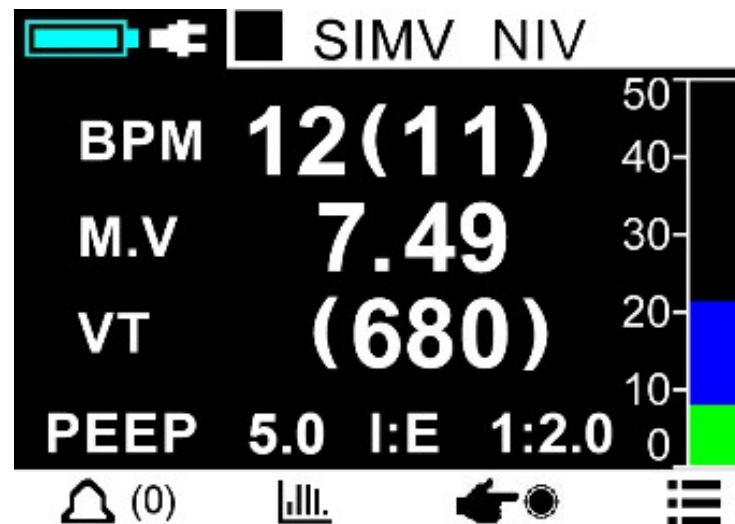
Ventilation Parameters screen

- Select BPM to change the breaths per minute delivered.
- Select VT_E to change the desired VT_E
- Select ALERTS to view the current active (silenced) alerts.
- Select GRAPH to display the Pressure or Flow graphs –Pressure and flow graphs.
- Select MANUAL BREATH to give one breath to the patient using the current parameters.
- Select MENU to display the Menu screen.

Ventilation Parameters



Note: When Non Invasive ventilation mode is applied, only the set value of VT is displayed in parenthesis. VTE and VTI are displayed as part of the graphs screens of pressure and flow. In Non Invasive ventilation the ventilator is programmed to compensate for the loss of volume due to leaks from the facemask or LMA. Actual delivered tidal volume can only be interpolated, and is not displayed.



Example of Non-Invasive Mode display

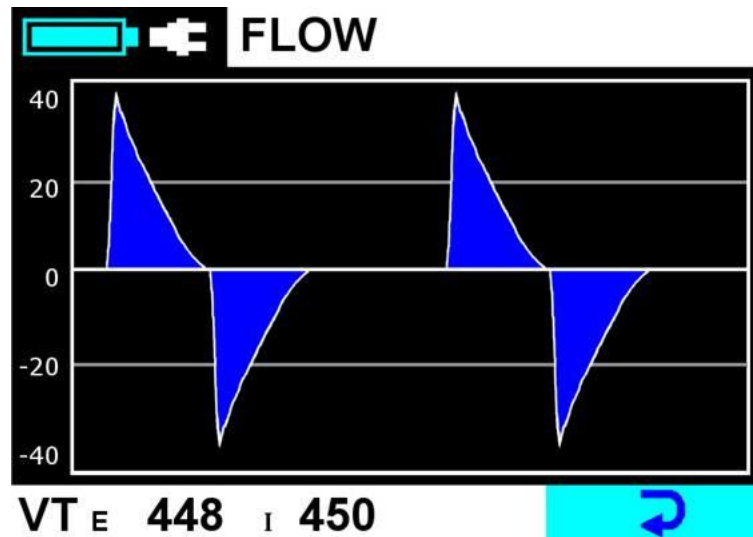
Numerical Representation of Breath Parameters

The measured and computed values that are displayed in the system are calculated using the filtering and smoothing techniques described in section 9.5 in the user manual.

