MLREMS Advanced Practice Paramedic
Clinical Competency
Hamilton T1 Ventilator

At the end of this skills session, the Paramedic will be able to:

1. Explain the indications for mechanical ventilation.
2. Demonstrate the proper ventilator circuit setup on the Hamilton T1.
3. Demonstrate ventilator pre-operation checks on the Hamilton T1.
4. Demonstrate the proper ventilator setup in volume (pressure regulated) and pressure control modes of ventilation.
5. Demonstrate the proper ventilator setup to ventilate a patient in (S)CMV+ mode.
6. Demonstrate the proper ventilator setup to ventilate a patient in SIMV+ with pressure support mode.
7. Demonstrate the proper ventilator setup to ventilate a patient in PCV+ mode.
8. Demonstrate the proper ventilator setup to ventilate a patient in PSIMV+ with pressure support mode.
9. Demonstrate the proper ventilator setup to ventilate a patient in Adaptive Support ventilation (ASV)
10. Demonstrate the proper ventilator setup to ventilate a patient in NIV (BiPAP/CPAP) mode.
11. Verbalize proper supplies needed to ventilate a patient with NIV (BiPAP/CPAP) mode.
12. Demonstrate the acquisition of the following values:
    a. Actual Respirator Rate (f)
    b. I:E Ratio
    c. Peak Inspiratory Pressure (PIP)
    d. Minute Volume (VE)
    e. Exhaled Tidal Volume (V_{te})
    f. Plateau Pressure (P_{plat})
13. Demonstrate setup and utilization of Low Pressure O_2 source

Action	Complete
Overview and Power-Up	
Locate and power-on ■ Activate standby mode	
Identify the following keys: ■ Alarm silence ■ Nebulizer ■ Inspiratory hold/manual breath	

▪ Oxygen enrichment ▪ Screen lock/unlock ▪ Press-and-turn knob	
Setting up circuit for ventilation ▪ Select appropriate ventilator circuit ▪ There are many styles available for the T1. Depending on the style, you may be required to use an adult or pediatric based on patient weight. However, many of them are “one size fits all”. ▪ Attach flow sensor to patient end of circuit (if not present) ▪ Attach HME/Bacterial filter to flow sensor (MUST BE PRESENT AT ALL TIMES DURING VENTILATION) ▪ Attach inspiratory and expiratory limb to ventilator ▪ Attach flow sensor to connectors	
Perform the pre-operation check before patient use ▪ Tightness test ▪ Flow sensor calibration ▪ O_2 cell calibration (performed by Equipment Maintenance)	
▪ Tightness Test ▪ Ensure circuit is assembled and connected ▪ Turn on power ▪ Make sure the ventilator is in standby, and select **Preop Check** from the Patient setup window. ▪ Under the **Test & Calib** menu, select **Tightness** ▪ Disconnect the breathing circuit at the patient side of the flow sensor. Do not block the open end of the flow sensor. ▪ The text **Tighten Patient System** is now displayed. ▪ Block the opening (wearing a clean glove is recommended). ▪ The text Connect Patient is now displayed. ▪ Observe that a green checkmark with the current date is displayed	
▪ Flow Sensor Calibration ▪ Each new flow sensor must be calibrated before patient use ▪ Ensure circuit is assembled and connected to the ventilator ▪ Activate **Flow Sensor** from the **Tests & Calib** window ▪ Disconnect patient if necessary ▪ Flow the instructions displayed in the message line, attaching the adapter when needed and turning the flow sensor around as indicated ▪ If the adapter is not available, you can use a hand to reverse the sensor while holding it tightly	

■ Follow the instructions displayed in the message line, turning the flow sensor back to its starting position when indicated. ■ When calibration is complete, verify that there is a green check mark in the **Flow Sensor** checkbox.	

General Patient Ventilation	
Turn Ventilator On	
Set patient's gender and height	
Select desired mode of ventilation from quick select or modes screen ■ ASV ■ (S)CMV+ ■ SIMV+ ■ PCV+ ■ PSIMV+ ■ NIV/NIV-ST	
ASV	
Ensure patient's gender and height are correct	
Select desired % of minute ventilation (%MinVol) ■ 100% for initial ventilation ■ Add 10% for HME/Filter ■ Add 20% if body temperature is >38.5°C (101.3°F) and 5% per 1500 ft above sea level	
Set the desired PEEP	
Set the desired FiO_2	
Set the Pasv limit (30 cm H_2O is default and recommended for initial settings)	
Set the desired Flow trigger level ■ Desired setting is 5 l/min but may need to be adjusted for transport conditions	
Attach circuit to patient and select Start Ventilation	
Set alarms to desired patient conditions ■ <u>The maximum inspiratory pressure delivered in ASV will be **10 cm H_2O below the preset high pressure limit**</u>	
Monitor ■ P_{peak} (Peak Inspiratory Pressure) ■ ExpMinVol (Minute Volume) ■ VTE (Exhaled Tidal Volume) ■ fControl (Ventilator initiated breaths) ■ fSpont (Patient initiated breaths) ■ fTotal (Total breaths delivered)	

