



<b>Wintergreen Fire and Rescue Standard Administrative Policy</b>	
Subject:	Zoll X-Series
Reference Number:	EMS 03-017
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Signature of Approval	Curtis Sheets, Chief

**Purpose:**

This policy is in place to provide necessary guidance and guidelines for using the Zoll X-Series monitor at Wintergreen Fire & Rescue.

End-tidal CO<sub>2</sub> Monitoring Zoll X-Series

**Description:**

A device which allows for a continuous non-invasive monitoring of End-Tidal CO<sub>2</sub> and respiratory rate in patients requiring ventilatory support.

**Introduction:**

CO<sub>2</sub> is a product of cellular metabolism that is removed from the body by ventilation, thus end-tidal air has a high pCO<sub>2</sub>. Inspired air has essentially no CO<sub>2</sub>. The CO<sub>2</sub> monitor is a device which measures the pCO<sub>2</sub> of expired air and displays a numerical value of measured end-tidal CO<sub>2</sub>. The unit can display a capnogram that demonstrates the change in pCO<sub>2</sub> during inspiration and expiration by a waveform on a monitor and will calculate and display respiratory rate based on the measured interval between detection peaks of the CO<sub>2</sub> waveform.

In the cardiac arrest patient, CO<sub>2</sub> may not be carried to the lungs because of poor perfusion. Therefore, the expired pCO<sub>2</sub> may be very low.

**Indications:**

The Zoll X-Series EtCO<sub>2</sub> option is indicated for the continuous noninvasive monitoring of end tidal carbon dioxide (EtCO<sub>2</sub>) and respiratory rate in patients.

All intubated patients will have this capnography initiated and documented including endotracheal tube, supraglottic airway, BVM ventilations via tracheostomy tube.

- Verification of placement
- Surveillance during transport
- CPR: compression efficacy
- Optimize ventilation of patients

**Contraindications:**

1. Mouth to adjunct ventilations
2. Patient's less than 15 kg (30 lbs) in weight

**Procedure:**

1. Turn on the monitor and ensure that the filter line set is plugged into the X-Series monitor
2. Press the CO<sub>2</sub> soft button on the left side of the unit. The numeric CO<sub>2</sub> display appears on the screen and displays the message “initializing”
3. Attach filter line to patient airway circuit
4. Ensure sensor to ET tube is correctly placed
5. Record waveform
6. Capnography device should remain in place for continuous monitoring with frequent checks to ascertain that the tube does not migrate.
7. Patients who do not require intubations but do require the use of nebulizer, the detector may be connected to the nebulizer and the same procedure followed to monitor EtCO<sub>2</sub> and to observe waveform capnography.
8. At hospital, record waveform again

**Documentation:**

Upon confirmation of successful endotracheal intubation (positive waveform), press the snapshot button on monitor to document the initial reading. Document any airway or pharmacologic interventions based on capnography readings. With any patient movement and upon arrival to the Emergency Department and **AFTER** transferring the patient to the hospital’s bed, press the snapshot button on the monitor to document a continued positive waveform. Transfer the capnography reading into ImageTrend (This is done upon transferring the case at the end of the call as required per this policy).

Zoll-X Series 12-Lead**Introduction:**

1. The principal purpose of obtaining a 12-lead ECG in the prehospital setting is to identify patients having an acute ST-elevation myocardial infarction (STEMI) and to relay this information to the receiving hospitals allowing them to appropriately prepare for patient arrival. This has been shown to decrease “door to drug” and “door to invasive intervention” time, both of which improve patient survival.

**Indications:**

1. A prehospital 12-lead ECG should specifically be considered during the assessment of patients being treated as per the following protocols:
  - a. Suspected myocardial infraction
    - i. Chest pain/palpitations
    - ii. Severe indigestion/nausea  $\geq$  35-years-old
    - iii. Epigastric pain unless evidence of GI bleeding
    - iv. Diaphoresis not explained by fever or environment
  - b. Respiratory Distress (possible congestive heart failure/pulmonary edema)
    - i. Asthma
    - ii. COPD
    - iii. CHF

- iv. Pulmonary Edema
- c. Dysrhythmia diagnosis
  - i. Cardiac dysrhythmia (may be particularly helpful in pediatric patients)
  - ii. Heart rate less than 50 BPM or greater than 150 BPM
- d. Stroke/TIA
- e. Return of Spontaneous Circulation (ROSC)
- f. Altered Mental Status
- g. Hypotension/Shock
- h. Syncope or near syncope
- i. Overdose, especially with tricyclic antidepressants, cocaine, and other known substances that may cause irregularity
- j. Allergic reaction
- k. Paramedic discretion

**Contraindications:**

Do not delay the treatment and/or transport of unstable patients to obtain a 12-lead ECG.

