

VICTORIAN RESPIRATORY SUPPORT SERVICE
AUSTIN HEALTH

GUIDELINES FOR THE OPERATION

OF

RESMED VS III VENTILATOR



SIZE:

Width: 27.5cm
Height: 14.5cm
Depth: 22.0cm
Weight: 2.9kg

The ResMed VSIII ventilator is a portable positive pressure ventilator. It delivers air to the user until a predetermined volume or pressure is reached.

MODES OF VENTILATION:

The ResMed VSIII ventilator has EIGHT modes of operation and a PEEP (Positive End Expiratory Pressure) function. It will be used only in one of the FOUR valve ventilation modes described below.

(A)CV (Assisted) Controlled Volume Ventilation CV - The ventilator delivers controlled breaths at the set rate until the predetermined **volume** is reached. **ACV** - The user can trigger breaths in excess of the set rate if the trigger function is turned on.

PS.Vt Pressure Support with Tidal Volume The ventilator delivers pressure supported breaths at the set rate and tidal volume for each breath, if necessary exceeding the set pressure for that breath cycle up to but not exceeding the High Pressure alarm. The user can trigger breaths in excess of the set rate if the trigger function is turned on.

(A)PCV (Assisted) Controlled Pressure Ventilation PCV - The ventilator delivers controlled breaths at the set rate until the predetermined **pressure** is reached. The machine will deliver a back up tidal volume, if the Vts function is set. **APCV** - The user can trigger breaths in excess of the set rate if the trigger function is turned on.

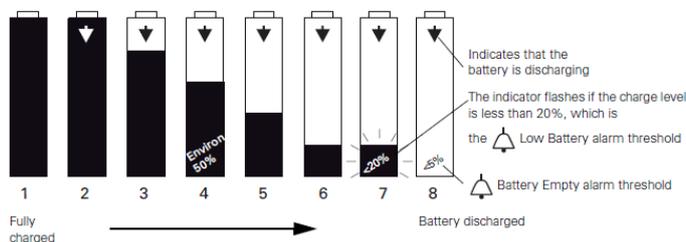
PS.Vs Pressure Support with/without back up rate The ventilator delivers pressure assisted breaths in response to patient effort, or at the set rate, with back up tidal volume, if the Vts function is set. Inspiratory time is determined by the patient (within the IPAP max and IPAP min limits).

POWER SOURCES:

The ventilator may be operated from AC Power, Internal Battery or External Battery.

 and  indicates unit is running on mains (AC) power and charging the internal battery.

 indicates unit is running on the external battery.



This battery symbol indicates unit is running on the internal battery, and the power remaining.

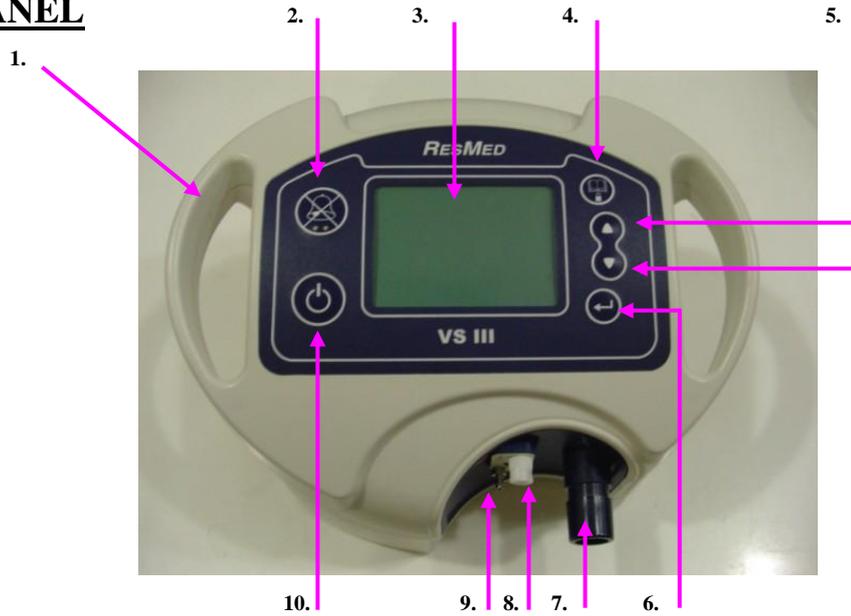
INTERNAL BATTERY:

The internal battery will provide approximately 2 hours of operation. The internal battery charges through the ventilator when it is plugged into AC power.