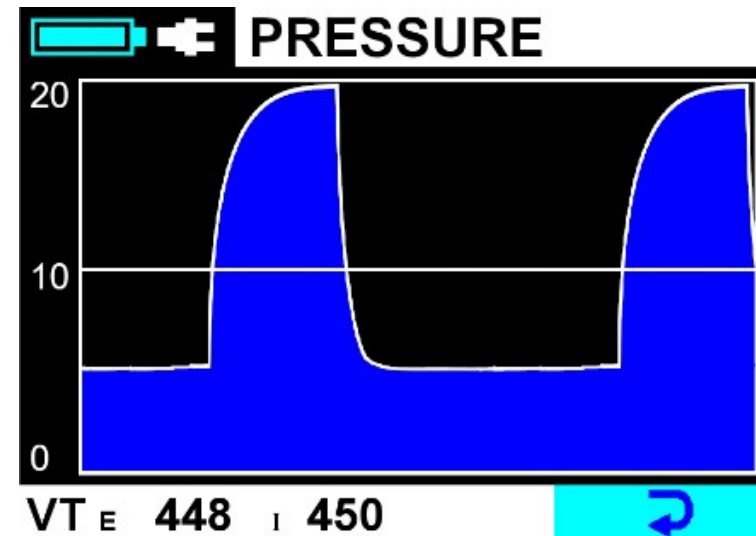
Pressure & Flow Graphs

This display shows the graphs of the pressure (in units of cmH2O) over time, and flow (in units of LPM) vs. time.

Rotation of the knob will switch between flow and pressure graphs.



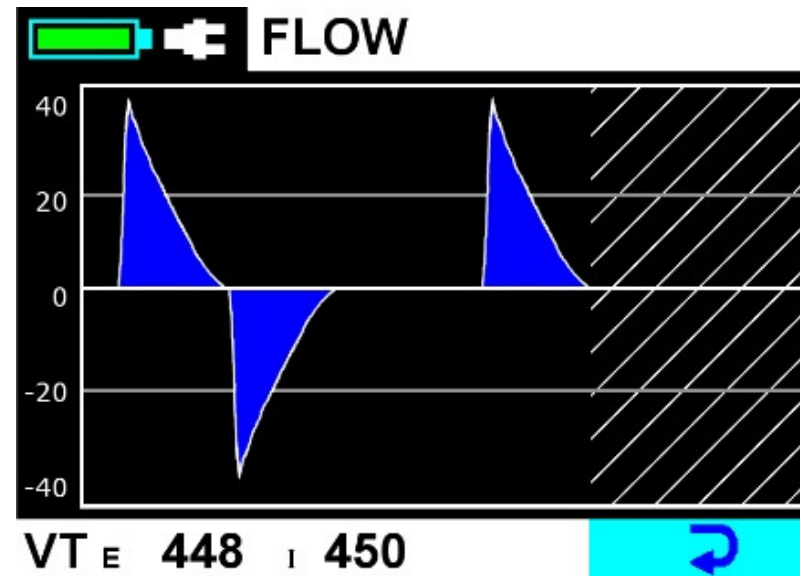
Flow Graph screen



Pressure Graph screen

Pressure & Flow Graphs

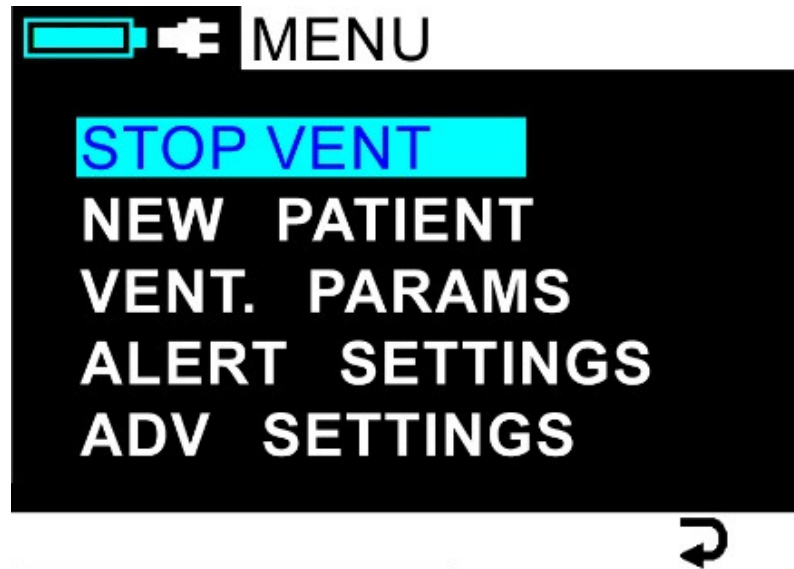
During sensor zeroing, diagonal lines are drawn on the graph to indicate no input from the sensors.



