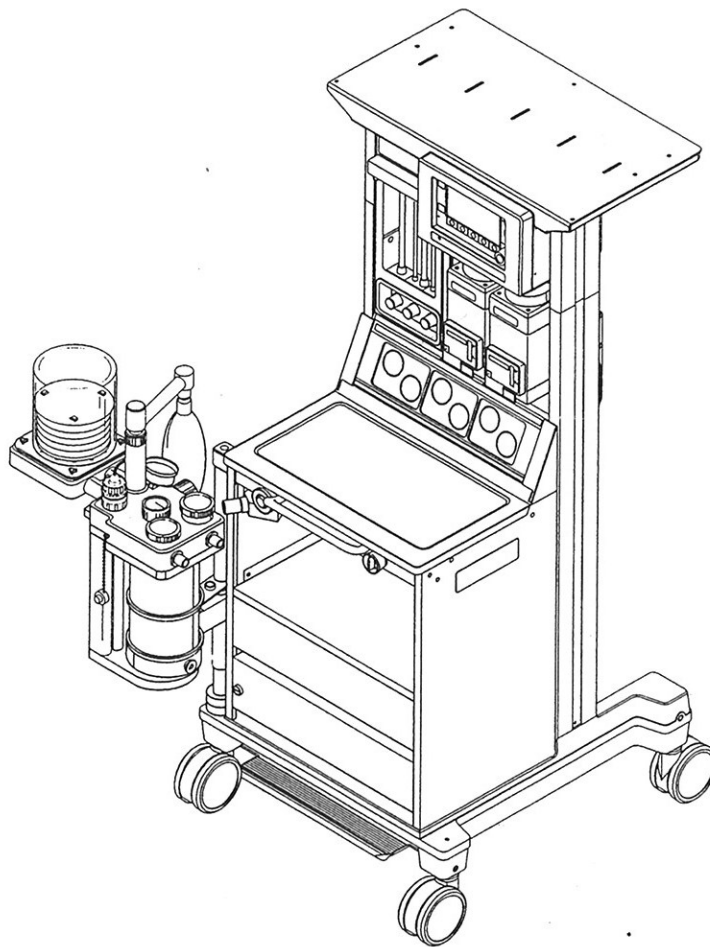


# OHMEDA

THE BOC GROUP



## Excel SE (ANSI)

Operation and Maintenance Manual



# User Responsibility

---

This Product will perform in conformity with the description thereof contained in this operating 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 such repair or replacement become necessary, Ohmeda recommends that a telephonic or written request for service advice be made to the nearest Ohmeda Field Service Support Center. This Product or any of its parts should not be repaired other than in accordance with written instructions provided by Ohmeda and by Ohmeda trained personnel. The Product must not be altered without the prior written approval of Ohmeda's Quality Assurance Department. 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 Ohmeda.

---

## CAUTION

- ⚠ U. S. Federal and Canadian law restrict this device to sale by or on the order of a licensed medical practitioner. Outside the U. S. A. and Canada, check local laws for any restrictions that may apply.
- 

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 A 12345

— This alpha character indicates the year of product manufacture and when the serial number was assigned; "Y" = 1995, "Z" = 1996, "A" = 1997, etc. "I" and "O" are not used.





# Table of Contents

## 1/Introduction

Introduction to the Excel System .....	1-1
Gases and vaporizers .....	1-1
Ventilators and monitors .....	1-1
Patient safety .....	1-1
Symbols used in the manual or on the equipment .....	1-2

## 2/General Information

Excel Systems .....	2-1
7800 Ventilator .....	2-1
7900 Ventilator .....	2-2
7000 Ventilator .....	2-2
Excel components and controls .....	2-2
Excel Systems with a 7800 Ventilator .....	2-7
Patient data .....	2-7
Alarms .....	2-7
The battery and power failure operation .....	2-7
Excel Systems with a 7900 Ventilator .....	2-9
Patient data .....	2-9
Alarms .....	2-9
Controls .....	2-10
Menus .....	2-10
The battery and power failure operation .....	2-10
Excel Systems with a Monitor Pod .....	2-11
Monitor Pod (patient data and alarms) .....	2-11
Monitor switches .....	2-12
7000 Ventilator (alarms and controls) .....	2-14
The batteries and power failure operation .....	2-15

## 3/Setup

Install the cylinders .....	3-1
How to attach equipment to the shelves .....	3-3
Circuit and sensor connections .....	3-6

## 4/Preoperative Test Procedure

Read this before you test the system .....	4-1
Initial tests .....	4-1
Electrical connections .....	4-2
Vaporizer installation .....	4-4
Test the vaporizer back pressure .....	4-4
Test the cylinder and pipeline supplies .....	4-5
Low-pressure leak test .....	4-6
Flow control tests .....	4-7
Breathing system tests .....	4-8
Monitor and ventilator tests .....	4-9

# Table of Contents

## 5/Maintenance

Minimum maintenance schedule .....	5-1
Operator service .....	5-2
Ohmeda approved service .....	5-3
How to clean and sterilize this equipment .....	5-3
To clean .....	5-4
To sterilize .....	5-5
Rubber items .....	5-6
How to replace Monitor Pod monitors .....	5-6
How to close circuit breakers .....	5-8
Monitor Pod circuit breaker .....	5-8
Outlet box circuit breaker .....	5-9

## 6/Troubleshooting

Repair policy .....	6-1
Pneumatics problems .....	6-1
Electrical problem – Monitor Pod Excel System .....	6-2
Electrical problem – Outlet Box Systems .....	6-3

## 7/Illustrated Parts

Excel parts .....	7-1
System operation and maintenance manuals .....	7-1

## Appendix

Pneumatic circuits .....	A-1
Signal diagrams .....	A-6
Low flow/closed circuit anesthesia .....	A-10
Specifications .....	A-10
Weight: .....	A-10
Dimensions: .....	A-10
Shelves: .....	A-11
Drawers & shelf: .....	A-11
Absorber & post: .....	A-12
Casters: .....	A-12
Pneumatics .....	A-12
Common gas outlet: .....	A-12
Gas supplies: .....	A-12
Shutoff valves: .....	A-12
Flowmeter: .....	A-13
Calibration: .....	A-13
Outlet relief: .....	A-13
Low O <sub>2</sub> alarm: .....	A-13
Flush button: .....	A-13
Pneumatic outlet pressures .....	A-14
Environmental specifications .....	A-15
Temperature: .....	A-15
Humidity: .....	A-15
Electrical specifications .....	A-15
Leakage current: .....	A-15
Monitor Pod/7000 Ventilator .....	A-16
Outlet Box .....	A-16

# Table of Figures

## 1/Introduction

None

## 2/General Information

Figure 2-1	Excel 210 SE without a mid shelf (front) .....	2-3
Figure 2-2	Excel 210 SE with a mid shelf and an Excel 110 SE (rear) .....	2-4
Figure 2-3	Vaporizers .....	2-5
Figure 2-4	GMS Absorber .....	2-6
Figure 2-5	The 7800 Ventilator control module .....	2-8
Figure 2-6	The 7900 Ventilator control module .....	2-11
Figure 2-7	The Monitor Pod .....	2-13
Figure 2-8	The 7000 Ventilator control module .....	2-14

## 3/Set Up

Figure 3-1	How to install the triangular clips .....	3-4
Figure 3-2	How to install the rectangular clips on an Excel 210 SE without a mid shelf .....	3-4
Figure 3-3	How to install the strap .....	3-5
Figure 3-4	Sensor connections for a 7800 Ventilator with a GMS Absorber .....	3-8
Figure 3-5	Sensor connections for a 7800 Ventilator with a basic absorber .....	3-9
Figure 3-6	How to connect the 7900 Ventilator flow sensors .....	3-10
Figure 3-7	How to assemble O <sub>2</sub> Sensor adapters for a 7900 Ventilator .....	3-11
Figure 3-8	Sensor connections for a 7900 Ventilator with a GMS and a circle breathing circuit .....	3-12
Figure 3-9	Sensor connections for a 7900 Ventilator with a basic absorber and a circle breathing circuit .....	3-13
Figure 3-10	Sensor connections for a GMS Bain circuit .....	3-14
Figure 3-11	Sensor connections for a 7000 Ventilator and Monitor Pod with a basic absorber and a circle breathing circuit .....	3-15
Figure 3-12	Sensor connections for a 7000 Ventilator and Monitor Pod with a GMS absorber and a circle breathing circuit .....	3-16
Figure 3-13	7800 or 7000 Ventilator and GMS absorber connections with an absorber manifold .....	3-18
Figure 3-14	7800 or 7000 Ventilator and GMS absorber connections without an absorber manifold .....	3-19
Figure 3-15	7900 Ventilator and GMS connections with an absorber manifold ....	3-20
Figure 3-16	7900 Ventilator and GMS connections without an absorber manifold ...	3-21
Figure 3-17	Interface cables .....	3-22

## 4/Preoperative Test Procedures

None

# Table of Figures

---

## 5/Maintenance

Figure 5-1	How to replace a monitor .....	5-7
Figure 5-2	How to close the Monitor Pod circuit breaker .....	5-8
Figure 5-3	How to close the outlet box circuit breaker .....	5-9

## 6/Troubleshooting

None

## 7/Illustrated Parts

None

## Appendix

Figure A-1	Excel pneumatic circuit with pneumatic alarm .....	A-3
Figure A-2	Excel pneumatic circuit with electronic alarm .....	A-5
Figure A-3	Excel System signals with a 7800 Ventilator .....	A-7
Figure A-4	Excel System signals w/ a 7900 Ventilator .....	A-9

# 1/Introduction

## In this section

Introduction to the Excel System .....	1-1
Gases and vaporizers .....	1-1
Ventilators and monitors .....	1-1
Patient safety .....	1-1
Symbols used in the manual or on the equipment .....	1-2

## Introduction to the Excel System (ANSI)

The Excel anesthesia machine supplies set flows of medical gases to the breathing system.