**Precautions:**

1. Do not prolong scene time to obtain 12-lead ECG (should take less than 5 minutes)
2. A normal (or nonspecific) 12-lead ECG does not rule out myocardial infarction or ischemia, therefore do not base prehospital treatment on the results of the ECG
3. If a patient on whom you have obtained a 12-lead ECG is refusing transport you must contact medical control for advice

**Technique:**

1. The patient should be in the supine position. If the patient cannot tolerate that position, place them in the semi-fowlers or sitting position
2. Prep the skin
  - a. Shave the chest area, if needed, being careful not to cause laceration
  - b. Cleaning oily skin with alcohol pad
  - c. Briskly rub dry
3. Apply electrodes as described (remember modesty especially with female patients). All electrodes must be connected. Use of proper electrodes are very important for good signal quality.

Limb Leads:	Precordial (Chest) Leads:
Right arm (RA) – Right wrist	V1 – 4 <sup>th</sup> intercostal space to the right of the sternum
Right leg (RL) – Right ankle	V2 – 4 <sup>th</sup> intercostal space to the left of the sternum
Left arm (LA) – Left wrist	V3 – Directly between leads V2 and V4
Left leg (LL) – Left ankle	V4 – 5 <sup>th</sup> intercostal space at midclavicular line
	V5 – Level with V4 at left anterior axillary line
	V6 – Level with V5 at left midaxillary line

- a. Do not use nipples as reference points as locations vary widely
- b. If the patient has pendulous breasts, place electrodes under breasts

4. Attach 12-lead cable to electrodes and machine – avoid patient, cable or vehicle movement and 60 cycle interference (i.e. cellular telephones, radios, most electrical devices).
5. Have the patient rest their arms/hands rather than firmly grasping the stretcher rail.
6. Assure patient is warm and free of shivering
7. Enter appropriate patient information
  - a. Age and Sex (both necessary for accurate 12-lead interpretation)
8. Obtain 12-lead ECG.
  - a. 12-lead Acquisition – the X-Series unit begins pre-acquisition of 12-lead data when you attach the electrodes to the patient, as follows:
    - i. Attach electrodes to the patient lead wires
    - ii. Attach lead wires and electrodes to the patient
    - iii. Attach the V-lead cable to the 12-lead ECG cable (when V-leads are not in use, ensure the V-lead protective cap is plugged into the V-lead connector)
    - iv. Attach the 12-lead cable to the ECG connector on the left side of the X-Series. Arrange the 12-lead cable such that it is neat and not dangling or looped and assure that it is not pulling on individual electrodes.
    - v. To observe the 12-lead waveform traces, press 12 soft button. The screen displays all twelve waveform traces, with the size displayed above the waveform traces.
    - vi. After observing the patient’s ECG and determining that all 12-lead traces display correctly, you can initiate 12-lead Interpretive Analysis. **Hint:** “P” wave in Lead I is always positive; aVR is always negative. If either of these results is different, check limb leads for misplacement.
    - vii. To begin 12-lead Interpretive Analysis, press the Acquire quick access key. The X-Series unit displays the Acquiring 12-lead Status bar as it collects 10 seconds of 12-lead ECG data
    - viii. After acquiring the ECG data, the unit saves the data and displays the Saving 12-lead Status bar
    - ix. After saving the data, the unit performs the post-acquisition Interpretive Analysis and displays the first page of 12-lead Interpretive Analysis information.
9. If the 12-lead ECG shows evidence of an acute myocardial infarction, then contact the destination emergency department as early in the call as possible to allow them the time to prepare appropriately for the patient. Review 12-lead analysis for confirmation.
  - a. “Evidence of myocardial infarction” is defined as:
    - i. ST segment elevation of > 1mm in two contiguous leads
    - ii. The 12SLTM interpretation reports “acute” or “possible acute” myocardial infarction
10. Transmission of 12-lead ECG
  - a. After acquisition, press envelope button on the left side of the display
  - b. Select desired destination from list

- c. Transmit ECG data
11. Transfer all acquired 12-leads to your ePCR in ImageTrend upon completion of the call (This is done upon transferring the case at the end of the call as required per this policy).

**Complications:**

Delay in treatment or transport to obtain a 12-lead ECG may result in patient deterioration

**Pulse Oximetry****Introduction:**

The pulse oximeter is a cutaneous monitor used as an adjunct in the assessment of respiratory issues. The device also assists in evaluating improvement or deterioration during treatment. This device is never used to withhold O<sub>2</sub> to a patient who needs it. Any patient who would currently receive O<sub>2</sub> per system protocol, or who appears to clinically need it, should continue to be given oxygen.

