S/5 Aespire

User's Reference Manual—Part 1
System Controls, Operation, Checkout

Datex·Ohmeda

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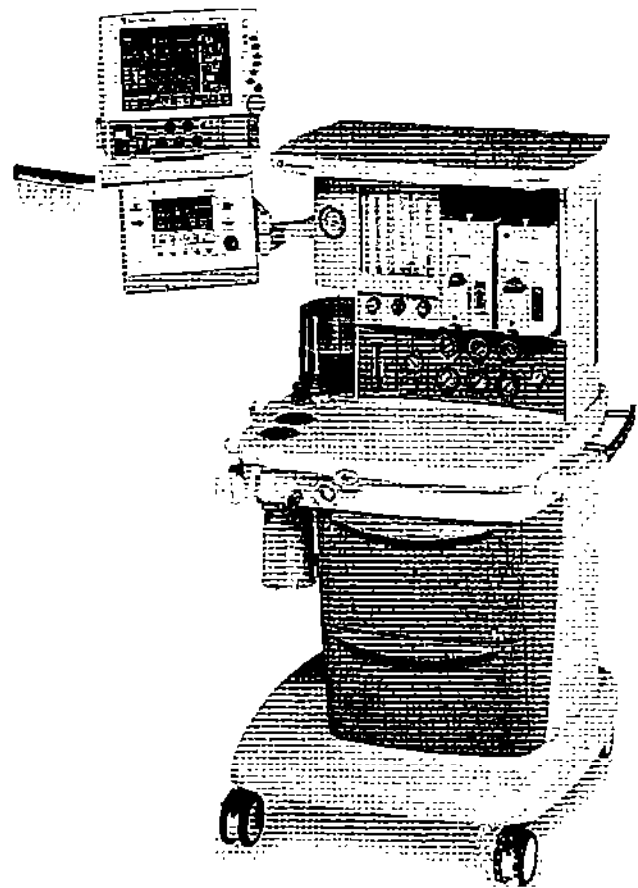
User Responsibility

This Product will perform in conformity with the description thereof contained in this User's Reference manual and accompanying labels and/or inserts, when assembled, operated, maintained, and repaired in accordance with the instructions provided. This Product must be checked periodically. A defective Product should not be used. Parts that are broken, missing, plainly worn, distorted, or contaminated should be replaced immediately. Should repair or replacement become necessary, Datex-Ohmeda recommends that a telephonic or written request for service advice be made to the nearest Datex-Ohmeda Customer Service Center. This Product or any of its parts should not be repaired other than in accordance with written instructions provided by Datex-Ohmeda and by Datex-Ohmeda trained personnel. The Product must not be altered without the prior written approval of Datex-Ohmeda. The user of this Product shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, improper repair, damage, or alteration by anyone other than Datex-Ohmeda.

⚠ **CAUTION**   U.S. Federal law restricts this device to sale by or on the order of a licensed medical practitioner. Outside the U.S.A., check local laws for any restriction that may apply.

Datex-Ohmeda products have unit serial numbers with coded logic which indicates a product group code, the year of manufacture, and a sequential unit number for identification.

AAA F 12345

This alpha character indicates the year of product manufacture and when the serial number was assigned; "D" = 2000, "E" = 2001, "F" = 2002, etc. "I" and "O" are not used.

CE
0197

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4 Preoperative Tests

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1 Introduction

In this section

What is S/5 Aespire?

The S/5 Aespire is a compact, integrated and intuitive anesthesia delivery system. The ventilator portion provides mechanical ventilation for patients during surgery as well as monitoring and displaying various patient parameters.

The system uses a microprocessor-controlled ventilator with internal monitors, electronic PEEP, Volume Mode, and other optional features. A serial interface permits communication to cardiovascular and respiratory gas monitoring.

Illustrations in this manual may not cover all types of options available. Other equipment may be attached to the system on the top shelf or on the side dovetail rails. Consult with your Datex-Ohmeda representative for details about systems available in your location.

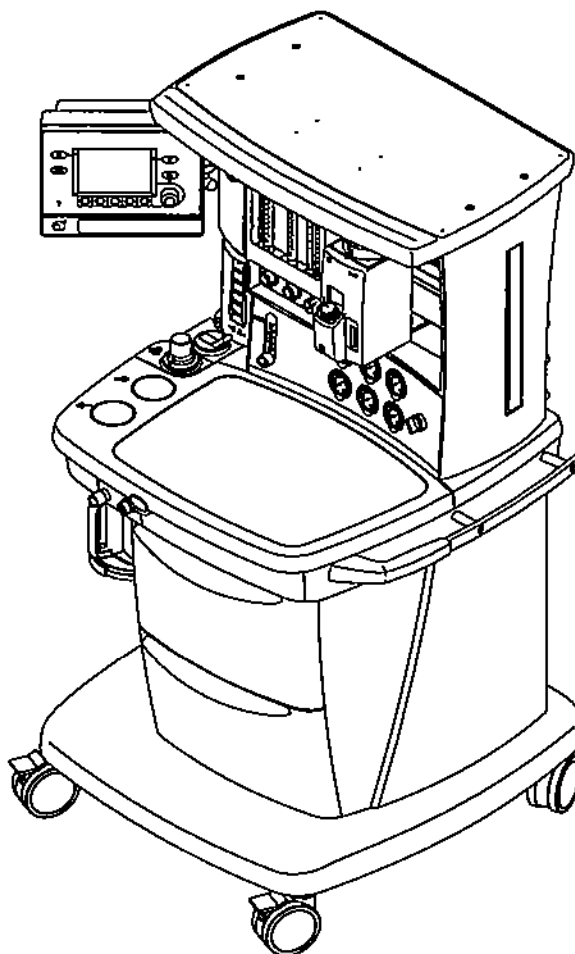The S/5 Aespire is not suitable for use in an MRI environment.

Figure 1-1 ▪ S/5 Aespire example

Symbols used in the manual or on the equipment

⚠ **WARNINGS** and ⚠ **CAUTIONS** tell you about dangerous conditions that can occur if you do not follow all instructions in this manual. Read and follow all warnings and cautions.

WARNINGS tell about a condition that can cause injury to the operator or the patient.

CAUTIONS tell about a condition that can cause damage to the equipment.

A **Note** provides additional information to clarify a statement in text.

An **Important** statement is similar to a Note, but provides a comment of greater emphasis.

Other symbols replace words on the equipment or in Datex-Ohmeda manuals. No one device or manual uses all of the symbols. These symbols include:

I	On (power)	⊖	Not autoclavable
O	Off (power)	⬥	Type B equipment
⏻	Standby	▣	Type BF equipment
⭮	Standby or preparatory state for part of the equipment	▣	Type CF equipment
⊙	"ON" only for part of the equipment	⚠	Caution, ISO 7000-0434
Ȯ	"OFF" only for part of the equipment	⚠⚠	Attention, refer to product instructions, IEC 601-1.
⎓	Direct current	↑↑	This way is up.
∼	Alternating current	ϟ	Dangerous Voltage
⏚	Protective earth ground	⊸⊗	Input
⏛	Earth ground	⊗⊸	Output
⏜	Frame or chassis ground	**REF**	Stock Number
⊠	Alarm silence button	**SN**	Serial Number
⩛	Equipotential		Bag position/ manual ventilation
◁	Variability		Read top of float
◁◻◻	Variability in steps		Vacuum inlet

+ Plus, positive polarity

− Minus, negative polarity

Lamp, lighting, illumination

⟶ Movement in one direction

⟷ Movement in two directions

Lock

Unlock

134°C Autoclavable

Open drain (remove liquid)

Inspiratory flow
Insp

$O_2\%$ O_2 sensor connection

Volume alarms On/Off touch key

$C\epsilon$
xxxx
Systems with this mark agree with the European Council Directive (93/42/EEC) for Medical Devices when they are used as specified in their Operation and Maintenance Manuals. The xxxx is the certification number of the Notified Body used by Datex-Ohmeda's Quality Systems.

Suction bottle outlet

O_2+ O_2 Flush button

Cylinder

Isolation transformer

Low pressure leak test

Mechanical ventilation

Close drain

Expiratory flow
Exp

Alarm silence touch key

Menu touch key

Alarm silence touch key (Tec 6)

End case touch key

$C\epsilon$ European Union Representative

2 System Controls and Menus

Anesthesia system controls

    ⚠WARNING   Explosion Hazard. Do not use S/5 Aespire systems with flammable anesthetic agents.

    ⚠WARNING   Do not use antistatic breathing tubes or masks. They can cause burns if you use them near high frequency surgical equipment.
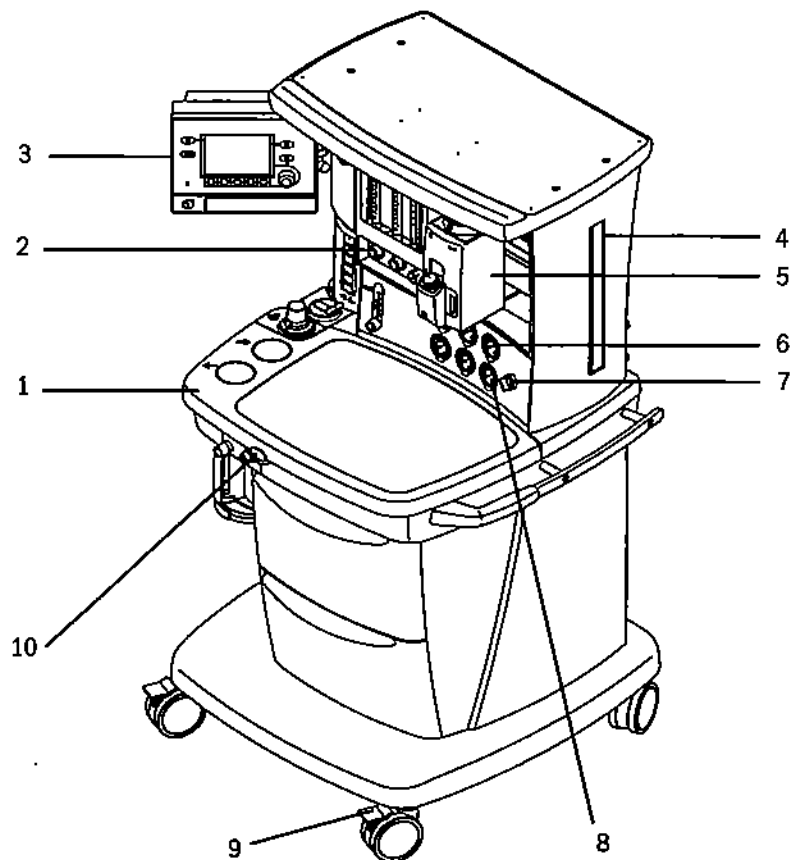
1. Breathing system
2. Flow controls
3. Ventilator / monitoring display
4. Dovetail rails
5. Vaporizer
6. Pipeline pressure gauge(s) (upper row)
7. System switch
8. Cylinder pressure gauge(s) (lower row)
9. Brake
10. O_2 flush button

Figure 2-1 • S/5 Aespire (front view)

Figure 2-1 shows these controls on the front of the S/5 Aespire.

