SIMV/ASB MODE: BASIC SETTINGS EXPLAINED

PARAMETER	STARTING POINT SETTINGS	PARAMETERS + FUNCTIONS EXPLAINED
O2	**60%**	Lowest setting is 21% equivalent to room air. Oxygenation of blood can be improved by increasing FiO2, increasing PEEP or prolonging the inspiration time.
Vt	**550**	This is the fixed amount of tidal volume that is delivered with each breath. Typical range is 5-7ml/kg but needs to be carefully monitored in patients with poor lung compliance as may induce high airway pressures. Titrate tidal volume carefully with aim to maintain airway pressure <30cm. Tidal volume x respiratory rate = minute ventilation.
T insp	**1.5**	The part of a single breath when the ventilator is able to deliver gas to the patient's breath over a fixed period of time (seconds). May be increased > 1.7 seconds to allow more time for oxygen/gas delivery. Touch this key and the I:E ratio is expressed along with the expiration time. Normal I:E ratio is 1:1.9. Asthmatics may require a longer I:E ratio e.g. 1:3 or even 1:4.
Rate	**14**	Respiratory rate may also be referred to as frequency (f). The respiratory rate multiplied by the tidal volume for each breath results in the expired minute volume or minute ventilation. An SIMV rate of 14 means that the patient is getting 14 mandatory breaths. The patient is allowed to take additional breaths in between the mandatory breaths. The respiratory rate parameter is often manipulated to control carbon dioxide levels. Aim to maintain PaCO4 of 4.0 kPa in acute cerebral injury.
Ramp	**0.35**	Rise time: determines the speed at which the set pressure can be achieved. Default setting is 0.2 seconds. Patients with stiff lungs e.g. brittle asthmatics/ARDS may benefit from a slightly slower rise time.
PEEP	**6**	Positive end-expiratory pressure: maintains alveolar expansion during expiration. Useful for increasing time for gas exchange/increasing PaO2. Also indicated in severe hypoxia. Average of 6-10cm is used. Avoid PEEP or use with caution in patients presenting with acute cerebral injury.
ASB	**16**	Assisted Spontaneous Breathing or commonly referred to as pressure support. This is the level of assistance that will provide tidal volume for each spontaneous breath. Ideally, the ASB level should always be set, irrespective of the patient's readiness to wean. It is usual to set ASB 16-20. The size or tidal volume of the spontaneous breaths may be small (so increasing the ASB level will help) or may be large (so decreasing the ASB level will help).

ACTIVATING THE AUTOFLOW FUNCTION

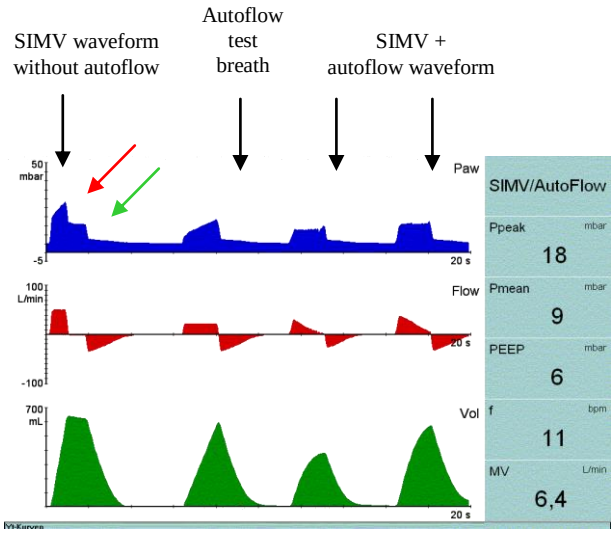
- Press the Extra Settings key.
- Press Autoflow.
- Press 'On'.
- SIMV/ASB Autoflow will now appear on the top left corner of the display screen.

WHAT IS AUTOFLOW?

- Autoflow is not a ventilation mode independently selected in itself. It can be used in conjunction with all volume controlled modes eg. SIMV / Autoflow, IPPV / Autoflow. It could be compared to the way one function enhances another such as flow trigger enhances pressure support.
- Autoflow is a function which enables the ventilator to automatically regulate inspiratory flow.
- The set tidal volume is always given at the minimum possible pressure and spontaneous breathing is possible (open valves) through the whole inspiratory and expiratory phases of the mechanical ventilatory cycle.
- A decelerating flow pattern reduces peak pressures and as lung compliance changes further they are recognised and responded to.

