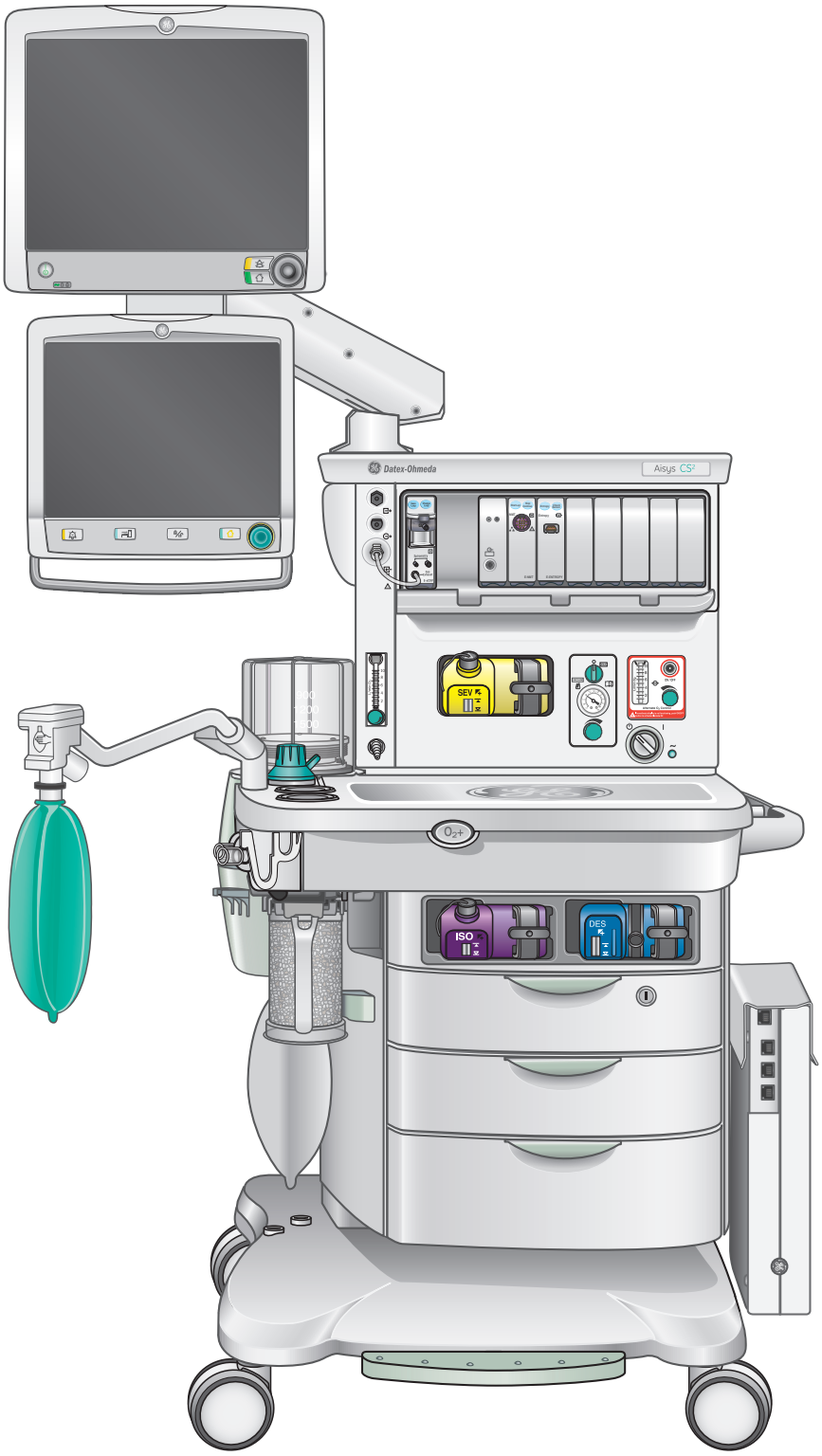
Aisys CS²

Clinical Reference Guide
Software Revision 11



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Notice

The materials contained in this document are intended for educational purposes only.

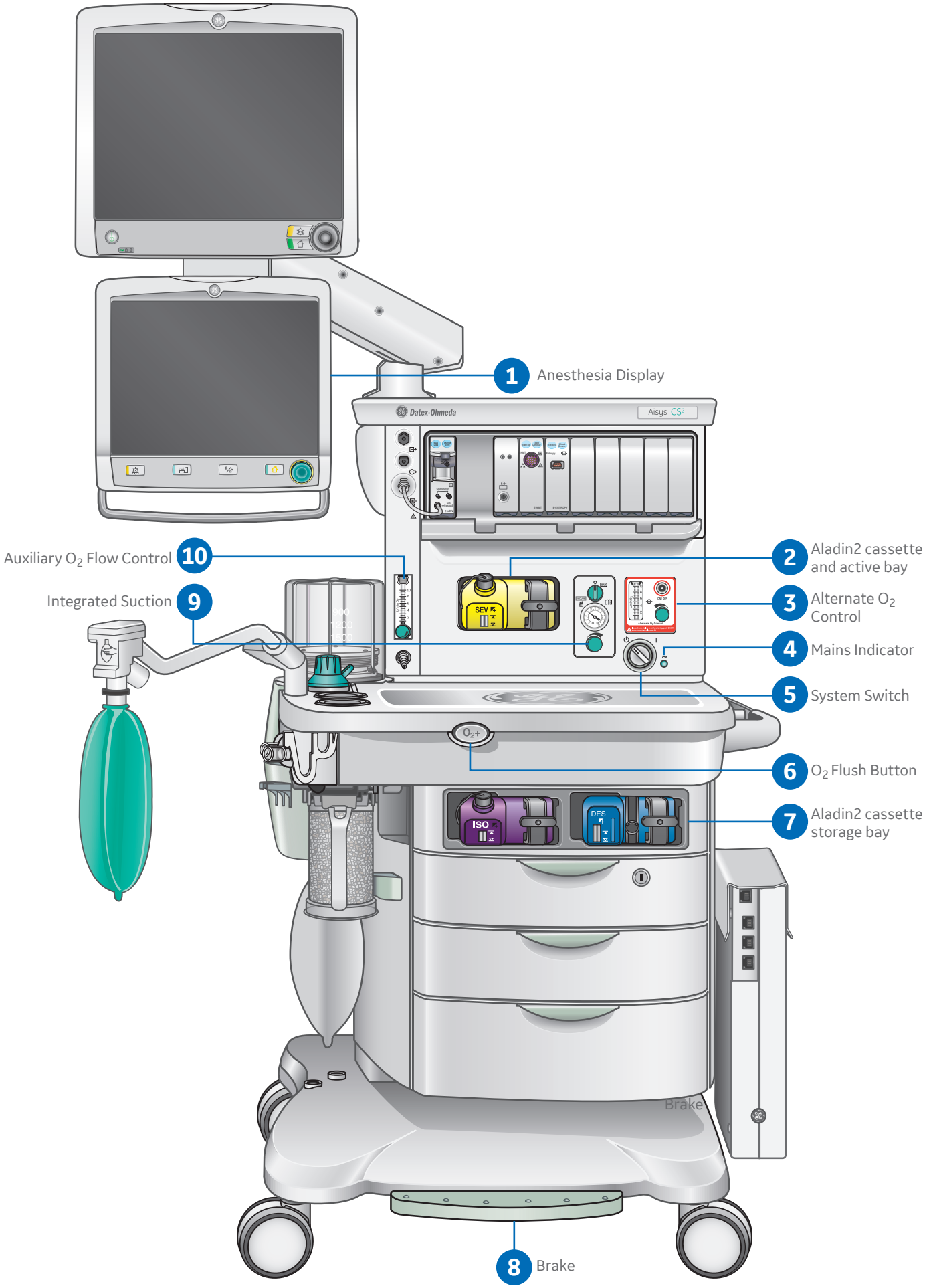
This document does not establish specifications, operating procedures or maintenance methods for any of the products referenced. Always refer to the official written materials (labeling) provided with the product for specifications, operating procedures and maintenance requirements.

Contents

01 Overview

Front View

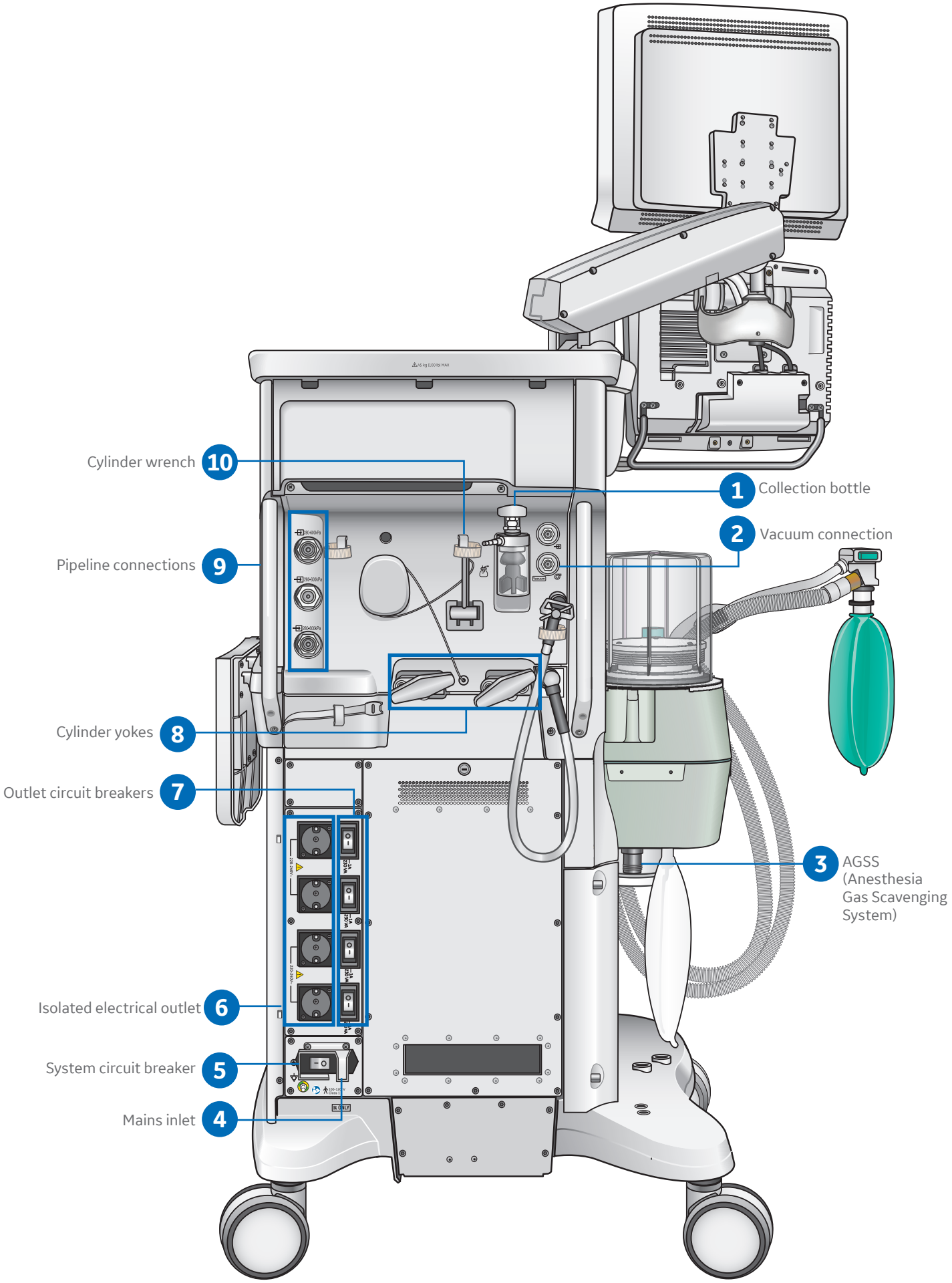
1. **Anesthesia Display:** The anesthesia display is used throughout the anesthesia delivery process and allows the clinician to interact with the system. The display also provides real-time patient data.
2. **Aladin2 Cassette and Active Bay:** The Aladin2 cassette is an electronic vaporizer that controls agent mixing and delivery.
3. **Alternate O_2 Control:** The Alternate O_2 control activates automatically in the case of certain failures or errors and delivers O_2 through an independent path to the vaporizers and patient circuit. It can also be activated manually.
4. **Mains Indicator:** The mains indicator is lit when AC power is connected.
5. **System Switch:** Used to turn the system on and off. When the system is turned on, the display will show the power-up screen and the system does a series of automated self-tests.
6. **O_2 Flush Button:** Push the O_2 flush button to deliver a high flow of O_2 to the breathing system.
7. **Aladin2 Cassette Storage Bay:** Storage bay for Aladin cassettes that are not in use.
8. **Brake:** Push down the brake pedal to lock the system in place. Lift up on the brake pedal to release the brake.
9. **Integrated Suction:** The optional integrated suction adjusts the vacuum used to suction fluids from the patient during a case. The switch can be set to max for full vacuum, Off for no vacuum, or On for adjustable vacuum.
10. **Auxiliary O_2 Control:** The optional auxiliary O_2 flowmeter is most often used to deliver oxygen through a nasal cannula or mask.