Item		Description
2	Flow controls	Turn the control counterclockwise to increase the flow and clockwise to decrease. The system switch must be On for gas to flow.
7	System switch	Set the switch to the on (I) position to permit gas flow and to turn on the system.
9	Brake	Push down to lock. Lift to release.
10	O_2 flush button	Push the O_2 flush button to supply high flows of O_2 to the breathing system.
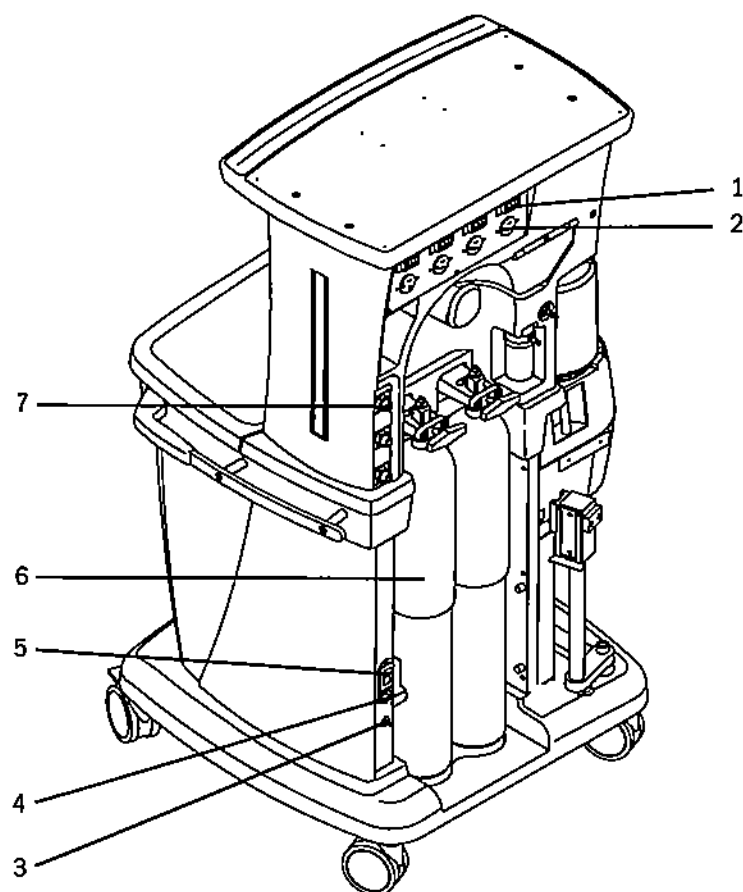
1. Circuit Breaker for Electrical Outlet
2. Electrical Outlet
3. Equipotential Stud
4. Mains Inlet
5. System Circuit Breaker
6. Cylinder(s)
7. Pipeline Connection(s)

Figure 2-2 ▪ S/5 Aespire rear view
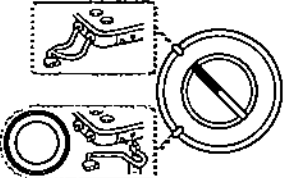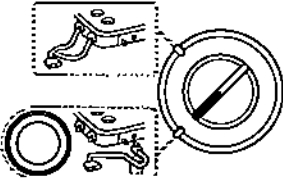
Breathing system components
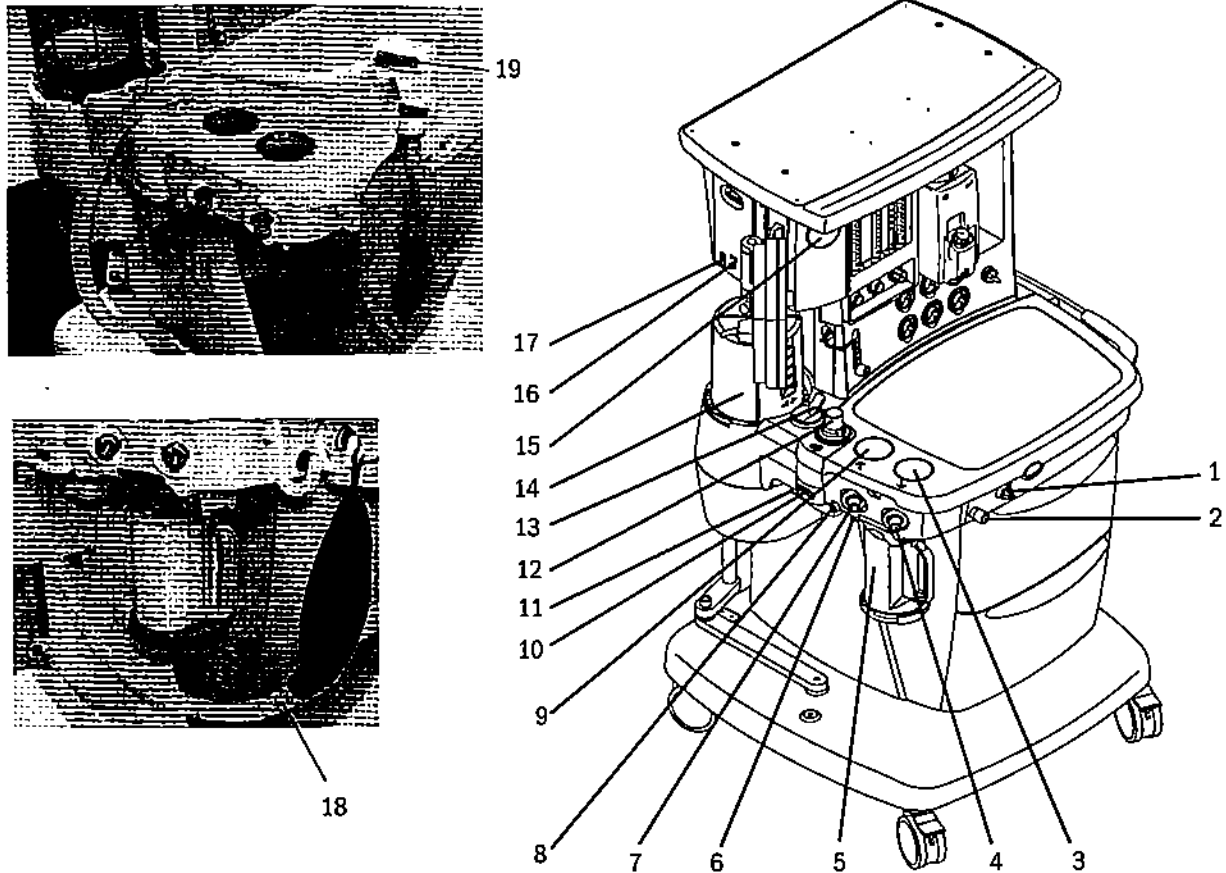
1. Auxiliary common gas outlet (ACGO) switch
2. ACGO
3. Inspiratory check valve (unidirectional valve)
4. Inspiratory flow sensor or flow port adapter / patient connection (circuit connections)
5. Canister (carbon dioxide absorbent)
6. Canister release
7. Expiratory flow sensor or flow port adapter / patient connection (circuit connections)
8. Leak test plug
9. Expiratory check valve (unidirectional valve)
10. Breathing system release
11. Manual bag port
12. APL (adjustable pressure-limiting) valve
13. Bag/mechanical ventilation switch
14. Bellows assembly (mechanical ventilation)
15. Pressure gauge (airway)
16. Sample gas return port
17. Serial port
18. Manual Bag (optional; no bag arm)
19. Bag arm (optional)

Figure 2-3 • Breathing system parts

Figure 2-3 shows these controls on the front of the S/5 Aespire.
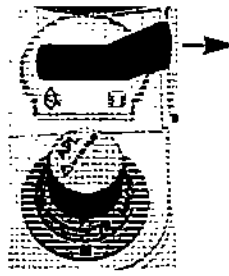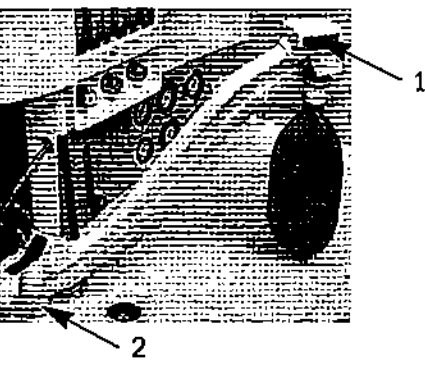
Item		Description
1	Auxiliary Common Gas Outlet switch (ACGO)	Sends fresh gas to the ACGO when the switch is activated. The ACGO may be used to provide fresh gas to an external manual breathing circuit. Mechanical ventilation is not available when the auxiliary outlet is selected and a medium priority alarm will sound and a message "Aux Gas Outlet On" is displayed. Pressure and volume monitoring are not available when the ACGO is selected. Fresh gas oxygen monitoring is available when the ACGO is selected. The ACGO should not be used to drive external ventilators or for jet ventilation. Breathing system selected: Auxiliary outlet selected:
4 & 7	Flow sensor or flow port adapter	Flow sensors provide volume measurements for some monitoring functions. Flow port adapters have no measurement capabilities. Systems with volume monitoring but without volume compensation have a flow port adapter in the front position of the flow sensor module (inspiratory) and a flow sensor in the rear position (expiratory). Systems without volume compensation and without volume monitoring have flow port adapters in both positions of the flow sensor module. All other systems have flow sensors in both positions of the flow sensor module.

Item		Description
6	Canister release	Push to remove the canister. This allows the breathing system to vent to the room. Be sure to hold the canister by the handle before releasing the canister. Note: Always do a leak test after operating the canister release.
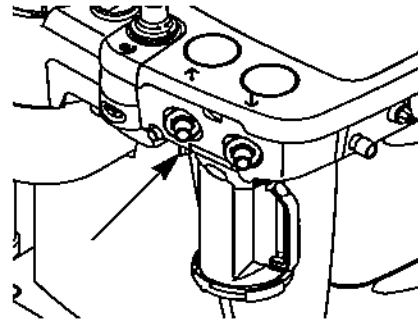
Item		Description
12	APL valve	Adjusts breathing system pressure limit during manual ventilation. The scale shows approximate pressures. Above 30 cm H_2O, you will feel clicks as the knob turns. Turn clockwise to increase. The following example setting is at about 20 cm H_2O:

Item		Description
13	Bag / Mechanical Ventilation switch	Selects between manual ventilation (bag) or mechanical ventilation (ventilator).

- Mechanical ventilation Off (gas to bag):

- Mechanical ventilation On (gas to bellows):

Item		Description
17	Bag arm (optional)	Squeeze at (1) to raise or lower the arm. The Bag arm rotates at (2).

ACGO

When you operate a breathing apparatus with fresh gas from the ACGO:

- Mechanical ventilation is not available.
- The pressure gauge, Bag/Vent switch, APL valve, and bag arm are not part of the external circuit.
- Volume and pressure monitoring are not available.
- O_2 monitoring of fresh gas is available automatically when the ACGO is selected if the system has the O_2 monitoring option.

- Fresh gas oxygen concentration is displayed on the ventilation screen. Set alarm limits appropriately. Note that fresh gas oxygen concentration may not reflect FiO_2 in rebreathing circuits such as the Mapleson series. Use an external O_2 monitor if using a rebreathing circuit on ACGO.
- A sample of the fresh gas is diverted to the O_2 cell in the breathing system.
- The sample flow to the O_2 sensor is dependent on the pressure in the external circuit. The sample flow reduces the fresh gas flowrate to the external breathing circuit as shown in the graph.
- Do not use an external ventilator on the ACGO.
- Do not use the ACGO to drive external ventilators or for jet ventilation.

Estimate the mean pressure required for ventilation and determine a mean sample flow rate from the graph:
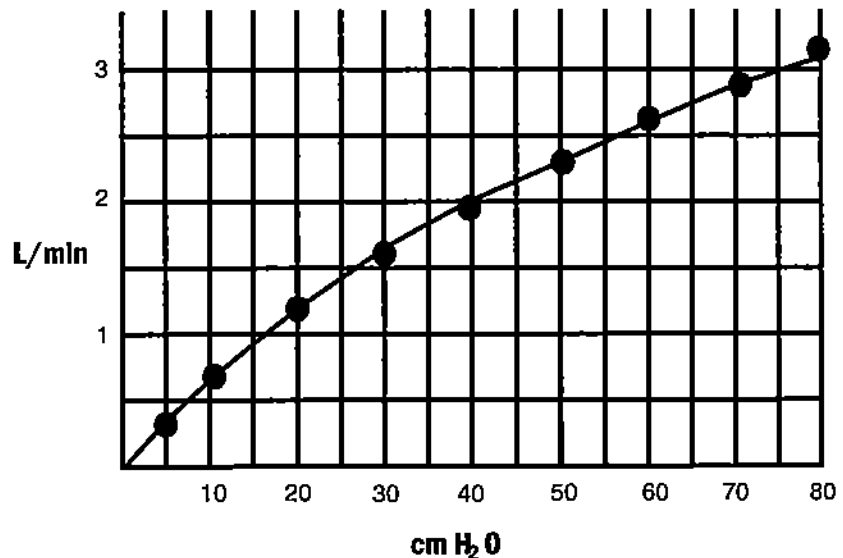
Figure 2-4 • Back pressure (cm H_2O) vs. flow to O_2 sensor (L/min)

Scavenging the ACGO sample flow

If the external manual breathing circuit is to be used with N_2O or volatile anesthetics, the sample flow should be scavenged.

