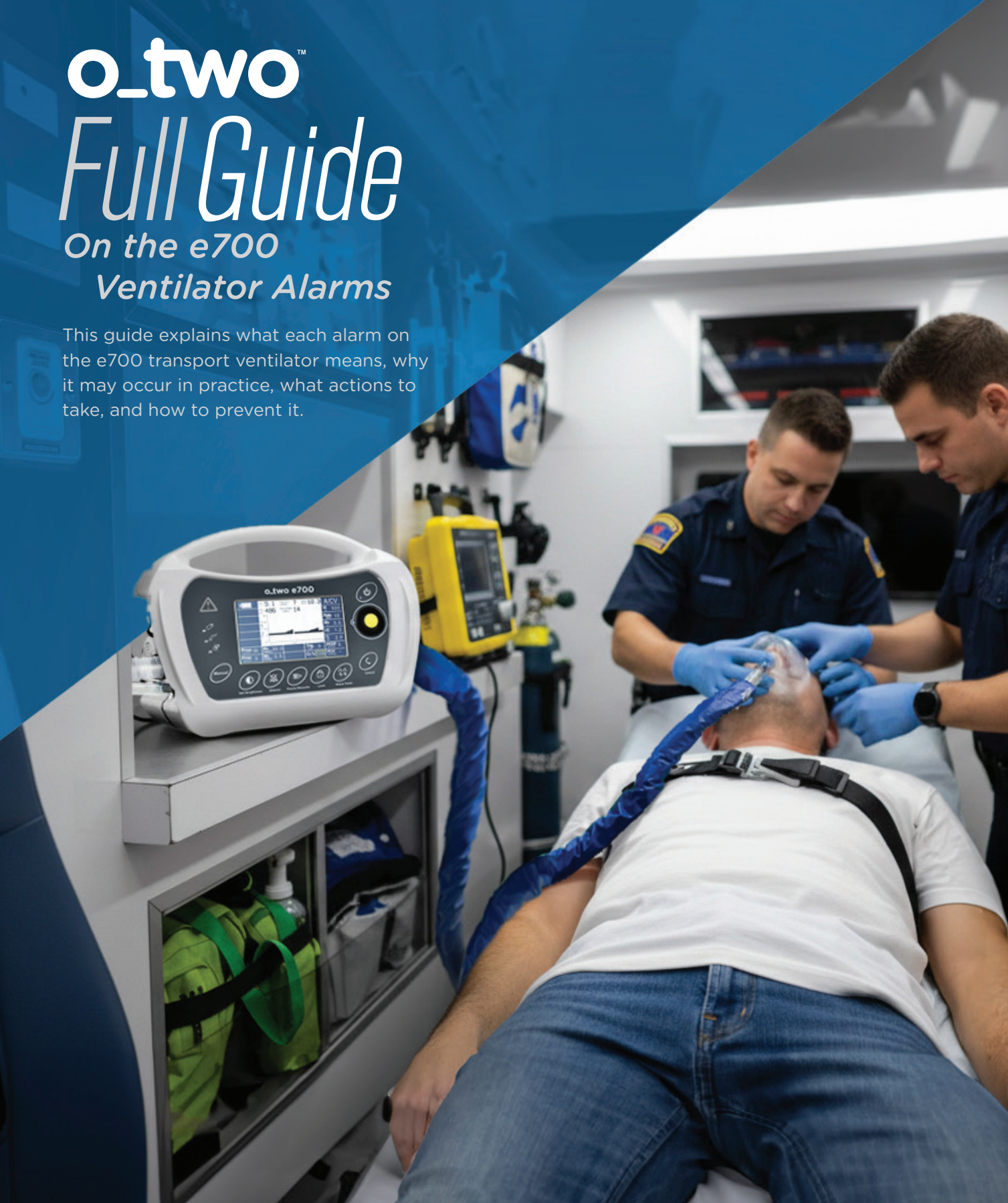
o_two™

# Full Guide

## On the e700 Ventilator Alarms

This guide explains what each alarm on the e700 transport ventilator means, why it may occur in practice, what actions to take, and how to prevent it.



# BCI

Patient Circuit Disconnect
(Breathing Circuit Integrity)

High Priority Alarm

## What It Means

The ventilator has detected a sudden, sustained drop in airway pressure and gas flow for about 15 seconds. This means there is a loss of circuit integrity, such as a major leak or a complete disconnection. When the circuit is open, air escapes before it reaches the patient's airway, leading to ineffective or no ventilation. This alarm acts as an early warning to check the circuit right away and restore a sealed, properly functioning patient connection.