A large selection of gases, vaporizers, ventilators, and monitors, gives you control of your system's configuration.

### Gases and vaporizers

- The Excel 110 SE comes with O<sub>2</sub> and N<sub>2</sub>O plus one more cylinder connection for N<sub>2</sub>O or O<sub>2</sub>.
- The Excel 210 SE comes with O<sub>2</sub> and N<sub>2</sub>O plus a third gas (air or heliox).
- Excels accept Tec 4, Tec 5, and Tec 6 Vaporizers.
- Low leak rates, accurate flowmeters, and a minimum proportion of O<sub>2</sub> to N<sub>2</sub>O permit closed circuit and low-flow anesthesia.

### Ventilators and monitors

The Excel System uses:

- The 7900 Ventilator, a microprocessor controlled ventilator with: internal monitors; electronic PEEP; two modes of ventilation; and a pressure waveform display.
- The 7800 Ventilator, a microprocessor controlled ventilator with internal monitors.
- The 7000 Ventilator and the Monitor Pod, a basic electronic ventilator with monitors that operate independently.

The Excel System also accepts:

- The Ohmeda Respiratory Gas Monitor or the Ohmeda Rascal II.
- Large monitors such as the HP OmniCare Component Monitoring System or the OmniCare Model 24.

### Patient safety

Safety devices decrease the risk of:

#### Hypoxic mixtures

- Ohmeda's Link 25 System keeps the O<sub>2</sub> concentration higher than 25% (approximate value) at the common gas outlet for O<sub>2</sub> and N<sub>2</sub>O mixtures.
- N<sub>2</sub>O and air or heliox flows stop if the O<sub>2</sub> supply decreases to less than 20 psig (138 kPa).

#### Agent mixtures

- With correctly installed Tec 4, Tec 5, and Tec 6 Vaporizers, you cannot turn on more than one vaporizer at a time.
- The vaporizer manifold prevents gas flow through all vaporizers that are OFF.

# 1/Introduction

Complete power or sudden gas supply failures















- Batteries continue Monitor Pod, 7800 and 7900 Ventilator operation during a power failure.
- The Monitor Pod has a power failure alarm.
- Ohmeda ventilators have power failure alarms.
- Ohmeda ventilators have alarms for low gas supply pressure.
- The Excel System has an alarm for O<sub>2</sub> supply pressures less than 30 psig (207 kPa; approximate value).

## Symbols used in the manual or on the equipment

**⚠ Warnings** and **⚠ Cautions** tell you about dangerous conditions that can occur if you do not obey all of the instructions in this manual.

Warnings tell you about a condition that can cause injury to the operator or the patient. Cautions tell you about a condition that can cause damage to the equipment. Read and obey all warnings and cautions.

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

	On (power)
	Off (power)
	Standby
	Standby or preparatory state for a part of the equipment
	"ON" only for part of the equipment
	"OFF" only for part of the equipment
	Direct Current
	Alternating Current
	Protective earth ground
	Earth Ground
	Frame or chassis ground
	Alarm silence button
	Equipotential
	Variability



# 1/Introduction



Variability in steps



Plus, positive polarity



Minus, negative polarity



Lamp, lighting, illumination



Movement in one direction



Movement in both directions



Lock



Unlock

134°C

Autoclavable



Non-autoclavable



Type B equipment



Type BF equipment



Type CF equipment



Caution, ISO 7000-0434



Attention, consult accompanying documents, IEC 601-1



This way up



Dangerous Voltage



Input



Output

REF

Stock Number

SN

Serial Number



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



Read top of float

# Notes

---

## 2/General Information

### In this section

Excel Systems .....	2-1
7800 Ventilator .....	2-1
7900 Ventilator .....	2-2
7000 Ventilator .....	2-2
Excel components and controls .....	2-2
Excel Systems with a 7800 Ventilator .....	2-7
Patient data .....	2-7
Alarms .....	2-7
The battery and power failure operation .....	2-7
Excel Systems with a 7900 Ventilator .....	2-9
Patient data .....	2-9
Alarms .....	2-9
Controls .....	2-10
Menus .....	2-10
The battery and power failure operation .....	2-10
Excel Systems with a Monitor Pod .....	2-11
Monitor Pod (patient data and alarms) .....	2-11
Monitor switches .....	2-12
7000 Ventilator (alarms and controls) .....	2-14
The batteries and power failure operation .....	2-15

## Excel Systems

### WARNINGS

- ⚠ **Explosion Hazard. Do not use the Ohmeda Excel with flammable anesthetic agents.**
- ⚠ **Do not use antistatic breathing tubes or masks. They can cause burns if you use them near high frequency surgical equipment.**

The type of ventilator controls how the Excel System operates.

This section is a quick guide. Refer to the applicable operation and maintenance manuals for complete instructions.

### 7800 Ventilator

Systems with the 7800 Ventilator use:

- The ventilator to monitor inspiratory O<sub>2</sub>, expiratory volume, and airway pressure.
- The system switch to start gas flow and to turn ON the ventilator.
- A pneumatic alarm for low O<sub>2</sub> supply pressure.
- A battery in the ventilator to continue ventilator operation during a power failure.
- An outlet box to supply electrical power to system components. A transformer in the box supplies power for the light.

## 2/General Information

### 7900 Ventilator

Systems with the 7900 Ventilator use:

- The ventilator to monitor inspiratory O<sub>2</sub>, expiratory and inspiratory volumes, and airway pressure.
- The system switch to start gas flow and to turn ON the ventilator.
- An electronic alarm on the ventilator for low O<sub>2</sub> supply pressure.
- A battery in the ventilator to continue ventilator operation during a power failure.
- Software that adjusts for changes in fresh gas flow, breathing circuit compliance, and leaks.
- An outlet box to supply electrical power to system components. A transformer in the box supplies power for the light.

### 7000 Ventilator

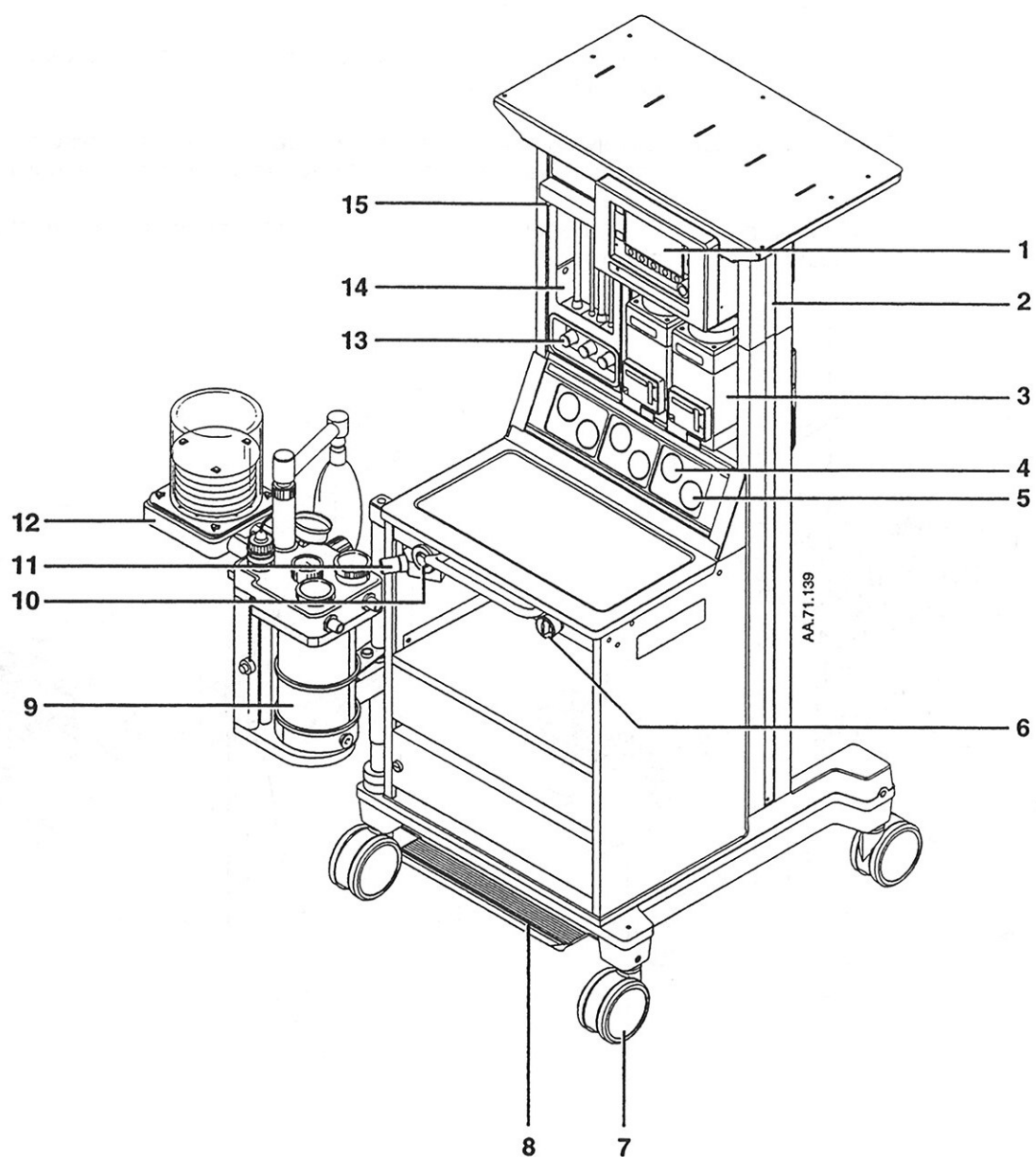
Systems with the 7000 Ventilator use:

- Monitors that operate independently.
- The system switch to start gas flow and supply power to the monitors.
- Batteries in the monitors to continue monitor operation during a power failure.
- Batteries in the 7000 Ventilator and the Monitor Pod for power failure alarms.
- A pneumatic alarm for low O<sub>2</sub> supply pressures.
- The Monitor Pod to supply electrical power to system components. A transformer connects to one of the electrical outlets and supplies power to the light.

## Excel components and controls

Control	Description (Figure 2-1)
System switch	Set the switch to ON to permit gas flow and energize the Monitor Pod or the 7800 or 7900 Ventilator.
Brake	Push the brake down to lock the Excel System in position. Lift the brake to move the Excel System.
Flush button	Push the O <sub>2</sub> Flush button to send high O <sub>2</sub> flows through the common gas outlet.
Flow controls	Turn the control counterclockwise to increase the flow rate and clockwise to decrease the flow rate. The system switch must be ON. Refer to the appendix for flow specifications.
Light switch	Turns the light ON and OFF.

## 2/General Information



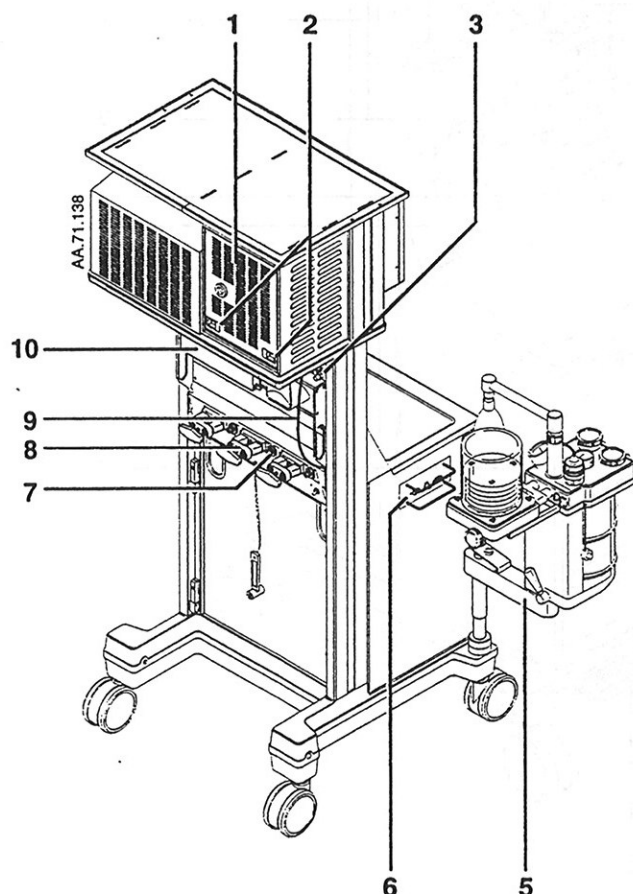
- |                              |                       |
|------------------------------|-----------------------|
| 1. 7900 Ventilator           | 9. GMS Absorber       |
| 2. Dovetail Rail             | 10. Flush Button*     |
| 3. Vaporizers                | 11. Common Gas Outlet |
| 4. Gauge (Pipeline Pressure) | 12. Bellows Assembly  |
| 5. Gauge (Cylinder Pressure) | 13. Flow Controls*    |
| 6. System Switch*            | 14. Flowmeter         |
| 7. Casters                   | 15. Light Switch*     |
| 8. Brake*                    |                       |

\* Refer to the control description in this section.

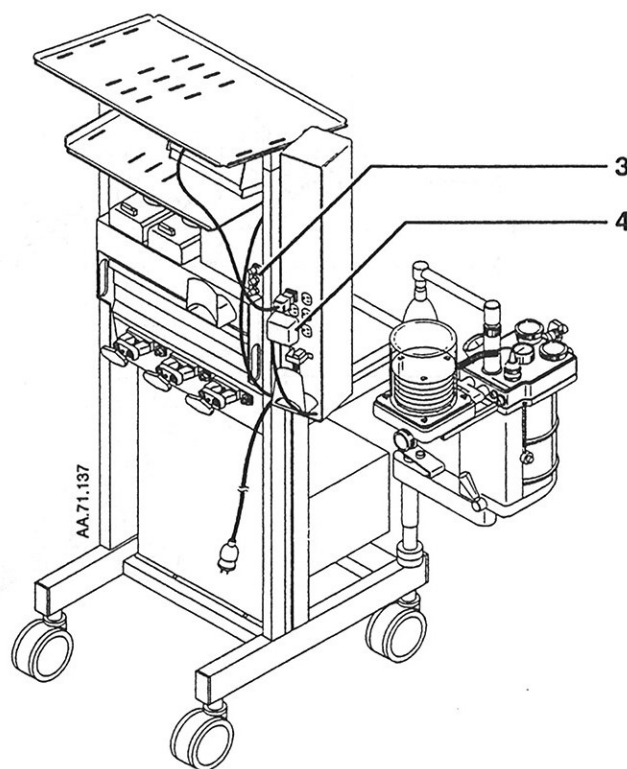
**Figure 2-1**  
Excel 210 SE without a mid shelf (front)

## 2/General Information

Control	Description (Figure 2-2)
Electrical outlets	Supply electrical power for accessory equipment.
Latches	Move the latches to the center and remove the rear panel from the ventilator shroud.
Pneumatic outlets	Supply O <sub>2</sub> at the pipeline pressure when an O <sub>2</sub> supply is connected to the Excel. Refer to the appendix for output flows.
Absorber arm and button	Push the button and slide the arm to change the height of the absorber.



Excel 210 SE with a mid shelf



Excel 110 SE with a Monitor Pod and 7000 Ventilator

1. Rear Panel (Excels With A Mid Shelf)
2. Latches\* (Excels With A Mid Shelf)
3. Pneumatic Outlets\*
4. Transformer (Light Power With Monitor Pod)
5. Absorber Arm\*
6. Interface Panel
7. Pipeline Inlet
8. Cylinder Yoke
9. Excel/Ventilator Cable
10. Outlet Box (electrical outlets, 9 A total, 10 A circuit breaker)\*

\* Refer to the description in this section.

Figure 2-2

Excel 210 SE with a mid shelf and an Excel 110 SE (rear)



## 2/General Information

### Control

### Description (Figure 2-3)

Vaporizer  
concentration  
control and  
release

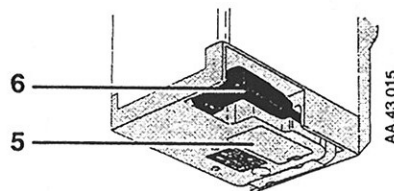
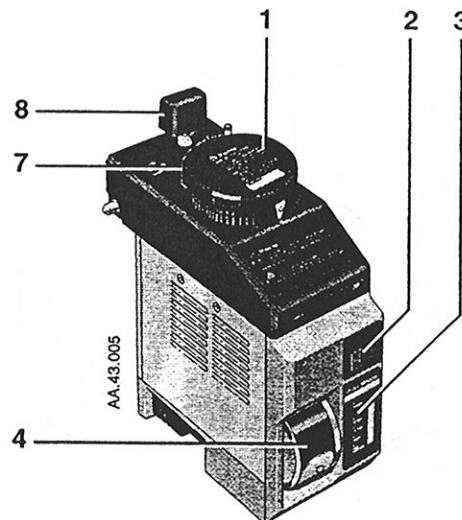
The lock lever must be fully clockwise (vaporizer locked in position). Push in the control release and turn the concentration control to set the agent concentration. With the Tec 6, the control is locked as long as the warm-up indicator is ON.