1. Occlude the patient circuit of the breathing system by using the leak test plug located to the rear of the expiratory port.

2. Check for clinically correct settings. Set the Bag to Vent switch to the ventilator mode. Alternatively set the Bag to Vent switch to the bag mode and set the APL to MIN and attach a bag.

3. The bellows, or bag, will fill slowly with the fresh gas sample flow and then spill to the AGSS.

Scavenging from the external manual breathing circuit

If the external manual breathing circuit is to be used with N_2O or volatile anesthetics, the exhaust should be scavenged.

An auxiliary inlet is available for active AGSS units. It provides a 30 mm male connection into the auxiliary port under the breathing system.

- The auxiliary inlet is a convenience inlet to the air brake of active AGSS units. There is a reservoir to capture exhaust flows higher than the extract flow.

For all AGSS, a separate exhaust hose is necessary from the external manual circuit to the disposal point.

Vaporizer controls

Refer to the description in this section and the vaporizer operation and maintenance manual for more detailed information on the vaporizer.

Figure 2-5 shows the vaporizer controls.
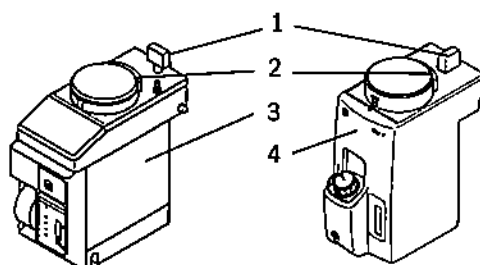
1. Lock Lever
2. Concentration Control and Release
3. Tec 6 Plus
4. Tec 7

Figure 2-5 • Vaporizer controls

Item		Description
1	Lock lever	Turn the lever fully clockwise to lock the vaporizer in position.

Item		Description
2	Concentration control and release	Push the release and turn the concentration control to set the agent concentration. The Tec 6 Plus concentration control does not turn as long as the warm-up indicator is on.

Ventilator controls

Optional features

The S/5 Aespire can be equipped with several optional ventilation functions. References made in this manual to Pressure Mode, O_2 Monitoring, Volume Monitoring, Volume Compensation, and Pressure Waveform Display are only applicable to systems equipped with these functions.

Control panel

Ventilator controls include:

- Touch keys
- Menu screens
- A control knob

All but two ventilator controls are located on the Ventilation/Monitoring display:

- The system switch provides power functions.
- · The Bag/Vent switch and ACGO switch start and stop mechanical ventilation.

⚠CAUTION

When using the oxygen sensor in the patient circuit, water vapor may condense on the sensor surface if the sensor's temperature is lower than, or equal to, the dew point temperature of the breathing gas. This may result in a lower than actual circuit O_2 concentration display.
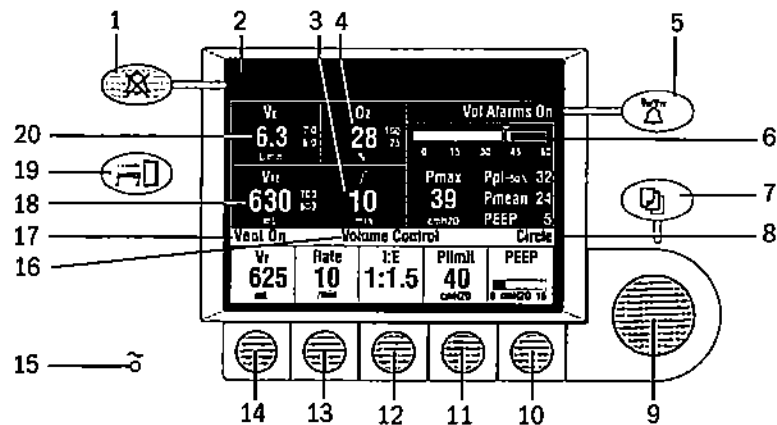
1. Alarm silence /suspend key
2. Alarm message display
3. Measured value
4. Measured value
5. Volume alarms On/Off key
6. Pressure bar graph or pressure waveform
7. Menu key
8. Circuit description
9. Control knob
10. PEEP selection key
11. Plimit selection key
12. I:E ratio selection key
13. Breathing rate selection key
14. Tidal volume (V_T) or airway pressure (P_{insp}) selection key
15. Mains indicator light
16. Ventilation mode
17. Mechanical ventilation status (on or off)
18. Measured value
19. End case key
20. Measured value

Figure 2-6 ▪ 7100 controls and monitored data

Menu

How to use the menu

Screens go back to the normal display 25 seconds after you complete the last action.

During a calibration or other procedure, the screen shows the instructions.

The following steps are an example of how to use the menu.

Step 1

Push the Menu key to see
the main menu.

Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen

Step 2

Turn the knob to select an
option
(highlight).

Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen

Step 3

Push the knob to show
the next screen.

Screen and Audio Setup	
Screen Contrast	**25**
Alarm Loudness	5
Alarm Limits	Show
Units of Measure	Show
Go to Main Menu	

Step 4

Turn, then push the knob
to select a setting.

Screen and Audio Setup	
Screen Contrast	25
Alarm Loudness	**5**
Alarm Limits	Show
Units of Measure	Show
Go to Main Menu	

Step 5

Turn the knob to change a
menu setting.
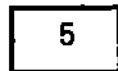
5 → 4

Step 6

Push the knob to save the
change.

4

Step 7

To exit, select "Go to Main Menu" and push the knob.

You can also push the menu key to exit to the normal screen.

Go to Main Menu

Step 8

Select "Exit to Normal Screen" and push the knob.

Exit to Normal Screen

Menu Map

Figure 2-7 shows the menu map. Some features are optional.

Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen

Main Menu	
Ventilation Mode	**Volume Control**
Alarm Settings	Pressure Mode
Setup	
Calibration	
Screen and Audio	
Exit to Normal Screen	

Alarm Settings			*
O₂	25	**100**	
Vᴇ	6.0	7.0	
Vᴛᴇ	600	700	
Circuit Leak	Audio On		
Cardiac Bypass	No		
Go to Main Menu			

Setup	
Inspiratory Pause	**Off**
Heliox Mode	Off
About Ventilator...	
Go to Main Menu	

Calibration
O₂ Sensor Cal
Paw Sensor Cal
Go to Main Menu

Screen and Audio Setup	
Screen Contrast	**25**
Alarm Loudness	5
Alarm Limits	Show
Units of Measure	Show
Go to Main Menu	

* If the Alarm Settings page shows VE auto Limits during mechanical ventilation, the system automatically calculates alarm limits according to ventilator parameters.

Figure 2-7 ▪ Menu map

Optional auxiliary O₂ flowmeter and suction regulators

These options are available:

- Auxiliary O₂ flowmeter
- A continuous suction regulator or a venturi suction regulator
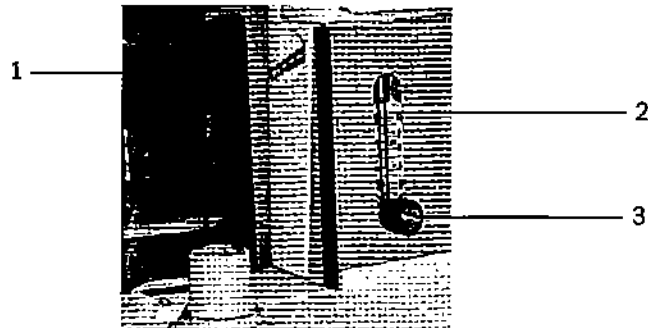
1. Auxiliary O₂ Flowmeter outlet
2. Auxiliary O₂ Flowmeter
3. Auxiliary O₂ flow control

Figure 2-8 ▪ Optional Auxiliary O₂ Flowmeter and control
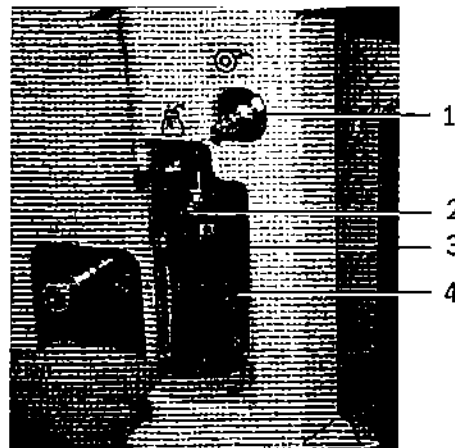
1. External vacuum (non-venturi)
2. Collection bottle connection
3. Filter
4. Overflow safety trap

Figure 2-9 ▪ Optional Suction Regulator

1009-0307-000

**Suction regulator
controls**

Mode switch:

MAX: for maximum suction, set the switch to **MAX.**

On (|): for adjustable suction, set the switch to on (|) or | .

Off (**0**): to turn off suction, set the switch to **0.**

With the mode switch set to " | ", turn the control clockwise to increase suction and counterclockwise to decrease it.

**Auxiliary flowmeter
control**

The auxiliary flowmeter is not pressure compensated.

Turn the control counterclockwise to increase the O_2 flow and clockwise to decrease.

3 Operation and Tutorial

⚠**WARNING**   In addition to volume apnea and low airway pressure alarms, other ventilator alarms are included to indicate potential hazard conditions. All alarms that occur should be investigated to help ensure adequate patient safety.

⚠   Maintain sufficient fresh gas flow when using sevofluorane.

⚠   Desiccated absorbers can be hazardous in the presence of anesthetic agents. Adequate precautions should be taken to ensure that soda lime in absorbers does not become desiccated. Turn off all gases when finished using the system.

In this section   This section describes specific tasks. Use it as a step-by-step guide or a training tool.

Turn on the system

Step 1

Connect the power cord to a wall outlet.

- The mains indicator comes on when AC power is connected.
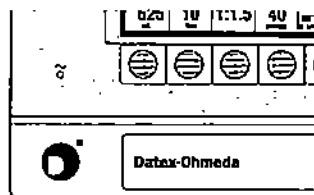
Step 2

Set the system switch to On (|).

- The display shows the power-up screen, and the system does a series of self tests.

- If the self tests pass, the normal display appears.

- If a test fails, the screen shows an alarm. Refer to the Troubleshooting section in Part 2 of this manual.

(On)

Ⓓ Datex·Ohmeda

7100 Ventilator Software Version: X.X 10:00
©2000 Datex-Ohmeda, Inc

O2 and volume monitoring not installed

Always do the preoperative test before you use this system.
⚠ Refer to the operation manual.

Self tests In progress

V̇ᴇ	O₂	Vol Alarms Standby		
--.- 4.3 2.8 L/min	39 93 21 %	0 15 30 45 60		
Vᴛᴇ	ƒ	Pmax		
---- 1000 Off mL		Pmean --		
Vent Off	Adjust settings? To start mech vent set Bag/Vent switch to Vent.			
Vᴛ 300 mL	Rate 12 /min	I:E 1:2	Plimit 40 cmH2O	PEEP Inactive Off

Set the alarm loudness

Step 1

Push the Menu key to see the main menu.

Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen

Step 2

Turn the knob to select Screen and Audio Setup.

Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen

Step 3

Push the knob to show the next screen.