1 Anesthesia Display
2 Aladin2 cassette and active bay
3 Alternate O_2 Control
4 Mains Indicator
5 System Switch
6 O_2 Flush Button
7 Aladin2 cassette storage bay
8 Brake
9 Integrated Suction
10 Auxiliary O_2 Flow Control
Datex-Ohmeda
Aisys CS²
SEV
ISO
DES
Brake

Rear View

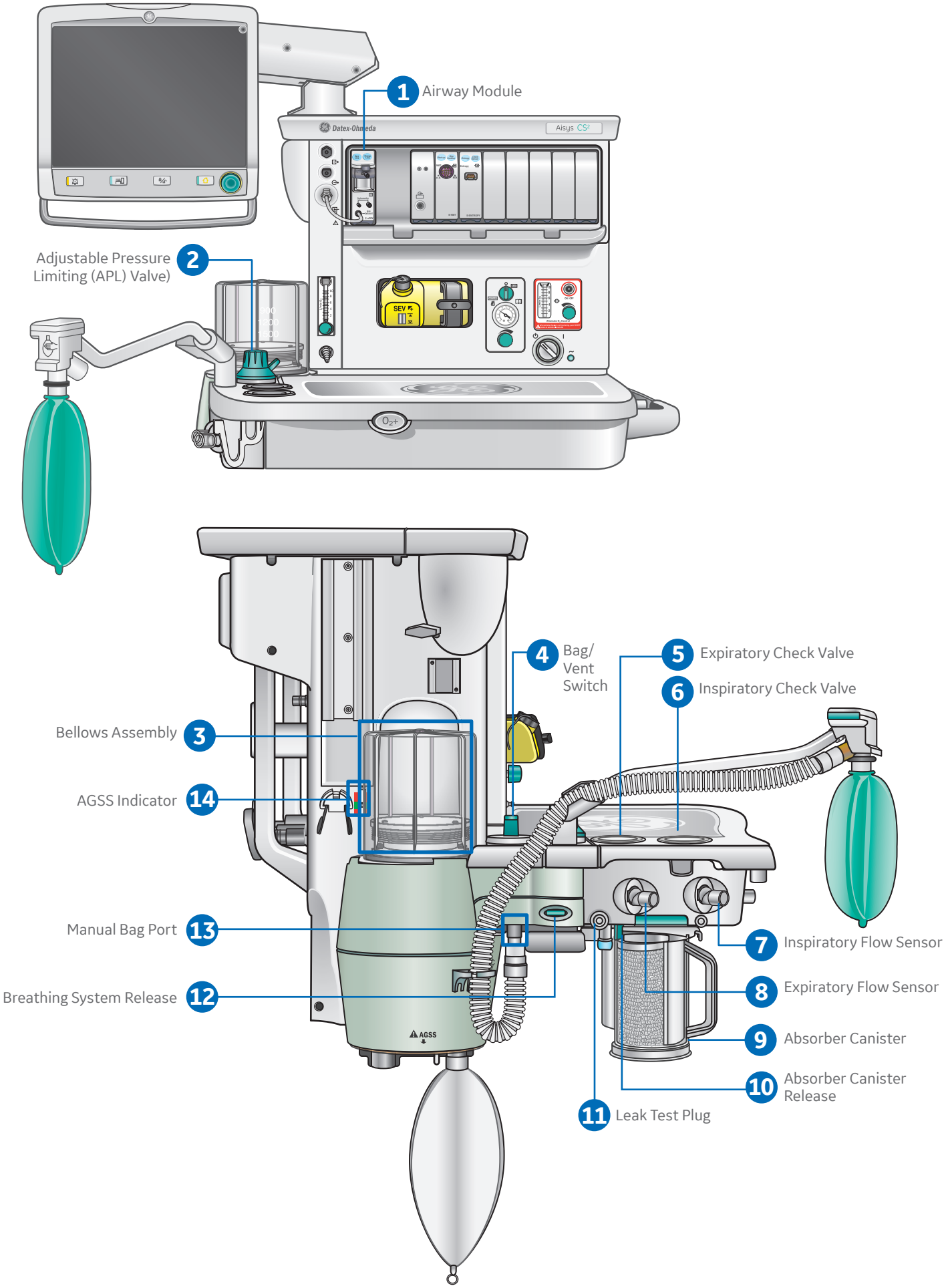
1. **Collection Bottle:** The collection bottle prevents fluids from entering the optional suction regulator.
2. **Vacuum Connection:** Connect the vacuum connection to the source vacuum supply.
3. **AGSS (Anesthesia Gas Scavenging System):** The scavenging system is designed to safely remove excess gas from the anesthesia machine.
4. **Mains Inlet:** AC power is connected to the system through the mains inlet.
5. **System Circuit Breaker:** This is the main circuit breaker. It should not be mistaken for an on/off switch. Accidentally pressing this switch will cause the system to be powered by its reserve battery instead of electricity from the wall outlet.
6. **Isolated Electrical Outlet:** A place to plug in low power accessories that are used in conjunction with the anesthesia machine.

   Note! *The electrical outlets are for low power only! Do not use these outlets for equipment such as blanket warmers and operating room beds.*
7. **Outlet Circuit Breaker:** An automatically operated electrical switch designed to protect the system from damage caused by overload. Unlike a fuse, which operates once and then must be replaced, a circuit breaker can be reset to resume normal operation.
8. **Cylinder Yokes:** Gas cylinders are mounted on the cylinder yoke.
9. **Pipeline Connections:** Hoses are connected between the pipeline inlets and the gas outlets in the hospital.
10. **Cylinder Wrench:** The cylinder wrench is used to open and close the gas cylinders.


Cylinder wrench
10
1
Collection bottle
2
Vacuum connection
Pipeline connections
9
Cylinder yokes
8
Outlet circuit breakers
7
3
AGSS
(Anesthesia
Gas Scavenging
System)
Isolated electrical outlet
6
System circuit breaker
5
Mains inlet
4

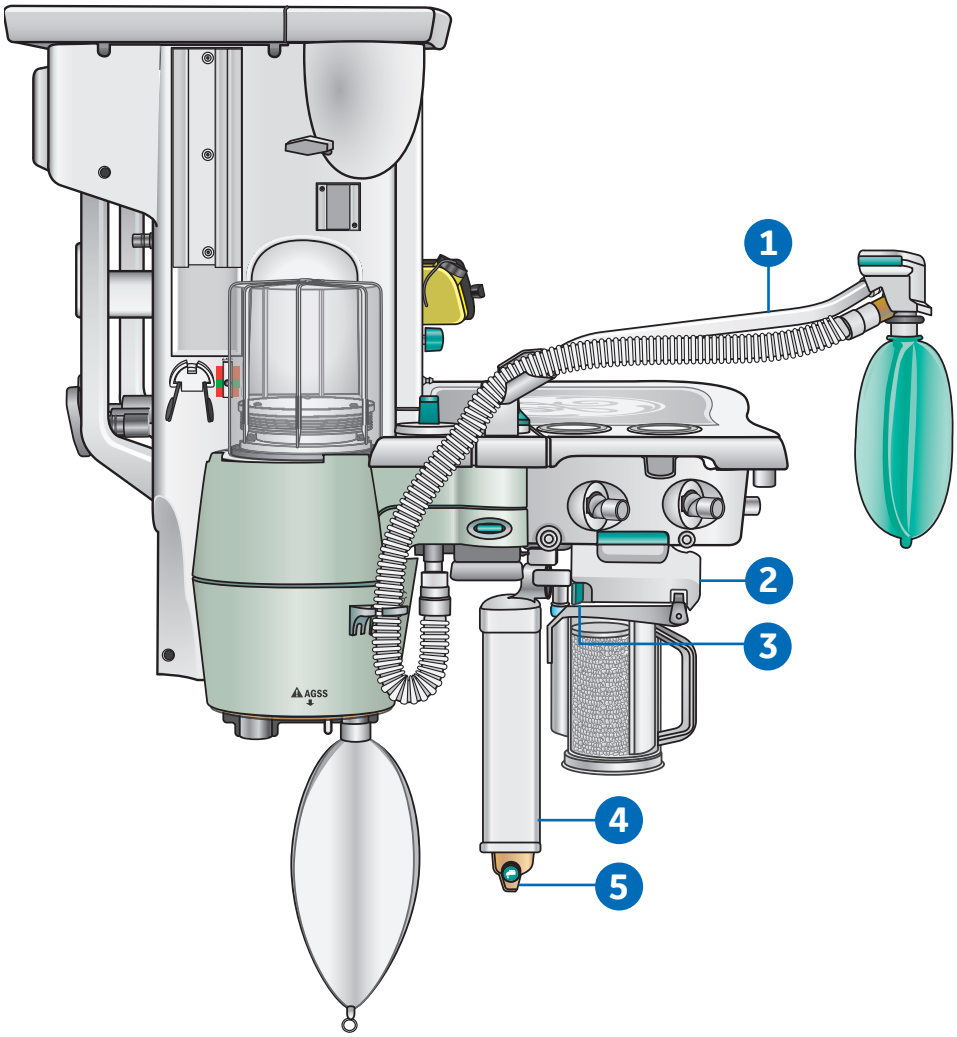
Advanced Breathing System (ABS) Components

1. **Airway Module (optional):** The airway module measures and monitors gases delivered to the patient. Depending on the configuration, this component may include sensors for measuring carbon dioxide, nitrous oxide, anesthetic agents and oxygen.
2. **Adjustable Pressure Limiting (APL) Valve:** During manual ventilation, the APL Valve allows you to change the pressure limit from minimum to 70 cmH_2O.
3. **Bellows Assembly**: During mechanical ventilation, the gases that are to be delivered to the patient are contained within the bellows assembly.
4. **Bag/Vent Switch:** The Bag/Vent switch selects between manual ventilation (bag) and mechanical ventilation (vent). When the switch is changed from bag to vent mode, the ventilator is automatically switched on.
5. **Expiratory Check Valve:** The expiratory check valve opens during expiration and closes at the start of inspiration.
6. **Inspiratory Check Valve:** The inspiratory check valve opens during inspiration and closes at the start of expiration.
7. **Inspiratory Flow Sensor:** The inspiratory flow sensor determines the volume of gas flowing to the patient.
8. **Expiratory Flow Sensor:** The expiratory flow sensor determines the volume of gas flowing from the patient.
9. **Absorber Canister:** This component removes carbon dioxide from the patient's exhaled breath. These scrubbed gases can then be sent back to the patient.
10. **Absorber Canister Release:** Push the absorber canister release to remove the canister from the holder.
11. **Leak Test Plug**: Occlude the breathing circuit using the leak test plug as part of the preoperative tests.
12. **Breathing System Release:** Push the absorber canister release to remove the breathing system.
13. **Manual Bag Port:** The bag hose and rebreathing bag attach to the manual bag port.
14. **AGSS Indicator (only on some AGSS versions):** With an active Anesthesia Gas Scavenging System (AGSS) that includes a flow indicator, the ball on the indicator should rise to the green zone.


1 Airway Module
Adjustable Pressure Limiting (APL) Valve
2
Bellows Assembly
3
4 Bag/ Vent Switch
5 Expiratory Check Valve
6 Inspiratory Check Valve
AGSS Indicator
14
Manual Bag Port
13
Breathing System Release
12
7 Inspiratory Flow Sensor
8 Expiratory Flow Sensor
9 Absorber Canister
10 Absorber Canister Release
11 Leak Test Plug

Breathing System Options

1. **Bag Support Arm:** Use the optional bag support arm to hold the breathing circuit bag.
2. **EZchange Canister Mode (CO_2 bypass):** Use the optional EZchange canister mode for continued ventilation of the patient while changing the absorber canister.
3. **EZchange Canister Release:** Push the EZchange canister release to unlock the canister cradle.
4. **Condenser:** Use the optional condenser to remove water in the system that is produced from the reaction of CO_2 gas with the absorbent.
5. **Condenser Drain Button:** Place a container under the reservoir and push the drain button to empty any water in the condenser.



Display Controls

The touchscreen has numerous touch point areas that make accessing menus and settings quick and easy. The buttons on the right side of the screen provide direct access to commonly used functions. The ventilation quick keys enable setup of ventilation modes. The gas control quick keys provide a method to set up the gas used for a case.

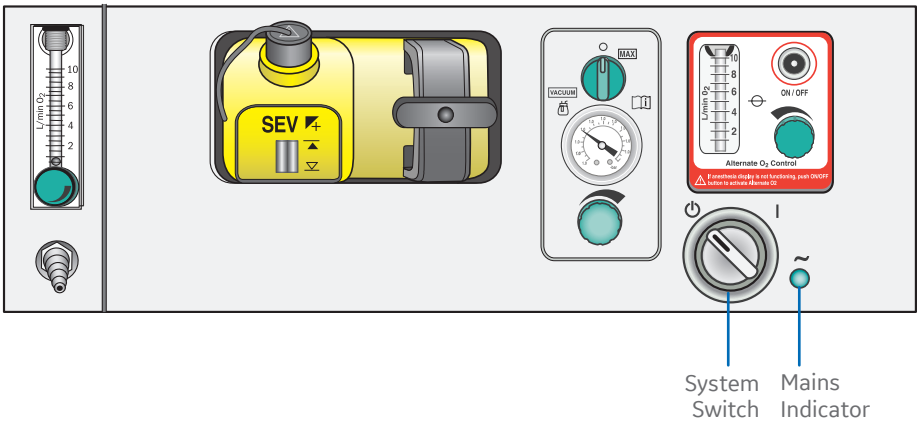
Touch only one touch point at a time to ensure the correct selection is made.

1. **ComWheel:** Selects a menu item or confirms a setting. Turn clockwise or counterclockwise to scroll through menu items or change settings.
2. **Home Key:** Removes all menus from the screen.
3. **Screen Lock/Unlock Key:** Locks the touchscreen. Toggles between lock and unlock functions.
4. **Start/End Case Key:** Initiates Start or End Case function.
5. **Touchscreen:** Activates functions when touch areas on the screen are selected.
6. **Audio Pause Key:** Stops audio for 120 seconds for any active, eligible high and medium priority alarms. Prevents audio (audio off) for 90 seconds when no medium or high priority alarms are active. Allows the operator to acknowledge any non-active medium or high priority latched alarms.

System Power

Turning On the System

1. Plug the power cord into an electrical outlet and make sure the system circuit breaker is on. The mains indicator is lit when AC power is connected and the battery is charging (if it is not already fully charged).
2. Check that the breathing system is properly connected.
3. Turn the System Switch to On. The display will show the power up screen and the system does a series of automated self-tests.
4. Perform a Full Test before the first case of the day (this is covered in full detail later in the course).
5. Perform a preoperative checkout before each case. See the ***Preoperative checkout*** section of the user's manual for more information.



Battery Information

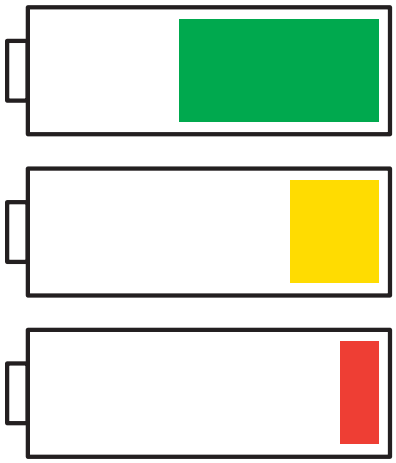
If AC power is lost, the battery has the capacity to operate for 90 minutes under typical operating conditions and 30 minutes under extreme conditions.

The color and fill amount of the ***battery in use*** symbol indicates the amount of battery power remaining.

Green indicates greater than 10 minutes.

Yellow indicates between 10 and 5 minutes.

Red indicates less than 5 minutes.