Flow graph screen during sensor zeroing

Main Menu

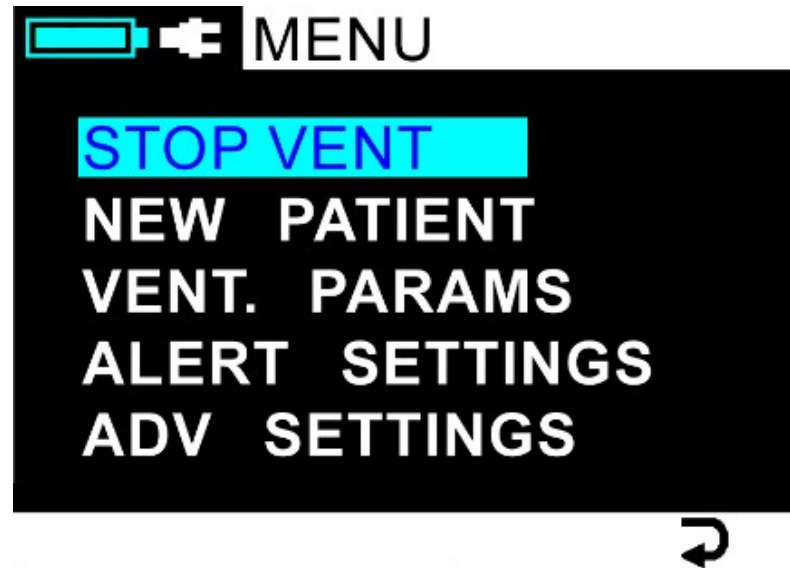
The Menu screen allows you to view and set various system values:



Manu screen

Main Menu

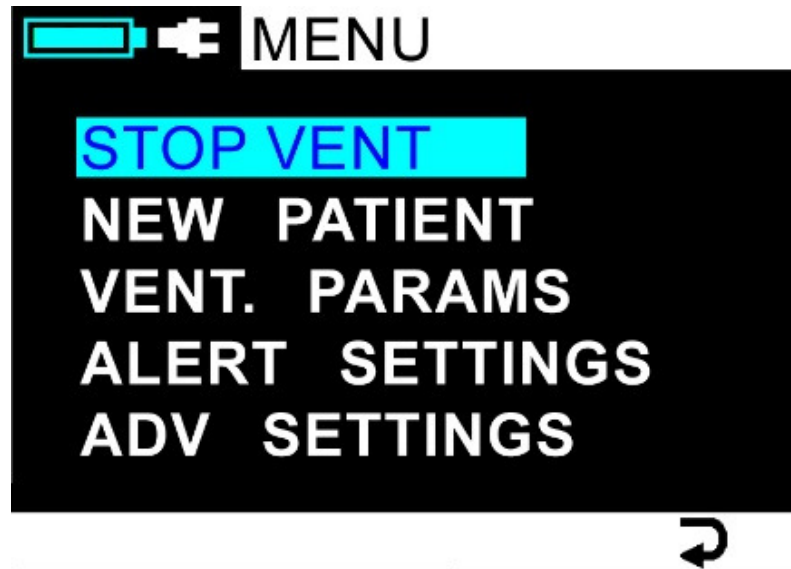
Screen Breakdown



1. **STOP VENT/START VENT** Stop or start the respiratory function of the device.
2. **NEW PATIENT** View the Disconnect Patient screen and reset all selected parameters. See Section

Main Menu

Screen Breakdown- Cont.