Alarm Silence  
Switch (Tec 6)

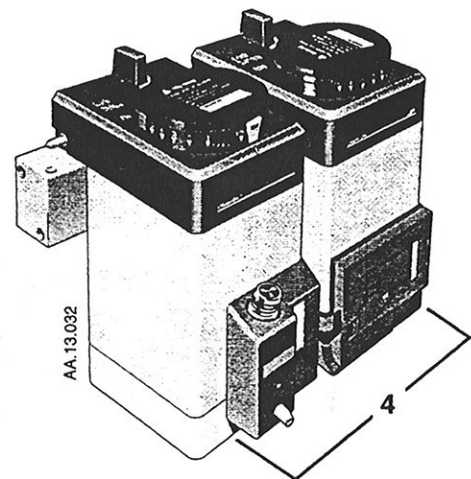
Push the switch to stop the alarm speaker. If you hold the switch in for four seconds, the alarm speaker starts and all the indicators come ON.

Indicators  
(Tec 6)

All indicators come ON at the start. The warm-up indicator goes OFF after approximately ten minutes when the operational indicator comes ON. Other indicators come ON for malfunctions.



Tec 6



Tec 5

1. Concentration Control<sup>^</sup>
2. Alarm Silence Switch<sup>#</sup>
3. Indicators<sup>#</sup>
4. Filler Port Controls<sup>\*</sup>
5. Battery Cover<sup>#</sup>
6. Power Cable<sup>#</sup>
7. Concentration Control Release<sup>^</sup>
8. Lock lever<sup>^</sup>

\* The vaporizer operation and maintenance manual tells you how to fill and drain the vaporizer.

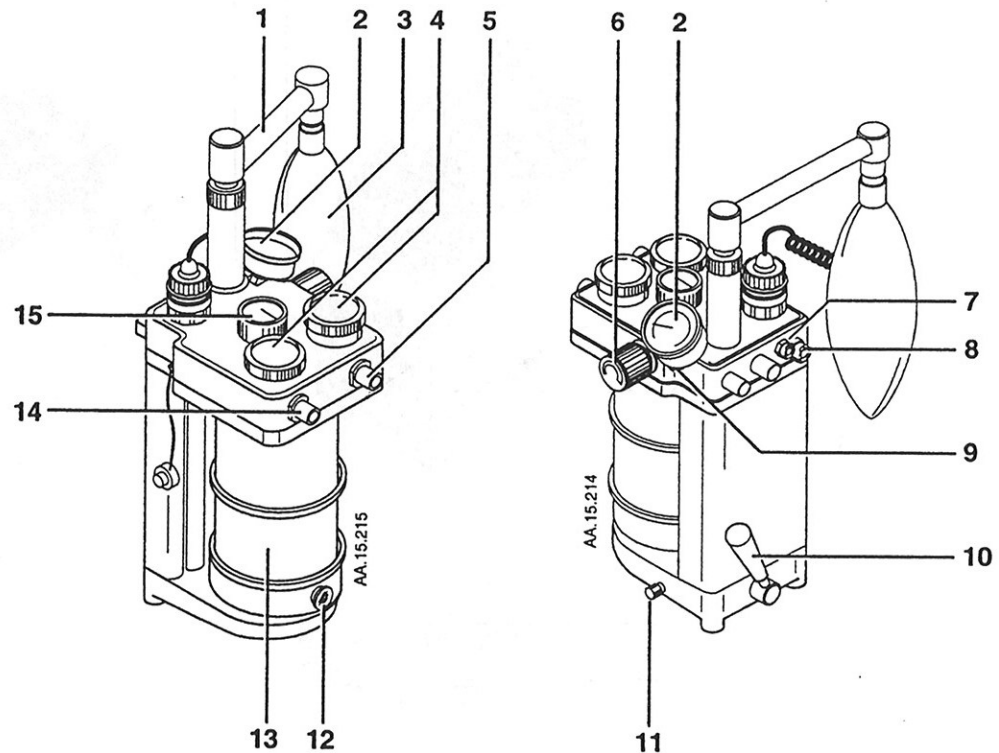
# Only the Tec 6 Vaporizer has these parts.

<sup>^</sup> Refer to the description in this section or the vaporizer operation and maintenance manual.

Figure 2-3  
Vaporizers

## 2/General Information

Control	Description (Figure 2-4)
Bag/APL-Ventilator switch	This switch sends gas to the bellows or the bag arm. Set the switch to the Bag/APL position for manual ventilation or to the Ventilator position for mechanical ventilation.
APL valve	This valve limits breathing circuit pressure during manual ventilation.
Canister release	This lever must be in the locked position during operation. Set the lever to release to remove the canisters.
Mounting knob	Turn the knob fully clockwise to tighten the absorber on the mounting pin. Turn the knob fully counterclockwise to release the absorber.



1. Bag Arm
2. Inspiratory Pressure Gauge
3. Rebreathing Bag
4. Check Valves (Inspiratory and Expiratory)
5. Expiratory Port
6. Adjustable Pressure Limit (APL) Valve\*
7. Expiratory Pressure Port
8. Fresh Gas Inlet
9. Inspiratory Pressure Port
10. Canister Release\*
11. Mounting Knob\*
12. Drain Plug
13. Canisters
14. Inspiratory Port
15. Bag/APL – Ventilator Switch\*

\* Refer to the description in this section or the GMS absorber operation and maintenance manual.

**Figure 2-4**  
GMS Absorber

## 2/General Information

### Excel Systems with a 7800 Ventilator

This section is a quick guide. Refer to the 7800 Ventilator operation and maintenance manual for complete instructions.

The 7800 Ventilator and the Excel work together as a system:

- The system switch turns the 7800 Ventilator ON and OFF.
- The 7800 Ventilator/Excel Interface Cable must be connected at all times.
- The power cable for the 7800 Ventilator connects to the outlet box or an electrical socket.

The 7800 Ventilator has two modes of operation, monitor mode and mechanical ventilation.

#### Patient data

Patient data includes:

- Tidal volume
- Respiratory rate
- Minute volume
- Inspired O<sub>2</sub> concentration

#### Alarms

The 7800 Ventilator includes alarms for:

- Apnea
- High and low airway pressure
- Reverse flow
- High and low O<sub>2</sub> concentration
- Low minute volume
- Open drive circuit
- Low battery
- Incorrect control combinations
- O<sub>2</sub> sensor calibration is necessary
- Power failure
- Subatmospheric pressure
- High and low supply pressure
- Ventilator or monitoring malfunction

#### The battery and power failure operation

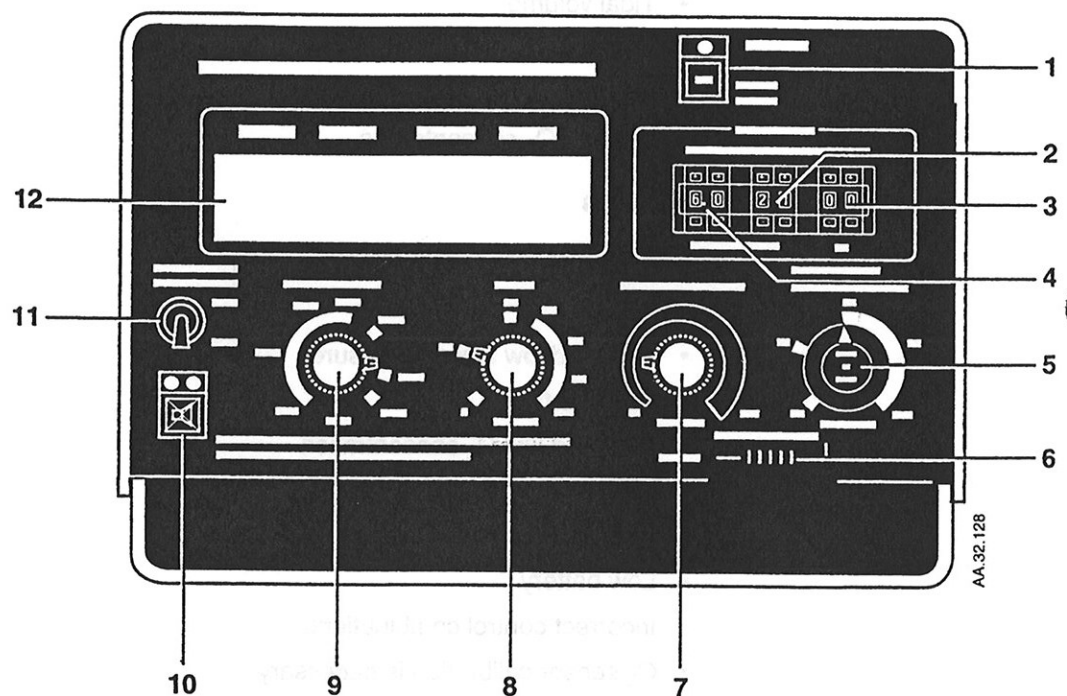
A fully charged battery permits approximately 20 minutes of mechanical ventilation and monitor operation.

To charge the battery:

1. Check the serial number on the rear label.

## 2/General Information

2. If the serial number starts with CAX:
  - The position of the system switch is not important.
  - Connect the ventilator power cable to an electrical supply.
  - The battery charges in approximately 24 hours.
3. If the serial number starts with CAT or CBA:
  - Connect the ventilator power cable to an electrical supply.
  - Set the system switch to ON.
  - Close the O<sub>2</sub> cylinder valve. If not, the minimum O<sub>2</sub> flow can empty the cylinder.
  - Turn all flow controls fully clockwise (minimum flow).
  - The battery charges in approximately 24 hours.