Note! *Electrical outlets (if provided) will not function while the system is on battery power.*

Vaporization

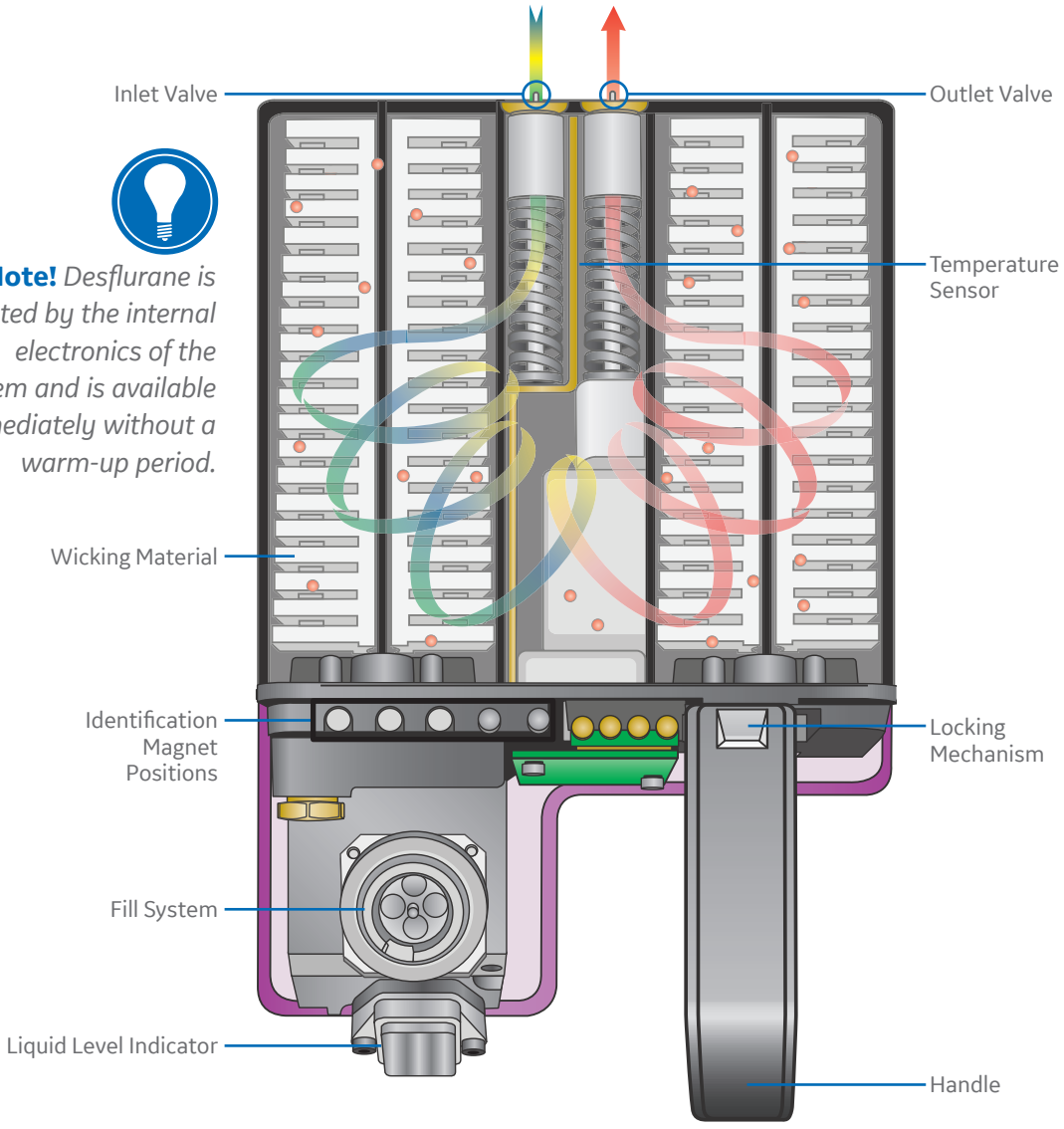
Overview

The working principle behind the Aladin2 cassette is based on the free vaporizing of the liquid agent inside the cassette. Agent concentration is adjusted by electronically controlling gas flow through the cassette in order to achieve the set concentration. Output of agent concentration remains constant with changes in fresh gas flow, and the vaporizer is not out of commission if cassettes are tilted.

Aladin2 cassettes are agent specific and color coded. Each cassette is magnetically coded for its specific agent allowing the unit to automatically identify the cassette being used.

Scheduled maintenance or calibration is not needed for Aladin2 cassettes, as they contain an electronic self-diagnosis.

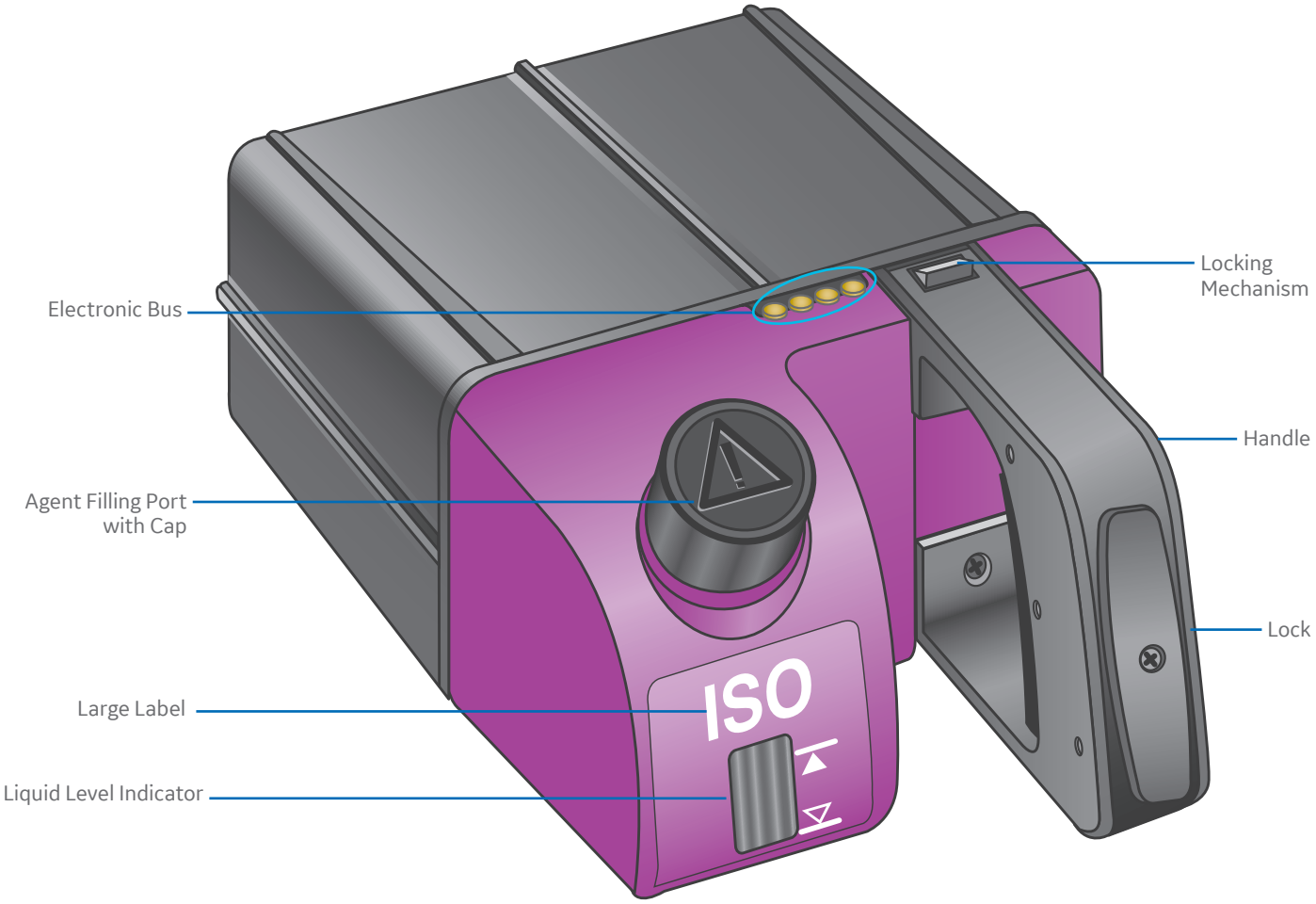
Note! *Desflurane is heated by the internal electronics of the system and is available immediately without a warm-up period.*

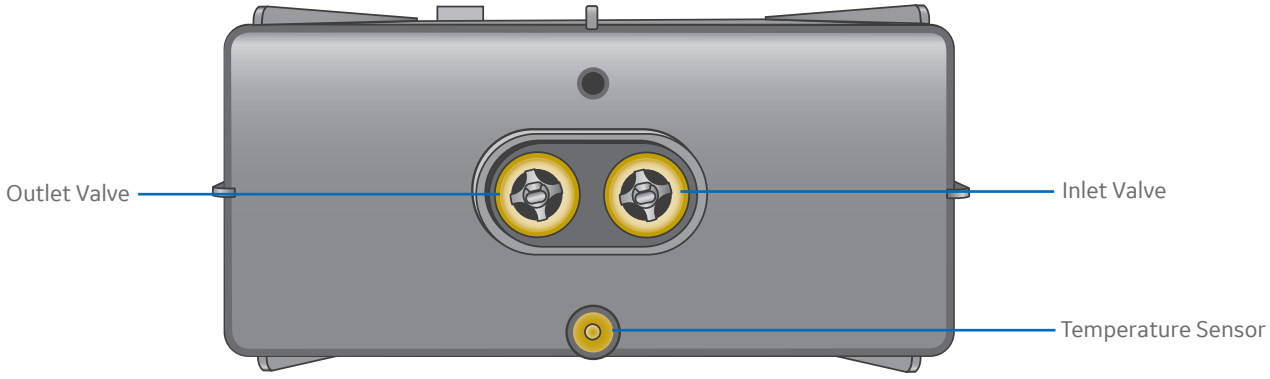


Aladin2 Features

Below are the external features of the Aladin$_2$ vaporizer.

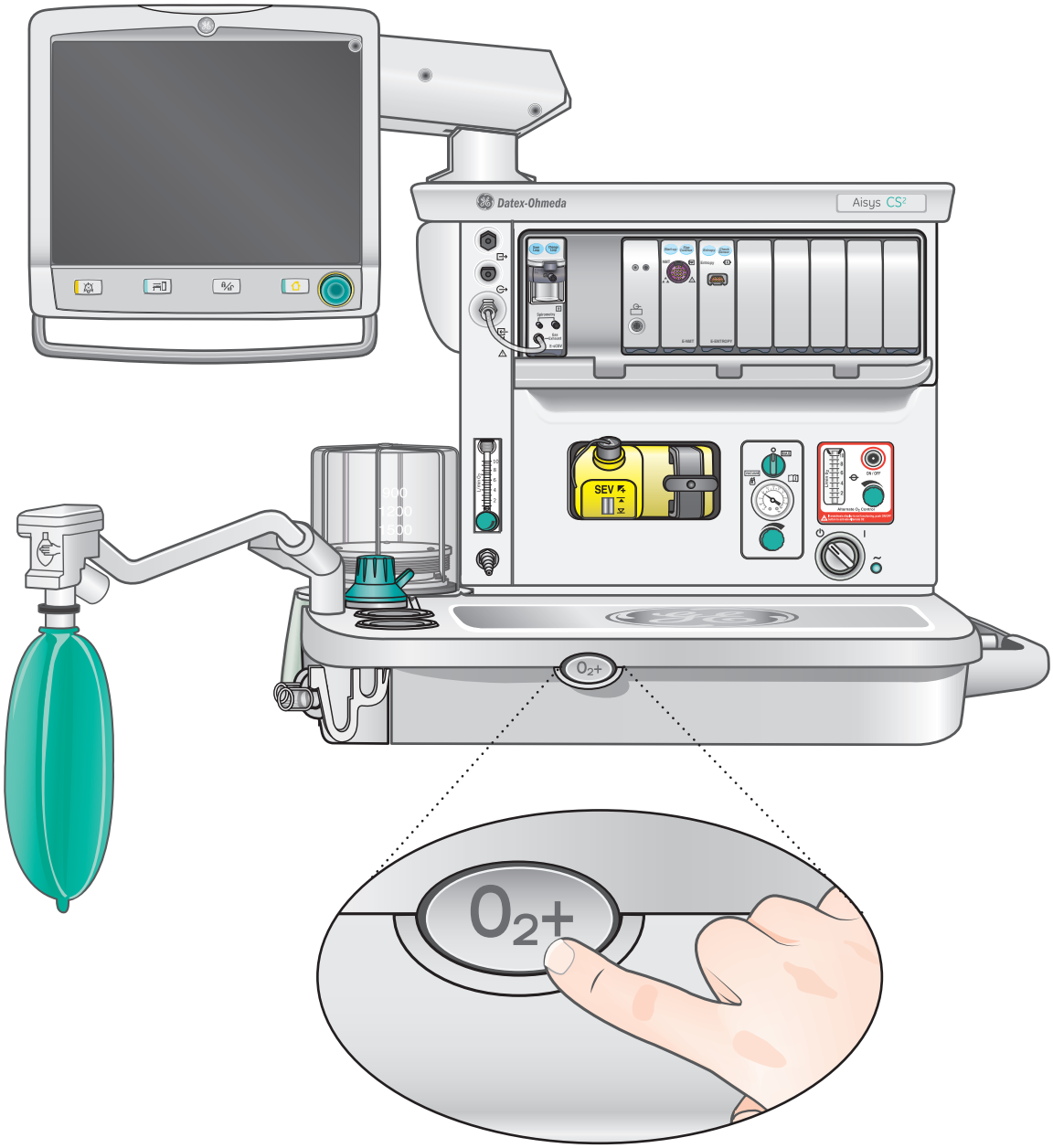
Note! *The Aladin2 is the newer version of the vaporizer cassette. Older units may have the original Aladin cassette. The Aladin2 cassette has a handle lock, a larger liquid level indicator and electronic agent level sensing.*





O_2 Flush Button

The O_2 Flush Button delivers a high flow of 100% O_2 to the breathing system, bypassing the vaporizers.



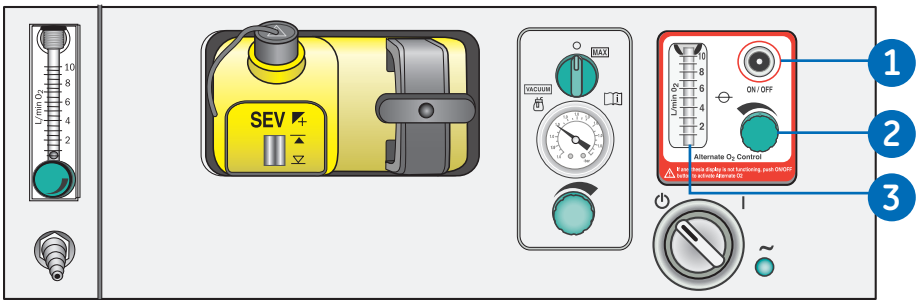
Alternate O_2 Control

When Alternate O_2 control is enabled, flow from the electronic mixer is stopped and the agent concentration is set to off. O_2 is flowing through the Alternate O_2 control to the breathing system. To activate anesthetic agent flow to the breathing system, set the agent to the desired concentration.

Use the Alternate O_2 control to deliver O_2 through an independent pneumatic path to the vaporizer and patient circuit. Alternate O_2 is connected to the system O_2 supply. Alternate O_2 control activates automatically in the case of certain failures or errors. It can also be activated manually.

The Alternate O_2 control is available approximately 20 seconds after the system is turned on. The Alternate O_2 flow is adjustable from approximately 0.5 l/min to 10 l/min as indicated on the flow tube.

