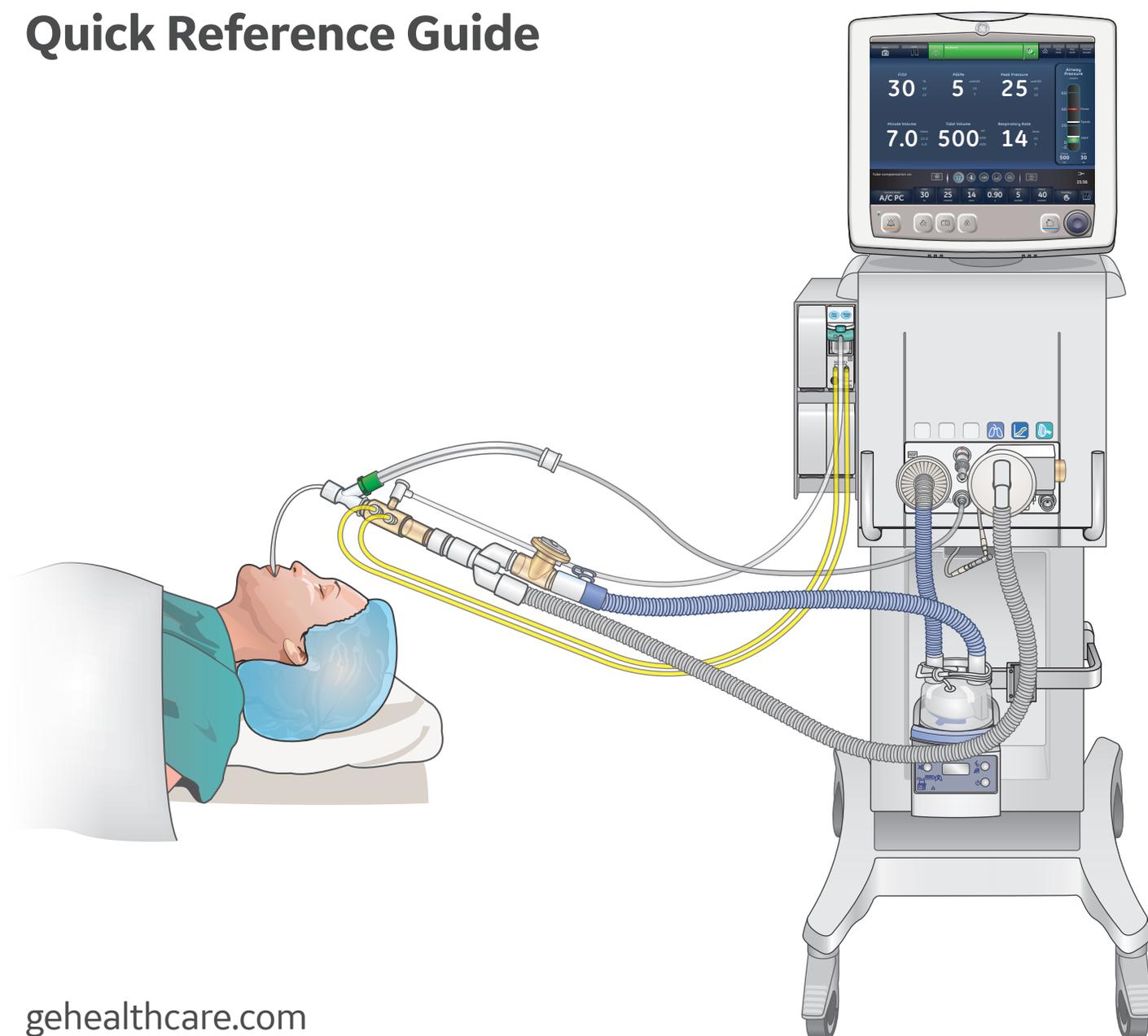




CARESCAPE R860 Lung Protective Tools

Quick Reference Guide





Notice

The materials contained in this document are intended for educational purposes only. This document does not establish specifications, operating procedures or maintenance methods for any of the products referenced. Always refer to the official written materials (labeling) provided with the product for specifications, operating procedures and maintenance requirements.

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Note! Always refer to the User Reference Manual before use.