1. Inspiratory Pause Button
2. Low O<sub>2</sub> Alarm Control
3. High O<sub>2</sub> Alarm Control
4. Low Minute Volume Alarm Control
5. Inspiratory Pressure Limit Control
6. O<sub>2</sub> Calibration Control
7. Inspiratory Flow Control
8. Rate Control
9. Tidal Volume Control
10. Alarm Silence Button
11. Mechanical Ventilation Switch
12. Display

**Figure 2-5**  
The 7800 Ventilator control module

## 2/General Information

---

### Excel Systems with a 7900 Ventilator

This section is a quick guide. Refer to the 7900 Ventilator operation and maintenance manual for complete instructions.

The 7900 Ventilator and the Excel work together as a system. Keep the 7900 Ventilator/Excel Interface Cable connected at all times:

- Some of the sensor circuits are in the Excel.
- The system switch turns the 7900 Ventilator ON and OFF.
- Low O<sub>2</sub> supply pressure in the Excel causes an alarm on the 7900 Ventilator.

The 7900 Ventilator has two modes of mechanical ventilation. Each mode adjusts the output as necessary to supply the set breath:

- The pressure mode supplies constant pressure during inspiration.
- The volume mode supplies constant flow during inspiration.

During some malfunctions, the ventilator automatically changes modes:

- The backup volume mode supplies the set tidal volume. It cannot adjust the ventilator output to supply the set breath.
- The minimum monitoring mode shows patient data, but does not permit mechanical ventilation.

#### Patient data

Patient data includes:

- Inspired O<sub>2</sub> concentration
- Exhaled tidal and minute volumes
- Respiratory rate
- Peak, mean, and plateau airway pressures
- Airway pressure waveforms

#### Alarms

The 7900 Ventilator includes alarms for:

- High and low O<sub>2</sub> concentration
- High, low, sustained, and subatmospheric airway pressures
- Volume apnea
- High and low minute volume (exhaled)
- High and low tidal volume (exhaled)
- Reverse flow
- The set breath was not supplied
- Empty bellows
- Incorrect control settings
- Incorrect flow sensor connections
- O<sub>2</sub> sensor calibration is necessary

## 2/General Information

- Low supply pressure to the ventilator
- High drive pressure to the bellows
- Low O<sub>2</sub> supply pressure to the Excel
- Ventilator or monitoring malfunctions
- Electrical power failure
- Low battery

### Controls

Figure 2-6 shows the ventilator controls. The ventilator uses touch switches that you push and an adjustment knob that you turn or push.

The bottom of the screen shows the control settings. To change a setting:

- Push the selection switch below the setting.
- Turn the adjustment knob to change the setting.
- Push the adjustment knob or the selection switch to keep the change.

### Menus

Use the menus for settings that change less frequently:

Menu	Use To
Ventilation	Set the ventilation mode, inspiratory pause, and breathing system (Circle, GMS Bain, Bain/Mapleson D).  Turn ON correction factors when the fresh gas includes heliox. This increases the accuracy of the flow sensors.
Calibration/ Communication	Calibrate the O <sub>2</sub> sensor or zero the flow sensors.  Set the serial port to work with a specific monitor or to use the 7800 Protocol.
Alarm limits	Set the O <sub>2</sub> concentration, minute volume, and tidal volume alarm limits.
Screen and audio	Set the display brightness and alarm loudness.  Show or hide the alarm limits and units of measure.

Push the menu switch to show the main menu.

All menu selections use the adjustment knob:

- Turn the knob to move the cursor.
- Push the knob to make a selection.

To set alarm limits:

- Turn the knob to change the setting.
- Push the knob to keep the change.

### The battery and power failure operation

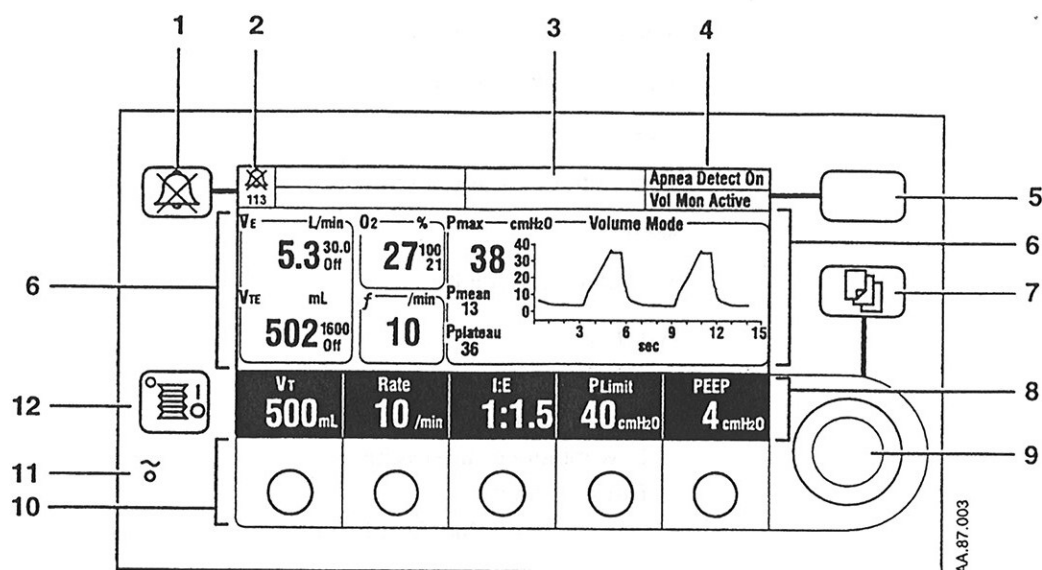
A fully charged battery permits approximately 30 minutes of mechanical ventilation and monitor operation.

An alarm tells you if the battery is not installed or not fully charged.

To charge the battery, connect the ventilator power cable to an electrical supply.



## 2/General Information



1. Alarm silence switch\*
2. Alarm silence indicator
3. Alarm displays
4. Apnea alarm and volume monitor settings
5. Apnea alarm ON/OFF and Volume monitor ON/Standby switch\*
6. Patient data
7. Menu switch\*
8. Control settings
9. Adjustment knob
10. Selection switches\*
11. Electrical power indicator
12. Mechanical ventilation switch (ON/OFF)\*

\* Touch switches

**Figure 2-6**  
The 7900 Ventilator control module

## Excel Systems with a Monitor Pod

### CAUTION

⚠ Do not use the Monitor Pod as a handle. Too much force can cause damage to the Monitor Pod.

### Monitor Pod (patient data and alarms)

This section is a quick guide. Refer to the monitor operation and maintenance manual for complete instructions.

## 2/General Information

The Monitor Pod holds the:

*Ohmeda 5420 Volume Monitor*

Data:

- Minute or Tidal Volume

Modes:

- Pediatric or adult

Alarms:

- Apnea
- High minute or tidal volume
- Low minute or tidal volume
- Reverse flow
- System (5420 Monitor) failure

*Ohmeda 5120 O<sub>2</sub> Monitor*

Data:

- O<sub>2</sub> concentration

Alarms:

- High O<sub>2</sub> concentration
- Low O<sub>2</sub> concentration
- Low battery
- Sensor not connected
- Low O<sub>2</sub> alarm limit <18%
- System (5120 Monitor) failure

*Ohmeda 5500 Airway Pressure Monitor*

Data:

- Airway pressure

Alarms:

- High airway pressure
- Sustained airway pressure
- Subatmospheric airway pressure
- Low battery
- System (5500 monitor) failure

*Tycos Blood Pressure Gauge (no alarms)*

Monitor Pod (alarm only)

