**Design**

* For both pressure and tidal volumes.
* If **pressure and/or tidal volumes are out of bounds** *and* the **internal negative feedback loop cannot restore these parameters**, operator of ventilator alerted.
  + **Manual override** for pressure valves in the case of an alarm
* Could use a piezoelectric buzzer? Need a loud one so the alarm is easily heard. A flashing light would also grab attention.
* <https://create.arduino.cc/projecthub/SURYATEJA/use-a-buzzer-module-piezo-speaker-using-arduino-uno-89df45> - Code and simple circuit for buzzer
  + Is there a way to have two different buzzer noises indicative of either high or low pressure? In addition we could have a screen that says high/low pressure depending on the situation.
* Useful link for a video on ventilator settings for nurses (<https://www.youtube.com/watch?v=I8KH68fR0gI>)

From that I gathered that there are two major things the ventilator tracks:

Low pressure Alarm/ Low minute ventilation :

* Disconnection
* Cuff Leak - cuff pressure manometer on ET tube (no greater than 20 cm h2o usually 8-20)
* Tube Displacement

High pressure Alarm :

* Excess secretions → need suction
* Biting
* Kinks
* Coughing
* Pneumothorax
* Bronchospasm

<https://www.youtube.com/watch?v=WtwDp4f0pqU> 9:42 - high tidal volume alarm

* Based on the Yale design’s proposed alarm settings:
  + Individual Vte low alarm: Vte - 50 mL, high alarm = vte + 50 ml
  + High pressure alarm
  + Low pressure alarm

**Typical Initial** [**Ventilator Settings**](https://www.ncbi.nlm.nih.gov/books/NBK448186/) **(look at the clinical significance section)**

[**This seems to be good**](https://emcrit.org/wp-content/uploads/vent-handout.pdf) **for specific values (need to go back and read it more)**

* It is started with an **FiO2 of 100%** and **titrated down** guided by pulse oximetry or ABG, depending on the case.
* Low tidal volume ventilation has been shown to be lung protective not only in ARDS but in other types of diseases. Starting the patient on a **low tidal volume (6 to 8 mL/Kg of ideal body weight)** will reduce the incidence of ventilator-induced lung injury (VILI).
  + Always use a **lung protective strategy** as there are not many advantages for higher tidal volumes and they will increase shear stress in the alveoli and may induce lung injury.
* **Initial RR** should be comfortable for the patient **10-12 bpm** should suffice.
  + A very important caveat on this is for patients with severe metabolic acidosis. For these patients, the **minute ventilation** should at least be **matched** to their **pre-intubation ventilation** as failure to do so will worsen acidosis and can precipitate complications such as cardiac arrest.
* **Flow** should be initiated **at or above 60 L/min** to **prevent auto-PEEP**.
* Start with a low **PEEP of 5 cm H2O** and **titrate up** as tolerated by the patient to the goal for oxygenation. Pay close attention to **blood pressure** and **patient comfort** while doing this.
* An **arterial blood gas** should be obtained 30 minutes after intubation and **changes to the ventilator settings** should be made in **accordance with ABG findings.**
* **Peak** and **plateau pressures** should be checked on the vent to assure there are no problems with airway resistance or alveolar pressure in order to prevent ventilator-induced lung injury.
* Attention should be given to the **volume curves** in the ventilator display as a reading showing that the **curve is not coming back to zero** at the time of **exhalation** is indicative of **incomplete exhalation** and **development of auto-PEEP** and **corrections to the vent should be made immediately.**