3. **VENT. PARAMS** View patient weight, ventilation mode, and other parameters.
4. **ALERT SETTINGS** Set the thresholds at which the alerts will be triggered.
5. **ADV SETTINGS** Set advanced settings, such as trigger sensitivity and technician mode.

Main Menu

New Patient

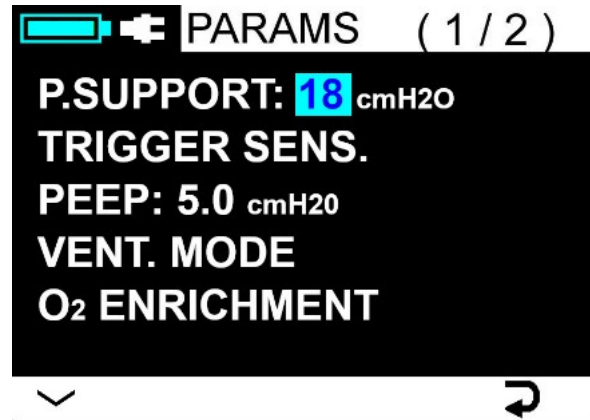


Disconnect Patient screen

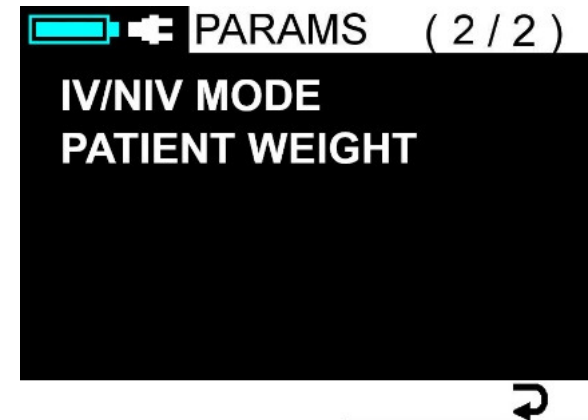
This screen allows you to disconnect an existing patient and reset parameters in preparation for a new patient.

Main Menu

Vent Params.



Vent Params. 1



Vent Params. 2

These screens allow you to set the patient weight, ventilation mode, and other parameters.

Main Menu

Trigger Sensitivity



Trigger Sensitivity screen

Set the trigger sensitivity for the flow and pressure measurements



Caution: When closed suction catheterization is performed, patient trigger sensitivity must be turned to "off".



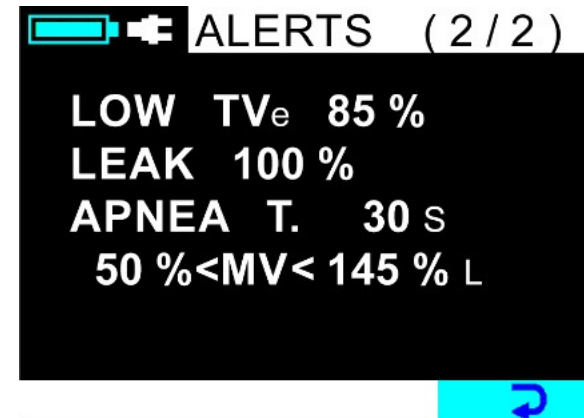
Caution: During transport ventilation, when the patient is often moved and subject to abrupt bumps, it is recommended to decrease pressure triggers sensitivity, in order to avoid auto triggers (e.g. -5 instead of -2).