1. Alternate O_2 ON/OFF button
2. Flow control
3. Flow tube

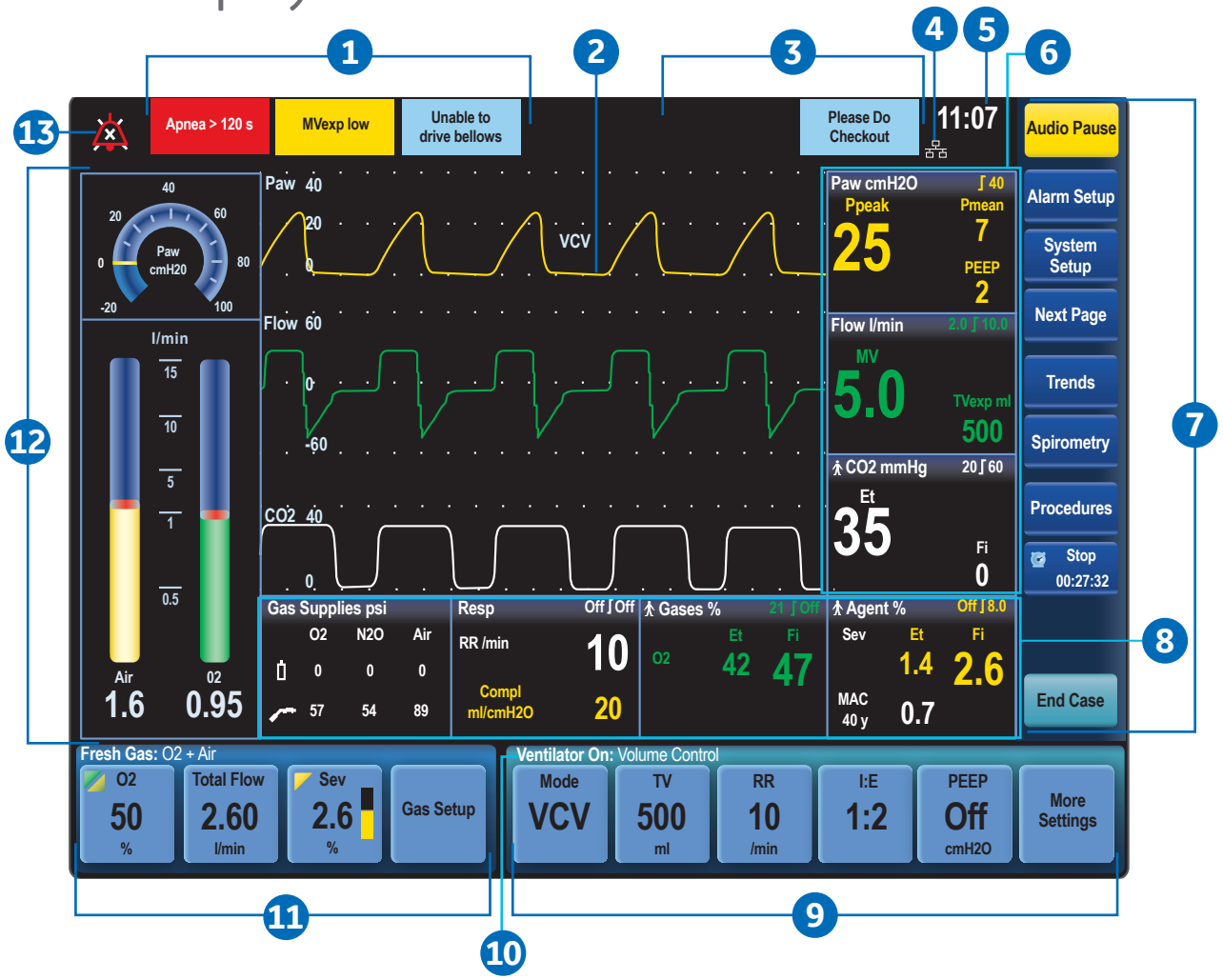


Using Alternate O_2 control

1. Push the Alternate O_2 ON/OFF button. The O2 flow is indicated on the flow tube.
2. Use the flow control to adjust the O_2 flow.
3. Set the agent to the desired concentration.
4. To end Alternate O_2 control, push the Alternate O_2 ON/OFF button.

02 Operation

System Display Overview

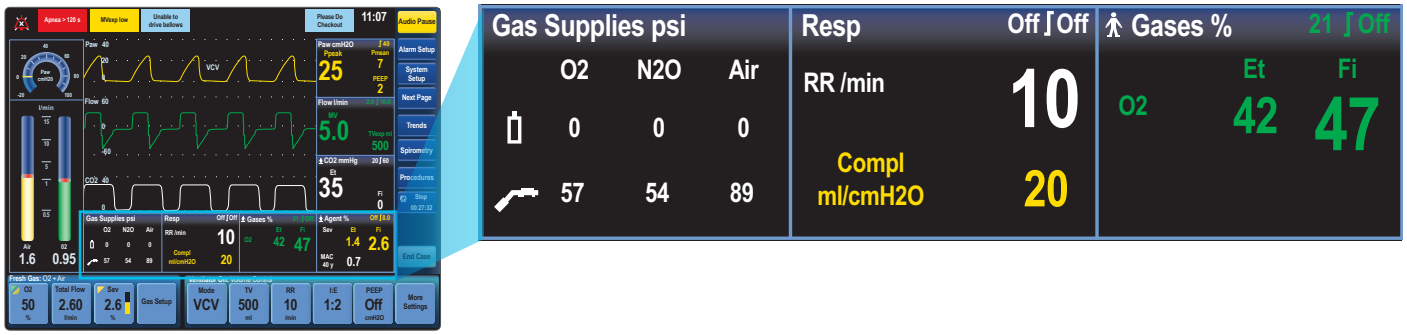


1. **Alarm Message Fields:** Displays the active alarms.
2. **Waveform Fields:** Displays the waveforms of measured values. For example: Paw, Flow, and CO_2.
3. **General Message Fields or Lock Touchscreen Indicator:** Displays general messages and the touchscreen lock indicator.
4. **Network Icon:** Indicates if the Network is receiving patient data from a Sapphire client.
5. **Clock:** Displays the current time.
6. **Measured Values Fields:** Displays the measured values. For example: Paw, Flow, and CO_2.
7. **Function Keys:** Functions available are Audio Pause, Alarm Setup, System Setup, Next Page, Trends, Spirometry, Procedures, Timer, Start, and End Case.
8. **Digit Fields:** Contains information for Spirometry, Resp, Agent, and Gases.
9. **Ventilator Quick Keys:** Displays mode, associated ventilation parameters, and more settings. For example: Mode, TV, RR, I:E, PEEP, and More Settings.
10. **Ventilation Mode:** Displays the selected ventilation mode. For example: Ventilator On, and Volume Control.
11. **Gas Quick Keys:** Displays O_2, Total Flow, and Gas Setup.
12. **Split Screen Field:** Contains airway pressure, gas flow values, compliance, trends, and optional ecoFLOW information.
13. **Audio Pause Symbol and Countdown Clock:** Indicates when alarm audio is paused and the countdown clock until audio is on.

Digit Fields

The digit fields can be set to show specific information such as gas types, gas supply, flow, agent, respiration, and spirometry loops. If the digit field is set to show agent and no airway module is inserted, the area is blank.

Paw, O_2, and either TVexp or CO_2 must show on the display during a case. If any of these parameters are not selected to show on the display, the right most digit field information is replaced with the missing parameter.

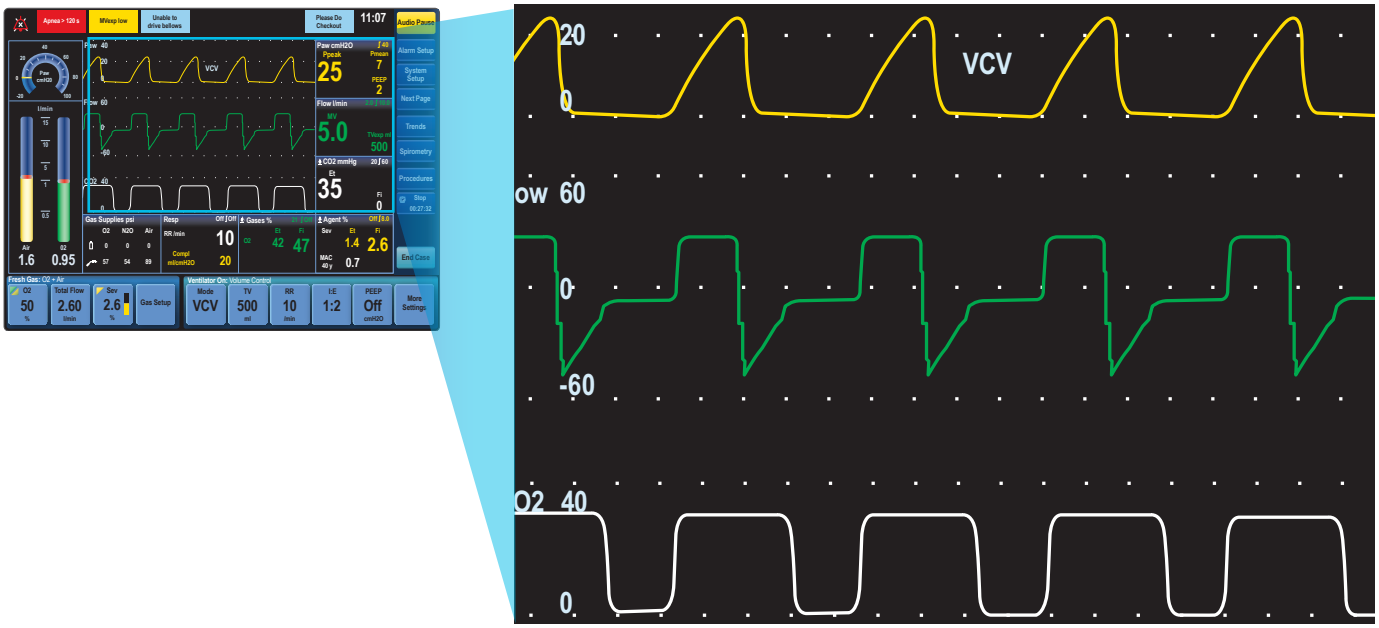


Waveform Fields

Up to three waveforms can be shown on the normal screen view. Each waveform can be set to show specific Paw, agent, flow, or CO_2 data. The corresponding numeric information shows in the measured values field to the right of the waveform. If the waveform is set to show the agent and no airway module is inserted, that waveform and numeric area is blank.

When one waveform is turned off, that waveform and the corresponding numerics information are removed from the normal screen view. The remaining waveforms and numerics increase in size to fill the waveform area. When two waveforms are turned off, those waveforms and the corresponding numerics information are removed from the normal screen view. The remaining waveform is centered in the waveform area.

When in a case, touch the waveform field area to close the menu.



Split Screen Field

The split screen field can be set to show gas delivery, trends, spirometry loops, Paw gauge, airway compliance, and optional ecoFLOW information. If ***None*** is selected, the split screen area will be blank.

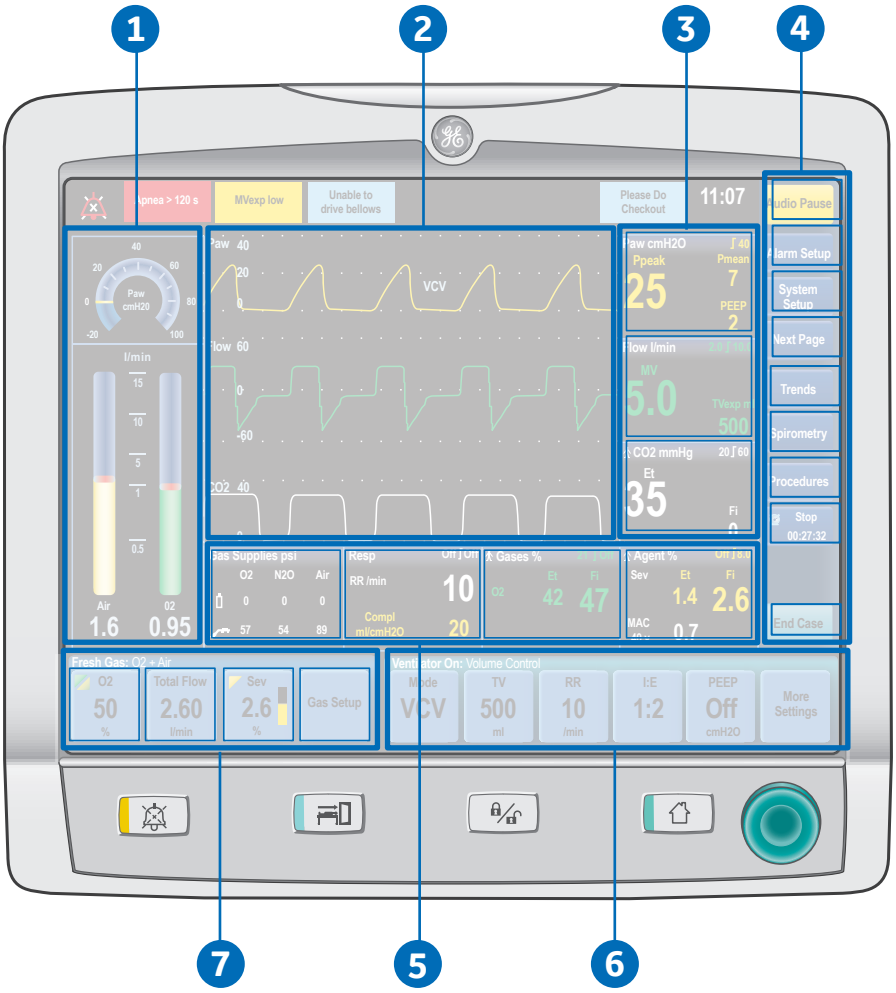
Touch the spilt screen field to directly open the Screen Setup menu.

Display Touch Points

CAUTION! Do not apply excessive force to the touchscreen as damage may occur.

The blue outlined areas indicates the touch points of the display.

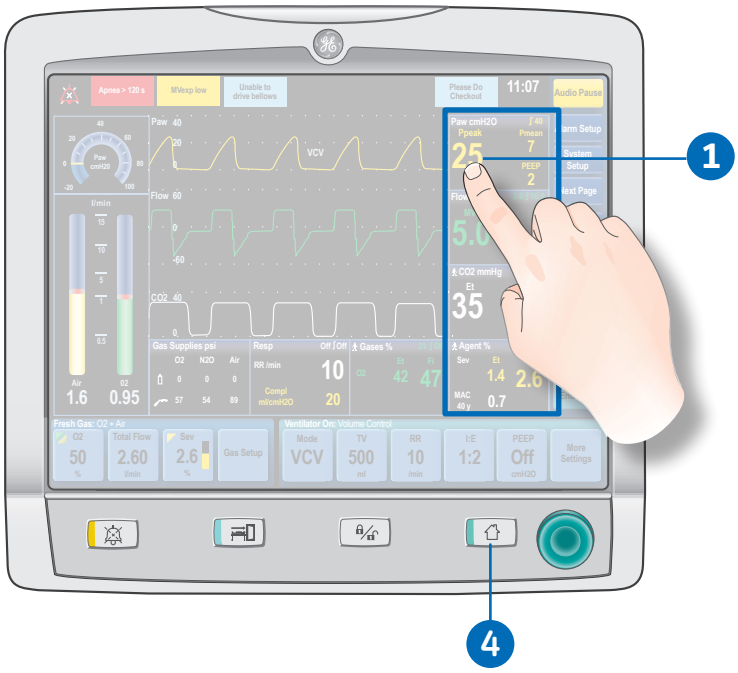
1. Split screen values
2. Wave fields
3. Measured values
4. Function keys
5. Digit fields
6. Ventilator quick keys
7. Gas quick keys



Measured Value Touch Points

Touching measured values provides access to the ***Alarm Setup*** menu and alarm limits.