▪ $EtCO_2$ ▪ SPO_2	
Increase or decrease %MinVol to adjust for alterations in patient pCO_2 or $EtCO_2$	
Adjust FiO_2 or PEEP to maintain an SPO_2 per MLREMS Standards of Care	
(S)CMV+	
Ensure patient's gender and height are correct	
Set (or confirm recommended) Tidal Volume	
Set the desired PEEP	
Set desired breath rate	
Set the desired FiO_2	
Set Inspiratory Time to appropriate value	
Set the desired Flow trigger level ▪ Desired setting is 5 l/min but may need to be adjusted for transport conditions	
Attach circuit to patient and select Start Ventilation	
Set alarms to desired patient conditions ▪ <u>The maximum inspiratory pressure delivered in will be **10 cm H_2O below the present high pressure limit**</u>	
Monitor ▪ P_{peak} (Peak Inspiratory Pressure) ▪ ExpMinVol (Minute Volume) ▪ VTE (Exhaled Tidal Volume) ▪ fSpont (patient initiated breaths) ▪ fTotal (Total breaths delivered) ▪ Cstat (Static Compliance) ▪ Pplateau (Plateau Pressure)	
Increase or decrease breath rate or tidal volume to adjust for alterations in patient pCO_2 or $EtCO_2$	
Adjust FiO_2 or PEEP to maintain an SPO_2 per MLREMS Standards of Care	
SIMV+	
Ensure patient's gender and height are correct	
Set (or confirm recommended) Tidal Volume	
Set the desired PEEP	
Set desired breath rate	
Set the desired FiO_2	
Set Inspiratory Time to appropriate value	
Set desired pressure support for patient initiated breaths	
Set the desired Flow trigger level ▪ Desired setting is 2 l/min but may need to be adjusted for transport conditions	

Attach circuit to patient and select Start Ventilation	
Set alarms to desired patient conditions ■ The maximum inspiratory pressure delivered in will be **10 cm $_{H2O}$ below the preset high pressure limit**	
Monitor ■ Ppeak (Peak Inspiratory Pressure) ■ ExpMinVol (Minute Volume) ■ VTE (Exhaled Tidal Volume) ■ fSpont (Patient initiated breaths) ■ fTotal (Total breaths delivered) ■ Cstat (Static Compliance) ■ Pplateau (Plateau Pressure)	
Increase or decrease breath rate or tidal volume to adjust for alterations in patient pCO_2 or $EtCO_2$	
Adjust FiO_2 or PEEP to maintain an SPO_2 per Mlrems Standards of Care	
PCV+	
Ensure patient's gender and height are correct	
Set desired pressure control (Pcontrol)	
Set the desired PEEP	
Set desired breath rate	
Set the desired FiO_2	
Set Inspiratory Time to appropriate value	
Set the desired Flow trigger level ■ Desired setting is 2 l/min but may need to be adjusted for transport conditions	
Attach circuit to patient and select Start Ventilation	
Set alarms to desired patient conditions	
Monitor ■ ExpMinVol (Minute Volume) ■ VTE (Exhaled Tidal Volume) ■ fSpont (Patient initiated breaths) ■ fTotal (Total breaths delivered) ■ Cstat (Static Compliance)	
Increase or decrease breath rate or pressure control to adjust for alterations in patient pCO_2 or $EtCO_2$	
Adjust FiO_2 or PEEP to maintain an SPO_2 per MLREMS Standards of Care	
PSIMV+	
Ensure patient's gender and height are correct	
Set desired pressure control (Pcontrol)	

Set the desired PEEP	
Set desired breath rate	
Set the desired FiO_2	
Set desired pressure support for patient initiated breaths	
Set Inspiratory Time to appropriate value	
Set the desired Flow trigger level ▪ Desired setting is 2 l/min but may need to be adjusted for transport conditions	
Attach circuit to patient and select Start Ventilation	
Set alarms to desired patient conditions	
Montior ▪ ExpMinVol (Minute Volume) ▪ VTE (Exhaled Tidal Volume) ▪ fSpont (Patient initiated breaths) ▪ fTotal (Total breaths delivered) ▪ Cstat (Static Compliance)	
Increase or decrease breath rate or pressure control to adjust for alterations in patient pCO_2 or $EtCO_2$	
Adjust FiO_2 or PEEP to maintain an SPO_2 per MLREMS Standards of Care	
NIV	
Ensure patient's gender and height are correct	
Set desired inspiratory pressure (Pinsp/IPAP)	
Set the desired PEEP (CPAP)	
Set the desired FiO2	
Set Inspiratory Time to appropriate value	
Set the desired Flow trigger level ▪ Desired setting is 5 l/min but may need to be adjusted for transport conditions	
Attach circuit to patient and select Start Ventilation	
Set alarms to desired patient conditions	
Monitor ▪ ExpMinVol (Minute Volume) ▪ VTE (Exhaled Tidal Volume) ▪ fSpont (Patient initiated breaths)	
Increase or decrease inspiratory pressure to adjust for alterations in patient pCO_2 or $EtCO_2$	
Adjust FiO_2 or PEEP to maintain an SPO_2 per MLREMSStandards of Care	
Monitors mental status and appropriateness of NIV	

Paramedic Name:

_____

Evaluator Name:

_____

Evaluator Signature:

_____

Date:_____