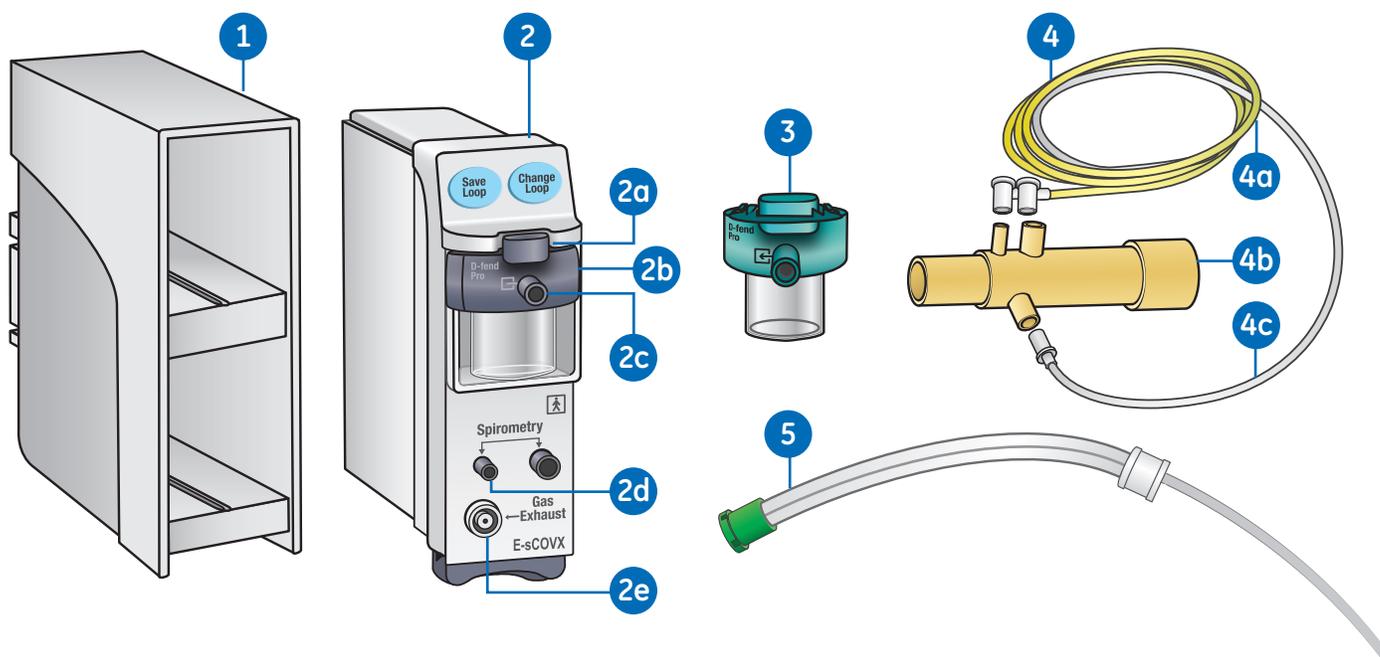
Lung Protective Tools

Patients who are mechanically ventilated can be at risk for developing pneumothoracies and lung injury¹. Lung injury may occur with high ventilating pressure or volumes which may lead to a higher mortality². Lung protective ventilation strategies including the use of low tidal volumes, high respiratory rates, PEEP and lower pressures are intended to decrease lung injury and mortality risk². The CARESCAPE R860 offers an individualized approach to lung protective strategies with the use of FRC INview, PEEP INview, Lung INview and SpiroDynamics.

Limitations

FRC INview, PEEP INview and SpiroDynamics are currently available in adult and pediatric software.

Equipment Required for FRC, PEEP INview and SpiroDynamics



1. Module Bay with cable

2. Airway Module

- a. Water trap latch
- b. D-fend water trap
- c. Gas sampling line connector on the water trap
- d. Connectors for patient spirometry
- e. Gas sampling outlet