EXTERNAL BATTERY:

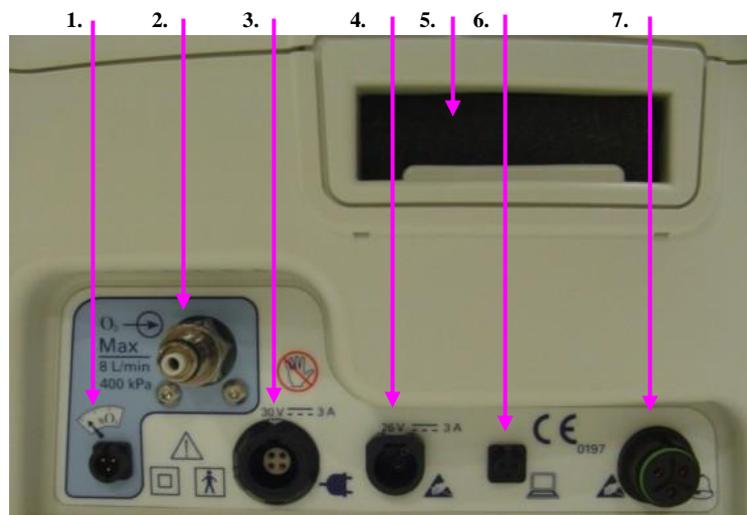
The 24 volt external battery supplied by VRSS, if connected to the unit, will provide about 24 hours of operation. **This battery does not charge through the ventilator.** A 3 stage 24 volt battery charger is needed to charge the external battery.

FRONT PANEL



1. Carrying handle – one on each side of machine.
2. Alarm silence button.
3. LCD screen – displays ventilation mode, power supply etc.
4. Menu button.
5. Up/Down buttons.
6. Enter button.
7. Air outlet – attach 22mm air tubing here.
8. Exhalation line port
9. Pressure line port.
10. On/Off button.

REAR PANEL

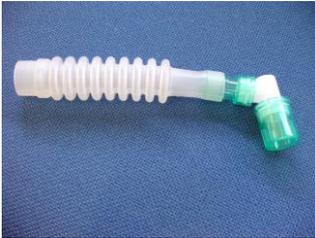


1. Oxygen sensor connector.
2. Oxygen port connector.
3. Mains power connector.
4. External battery connector.
5. Air intake with dust filter – wash dust filter every 3 months.
6. Data cable connector.
7. External alarm connector.

1. BREATHING CIRCUIT:

The breathing circuit consists of a flex tube and swivel connector, ONE length of 22mm diameter smooth bore tubing, TWO lengths of small bore tubing and a dual line exhalation manifold.

Flex tube & swivel connector



22mm, 3mm & 4mm tubes



Single circuit ports



Single circuit



1.1 Flex tube and swivel connector

Connects from the exhalation manifold to the tracheostomy tube. During the day an HME should be placed between the swivel connector and the flex tube to provide humidification.

1.2 22mm Smooth Bore Tubing

Connects from the **patient air** port on the ventilator to the body of the **exhalation valve**.

1.3 3mm Tubing (marked or coloured)

Connects from the **exhalation valve** port on the ventilator to the **nipple** on top of the exhalation valve.

1.4 3mm Tubing

Connects from the **pressure** port on the ventilator to the **pressure line** on the side of the exhalation valve.

Exhalation Valve



Consists of a Body (1), Green Diaphragm (2), Diaphragm Cap (3) and Lid (4). The Diaphragm (2) fits into the Body (1). The Diaphragm Cap (3) sits on top of the Diaphragm and is secured by the Lid (4) which locks with a clock-wise turn.

- Daily – take apart and wipe Diaphragm with an alcohol swab.
- Weekly – take apart and wipe Diaphragm with an alcohol swab. Warm soapy wash rest of exhalation valve; rinse; dry & put back together.