<u>When would you use Autoflow</u>?

- Using Autoflow in addition to volume controlled ventilation modes means that high airway pressures can be reduced and spontaneous breathing can be enhanced with reduced use of sedation and muscle relaxants.
- The decelerating flow and the regulated inspiratory and expiratory valves provide a response to every inhalatory and exhalatory effort of the patient. This feels like breathing through an open system.
- The matching of flow and volume to patient needs in synchrony with inspiratory time at minimum pressures promotes harmony between patient and ventilator. This reduces considerably the phenomena known as "fighting the ventilator".



<u>Pressure waveform differences using autoflow</u>:

- <u>SIMV/VC waveform without autoflow</u>: observe the sharp peak pressure (red arrow) before the plateau (green arrow)
- <u>Autoflow test breath</u>: when autoflow is switched on, the test breath searches for the level of the plateau and then gauges consequent breaths at plateau pressure.
- <u>SIMV + autoflow waveform</u>: no sharp peak pressures noted. Tidal volume is delivered equally at the level of the plateau.

SIMV/ASB EXTRA SETTINGS: DRAGER EVITA 4		
TRIGGER	**3**	• The default setting is 5 litres/minute. • ICU's preference is to change this to 3 litres/minute • Reducing the setting to 3litres makes it easier for the patient to trigger a spontaneous supported breath. • 3 litres is set, irrespective of the patient's readiness to wean. • Do not lower the setting < 3litres/minute as auto-cycling make occur.
APNOEA VENTILATION	**500** **8**	• Always ensure that apnoea ventilation is switched on. • Particularly important when in CPAP/ASB mode. • Using the 'alarm limits' key set the apnoea time to 20 seconds. • Set the tidal volume to 500ml and breaths to 8. • This means that if the patient fails to initiate a breath within 20 seconds, the ventilator will provide 8 back-up mandatory breaths and each breath will deliver a tidal volume of 500ml. • The 'Apnoea ventilation' message will continue to appear until the 'Alarm reset' key is pressed. This needs to be done to allow the patient to resume spontaneous breathing. • If 'Apnoea ventilation' message continues, it may be necessary to resumemandatory ventilation mode i.e. SIMV/ASB for a short period and re-attempt CPAP/ASB later if condition allows.

WEANING FROM SIMV/ASB TO CPAP/ASB
Step 1: Reduce ventilator breaths to 8 and if spontaneous effort is observed, then change to CPAP/ASB.
Step 2: Maintain set level of PEEP and start reducing ASB by 2cm every 2 hours (or more speedily if patient condition allows) until ASB = 6cm
Step 3: If patient doesn't attempt spontaneous effort: increase ventilator rate to previous setting. Rest for 1 hour and repeat Step 1 each hour until converted to CPAP/ASB or as otherwise directed by Medical Staff.

EXTUBATION CRITERIA
• Respiratory rate < 35 per minute. • Oxygen saturations > 90%. • Conscious level is adequate: obeys simple commands appropriately. • Sedation is stopped. • Enteral feeding is stopped – or stomach decompressed. • The patient is cardiovascularly stable. • Swallow and gag reflexes are present. Is able to cough effectively + clear secretions. • Breath sounds equal + clear. CXR is satisfactory.

UNDERSTANDING INSPIRATION:EXPIRATION RATIO

- The respiratory rate determines the total time period for each breath.
- 60 seconds ÷ respiratory rate = duration in seconds for each breath.
- The default setting for the inspiration time on the Evita 4 ventilator is 1.7 seconds.
- The ratio is then calculated as shown in the following examples.

If respiratory rate is set at 12:

- 60 seconds ÷ 12 = 5 seconds for each breath.
- Inspiration default time is 1.7 seconds.
- 5 seconds – 1.7 seconds (inspiration) = 3.3 seconds for expiration.
- Calculate ratio by: dividing expiration time (3.3) by inspiration time (1.7) = 1.9
- I:E ratio is 1:1.9
- Expiration is almost twice as long as inspiration.