Main Menu

Alert Settings



Alert Settings 1



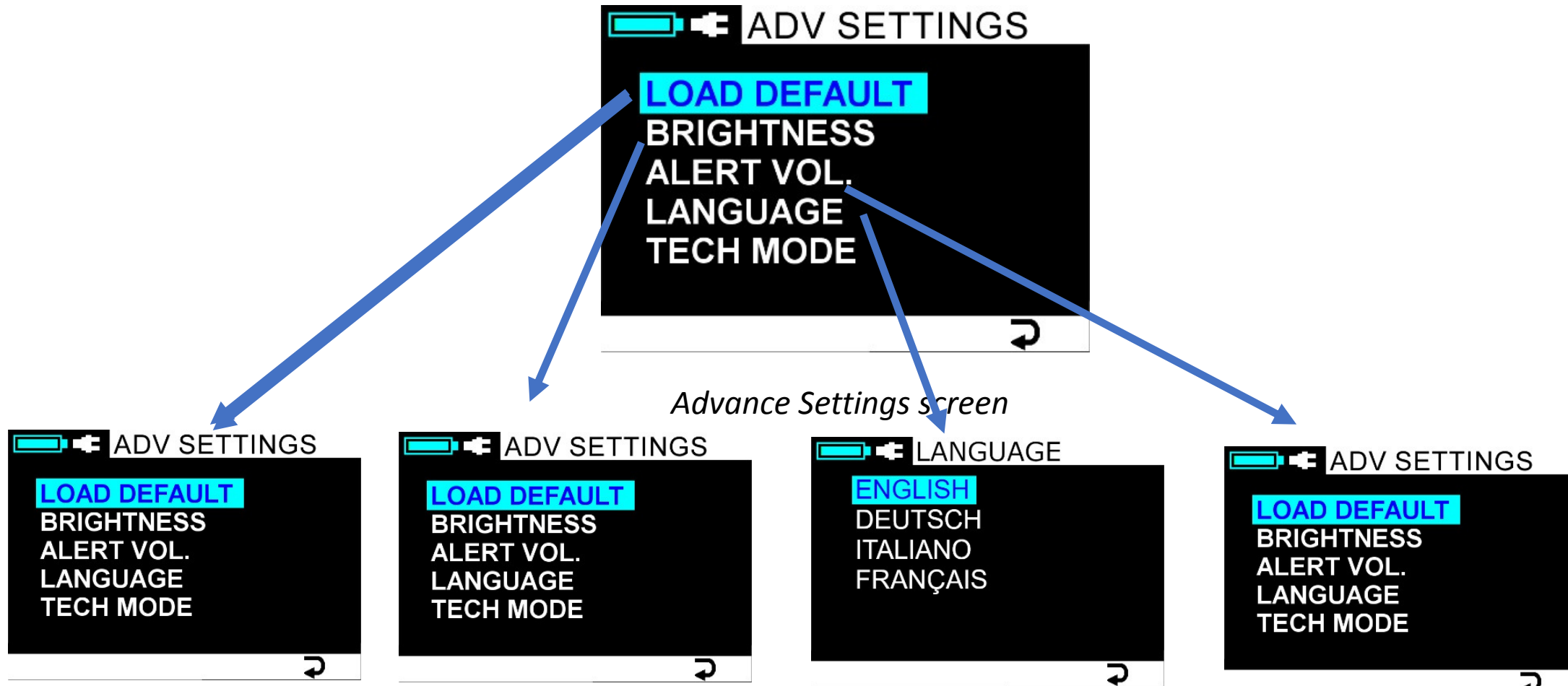
Alert Settings 2

The Alert Settings screens allow you to set the threshold values for each type of alert*.

*More on alerts will be elaborated at Alerts lesson

Main Menu

Advance Settings

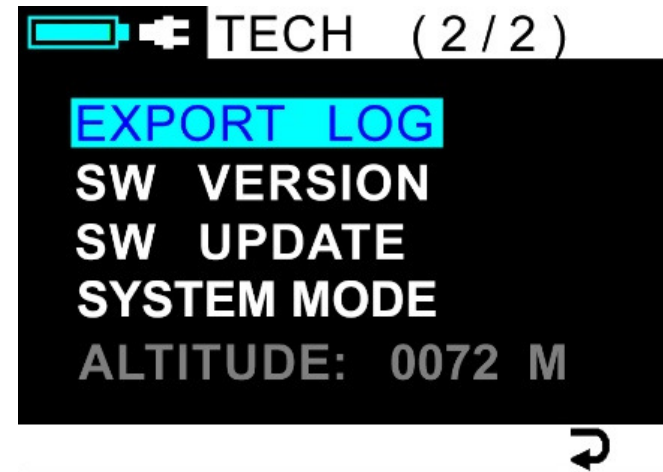


Main Menu

Advance Settings-Tech mode



Tech screen 1



Tech screen 2

Tech mode allows the setting of the time, total hours of operation, and allows a system self-test function.