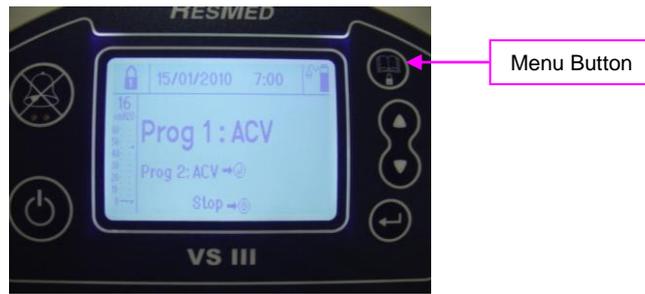
ENSURE THAT THE CIRCUIT IS PROPERLY CONNECTED

THE “CHANGE CURCUIT ALARM” WILL SOUND IF THE 3mm TUBES ARE CROSS-CONNECTED WHEN THE VENTILATOR IS TURNED ON

THE PATIENT WILL NOT BE VENTILATED IN THIS SITUATION

2. CONTROL PANEL:

2.1 LCD Display



When operating it shows the bar graph, control lock, date and time, power sources available, Prog 1 and Prog 2 (if activated). Press the **Menu** button, use the **Up/Down** arrows to select **View Settings** then press **Enter** to view the current settings. It will revert to the main screen after **30 seconds**.

2.2 On/Off button

Always assemble and attach the circuit before starting ventilation



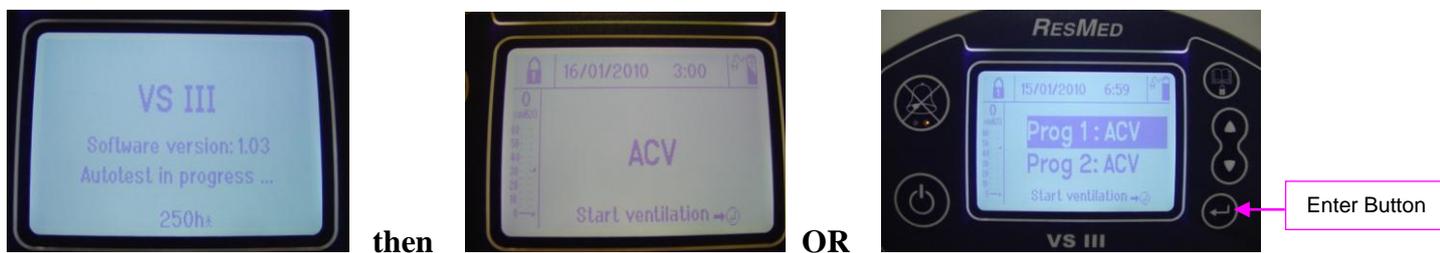
Start Ventilation – Press and release the **On/Off button** to turn the ventilator on.

The LCD screen will light up and the following screens will be displayed.

Press and release the **Enter button** start ventilation.

The machine will perform a self check before delivering air to the user.

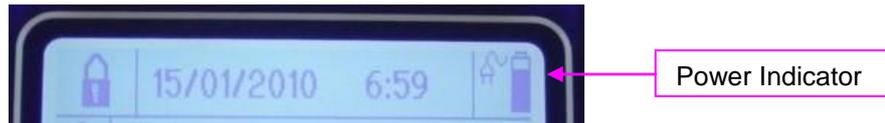
The self test takes about 11 seconds and there will be no air flow until the test is complete.



Stop Ventilation - Press and release the **On/Off button** then Press and Hold the **On/Off button** for **2 seconds**, or press and release the **Enter** button to go into standby mode.

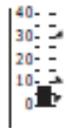
Turn Ventilator OFF - press and release the **On/Off** button then the **Down Arrow** then the **Enter button** to turn ventilator off. When the ventilator **STOPS** the alarm will sound. Press the **ALARM SILENCE BUTTON** to confirm shut down.

2.3 Power Indicator



Located in the upper right hand corner of the LCD it indicates the power source being used – Mains (AC) power, Internal battery or External battery.

2.4 Patient Pressure Graph



A bar graph on the LEFT side of the LCD shows the patient pressure during every breath cycle. The pressure meter is calibrated from 0 to 60cmH2O. The Peak Inspiratory Pressure will be displayed at the top of the graph after every breath.

2.5 Screen Locked/Unlocked



The control panel should be unlocked only by trained personnel. Press the **Menu** button for 5 seconds (1 beep) to unlock the panel. Use **Down** arrow to select 5 minutes then press the **Enter** button to confirm. Always ensure that the panel is locked after making adjustments to the ventilator settings.

