HT50 in service

Objectives

- **HT50 IN SERVICE**
- Familiarization with the HT50 ventilator.
- HT50 set up.
- Review of intubated/invasive modes and non-invasive modes.
- CLEMC protocol specific BiPAP settings.
- Hands on training.

Review

- Intubated/Invasive
  - A/C: assist control
    - Not recommended for transport
    - Risk of autocycling secondary to vibrating environment and therefore potential for inadvertent breath stacking and related complications.
  - PS: pressure support
    - Always utilized in conjunction with SIMV.
    - 8-10cmH20 (above PEEP) standard initial setting
    - Adjust as necessary for patient comfort.
    - Can be used alone as intubated spontaneous mode in certain cases where patient controlled VE is ideal and respiratory effort is sufficient.
  - SIMV: synchronized intermittent mandatory ventilation
    - Mode of choice for transport
    - Awareness must be made to patients received on A/C and over breathing; if the plan of care includes eliminating spontaneous effort for transport- monitor for need to increasing SIMV breath rate to maintain adequate / desired VE.

Review

- CPAP – Continuous positive airway pressure throughout the respiratory cycle
- BiPap – Pressure support on inspiration and peep on exhalation. IPAP and EPAP
- CPAP helps to splint open smaller airways, BiPap eases WOB by allowing accessory muscles to rest and recruiting collapsed alveoli

Review

- Non Invasive
  - CPAP/BiPAP:
    - Set alarms:
      - High pressure alarm limit +10cm H2O above actual PIP
      - Low pressure limit 5 to 10 below PIP
    - PC: pressure control (cmH2O)
      - Set PC value to be delivered (above PEEP)
      - Start at 15cmH2O / PEEP and adjust as necessary
      - Adjust PC to obtain desired chest rise / Vte
    - Volume: ml
      - Set Vt vlue to be delivered
      - For any patients generating PIP > 30cmH2O consider switching to PC
    - Select breath type:
      - Target Vte for all patients = 6-8ml/kg based on IBW
      - Consider 4-6ml/kg Vte strategy for patients requiring excessive PIP

Review

- FiO2:
  - Ideally maintain SpO2 > 94% may be lower for COPD patients with hypoxic drive
- I-time: seconds
  - Based on age and/or disease process
  - Longer I-times can help contribute to recruitment and increased mean airway pressure
  - Suggested ranges:
    - Adult 0.80 – 1.5
- PEEP: (cmH2O)
  - Physiological 3-5 cm/H20
  - Therapeutic 5-20 cm/H20

Review

- Non invasive positive pressure ventilation (NPPV):
  - CPAP and BiPAP assist in restoring proper functional residual capacity (FRC) in the respiratory compromised patient. The treatment goal is to increase compliance, alveolar recruitment, improved gas exchange and decreased overall work of breathing (WOB). CPAP may provide additional benefit by improving cardiac function in the patient with poor left ventricular function by reducing left ventricular preload and afterload.
  - BiPAP: bi level positive airway pressure
    - Provides both inspiratory and expiratory positive pressures
    - Primary choice for: fatigue due to respiratory distress, extreme air hunger, asthmatics and COPD
  - CPAP: continuous positive airway pressure
      - Can be delivered invasively or non invasively
      - CPAP is ideal for initiating NPPV, if desired response not achieved can switch to BiPAP
  - Patients conditions:
    - CHF
    - Pulmonary edema
    - Respiratory distress
    - Pneumonia or other respiratory infections
    - Asthma / COPD
    - Neuromuscular disorders

Review

- Contraindications:
  - Respiratory or cardiac arrest
  - Depressed level of consciousness w poor respiratory drive
  - Severe hypotension
  - Untreated tension pneumothorax