Main Menu

Advance Settings-Tech mode-screens

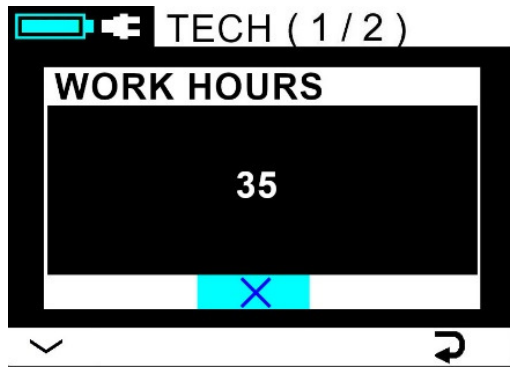


The Set Time screen

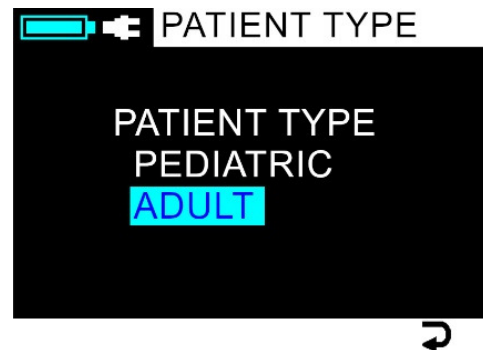
Main Menu

Advance Settings-Tech mode-screens

Under Tech mode, the user may perform volume calibration by choosing the calibration screen. The Calibration screen requires a device key to be entered:



Calibration screen: Enter key



Choose the patient type, before calibrating

CALIBRATION

	VTI	VTE
1	0493 ml	0503 ml
2	0500 ml	0502 ml
3	0501 ml	0490 ml
4	0000 ml	0000 ml

✓

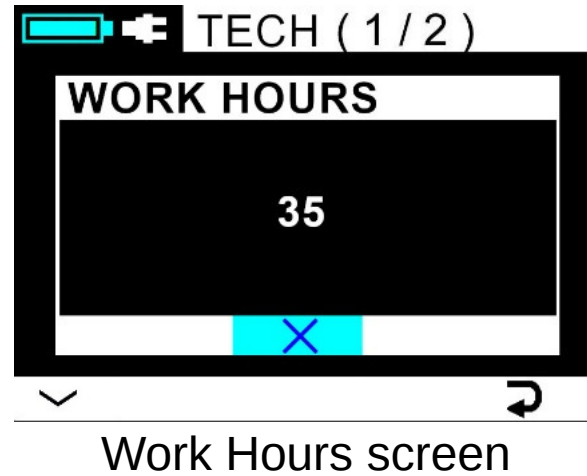
✗

Volume Calibration screen

*More on calibration- in Maintenance lesson

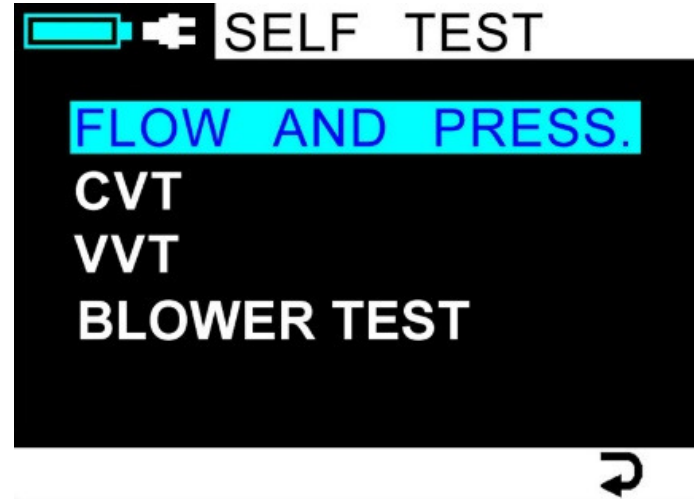
Main Menu

Advance Settings-Tech mode-screens



Main Menu

Advance Settings-Tech mode-Self Test



Self Test Screen

*for more information regarding the test please refer to chapter 10.4.5.4 in the user manual