Screen and Audio Setup	
Screen Contrast	**25**
Alarm Loudness	1
Alarm Limits	Show
Units of Measure	Show
Go to Main Menu	

Step 4

Turn the knob to highlight Alarm Loudness.

Screen and Audio Setup	
Screen Contrast	25
Alarm Loudness	**1**
Alarm Limits	Show
Units of Measure	Show
Go to Main Menu	

Step 5

Push the knob to select Alarm Loudness.

- A tone sounds at the loudness currently active.

Screen and Audio Setup	
Screen Contrast	25
Alarm Loudness	**1**
Alarm Limits	Show
Units of Measure	Show
Go to Main Menu	

Step 6

Turn the knob to select a new volume.

- The volume range is 1 to 5 (loudest).
- As you change the selection, you hear the loudness of your selection.

1 → 5

Step 7

Push the knob to save the change.

→ 5

Step 8

To exit, select "Go to Main Menu" and push the knob.

You can also press the menu key to exit to the normal screen.

→ Go to Main Menu →

Step 9

Select "Exit to Normal Screen" and push the knob.

→ Exit to Normal Screen →

Show or hide alarm limits and units

To simplify the displays, you can hide alarm limits and units of measurement. For example:

$\dot{V}_E$ **6.3** 7.0 6.0 L/min	$\dot{V}_E$ **6.3** L/min
V_{TE} **630** 700 600 mL	V_{TE} **630** mL
Show alarm limits	Hide alarm limits

$\dot{V}_E$ **6.3** 7.0 6.0 L/min	$\dot{V}_E$ **6.3**
V_{TE} **630** 700 600 mL	V_{TE} **630**
Show units	Hide units and alarm limits

If you hide the alarm limits, the screen automatically shows the limits when:

- An alarm occurs.
- Volume monitoring is off or the auxiliary common gas outlet is selected (monitoring off).
- When you turn the system switch on.

Step 1

Push the Menu key to see the main menu.

Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen

Step 2

Turn the knob to select Screen and Audio Setup.

Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen

Step 3

Push the knob to show
the next screen.

Screen and Audio Setup	
Screen Contrast	25
Alarm Loudness	5
Alarm Limits	Show
Units of Measure	Show
Go to Main Menu	

Step 4

Turn, then push the knob
to select Alarm Limits (or
Units of Measure).

| Screen and Audio Setup	
Screen Contrast	25
Alarm Loudness	5
Alarm Limits	Show
Units of Measure	Show
Go to Main Menu	

Step 5

Turn the knob to select
Show or Hide.

Show
Hide

Step 6

Push the knob to save the
change.

Hide

Step 7

To exit, select "Go to Main
Menu" and push the
knob.

Go to Main Menu

You can also press the
menu key to exit to the
normal screen.

Step 8

Select "Exit to Normal
Screen" and push the
knob.

Exit to Normal Screen

Turn the Volume Alarms on or off

⚠ WARNING   Do not turn off volume alarms with a spontaneously breathing patient. The system will not alarm for low volume.

The volume alarm key ($\dot{V}_E/V_{TE}$) turns volume alarms on and off. When the alarms are off, a large X covers the limits.

Use this control during manual ventilation when constant attention is being kept on the patient's ventilation.
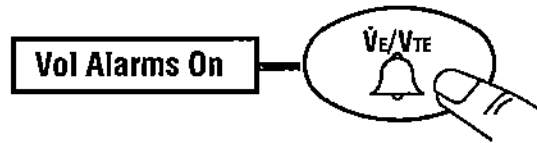
Use the End Case key (on control panel) to prevent volume apnea and alarms between cases. These alarms will reactivate if two breaths are detected within 30 seconds.

Set alarm limits

Note: If the Alarm Settings page shows V_E Auto Limits during mechanical ventilation, the system is set to automatically calculate V_E limits according to ventilator parameter settings.

Step 1

Push the Menu key to see the main menu.

```
Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen
```

Step 2

Turn the knob to select Alarm Settings.

```
Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen
```

Step 3

Push the knob to show the next screen.

```
Alarm Settings
O2                       25     100
VE                       1.5    10.0
VTE                      120    1000
Circuit Leak       Audio On
Cardiac Bypass    No Bypass ▲
Go to Main Menu
```

Step 4

Turn, then push the knob to select a setting.

```
Alarm Settings
O2                       25     100
VE                       1.5    10.0
VTE                      120    1000
Circuit Leak       Audio On
Cardiac Bypass    No Bypass ▲
Go to Main Menu
```

Step 5

Turn the knob to adjust the setting.

100 → 95

Step 6

Push the knob to save the change.

→ **95**

Step 7

To exit, select "Go to Main Menu" and push the knob.

You can also press the menu key to exit to the normal screen.

→ **Go to Main Menu** →

Step 8

Select "Exit to Normal Screen" and push the knob.

→ **Exit to Normal Screen** →

Set an audible alarm for circuit leaks

The patient circuit leak alarm comes on if less than half of the inspired volume returns through the expiratory flow sensor during mechanical ventilation.

To prevent nuisance alarms from a known circuit leak (e.g. an un-cuffed endotracheal tube), you can set the audio to off.

Normal volume and apnea monitoring does not change.

Note: This alarm is the first stage in detecting a circuit disconnect. You cannot turn off the audible circuit leak alarm unless: volume alarms are on, and the low $\dot{V}_E$ limit is set to a value other than off.

Step 1

Push the Menu key to see the main menu.

```
Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen
```

Step 2

Turn the knob to select Alarm Settings.

```
Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen
```

Step 3

Push the knob to show the next screen.

```
Alarm Settings
O2              18      100
VE              6.0     7.0
VTE             Off     Off
Circuit Leak    Audio On
Cardiac Bypass  No
Go to Main Menu
```

Step 4

Turn, then push the knob to select Circuit Leak.

Alarm Settings		
O₂	18	100
V̇ᴇ	6.0	7.0
Vᴛᴇ	Off	Off
Circuit Leak	Audio On	
Cardiac Bypass	No	
Go to Main Menu		

Alarm Settings	
O₂	Audio On
V̇ᴇ	Audio Off
Vᴛᴇ	
Circuit Leak	
Cardiac Bypass	
Go to Main Menu	

Step 5

Turn the knob to select Audio On or Audio Off.

Step 6

Push the knob to save the change.

Note: When Circuit Leak Audio Off is selected, the message "Circuit Leak Audio Off" appears on the display.

Alarm Settings		
O₂	18	100
V̇ᴇ	6.0	7.0
Vᴛᴇ	Off	Off
Circuit Leak	Audio On	
Cardiac Bypass	No	
Go to Main Menu		

Step 7

To exit, select "Go to Main Menu" and push the knob.

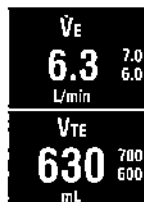You can also press the menu key to exit to the normal screen.

Go to Main Menu

Step 8

Select "Exit to Normal Screen" and push the knob.

Exit to Normal Screen

Set Cardiac Bypass

Cardiac Bypass (No / In Progress) turns off volume and apnea alarms when these are not appropriate (e.g. during heart / lung bypass).

Set Cardiac Bypass to In Progress to prevent volume and apnea alarms when the patient is on cardio-pulmonary bypass. When Cardiac Bypass In Progress is selected, the display shows:

- Cardiac Bypass
- Apnea Alarm off

Note: Mechanical ventilation must be off. When mechanical ventilation is turned back on, Cardiac Bypass returns to the No setting and monitoring is available.

Step 1

Set the Bag/Vent switch to Bag position:

This selects manual ventilation (bag) and stops the mechanical ventilation (ventilator).

Step 2

Push the Menu key to see the main menu.

Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen

Step 3

Turn the knob to select the Alarm Settings.

Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen

Step 4

Push the knob to show the next screen.

Alarm Settings		
O₂	25	**100**
V̇ᴇ	6.0	7.0
Vᴛᴇ	600	700
Circuit Leak	Audio On	
Cardiac Bypass	No	
Go to Main Menu		

Step 5

Turn, then push the knob to select Cardiac Bypass.

Alarm Settings		
O₂	25	100
V̇ᴇ	6.0	7.0
Vᴛᴇ	600	700
Circuit Leak	Audio On	
Cardiac Bypass	No	
Go to Main Menu		

Alarm Settings	
O₂	**No**
V̇ᴇ	In Progress
Vᴛᴇ	
Circuit Leak	
Cardiac Bypass	
Go to Main Menu	

Step 6

Turn the knob to select "No" or "In Progress".

No

In progress

Step 7

Push the knob to save the change.

→ No

In progress

Step 8

To exit, select "Go to Main Menu" and push the knob.

You can also press the menu key to exit to the normal screen.

→ Go to Main Menu →

Step 9

Select "Exit to Normal Screen" and push the knob.

→ Exit to Normal Screen →

Set the ventilation mode

Text shows the ventilation mode:

- Pressure mode supplies a set pressure during inspiration.
- Volume control supplies a set tidal volume during inspiration.

Step 1

Push the Menu key to see the main menu.

```
Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen
```

Step 2

Push and turn the knob to select the Ventilation Mode.

```
Main Menu
Ventilation Mode    Volume Control
Alarm Settings      Pressure Mode
Setup
Calibration
Screen and Audio
Exit to Normal Screen
```

Step 3

Push, then turn the knob to set a value for the selected ventilation mode.

A box flashes around the value being set.

Note: The P_{insp} bar graph shows a different scale depending on the value set:
"0 to 25 cm H_2O"
or
"0 to 50 cm H_2O".

Vт
625
mL

Pinsp
5
0 cmH2O 25

or.

Pinsp
30
0 cmH2O 50
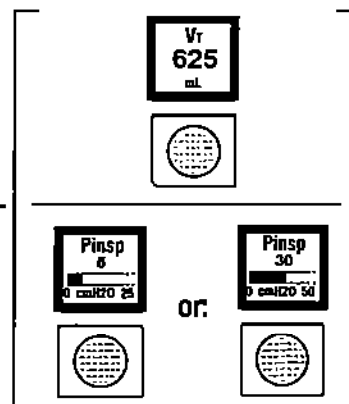
Step 4

Press the knob to confirm
the set value.

- The flashing box
  disappears.
- The system returns to
  the main screen.
- The ventilation mode is
  displayed on the main
  screen.

Vr
625
mL

or
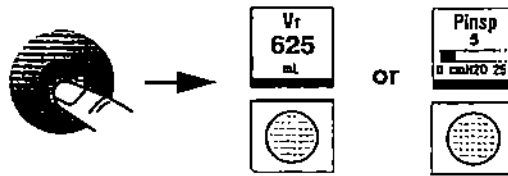
Pinsp
5
0 cmH2O 25

Set ventilator controls

The screen shows control settings:

Vт	Rate	I:E	PIlmlt	PEEP
625	10	1:1.5	40	

In the pressure mode (an optional function), P_{Insp} replaces V_T:

Pinsp	Rate	I:E	PIlmlt	PEEP
	10	1:1.5	40	

Messages appear on the screen if:

- You try to set a value the system cannot supply.
- You change a setting but do not save it:
  "Push knob to confirm change
  Turn knob to change setting".

An example of setting controls

Step 1

Push the selection key.

- A box flashes around the setting.
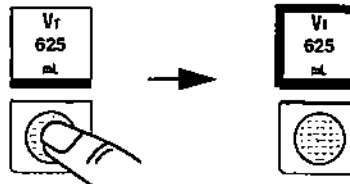
Step 2

Turn the knob to set the value.

- The ventilator will display a message and will not allow settings outside of its performance specifications.
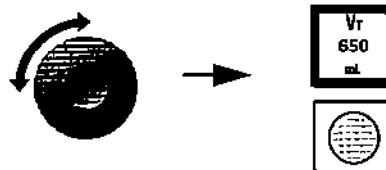
Note: When adjusting P_{Insp}, a digital value is displayed to assist setting P_{Insp} until the setting is confirmed. The P_{max} value will display the actual pressure delivered.