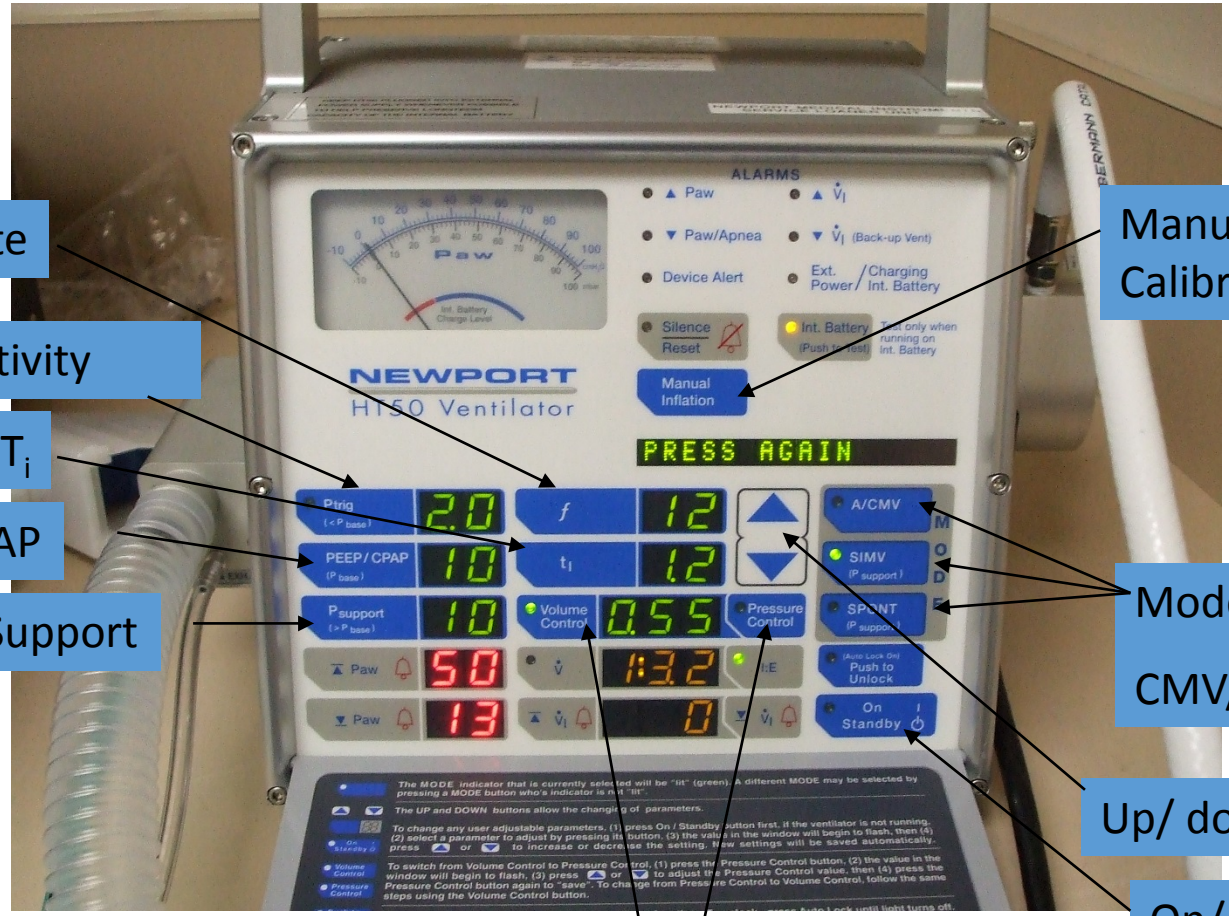
HT50 Overview

- Ptrig – sets pressure required for the machine to *trigger* a breath.
- Peep/CPAP – sets the Peep/CPAP pressure
- Psupport – sets the pressure support added to each inspiration
- F – sets inspiratory rate
- Ti – sets inspiratory time

HT50 overview

- To change any value/ setting, push blue soft key associated with value/ setting until the value flashes. Use up/ down arrows to adjust.
- To lock in new value, push soft key again to confirm before selecting another value to adjust. If left alone for approx. 3 seconds, the ventilator will accept the new value automatically.
- If changing between modes of ventilation, the blue soft key needs to be pushed twice. The ventilator will prompt you to "Press again" in message display window. (If not pressed twice, it will revert back to previous setting)
- The **green values** displayed (Ptrigger, PEEP, Psupport, f, ti, pressure control or volume control) are settings that can be manipulated using the **blue** soft keys.
- The displayed red values (High and low airway pressures) are alarm settings that can be manipulated by using the grey soft keys.
- The displayed orange values are calculated values based on settings (with the exception of high & low minute volume alarms which are set values) and cannot be changed unless other settings are changed. These values are also selected using the grey soft keys.

