

HAMILTON-C6

Quick Guide



This Quick Guide is intended as a useful reference for ventilation of **adult and pediatric** patients. It does *not* replace the clinical judgment of a physician nor the content of the ventilator *Operator's Manual*, which should always be available when using the ventilator.

Some functions are optional and are not available in all markets.

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1. HAMILTON-C6 basics 1.1 Monitor



- **1 Alarm lamp.** Lights when an alarm is active. Red = high priority. Yellow = medium or low priority.
- 2 Touch screen
- **3** Manual breath key. Delivers a mandatory breath or a prolonged inspiration.
- **4 O2 enrichment key.** Delivers a minimum of 100% oxygen for a set time. Also used for suctioning.
- **5** Audio Pause key. Pauses the audible alarm for 2 minutes. Press the key again to cancel the audio pause.
- 6 Screen lock/unlock key. Disables/enables the touch screen (for example, for cleaning).
- **7 Nebulizer on/off key.** Activates nebulization during the breath phases for a configured duration.
- 8 **Power/Standby key.** Turns the ventilator on/off, used to enter Standby.
- 9 Print screen key. Saves a PNG of the current display to a USB storage device.
- 10 Press-and-turn (P&T) knob. Selects and adjusts settings.

- 1. HAMILTON-C6 basics
- 1.2 Ventilator, front view



- 1 Monitor post
- 2 Communication board with CO2, SpO2, Aerogen ports (optional)
- **3** *To patient* **inspiratory port.** Connect an inspiratory filter and the inspiratory limb of the breathing circuit.
- 4 *From patient* expiratory port. Connect the expiratory valve set and expiratory limb of the breathing circuit.
- 5 Expiratory valve set
- **6 Pes port.** Allows you to use pressure readings other than airway pressure (Paw), for example, from an esophageal balloon catheter, for monitoring purposes. Transpulmonary pressure is also calculated using a combination of the Paw and Pes pressures.
- 7 IntelliCuff port. Dedicated connection port for IntelliCuff.
- 8 Pneumatic nebulizer port
- **9** Flow sensor ports. Always attach the blue tube to the blue connector and the clear tube to the silver connector.
- 10 Status indicators. ventilator status, as follows:
 - Power indicator. Green when ventilator is turned on.
 - Detery status indicator. Lit: charged; Flashing: charging; Not lit: not charging
 - Active ventilation indicator. Pulses with each inspiratory breath.
 - Alarm indicator. Flashes red when an alarm is active.

HAMILTON-C6 basics Main display



- 1 Patient group. Shows the selected patient group. Touch the icon to open the Patient window.
- 2 Active mode. Shows the active mode. Touch the mode name to open the Modes window.
- **3** Message bar. Displays alarms and other messages. Touch the message to open the Alarms > Buffer window and to access the on-screen help.
- **4 Graphic panels.** Real-time waveforms, loops, trends, Intelligent panels. Touch a graphic to change the display.
- 5 i-icon. Displayed when there are unreviewed alarms. Touch the icon to display alarm info and access the on-screen help.
- **6** Target button. Access INTELLiVENT-ASV settings and controls.
- 7 Mode button. Access to the Modes window.
- 8 Controls for the active mode.
- **9 Window buttons.** Open the Monitoring, Graphics, Tools, Events, System, Alarms, Controls windows. The Controls window provides access to patient, TRC, and apnea settings.
- **10 Power source.** Shows the active and available power sources, and the date/time. Touch to open the System > Info window.
- **11 Audio Pause indicator.** Shows that Audio Pause is enabled and how much time remains before the audible alarm sounds. Touch to open the Alarms > Buffer window.
- **12 Quick access icons.** Touch to reset the display (**Home** button), or access the IntelliCuff or Humidifier windows.
- **13 Main monitoring parameters (MMPs).** Configurable monitoring data. Touch an MMP to open the Alarms window.