2.6 Date and Time

While in standby mode press the **Menu** button. Use the **Down** arrow to select **Date and Time Setting** then press **Enter**. Use the **Down** arrow to select the field to be changed then **Enter**. Use the **Up/Down** arrow to make change then **Enter** to confirm. Once changes are complete press the **Menu** button to return to the standby screen.

2.7 Program 1

This will have the main settings for the user. To change from P1 to P2 when in standby mode press **Down** arrow then the **Enter** button to confirm. The selected Program will be highlighted with a purple bar.



2.8 Program 2 (if activated)

May have different settings than Program 1 for specific uses, such as physiotherapy or speaking valve placement into the circuit. May not always be utilised. View settings function as for Program 1. The ventilator will revert to the main screen after **30 seconds**.

2.9 Alarm Silence and Alarm Indicator



The alarm LED shows a RED or ORANGE light, an audible alarm will sound and alarm type will be displayed across the top of the screen if any of the ventilation parameters are not met. Press the **Alarm Silence** button to stop the alarm for **TWO** minutes, press again to clear the alarm icon from the screen once the problem has been corrected.

3. ACCESSING MENUS:

There are TWO accessible menus on this machine: **Patient menu** and **Clinical Menu**.

3.1 Patient Menu (default menu)

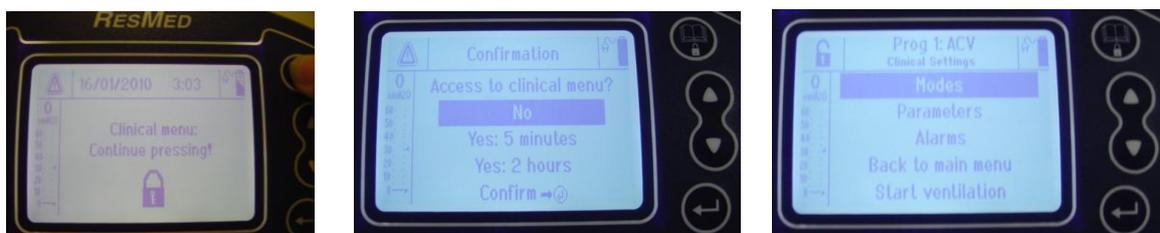
Displays the current ventilator settings. The screen is locked, giving read-only access to most settings. Press the **Menu** button, use the **Up/Down** arrows to select **View Settings** then press **Enter** to view the current setting. It will revert to the main screen after **30 seconds**.



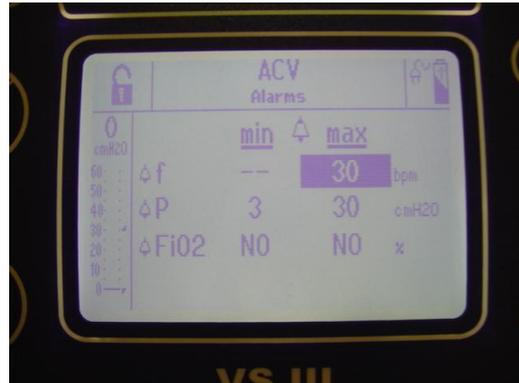
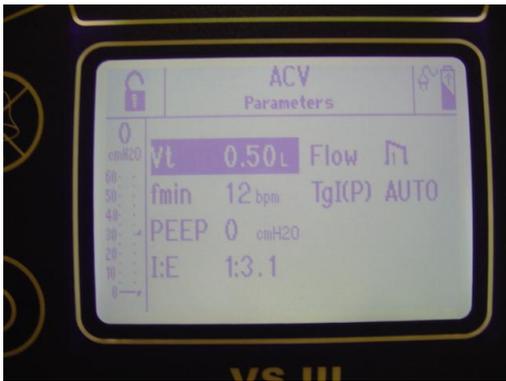
The patient menu allows the user to change only the date and time setting (see section 2.6 for a description of this operation).

3.2 Clinical Menu (screen unlocked)

This menu should be used only by trained personnel. It gives access to all ventilator settings. Press and hold the **Menu** button for 5 seconds (1 beep) to open the clinical menu. Press the **Down** button to select 5 minutes then the **Enter** button to confirm. Select the menu item to be changed and follow prompts on screen. Press and hold the **Menu** button to lock the control panel and return to the patient menu.