## Possible Causes

- Circuit or flow-sensor tubing is disconnected or loose.
- Circuit elbow joint, ETT, or mask is displaced or leaking.
- A filter, humidifier, or HME is loose or leaking.

## What To Do

- Immediately inspect the entire breathing circuit.
- Reconnect or tighten any loose tubing or connectors.
- Verify the ETT or mask is in place and properly sealed; re-seat it if needed.

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## How to Prevent It

- ✓ Secure all circuit components before use.
- ✓ check that the ETT cuff is inflated and airtight, and that filters or any added equipment are firmly attached.
- ✓ Avoid tension or kinks in the circuit that could pull connectors loose.
- ✓ Before transport, perform a leak test and visually inspect all connections

High Priority Alarm

# LOW PAW

Low Airway Pressure

## What It Means

This alarm activates when peak airway pressure (PAWpeak) during inspiration falls to or below the set minimum pressure limit (Pmin). This indicates that airway pressure is too low for effective ventilation, most often due to a significant circuit leak, disconnection, or poor mask/airway seal. It can also occur if ventilator settings are too low to generate adequate pressure. When this alarm appears, immediately check the circuit, patient connection, and settings.

## Possible Causes

- Circuit leak.
- Disconnection anywhere in the circuit.
- Poor mask or airway seal (ETT cuff or supraglottic leak).
- Seal loss from patient movement or coughing.
- Settings too low to build pressure (low Vt, PEEP, inspiratory pressure, or rate).
- Pmin set too close to the expected PAWpeak.

## What To Do

- Check chest rise, breath sounds, and $SpO_2$.
- Look for circuit leaks or disconnections.
- Set the Pmin about 5–10 $cmH_2O$ below the expected PAWpeak.
- Monitor pressure waveforms for sudden drops indicating leaks or disconnections.

## How to Prevent It

- ✓ Verify circuit and patient interface are airtight.
- ✓ Check ETT cuff pressure and mask seal.
- ✓ Set the Pmin about 5–10 $cmH_2O$ below the expected PAWpeak.
- ✓ Monitor pressure waveforms for sudden drops indicating leaks or disconnections.

High Priority Alarm

# HIGH PAW

High Airway Pressure

## What It Means

The ventilator has detected that peak airway pressure (PAWpeak) has gone above the set high-pressure limit (Pmax) during inspiration. When this happens, the ventilator ends the breath early to prevent excessive pressure and protect the lungs. This high-priority alarm indicates that airway pressures are excessive.

## Possible Causes

- Any increase in airway resistance or decrease in compliance can trigger high pressure.
- Kinked or occluded circuit tubing or ETT.
- Excessive secretions or mucus plugging the airway.
- Bronchospasm (e.g., asthma exacerbation).
- Pneumothorax or pulmonary edema (stiff lungs / low compliance).
- Patient–ventilator asynchrony (coughing or breathing against the vent).
- Patient biting the tube.
- Ventilator settings too high (Vt, rate, PEEP).
- Pmax set too low, causing normal breaths to hit the limit

## What To Do

1. Check respiratory effort, chest rise, and $SpO_2$.
2. Remove kinks, straighten tubing, and suction to clear secretions.
3. Give bronchodilators if bronchospasm is suspected.
4. If pressure remains high, disconnect and bag with 100% $O_2$ to assess lung compliance:
   - **Hard to squeeze** BVM: likely a lung/patient issue (bronchospasm, tension pneumothorax).
   - Easy to squeeze BVM: likely a circuit issue.
7. If needed: lower (Vt, Rate, PEEP), increase (Ti), and raise (Pmax by ~5–10 $cmH_2O$ above expected PAWpeak)

## How to Prevent It

- ✓ Use bite block,
- ✓ Suction regularly,
- ✓ Set Pmax 5–10 $cmH_2O$ above the expected PAWpeak to avoid false alarms.
- ✓ Regularly monitor PAWpeak and waveforms to identify changes in resistance or compliance early.

High Priority Alarm

# Low Mv

Low Minute Volume

## What It Means

The ventilator has detected that the total exhaled minute volume (MVe) has dropped to or below the minimum set limit (MVmin), indicating that the patient isn't getting enough volume or isn't breathing adequately. This may be due to a disconnection, apnea, severe hypoventilation, a large leak, or improper ventilator settings where the rate or tidal volume are insufficient for the patient's needs.

## Possible Causes

- Apnea or very weak breathing effort.
- A circuit disconnection or leak.
- Deflated or leaking ETT cuff.
- Leak at $ETCO_2$ adaptor or filter connection.
- Minute volume set too low to meet patient's metabolic needs.
- Air escape from open chest wound
- MVmin alarm limit set too tight (high).