Step 3

Push the knob or the selection key to save the setting.

- The flashing box disappears.
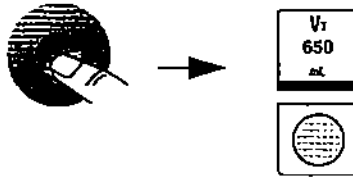
or:
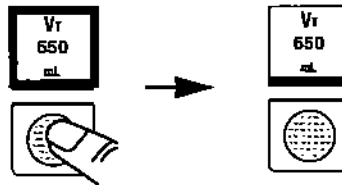
Tidal Volume (V$_T$) Control or Pressure (P$_{Insp}$) Control

The left most primary control depends on the ventilation mode.

- Sets tidal volume (V$_T$) if the volume ventilation mode is set.
- Sets airway pressure (P$_{Insp}$) if the pressure ventilation mode (an optional function) is set.
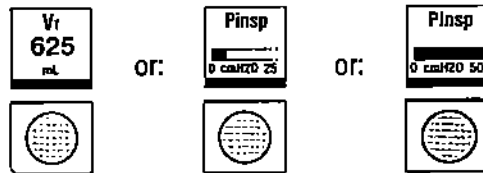
V$_T$ can be adjusted from 45 to 1500 mL.

P$_{Insp}$ can be adjusted from 5 to 50 cm H$_2$O.

Note: When adjusting P$_{Insp}$, a digital value is displayed to assist setting P$_{Insp}$ until the setting is confirmed. The P$_{max}$ value will display the actual pressure delivered.

Breathing Rate Control (Breaths/minute)

This control permits you to set the respiratory rate of mechanical breaths delivered to the patient.
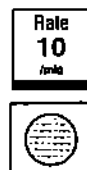
Rate can be adjusted from 4 to 65 breaths per minute in one breath increments.

I:E Ratio Control

This control lets you set the I:E ratio of mechanical breaths supplied to the patient.

```
I:E
1:1.5
```

Ratios range from 2:1 through 1:6, in 0.5 increments (e.g.: 2:1, 1.5:1,...1:6).

High Airway Pressure Limit Control

This control lets you set maximum (and sustained) airway pressures tolerated in the patient's breathing system.

```
Plimit
40
cmH2O
```
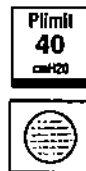
P_{limit} - set range 12 to 99 cm H_2O, 1 cm H_2O increments.

- If the high airway pressure limit is reached, inspiration stops and exhalation starts.
- The limit is an absolute value. There is no offset for PEEP pressure.

Note: P_{max} is the peak-sensed airway pressure; P_{limit} is the airway pressure limit set with front panel controls.

⚠ **WARNING**

Set the P_{limit} at an appropriate level for each patient. The P_{limit} setting should not greatly exceed the P_{max} in order to allow the system to operate at its highest safety and performance levels.

PEEP   PEEP is only available during mechanical ventilation. But, you can set the control at any time.

The range is off or between 4 and 30 cm H_2O.

 or
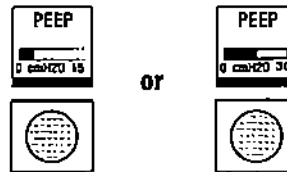
Note: When adjusting PEEP, a digital value is displayed to assist PEEP setting until the setting is confirmed. The PEEP pressure value in the monitoring section of the display will indicate the actual PEEP pressure being delivered.

No value is shown if PEEP is off.

⚠ WARNING   Do not use a separate mechanical PEEP valve; incorrect operation and patient injury can result.

Set inspiratory pause

You can only use inspiratory pause in volume control.

When Pause is on, the inspiratory volume stays in the patient's lungs for the set pause time at the end of inspiration.

Pause can be set to off or 5 to 60 percent of inspiratory time in increments of five percent.

When the ventilator is turned on, the inspiratory pause is at the value set when the ventilator was last used.

Step 1

Push the Menu key to see the Main Menu.

| Main Menu |
| Ventilation Mode |
| Alarm Settings |
| Setup |
| Calibration |
| Screen and Audio Setup |
| Exit to Normal Screen |
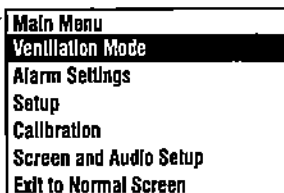
Step 2

Turn the knob to select
the Setup screen.

Main Menu
Ventilation Mode
Alarm Settings
Setup
Calibration
Screen and Audio Setup
Exit to Normal Screen

Step 3

Push the knob to show
the Setup screen.

Setup	
Inspiratory Pause	Off
Hellox Mode	Off
Go to Main Menu	

Step 4

Push the knob to select
Inspiratory Pause.

Setup	
Inspiratory Pause	Off
Hellox Mode	Off
Go to Main Menu	

Step 5

Turn the knob to change
the setting.

60% TI

Step 6

Push the knob to save the
change.

60% TI

Step 7

To exit, select "Go to Main
Menu" and push the
knob.

Go to Main Menu

You can also press the
menu key to exit to the
normal screen.

Step 8

Select "Exit to Normal Screen" and push the knob.

Optional Passive AGSS operation

The S/5 Aespire Passive AGSS (Anesthesia Gas Scavenging System) consists of a two-liter reservoir to minimize rapid pressure changes. It contains both positive and negative pressure relief valves to protect the breathing system. The outlet is a 30 mm connector on the bottom of the reservoir.
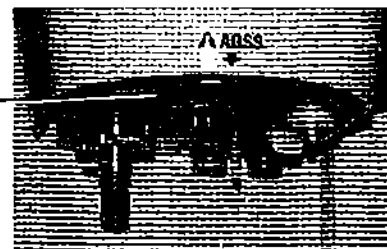
There is also a connector that may be used for scavenging the sample from a gas monitor. The inlet connection is near the 30 mm connector.

Passive AGSS is intended primarily for use in operating room environments which have no dedicated vacuum system for waste gas disposal. The disposal system generally consists of large diameter tubing and/or duct directly linking the passive AGSS with the building exterior. The tubing should be as large in diameter and as short as needed for the particular application.

Passive AGSS may also be used with a non-recirculating ventilation system for waste gas disposal. The tubing connection from passive AGSS to the non-recirculating ventilation system should be an open connection, essentially at atmospheric pressure, such as to an exhaust grill.

Optional Active AGSS operation

Versions There are at least four versions of the optional active AGSS (Anesthesia Gas Scavenging System) available depending on the hospital's type of waste gas disposal system.

The active low flow system is for use with high vacuum disposal systems. It requires a vacuum system capable of a continuous nominal flow of 36 L/min and 300 mm Hg (12 in Hg) or greater vacuum pressure. A flow indicator on the system indicates when the unit is in operation.

The active high flow system is for use with low vacuum (blower type) disposal systems. This requires a system capable of providing a continuous nominal flow of 50 L/min. A flow indicator on the system indicates when the unit is in operation.

The third type is for hospital supplied venturi / ejector systems having their own extract flow meter. This will operate satisfactorily with a minimum extract flow of 30 L/min to 100 L/min.

A fourth type is an active adustable fllow. It provides the capability to adjust the flow with a needle valve and a visual indicator bag which should be properly inflated.

All versions have a two-liter reservoir to capture peak exhaust flows that briefly exceed the extract flow. The disposal system normally entrains room air through an air brake (located in a receiver underneath the breathing system), but will spill from this port during extended periods of high exhaust flow. Its effectiveness is limited by the extract flow of the particular active AGSS device.

⚠WARNING   Always verify the proper operation of any gas scavenging system; ensure the scavenging system is not occluded.

Connecting Active AGSS with a flow indicator

To use the optional active AGSS on a system which has a flow indicator (1), connect it as follows.

1. Connect the proper hose to the AGSS outlet connector on the bottom of the AGSS (below the ventilator engine (bellows). Attach the other end to the hospital disposal system.

2. To scavenge gas from a gas monitor, connect tubing from the monitor to the quick-connect fitting near the AGSS outlet connector on the bottom of the AGSS below the ventilator engine (bellows).

3. With the AGSS operating, verify that the flow indicator ball (4) on the flow indicator (1) rises to the green zone (3), indicating adequate flow.

AGSS
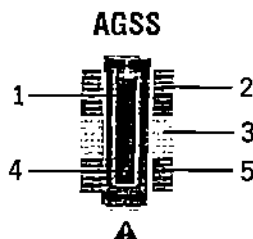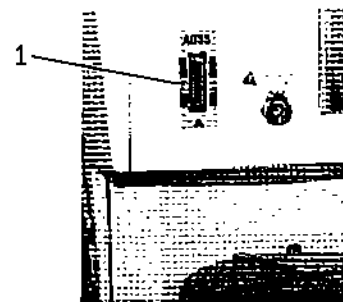
Note   The ball in the upper red zone (2) indicates excessively high extraction flow. The ball in the lower red zone (5) indicates extraction flow rate is too low or a blocked filter.

4. Before you use the system, complete the Preoperative Test procedure. Refer to section 4 Preoperative Tests of this manual.

Connecting Active AGSS without a flow indicator

The active AGSS option without a flow indicator is for use only with the active adjustable flow scavenging. The flow rate is limited to 30 L/min with this option.

To use the optional active AGSS installed on the system which does not have a flow indicator, connect it as follows.

1. Connect a disposal hose to the barbed connector on the needle valve on the bottom of the AGSS below the ventilator engine (bellows).
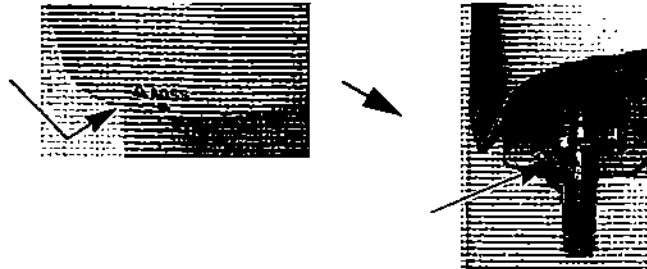
- The hose should be flexible and reinforced to help prevent kinking and crushing.
- Attach the other end of the hose to the hospital disposal system.

2. Attach the 3 liter visual indicator bag to the 30 mm auxiliary #1 port on the bottom of the AGSS (below the ventilator engine (bellows).

3. Use the needle valve to adjust the flow rate. Use the visual indicator bag when adjusting the flow rate. The bag should be properly inflated to · indicate flow.

4. Before you use the system, complete the Preoperative Test procedure. Refer to section 4 Preoperative Tests of this manual.

Start mechanical ventilation

⚠WARNING   Make sure the patient circuit is correctly assembled and the control settings are correct before you start ventilation.

This example assumes the system is on and in manual ventilation (bag) mode.

Step 1

Make sure the control settings are clinically appropriate.

Step 2

Set the ACGO switch to the circle system position.
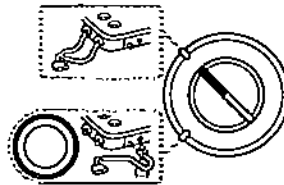
Step 3

Set the Bag/Vent switch to the Vent position.

- This selects mechanical ventilation (Vent).
- If mechanical ventilation is not available, a message tells you what to do. For example:

  "To start mech vent set the Bag/Vent switch to Bag and back to Vent."
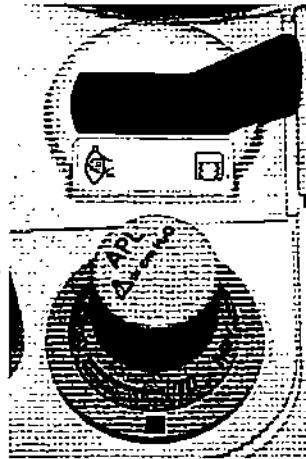
Step 4

If necessary, inflate the bellows using the O_2 flush button.
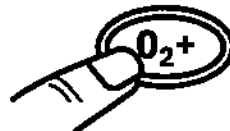
Stop mechanical ventilation

Step 1

Make sure a manual circuit is set up and the APL valve setting is OK before stopping mechanical ventilation.