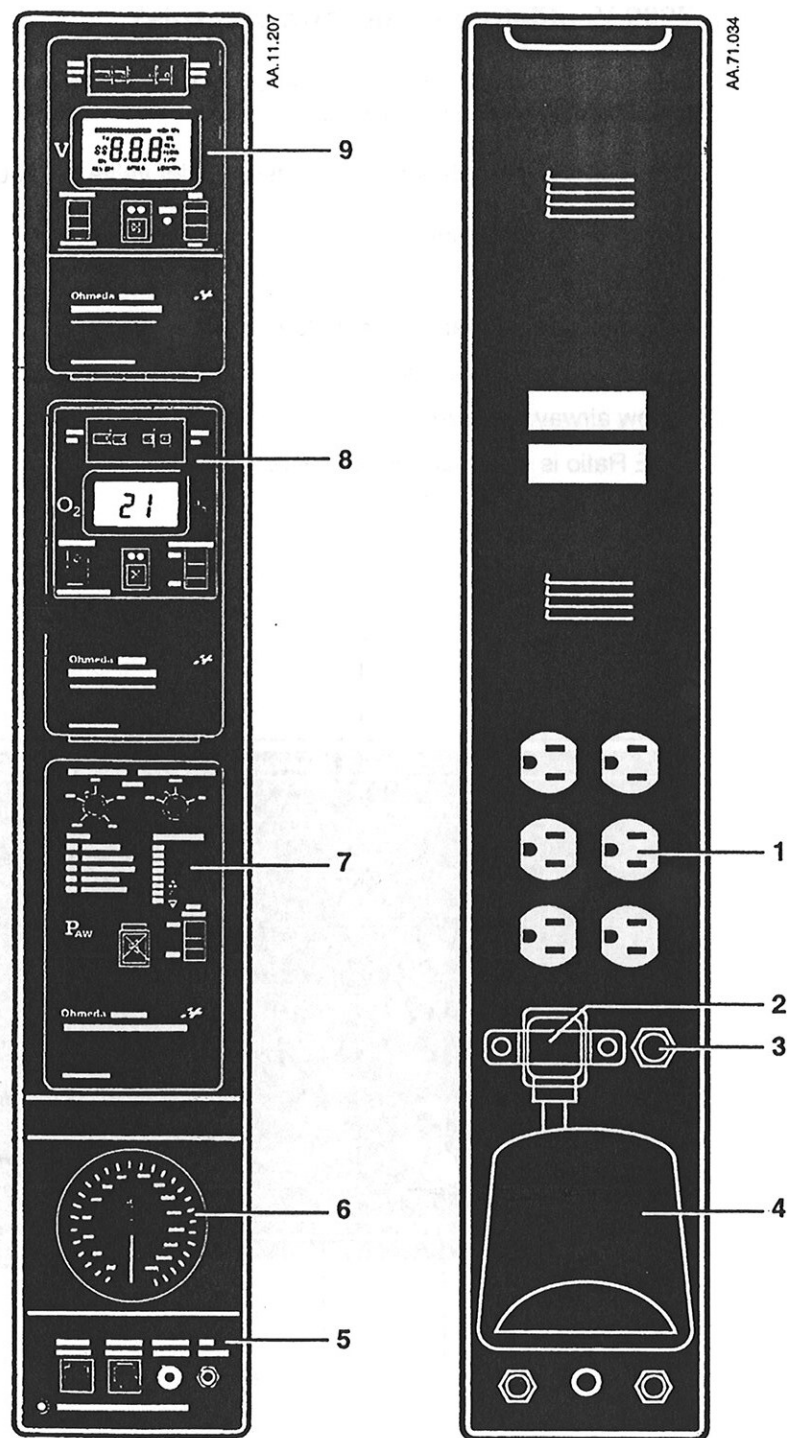
- Power failure

### Monitor switches

With the switches in the usual positions, the system switch turns ON the monitors.

Component	Usual Switch Position
Volume Monitor	ON
O <sub>2</sub> Monitor	OFF
Airway Pressure Monitor	ON

## 2/General Information



1. Electrical Outlets (9 Amps Total)
2. Electrical Socket
3. Circuit Breaker
4. Power Cable Bracket
5. Interface Panel
6. Tycos Blood Pressure Gauge
7. Ohmeda 5500 Airway Pressure Monitor
8. Ohmeda 5120 O<sub>2</sub> Monitor
9. Ohmeda 5420 Volume Monitor

**Figure 2-7**  
The Monitor Pod

## 2/General Information

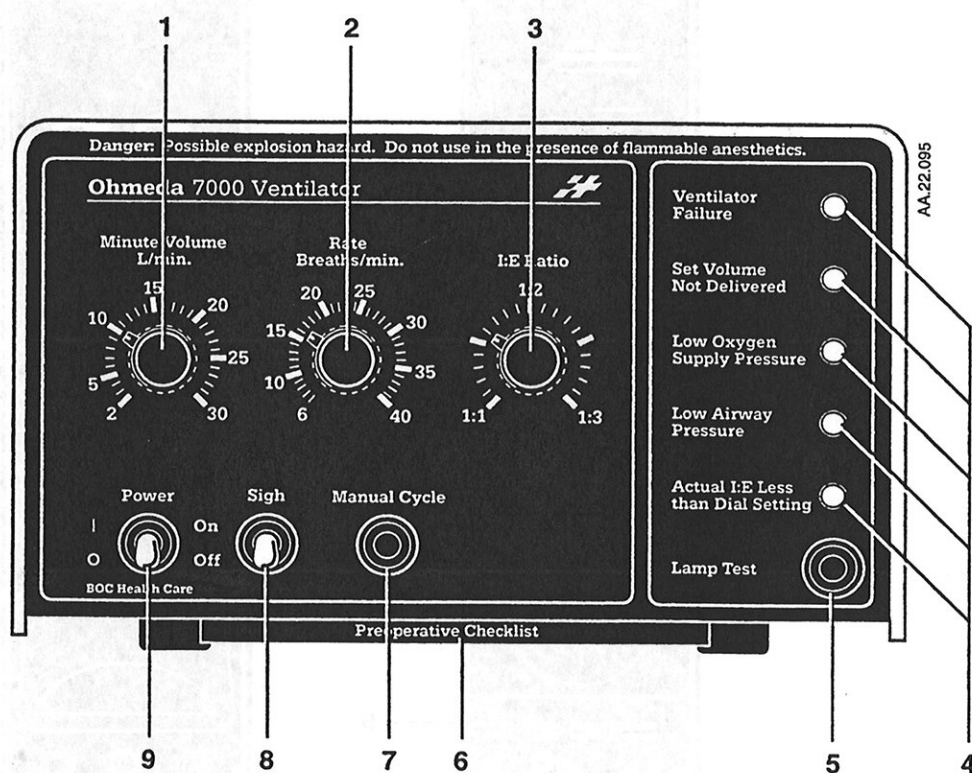
### 7000 Ventilator (alarms and controls)

This section is a quick guide. Refer to the 7000 Ventilator operation and maintenance manual for complete instructions.

The 7000 Ventilator has a high pressure relief valve set at 65 to 70 cm H<sub>2</sub>O.

Ventilator alarms include:

- Ventilator failure
- Volume is less than the set value
- Low O<sub>2</sub> supply pressure
- Low airway pressure
- I:E Ratio is less than the set value
- Power failure



1. Minute Volume Control
2. Rate Control
3. I:E Ratio Control
4. Alarm Indicators
5. Lamp Test Button (Push to Test Alarm Indicators)
6. Preoperative Test Card
7. Manual Cycle Button
8. Sigh Switch
9. ON/OFF Switch

**Figure 2-8**

The 7000 Ventilator control module

## 2/General Information

### The batteries and power failure operation

With the switches in the power failure positions, each monitor uses its internal battery. Mechanical ventilation stops during a power failure.

Component	Power Failure Switch Position
Volume Monitor	Cycle Switch Standby-ON
O <sub>2</sub> Monitor	ON
Airway Pressure Monitor	ON

When power comes back ON:

- The volume monitor automatically changes back to system power.
- Set all other switches to the usual position.

Monitor	Battery Life (New/Full Charge)	Charge or Replace
Volume	6 hours	Charge Battery
O <sub>2</sub>	1300 hours	Replace Battery
Pressure	1 hour	Charge Battery
Monitor Pod (Power Failure Alarm Only)	1.25 hours at the maximum sound level; 45 minutes at decreased levels	Charge Battery
7000 Ventilator (Power Failure Alarm Only)	1 hour minimum	Charge Battery

Replace the O<sub>2</sub> monitor batteries. Refer to the O<sub>2</sub> monitor operation and maintenance manual for instructions.

To charge the other batteries, connect the power cable to an electrical supply and set the necessary switches.

Monitor	Switch Positions	Charge Time
Volume	System Switch: ON	Overnight
Pressure	System Switch: ON or Standby	Overnight
Monitor Pod (Power Failure Alarm)	System Switch: ON or Standby	Approximately 14 hours
7000 Ventilator (Power Failure Alarm)	7000 Switch: ON	Approximately 21 hours

# Notes

---



## In this section

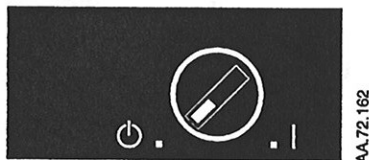
Install the cylinders .....	3-1
How to attach equipment to the shelves .....	3-3
Circuit and sensor connections .....	3-6

## Install the cylinders

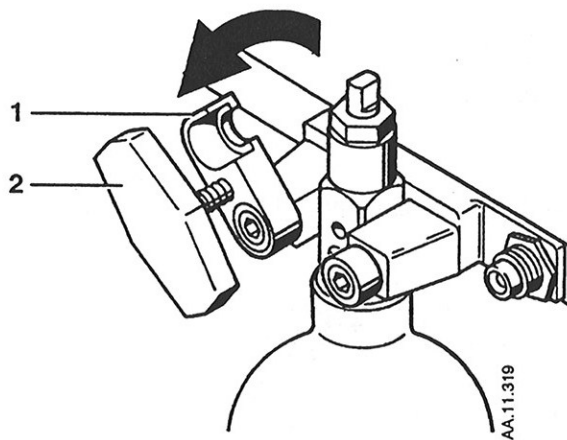
### WARNINGS

- ⚠ Install a plug and gasket in all empty cylinder connections to prevent leaks.
- ⚠ Leaks through an empty cylinder connection can drain other cylinders of the same gas.