## What To Do

- Evaluate the level of consciousness, effort, chest movement, and $SpO_2$.
- Reconnect circuit
- Manually bag with 100% $O_2$ while troubleshooting.
- If the MVe remains low, adjust rate or tidal volume to meet the patient's needs.
- Set MVmin to approximately 20-30% below the patient's typical MVe.

## How to Prevent It

- ✓ Secure all connections
- ✓ Monitor patient effort
- ✓ Watch for signs of patient fatigue or sedation-related hypoventilation.

High Priority Alarm

# High Mv

High Minute Volume

## What It Means

The ventilator has detected that the exhaled minute volume (MVe) has risen above the high alarm limit (MVmax). This means the patient is moving more air per minute than expected, often from rapid or deep breathing, agitation, or ventilator settings delivering excessive volume.

## Possible Causes

- Anxiety, pain, tachypnea
- Trigger sensitivity (Trig) set too high, causing the vent to auto-trigger breaths.
- The patient has a strong spontaneous respiratory drive added on top of mandatory breaths.
- Excessive set rate or tidal volume on controlled modes.
- MVmax limit set too low, leading to false alarms.
- Inadequate sedation or ventilator asynchrony.

## What To Do

- Assess the patient first (Check for anxiety, pain, or distress).
- Adjust trigger sensitivity (Trig) if the vent is auto-triggering.
- Review the rate and tidal volume settings.
- Consider sedation or analgesia if the patient is fighting the vent.
- Monitor $SpO_2$ and $ETCO_2$ to confirm ventilation adequacy
- Set MVmax ~20–30% above the patient's typical MVe to reduce false alarms.

## How to Prevent It

- ✓ Ensure adequate sedation and analgesia.
- ✓ Optimize trigger sensitivity (Trig) to prevent auto-cycling.
- ✓ Reassess rate/tidal volume after any clinical change.

# Blocked Airway

High Priority Alarm

## What It Means

The ventilator cannot move air in or out of the lungs, it's detecting no airflow, indicating a complete obstruction of the airway or circuit. In a blocked airway event, the patient is not being ventilated until the blockage is relieved. This is a life-threatening alarm that requires immediate action.

## Possible Causes

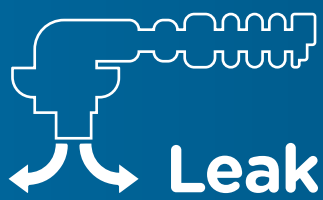
- Mucus plug in ETT.
- A severely Kinked tubing.
- Water in circuit.
- The patient biting on the ETT.
- A foreign body or large blood clot in the airway.

## What To Do

- Immediately check the patient's airway and breathing.
- Suction the airway
- Inspect the circuit and straighten any kinks.
- Drain circuit water.
- If no airflow is restored, disconnect and manually bag with 100% $O_2$ to confirm airway patency.
- If unable to bag manually, treat it as a complete airway obstruction.

## How to Prevent It

- ✓ Suction the airway regularly.
- ✓ Keep circuit free of loops to prevent water accumulation.
- ✓ Use bite block or oral airway.
- ✓ Monitor for rising airway pressures and reduced exhaled volume (early signs of partial obstruction).



# Leak

≥40% Below Set Vt

High Priority Alarm

## What It Means

The ventilator has detected that the exhaled tidal volume is significantly lower than the delivered tidal volume, specifically, the exhaled volume is at least 40% less than what was delivered. This means a substantial portion of the air is not returning, indicating a significant leak in the circuit or patient connection.

## Possible Causes

- Poor mask seal
- Loose or deflated ETT cuff.
- Partially disconnected circuit or flow sensor lines.
- Circuit leak.

**NOTE**

A sudden negative-pressure event (while using ReqPOD) may falsely indicate a leak because it briefly generates negative pressure.

## What To Do

- Re-seat the mask to improve the seal.
- Re-inflate ETT cuff.
- Inspect all connections.
- If unresolved, bag manually with 100% $O_2$, until solving the problem.

## How to Prevent It

- ✓ Perform circuit leak test before transport.
- ✓ Verify ETT cuff pressure or mask fit.
- ✓ Secure all tubing connections.

High Priority Alarm

# LowPi

Low Inspiratory Pressure

## What It Means

The ventilator cannot reach the expected inspiratory pressure (Pi) during a breath. It's trying to deliver a set pressure (or achieve a pressure based on flow), but isn't attaining it. This usually points to a major leak in the circuit that prevents pressure from building.