This valve adjusts the breathing system pressure limit during manual ventilation. The scale shows approximate pressures. Above 30 cm H_2O, you will feel clicks as the knob turns.
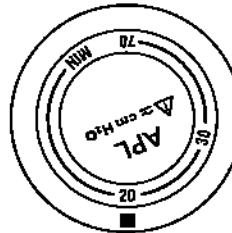
(Setting is at about 20 cm H_2O)

Step 2

Set the Bag/Vent switch to Bag position.

- This selects manual ventilation (bag) and stops the mechanical ventilation (ventilator).

Or:

Select the ACGO and mechanical ventilation will stop.
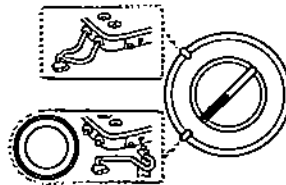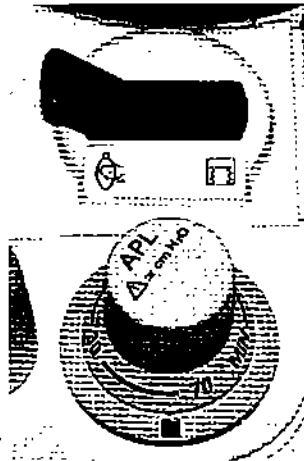
Alarms

Alarms appear at the top of the screen. The highest priority alarm is shown in Area 1, the next highest priority alarm in area 2. If all areas are used, the lowest priority alarms cycle in area 4.

🔔 113	Area 1	00:01	Area 3	00:30
	Area 2	00:15	Area 4	01:25

Alarm Tones

Alarm tones tell you about the alarm priority:

- High Priority: 2 bursts of 5 tones, every 10 seconds, (repeat)...
- Medium Priority: 3 tones every 25 seconds, (repeat)....
- Informational: single tone.

Alarm Silence

- The screen shows the time remaining in the silence period.
- If you push the alarm silence key while an alarm is silenced, countdown time resets to 120 seconds:

- High priority alarms always cause an audible tone and must be silenced individually.

Alarm Suspend

Pressing and holding the alarm silence key for one second, when no alarms are active, suspends audio tones for medium and low priority alarms for 90 seconds.

Refer to Part 2 of this manual for more information about alarms and messages.

Use the pressure waveform

Pressure waveform display is an optional feature. The waveform represents instantaneous values of airway pressure, measuring the same values as the pressure bar graph.

Volume Control Mode

Pressure Mode
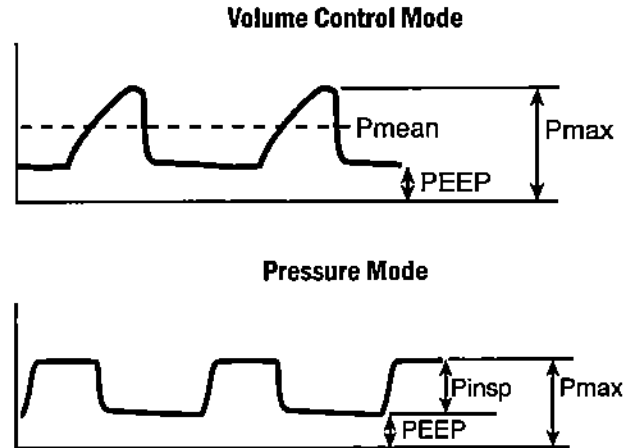
Scales

The display automatically adjusts time and pressure scales to fit the control settings.

The time scale changes with the respiratory rate:

Respiratory Rate (breaths per minute)	Time Scale (seconds)
4 to 25	0 to 14.4
26 to 65	0 to 7.2

When the time scale changes, existing pressure data is cleared from the waveform display and new waveform data begins at time = 0.

The pressure scale changes with the pressure limit:

Pressure Limit (cm H_2O)	Pressure Scale (cm H_2O)
12 to 40	-5 to 40
41 to 60	-5 to 60
61 to 99	-5 to 100

When the pressure scale changes, existing pressure data is cleared from the waveform display and new waveform data begins at time = 0.

Measure circuit compliance

To measure compressible volume in patient tubes:

1. Set the ventilator in volume control mode.

2. Set a tidal volume (V_T) of approximately 500 mL

3. Set a rate of 10 breaths/min.

4. Set an I:E ratio of 1:1.

5. Set the P_{limit} control to 20 cm H_2O.

6. Occlude the patient connection of the wye piece. Do not contaminate a clean patient connection.

7. Turn on mechanical ventilation.

8. Monitor the exhaled tidal volume V_{TE} and P_{max} (measured peak airway pressure).

The V_{TE} measures the gas needed to fill the patient circuit at the measured pressure.

The example shows how tubing compliance factor can be calculated.

$V_{TE}/(P_{max} - 2.5$[1] cm H_2O) = Compliance factor in mL per cm H_2O

    Example:

    P_{max} = 20 cm H_2O

    V_{TE} = 24 mL

    24/(20–2.5) = 1.4 mL/cm H_2O

This factor can be used to calculate the approximate gas compression in patient tubes. For example, if the patient is requiring 30 cm H_2O to ventilate, 30 X 1.4 = 42 mL of gas is compressed in the tubes each breath. This gas (42 mL) is part of the displayed tidal volume but it does not reach the patient.

[1] Force of the bellows.

4 Preoperative Tests

S/5 Aespire Preoperative tests schedules

Test Intervals   Do the Preoperative tests listed below at these events:

1. Every day before the first patient.

2. Before each patient.

3. When required after a maintenance or service procedure.

The following table indicates when a test must be done and gives a page number location where the test can be found.

Test Intervals	Every day before the first patient	Before every patient
Inspect the system:	4-4	
Test the system:		
Power failure alarm test:	4-5	
Minimize alarms (optional):	4-5	
Pipeline and cylinder tests:	4-6	
Flow control tests:	4-7	
Vaporizer installation:	4-11	
Vaporizer back pressure test:	4-12	
Low-pressure leak test:		
Negative low-pressure leak test:	4-13	4-13
ISO 5358 or BSI standard positive low-pressure leak test:	4-15	4-15
Alarm tests:	4-16	
Breathing system tests:	4-18	4-18
Monitor and ventilator tests:	4-20	4-20

⚠WARNING   Do not use this system unless you have read each component's operation and maintenance manual and understand:

- All system connections

- All of the warnings and cautions

- How to use each system component

- How to test each system component

Before you use this system:

- Complete all of the tests in this section

- Test all other system components

If a test failure occurs, do not use the equipment. Have an approved service representative repair the equipment.

Test devices   The following test tools are needed for some of the tests.

Item	Datex-Ohmeda Ref.
Positive pressure leak test device (BSI, 25 kPa)	1001-8975-000
Positive pressure leak test device (ISO 5358, 4 kPa)	1001-8976-000
Positive pressure leak test adapter	1009-3119-000
Negative pressure leak test device	0309-1319-000
Test lung	0219-7210-300
Stopper, test plug, red silicone, nominal 17 mm and 22 mm	2900-0001-000

Inspect the System

⚠WARNING   Make sure that the breathing circuit is correctly connected and not damaged.

⚠WARNING   The upper shelf weight limit is 34 kg (75 lb).

Make sure that:
1. The equipment is not damaged.
2. All components are correctly attached.
3. The breathing circuit is correctly connected, not damaged, and the breathing system contains sufficient absorbent.
4. The vaporizers are locked in position and contain sufficient agent.
5. Pipeline gas supplies are connected and the pressures are correct.
6. Cylinder valves are closed on models with cylinder supplies.

⚠WARNING   Do not leave gas cylinder valves open if the pipeline supply is in use. Cylinder supplies could be depleted, leaving an insufficient reserve supply in case of pipeline failure.

7. Models with cylinder supplies have a cylinder wrench attached to the system.
8. The necessary emergency equipment is available and in good condition.
9. Equipment for airway maintenance, tracheal intubation, and IV administration is available and in good condition.
10. Applicable anesthetic and emergency drugs are available.
11. If the optional O_2 flowmeter and suction regulator are present, the system O_2 and vacuum source must be connected and the system switch in the standby position:
    - The O_2 flowmeter provides adequate flow.
    - The suction regulator provides adequate suction.
12. Make sure the casters are not loose and the brake(s) is set and prevents movement.

1009-0307-000
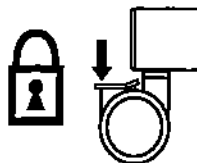
13. Connect the power cord to a wall outlet. The mains indicator comes on when AC Power is connected.
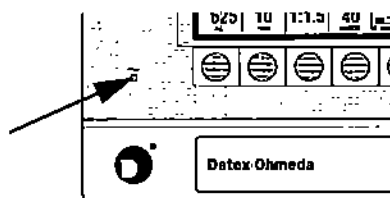
- If the indicator is not on, the system does not have mains (electrical) power. Use a different outlet. Close the circuit breaker or replace or connect the power cable. Refer to Figure 2-2.

Power failure alarm test

1. Set the system switch to On.

2. Unplug the power cord with the system turned on.

3. Make sure that the power failure alarm (audio tone and "On Battery - Power OK?" message on the display) comes on.

4. Connect the power cord again.

5. Make sure the alarm cancels.

6. Set the system switch to Standby.
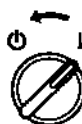
Minimize alarms (optional)

Set the ventilator controls to decrease the number of alarms:

1. Set the system switch to On.
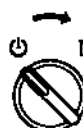
2. Control Keys:
   - Volume alarms: Off.

3. Alarm menu:
   - Low O_2: 21%
   - High O_2: Off.

4. Bag/Vent switch:
   - Bag

5. Set the system switch to Standby.

Pipeline and cylinder tests

△CAUTION   To prevent damage:

- Open the cylinder valves slowly.

- Do not force the flow controls.

If your system does not use cylinder supplies, do not do steps 2 through 12.

1. Disconnect the pipeline supplies and close all cylinder valves.
    If the pipeline and the cylinder pressure gauges are not at zero:
    - Connect an O_2 supply.
    - Set the system switch to On, if it is not already set.
    - Set the flow controls to mid range.
    - Make sure that all gauges but O_2 go to zero.
    - Disconnect the O_2 supply.
    - Make sure that the O_2 gauge goes to zero. As pressure decreases, alarms for low O_2 supply pressure should occur.

2. Make sure that the cylinders are full:
    - Open each cylinder valve.
    - Make sure that each cylinder has sufficient pressure. If not, close the applicable cylinder valve and install a full cylinder.

3. Test one cylinder at a time for high pressure leaks.

4. Set the system switch to Standby, which stops the O_2 flow.

5. Turn OFF the auxiliary O_2 flowmeter.

6. Turn off the suction.

7. Open the cylinder.

8. Record the cylinder pressure.

9. Close the cylinder valve.

10. Record the cylinder pressure after one minute. If the pressure (for air and O_2) decreases more than 5000 kPa (725 psig) there is a leak.

- If there is a leak, install a new cylinder gasket and tighten the tee handle as shown in "How to install gas cylinders (high pressure leak test)" of the section '1 Setup and Connections' in Part 2 of this manual.
- Do this step again. If the leak continues, do not use the system.

11. Repeat steps 7 through 10 for all cylinders. N_2O should not fall more than 100 psig in one minute.

12. Close cylinder valves.

⚠CAUTION Do not leave gas cylinder valves open if the pipeline supply is in use. Cylinder supplies could be depleted, leaving an insufficient reserve supply in case of pipeline failure.

