

## Bio-Med Devices Crossvent 4+ Competency

- 1) How long will the vent run on battery power? How long will it take to fully charge?
  - a. One hour and one hour to charge.
  - b. A fully charged and properly conditioned battery can power the vent for approximately 6-7 hours. It takes a fully depleted battery approximately 4 ½ hours to charge.
  - c. A fully charged battery will last about 5 hours and takes 2 hours to charge.
- 2) Why might it be important to turn the “MAX PRESSURE” and “PEEP” knobs to their minimum settings?
  - a. The vent can use gas even if the switch is off and the knobs are not set to the minimum setting.
  - b. It doesn't matter where the knobs are set.
  - c. If the vent is hooked to a gas source, but the power is off, no gas will be used.
- 3) What is the proper method of using the touch screen controls?
  - a. Push hard with the pad of your finger for any parameter you wish to change.
  - b. Any kind of touch should be sufficient on any part of the screen.
  - c. Touch with the back and /or point of your fingernail in the center of the parameter you wish to change.
- 4) How do you silence the alarm that sounds when the vent switches from external power to battery power?
  - a. Touch and hold the alarm quiet key until the flashing battery indicator stops flashing.
  - b. It can only be silenced for 60 or 120 seconds at a time.
  - c. Simply touch the flashing battery bar graph indicator to acknowledge the fact that the vent is now running on battery power.
- 5) What is the pneumotach used for?
  - a. The pneumotach is part of the circuit and must be used with every patient.
  - b. The pneumotach is used in order to provide flow triggering to the patient and also is used to measure exhaled tidal volume. It is placed in line with the circuit near the patient connection.
  - c. The pneumotach is used to calibrate the ventilator.
- 6) When setting up the vent to deliver volume ventilation, it is important to set what correctly to insure the set tidal volume is being delivered.
  - a. Verifying the volume setting is all that needs to be done.
  - b. Make sure that the MAX PRESSURE knob is not pressure limiting the breath. This can be achieved by setting the MAX PRESSURE knob to it's max setting.
  - c. Making sure FLOW, PEEP and VOLUME are set correctly will ensure that the set tidal volume is being delivered.
- 7) When I get an alarm condition, why can't I go to another screen?
  - a. You can. Simply correct the condition that is causing the alarm, change the alarm parameters, or press the ALARM QUIET key, and proceed to whichever menu you desire.
  - b. You must stay in the alarm screen until the alarm condition is no longer active.
  - c. If you are very quick with your touch, you can go to whatever menu you desire.

- 8) Can Inspiratory Time and Tidal Volume settings be controlled in different ways?
  - a. They are both controlled at all times with the arrow keys after the parameter is highlighted.
  - b. Depending on how the vent is set up, the parameter that appears right below the RATE setting, is controlled with the arrow keys after that parameter is highlighted. The other parameter appears in the next key below and varies as the Flow rate is changed.
  - c. They can both be controlled in the SETUP menu.
  
- 9) On a unit that is equipped with the Air Entrainment option, what is important to note prior to switching the position of the entrainment switch?
  - a. Note the FLOW setting prior to making the switch and readjust flow to the correct level immediately afterwards.
  - b. There is nothing to worry about. Just make the switch.
  - c. The vent must be turned off prior to switching the position.
  
- 10) What is the CONSTANT FLOW key used for?
  - a. It activates a gas saving mode to conserve air and oxygen.
  - b. It is a displayed condition only, and can't be turned "ON" or "OFF".
  - c. It provides a constant flow of gas through the circuit at the flow level set by the FLOW knob. This is the mode generally used for neonatal ventilation.