## Possible Causes

- Disconnected or loose supply hose.
- Cracked or kinked tubing.
- ircuit leak or open patient interface.

## What To Do

- Verify $O_2$ source and connections.
- Inspect circuit for leaks.
- Reconnect or replace any damaged hose or tubing.
- Switch to manual ventilation if pressure cannot be restored.

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## How to Prevent It

- Check $O_2$ and hoses before departure.Verify ETT cuff.
- Inspect hoses and connectors routinely.
- Make sure to open the $O_2$ cylinder valve fully and confirm flow through the ventilator.

High Priority Alarm

# No Oxygen

(≤20 PSI)

## What It Means

The ventilator is sensing that the oxygen inlet pressure has dropped at or below ~20 PSI. This means the ventilator is no longer receiving oxygen input, as the $O_2$ source has been depleted or disconnected. This alarm indicates an imminent loss of supplemental oxygen to the patient.

## Possible Causes

- The oxygen cylinder/tank is empty or nearly empty.
- Disconnected oxygen supply line.
- Regulator failure.

## What To Do

- Switch to backup $O_2$ source immediately.
- Verify flow and cylinder pressure.
- If oxygen cannot be restored, manually ventilate with BVM and supplemental $O_2$.

## How to Prevent It

- Always have a spare $O_2$ cylinder.
- Monitor the primary oxygen tank's pressure frequently.
- Ensure oxygen regulator tightly attached, hoses connected and the tank valve is fully opened.

High Priority Alarm

# High Input Pressure

(≥90 PSI)

## What It Means

The ventilator has detected that the incoming oxygen supply pressure is too high (≥90 PSI), above the ventilator's safe operating range (45–87 PSI). Excessively high supply pressure can impact the ventilator's internal components and functions. This alarm is a warning that the oxygen source pressure is too high, and will be active until safe pressure is restored.

## Possible Causes

- A faulty $O_2$ regulator
- Issues with an ambulance's onboard oxygen outlet delivering higher pressure.
- Using malfunctioning or incompatible regulator.

## What To Do

- Immediately disconnect the oxygen source from the ventilator to prevent potential damage to the ventilator.
- Switch to a proper, verified oxygen source with a functioning regulator.
- Manually ventilate with BVM and $O_2$ if necessary until stable source confirmed.

## How to Prevent It

- ✓ Always use an approved and compatible regulator with the e700 ventilator that maintains a dynamic pressure between (45-87 PSI).
- ✓ Check source pressure on the regulator gauge before connecting the vent.
- ✓ Regularly maintain and inspect oxygen regulators.

# APNEA

High Priority Alarm

## What It Means

In non-invasive ventilation modes (CPAP and BPAP), if the e700 does not detect a spontaneous breath within the set apnea interval (T-Apnea), the Apnea alarm activates. The ventilator then switches to Assist-Control Ventilation (ACV) to deliver mandatory breaths. This indicates either loss of respiratory drive or a problem detecting patient effort, such as a disconnected flow-sensor line. The alarm requires immediate assessment of the patient, verification of airway and sensor connections, and a decision on whether to continue NIV or move to invasive ventilation.

## Possible Causes

- Excessive sedation, or neurologic depression causing loss of respiratory drive.
- Opioid or medication-induced hypoventilation.
- Severe fatigue or deterioration.
- Flow sensor hoses disconnection causing poor trigger detection (no detected effort).

## What To Do

- Assess the patient immediately.
- Determine the cause of apnea.
- Decide if the patient is still a candidate for noninvasive ventilation or if invasive ventilation is indicated.
- Check sensors disconnection.

## How to Prevent It

- ✓ Set an appropriate T-apnea (apnea time) on the ventilator.
- ✓ Avoid over-sedation or placing unstable patients on CPAP without monitoring.
- ✓ Continuously observe respiratory rate, effort, and $ETCO_2$.
- ✓ Have intubation equipment ready for patients at risk of deterioration.

# Empty Battery

High Priority Alarm

## What It Means

The ventilator's internal battery is critically low and nearly depleted. A "Battery Empty" alarm means the ventilator will shut down imminently if not connected to a power source. This is a high-priority operational alarm because if the ventilator loses power, the patient will no longer receive mechanical ventilation.

## Possible Causes

- Extended operation of the ventilator on battery power without recharging.
- Battery was not fully charged before use.

## What To Do

- Immediately connect the ventilator to an external power source.
- Confirm that the charging indicator is active
- If power source is available, switch to manual BVM with 100% $O_2$ to maintain ventilation.