3. Disposable water trap

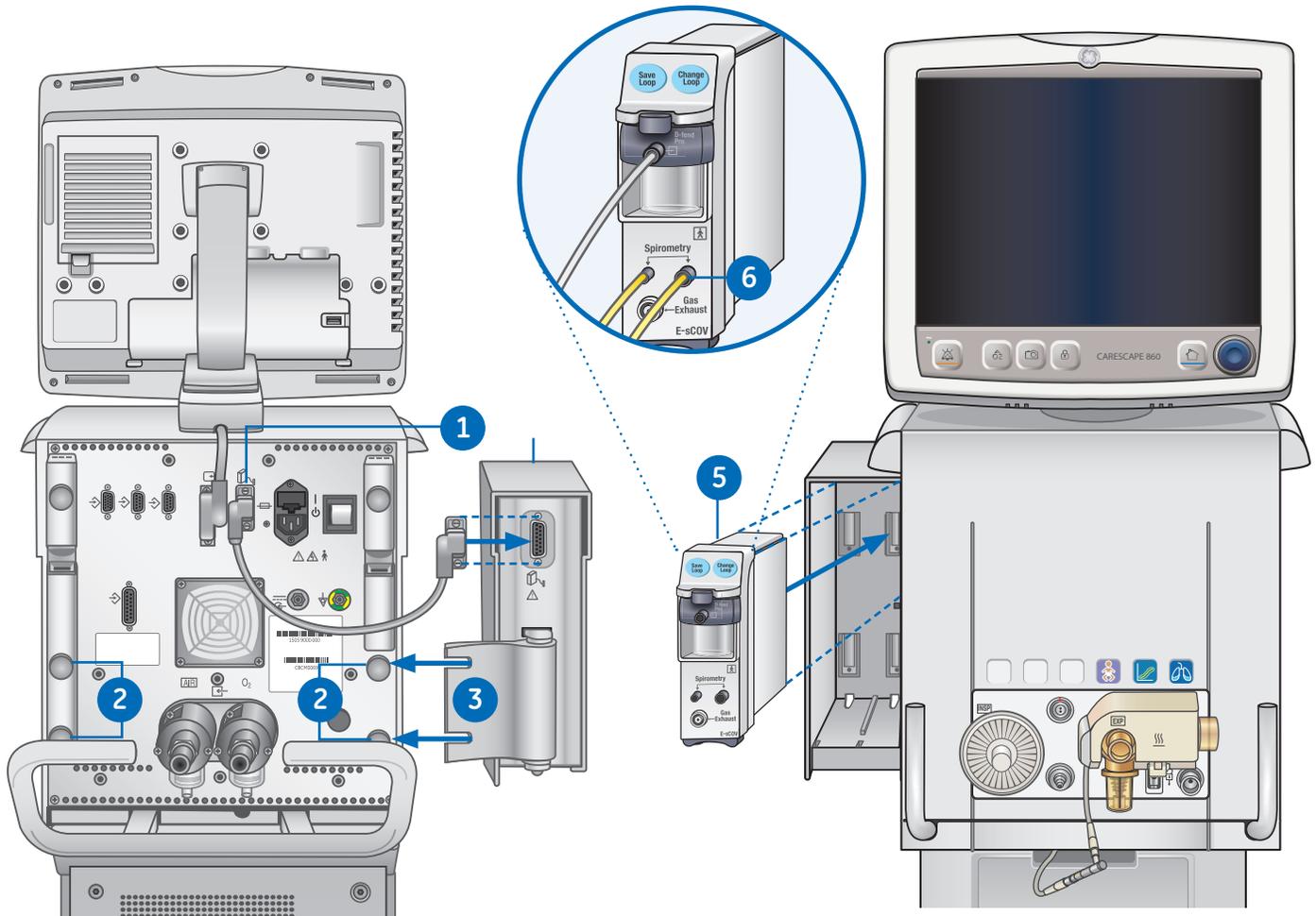
4. Disposable spirometry set consists of:

- a. 2 yellow plastic spirometry lines
- b. D-lite sensor
- c. Sampling line (clear plastic)

5. SpiroDynamics Catheter

Equipment Set-up

Attach the Module Bay and Module



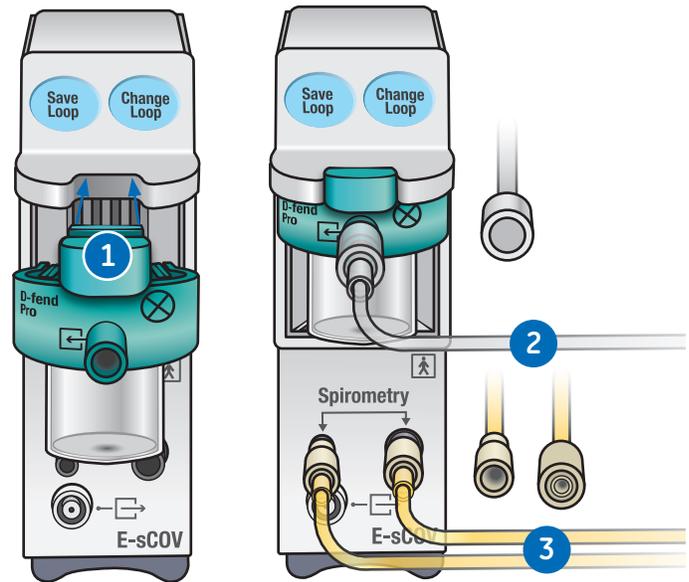
1. Connect one end of the cable to the airway module bay connection on the back of the ventilator, and tighten the screws.
2. To attach the module bay, loosen the thumbscrews on the desired side of the ventilator.
3. Slide the airway module bay behind the thumbscrews and tighten.
4. Connect the end of the cable to the airway module bay connection, and tighten the screws.
5. Slide the airway module into the upper portion of the airway module bay.
6. Attach the tubing to the airway module.
Please see next section for detailed steps on how to connect the water trap and measurement tubings.