4. (A)CV Mode:



4.1 Vt: Setting range: 50ml to 2500ml. Controls the tidal volume (Vt) of air delivered by the machine in (A)CV mode.

4.2 f min: Setting range: 5 to 50 bpm. Indicates the MINIMUM breath rate to be delivered to the user in ACV mode. The user can trigger breaths in excess of the **fmin** up to the prescribed alarm limit.
f: Setting range: 5 to 50bpm. Indicates the breath rate delivered to the use in CV(controlled ventilation) mode in which the trigger function is turned off.

4.3 PEEP: Setting range: 0, 4 to 20cmH2O. Indicates the level of Positive End Expiratory Pressure maintained in the circuit during exhalation.

4.4 I:E ratio: Setting range: 1:0.3 to 1:8.0, depending upon settings. Indicates time allowed for inspiration compared to time for exhalation, for example 1:1 gives equal time for inspiratory and expiratory phase.

4.5 Ti: Setting range: 0.4sec to 4.3 sec. Indicates the duration fixed for inspiration in controlled ventilation modes: **CV** and **PCV**

4.6 Flow: Setting range:

4.7 TgI(P): Setting range Auto/1 to 6/No: Indicates the effort required to trigger a breath in excess of the set breath rate

ALARMS:

4.9 fmax Alarm: Setting range: 10 bpm to 70bpm, Off

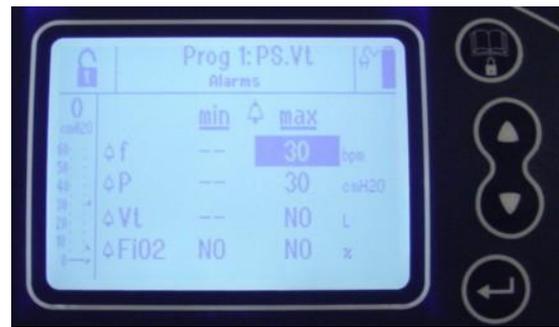
4.10 P min Alarm: Setting range: 2cm to 20cm H2O.

4.11 P max Alarm: Setting range: 20cm to 60cm H2O.

4.12 FiO2 min Alarm: Setting range: Off, 18% to 80%.

4.13 FiO2 max Alarm: Setting range: Off, 30% to 100%

5. PS.Vt Mode:



5.1 PS: Setting range: 5cm to 50cm.

5.2 PEEP: Setting range: 0, 4cm to 20cm

5.3 f min: Setting range: No, 5 to 50 bpm

5.4 Vt: Setting range: No, 0.05 litres to 2.5 litres

5.5 Rise t: Setting range: 0, 1 to 3

5.6 TgI (P): Setting range: Auto, 1 to 6

5.7 TgE: Setting range: Auto, 5% to 90%

5.8 Ti max: Setting range: 0.3 sec to 2.7 sec

ALARMS:

5.9 Vti Min alarm: Setting range: No, 0.02 litres to 2.5 litres

5.10 Vti Max alarm: Setting Range: No, 0.05 litres to 2.5 litres

Other alarms in this mode the same as (A)CV mode

6. (A)PCV Mode:



6.1 PS: Setting range: 5cm to 50cm H2O

6.2 PEEP: Setting range: 0, 4cm to 20cm H2O

6.3 f min: Setting range: 5 to 50 bpm

6.4 Ti : Setting Range: 0.5sec to 3.0 sec

6.5 Rise t: Setting range: 0, 1 to 3

6.6 Vts: Setting range: no, 0.05 litres to 2.5 litres

6.7 TgI (P): Setting range: Auto, 1 to 6, No

ALARMS:

6.8 f Alarm: Setting range: 10 to 70 bpm

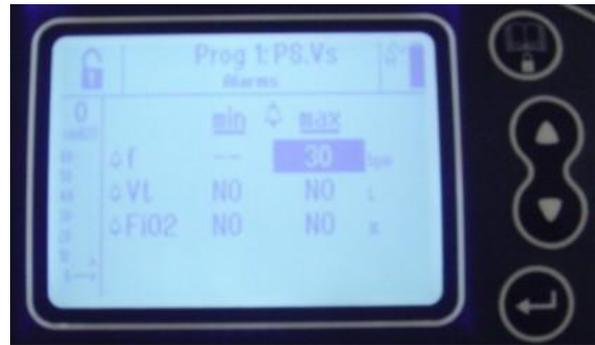
6.9 Vt Min Alarm: Setting range: No, 0.02 litres to 2.5 litres