1. Set the system switch to Standby.



2. Close all cylinder valves.
3. Open the yoke gate.
4. Fully loosen the tee handle.



1. Yoke Gate
2. Tee Handle

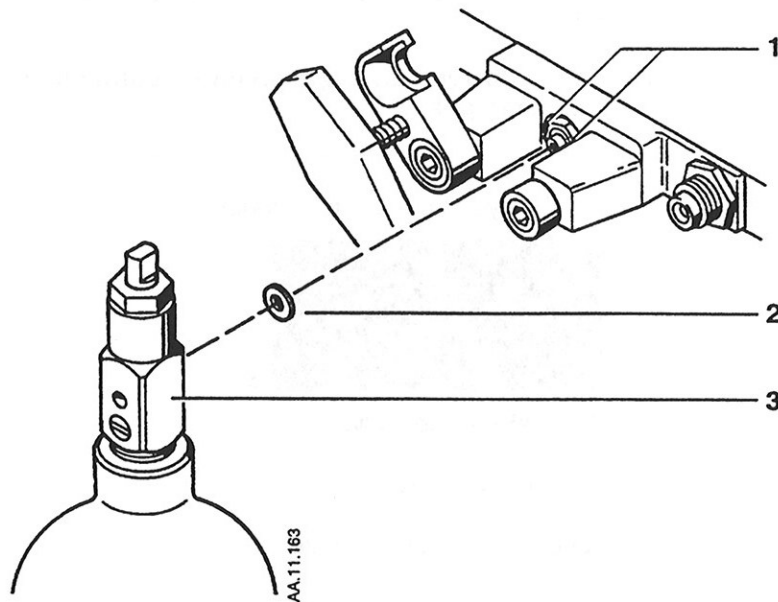
## 3/Setup

5. Remove the used cylinder and the used gasket.
6. Remove the cap from the cylinder valve on the new cylinder.

### CAUTION

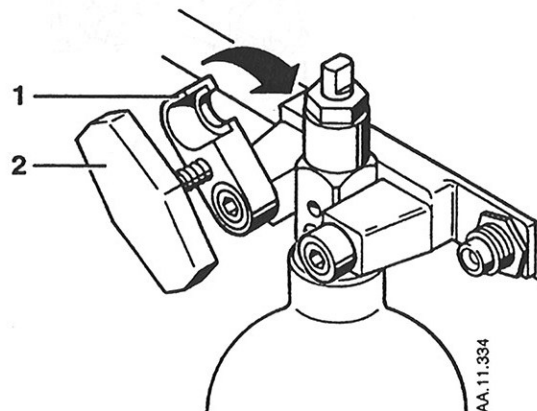
- ⚠ No gasket or more than one gasket can cause a leak.

7. Install a new gasket.
8. Align the cylinder post with the index pins.



1. Index Pins
2. Gasket
3. Cylinder Post

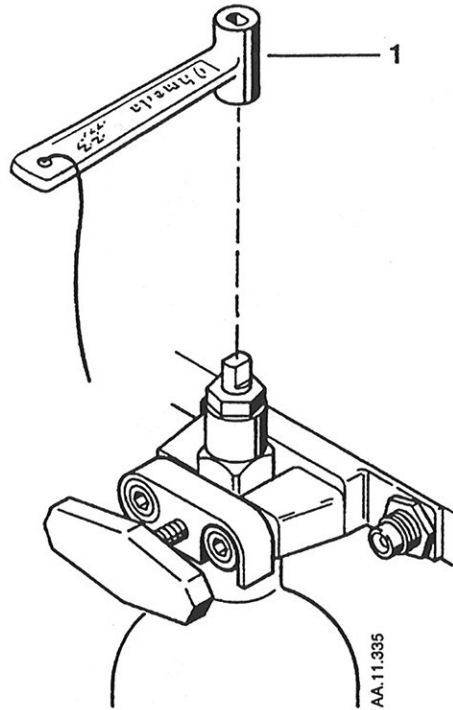
9. Close the yoke gate and tighten the tee handle.



1. Yoke Gate
2. Tee Handle

## 3/Setup

10. Install a cylinder plug and gasket in all empty cylinder yokes.
11. Make sure that you have a cylinder wrench.



1. Cylinder Wrench

### WARNING

- ⚠ The Excel can use cylinder and pipeline supplies at the same time. When you use pipeline supplies, close the cylinder valves to keep cylinder supplies for emergencies.

## How to attach equipment to the shelves

There are three ways to attach equipment to the shelves:

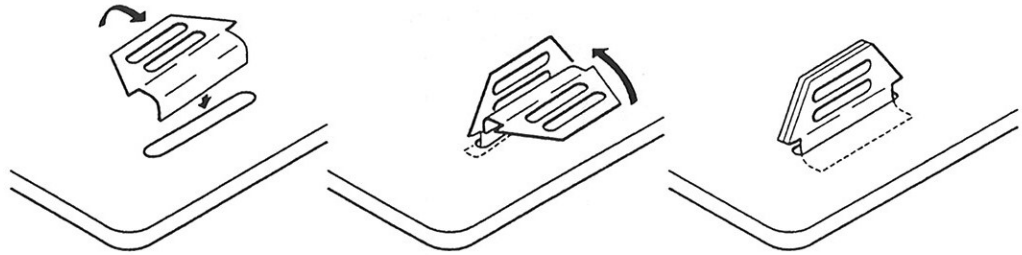
- Shelves with slots use two pairs of triangular clips and a strap.
- The Excel 210 SE without a mid shelf also uses rectangular clips that fit into slots on the side of the shelf.
- The Excel 210 SE with a mid shelf has threaded holes in the mid shelf. Use screws to install the triangular clips, or one of several large monitor mounting kits.

### CAUTION

- ⚠ The shelf weight limits are:
- Excel 210 SE (With Mid Shelf) – Mid Shelf: 34 kg (75.0 lb); Top Shelf: 45 kg (100 lb)
  - Excel 210 SE (Without Mid Shelf) – Top Shelf: 56 kg (125 lb)
  - Excel 110 SE – Mid Shelf: 11 kg (24 lb); Top Shelf: 23 kg (50 lb)

