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| **INITIALS SYSTEM SETUP – Driving Ventilator Settings** | |
| Step 1: | Ventilation Mode: Pressure Control |
| Step 2: | Driving Pressure = 60 m H20 |
| Step 3: | Pressure limit = 75 cm H2O |
| Step 4: | Frequency/Respiratory Rate (RR) = 10 – 30 breathes per minute |
| Step 5: | Inspiratory time = 0.8 s (range = 0.6 – 1.0 s)  I:E ratio = value needed to satisfy inspiratory time.   * **LOWER LIMIT = 1:2** |
| Depending on the ventilator, inspiratory time may be separately set on the ventilator resulting in a defined I:E ratio for a given RR  OR  The I:E ratio is set resulting in a fixed inspiratory time for a given RR  Note that as RR increases, the I:E ratio must be decreased to maintain inspiratory time in appropriate range.   * For RR = 10. I:E = 1:6.5 in order to obtain an inspiratory time of 0.8 s * For RR = 30. I:E = 1:2.33 in order to obtain an inspiratory time of 0.6 s | |
| Step 6: | Rise Time = 50% |
| Step 7: | PEEP = 0 |
| Step 8: | O2 = 21% |
| Step 9: | Flow Rate = 2 L/min |
| Step 10: | Volume Alarm = DISABLED   * Note: Alarm is disabled at start-up for patient titration |
| **After desired patient settings are titrated for each patient the VOLUME ALARM must be set as directed in “Alarms” instructions** | |

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| **Connecting Patient** | |
| Step 1: | Set Fresh gas flow = 4 L/min   * 100% O2 or desired blended FiO2 |
| Step 2: | Ensure each secondary circuit PEEP valve is set to 5 cm H20   * Confirm driving ventilator PEEP is set to 0 cm H2O |
| Step 3: | Connect patient to Cerebrus system via patient secondary circuit |
| Step 4: | Confirm peak inspiratory pressure on each manometer is no greater than clinically desired peak inspiratory pressure   * Peak inspiratory pressure should be less than or equal to 35 cm H2O * If peak pressure exceeds clinically desired level, then fresh gas flow for the secondary patient circuit must be decreased to lower tidal volume until peak pressure is in desired range   + Refer to instructions on “How to adjust tidal volume (for a given respiratory rate)” |
| Step 5: | Confirm the PEEP as indicated by the manometer is at least 5 cm H2O   * Note: due to intrinsic PEEP generated by the ventilated patients fresh gas flow rate, measured PEEP will be 2-5 cm H2O above the set PEEP. |
| Step 6: | Titrate each ventilated patient to desired parameters |
| Step 7: | Observe ventilation for 2 minutes following titration of both patients to ensure steady state ventilation is reached |
| Step 8: | Set volume alarms as described in instructions on “Alarm Settings” |

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| **How to Adjust Tidal Volume (for a given respiratory rate)** | |
| Step 1: | Silence ventilator volume alarms |
| Step 2: | Ensure the inspiratory time on the driving ventilator is between 0.6 – 1.0 second   * optimal = 0.8 seconds |
| Depending on the ventilator, inspiratory time may be separately set on the ventilator resulting in a defined I:E ratio for a given RR  OR  The I:E ratio is set resulting in a fixed inspiratory time for a given RR  **I:E LOWER LIMIT = 1:2** | |
| Step 3: | Set desired tidal volume = Fresh Gas Flow Rate / Respiratory Rate   * If set tidal volume results in peak inspiratory pressure greater than clinically desired peak inspiratory pressure then reduce fresh gas flow rate by 0.5 -1 L/min increments until clinically desired peak inspiratory pressure   **Fresh Gas Flow UPPER LIMIT = 14 L/min** |
| Step 4: | Using inline manometer or spirometer, confirm the PEEP for the patient measures at desired level.   * If not, adjust individual patient PEEP valve to desired level by following the instructions for “How to adjust patient PEEP”   Note: due to intrinsic PEEP generated by the ventilated patients fresh gas flow rate, measured PEEP will be 2-5 cm H2O above the set PEEP. |
| Step 5: | Observe ventilation for 2 minutes following titration to ensure steady state ventilation is reached |
| Step 6: | **Set volume alarms as described in instructions on “Alarm Settings”** |

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| **How to Adjust Respiratory Rate** | |
| Step 1: | Reduce fresh gas flow rate on both secondary patient circuits to 4 L/min   * This is done to ensure peak inspiratory pressures are not exceeded with a change in respiratory rate |
| Step 2: | Set respiratory rate to new desired rate on the driving ventilator |
| Step 3: | Set inspiratory time = 0.6 -1. S   * Optimal = 0.8 s |
| Depending on the ventilator, inspiratory time may be separately set on the ventilator resulting in a defined I:E ratio for a given RR  OR  The I:E ratio is set resulting in a fixed inspiratory time for a given RR  **I:E LOWER LIMIT = 1:2** | |
| Step 4: | Increase tidal volume to desired level according to instructions provided for “How to adjust tidal volume (for a given respiratory rate)” |
| Step 5: | **Set volume alarms as described in instructions on “Alarm Settings”** |