**Indications:**

1. The following is a partial list of situations where pulse oximetry may be used:
  - a. Only for use in perfusing patient
  - b. Respiratory disorders (e.g. Asthma, COPD, respiratory distress, airway obstruction or injury)
  - c. Cardiovascular disorder (e.g. CHF, chest pain, dysrhythmia)
  - d. Altered Mental Status (e.g. Coma, Overdose, CVA, Seizures)
  - e. Trauma
2. The pulse oximeter must be used prior to and after intubation or assisted ventilation of the perfusing patient
3. The pulse oximeter must be used prior to and after administering sedative agents

**Contraindications:**

1. Non-perfusing rhythm

**Precautions:**

1. Pulse oximetry values may be inaccurate in a variety of situations:
  - a. Inaccurate readings can be seen with patient movement, the presence of nail polish, vasoconstriction, decreased peripheral perfusion, hypotension, hypothermia, abnormal hemoglobin's, hypovolemia, carbon monoxide poisoning, smoke inhalation, and methemoglobinemia
  - b. Prehospital personnel should correlate the SaO<sub>2</sub> reading with the clinical status of the patient.
2. Sick cell anemia (readings are generally falsely low secondary to the abnormal hemoglobin molecule)

**Technique:**

1. Check vital signs
2. Turn on the Zoll X-Series monitor

3. Ensure that the pulse oximetry probe cable is connected to the monitor
4. Select appropriate site. Avoid placing the probe on areas distal to orthopedic injuries or distal to a blood pressure cuff
5. Place probe on the patient
6. Read the pulse rate, O<sub>2</sub> saturation and document findings at least every 10 minutes and with any changes in therapy or clinical condition
7. Oxygen will be applied or increased according to the clinical setting. Although normal SaO<sub>2</sub> levels are > 95%, SaO<sub>2</sub> levels above 90% are generally acceptable in almost any adult patient. Pediatric patients in respiratory distress should be placed on supplemental oxygen regardless of the oxygen saturation reading.
  - a. For patient's not on home O<sub>2</sub> therapy, oxygen should be applied via nasal cannula or mask per system protocol
  - b. Patient currently on chronic home O<sub>2</sub> therapy should have an initial SaO<sub>2</sub> reading done. Oxygen may be increased until SaO<sub>2</sub> levels of 90%-92% are obtained.

### Monitoring

Patients can be monitored using either multifunction pads or by using the four-lead patient cables

#### **Application/Use:**

1. Multifunction pads:
  - a. Turn the power on by pressing the green ON button
  - b. Press the top left soft key until PADS is displayed
  - c. Check expiration date on package
  - d. Pad position is anterior/posterior
  - e. Attach pad connector wires to the See-Thru CPR adapter
  - f. Dry patient's chest
  - g. Peel off protective backing
  - h. Press the pads firmly onto the patient's chest and back in instructed position
2. Using four-lead patient cables:
  - a. Turn the power on by pressing the green ON button
  - b. Attach electrodes to patient using standard method
  - c. Select the lead you wish to monitor in (I, II, III, aVR, aVL, aVF)

The monitor will display in the lead selected and will print either Lead I, II, III or aVR, aVL, aVF

### Defibrillation

#### **Multifunction pads:**

1. Ensure defibrillation pads are in place
2. Press the ENERGY SELECT rocker button
3. Select desired energy level on ENERGY SELECT rocker (defaults to 120 joules)

4. Press the red-lettered CHARGE button
5. The device will indicate charging with an audible beep and the screen will state charging to XXX JOULES. When the unit has reached the selected energy level, the beeping will become continuous and the SHOCK button will light up orange until the energy is delivered. The screen will show DEFIB XXX JOULES READY
6. After assuring the patient is clear, press the orange SHOCK button

### Synchronized Cardioversion

#### **Caution:**

The SYNC button must be pressed after each defibrillation attempt to reactivate the SYNC function

1. Connect both the four-lead patient cables and the defibrillation cables with pads to the patient as described in the monitoring section
2. Select desired energy level on ENERGY SELECT rocker
3. Press the 5<sup>th</sup> left softkey (SYNC). Ensure the QRS marker is visible on the screen.
4. Press the CHARGE button
5. The device will indicate charging with an audible beep and the screen will state charging to XXX JOULES. The unit will be ready to shock when the SHOCK button is lit
6. Assuring the patient is clear (**boldly state**, all clear?), press the orange SHOCK button
7. If further SYNCHRONIZED cardioversion is needed, the SYNC button **must** be pressed again prior to shock

### Transferring Data

#### **Introduction:**

Data that is obtained from the Zoll X-Series is vital in the history of care that was given to the patient while under pre-hospital care. Valuable trending data including vitals as well as 12-leads provide the hospital with information necessary for continuing care. Also important, when transferring data is the use of code markers, which get transferred to the procedures and medications part of the report when used appropriately. This provides an accurate timeline of when certain procedures and/or medications were administered during patient care.

Note: This is **REQUIRED** for all reports and patients utilizing the Zoll X-Series monitor

#### **Procedure:**

1. Press the back arrow on the left-side bottom soft keys, then press the Log soft key
2. Assure you are connected to the MiFi indicated by the signal icon located near the middle-top of your monitor screen that will show green
3. Press the soft key that looks like an envelope
4. Press the Enter button (black dot) to Close Case, if not already done so
5. Press Enter button to select cases

6. Use up or down arrow to select the appropriate case based on date/time of your run
7. Press enter button once you have located your record
8. Press Home key, then press Enter button to start the data transfer (Note: the green light at top of monitor will illuminate when data is being transferred).