HT50 overview



Rate

Trigger sensitivity

T_i

PEEP/ CPAP

Pressure Support

Manual Inflation / Calibration

Mode selections:

CMV/ SIMV/ Spont

Up/ down adjustments

On/ Standby

Volume (V_t) / Pressure (PIP) controls

HT50 overview

Alarm Silence/ Reset

Internal Battery

Flowrate- calculated based on f and V_t

I : E ratio

High airway pressure

Low airway pressure

High minute volume

Low minute volume

HT50 overview

Pressure gauge

Alarms

Message display window

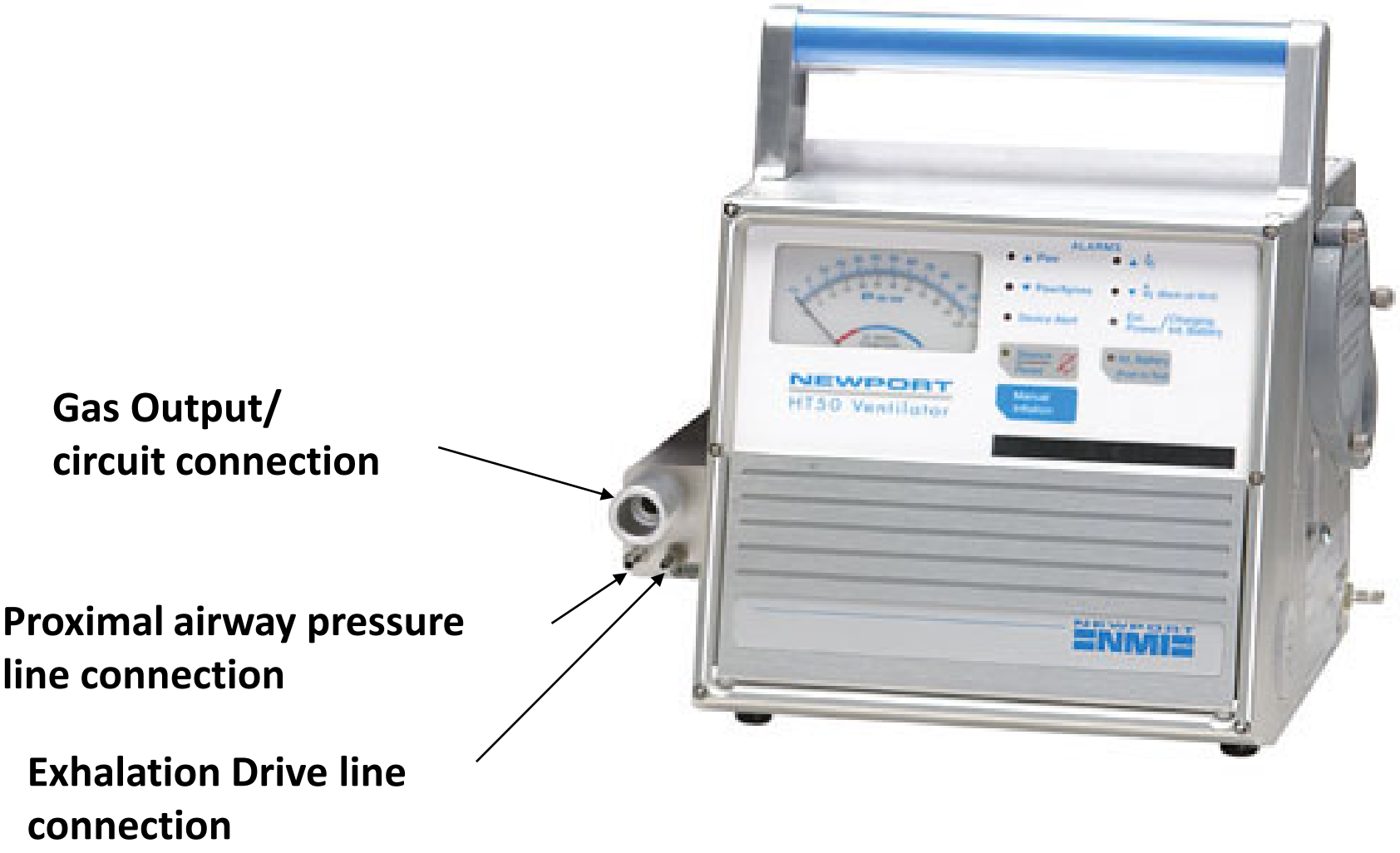
HT50 overview

Fresh Gas Intake & filter- Filter should be changed when dirty or contaminated

Oxygen Blender/ FiO_2 adjustment- No O_2 analyzer built in therefore, an inline oxygen analyzer must be used.

