



# Clinical Practice Procedures: Respiratory/Ventilation – HAMILTON-T1

<b>Policy code</b>	CPP_RE_HT1V_0924
<b>Date</b>	September, 2024
<b>Purpose</b>	To ensure a consistent procedural approach for the HAMILTON-T1 ventilator.
<b>Scope</b>	Applies to Queensland Ambulance Service (QAS) clinical staff.
<b>Health care setting</b>	Pre-hospital assessment and treatment.
<b>Population</b>	Applies to all ages unless stated otherwise.
<b>Source of funding</b>	Internal – 100%
<b>Author</b>	Clinical Quality & Patient Safety Unit, QAS
<b>Review date</b>	September, 2027
<b>Information security</b>	UNCLASSIFIED – Queensland Government Information Security Classification Framework.
<b>URL</b>	<a href="https://ambulance.qld.gov.au/clinical.html">https://ambulance.qld.gov.au/clinical.html</a>

While the QAS has attempted to contact all copyright owners, this has not always been possible. The QAS would welcome notification from any copyright holder who has been omitted or incorrectly acknowledged.

All feedback and suggestions are welcome. Please forward to: [Clinical.Guidelines@ambulance.qld.gov.au](mailto:Clinical.Guidelines@ambulance.qld.gov.au)

## Disclaimer

The Digital Clinical Practice Manual is expressly intended for use by appropriately qualified QAS clinicians when performing duties and delivering ambulance services for, and on behalf of, the QAS.

The QAS disclaims, to the maximum extent permitted by law, all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs incurred for any reason associated with the use of this manual, including the materials within or referred to throughout this document being in any way inaccurate, out of context, incomplete or unavailable.

© State of Queensland (Queensland Ambulance Service) 2024.



This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivatives V4.0 International License

You are free to copy and communicate the work in its current form for non-commercial purposes, as long as you attribute the State of Queensland, Queensland Ambulance Service and comply with the licence terms. If you alter the work, you may not share or distribute the modified work. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/deed.en>

For copyright permissions beyond the scope of this license please contact: [Clinical.Guidelines@ambulance.qld.gov.au](mailto:Clinical.Guidelines@ambulance.qld.gov.au)

# Ventilation – HAMILTON-T1

September, 2024

The **HAMILTON-T1 ventilator** is designed to provide positive pressure ventilatory support to adults, paediatrics and neonates. It can deliver tidal volumes between 2 mL and 2000 mL and has a battery life of up to 9 hours. The HAMILTON-T1 ventilator is turbine driven and therefore does not require connection to an oxygen supply to operate at 21% oxygen concentration.



## Indications

- Invasive mechanical ventilation
- Non-invasive ventilation (NIV)

## Contraindications

- Nil in this setting

## Complications




- Atelectrauma
- Barotrauma
- Volutrauma
- Pneumothorax
- Hypotension
- Hypoxia
- Ventilator associated pneumonia

### Connecting the HAMILTON-T1 ventilator to a patient

1. Connect the ventilator to an oxygen supply via the oxygen hose.
2. Select the appropriate circuit and expiratory valve for the patient group:
  - < 15 kg – ‘Neonate’ – Neonatal circuit & neonatal expiratory valve
  - ≥ 15 kg – ‘Adult/Ped’ – Adult/paediatric circuit & adult expiratory valve
  - ‘Last patient’ – has settings stored from last patient connected
3. Install the expiratory valve by doing the following:
  - a) Remove the safety cover and check that the membrane is properly aligned with the expiratory valve housing, and that the metal plate is facing upwards.
  - b) Position the expiratory valve set in the expiratory port (B) and twist clockwise to lock into place.
4. Connect the breathing circuit to the inspiratory port and expiratory valve. The circuit can be connected to face in either direction.
5. Attach the blue and clear tubes to the flow sensor connection ports, ensuring they are connected blue to blue and clear to white.
6. Ensure the flow sensor is always positioned on top of the breathing circuit at the patient connection end.
7. Perform the ‘Leak test’ and ‘Flow sensor’ pre-operation checks. If required, also perform the ‘O<sub>2</sub> sensor’ calibration.
8. If using the extension tube, connect it to the breathing circuit.
9. Connect a heat and moisture-exchange (HME) filter or bacterial/viral filter to the breathing circuit.
10. Connect the CO<sub>2</sub> connector to either the HME filter port or in-line with the breathing circuit, ensuring that the filter is between the patient and the connector.