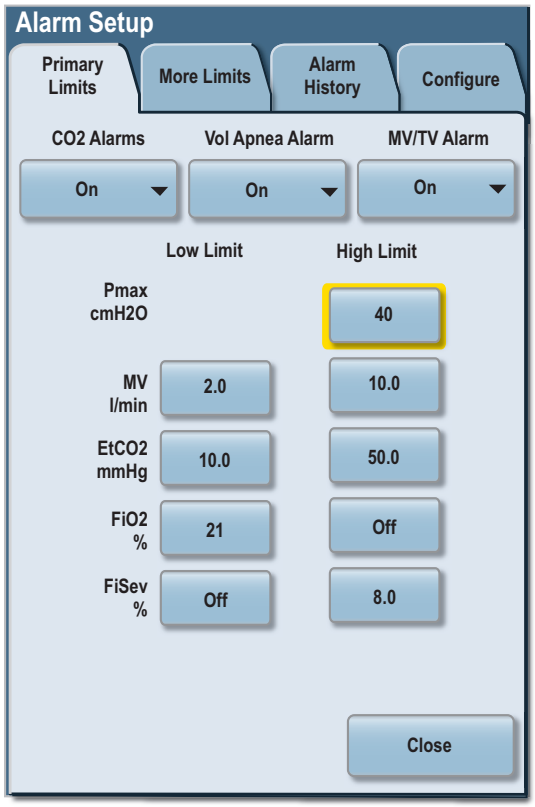
1. Touch the measured value to access the ***Alarm Setup*** menu.
2. The ***Alarm Setup*** menu displays.
3. Select the alarm limit and set it to the correct value. Touch the value on the touchscreen or push the ComWheel to confirm the desired setting.
4. Push the ***Home*** key, touch the waveform area of the display, or select ***Close*** to close the menu.



Active Alarm Touch Points

When an alarm sounds the alarm message is displayed at the top of the screen and, if applicable, the alarming numeric field and digit field flashes. The Alarm messages at the top of the screen are message alerts only and not active touch points.

1. Touch the flashing numeric field to access the ***Alarm Setup*** menu and alarm limits for the active alarm.
2. The ***Alarm Setup*** menu displays with the active alarm limit highlighted.
   For example: If the ***Ppeak high*** alarm activates, the high alarm limit setting for Ppeak displays with the highlight.
3. Select the active alarm limit and change it to the desired setting.

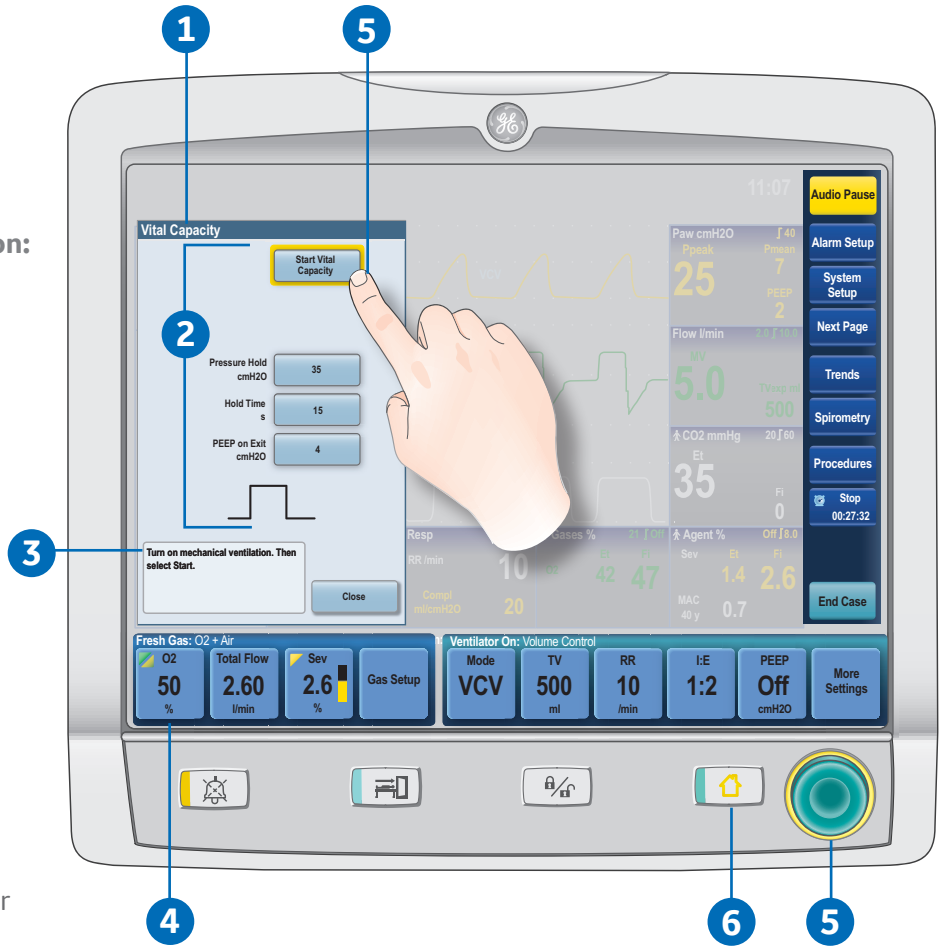


Navigating the Display

Use the touchscreen and ComWheel to navigate the display.

Menu Components

1. **Menu Heading:** Displays the title of the open menu.
2. **Menu Items:** Contains the items to either adjust or select from a drop-down list.
3. **Instructions or Help Information:** This shows any additional instructions or help messages.



Using Menus

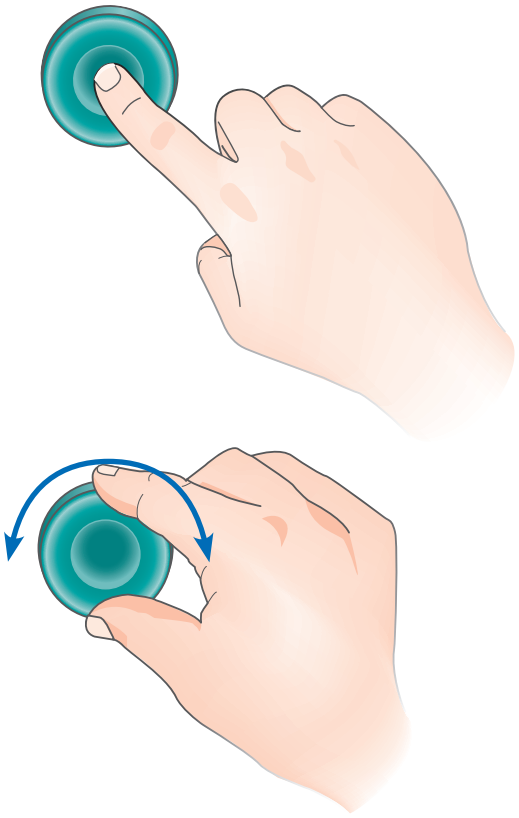
Use the function keys to access the corresponding menus. When a menu is selected, the menu field overlays the normal view and the waveform fields start at the right edge of the menu.

4. Select a function or quick key to access the corresponding menu.
5. Select a menu item to choose the item, or turn the ComWheel left or right to highlight a menu item and then push to confirm. If the menu item selected is an adjustment, turn the ComWheel left or right to make the setting and then push to confirm. If the menu item has a drop-down list, select the desired value from the list by touching the item.
6. Select ***Close***, touch the waveform area, or push the ***Home*** key to exit the menu.

Using the ComWheel

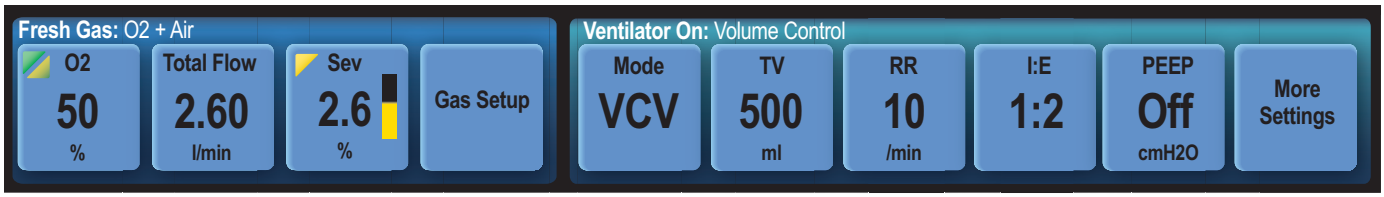
Use the ComWheel to scroll through the quick key settings and function keys, make selections, change settings, and confirm settings.

1. Push the ComWheel to make a selection.
2. Turn the ComWheel to the right.
   - For menu items, the highlight moves down.
   - For quick keys, the highlight moves to the next key on the right.
   - For settings, the value changes to the next available setting.
   - For pull-down selections, the highlight moves to the next available selection.
3. Turn the ComWheel to the left.
   - For menu items, the highlight moves up.
   - For quick keys, the highlight moves to the next key on the left.
   - For settings, the value changes to the previous available setting.
   - For pull-down selections, the highlight moves to the previous available selection.
4. Push the ComWheel to confirm a setting.



Using Quick Keys

The gas settings and the main ventilator settings for each ventilation mode can be changed using the quick keys.



1. Select a quick key to open the menu or select a parameter.
2. If Gas Setup, Mode, or More Settings is selected, a menu displays. Select the desired value on the menu by touching the value. If any other quick key is selected, the value displays with a highlight. Turn the ComWheel left or right to set the desired value.
3. Push the ComWheel or select the quick key to confirm the change.

Note! *To cancel a quick key selection, push the **Home** key.*

Starting a Case

Use the ***Start Case*** menu to access the tabs for ***Anesthesia, Patient/Case ID***, and ***Monitoring Only***.

A case can be started using default settings or using custom settings. The ***Case Defaults*** setting is linked on the ***Anesthesia*** tab and the ***Monitoring Only*** tab. The default settings are configured by the Super User.

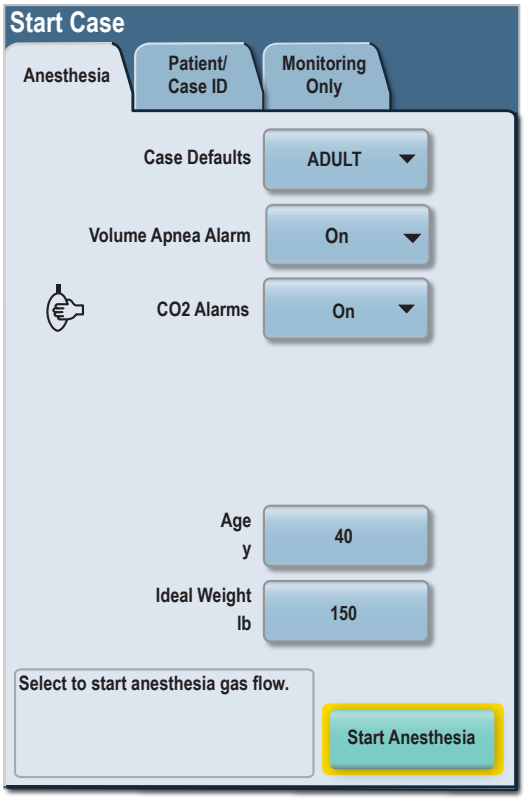
Note! *A Super User is a person that has been given the authority to change default settings using a special password.*

The ***CO_2 Alarms*** is ***On*** by default.

The ***Age*** and ***Ideal Weight*** values are exchanged when the system has a direct network connection to a Sapphire client. The Network device okay symbol shows when the patient data is received from a Sapphire client for these values. A message shows when the patient data is received from the Sapphire client.

The ***Volume Apnea Alarm, Age***, and ***Ideal Weight*** values are set to the pre-selected settings defined by the Super User corresponding to the case type if the system is not connected to a network.

Note! ***Volume Apnea Alarm*** *is not shown on the Anesthesia tab when the* ***Volume Apnea Selection*** *is disabled in the Super User settings.*



Start Anesthesia

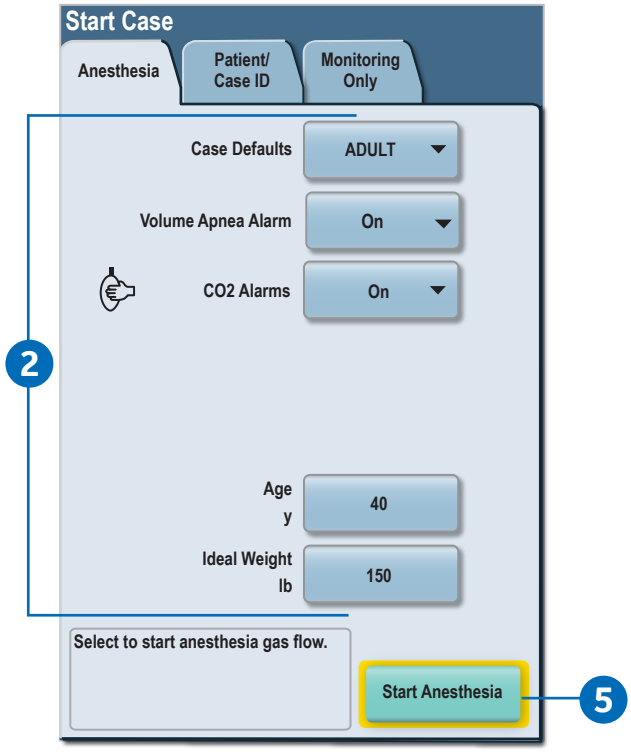
Start anesthesia using the default settings or custom settings on the ***Anesthesia*** tab. The ***Case Defaults*** setting shows the first preset case type. There are five default case selections. The case default selections are defined by the Super User.

Use a custom setting by changing any of the settings on the Anesthesia tab. The Case Defaults setting shows Preset when custom settings are used.

Start Anesthesia Using Default Settings

Start anesthesia using one of the five default case selections. Each case type has preset values for ***Volume Apnea Alarm, Age***, and ***Ideal Weight***. The first four default case types are configured and named by the Super User. The fifth default case is ***Last Case***.

1. Set the Bag/Vent switch to ***Bag***.
2. Select ***Start Case***. The ***Case Defaults*** shows the first preset case type. Default settings based on case type show for ***Volume Apnea Alarm, CO_2 Alarms, Age***, and ***Ideal Weight.***
3. Verify or change the preset case type.
4. Verify the settings are clinically appropriate.
5. Select ***Start Anesthesia*** and the gas flow starts.