A/C connection- should be plugged in at all times to charge internal battery. Fully charged the battery offers 10 hrs of operation. Low battery alarm will sound when battery life is down to approx. 20%.

HT50 set up


Gas Output/
circuit connection
Proximal airway pressure
line connection
Exhalation Drive line
connection
NEWPORT
HT50 Ventilator
NMI

HT50 set up

WARNING!
EMERGENCY AIR INTAKE
DO NOT OBSTRUCT!
GAS OUTPUT
AIRWAY PRESSURE
COMM. PORT

Calibrate the exhalation valve prior to using the ventilator

- Press *On/Standby* once to turn on ventilator
- Occlude end of circuit or attach circuit to an adult test lung
- Press *Manual inflation* TWICE within 3 seconds to begin Calibration procedure - ventilator will perform calibration and display 'cal completed' when finished.
- If calibration fails ('cal failed'), press *silence/reset* and check circuit & test lung for leaks then press *manual inflation* twice to perform calibration again.

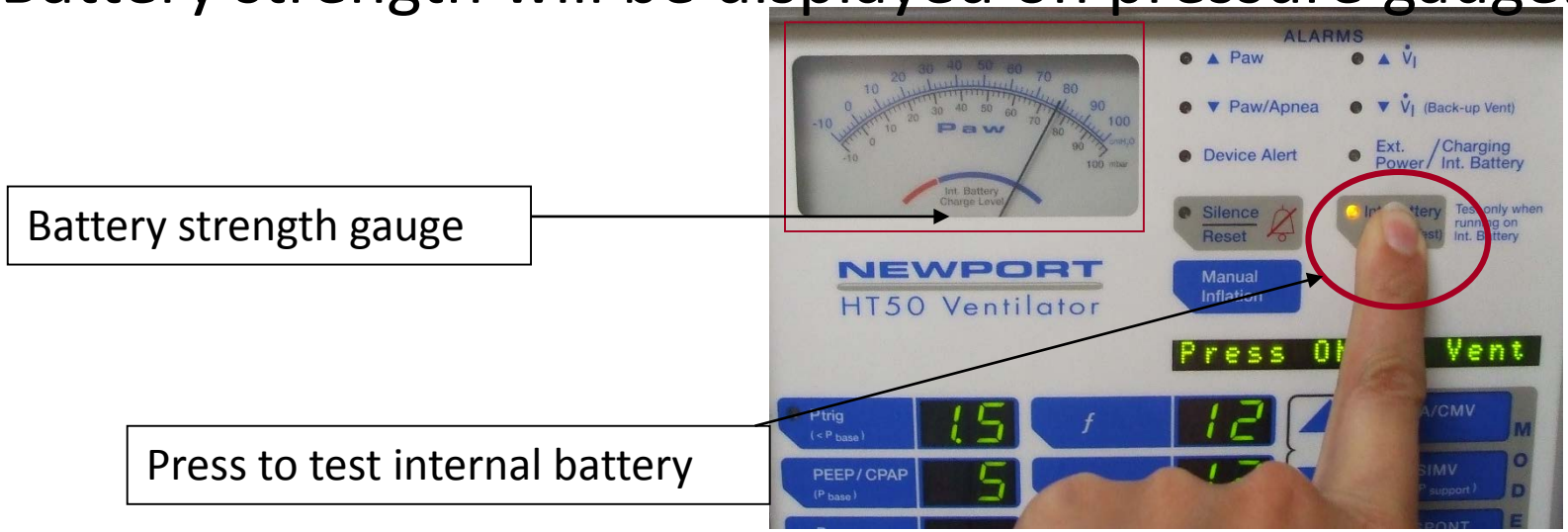
You can now set desired ventilation parameters.

Testing Internal Battery

- Unplug ventilator to activate internal battery (Internal battery indicator will light and alarm will sound). Silence alarm.