11. Connect the in-circuit suction, if this is to be used.
12. The circuit is now ready for connection to the patient.
13. Check to ensure the appropriate mode and settings are selected on the ventilator.
14. Connect the circuit to the patient.
15. On the standby window select ‘Start ventilation’.




### Pre-operation tests

1. Press the  (Power/Standby) button to turn on the ventilator and the ventilator will automatically run a self-test.
2. On the Standby Window, select the ‘Pre-op check’ button.
3. Select the ‘Leak test’ button and follow the instructions on the ventilator:
  - a) ‘Disconnect patient’ – ensure all connections and test lung are disconnected from the breathing circuit.
  - b) ‘Block breathing circuit’ – block the opening with a gloved hand.
  - c) ‘Reconnect breathing circuit’ – the test is completed.
  - d) The ventilator will automatically return to the test and calibration menu.
  - e) A green checkmark  indicates the test has been completed successfully. A red cross  indicates the test has failed.



4. Select the 'Flow sensor' button and follow the instructions on the ventilator:
  - a) 'Disconnect patient' – ensure all connections and test lung are disconnected from the breathing circuit and attach the adapter to the flow sensor.
  - b) 'Flip flow sensor' – flip the flow sensor back 180° so that the adaptor is connected directly to the breathing circuit, then wait while the screen displays calibration in progress.
  - c) 'Flip flow sensor' – flip the flow sensor back 180° to the original position.
  - d) At the end of the calibration, the ventilator will automatically return to the test and calibration menu.
  - e) A green checkmark  indicates the test has been completed successfully. A red cross  indicates the test has failed.
5. O<sub>2</sub> sensor calibration test (this only needs to be performed if a red cross is displayed in the O<sub>2</sub> sensor checkbox, or if there is a related alarm).
  - a) Connect the oxygen hose to an oxygen source.
  - b) Set the 'Oxygen' control to 22% concentration or higher.
  - c) Select the 'O<sub>2</sub> sensor' button to commence the test. The test takes approximately 2 minutes to complete.
  - d) The ventilator will automatically return to the test and calibration menu on completion.
  - e) A green checkmark  indicates the test has been completed successfully. A red cross  indicates the test has failed.

### Turning off the ventilator

1. Press the  (Power/Standby) button to open the 'Activate Standby' window during active ventilation.
2. Touch 'Activate standby' to confirm and the ventilator enters Standby.
3. Press and hold  for 3 seconds to turn off the ventilator.
4. In the event of a technical fault, or if the device will not turn off:
  - a) Press and hold  for 10 seconds to turn off the ventilator.