13. Connect the pipeline supplies.

14. Set the system switch to On.

15. Use this chart to check pipeline pressure:

ANSI (USA and Intl.), Australian, Canadian, French, Japanese	345 kPa (50 psig)
ISO, Italian, Scandinavian, South African, Spanish, Swiss	414 kPa (60 psig)
Austrian, German	500 kPa (75 psig)

16. Set the system switch to Standby.

Flow control tests

Important
- Without O_2 monitoring, follow steps 1 through 13 of "Without O_2 monitoring."
- With O_2 monitoring, follow steps 1 through 13 of "With O_2 monitoring."

Without O_2 monitoring

⚠WARNING The Link system cannot replace an O_2 monitor. Sufficient O_2 in the fresh gas may not prevent hypoxic mixtures in the breathing circuit.

- Nitrous oxide (N_2O), if available, flows through the system during this test. Use a safe and approved procedure to collect and remove it.

- Incorrect gas mixtures can cause patient injury. If the Link system does not supply O_2 and N_2O in the correct proportions, do not use the system.

- The following procedure will test for any significant malfunction of the Link system but it will not confirm proper calibration. Periodic calibration procedures using an accurate and properly calibrated O_2 monitor must be performed as recommended in the User Reference Manual, Part 2, section 3 User Maintenance.

To do the flow control tests:

1. Connect the pipeline supplies or slowly open the cylinder valves.

2. Turn all flow controls fully clockwise (minimum flow).

3. Set the system switch to On.

4. Do not use the system if low battery or other ventilator failure alarms occur.

5. Make sure the O_2 flowtube shows approximately .025 to .075 L/min. (.200 L/min. for single-tube variants). The other flowtubes must show no gas flow.
   - Steps 6 and 7 are only for systems with N_2O.

⚠WARNING Keep the Link system engaged during steps 6 and 7:

- Adjust only the test control (N_2O in step 6 and O_2 in step 7).

- Test the flows in sequence (N_2O then O_2).

- If you adjust the test control too far, set the flow controls to their most recent positions and do the step again.

6. Test the Link system with flow increasing:
   - Turn the N_2O and O_2 flow controls fully clockwise (minimum flow).
   - Slowly turn the N_2O flow control counterclockwise.

- Set the N$_2$O flow control to the rates shown in the table. The O$_2$ flow must be greater than the minimum limits.

Set the N$_2$O flow control to (L/min):	The O$_2$ flow must be greater than (L/min):
0.8	0.2
2	0.5
4	1.0
10	2.5

7. Test the Link system with flow decreasing:
   - Set the N$_2$O flow to 9.0 L/min.
   - Set the O$_2$ flow to 3 L/min or higher.
   - While reducing the O$_2$ flow, set the N$_2$O flow to the rates shown in the table. The O$_2$ flow must be greater than the minimum limits.

Set the N$_2$O flow to (L/min):	The O$_2$ flow must be greater than (L/min):
8.0	2.0
4.0	1.0
0.8	0.2

8. Adjust the flow of all gases through their full range and make sure that the flowtube floats move smoothly.

9. Disconnect the O$_2$ pipeline supply or close the O$_2$ cylinder valve.

10. Make sure that:
    - The low O$_2$ supply alarm occurs.
    - N$_2$O, and O$_2$ flows stop. The O$_2$ flow stops last.
    - Air flow continues.
    - Gas supply alarms occur on the ventilator if the ventilator uses O$_2$ as the drive gas.

11. Turn all the flow controls fully clockwise (minimum flow).

12. Reconnect the O$_2$ pipeline supplies or open the O$_2$ cylinder valve.

13. Set the system switch to Standby.

With O₂ monitoring

⚠WARNING   The Link system cannot replace an O_2 monitor. Sufficient O_2 in the fresh gas may not prevent hypoxic mixtures in the breathing circuit.

- Nitrous oxide (N_2O), if available, flows through the system during this test. Use a safe and approved procedure to collect and remove it.

- Incorrect gas mixtures can cause patient injury. If the Link system does not supply O_2 and N_2O in the correct proportions, do not use the system.

Important   Test the O_2 monitor as described in Alarm tests, step 8, before continuing.

To do the flow control tests:

1. Connect the pipeline supplies or slowly open the cylinder valves.

2. Turn all flow controls fully clockwise (minimum flow).

3. Set the system switch to On.

4. Do not use the system if low battery or other ventilator failure alarms occur.

5. Make sure the O_2 flowtube shows approximately .025 to .075 L/min. (0.200 L/min. for single-tube variants). The other flowtubes must show no gas flow.
    - Steps 6 and 7 are only for systems with N_2O.

⚠WARNING   Keep the Link system engaged during steps 6 and 7:

- Adjust only the test control (N_2O in step 6 and O_2 in step 7).

- Test the flows in sequence (N_2O then O_2).

- The O_2 sensor used in steps 6 and 7 must be correctly calibrated.

6. Test the Link 25 system with flow increasing:
    - Turn the N_2O and O_2 flow controls fully clockwise (minimum flow).
    - Slowly turn the N_2O flow control counterclockwise.
    - Make sure that the O_2 flow increases. The measured O_2 concentration must be ≥21% through the full range.

7. Test the Link 25 system with flow decreasing:
    - Set the N$_2$O flow to 9.0 L/min.
    - Set the O$_2$ flow to 3 L/min or higher.
    - Slowly turn the O$_2$ flow control clockwise.
    - Make sure that the N$_2$O flow decreases. The measured O$_2$ concentration must be ≥21% through the full range.

8. Adjust the flow of all gases through their full range and make sure that the flowtube floats move smoothly.

9. Disconnect the O$_2$ pipeline supply or close the O$_2$ cylinder valve.

10. Make sure that:
    - The low O$_2$ supply alarm occurs.
    - N$_2$O, and O$_2$ flows stop. The O$_2$ flow stops last.
    - Air flow continues.
    - Gas supply alarms occur on the ventilator if the ventilator uses O$_2$ as the drive gas.

11. Turn all the flow controls fully clockwise (minimum flow).

12. Reconnect the O$_2$ pipeline supplies or open the O$_2$ cylinder valve.

13. Set the system switch to Standby.

Vaporizer installation

⚠WARNING   Use only the Selectatec series vaporizers Tec 4 or greater.

Do not use a vaporizer that lifts off the manifold when the lock lever is in the locked position.

Do not use this anesthesia system if you can turn ON more than one vaporizer at the same time.

Tec 6 Plus Vaporizers will not align correctly unless the power cable goes through the channel on the bottom of the vaporizer. Do not put the power cable on top of the manifold or between vaporizers.

1. If the top of a vaporizer is not horizontal, remove the vaporizer and reinstall it.

2. Set each vaporizer lock lever to the locked position.

3. Try to lift each vaporizer straight up off the manifold rather than pulling forward. Do not rotate the vaporizer on the manifold.

4. If a vaporizer lifts off the manifold, install it again and complete steps 1, 2, and 3. If the vaporizer lifts off a second time, do not use the system.

5. With a Tec 6 Plus Vaporizer:
   - Make sure that the vaporizer is connected to an electrical outlet.
   - Hold down the alarm silence switch for a minimum of four seconds.
   - Make sure all indicators turn on and the alarm speaker starts.
   - Release the alarm silence switch.
   - Do not continue until the operational indicator turns on. The concentration control will not turn if the operational indicator is OFF.

6. Try to turn on more than one vaporizer at the same time:
   - Test each possible combination.
   - If more than one vaporizer turns on at the same time, remove the vaporizers, install them again, and complete steps 1 through 6.

Vaporizer back pressure test

⚠WARNING Anesthetic agent comes out of the common gas outlet during this test. Use a safe, approved procedure to remove and collect the agent.

⚠CAUTION To prevent damage, turn the flow controls fully clockwise (minimum flow or OFF) before you turn On the system.
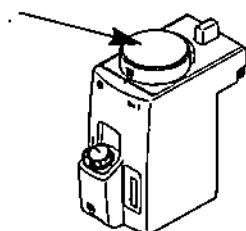
1. Set the system switch to on. Alarms can occur.
2. Set the O$_2$ flow to 6 L/min.
3. Make sure that the O$_2$ flow stays constant and the float moves freely.
4. Adjust the vaporizer concentration from 0 to 1% one click at a time. The O$_2$ flow must not decrease more than 1 L/min through the full range. If the O$_2$ flow decreases more than 1 L/min:

1009-0307-000

- If O_2 flow decreases more than 1 L/min, then install a different vaporizer and try this step again.

- If the O_2 flow decreases less than 1 L/min with a different vaporizer, the malfunction is in the first vaporizer.

- If the O_2 flow also decreases more than 1 L/min with a different vaporizer, the malfunction is in the anesthesia system. Do not use the system until it is serviced.

5. Complete steps 3 and 4 for each vaporizer.

6. Set the system switch to Standby.

Low-pressure leak test

⚠WARNING   Do not use a system with a low-pressure leak. Anesthetic gas will go into the atmosphere, not into the breathing circuit.

Perform either the Negative low-pressure leak test or the ISO 5358 or BSI standard positive low-pressure leak test. It is not necessary to perform both types of tests.

Negative low-pressure leak test

1. Set the System switch to Standby.

2. Turn on the auxiliary common gas outlet (switch in the ACGO .position).
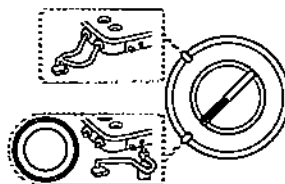
3. Test the negative pressure leak test device. (Ref. 0309-1319-000):
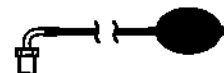
- Remove all air from the bulb.
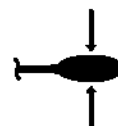
- Put your hand on the inlet of the leak test device. Push hard for a good seal.
- If the bulb inflates in less than 60 seconds, replace the leak test device.
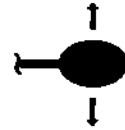
4. Turn off all vaporizers.

5. Test the anesthesia machine for low-pressure leaks:
   - Turn the flow controls one and a half turns counterclockwise.
   - Connect the test device to the auxiliary gas outlet.
   - Compress and release the bulb until it is empty.
   - The vacuum causes the floats to move. This is usual. If the bulb inflates in 30 seconds or less, there is a leak in the low-pressure circuit. Refer to the "Pneumatic problems" table in "Alarms and Troubleshooting" of Part 2 of this manual).
   - Disconnect the test device.

6. Test each vaporizer for low-pressure leaks:
   - Set the vaporizer to 1%.
   - Repeat step 5. If there is a low pressure leak, refer to Part 2 of this manual.

7. Keep the test device with the system.

8. Turn all flow controls fully clockwise (minimum flow). Do not over tighten.

⚠**WARNING** Agent mixtures from the low-pressure leak test stay in the system. Always flush the system with O_2 after the low-pressure leak test (1 L/min for one minute).

⚠**WARNING** Turn off all vaporizers at the end of the low-pressure leak test.

9. Flush the system with O_2:
   - Set the system switch to on.
   - Set the O_2 flow to 1 L/min.
   - Continue the O_2 flow for one minute.
   - Turn the O_2 flow control fully clockwise (minimum flow).
   - Set the system switch to Standby.

ISO 5358 or BSI standard positive low-pressure leak test

⚠ CAUTION   Do a positive pressure leak test at the ACGO port only.

1. Connect the leak test device to the ACGO port with the positive pressure leak test adapter. Push the adapter into the ACGO port throughout the test to get a good seal.

   - Test device ref:
     1001-8976-000 (4 kPa);
     1001-8975-000 (25 kPa);
     1009-3119-000 (Adapter).
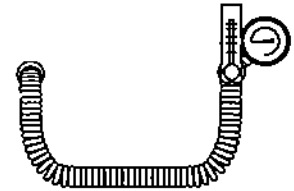
2. Turn on the auxiliary common gas outlet (switch in the ACGO position).
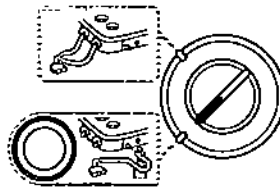
3. Turn all controls fully clockwise (minimum flow).