Start Anesthesia Using Custom Settings

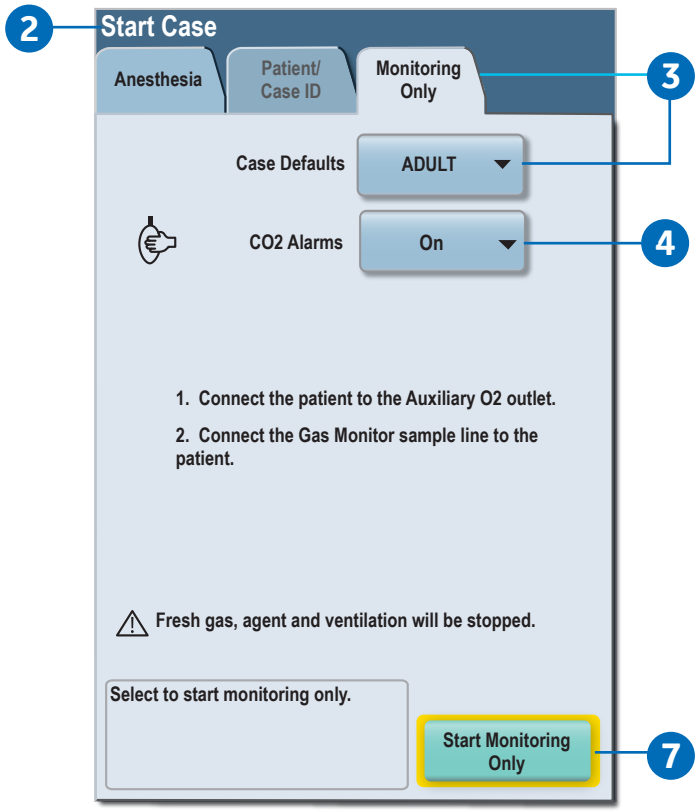
Ideal Weight, Age, CO_2 Alarms, and ***Volume Apnea Alarm*** can be custom set before starting a case. Additional ventilator settings, ventilation mode, alarm settings, and gas settings can be custom set through the ***Vent Mode*** menu and other ventilation quick keys, ***Alarm Setup*** menu, and ***Gas Setup*** menu.

1. Set the Bag/Vent switch to ***Bag***.
2. Select ***Start Case***. The ***Case Defaults*** selection shows the first preset case type. ***Ideal Weight, Age, CO_2 Alarms***, and ***Volume Apnea Alarm*** show the default settings that correspond to the case type shown.
3. Change ***Ideal Weight, Age***, or ***Volume Apnea Alarm*** settings on the menu. The ***Case Defaults*** changes from the case name to ***Preset***. If the ***CO_2 Alarms*** setting on the menu is changed, the ***Case Defaults*** remains as previously selected.
4. To change ventilation mode, select ***Mode***. Make the change. To change the ventilation settings, select a ventilator quick key or ***More Settings***. Make the change.
5. To change alarm settings, select ***Alarm Setup***. Make the change.
6. To change the gas settings or the circuit type, select ***Gas Setup***. Make the change.
7. From the Anesthesia tab, select ***Start Anesthesia*** and the gas flow starts.

Starting Monitoring Only

Use Monitoring Only to view monitoring parameters on the anesthesia display. There is no ventilation, fresh gas flow through the common gas outlet, or agent delivery while the system is in Monitoring Only. An example of when to use Monitoring Only would be when the patient is lightly sedated, and ventilator and agent delivery is not required.

1. Set the Bag/Vent switch to ***Bag***.
2. Select ***Start Case***.
3. Select the ***Monitoring Only*** tab. The ***Case Defaults*** selection shows the first preset case type if no select was made on the Anesthesia tab.
4. Verify or change the preset case type. The CO_2 Alarms setting corresponds to the preset case type. Any changes made to the settings carry over to anesthesia delivery.
5. Connect the patient to the auxiliary O_2 outlet.
6. Connect the gas monitor sample line to the patient connection.
7. Select ***Start Monitoring Only***.



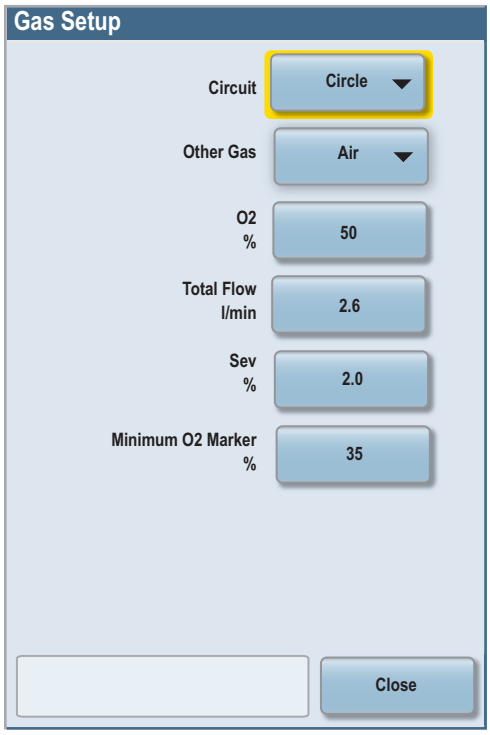
Note! *Fresh gas, agent delivery, and ventilation are not available. The 'Gas Monitoring Only': 'Ventilator Off' message shows.*

Gas Settings

Use the ***Gas Setup*** menu to adjust the Agent, O_2% and total flow, to change the balance gas, and to change the circuit type.

Changing Gas Settings

1. Select the ***Gas Setup*** quick key from the bottom of the display.
2. Select the setting to change from the ***Gas Setup*** menu.
3. Change the setting.
4. For ***Circuit***, select the menu item and change using the dropdown menu. Select ***Confirm***.
5. For ***Other Gas***, select the menu item and change using the dropdown menu.
6. For **Agent, O_2%** and ***Total Flow***, select the setting and make the change using the ComWheel and push to confirm the setting.



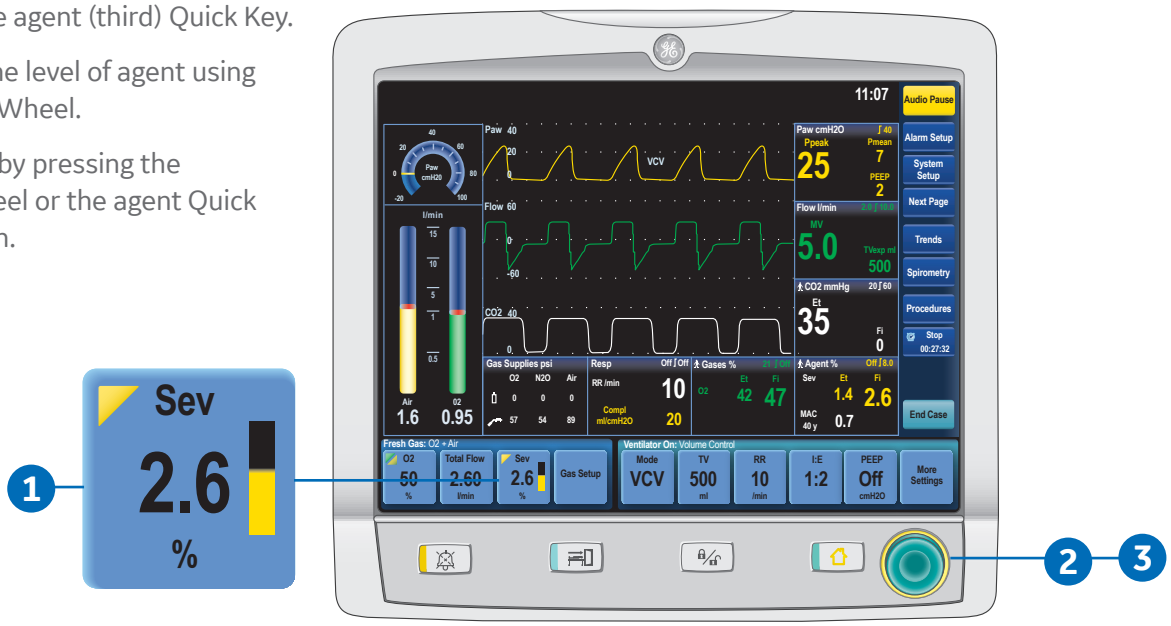
Gas Setup Quick Key

Turning On and Adjusting Agent Level Using Quick Keys

Before turning on the Aisys Carestation check to make sure the cassette is fully engaged. After turning the system on, check that there is adequate O_2 flow into the breathing system.

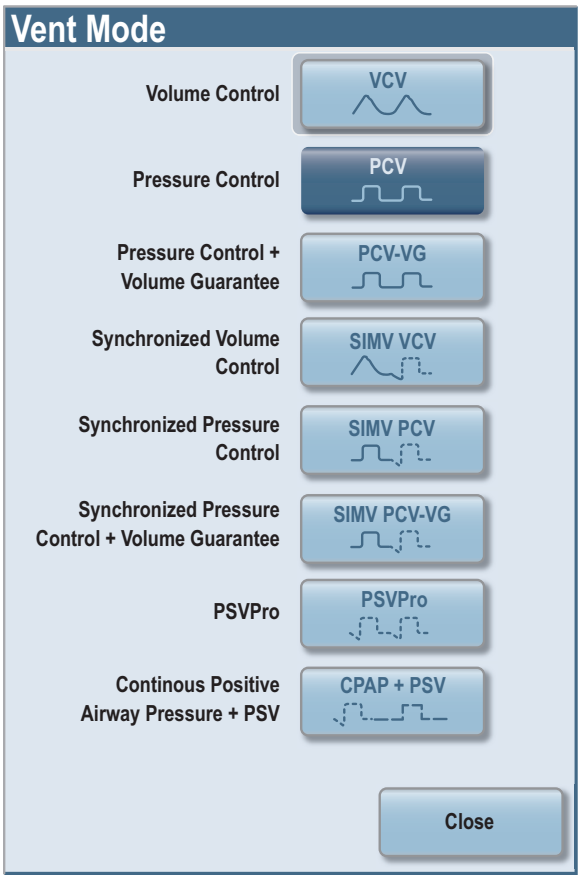
To turn on and adjust the agent:

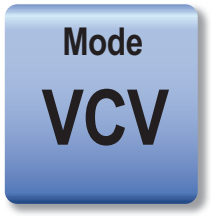
1. Press the agent (third) Quick Key.
2. Adjust the level of agent using the ComWheel.
3. Confirm by pressing the ComWheel or the agent Quick Key again.



Ventilator Settings

Use the ***Vent Mode*** menu to set the ventilation mode. Use ventilator quick keys and ***More Settings*** to change ventilator settings.





Vent Mode Quick Key

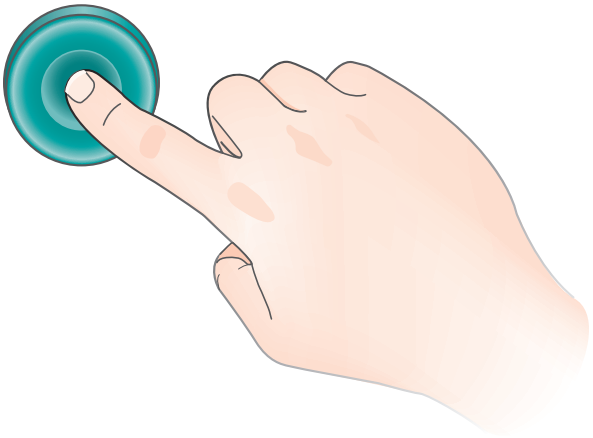
Changing Ventilator Mode

1. Select the ***Mode*** quick key from the bottom of the display. The Vent Mode menu shows.
2. Select the desired ventilation mode.
3. Set and confirm the primary ventilation setting to activate the ventilation mode. Controls that are frequently used in the ventilation mode can be adjusted with the ventilator quick keys and the ***More Settings*** quick key.

Changing Ventilator Settings

Change the ventilator settings for the ventilation mode when a case is running.

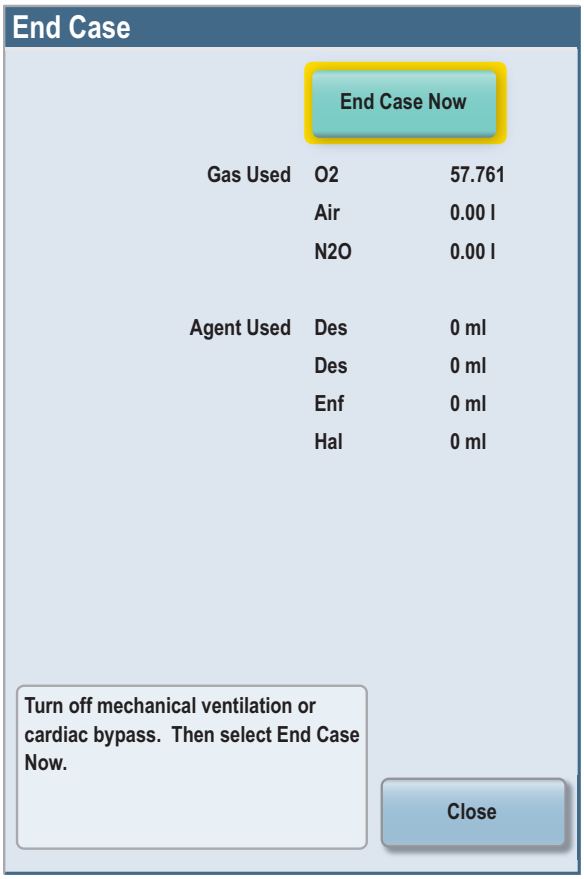
1. Select the ventilation setting to be adjusted. Set the desired value.
2. Push the ComWheel to activate the change.



Ending a Case

Use the ***End Case*** menu to stop gas flow and end the patient alarms.

1. Set the Bag/Vent switch to ***Bag***.
2. Select ***End Case*** from the right side of the display.
3. Select ***End Case Now*** on the menu to put the system in standby (stops the gas flow and patient alarms). The End Case menu shows the gas and agent usage for the case.



Turning Off the System

1. Select ***End Case Now*** to put the system in standby, if appropriate.
2. Turn the System switch to ***Standby***.
3. Turn the suction switch (optional) to the ***off*** position.
4. Rotate the Auxiliary O_2 knob fully clockwise to turn off the flow.
5. Disconnect or turn off any scavenging.

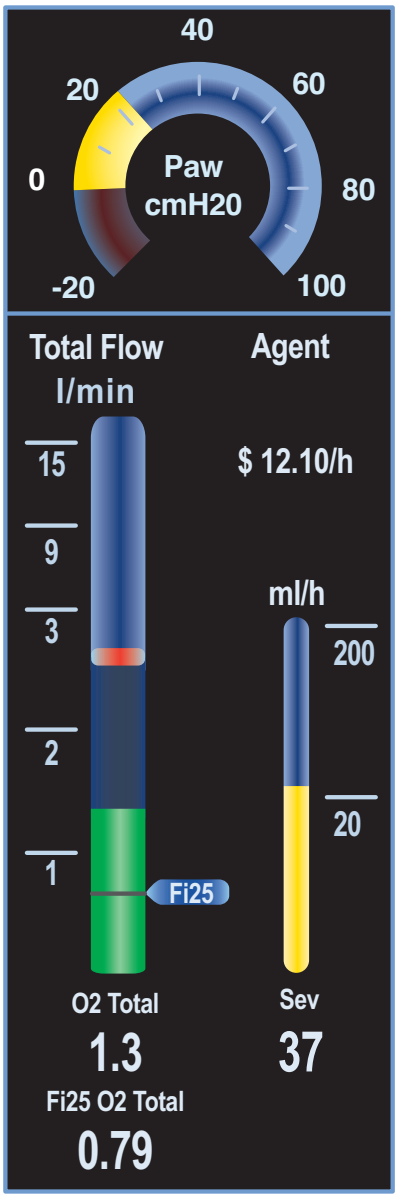
ecoFLOW

The ecoFLOW option provides a split screen view that shows the approximate minimum O_2 flow to maintain a preset FiO_2 value. It also shows the approximate agent used per hour and the cost.