- Press and hold *Int. Battery* softkey

- Battery strength will be displayed on pressure gauge.



A/CMV *(assist/continuous mandatory ventilation - mode of ventilation characterized by a ventilator that makes no effort to sense patient breathing effort. In continuous mandatory ventilation, the ventilator can be triggered either by the patient or mechanically by the ventilator. The ventilator is set to deliver a breath according to parameters selected by the operator.)*

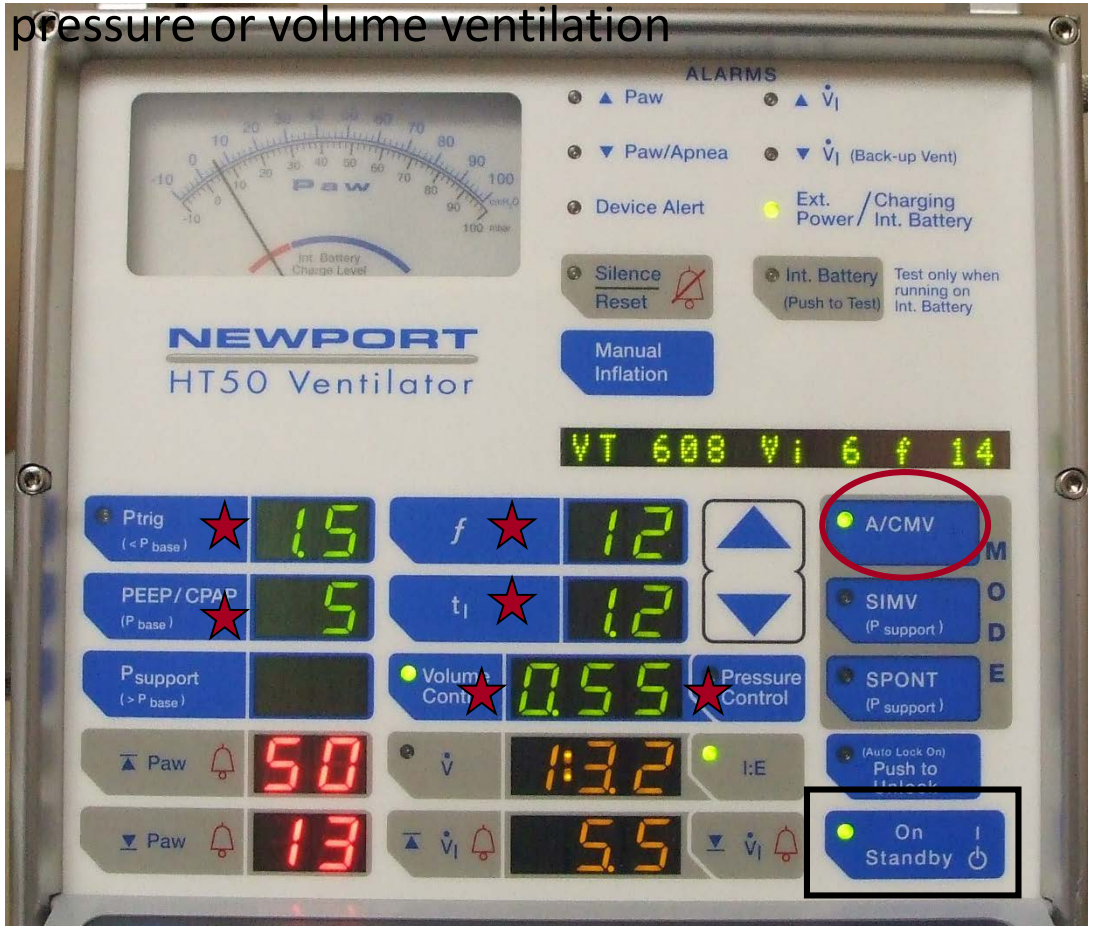
- Can be used with pressure or volume ventilation

<u>Set</u>:

- *A/CMV*
- *PEEP*
- *f*
- T_i
- V_t *or PIP*

(above ambient P)

- Alarms



- Press *On/Standby* to start ventilator then attach circuit to patient.

