1. PURPOSE
1.1 To set forth the policy and procedure for performing continuous end-tidal waveform capnography.

2. SCOPE
2.1 This procedure applies to all FDNY ALS providers.

3. DEFINITIONS
3.1 **End-Tidal Waveform Capnography**— the measurement of carbon dioxide in exhaled breaths using a device with quantitative real-time visual output that provides an objective marker of the patient’s ventilation status

3.3 **End-Tidal CO₂ (EtCO₂)** – the greatest amount of exhaled CO₂

3.4 **Advanced Airway** - any definitive airway device (e.g., endotracheal tube, Combitube)

4. BACKGROUND INFORMATION
4.1 EtCO₂ waveform capnography is a non-invasive method of measuring carbon dioxide in exhaled air. This allows for direct assessment of a patient’s ventilation status, as opposed to pulse oximetry, which is an indirect assessment. There are many clinical applications using this technology but it will be mainly used for confirming and monitoring all advanced airways.

4.2 Capnography shall be used as secondary confirmation of advanced airway placement and for ensuring that the airway device is maintained and not displaced.

5. POLICY
5.1 According to the New York State Department of Health, the new standard of care for all patients intubated by paramedics in the prehospital setting is monitoring with continuous end-tidal waveform capnography to confirm advanced airway device placement.

5.2 Patients with pre-existing advanced airways (e.g., advanced nursing facilities patients) requiring mechanical ventilation **must** have continuous EtCO₂ waveform capnography monitoring during treatment / transport.

5.2.1 Patients with a pre-existing tracheostomy **do not** require continuous EtCO₂ waveform capnography monitoring for transport.
6. **EQUIPMENT**

6.1 LifePack-12 (LP 12) Monitor

6.2 Disposable Filterline breath sampling device (Photo 1)

7. **PROCEDURE**

7.1 **Monitor Set-Up** - All LP-12s with capnography have been programmed to display Lead II, III and CO2 as the default upon power up along with a numerical EtCO₂ reading. (Photo 2)

7.1.1 When viewing a 12-lead EKG on the monitor screen, the aVF lead is not shown. Members shall print out the 12-lead to view all leads. To switch to a screen showing leads II, III, and aVF, press the "LEAD" Button on the Large Key Pad of the monitor, dial down to Leads II, III, aVF, then depress the Dial to select that feature. The monitor will now be displaying Leads II, III, aVF.
7.2 To perform capnography, place the disposable filterline into the LifePak-12 port labeled “CO₂” located in the upper left corner of the monitor. Turn the filter line clockwise three times making sure it is firmly in place. The “wings” of the filter end should be in a horizontal position. (Photos 3-4)

![Photo 3](image1) ![Photo 4](image2)

7.3 Using the distal end of the Filterline, connect the tapered end directly on top of the advanced airway, and the other end to the BVM. (Photo 5)

![Photo 5](image3)

7.4 After giving five ventilations, an accurate numerical EtCO₂ reading and continuous waveform should be noted on the monitor. (Figure 1)

![Figure 1](image4)
7.5 A normal EtCO2 is approximately 35 mmHg. If the patient is in cardiopulmonary arrest, an EtCO2 reading of at least 10 mmHg should be noted. This indicates that the advanced airway is in place and that effective chest compressions are being performed. (Figure 2)

7.6 If the EtCO2 reading is <10 mmHg it could mean the endotracheal tube is not in the trachea; the advanced airway is in the correct position but the filterline is loose; or that the patient has expired. The following actions shall be taken in the setting of a persistent reading <10 mmHg (Figure 3):

7.6.1 Tighten the filterline slightly (wings horizontal) to the monitor and ventilate the patient 2 to 3 times watching for a waveform or variation.

7.6.2 If no return of a waveform or variation is noted then immediately, reconfirm the correct advanced airway placement by direct visualization using a laryngoscope and by chest auscultation.

7.6.3 If an alternate airway is being used, ensure that ventilations are being given through the proper lumen.

7.6.4 Ensure that effective chest compressions are being performed during CPR.

7.6.5 If after performing the previous troubleshooting steps, the EtCO2 remains <10 mmHg and the patient has a pulse, re-intubate the patient or place an alternative airway.

7.6.6 If after performing the previous troubleshooting steps, the EtCO2 is zero, the patient does not have a pulse and the correct airway position is confirmed by direct visualization, continue resuscitative efforts and contact OLMC. If EtCO2 remains zero after 20 minutes of adequate ALS resuscitative care, this may be a factor in OLMC physician’s termination decision.
7.7 Monitor waveform capnography as you would cardiac monitoring or pulse oximetry.

7.7.1 If during treatment or transport, EtCO₂ falls below 10, immediately perform the troubleshooting procedures listed above and document the actions and results on the ePCR.

7.7.2 Unless significant adverse conditions occur, the capnography monitor should only be removed after the patient has been transferred to the Emergency Department staff of a 911 receiving facility.

7.8 Avoid obstructing the CO₂ exhaust port located in the back of the monitor. This could lead to inaccurate capnography readings.

8. DOCUMENTATION

8.1 The use of capnography, the EtCO₂ reading, and the confirmation and monitoring of the tube shall be recorded in the Narrative History and Comments section of the ePCR.

8.2 The EtCO₂ readings and continuous end-tidal waveform capnography data will be automatically transferred electronically with other information from the LP 12 to be integrated into the electronic Patient Care Report (ePCR).

9. MONITOR FAILURE

9.1 If a LP 12 failure occurs, members shall perform the following:

9.1.1 If the patient is not intubated, only BLS airway maneuvers may be performed.
9.1.2 If the patient was intubated prior to ALS unit arrival (e.g., nursing facility), or had an advanced airway (e.g., endotracheal tube, Combitube) placed by a paramedic with subsequent LP 12 failure, members shall:

A. Call for a backup ALS unit.

B. If the patient condition requires immediate transport, reconfirm the correct advanced airway placement by direct visualization using a laryngoscope and by chest auscultation and transport the patient to the nearest 911 ambulance destination.

C. If needed, contact OLMC for guidance

9.2 The ALS unit shall document the LP 12 failure in accordance with Department policy and procedures.

BY ORDER OF THE FIRE COMMISSIONER AND THE OFFICE OF MEDICAL AFFAIRS