2. Navigation shortcuts and icon states

Touch Quick access icon/ shortcut on main display	To display the
ŤŤ	Controls > Patient window
Mode name	Mode window
Any MMP	Alarms > Limits 1 window
SpO2 value (under MMPs)	Alarms > Limits 2 window
Any graphic (waveform, loop, trend, Intelligent panel)	Graphics selection window
	System > Info 1 window
(any displayed battery icon)	
2017-08-07 07:11:58	System > Settings > Date & Time window

2. Navigation shortcuts and icon states

Touch Quick access icon/ shortcut on main display	To display the
i 🛱 0r 1:40	Alarms > Buffer window
Alarm message in the Alarms > Buffer window	On-screen alarm troubleshooting help
ñ	Reset the display layout and graphic selections to the defaults specified for the selected Quick Setup
	System > IntelliCuff window*
	See next page for icon states.
	System > Humidifier window**
	See next page for icon states.

* If IntelliCuff is connected

** If HAMILTON-H900 humidifier is connected

2. Navigation shortcuts and icon states

IntelliCuff icon state	Description	HAMILTON- H900 icon state	Description
ζ >	<i>Grayed out</i> . IntelliCuff is not connected.		<i>Grayed out</i> . Humidifier is not connected.
< >	<i>Cuff is empty.</i> IntelliCuff is connected, but turned off.	(\mathcal{L})	<i>Outline only.</i> Humidifier is connected, but turned off.
$\langle \bullet \rangle$	White. IntelliCuff is connected, operational.		<i>White</i> . Humidifier is connected, operational.
$\langle \phi \rangle$	<i>Yellow.</i> A low- or medium-priority IntelliCuff-related alarm is active.		<i>Yellow.</i> A low- or medium-priority humidifier-related alarm is active.
$\langle \boldsymbol{\diamond} \rangle$	<i>Red.</i> A high-priority IntelliCuff-related alarm is active.		<i>Red.</i> A high-priority humidifier-related alarm is active.

Setting up the ventilator Connecting the humidifier



Back/bottom of humidifier



1 Mounting bracket

2 AC power socket

3 COM port and communication cable

4 Potential equalization conductor

If using a HAMILTON-H900 humidifier, operation of the humidifier is integrated with the ventilator.* See page 36.

^{*} Not available in all markets

3. Setting up the ventilator

3.2 Assembly/installation of expiratory valve set



To install the expiratory valve set

- Holding the expiratory valve housing, seat the silicone membrane onto the housing (1). The metal plate must face up and be visible.
- Position the housing into the expiratory port (2) and twist clockwise until it locks into place (3).

3. Setting up the ventilator

3.3 Connecting a breathing circuit (humidification/HMEF)



- 1 To patient inspiratory port
- 2 From patient expiratory port
- 3 Expiratory valve set
- 4 Flow sensor connection ports
- 5 Bacteria filter
- 6 Inspiratory limb to humidifier
- 7 Heated inspiratory limb with temperature sensor, to patient
- 8 Y-piece
- 9 Heated expiratory limb
- 10 CO2 sensor/adapter
- 11 Flow sensor
- 12 Humidifier
- **13** Coaxial inspiratory/expiratory limb
- 14 Expiratory limb extension
- 15 HMEF

Setting up the ventilator Breathing circuit (high flow oxygen)



- 1 To patient inspiratory port
- 2 From patient expiratory port
- 3 Expiratory valve set
- 4 Bacteria filter
- 5 Inspiratory limb to humidifier
- 6 Heated inspiratory limb with temperature sensor, to patient
- 7 Y-piece
- 8 Heated expiratory limb
- 9 Adapter
- 10 Nasal cannula
- 11 Attachment strap
- 12 Humidifier

- 3. Setting up the ventilator
- 3.5 Connecting an internal pneumatic nebulizer (optional)



- 1 Inspiratory limb (or coaxial inspiratory/expiratory limb)
- 2 Nebulizer (example)
- 3 Connection tube to ventilator
- 4 Flow sensor

Inspiratory filter not shown.

For details about using an Aerogen nebulizer, see the Aerogen Solo/Aerogen Pro Instructions for Use.

