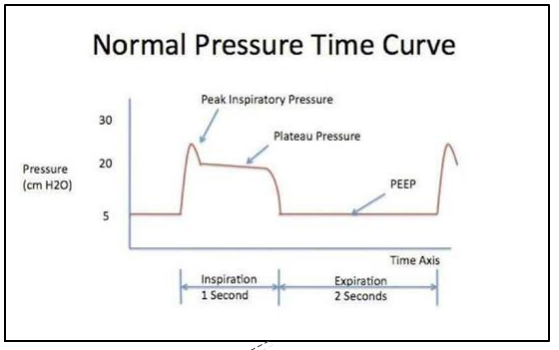
Functional Block Diagram for VC Ventilator Option 2

R. Collins, Version 4, 20th March 2020,

Diagram Key

Hatched components are 'nice to have' - not part of a 'Minimum Viable Product' (MVP)

From Ethan Chaleff's Requirements Document



Decision is that this needs to be from controller to create a close-loop control to the patient end-point

CE marked supply – localise electrical safety issues to off the shelf components

'Factory set' maximum over-pressure for safety

COTS Compressor?

Power supply

6/12V DC

Pump Motor (Electrical)

Mechanical Drive

Mechanical Air pump

240V AC

Atmospheric air

Air flow

HEPA Filter

Air flow

Over-pressure relief valve

Air flow

Pressure control valve

Pressure control signal

A

Static air pressure

Pressure indicator

Adds a level of integrity in aid of safety goal

Pressure reservoir

Oxygen

Oxygen Pressure Regulator

Oxygen

Heat energy

Heater (Optional for early version)

Heat control setting

B

Warm Air flow

Tidal valve

Modulated Air flow

Filter (Optional?)

Clean Modulated Air flow

Humidification

Clean Modulated Air flow (CMAF)

T-piece

CMAF

Pressure sensor

Clean Modulated Air flow (CMAF)

T-piece

CMAF

CMAF

CMAF

Independent tidal rate indicator / alarm

Independent Patient-side pressure indicator / alarm

Independent Patient-side temperature indicator / alarm

A

Pressure control signal

Tidal valve control signal

6 / 12V DC

Controller

Pressure measurement data

Used for closed-loop control of tidal rate

Think 'arduino' - simplest programming model, cheap, available and good range of on-board I/O (including A/D)

Think simple : single lamp indicators or LCD panel at most

Display data

Doctor display

Pump rate

Doctor control input

B

Heat control setting

Doctor PEEP value setting

Patient return valve

Inhaled air

Exhaled air

Exhaled air

Clean Modulated air-flow to patient

Could not find clip-art of a medic exhausted to breaking point

Must maintain an 'above ambient pressure' PEEP – possibly adjustable