Normal I:E ratio is 1:1.9 or 1:2

Asthmatics or individuals with chronic lung disease may have a longer I:E ratio and this may mean adjusting the ventilator settings appropriately. Generally these patients need longer time for expiration – so the expiration time needs to be adjusted on the ventilator. This can be achieved by manipulating the inspiration time.

If an I:E ratio of around 1:3 is needed, then undertake the following:

- Touch the inspiration time parameter.
- And at the same time, rotate the control dial to adjust the inspiration time.
- Changing the inspiration time to 1.3 seconds will increase the expiration time to 3.7 seconds (assuming that the ventilator rate is set at 12).
- 3.7 ÷ 1.3 = 2.8 or an I:E ratio of 1:2.8
- Expiration is almost 3 times as long as inspiration.
- Increasing the expiration time may reduce the unwanted effect of intrinsic PEEP or gas trapping + may also aid CO_2 clearance.

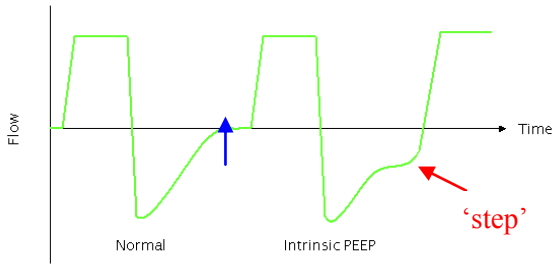
Flow Waveforms:

The flow waveform shows changes in the rate of flow of gas over time. The vertical axis of the flow graphic represents L/min flow; the horizontal axis represents time. A deflection above the baseline of the flow waveform indicates gas is flowing into the patient (inspiration). A deflection below the baseline of the flow waveform indicates that gas is flowing out of the patient (expiration). The flow waveform can be used to determine whether the ventilator is well-synchronized with the patient, the presence of air trapping/intrinsic PEEP and whether the patient's flow needs are being met.

Observe the flow waveform:

If the expiratory flow returns smoothly to the baseline, then the patient has adequate time to fully exhale (blue arrow).

If the expiratory flow doesn't return smoothly to the baseline and has a 'step-like' appearance, this may indicate that the patient doesn't have enough time to fully exhale (red arrow).



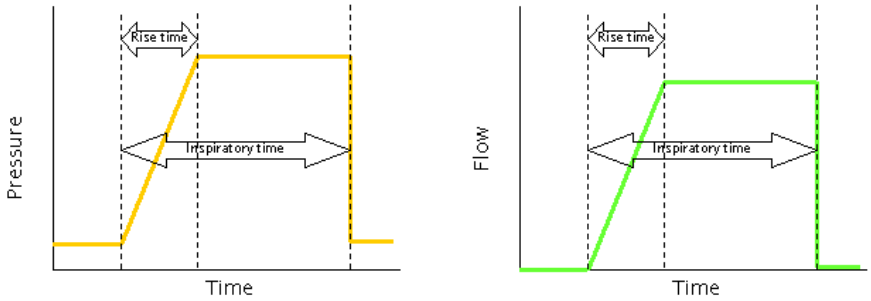
TRIGGER SENSITIVITY, RISE TIME AND INTRINSIC PEEP EXPLAINED:

Trigger Sensitivity: the point at which the act of drawing breath is detected.

- Trigger sensitivity determines how easy it is for the patient to trigger the ventilator to deliver a breath.
- Triggering may be flow-triggered or pressure triggered.
- The smaller the flow or the smaller the negative pressure the more sensitive the trigger.

Rise Time: time taken (in seconds) to inflate the lung to set pressure.

- Determines speed of rise of flow or pressure.
- Very short rise times may be more uncomfortable for the patient (especially for those with brittle lung disease).
- Long rise times may result in a lower tidal volume being delivered.



Intrinsic PEEP: in simple form – inability to fully exhale.

- Occurs when inspiratory time is too long and expiratory time is short.
- Can also occur when respiratory rate is high – so expiratory time is short.
- Often seen in chronic obstructive pulmonary disease/asthma.
- Insufficient expiratory time results in insufficient time for the alveoli to empty before the next breath.
- Also referred to as "gas trapping".
- Can be measured on some ventilators (expiration hold control) or by observing flow or pressure patterns.