Setting up the ventilator Connecting a mainstream CO2 sensor





Attaching the CO2 sensor to the airway adapter

- Connect to CO2 port on the ventilator communication board
- 2 Airway adapter
- 3 CO2 sensor



Connecting the CO2 sensor/ adapter to the breathing circuit

You can connect the CO2 sensor in front of or behind the flow sensor, according to your institution's protocol.

3. Setting up the ventilator

3.7 Connecting an SpO2 pulse oximeter (Masimo SET)





Masimo SET pulse oximeter components

- 1 Adapter, which contains the oximeter hardware
- 2 Cable connection ports
- 3 Sensor and cable
- 4 Patient cable (connects to adapter and sensor)
- Adapter cable (connects the adapter to the SpO2 port on the ventilator communication board)
- 6 Sensor cable holder

To connect the cables

 Connect the ventilator, patient, and sensor cables as shown.

3. Setting up the ventilator

3.8 Connecting an SpO2 pulse oximeter (Nihon Kohden)







Nihon Kohden pulse oximeter components

- Adapter cable (connects the adapter (2) to the SpO2 port on the ventilator communication board)
- 2 Adapter
- 3 Sensor and sensor cable

To connect the cables

 Connect the patient and sensor cables to the ventilator as shown.

Setting up the ventilator Connecting IntelliCuff (built-in)



The built-in IntelliCuff has permanent power, data, and pressure connections. You only need to connect the tubing to the patient ET tube and to the ventilator.

To connect IntelliCuff (built-in)

- 1 Connect the patient end of the tubing to the patient ET tube as shown to the left.
- 2 Connect the other end of the tubing to the IntelliCuff port (1) on the front of the ventilator.

Setting up the ventilator Turning on the ventilator



- 1 Connect ventilator to AC power and oxygen supply.
- **2** Assemble and connect the patient breathing circuit.
- **3** Do either of the following:
 - Press the Power/Standby button(1) on the rear of the ventilator.
 - Press the Power/Standby key (2) on the front of the monitor.

The ventilator runs a self-test and, when complete, displays the Standby window.

Use the ventilator only if it passes all tests.

Setting up the ventilator Inabling O2, CO2, and/or SpO2 monitoring



- 1 System
- 2 Sensors
- 3 On/Off
- 4 Sensor options
- 5 SpO2 sensor type
- 6 SpO2 sensor status

To enable O2 / CO2 / SpO2 monitoring

- 1 Touch System > Sensors > On/Off.
- 2 Select the O2 sensor, CO2 sensor, and/or SpO2 sensor checkboxes as required, and close the window.

The status text Active appears next to the SpO2 checkbox as long as the adapter is connected to the ventilator. If the status area is empty, the adapter is not connected.

4. Configuring settings for the patient



- 1 Patient group: Neonatal, Adult/Ped, Last patient
- 2 Quick setups
- **3** Selected mode and patient group
- 4 Sex, Patient height, calculated IBW*
- 5 Preop check
- 6 Start ventilation (Start therapy if HiFlowO2 is active mode)

* Adult/Ped only.

To select the patient group and specify patient data

- 1 Touch Adult/Ped, Neonatal, or Last patient. Last patient uses the last-specified settings.
- 2 If Adult/Ped is selected, touch the appropriate patient icon (male or female) and set the patient height. The device calculates the ideal body weight (IBW).
- **3** Touch **Preop check** to perform the preoperational check.

5. Performing the preoperational check 5.1 Tightness test

Step one

- 1 Touch **Preop check** in the Standby window. The System > Tests & calib window is displayed.
- 2 Touch the **Tightness** button to perform the tightness test.
- **3** When prompted, block the patient end of the breathing circuit. Hold until prompted.

Pass \checkmark or fail \Join and date/time of completed test are displayed.

×			
	2015/04/28	13:02	
	2015/04/28	13:03	
	2015/04/28	13:50	
	2015/04/28	13:55	



5. Performing the preoperational check5.2 Calibrating the flow sensor

Step two

1 Touch the **Flow sensor** button to calibrate the flow sensor.

Calibration starts automatically.