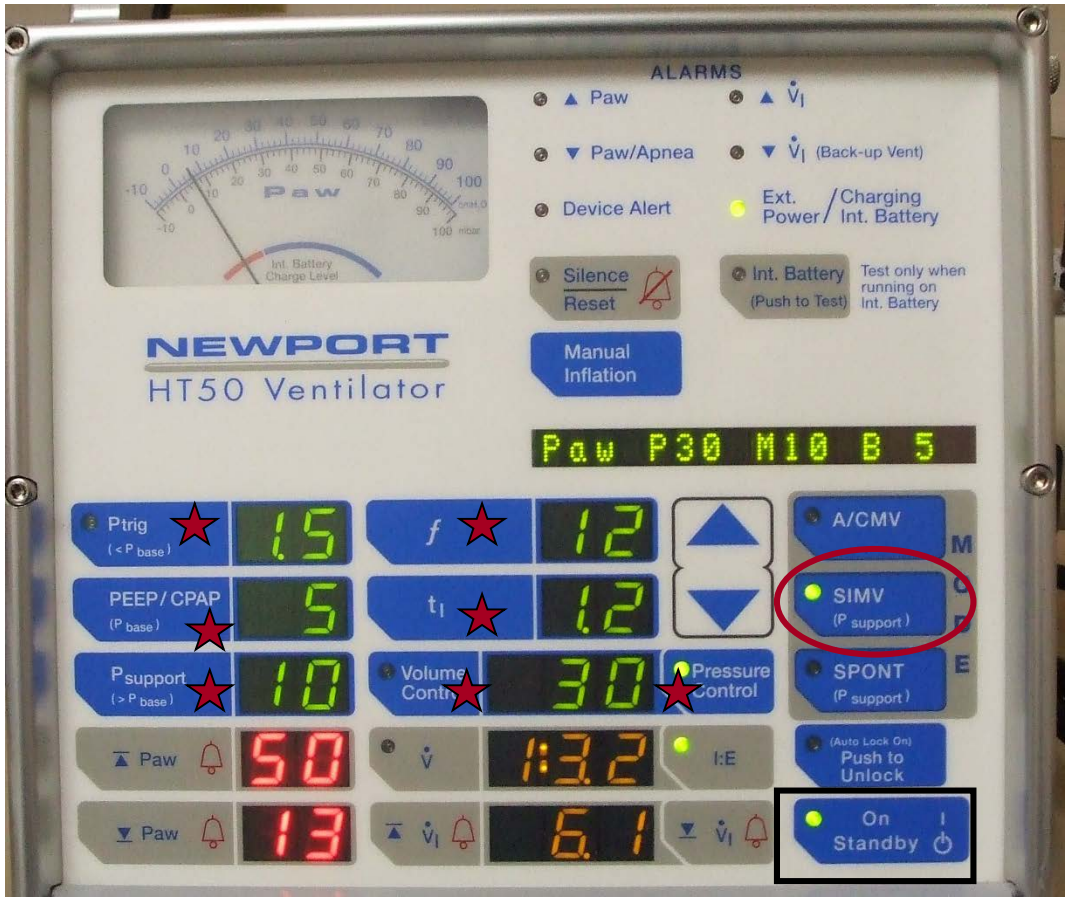
SIMV *(synchronised intermittent mechanical ventilations - a regular series of breaths are scheduled but the ventilator senses patient effort and reschedules mandatory breaths based on the calculated need of the patient.)*

- Can be used with pressure or volume ventilation

Set:

- *SIMV mode*
- *V_t* or *PIP*
- *f*
- *T_i*
- *Ptrig*
- *PEEP*
- *Psupport*
  (above PEEP)

- Alarms
  (V_i and Paw



Press *On/Standby* to start ventilator then attach circuit to patient

Message Display Window

Displays alarm details as well as measured patient parameters

When ventilator is ventilating:

- press the Up arrow once to display V_t, V_i, f .

- Press the Up arrow twice to display airway pressures (p- peak, m- mean, b- base (PEEP)

*Measurements are updated breath by breath

(Pressing the up arrow a third time will display total ventilator hours)

- If there is an alarm condition displayed, it will need to be fixed and reset before pt. measurements can be displayed.

Alarms

- When an alarm is active there will be a flashing light in the alarm panel and further info printed in the display window.
- Pressing *silence/reset* soft key will silence the audible alarm for 60 seconds.
- The alarm indicator and displayed message will remain when the alarm condition no longer exists.
- Press *silence/reset* to clear the alarm panel and message display.