6.10 Vt Max Alarm: Setting range: No, 0.10 litres to 2.5 litres

6.11 FIO2 min Alarm: Setting range: Off, 18% to 80%

6.12 FIO2 max Alarm: Setting range: Off, 30% to 100%

7. PS.Vs Mode:



7.1 PS: Setting range: 5cm to 50cm H20

7.2 PEEP: Setting range: 0, 4cm to 20cmH20

7.3 f min: Setting range: No, 5 to 20 bpm

7.4 Rise t: Setting range: 0, 1 to 3

7.5 Vts: Setting range: No, 0.05 litres to 2.5 litres

7.6 TgI (P): Setting range: Auto, 1 to 6

7.7 TgE: Setting range: Auto, 5% to 90%

7.8 Ti min: Setting range: 0.3 sec to 2.5 sec

7.9 Ti max: Setting range: 0.7 sec to 3.0 sec

Alarms in this mode the same as (A)PCV mode

8. ALARM PRIORITIES:

8.1 High Priority Alarms:

Red LED flashes rapidly and there is a series of beeps every **10 seconds** (** * * * ** * * * **)

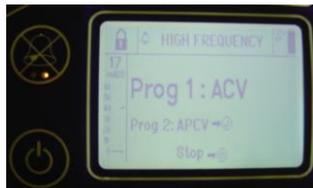
8.2 Medium Priority Alarms:

Orange LED flashes slowly and there is a series of beeps every **20 seconds** (* * *)

9. ADJUSTABLE ALARMS:

9.1 High Frequency (Rate) Alarm:

Orange LED flashes and alarm sounds if the breath rate limit is exceeded for 15 seconds.



9.2 Low Vti

Red LED flashes and alarm sounds if the minimum inspired volume setting is not met for 15 seconds

9.3 High Vti Alarm:

Red LED flashes and alarm sounds if the **Maximum** tidal volume setting is exceeded for 15 seconds.

9.4 Low Pressure Alarm:

Red LED flashes and alarm sounds if the **Minimum** inspiratory pressure setting is not reached for 15 seconds.



9.5 High Pressure Alarm:

Red LED flashes and alarm sounds if the **Maximum** inspiratory pressure setting is exceeded for 3 breath cycles.



9.6 Low FiO² Alarm:

Orange LED flashes and alarm sounds if the FiO² value has fallen below the minimum value.

9.7 High FiO² Alarm:

Orange LED flashes and alarm sounds if the FiO² value has exceeded the maximum value.

9.8 Connect Circuit Alarm: - NOT ADJUSTABLE

Red LED flashes and alarm sounds if any of the tubes disconnect or become loose or if the exhalation manifold is not correctly assembled

10. CLEANING AND MAINTENANCE:

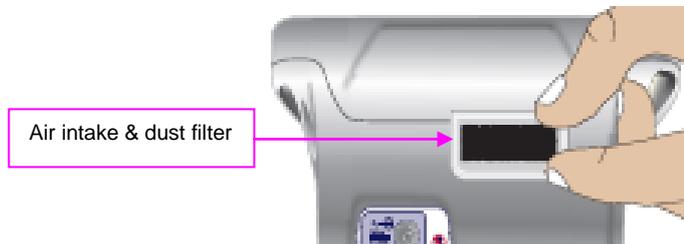
Do not place anything on top of the ventilator.

Do not allow water or other fluid to spill onto the ventilator.

If a humidifier is in use a water trap should be placed between the humidifier tube and the ventilator to prevent fluid running back into the air outlet.

10.1 Dust Filter:

The grey foam filter located in the air intake on the rear of the machine should be washed in warm soapy water every month and replaced as necessary.



10.2 Cleaning:

Wipe the ventilator over with a lint free cloth slightly dampened with water and/or a mild detergent. Do not allow any liquid to enter the ventilator. Do not use alcohol or abrasive cleaning agents.



10.3 Ventilator Service:

Authorised personnel will a yearly service and performance test, as required by the manufacturers maintenance schedule. The VRSS Outreach Service will contact you to make arrangements for routine servicing.

The expected life of the internal battery is **2 years**. To ensure maximum battery life, the internal battery should be discharged and recharged **ONCE** every **Six** months. A full recharge will take 12 hours. The internal battery will be replaced as part of routine service every **2 years**.