2 When prompted, turn the flow sensor and connect to the Y-piece using the calibration adapter.

Calibration starts automatically.

3 When prompted, turn the flow sensor again and remove the calibration adapter.

Pass \checkmark or fail \bigotimes and date/time of completed test are displayed.





5. Performing the preoperational check
5.3 O2 sensor calibration, alarm tests

Step three

- 1 If an X is displayed next to O2 sensor, touch the **O2 sensor** button to calibrate the O2 sensor.
- 2 If the O2 sensor calibration needed alarm is generated, repeat the calibration.

Step four

▶ Test the alarms to ensure proper operation. See the ventilator *Operator's Manual*.

When calibration and tests are complete, the ventilator is ready for use.

5. Performing the preoperational check5.4 If the preoperational check fails



6. Configuring ventilation settings6.1 Selecting a mode



- 1 Active mode
- 2 Mode button
- 3 New mode
- 4 Confirm/Cancel buttons

To change the mode

- 1 In the Modes window, touch the desired ventilation mode.
- 2 Touch Confirm.

The Controls window opens.

The **Confirm/Cancel** buttons are only displayed when selecting a new mode.

6. Configuring ventilation settings6.2 Reviewing and adjusting mode controls



Controls window

To adjust settings

- 1 Adjust control settings as needed.
- 2 Touch Confirm, if displayed.

The new mode becomes active.

The **Confirm/Cancel** buttons are only displayed when selecting a new mode.

To start ventilating the patient

 Touch Start ventilation to start ventilating the patient.

Adjust controls at any time during ventilation by touching **Controls**.

For details about control settings, see the ventilator *Operator's Manual*.

6. Configuring ventilation settings6.3 Reviewing and adjusting alarm limits



- 1 Alarms
- 2 Limits 1, 2
- 3 Current monitored value
- 4 Auto button
- 5 Red or yellow bar indicates monitored value is out of range
- 6 Alarm Off symbol when limit is set to Off

To review alarms

1 Touch Alarms (1).

The Alarms > Limits 1 window opens.

2 Set alarm limits as appropriate.

Changing the High pressure and Vt high alarm limits may affect ventilation. See next page.

6. Configuring ventilation settings6.3 Reviewing and adjusting alarm limits

High pressure alarm

The ventilator uses the high **Pressure** alarm limit minus 10 cmH2O as a safety boundary for its inspiratory pressure adjustment, and does not exceed this value. An exception is sigh breaths, when the ventilator may apply inspiratory pressures 3 cmH2 O below the high **Pressure** alarm limit.

High Pressure alarm limit (1)



High Pressure alarm limit (1)



High Vt alarm

Inspiratory volume is limited to 150% of the set high Vt alarm limit. Changing the high Vt alarm limit may limit the inspiratory volume. Volume limitation is disabled in NIV modes.

7. Working with IntelliCuff7.1 IntelliCuff window



1 IntelliCuff quick access icon

- 2 System
- 3 IntelliCuff
- 4 Modes: Off, Auto, Manual
- **5** Cuff pressure/Hold pressure
- 6 Ppeak
- 7 Pcuff
- 8 Pressure controls: Relative, Minimum, Maximum
- 9 Deflate and Hold

IntelliCuff modes

Auto mode. The device adjusts cuff pressure dynamically to maintain the set pressure within stated limits. The pressure is determined relative to **Ppeak**.

Manual mode. You set the cuff pressure. The device maintains this pressure regardless of the current airway pressure.

7. Working with IntelliCuff7.2 Performing a hold



- 1 System
- 2 IntelliCuff
- 3 Hold
- 4 Hold pressure
- 5 Hold timer progress bar

A hold temporarily increases the cuff pressure by a set amount for 5 minutes. By default, the device applies 5 cmH2O above the currently set pressure.

To perform a hold

In the System > IntelliCuff window, touch the Hold button. The progress bar counts down the remaining time.