Insert the Water Trap

1. Hold the water trap as in the picture on the right and push it in firmly until a **Click** sound can be heard.
2. Connect the sampling line to the water trap.
3. Connect the two Spirometry lines to the two Spirometry ports on the module.

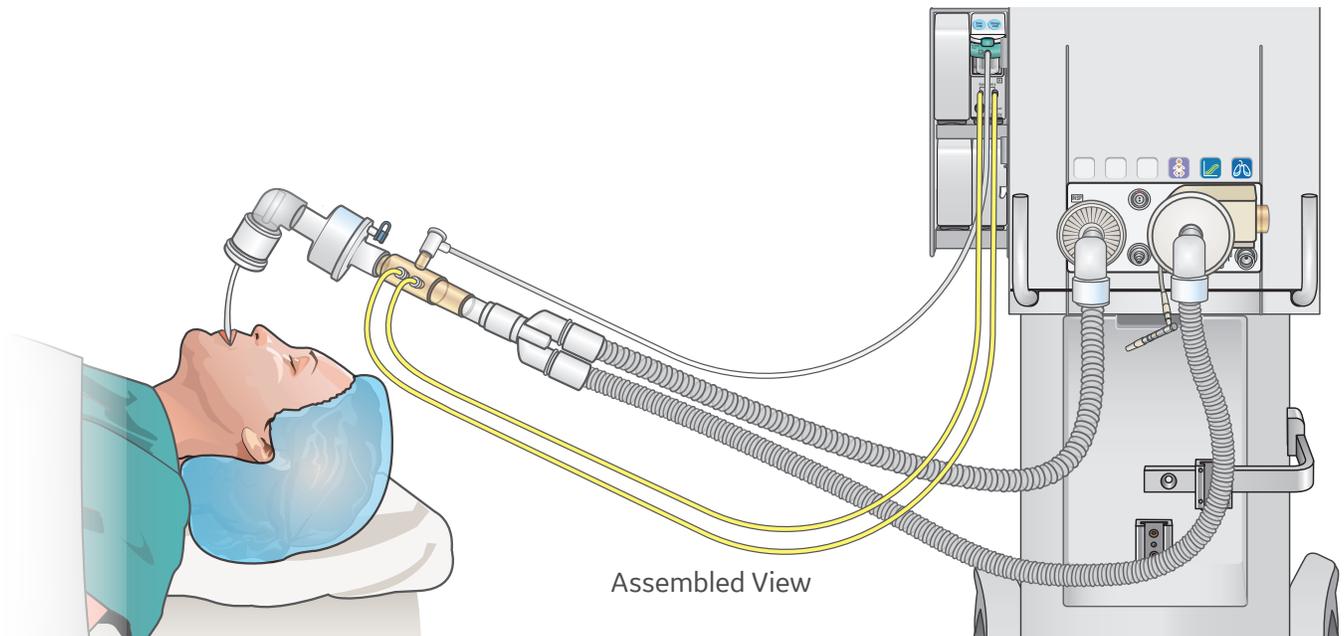
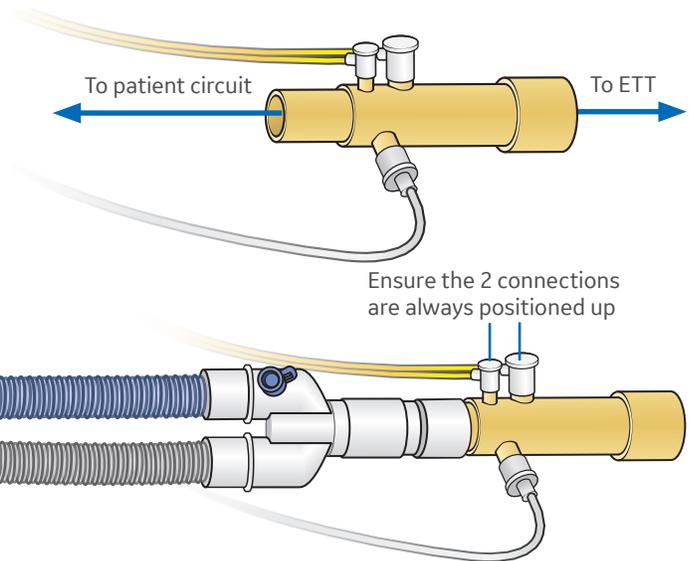
Note: the difference in size and design of the connections to ensure correct assembly.