## Additional information

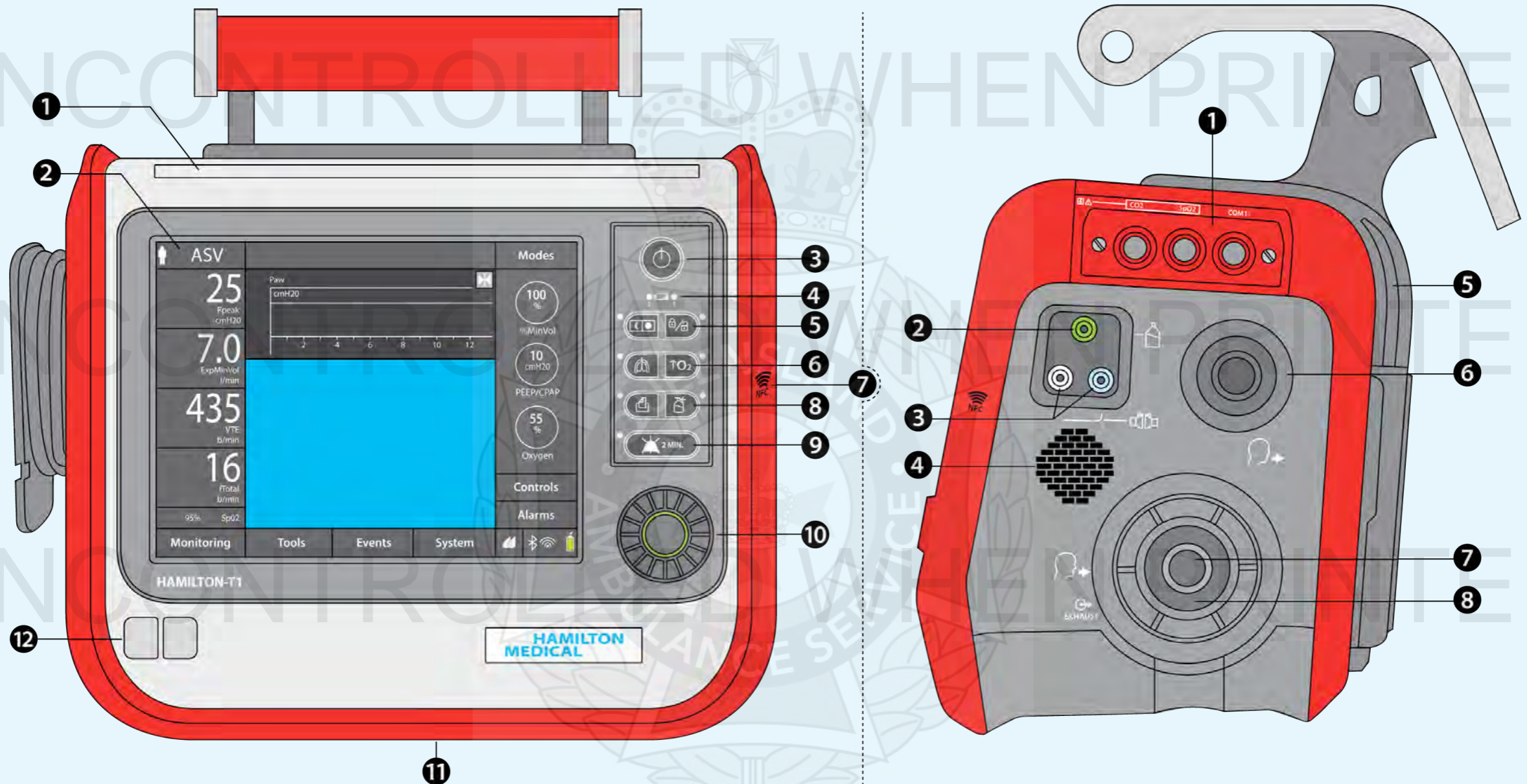
- The leak test detects whether there are any leaks from the breathing circuit due to damage or an improperly connected circuit. If the leak test fails, check to make sure all connections are firm, including the expiratory valve. If it fails again, replace the breathing circuit.
- The O<sub>2</sub> sensor calibration test should be performed using an oxygen source to improve the stability of measurements at higher oxygen concentrations. However, it can be performed without an oxygen source connected. First select the low pressure oxygen (LPO) from the tools menu then return to the 'Pre-op check' menu and complete the test using 21% oxygen on room air.
- The HAMILTON-T1 pressure limits ventilations to 10 cmH<sub>2</sub>O below the set pressure alarm. With a pressure alarm set at 40 cmH<sub>2</sub>O, the ventilations delivered will be limited to a maximum pressure of 30 cmH<sub>2</sub>O.
- Be aware of the dead air space implications of using multiple inline connectors.
- With small paediatric patients under 15 kg, using the adult/paediatric circuit can generate too much dead air space. The manufacturer recommends consideration should be given to using the neonatal/paediatric breathing circuit for these patients.
- Patient group selection for size of circuit:

Adult/Paed circuit	Neonatal circuit
<b>Sex:</b> Male, Female	<b>Weight:</b> 0.2 – 30 kg
<b>Height:</b> 30 – 250 cm	<b>Minimum delivered tidal volume:</b> 2 mL
<b>IBW:</b> 3 – 139 kg	
<b>Minimum delivered tidal volume:</b> 20 mL	



**+** Additional information (cont.)

**Parts of the HAMILTON-T1 ventilator**



- |   |  |
|---|--|
| 1. Alarm lamp   | 7. Near-field communication (NFC) connection area  |
| 2. Touch screen display                               | 8. Print screen key / nebuliser key                |
| 3. Power / Standby key                                | 9. Audio pause key                                 |
| 4. Battery charge indicator                           | 10. Press-and-Turn (P&T) knob                      |
| 5. Day/Night key / Screen lock key/unlock key         | 11. Expiratory valve bleed port (under ventilator) |
| 6. Manual breath key / O <sub>2</sub> enhancement key | 12. Front cover and battery                        |

- |                                   |                                 |
|-----------------------------------|---------------------------------|
| 1. Communication board (optional) | 5. Cooling air outlet           |
| 2. Pneumatic nebuliser port       | 6. To patient inspiratory port  |
| 3. Flow sensor connection ports   | 7. From patient expiratory port |
| 4. Loud speaker                   | 8. Expiratory valve set         |