The split screen shows the Paw gauge in the upper area and the ecoFLOW gauge in the lower portion of the screen. The ecoFLOW gauge consists of a fresh gas flow tube, an agent flow indicator, and related parameters.

The fresh gas flow tube is a stacked flow tube showing the total O_2 flow on the bottom and the remaining gas (N_2 or N_2O) on top. Below the fresh gas flow tube is the measured total O_2 flow to the patient and the calculated FiO_2 flow value. The FiO_2 flow value is based on the FiO_2 setting. This is the minimum O_2 flow needed to deliver a preset inspired O_2 concentration. The FiO_2 flow value is specific to each patient and case. It is calculated using the fresh gas settings, the patient O_2 uptake, the dilution effect of agent being delivered, and the effects of the circle breathing system.

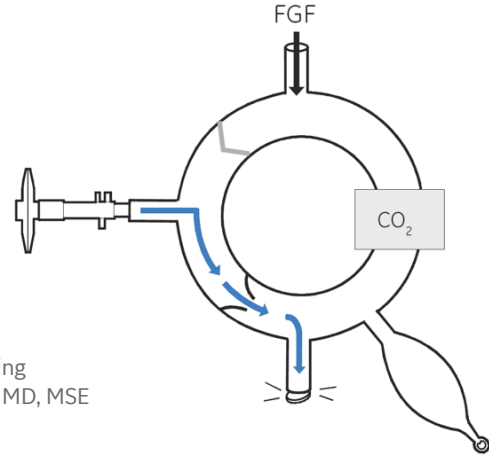
The agent flow indicator shows the amount of liquid agent flow as related to the fresh gas setting. The calculated cost of the agent shows above this indicator. This cost is based on agent flow and the values entered in the ***Agent Costs*** menu set in ***Super User*** mode.



Benefits of Low Flow Anesthesia

There are many benefits to reducing the amount of fresh gas flow in the operating room, including:

- Total FGF determines the amount of gas entering the scavenging system. Whenever FGF exceeds the patient's requirement, gases and vapors will enter the scavenging system and, ultimately, contaminate the atmosphere. By choosing minimal total FGF, the environmental impact of anesthetic vapors and gases can be minimized.[1]
- Anesthetic agents are the biggest ongoing expense associated with anesthesia units.[2]

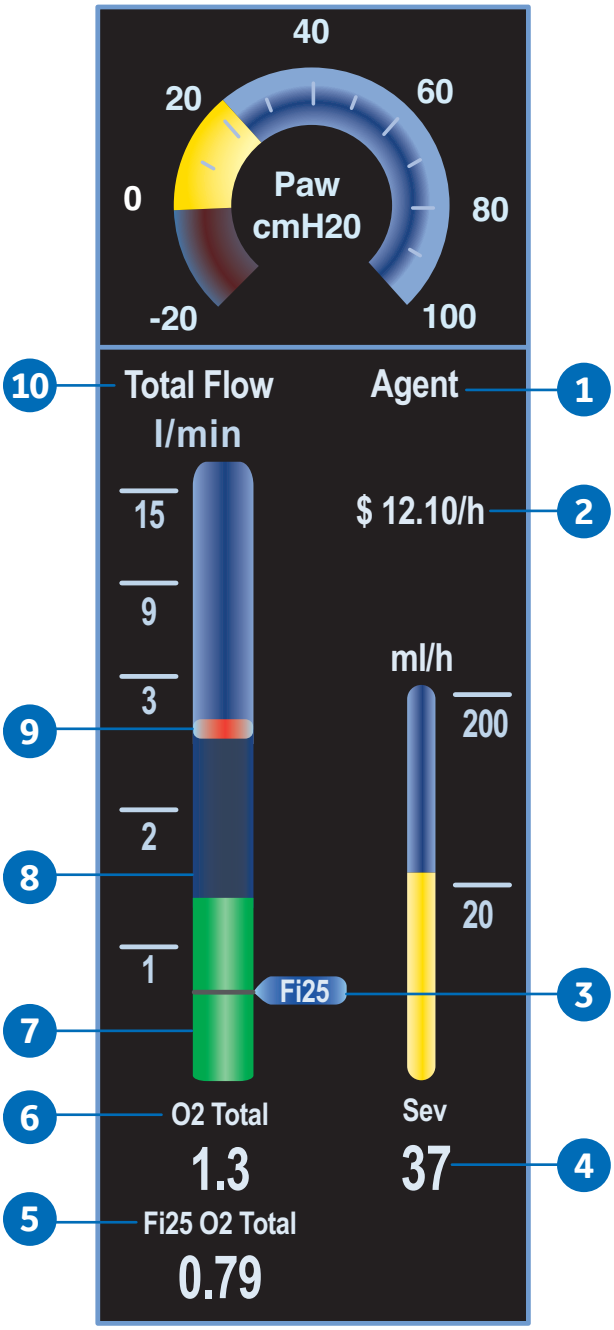


1. Source: "Greening the Operating Room: Reduce, Reuse, Recycle, and Redesign Managing Fresh Gas Flow to Reduce Environmental Contamination" Author: Jeffrey M. Feldman, MD, MSE
2. Source: ECRI https://www.ecri.org/ES/Documents/Anesthesia Units.pdf

ecoFLOW Split Screen Components

1. **Agent:** Shows Agent cost and flow information.
2. **Agent Cost:** The cost of the current agent flow. This value is determined by the agent flow multiplied by the agent cost set in Super user mode.
3. **Minimum O_2 Marker:** The graphical representation on the flow tube of the FiO_2 flow value. This marker can be removed by disabling it in Super user mode.
4. **Agent Flow:** The measured value of the liquid agent flow from the vaporizer. The agent flow may have a delayed response. For example: Sev.
5. **FiO_2 Flow:** The minimum O_2 flow needed to maintain the set inspired O_2 flow.

   Note! *This value is discussed in greater detail in the next section,* ***Understanding and Adjusting the Fi25* O_2 Total****.*
6. **O_2 Total (numeric):** The numeric representation of the total O_2 flow. If N_2O is the balance gas, this equals the set O_2 flow. If Air is the balance gas, this is the set O_2 flow plus 21% of the Air flow.
7. **O_2 Total (graphical):** The graphical representation of the total O_2 flow. If N_2O is the balance gas, this equals the set O_2 flow. If Air is the balance gas, this is the set O_2 flow plus 21% of the Air flow.
8. **Remaining Gas Flow:** If N_2O is the balance gas, this equals the set N_2O flow. If Air is the balance gas, this N_2 is 79% of the Air flow.
9. **Flow Bobbin:** The height of this represents the total fresh gas flow delivered to the breathing system.
10. **Total Flow:** Shows Total Flow information.



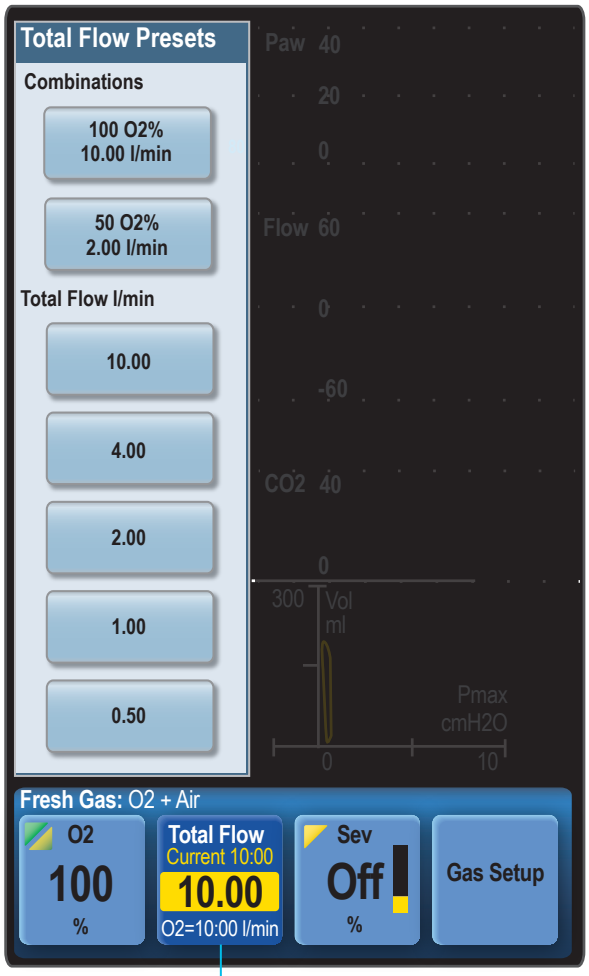
*The minimum FiO_2 is shown as 25% for illustrative purposes. It can be set by the clinician from 25% to 50% by selecting ***Gas Setup >Minimum O_2 Marker*** and adjusting the FiO_2 value.

Understanding and Adjusting the Fi25* O_2 Total

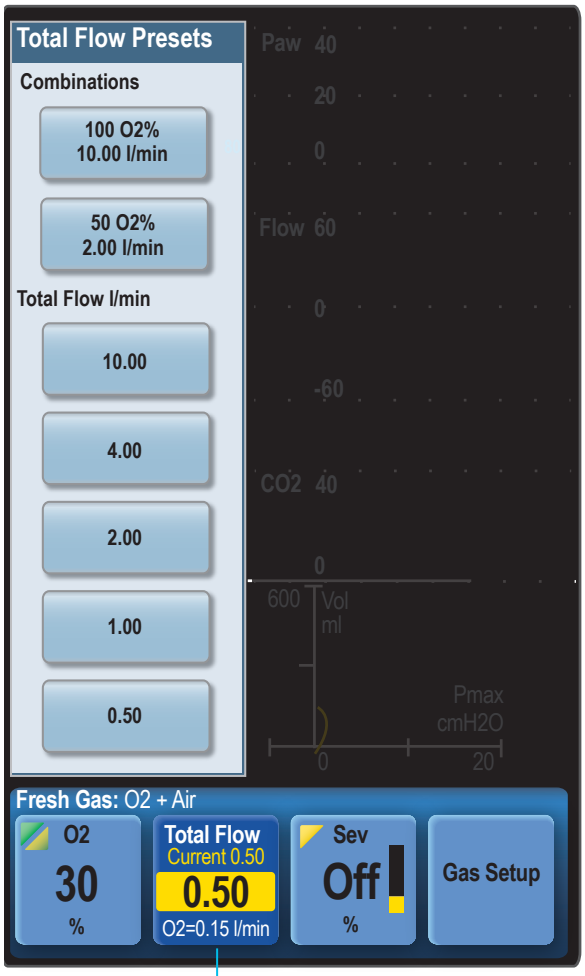
In the EcoFLOW split screen, the Fi25* O_2 Total value is displayed in the lower left corner below O_2 Total flow. The Fi25* O_2 Total indicates the lowest O_2 Flow needed within the Total Fresh Gas Flow (FGF) to maintain a minimal FiO_2 based upon the FiO_2 Flow Marker value.

To adjust the O_2 Flow within the total FGF to achieve the recommended Fi25* O_2 Total value, select the ***Total Flow*** quick key. Once selected, a small, white numerical value will appear on the quick key below the large, black ***Total Flow*** value. This small, white number represents the O_2 Flow within the total FGF and is the value you adjust to achieve the recommended ***Fi25* O_2 Total***. Turn the comwheel to adjust this white numerical value and push comwheel to confirm. The Fi25* O_2 Total flow recommendation will adjust in increments. After your first initial change and depending on your starting point, the system will re-evaluate the minimal O_2 in the system and provide you with a new recommended Fi25* O_2 Total value. You may need to readjust the O_2 Flow as your patient's demands change.

Note! *When delivering 100% O_2, the Fi25* O_2 Total will match the total FGF. However, when delivering less than 100% O_2 in the system, it is important to adjust the O_2 flow (white numerical value found below Total Flow value when quick key is selected) within the FGF to match the recommended Fi25* O_2 Total. See examples below.*



Fi25* 0_2 Total will match the total FGF when delivering 100% O_2.

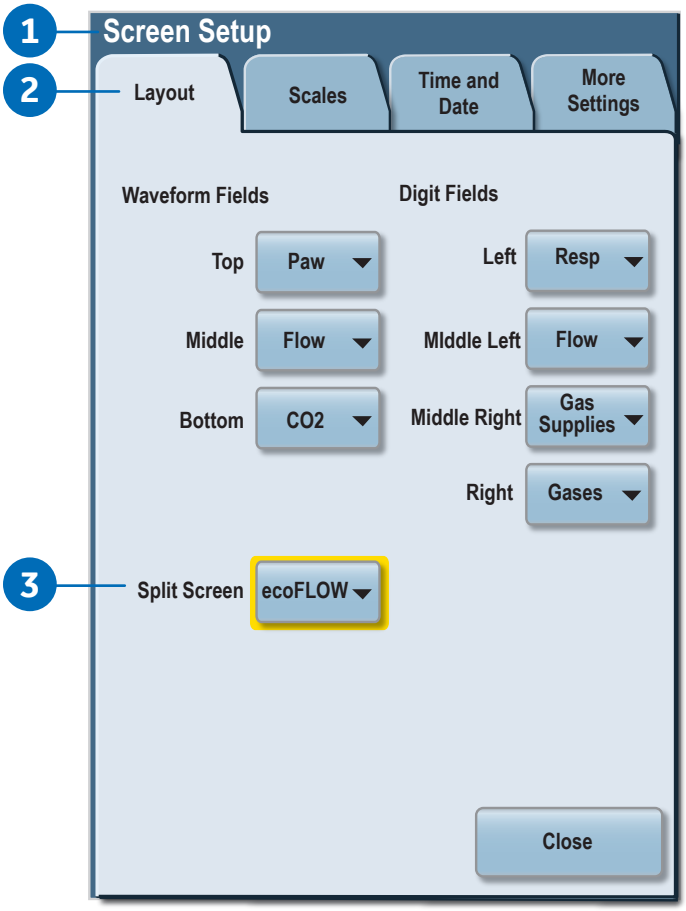


Adjust the 0_2 flow (white numerical value when Total Flow quick key is selected) within the FGF to match the recommended Fi25* O_2 Total.

*The minimum FiO_2 is shown as 25% for illustrative purposes. It can be set by the clinician from 25% to 50% by selecting Gas Setup > ***Minimum O_2 Marker*** and adjusting the FiO_2 value.

Using ecoFLOW:

1. Select ***System Setup*** > ***Screen Setup*** from the right side of the display.
2. Select the ***Layout*** tab.
3. Select ***Split Screen*** and select ***ecoFLOW*** from the drop-down menu.
4. Select ***Close***.