When complete, IntelliCuff beeps, the hold bar disappears, and the pressure returns to the previous setting.

7. Working with IntelliCuff7.3 Deflating the cuff



Before turning off IntelliCuff or the ventilator, you must first deflate the cuff. Once it is deflated, you can turn off the device.

To deflate the cuff

- 1 In the System > IntelliCuff window, touch **Deflate** (1).
- 2 When prompted to confirm, touch Yes.

When the cuff is fully deflated, the **Pcuff** value is 0.

8. Working with the HAMILTON-H9008.1 Humidifier window



- 1 Humidifier quick access icon
- 2 System
- 3 Humidifier
- 4 Operating modes: Invasive (selected), NIV
- 5 Control modes: Off, Auto (selected), Manual
- 6 Set temp control
- 7 T humidifier
- 8 T gradient control
- 9 T Y-piece
- **10** Breathing circuit (Invasive shown)
- **11** Exp. temperature increase checkbox

8. Working with the HAMILTON-H9008.2 Operating and control modes

Operating modes (Invasive, NIV)

The operating mode determines:

- Initial temperature settings
- Allowed temperature ranges

When connected to the ventilator, the humidifier *automatically* matches the ventilator mode type.

You can change the mode at any time.

The breathing circuit shown in the Humidifier window matches the selected mode.

Auto and Manual control settings

The water chamber exit temperature and temperature gradient settings are either:

- Loaded from default settings on humidifier (Auto)
- Set manually by operator (Manual)

When set to Auto, temperature controls in the System > Humidifier window are disabled.

In both cases, the humidifier automatically controls the temperatures to reach the specified settings.

NOTE. Changing the operating mode automatically causes a switch to **Auto** control. The default settings for the newly selected operating mode are automatically applied.

8. Working with the HAMILTON-H9008.3 Changing humidity using temperature controls

Control	Description
Set temp	Temperature at water chamber exit. Higher values result in higher absolute humidity.
T gradient	The difference between temperature at water chamber exit and at Y-piece. A higher value decreases condensation.
Exp. temperature increase	When selected, provides additional heat in the expiratory limb to reduce condensation.

To manually specify humidity settings

- ► Do either of the following:
 - In the System > Humidifier window (page 36), touch Manual, then select the Set temp and T gradient values, and select the Exp. temp increase checkbox if needed.
 - Change the settings directly on the humidifier.

In this case, the ventilator controls automatically switch to Manual.

9. Monitoring the patient9.1 Reviewing patient data



- 1 Main monitoring parameters (MMP), configurable
- 2 SpO2 (when enabled)
- 3 Dynamic Lung panel
- 4 Waveforms, configurable
- 5 Vent Status panel
- 6 Monitoring window, shows all available monitoring data Not shown. Monitoring panel (SMP), configurable

The main display provides an at-a-glance overview of the patient's condition.

9. Monitoring the patient9.2 The Dynamic Lung



- * When IntelliCuff connected
- ** When SpO2 enabled and sensor connected

- 1 Sex, height, IBW
- 2 Real-time representation of lung compliance
- 3 Cuff indicator*
- 4 Real-time representation of airway resistance
- 5 Patient trigger (diaphragm)
- 6 Heart and pulse display**
- 7 Parameter values

Visualizes real-time:

- Tidal volume
- Lung compliance
- Resistance
- Patient triggering
- Heart rate
- Cuff pressure

The lungs expand and contract in synchrony with patient breaths.

- 9. Monitoring the patient
- 9.3 Dynamic Lung: resistance, compliance display



- 1 Normal resistance
- 2 Moderately high resistance
- 3 High resistance



- 1 Low compliance
- 2 Normal compliance
- 3 High compliance

9. Monitoring the patient 9.4 Reviewing alarms



- 1 Alarms
- 2 Buffer
- 3 i-icon (not displayed with active alarms)
- 4 Message bar with alarm
- 5 High-priority alarm (red)
- 6 Medium- or low-priority alarm (yellow)
- 7 On-screen help for selected alarm

The *alarm buffer* displays *active* alarms. Active alarm messages also alternate in the message bar.