4. Ensure all three connections are tight to avoid leaks and errors in measurement.

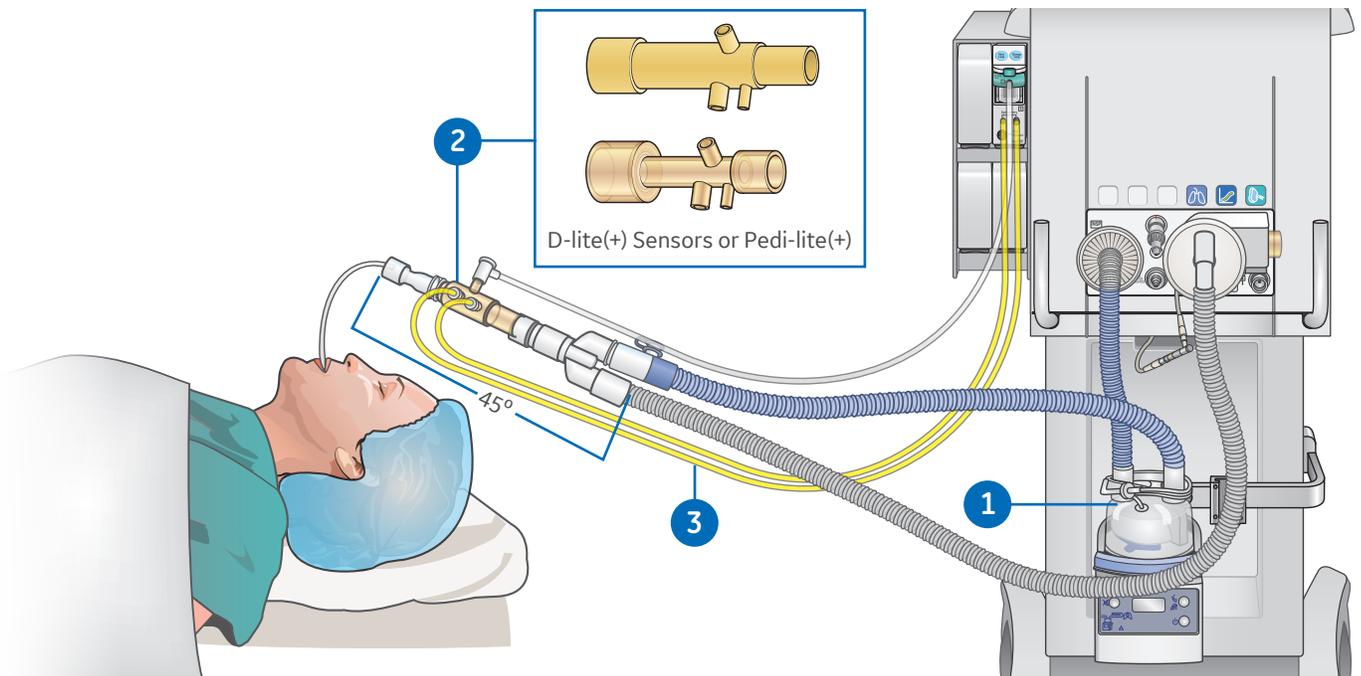


Position of D-lite Sensor

1. For optimum accuracy, allow the respiratory module to warm up for 30 min prior to performing a FRC procedure.
2. Note that the airway module requires calibration every six months.
3. Adding a 5 ml spacer between the D-lite sensor and the patient will prevent bias flow from adversely affecting gas measurements.