Minute volume alarms

- Set using Grey softkeys
- Press appropriate grey softkey, use arrows to adjust and then press softkey again.
- Alarm will be indicated in alarm panel and on message display window

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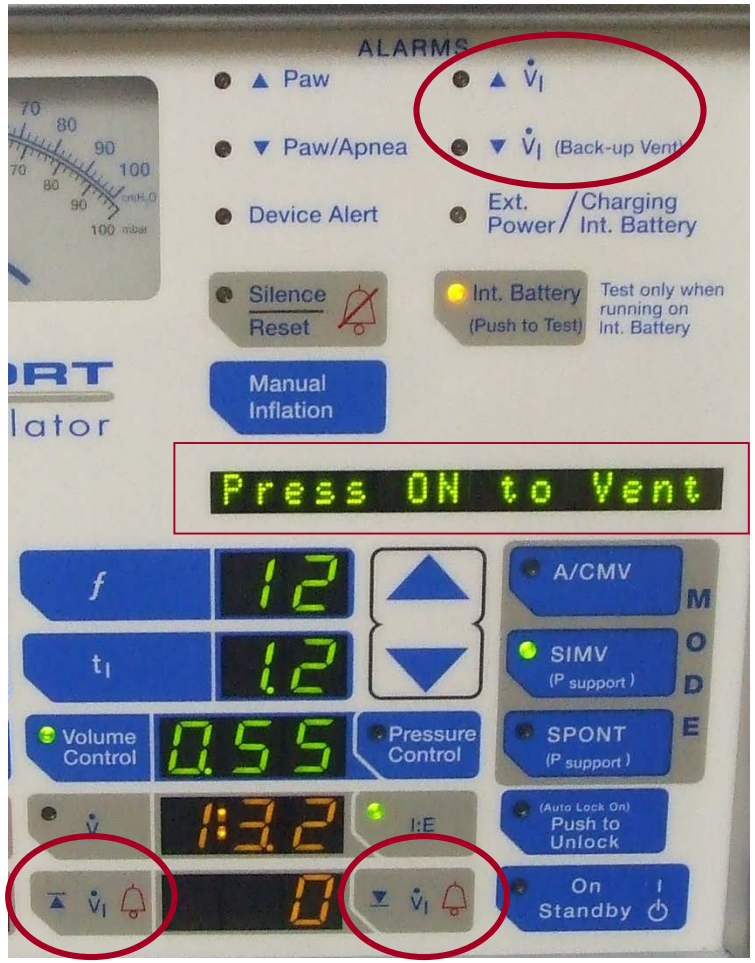
- If Low V_i alarm is activated and not immediately corrected, back up ventilation will start.

. Therefore…

Ensure low V_i alarm is set appropriately



Back Up Ventilation

- If minute volume falls below V_i alarm limit, back up ventilation will begin and ventilator will continue to alarm.
- In *A/CMV* or *SIMV* mode: all settings will remain the same with the exception of *f*.
- *f* will increase to 1.5 times the set *f*, or a minimum of 15
- In *Spont* mode: ventilator will begin in *SIMV* mode with a *Psupport* of 25 and *f* of 15 with other settings unchanged
- The ventilator will revert back to previous mode/ settings once the back up ventilation has achieved minute ventilation above the alarm limit.

How to set up the vent circuit for CPAP and BiPAP

We have 2 different circuits but they both work. One is clear and the other one is blue.

How to set up BiPAP

on

SPONT

How to set up BiPAP

*Normal Ptrig 1.5
*Normal PEEP 6
*Normal Pressure Support 10

*Ask the RT for settings for transfers.

-> prehospital setting the “normal” values can be found above. If breath stacking occurs ⇧ the Ptrig, if the pt cannot trigger a breath ⇩ Ptrig. FOLLOW BI-LEVEL POSITIVE AIRWAY PRESSURE PROTOCOL! (SUPERVISOR ONLY)

How to set up CPAP

Same mode as for BiPAP – spont

*Ptrig 1.5
*PEEP 5-15
***Psupport 0**

*Ask the RT for settings

HT50 training

https://connect2.covidien.com/nmimages/training/HT-50_Part2/index.htm

http://www.amethyst-research.com/demos/ventilator/starthere.html