To review active alarms

Do one of the following:

- Touch the message bar
- Touch Alarms > Buffer

The Events > Alarms window displays all previous (now inactive) alarms.

To review previous (inactive) alarms

Do one of the following:

- Touch the i-icon
- Touch Events > Alarms

To review the on-screen help

► In the buffer, touch an alarm.

The associated on-screen help page appears.



Parameter D	efinition
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Apnea Backup	A function that provides ventilation after the adjustable apnea time passes without breath attempts. If Backup is enabled, control settings are calculated based on the patient's IBW.
ETS	Expiratory trigger sensitivity. The percentage of peak inspiratory flow at which the ventilator cycles from inspiration to exhalation.
Flow	With high flow oxygen, Flow is the continuous and constant flow of medical gas to the patient, in liters per minute.
Flow pattern	Flow pattern for gas delivery. Applies to volume-controlled mandatory breaths.
Flow trigger	The patient's inspiratory flow that triggers the ventilator to deliver a breath.
l:E	Ratio of inspiratory time to expiratory time. Applies to mandatory breaths, when the device is configured in this way.
%MinVol	$Percentage \ of \ minute \ volume \ to \ be \ delivered \ in \ ASV \ mode. \ The \ ventilator \ uses \ the \ \% MinVol, \ Pat. \ height, \ and \ Sex \ settings \ to \ calculate \ the \ target \ minute \ ventilation.$
Oxygen	Oxygen concentration to be delivered.
Pasvlimit	The maximum pressure to apply in ASV mode. Changing Pasvlimit or the Pressure alarm limit automatically chan- ges the other. The upper Pressure alarm limit is always 10 cmH2O greater than Pasvlimit.



Parameter Definition

Pat. height	Patient height. Used in calculation of the ideal body weight (IBW), which is used in calculations for ASV and startup settings for adult and pediatric patients.
Pause	Inspiratory pause or plateau, as a percentage of total breath cycle time. Applies to volume-controlled mandatory breaths, when the device is configured in this way.
Pcontrol	The pressure additional to PEEP/CPAP.
Peak flow	Peak (maximum) inspiratory flow. Applies to volume-controlled mandatory breaths, when the device is configured in this way.
PEEP/CPAP	Positive end expiratory pressure.
P high	The high pressure setting in APRV and DuoPAP modes. Absolute pressure, including PEEP.
Pinsp	Pressure (additional to PEEP/CPAP) to apply during the inspiratory phase. Applies in PSIMV+ PSync and NIV-ST.
P low	The low pressure setting in APRV.
P-ramp	Pressure ramp. Time required for inspiratory pressure to rise to the set (target) pressure.
Pressure trigger	The drop in airway pressure when the patient tries to inhale triggers the ventilator to deliver a breath.

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Parameter Definition

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Psupport	Pressure support for spontaneous breaths in SPONT, NIV, and SIMV+ modes.
Rate	Respiratory frequency or number of breaths per minute.
Sex	Sex of patient. Used to compute ieal body weight (IBW) for adults and pediatrics.
Sigh	Breaths delivered at a regular interval (every 50 breaths) at a pressure up to 10 cmH2O higher than non-sigh breaths, as allowed by the upper Pressure alarm limit.
T high	Length of time at the higher pressure level, P high, in DuoPAP and APRV modes.
ТІ	Inspiratory time, the time to deliver the required gas (time to reach the operator-set Vt or Pcontrol value). Used with Rate to set the breath cycle time.
TI max	Maximum inspiratory time for flow-cycled breaths in neonatal NIV, NIV-ST, and SPONT modes.
Tip	Inspiratory pause or plateau time. Applies to volume-controlled mandatory breaths when the device is configured in this manner.
T low	Length of time at the lower pressure level, P low, in APRV mode.
Vt	Tidal volume delivered during inspiration in (S)CMV+ and SIMV+ modes.

Notes

Intelligent Ventilation since 1983

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