The Self Test screen allows 4 tests:

- Flow and Press (10.4.5.4.1 in the user Manual)
- CVT (circuit verification test) (10.4.5.4.2 in the user Manual)
- VVT (ventilator verification test) (10.4.5.4.3. in the user Manual)
- Blower Test (10.4.5.4.4. in the user Manual)

Main Menu

Advance Settings-Tech mode-screens

The Logbook screen shows alerts, indications and user interaction with the ventilator:



Example of an alert



Note: The logbook is displayed in technician mode. Download is possible only in technician mode.



Note: Press **BACK** to exit log or **SCROLL** to continue viewing the log.

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Mini-size Turbine EMS & Transport Ventilator

Alerts

The following table summarizes the various types of alerts:

Alert type	Value	Range/Display
User Adjustable	Respiratory rate	High: 12-60 bpm Low: 1-20 bpm
	Inspiratory pressure	Limit: 10-65 cmH ₂ O Alert: 10-55 cmH ₂ O
	Apnea	5-120 seconds
	Leak	0-100%
	Low Tidal Volume Delivered	Off or 15%-85%
	Volume Limit Reached	70-1800 mL
	Inverse I:E Ratio	ON/OFF
	Alert Volume	0 (off) 1-34
	Pressure limit	10-60 cmH ₂ O
	Pressure alert limit	10-55 cmH ₂ O
	AC Power Disconnect	Screen icon and an audio cue

Alerts

The following table summarizes the various types of alerts:

Additional	Low Battery	Estimated battery energy level + Alert
	Empty Battery	Screen Icon + Alert
	Battery Disconnect	Screen Icon (swapping)
	Check Sensor tubes	Alert
	Tube Disconnect	Alert
	High PEEP	Alert
	Service Notice	Alert
	System Boot Failed	Alert



Note: If no patient weight was set, the user will not be able to change any default alert parameters.



Note: Minimal alarm sound level is 80 dB at a distance of one meter from the ventilator.

Alerts

Defenition

Alerts are defined with three levels of importance:

- High: Five beeps every two seconds
- Medium: Three beeps every five seconds
- Low: One beep one time only. Not shown in list of active alerts.



Example of an alert



Warning message

Alerts

Defenition

Alert category	Alert
High level	Blower malfunction
	Tube disconnect
	Patient disconnect
	Apnea
	System recovered from a crash
	Battery empty
	Sensor disconnect
	Low respiratory rate
	High minute volume
	Low minute volume
	High inspiratory pressure
	Low inspiratory pressure
	Leak
	Inverse I:E ratio
	Battery low
	High temperature
	Expiratory valve blocked
	High PEEP
	Low PEEP

Alert category	Alert
Medium level	High respiratory rate
	Volume limit reached
	Low tidal volume
	Low pressure
Low level	Replace filter
	Service needed
	Altitude out of range
	External power connected/disconnected (icon instead of popup message)
	Battery charge protection active

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Mini-size Turbine EMS & Transport Ventilator

Lesson 4

Default parameters and Oxygen enrichment

Lesson Scope:

- Default Params.
- Alert Default Params.
- Oxygen Supply

Default Parameters

Start Volume ventilation

The initial ventilation parameters for regular settings:

Patient Weight	Rate	Tidal Volume	Max. Pressure
(Kg)	(bpm)	(ml)	(cm H2O)
5	35	30	21
10	30	100	23
15	25	150	25
20	20	200	30
30	18	300	33
40	16	400	35
50	14	500	40
60	12	600	40
70+	12	700	40