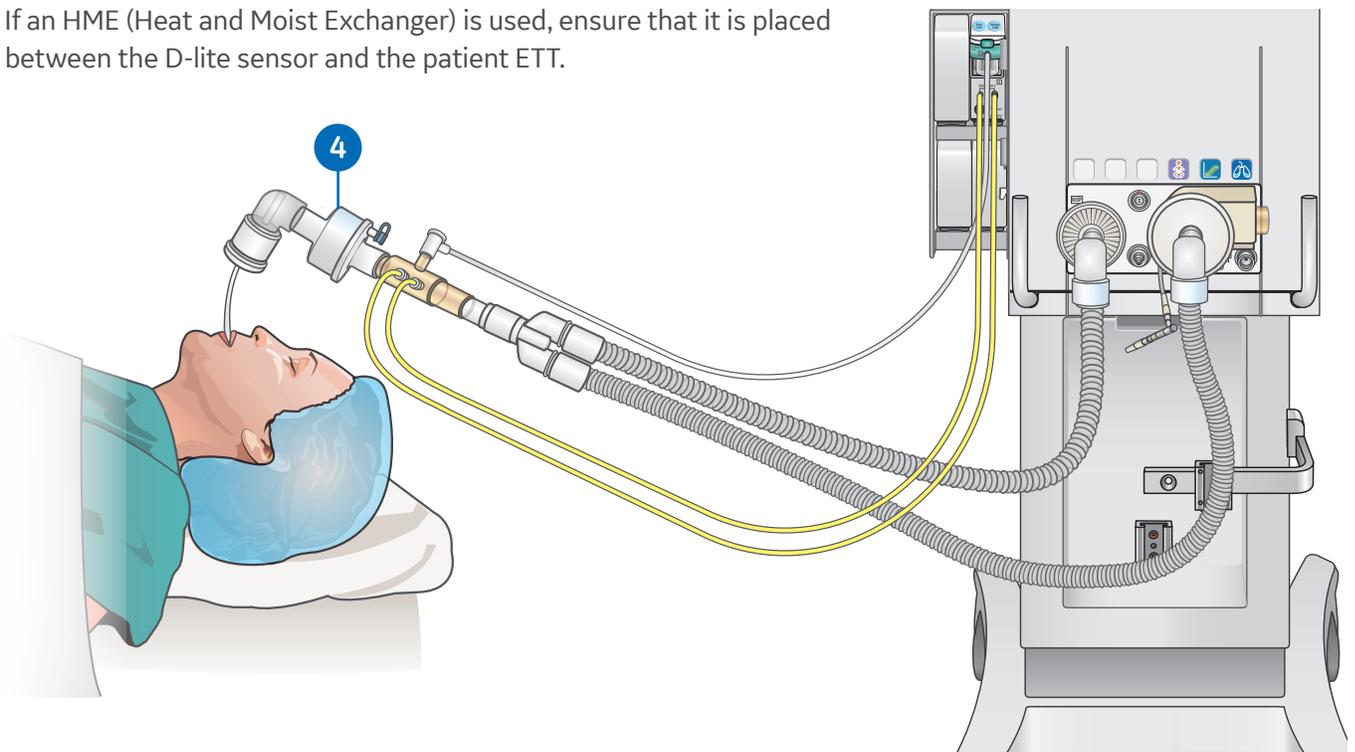
Managing Humidity in the Patient Circuit



1. If active humidification is used, the D-lite sensor and the sampling line shall remain free from condensation.
2. D-lite+ and Pedi-lite+ sensors have a hydrophobic coating to repel condensation from its inner surface and minimize the possibility of entry in the sampling lines.
3. Ensure that the two yellow spirometry lines and the transparent gas sampling line are positioned on the top of the sensor; and the sensor is placed at a 45 degrees tilt to avoid condensate accumulation.

Position of HME

4. If an HME (Heat and Moist Exchange) is used, ensure that it is placed between the D-lite sensor and the patient ETT.



Steady State



Prior to taking an FRC measurement the patient should be in a steady state with a constant level of delivered oxygen to ensure accuracy. The patient's gas exchange must be stable for at least 10 minutes.

To ensure accuracy:

1. Do not change any ventilation settings, perform any procedures that alter ventilation settings, perform a nebulization procedure or remove the airway module.
2. Delivered oxygen should be constant and maintained for 5 minutes prior to measurement.

Using CARESCAPE R860 Clinical Decision Support Tool to Find Steady State for FRC Measurements