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## How to Prevent It

- ✓ Keep the ventilator fully charged whenever it's not actively in use. After every use or at the start of every shift.
- ✓ Use external power during transport if available.
- ✓ Pay attention to the Low Battery alarm.

## Low Oxygen
(≤40 PSI)

### What It Means

The ventilator senses that the oxygen supply pressure is dropping below ~40 PSI, which is at the lower limit of the required operating range (45-87 PSI). This is a warning that the oxygen delivery pressure is becoming insufficient.

### Action

- Extended operation of the ventilator on battery power without recharging.
- Connect to a new or stable oxygen supply before total depletion.
- Always use an approved and compatible regulator with the e700 ventilator that maintains a dynamic pressure between (45-87 PSI).

## Low Battery

### What It Means

The battery charge is low, but the ventilator is still operating normally.

This is an early warning before the Empty Battery alarm.

### Action

- Connect to external AC/DC power as soon as possible.
- Confirm that the charging indicator is active.
- If no power source is available, prepare a backup battery or manual ventilation plan.
- Do not delay reconnection, especially during transport.

# Alarm Response Algorithm (EMS)

## 1. Check the patient – Always First

- Assess airway, breathing, and circulation immediately.
- Look for chest rise, $SpO_2$, skin color, and responsiveness.
- If the patient shows apnea, cyanosis, or no chest movement → Disconnect from the ventilator and ventilate manually with 100% $O_2$.
- Verify ETT depth or mask position, confirm capnography ($ETCO_2$), and reassess pulse and perfusion.

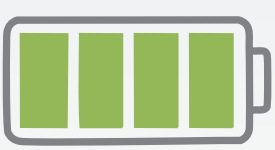
**Remember**

The patient's condition determines urgency, not the alarm tone.

## 2. Check the circuit

- Inspect from patient to ventilator: ensure all tubing and connectors are tight.
- Look for leaks, kinks, water pooling, or disconnections.
- Verify ETT cuff pressure or mask seal in NIV.
- Check HME/filter and flow sensor for occlusion or misplacement.
- Drain condensate from the circuit, moisture causes false high-pressure alarms.

## 3. Check the ventilator



- Confirm the selected ventilation mode, parameters, and alarm limits match the patient plan.
- Confirm the oxygen regulator maintains a dynamic pressure of 45–87 PSI
- Confirm battery status and power connection (AC/DC) to avoid interruption
- Review alarm limits (Pmax, Pmin, MVmax, MVmin) and compare with live parameters (PAWpeak MVe) to ensure they fall within safe and expected ranges.
  - If PAWpeak > Pmax → High PAW Alarm (→ resistance or →compliance)
  - If PAWpeak < Pmin → Low PAW Alarm (leak or disconnection)
  - If MVe > MVmax → High MV Alarm (over-ventilation or tachypnea)
  - If MVe < MVmin → Low MV Alarm (apnea, leak, or low settings)
- Adjust limits according to patient size, lung compliance, and clinical condition to minimize false alarms and prevent missed critical events.
- Check trigger sensitivity (Trig) and patient–ventilator synchrony.

# 4. If unresolved – Back to Basics

- Disconnect the ventilator and manually bag with 100% $O_2$.
- While bagging, pay attention to lung compliance and resistance:
  - Hard to squeeze the bag with barely chest rise → high resistance or low compliance issue (e.g. bronchospasm, blocked ETT, or stiff lungs).
  - Easy bag with no chest rise  disconnection or major leak.
- Correct the issue (suction, reposition, decompress) before reconnecting.
- If ventilation cannot be restored, continue manual ventilation and consider re-intubation.

# 5. Once stable – Resume Ventilation

Reconnect to the ventilator and confirm → Adequate chest rise, normal $SpO_2$, $ETCO_2$ in target range, stable airway pressures.

**NOTE**

If the issue is not resolved and ventilation is effected, use BVM with 100% $O_2$ until ventilation is restored.

**Core Principle**

- When the ventilator alarms, don't panic, and don't just silence it.
- Look at your patient first. The vent is only telling you that something changed.
- It might be a leak, a kink, a drop in pressure, or a real clinical turn.
- Stay calm. Check your patient, then the circuit, then the vent, in that order.
- Most alarms are early warnings, not emergencies, but they become one if ignored.

## DISCLAIMER

This Quick Guide is intended as a simplified reference for EMS providers. It is not a substitute for the full User Manual. For complete instructions on operation, safety, contraindications, maintenance, and troubleshooting, always consult the official User Manual for each device. All O-Two devices must be operated only by trained personnel and in accordance with local EMS protocols, medical direction, and established clinical guidelines.

For full operational guidance, consult the complete manual at:

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