Default Parameters

Alert default parameters

Alert Parameter	Weight								
	5kg	10kg	15kg	20kg	30kg	40kg	50kg	60kg	70+ kg
Pressure Alert (cm H ₂ O)	21	23	25	30	33	35	40	40	40
Pressure Limit (cm H ₂ O)	25	28	30	35	40	42	47	50	50
High Rate (BPM)	45	40	35	30	30	30	30	25	25
Low Rate (BPM)	12	10	10	10	8	6	6	6	6
High Min. Vol. (LPM)	2.5	4.2	5.3	5.6	7.6	9	9.8	10.1	12
Low Min Vol. (LPM)	1	1	1	2	2	3	3	4	4

Default Parameters

Alert default parameters- All patients weights

PEEP	> 2.5 cm H₂O from set value
Low pressure	5 cm H ₂ O
Leak (%)	100% (off)
Inverse I:E Ratio	ON
Low Tidal Volume Alert Range	85% of set volume

Default Parameters

Alert default parameters- All patients weights

PEEP	> 2.5 cm H₂O from set value
Low pressure	5 cm H ₂ O
Leak (%)	100% (off)
Inverse I:E Ratio	ON
Low Tidal Volume Alert Range	85% of set volume

Oxygen Supply

Connecting the air inlet to the demand valve:

- When a high-pressure oxygen source that is connected to a demand valve is not available, the Ventway Sparrow ventilator can accept oxygen from a low pressure oxygen source such as a reservoir bag connected to a flow meter. To do this, use an optional low-pressure oxygen enrichment system attached to the ventilator air inlet port through an optional Ventway adapter.
- Adjust the flow of oxygen to reach the desired value of FiO₂. Select the "O₂ ENRICHMENT" option in the VENT. PARAMS menu.
- The FiO₂ value must be measured with a calibrated external oxygen analyzer.

Oxygen Supply

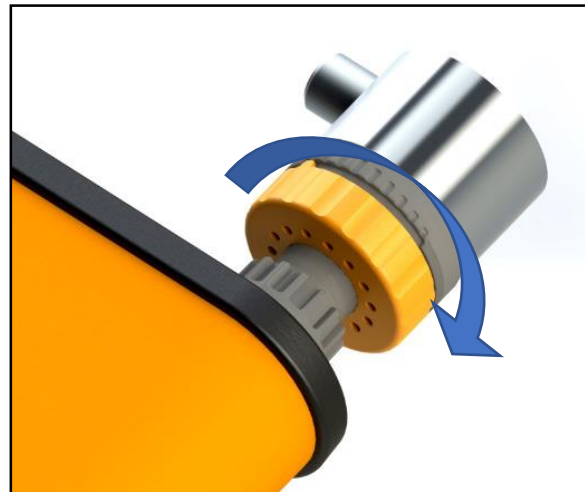
Connecting the air inlet to the demand valve:

- If a high-pressure oxygen source is available, an Inovytec-approved demand valve can be used to connect to the air inlet port, delivering between 30% to 95% FiO₂ to the patient. Measure FiO₂ with a calibrated external oxygen analyzer.
- The oxygen supply pressure shall be according to manufacturer specifications (usually 40-60 psi).

Oxygen Supply

Connecting the air inlet to the demand valve:

- If a high-pressure oxygen source is available, an Inovytec-approved demand valve can be used to connect to the air inlet port, delivering between 30% to 95% FiO₂ to the patient. Measure FiO₂ with a calibrated external oxygen analyzer.
- The oxygen supply pressure shall be according to manufacturer specifications (usually 40-60 psi).
- The oxygen demand valve is connected to the device.
- The oxygen demand valve connector is specially threaded to fit securely on top of the air/oxygen inlet.



Oxygen Supply

Connecting the air inlet to the demand valve:

- The demand valve/mixer may be adjusted so to mix atmospheric air and oxygen in ratios between 30% to 95%.
- The user may change the oxygen percentage of the gas mixture by rotating a knob at the base of the demand valve.
- The high pressure connection to the demand valve should be performed using a standard female DISS connector.