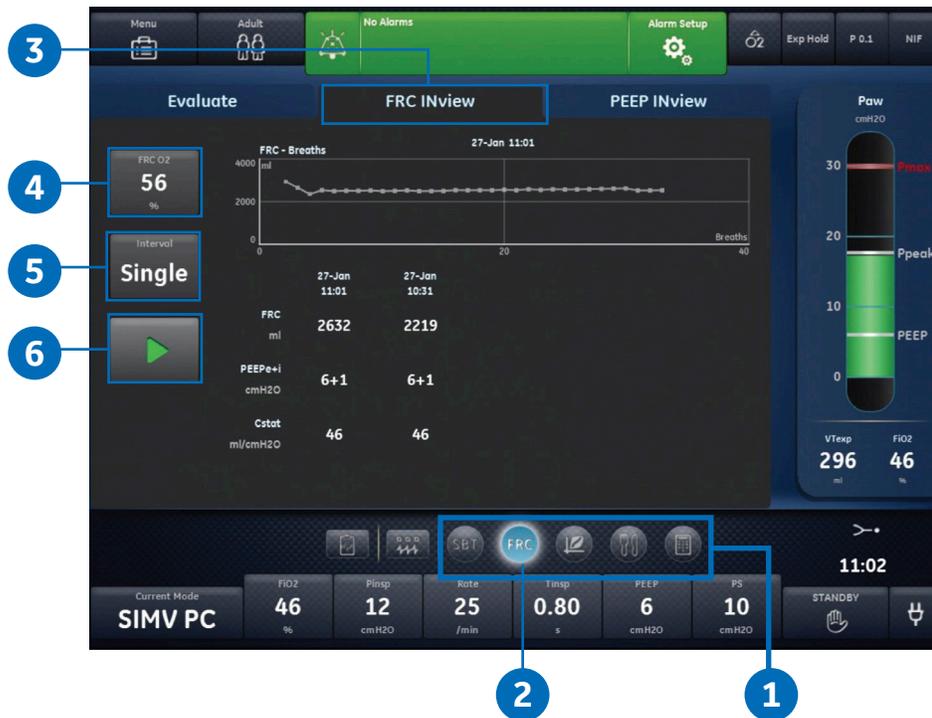


Note: To enter the **Future/Clinical Decision Support Workspace**, select the icon (as shown). If the icon is not available, then you are already in the Future/Decision Support Workspace.

1. Scroll to the **Clinical Decision Support Workspace**.
2. Select **FRC**.
3. Select the **Evaluate** tab.

VO₂ and VCO₂ are graphically displayed in a 1 hour trend. The graphical representation of VO₂, VCO₂, and CO₂ will help you verify the patient is stable. Wait at least 10 minutes or longer for the graphical trends and volume measurements from the ventilator and airway module to stabilize before starting your measurement.

Performing an FRC INview Procedure



1. Scroll to the **Clinical Decision Support Workspace**.

2. Select **FRC**.

3. Select **FRC INview** tab.

4. Select **FRC O₂** and set the FRC O₂ value.

Note: FRC O₂ is adjustable to within plus or minus 10% of set FiO₂ value.

5. Select **Interval**.

- Select **Single** to perform one measurement
- Select between **1** and **12** hours to perform a series of FRC procedures

6. Select **Start**.

After start is selected:

- The FiO₂ changes to the FRC O₂ setting
- As data is collected, the FRC curve is plotted
- After the FRC measurement is complete at the FRC O₂ level, the O₂ level returns to the initial FiO₂ setting
- At the end of the FRC procedure, the ventilator initiates an inspiratory hold and measures Cstat
- When available, FRC, PEEP e+i and CStat is displayed

The FRC curve is displayed with the date and time of the most recent procedure.

Note: Select **stop** to end FRC INview measurement.

Performing a PEEP INview Procedure



1. Scroll to **Clinical Decision Support Workspace**.
2. Select **FRC**.
3. Select **PEEP INview**.
4. Select **FRC O₂** to set the FRC O₂ value.
5. Select **Start PEEP** to select the first PEEP value.
6. Select **End PEEP** to select the final PEEP value.
7. Select **Steps** to select the number of measurements to be taken.
 - The maximum number of steps is 5
8. Select **Step Time** and set the duration between PEEP level changes and measurements at that level.

Note: If the number of steps set between the Start PEEP and End PEEP cannot be completed, the value will change to the maximum steps possible when the procedure is started.
9. Select **Start**.

After start is selected:

- The PEEP setting changes to the start PEEP setting
- The FiO₂ changes to the set FRC O₂, then returns to the set FiO₂ to calculate FRC at the start PEEP. FiO₂ will alternate between original set FiO₂ and FRC O₂ with each PEEP change
- When the FRC calculation has completed at the Start PEEP setting, PEEP changes to the next setting based on the step level
- As data is collected, the FRC and Cstat curves are plotted on the graph
- When available, numerical FRC data is shown for each step
- The FRC and Cstat curves is displayed with the date and time of the most recent PEEP INview procedure

Note: Select **Stop** to end PEEP INview procedure.

Set-up for SpiroDynamics



The use of Lung INview and SpiroDynamics gives the clinician an enhanced view of the patient's lung function with the addition of the intratracheal catheter.

SpiroDynamics is a CARESCAPE R860 clinical decision support tool which draws a dynamic P/V curve, breath-by-breath, regardless of the volume- or pressure-controlled modes of ventilation. The catheter provides an accurate measurement of pressure delivery to the lungs by removing the resistance of the endotracheal tube from the spirometry loop. After a breath, a dynostatic curve is calculated from the loop providing an estimate of the alveolar pressure and volume. This curve is an estimate of the pulmonary compliance during a breath.

1. Attach the intratracheal pressure sensor to the auxiliary pressure port on the ventilator.
2. Access **Menu**.
3. Select **System**.
4. Select **Purge Flow**.
Note: A continuous purge flow of approximately 35 ml/min prevents the buildup of mucous inside of the sensor.
5. Select **Paux Zero** to zero the pressure sensor. When completed, a green check mark appears next to indicating success.
6. Insert the sensor into the endotracheal tube according to the Instructions for Use provided with the sensor.