## CV-4+ Answers and Explanations

- 1) B A fully charged battery will last approximately 6-7 hours. The battery type is Nickel Metal Hydride (NiMH) and does not have a memory effect (It does **not need** to be periodically fully discharged to be properly conditioned. It takes about 4½ hours to fully charge a fully depleted battery. Charging time will be less if it is not fully depleted. The Green LED on the side of the vent indicates the charging status: A steady green light indicates the battery is fully charged and a flashing green light indicates that the battery is charging.
- 2) A Even when the power is off, if the vent is connected to a gas source, gas can bleed off if the “MAX PRESS” and “PEEP” knobs are not set to the minimum setting. If the vent is only connected to a gas source when it is being used, this is not an issue. This is really only a concern when the vent is built into a stretcher or vehicle and always connected to the gas source.
- 3) C Since the screen works by detecting point pressure it’s best to **not** use a flat surface (like the pad of your finger). The back of your finger works best. This was more important in the older monochrome versions of the touch screen. The color screen version is much more sensitive and just about any touch will suffice. Keep in mind that every part of the screen is not controlled by the touch screen: some areas only display information, rather than a parameter that can be changed. Example: Touching “FLOW” on the screen will not produce “reverse video” and allow one to change the flow. The flow level will change as the flow knob is turned.
- 4) C Although this alarm can be momentarily silenced by using the alarm quiet key, the alarm will not go away until the flashing battery indicator is touched to acknowledge that the vent is running on battery power. This is so that you are indeed aware that you are running on the internal battery’s power. For instance, in the case of a ground ambulance that is providing power with an on-board generator, since road noise can be loud, if a failure occurs with the generator, you may not be aware that you switched power. This way you are promptly notified of the switch and need to acknowledge.
- 5) B The pneumotach is used in order to measure the exhaled tidal volume coming from the patient. It is packaged separately from the circuit. While the vent works with or without it in line, exhaled tidal volume can only be measured when it is used. Once installed and placed in-line with the circuit the patient’s exhaled tidal volume can be measured by turning “ON” EXHTV on the ALARM 1 screen: Touch the low limit, then press the arrow up key to turn on. Volumes can be measured from 50 ml and greater. Exhaled tidal volume can be valuable information for the following reasons: 1) In the event the patient being transported is being pressure ventilated as opposed to volume ventilated, the pneumotach will provide the exhaled tidal volume and allow the caregiver to decide whether the patient is receiving adequate ventilation. 2) In the event of a smaller pediatric patient who has been intubated with an uncuffed endotracheal tube, where a leak is present, the exhaled tidal volume again will help verify adequate ventilation. 3) A sudden drop in tidal volume may indicate an incidence of a pneumothorax or a changing lung condition that may need to be addressed. Volume can be measured as exhaled tidal volume EXHTV (the usual value) displayed in ml, or as minute ventilation EXHMV, displayed in L. To switch parameters, touch the EXHTV or EXHMV key on the ALARM 1 screen and press either the “up” or “down” arrow key.

- 6) B If the MAX PRESSURE knob is set too low, it is possible for the vent to pressure limit before the set tidal volume is delivered. The peak pressure high limit alarm can be set to provide a safety pop off at a desired safety level.
- 7) A The alarm condition brings you to the alarm screen so that you will know immediately what alarm condition has been met. Once the alarm condition is no longer present, you are free to proceed to another menu. If you would like to go to another menu without correcting the alarm condition, simply press the ALARM QUIET key and proceed to whatever screen you desire.
- 8) B The user can decide whether INSP (time) or TV (tidal volume) is displayed in the key right below the RATE key, by accessing the SETUP key after turning on the ventilator. This key is available in the space normally occupied by the arrow keys. Whichever key is in the position below RATE is controlled by the arrow keys after highlighting the key. The other key is controlled by the flow setting. For instance: If TV is displayed in the key below RATE, the tidal volume is set by highlighting the TV key and making the appropriate setting using the arrow keys. In this case changing the flow setting will change the set inspiratory time. If INSP is displayed below RATE, the Inspiratory Time is set using the arrow keys in 0.1 increments and changing the flow setting will change the set Tidal Volume.
- 9) A When turning Air Entrainment on or off, the vent uses different valves depending on whether air entrainment is selected or not. This can cause a different flow value to be active. Note the flow setting prior to switching and make sure flow is readjusted to its original setting. When the vent is set so that TIDAL VOLUME is displayed right below RATE on the Main screen, adjusting the flow rate will change the Inspiratory time setting on the vent. When the vent is set so that INSP (time) is displayed right below RATE, changing the flow will change the tidal volume setting. For this reason, it may be advisable to remove the patient from the ventilator until settings are reset.
- 10) C This is the most common mode used for neonatal ventilation. When selected, the TV key on the MAIN screen becomes INSP and allows a specific inspiratory time to be set. Most people choose to provide pressure limited ventilation by using the MAX PRESS knob to achieve a desired peak pressure. Simply turn the MAX PRESS knob counter clockwise until the desired Peak Pressure is displayed in the top left corner of the screen. In this case the TV displayed on the MAIN screen should be disregarded. The CONSTANT FLOW mode provides a constant flow of gas through the circuit at the level set by the FLOW knob on the vent. It is important to note that the vent has no triggering capabilities when CONSTANT FLOW is "ON". While there is a supply of gas available to the patient in the circuit, the vent will only cycle at the set RATE. Patient RATE alarms are disabled when CONSTANT FLOW is "ON". For Infant Nasal CPAP, CONSTANT FLOW is generally preferred. A low PEEP alarm can be set to alert when the prongs are out of the nose and the constant flow will maintain CPAP levels. No backup ventilation will occur however in the event of apnea.