11. Troubleshooting Guide:

11.1 Alarms that can be stopped for TWO minutes:

Press the alarm silence button  to stop the audible alarm for 2 minutes. The message and LED continue to flash. If the problem is not resolved within this time the audible alarm starts to beep again. Once the problem is resolved the message stops flashing. Press the alarm silence button to clear the alarm message from the screen.

Alarm	Symptoms	Solution
 Low Battery (no power supply)	The charge level of the internal battery is 15% or less and no other power supply is connected.	Connect the respirator to mains power without delay to recharge the internal battery.
 Empty Battery (with power supply)	The internal battery is faulty, disconnected or flat (charge level < 5%).	Charge the internal battery by connecting the respirator to mains power. If the problem persists, you may need to ask a technician to check the electrical connections or replace the battery.
 Low Pressure (pressure and volume modes)	Insufficient pressure in the circuit.	Check that there are no leaks in the air circuit, and check the alarm threshold in volume modes.
 Connect Circuit	Maximum flow and zero pressure at the end of the tubing.	Check that the patient circuit is connected correctly.
 Sgl. Cir. Detected	Circuit configuration changed from double to single.	Check that the respirator is correctly configured and, if necessary, confirm that the circuit type has changed.
 Dbl. Cir. Detected	Circuit configuration changed from single to double.	Check that the respirator is correctly configured and, if necessary, confirm that the circuit type has changed. Check that the circuit support is assembled correctly.
 Prox. P. Lost	The proximal pressure line is disconnected.	Reconnect the proximal pressure tube.
 Prox. P. Detected	Either the respirator has not detected the proximal pressure line, or the previous configuration did not include a proximal pressure line.	Check that the proximal pressure line is connected correctly and the respirator is correctly configured (ask your technician to check).
 High Frequency	High respiratory rate. The patient is having difficulty breathing.	Check the alarm threshold level.
 Low Vti	The inspiratory tidal volume is low.	Check the circuit, check that the patient is not obstructed and check the alarm threshold level.
 High Vti	The inspiratory tidal volume is high. The patient circuit is disconnected.	Check the patient circuit, check for leaks and check the alarm threshold level.
 Low FiO ₂	The FiO ₂ value has reached/fallen below the lower threshold.	Check the level at which the alarm threshold is set, then check the oxygen supply.
 High FiO ₂	The FiO ₂ value has reached/risen above the upper threshold.	Check the level at which the alarm threshold is set, then check the oxygen supply.

11.2 Alarms that can be stopped permanently:

The audible alarm can be stopped by pressing the alarm silence button . The LED and message will continue to flash. Once the problem is resolved the message disappears and the beeping stops. Press the alarm silence button again to clear the message from the screen.

Alarm	Symptoms	Solution
 Mains Disconnect	Loss of mains power supply with another power source connected.	Check the power cords.
 Ext. Battery Lost	The connection with an external battery has been lost.	Check the connections and charge level of the external battery.
 Low Backup Batt	The voltage of the backup battery is low. The time setting has been lost. The respirator has been disconnected from mains power for too long.	Connect the respirator to mains power for half a day. If the problem persists, ask your technician for advice.
 O2 Cell Missing	The O ₂ sensor is missing.	Check the sensor cable is firmly connected to the rear of the respirator.
 Change O2 Cell	The O ₂ sensor is faulty.	Replace the O ₂ sensor.

11.3 Alarms that cannot be stopped:

The alarm will stop and reset automatically when the problem is resolved.

Alarm	Symptoms	Solution
 Tech.[n]	Sensor or microcontroller fault.	Contact your technical department and tell them the alarm number.
 Turbine	The turbine has stopped.	Contact your technical department.
 High Pressure (pressure/volume modes)	Excessive pressure in the circuit.	Check the respiratory circuit, check that the patient is not obstructed, and check the alarm threshold level for volume modes.
 High Battery Temp	The temperature of the internal battery is too high.	Contact your technical department.
 Empty Battery (no power supply)	The battery is flat and no backup power supply is connected.	Charge the internal battery immediately by connecting the respirator to mains power.
 FiO ₂ < 18%	The FiO ₂ has fallen below 18%.	Check and if necessary change the O ₂ sensor.
 Change Circuit	The circuit is different to the one for which the respirator is configured.	Patient: Connect the circuit correctly. Technician: Configure the respirator for the correct circuit in accordance with the ventilation modes.