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| **How to Adjust Patient Specific PEEP**  At higher fresh gas flow rates infer a clinically significant intrinsic PEEP to the system. | |
| Step 1: | Determine the set value needed for the individual PEEP value |
| Step 2: | Clamp patient at endotracheal tube   * This is done to preserve PEEP the patient currently has while the level is adjusted |
|  | *Volume alarms will trigger for inadequate volume return. This is expected and will resolve with reconnection of circuit after new PEEP target is set.* |
| Step 3: | Disconnect secondary circuit patient expiratory limb between the proximal one-way valve and the PEEP valve |
| A picture containing indoor, bottle, table, open  Description automatically generated  **DISCONNECT HERE** | |
| Step 4: | Adjust PEEP valve to desired value. Prescribed value can be seen through the translucent external casing.   * To adjust PEEP valve. Rotate the large diameter casing while valve casing is still connected to common expiratory limb tree of the driving ventilator   + Increased PEEP = clockwise rotation   + Decreased PEEP = counter clockwise rotation |
| A picture containing indoor, bottle, sitting, filled  Description automatically generated  **ROTATE HERE** | |
| Step 5: | Reconnect the secondary circuit patient expiratory limb to PEEP valve |
| Step 6: | Unclamp the endotracheal tube |
| Step 7: | Using manometer or spirometry, confirm that changes in PEEP has not resulted in peak inspiratory pressures greater than clinically desired peak inspiratory pressures   * If peak inspiratory pressure exceeds clinically desired peak inspiratory pressure, decrease fresh gas flow in 1 L/min decrements until tidal volume decreases lower peak inspiratory pressures to desired thresholds.   + Refer instructions provided for “How to adjust tidal volume (for a given respiratory rate)” |
| Step 8: | Using manometer or spirometry, confirm the PEEP is measured as desired patient individualized PEEP |
| Step 9: | Repeat steps 2-8 until desired PEEP is achieved |
| Step 10: | Observe ventilation for 2 minutes following titration to ensure steady state ventilation is reached |
| Step 11: | **Set volume alarms as described in instructions on “Alarm Settings”** |

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| **How to disconnect a patient from the Cerebrus System** (while co-ventilated patient remains) | |
| Step 1: | For patient to be disconnected, clamp ETT to maintain patient specific PEEP during transfer. |
| *Volume alarm will trigger as it is correctly recognized as a disconnect* | |
| Step 2: | Using spirometry or observation of chest rise and breathing-delivery bag cycling, ensure the non-disconnected patients ventilation is unchanged. |
| Step 3: | Place disconnected patient onto one-to-one vent with desired setting for continued treatment |
| Step 4: | Place new patient on the Cerebrus System by following instructions for:   1. “Connecting Patient” 2. “How to adjust tidal volume (for a given respiratory rate)” 3. “How to adjust patient specific PEEP” |
| Step 5: | Observe ventilation for 2 minutes following titration to ensure steady state ventilation is reached |
| Step 6: | **Set volume alarms as described in instructions on “Alarm Settings”** |

**NOTE:**

**if only one patient is to remain on system then patient should be changed to normal ventilator tubing and initiated on one-to-one ventilation.**

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| **Alarm Settings**  *The volume alarm must be adjusted to appropriate levels following any changes in either co-ventilated patient’s ventilation parameters* | |
| Step 1: | Titrate each co-ventilated patient’s ventilation parameters as desired using instructions for:   1. “How to adjust tidal volume (for a given respiratory rate)” 2. “How t adjust respiratory rate” 3. “How to adjust patient specific PEEP” |
| Step 2: | Observe ventilation for 2 minutes following titration of both co-ventilated patient to ensure steady state ventilation is reached |
| Step 3: | Note the total volume returned to the ventilator as indicated on the monitors. |
| Step 4: | Set High Volume Alarm = “Total Volume Returned” + 100 mL |
| Step 5: | Set Low Volume Alarm = “Total Volume Returned” – 100 mL |

**Note**

**If pop-off valve is incorporated into secondary circuit patient expiratory limb then the above volume alarm settings will trigger for either secondary circuit disconnect or obstruction**

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| **Elevated Airway Pressure Monitoring** (in the absence of pop-off valve in the patient secondary circuit expiratory limb)   * Requires ability to monitor pressure wave forms using a standard hemodynamic monitoring system * DOES NOT provide true measure of inspiratory pressure. Refer to inline manometer for true inspiratory pressure | |
| Step 1: | Set up arterial line transducer   * NO fluid or pressure bag needed; leave IV spike end for IV bag OPEN to air * Zero art line transducer * Attach patient end of transducer to stopcock at HME filter |
| A picture containing indoor, table, sitting, cup  Description automatically generated  To arterial line transducer  PETCO2 stopcock  - Off in picture as not sampling continuously  To Inline manometer  Pressure stopcock for pressure monitoring | |
| Step 2: | Set up pressure transducer on ICU monitor (Varies with make of monitor)   1. Connect arterial line transducer to ICU monitor 2. Select label with mean pressure ie: ICP 3. Relabel “ICP” with “Ventilator” or tape and write ventilator pressure 4. DO NOT USE Arterial pressure labels. Ie. ART, FEM, ABP 5. Suggested sweep speed = lowest sweep possible on monitor |
| Step 3: | Titrate each co-ventilated patient’s ventilation parameters as desired using instructions on:   1. “How to adjust tidal volume (for a given respiratory rate)” 2. “How t adjust respiratory rate” 3. “How to adjust patient specific PEEP” |
| Note: pressure tracing seen on monitor represents volume control ventilation (VCV)  A picture containing monitor, screen, sitting, display  Description automatically generated  VCV  Waveform  Transduced mean pressure | |
| Step 4: | Observe ventilation for 2 minutes following titration to ensure steady state ventilation is reached |
| Step 5: | Note the transduced mean pressure of the volume control wave form |
| Step 6: | Set the mean pressure alarm for the transduced pressure wave form to **Mean Pressure** (noted in Step 5) + 1 mm Hg |

With the above settings, any increase in mean pressure resulting in alarm triggering OR change in waveform should prompt investigation of the patient for acute obstruction or dramatic increases in compliance.

* **Immediate action = check peak inspiratory pressure using inline manometer**

**A picture containing clock, meter

Description automatically generated**

Increase in Mean Pressure

-Triggers alarm

Change in   
pressure waveform