4. Fully open the needle valve on the test device.

   - Keep the test device flow tube vertical for accurate results.

⚠ CAUTION   If the needle valve is not fully open, this test can damage the pressure gauge on the test device.

5. Open the O_2 flow control and set a total flow of 0.4 L/min through the flowmeter on the test device.

6. Make sure that the pressure gauge on the test device reads zero and that all other flow controls are fully closed.

7. Close the needle valve on the test device until the test gauge reads:

   - BSI: 20 kPa (2.9 psi)
   - ISO 5358: 3 kPa (0.4 psi)

8. If the flow through the test device is less than 0.35 L/min (ISO) or 0.3 L/min (BSI), there is a low pressure leak in the anesthesia machine. Refer to Part 2 of this manual.

9. Repeat this low-pressure leak test for each vaporizer:
    ▪ Set the applicable vaporizer to 1% and do steps 2 through 8.
    ▪ Fully open the needle valve on the test device to decrease the back pressure.
    ▪ Turn the vaporizer off.

⚠WARNING   Agent mixtures from the low-pressure leak test stay in the system. Always flush the system with O_2 after the low-pressure leak test (1 L/min for one minute).

Turn all vaporizers off at the end of the low-pressure leak test.

10. Remove the adapter and leak test device.

11. Flush the system with O_2:
    ▪ Set the O_2 flow to 1 L/min and continue flow for one minute.
    ▪ Turn the O_2 flow control fully clockwise (minimum flow).
    ▪ Set the system switch to Standby.

Alarm tests

1. Connect a test lung to the patient connection. Test device ref. 0219-7210-300.

2. Set the Bag/Vent switch to Vent.

3. Set the system to On.

4. Set the controls:

Ventilation Mode:	Volume control (Select from main menu)
Ventilator:	Tidal Vol: 400 ml
	Rate: 12
	I:E Ratio: 1:2
	P_{limit}: 40 cm H_2O
	PEEP: Off
Anesthesia Machine:	O_2 flow: minimum flow (25-75 mL/min) (about 200 mL for single-tube variant)
	All other gases: OFF
	Push flush to fill the bellows.

5. Turn the Bag/Vent switch to Bag and back. Make sure that:
   - Mechanical ventilation starts.
   - A subatmospheric pressure alarm does not occur.
   - The ventilator displays the correct data.
   - The bellows inflate and deflate during mechanical ventilation.

6. Set the O_2 flow control to 5 L/min.

7. Make sure that:
   - The end expiratory pressure is approximately 0 cm H_2O.
   - The ventilator displays the correct data.
   - The bellows inflate and deflate during mechanical ventilation.

8. Test the O_2 monitor and alarms:
   - Remove the O_2 sensor and make sure the sensor measures approximately 21% O_2 in room air.
   - Set the low O_2 alarm to 50% and make sure a low O_2 alarm occurs.
   - Set the low O_2 alarm back to 21% and make sure that alarm cancels.
   - Put the O_2 sensor back in the circuit.
   - Set the High O_2 alarm to 50%.
   - Push the flush button to fill the breathing system.
   - Make sure the high O_2 alarm comes on.
   - Set the high O_2 alarm back to 100% and make sure that alarm cancels.
   - After 2 minutes in pure O_2, make sure that the sensor measures approximately 100% O_2.

9. Test the low minute volume alarm:
   - Go to the alarms menu.
   - Set the alarm limit for low minute volume to 6.0 L/min.
   - Make sure that a low minute volume alarm occurs.
   - Go to the alarms menu.
   - Set the low minute volume alarm to Off.

10. Test the high airway pressure alarm:
    - Set P_{limit} to less than the peak airway pressure.
    - Make sure that the high airway pressure alarm occurs.
    - Set P_{limit} back to 40.

11. Test the apnea and low airway pressure alarms:
    - Remove the test lung from the patient connection.
    - Other alarms such as low minute volume can occur.
    - Make sure that the low airway pressure and apnea alarms occur. The apnea alarm occurs after 30 seconds.

12. Test the sustained airway pressure alarm:

- Set the controls:

  APL Valve: 70

  Bag/Vent switch: Bag

- Mechanical ventilation stops when the Bag/Vent switch is set to Bag.
- Close the patient connection and push the O_2 Flush button.
- Make sure that the sustained pressure alarm occurs after approximately 15 seconds at the sustained pressure limit (6-30 cm H_2O varies with pressure limit).

13. Set the system to Standby.

Breathing system tests

Refer to the applicable operation manuals. At a minimum:

1. Make sure that the auxiliary equipment (humidifier, etc.) operates correctly.

2. Verify that AGSS is operating. Breathing systems with active scavenging have a flow indicator on the side. Make sure that the flow indicator shows a flow in the green (normal) region.

3. Make sure that the check valves on the breathing circuit module work correctly:

   - The Expiratory check valve (1) rises during expiration and falls at the start of inspiration.

   - The Inspiratory check valve (2) rises during inspiration and falls at the start of expiration.
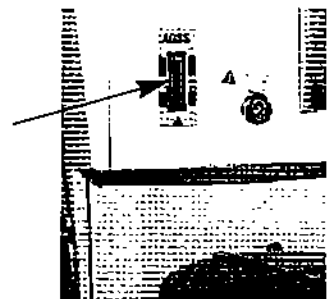
⚠**WARNING**   Objects in the breathing system can stop gas flow to the patient. This can cause injury or death:

Do not use a test plug that is small enough to fall into the breathing system.

4.   Ventilator bellows test:
   ▪   Set the system switch to Standby.
   ▪   Set the Bag/Vent switch to Ventilator.
   ▪   Set all flow controls to minimum.
   ▪   Close the breathing circuit at the patient connection. Use your hand or the test plug.
   ▪   Push the O_2 flush button to fill the bellows.
   ▪   The pressure must not increase to more than 15 cm H_2O on the pressure gauge.
   ▪   If the bellows falls lower than the top of the indicator, it has a leak. On a single-tube variant, the bellows should not fall at all. Refer to the troubleshooting procedure in the Part 2 of this manual.
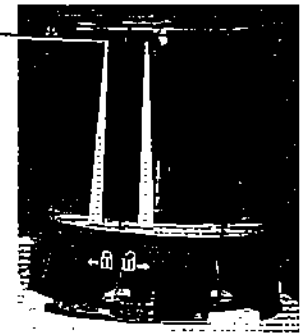
5.   Test the Bag circuit for leaks:
   ▪   Set the system switch to On.
   ▪   Set the Bag/Ventilator switch to Bag.
   ▪   Plug the Bag port; use your hand or the approved test plug.
   ▪   Close the APL valve (70 cm H_2O).
   ▪   Set the O_2 flow to 250 mL/min.
   ▪   Close the patient connection using a hand or test plug on the breathing system and pressurize the bag with the O_2 flush button to approximately 30 cm H_2O.
   ▪   Release the flush button. The pressure must not decrease. A pressure decrease large enough to see on the gauge indicates a leak. Look for and repair the breathing circuit leak.

6.   Test the APL valve:
   ▪   Fully close the APL valve (70 cm H_2O).
   ▪   Set the total fresh gas flow to approximately 3 L/min and make sure that the value on the inspiratory pressure gauge does not exceed 85 cm H_2O. Some pressure fluctuation is normal.
   ▪   Fully open the APL valve (to the MIN position).
   ▪   Set O_2 flow to 3 L/min. Turn any other gases off.

- Make sure that the value on the inspiratory pressure gauge is less than approximately 5 cm H_2O.
- Push the O_2 flush button. Make sure that the value on the inspiratory pressure gauge stays near zero.
- Set the O_2 flow to minimum and make sure that the value on the inspiratory pressure gauge does not decrease below 0 cm H_2O.

7. Remove your hand or the test plug from the patient connection.

8. Set the System switch to Standby.

⚠WARNING   Make sure that there are no test plugs or other objects caught in the breathing system.

Monitor and ventilator tests

1. Connect a test lung to the patient connection.

2. Set the Bag/Ventilator switch to Bag.

3. Set the System switch to On.

4. Set the controls:

Ventilation Mode:	Volume control (Select from main menu)
Ventilator:	Tidal Vol: 400 ml
	Rate: 12
	I:E Ratio: 1:2
	P_{limit}: 40 cm H_2O
	PEEP: Off
Anesthesia Machine:	O_2 flow: minimum flow)
	All other gases: OFF

5. Set the Bag/Vent switch to Ventilator.

6. Push the O_2 flush button to fill the bellows.

7. Make sure that:
- Mechanical ventilation starts.
- A subatmospheric pressure alarm does not occur.
  Note: With active gas scavenging, too much scavenging flow can cause subatmospheric alarms.
- The ventilator displays the correct data.
- The bellows inflate and deflate during mechanical ventilation.

8. Set the O_2 flow control to 5 L/min.

9. Make sure that:
- The end expiratory pressure is approximately 0 cm H_2O.
  Note: Positive end expiratory pressure when PEEP is off may indicate that the scavenging system is not removing enough gas.

- The ventilator displays the correct data.
- The bellows inflate and deflate during mechanical ventilation.

10. Set the ventilator controls and alarm limits to clinically appropriate levels.

11. If the system will not be used immediately, set the System switch to Standby and close all cylinder valves.

12. Make sure that you have:

Equipment for:	Airway maintenance
	Manual ventilation
	Tracheal intubation
	IV administration
Applicable anesthetic and emergency drugs	

13. Prepare the system:
- Turn all vaporizers off.
- Open the APL valve.
- Set the Bag/Ventilator switch to Bag.
- Set all flow controls to minimum.
- Set sufficient patient suction.
- Make sure that the breathing system is correctly connected and not damaged.

⚠**WARNING**   Make sure that the breathing circuit is correctly connected and not damaged.

⚠**WARNING**   Before you connect a patient, flush the anesthesia machine with 5 L/min of O_2 for at least one minute. This removes unwanted mixtures and by-products from the system.

- End of Part 1 of the User Reference Manual. –

S/5 Aespire

Warranty

This Product is sold by Datex-Ohmeda under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to the purchase of this Product directly from Datex-Ohmeda or Datex-Ohmeda's Authorized Dealers as new merchandise and are extended to the Buyer thereof, other than for the purpose of resale.

For a period of twelve (12) months from the date of original delivery to Buyer or to Buyer's order, but in no event for a period of more than two years from the date of original delivery by Datex-Ohmeda to a Datex-Ohmeda Authorized Dealer, this Product, other than its expendable parts, is warranted against functional defects in materials and workmanship and to conform to the description of the Product contained in this User's Reference manual and accompanying labels and/or inserts, provided that the same is properly operated under the conditions of normal use, that regular periodic maintenance and service is performed and that replacements and repairs are made in accordance with the instructions provided. This same warranty is made for a period of thirty (30) days with respect to expendable parts. The foregoing warranties shall not apply if the Product has been repaired other than by Datex-Ohmeda or in accordance with written instructions provided by Datex-Ohmeda, or altered by anyone other than Datex-Ohmeda, or if the Product has been subject to abuse, misuse, negligence, or accident.

Datex-Ohmeda's sole and exclusive obligation and Buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing, free of charge, at Datex-Ohmeda's option, a Product, which is telephonically reported to the nearest Datex-Ohmeda Customer Service Center and which, if so advised by Datex-Ohmeda, is thereafter returned with a statement of the observed deficiency, not later than seven (7) days after the expiration date of the applicable warranty, to the Datex-Ohmeda Customer Service and Distribution Center during normal business hours, transportation charges prepaid, and which, upon Datex-Ohmeda's examination, is found not to conform with above warranties. Datex-Ohmeda *shall not be otherwise liable for any damages including but not limited to incidental damages, consequential damages, or special damages.*

There are no express or implied warranties which extend beyond the warranties hereinabove set forth. Datex-Ohmeda makes no warranty of merchantability or fitness for a particular purpose with respect to the product or parts thereof.

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The addresses listed on this cover are current as of 2/05. For any location changes,
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