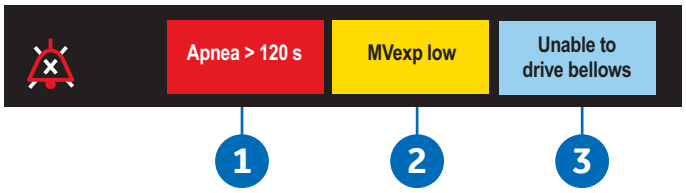


Alarm Management

Alarm Priorities

Alarms may be high priority, medium priority, or low. Alarm priority is indicated by the color of the alarm message and the audio sequence.

1. **High-priority alarm** messages appear in white text on a red background.
2. **Medium-priority alarm** messages appear in black text on a yellow background.
3. **Low-priority alarms** appear in black text on a blue background.



Pausing Alarms

Selecting ***Audio Pause*** for an active alarm stops the audible tone for 120 seconds. The alarm message shows in the alarm message field. Selecting ***Audio Pause*** when no medium or high priority alarms are active prevents the audible alarm tones (audio off) for 90 seconds.

Cancelling Audio Pause

Selecting and holding ***Audio Pause*** for 2 seconds will cancel the audio pause function.

Setting Alarm Limits

1. Select ***Alarm Setup*** from the right side of the display.
2. From the ***Primary Limits*** and ***More Limits tabs***, select the alarm limit and make the change.
3. Push the ***Home*** key, touch the waveform area of the display, or select ***Close*** to close the menu.

Setting Volume Apnea Alarm

Note! *The Volume Apnea Alarm setting may not be available if the system has been configured to disable this feature.*

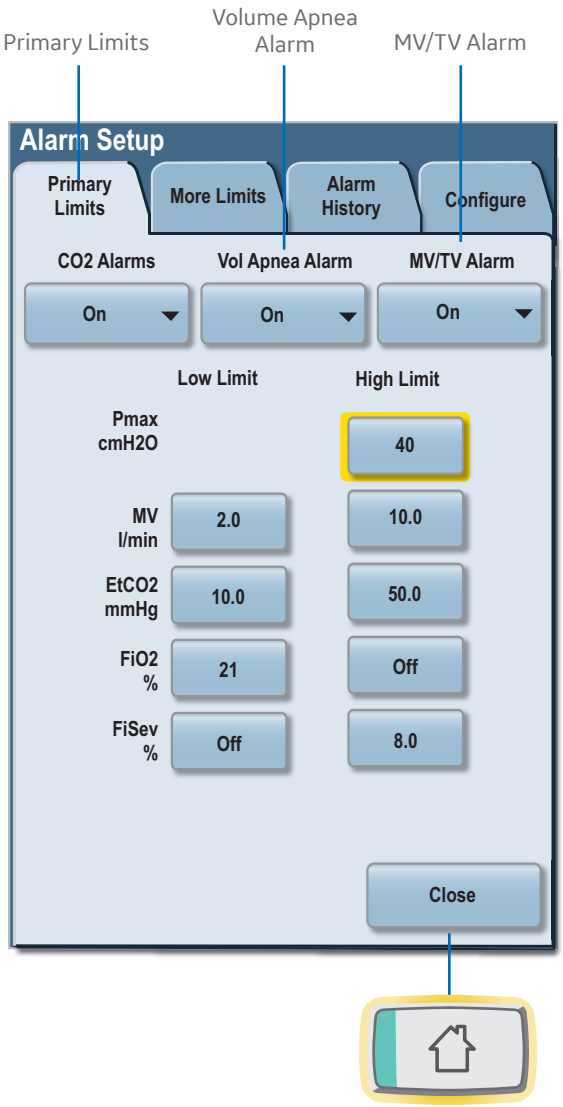
Use the Vol Apnea Alarm setting to turn off the volume apnea alarm during manual ventilation. The volume apnea alarm remains off until the Bag/Vent switch is set to Vent or Vol Apnea Alarm is set to ***On***.

1. Select ***Alarm Setup.***
2. To turn the volume apnea alarms off, select ***Vol Apnea Alarm*** to ***Off.***
3. ***Volume Apnea Off*** shows in the general message field.
   - If mechanical ventilation is started, the volume apnea alarms are active
   - If manual ventilation is restarted, a pop-up confirmation window appears to resume the Off setting
4. To turn the volume apnea alarms on, set ***Vol Apnea Alarm*** to ***On***.
5. Select ***Close***.

Setting MV/TV Alarms

Use the MV/TV Alarms setting to turn off the MV and TV alarms.

1. Select ***Alarm Setup***.
2. To turn the volume alarms off, set ***MV/TV Alarms*** to ***Off***.
   - ***MV/TV Alarms Off*** appears in the general message field
   - The volume alarm limits waveform numerics shows dashes during a case
3. To turn the volume alarms on, set ***MV/TV Alarms*** to ***On***.
4. Select ***Close***.

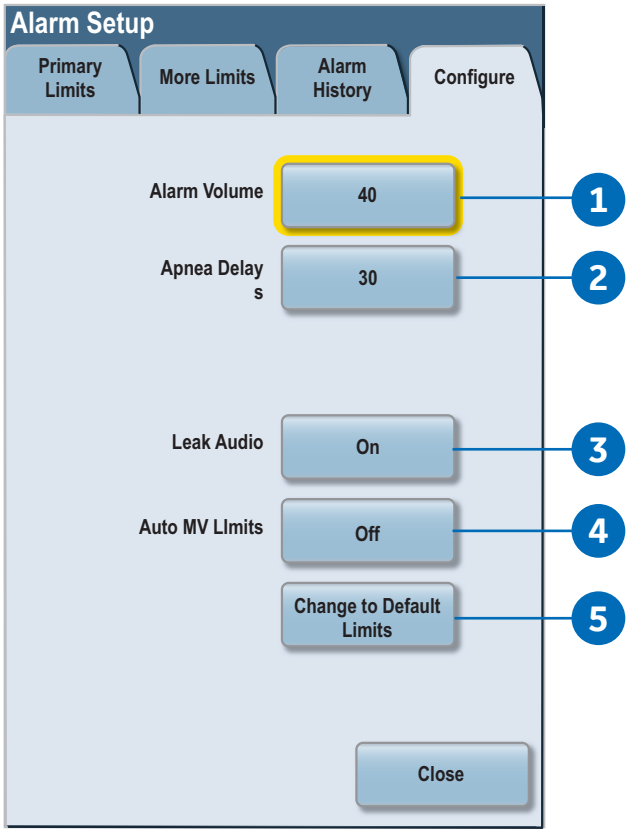


Note! *Settings made during manual ventilation are not retained when mechanical ventilation starts. Settings made during mechanical ventilation are retained when manual ventilation starts.*

Alarm Setup Configure Tab

The following settings are available in the Alarm Setup Configure Tab:

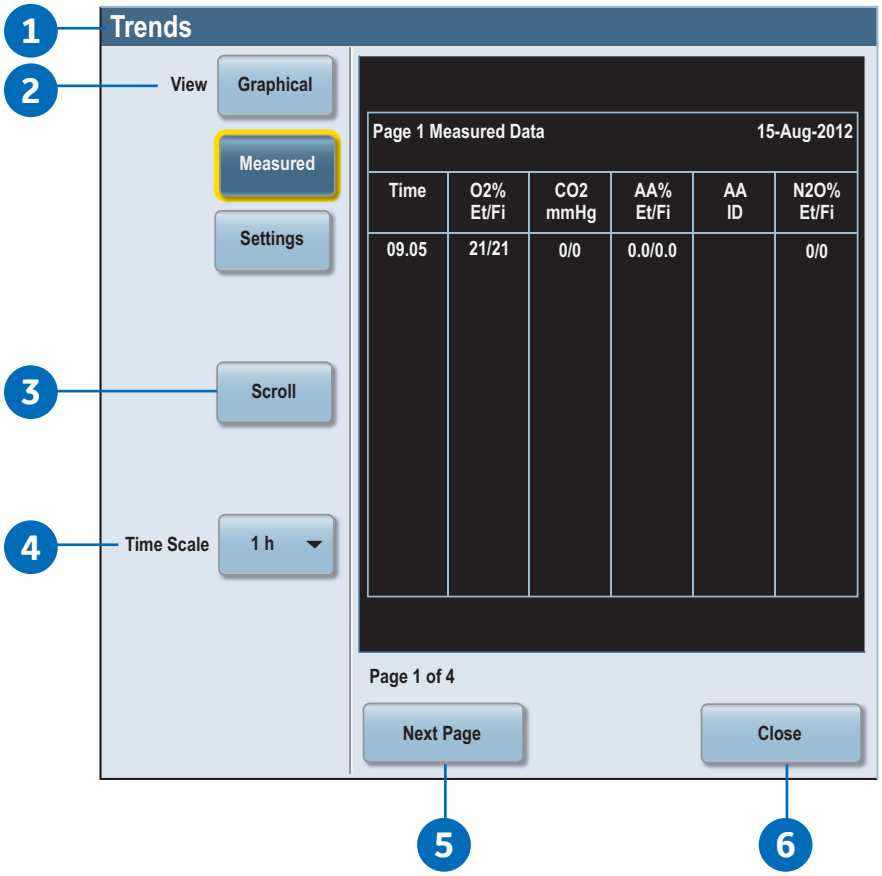
1. **Alarm Volume:** Adjusts the alarm volume range from 1 to 5.
2. **Apnea Delay:** The apnea delay time is the amount of time that can pass without the system detecting a measured breath before the apnea alarm occurs. The apnea time delay range is 10 to 30 seconds in 1 second increments.
3. **Leak Audio:** Use the ***Leak Audio*** setting to silence audio alarms of small leaks. If the Low MV alarm limits are off or MV/TV Alarms is set to ***Off, Leak Audio*** is automatically set to ***On*** and cannot be changed.
4. **Auto MV Limits:** MV alarm limits can be calculated automatically for mechanical ventilation when in VCV or PCV-VG modes and volume compensation is enabled. Use the Auto MV Limits setting to turn on automatic calculations of the MV alarm limits.
5. **Change to Default Limits:** Sets the alarm limits to the values set by the Super User.



Trends

Use the ***Trends*** menu to view patient trends and set the time scale. There are three views for patient trends: measured (numerical), settings, and graphical. Trend information is saved every 15 seconds for the most recent 24 hours.

1. Select ***Trends*** from the right side of the display.
2. Select the desired view.
3. Select ***Scroll*** to move through the current trend view.
4. Select ***Time Scale*** to select the desired scale from the drop-down menu.
5. Select ***Next Page*** to view additional parameters.
6. Select ***Close.***



Checkout

About the Checkout Menu

The Checkout menu shows on the display after turning on the system. To access the Checkout menu between cases, select ***Checkout*** from the right side of the display. Step-by-step instructions show in the Checkout menu during the tests. Use the Checkout menu to:

- Perform a Full Test
- Perform any of the individual tests
- View the Test Log
- Start a case Full Test

Full Test

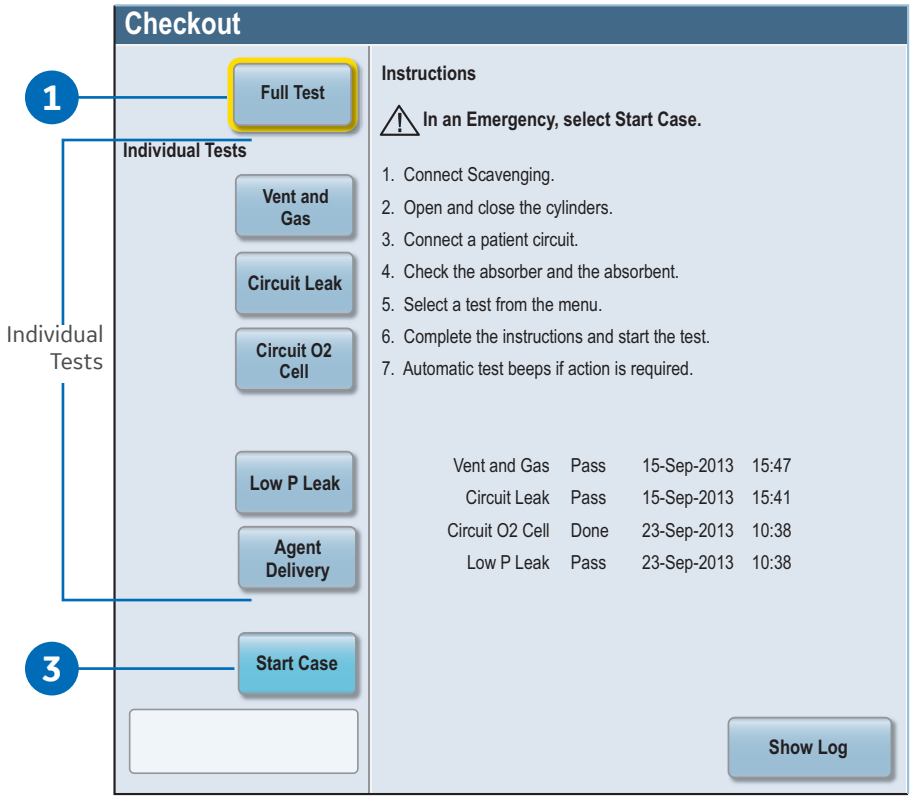
The Full Test or the individual tests must be performed at least once within every 24-hour period. Perform the Full Test at the start of each day. The full test runs automatically and beeps to indicate when it is finished or if interaction is required.

The Full Test does the following tests: Vent and Gas, Circuit Leak, and Circuit O_2 Cell (if circuit O_2 cell is present). When one of the tests is completed, the next test begins.

Performing a Full Test

1. From the Checkout menu, select ***Full Test*** and follow the instructions.
2. If a test fails, follow the instructions to perform a retest or accept the results.
3. When the Full Test is completed, select ***Start Case.***

Note! *In case of a patient emergency, the Full Test may be bypassed by selecting* ***Start Case****. The general message* ***Please Do Checkout*** *is displayed if a Full Test or all of the individual tests are not completed with passing results within 24 hours.*



Tests Performed During a Full Test

- **Vent and Gas:** The Vent and Gas test checks the agent delivery, airway module, Bag/Vent switch, proper gas supply pressures, ventilation operation and leak, battery and electrical power, circuit compliance and flow control operation. This is a two-step test. To run this test, follow the on-screen instructions. When the test passes, the next test starts.
- **Circuit Leak:** The Circuit Leak test checks the Bag/Vent switch, proper gas supply pressures, airway pressure measurement transducer, APL valve, and manual circuit leak. To run this test, follow the on-screen instructions. When the test passes, the next test starts.
- **Circuit O_2 Cell:** If the circuit O_2 cell is present, the Circuit O_2 Cell test measures the O_2 percent. To run this test, follow the on-screen instructions. Do not select ***Done*** when 21 is first displayed. Allow the reading to stabilize, then select ***Done***. Calibrate the O_2 cell if necessary.
- ***External Gas Monitor:*** When enabled by the Super User, the External Gas Monitor reminder occurs. This is not a test. This is a reminder to connect a respiratory gas monitor.

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DOC2113417
November 2018