SpiroDynamics Settings Menu



1. Scroll to **Clinical Decision Support Tools**.
2. Select the **Spirometry** view.
3. Select the **SpiroDynamics** tab.
4. Select the **SpiroDynamics loop** Field.
5. Select the **settings** icon in the upper right hand corner to access the settings menu.
6. Select the **loop type** and how the loop is scaled.
 - **Auto:** The system scales the waveform to include the full range of the waveform curves or loop. The system continuously adjusts the scale as data is collected.
 - **Manual:** Select the scaling controls to increase or decrease the scale of the waveform.

Viewing SpiroDynamics Data



1. Scroll to **Clinical Decision Support Workspace**.

2. Select **Spirometry** view.

3. Select the **SpiroDynamics** tab.

Note: The current SpiroDynamics and Spirometry data is shown based on the SpiroDynamics settings. See SpiroDynamics settings menu for more information.

4. To save the current data as reference data, press **Save Loops**.

Note: Up to six sets of SpiroDynamics data can be saved. When six sets of reference data have been saved, subsequent saves overwrite the oldest set of reference data.

5. To show a specific set of reference data in the loop graph, select the set of reference data.

6. Select and move the SpiroDynamics loop cursor to view specific data points.

7. To remove a specific set of reference data from the loop graph, select the set of reference data.

Note: The following data is collected by the intratracheal catheter:

- Ppeak
- Pmean
- PEEP
- C 5-15: Compliance measured between 5 and 15% of the volume range.
- C 45-55: Compliance measured between 45 and 55% of the volume range.
- C 85-95: Compliance measured between 85 and 95% of the volume range.

This data is shown for the current breath and reference breaths when selected. Review this data to evaluate lung function.

Performing a Lung INview Procedure



1. Attach the intratracheal pressure sensor to the auxiliary pressure port on the ventilator.
2. Access **Menu**.
3. Select **System**.
4. Select **Purge Flow**.

Note: A continuous purge flow of approximately 35 ml/min prevents the buildup of mucous inside of the sensor.
5. Select **Paux Zero** to zero the pressure sensor. When completed, a green check mark appears next to indicating success.
6. Insert the sensor into the endotracheal tube according to the **Instructions for Use** provided with the sensor.

Once the intratracheal sensor is connected to the endotracheal tube follow the same steps to perform a PEEP INview procedure.

7. Scroll to **Clinical Decision Support Workspace**.
8. Select **FRC**.
9. Select **PEEP INview** tab.
10. Select **FRC O₂** to set the FRC O₂ value.
11. Select **Start PEEP** to select the first PEEP value.
12. Select **End PEEP** to select the final PEEP value.
13. Select **Steps** to select the number of measurements to be taken.
 - The maximum number of steps is 5

Note: If the number of steps set between the Start PEEP and End PEEP cannot be completed, the value will change to the maximum steps possible when the procedure is started.
14. Select **Step Time** and set the duration between PEEP level changes and measurements at that level.
15. Select the **Lung INview** checkbox.
16. Select **Start**.

After start is selected:

- The PEEP setting changes to the start PEEP setting.
- The FiO₂ changes to the set FRC O₂, then returns to the set FiO₂ to calculate FRC at the start PEEP. FiO₂ will alternate between original set FiO₂ and FRC O₂ with each PEEP change.
- When the FRC calculation has completed at the Start PEEP setting, PEEP changes to the next setting based on the step level.
- At each PEEP, the FRC and airway resistance is measured and a SpiroDynamics loop is saved.
- The dynostatic curve from the measurement at the current PEEP setting is compared to the dynostatic curve taken from the previous PEEP setting. This value is displayed as the Gain.
- FRC and Cstat curves for the completed Lung INview procedure can be viewed by unchecking the Lung INview check box.
- When available, numerical FRC, PEEPe+i, Cstat, FRC change, Dynostatic Curve Volume, and Dynostatic Curve. Difference data are shown.
- The FRC and Cstat curves is displayed with the date and time of the most recent PEEP INview procedure.

Note: Select **Stop** to end Lung INview procedure.

Conclusion

Individualized settings can help prevent Ventilator-Induced Lung Injury and shorten time in the ICU for your patients. CARESCAPE R860 provides the ability to assess the volume and pressure in the patient's lungs so that clinician's can tailor the vent settings accordingly.

References:

1. <https://www.thoracic.org/patients/patient-resources/resources/mechanical-ventilation.pdf>
2. CARESCAPE R860 SpiroDynamics Appliguide



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