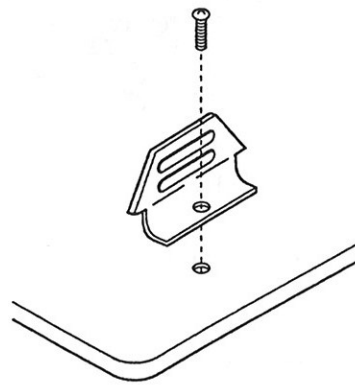
## 3/Setup

1. Put one item of equipment on the shelf.
2. Install the clips. With slots, use the two slots nearest to the equipment.



AA.71.145

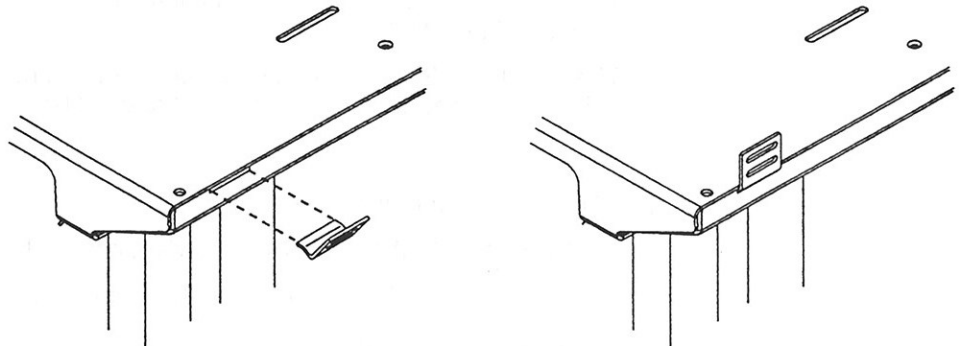
Install the clips in shelf slots



AA.71.146

Install the clips on the mid shelf of an Excel 210 SE

**Figure 3-1**  
How to install the triangular clips

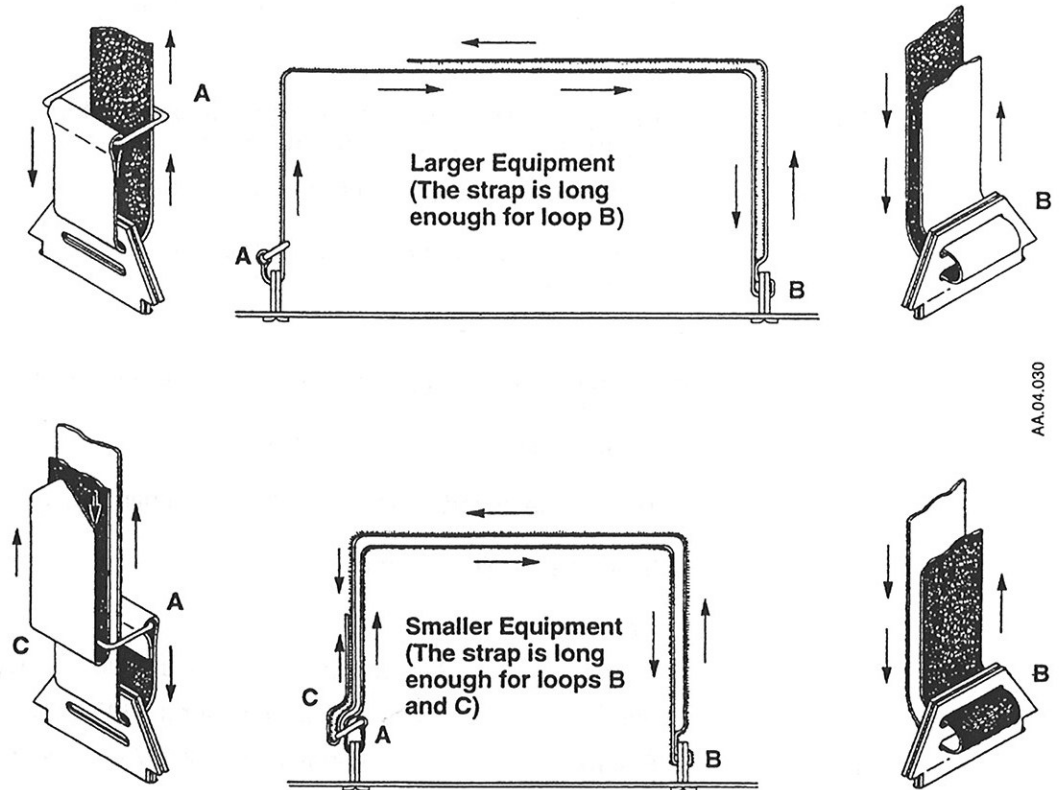


AA.71.126

**Figure 3-2**  
How to install the rectangular clips on an Excel 210 SE without a mid shelf

## 3/Setup

3. Install the straps. The triangular and the rectangular clips use the same strap routing (Figure 3-3):



**Figure 3-3**  
How to install the strap

4. Fully tighten the straps.
5. Make sure that the straps hold the equipment in position.

### WARNING

⚠ If you do not fully tighten the strap, equipment can fall off the shelf.

# 3/Setup

## Circuit and sensor connections

### Important

Ohmeda strongly recommends that you use O<sub>2</sub> monitoring with this equipment. Refer to local standards for mandatory monitoring.

### WARNING

- ⚠ Always make sure that the pipeline supply hoses, the fresh gas hose, and the breathing circuit components are not toxic and will not:
- Cause an allergic reaction in the patient.
  - React with the anesthetic gases or agent to produce dangerous byproducts.

Refer to the applicable operation and maintenance manuals for complete instructions.

1. Set the system switch to Standby.
2. Tighten the absorber and the bellows mounting knobs if necessary.
3. Make the monitoring connections:

Refer to :

- |             |   |
|-------------|---|
| Figure 3-4  | Sensor connections for a 7800 Ventilator with a GMS Absorber  |
| Figure 3-5  | Sensor connections for a 7800 Ventilator with a basic absorber  |
| Figure 3-6  | How to connect the 7900 Ventilator flow sensors   |
| Figure 3-7  | How to assemble O <sub>2</sub> Sensor adapters for a 7900 Ventilator  |
| Figure 3-8  | Sensor connections for a 7900 Ventilator with a GMS and a circle breathing circuit                            |
| Figure 3-9  | Sensor connections for a 7900 Ventilator with a basic absorber and a circle breathing circuit                 |
| Figure 3-10 | Sensor connections for a GMS Bain circuit   |
| Figure 3-11 | Sensor connections for a 7000 Ventilator and Monitor Pod with a basic absorber and a circle breathing circuit |
| Figure 3-12 | Sensor connections for a 7000 Ventilator and Monitor Pod with a GMS absorber and a circle breathing circuit   |

The 7900 Ventilator uses a different O<sub>2</sub> sensor than the 7800 Ventilator and the Monitor Pod. Make sure that you use the correct O<sub>2</sub> sensor for your system.

### With the Monitor Pod or a 7800 ventilator:

If you disconnected the O<sub>2</sub> sensor or replaced the sensor cartridge, stop here until the O<sub>2</sub> concentration becomes stable:

- a. If you connected the contacts with a conductor (the metal disk or clip) or installed a new cartridge, the O<sub>2</sub> concentration becomes stable in approximately five minutes.
- b. If not, the O<sub>2</sub> concentration will not become stable for many hours.

## 3/Setup

---

- c. If necessary, install a new cartridge.

Use the metal disk or clip supplied with the new cartridge to connect the contacts on the used cartridge.

After 18 hours, test the used cartridge again.

If the O<sub>2</sub> concentration continues to change or you cannot calibrate the sensor, discard the used cartridge.

### With the 7900 Ventilator:

The flow sensors have a lock sleeve on the connectors. To connect the sensors (Figure 3-6):

- Push the sleeve away from the sensor connector.
- Connect the sensor to the interface panel.
- Push the sleeve back on top of the connector.

To disconnect the flow sensors:

- Push the sleeve away from the sensor connector.
- Disconnect the sensor.

The O<sub>2</sub> Sensor uses one or more adapters (Figure 3-7).

4. If the Excel has a mid shelf, remove the rear panel from the ventilator shroud:
- a. Move the latches to the center.
  - b. Remove the rear panel.

---


### WARNING

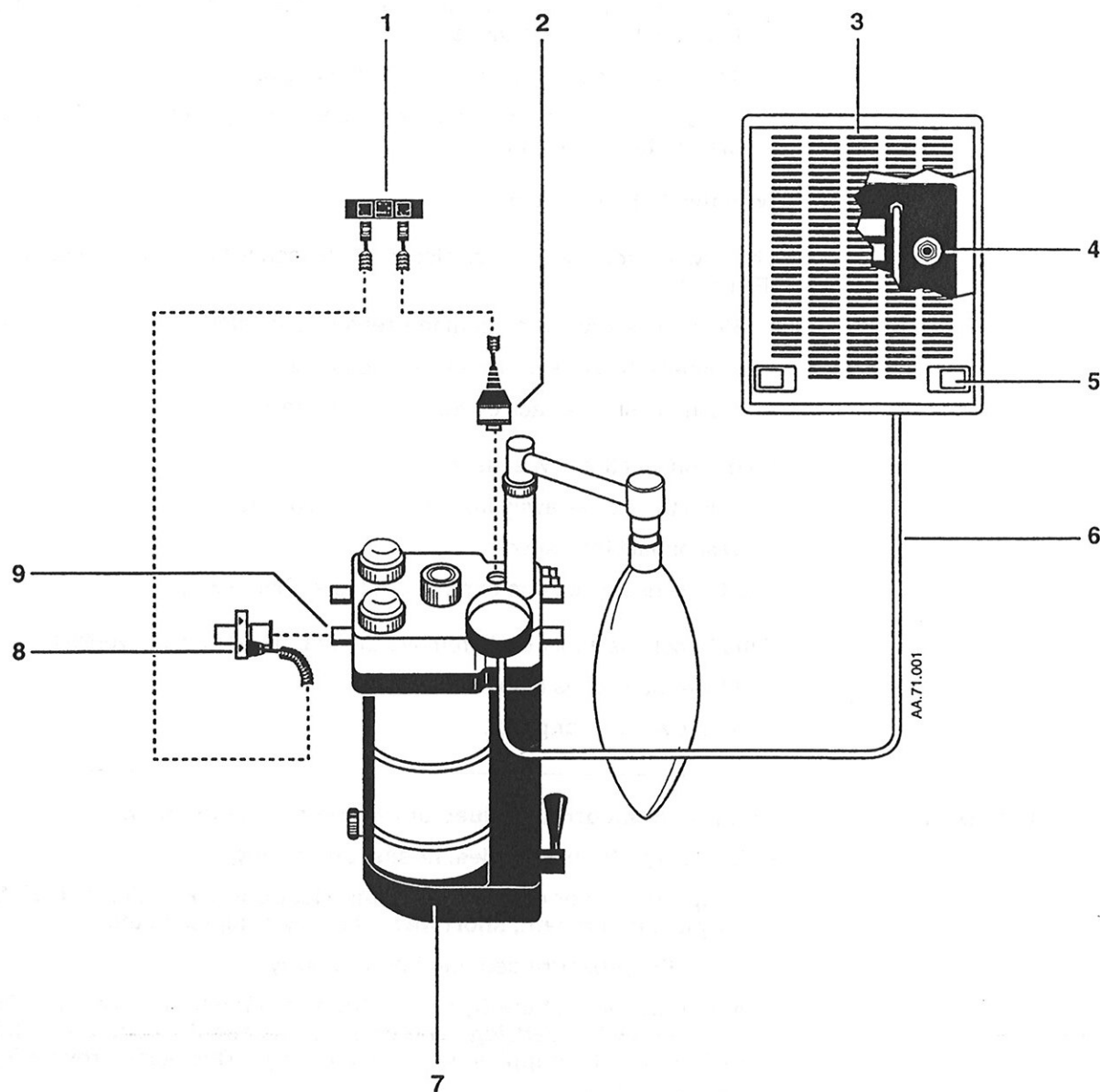
#### To prevent incorrect values or equipment malfunction:

- Use only Ohmeda cables, hoses, and tubing.
- Keep the sensor cables away from electromagnetic fields (high frequency surgical equipment, short wave therapy equipment, etc.)
- Drain the pressure sensing line regularly.
- If you disconnect the O<sub>2</sub> sensor from the Monitor Pod or the 7800 Ventilator, remove the cartridge and connect the circular contacts with the metal disk or the clip supplied with the cartridge. This helps prevent incorrect O<sub>2</sub> values (high).

---

### CAUTION

-  To keep condensation out of the O<sub>2</sub> sensor, install the sensor with the cable end up.
-

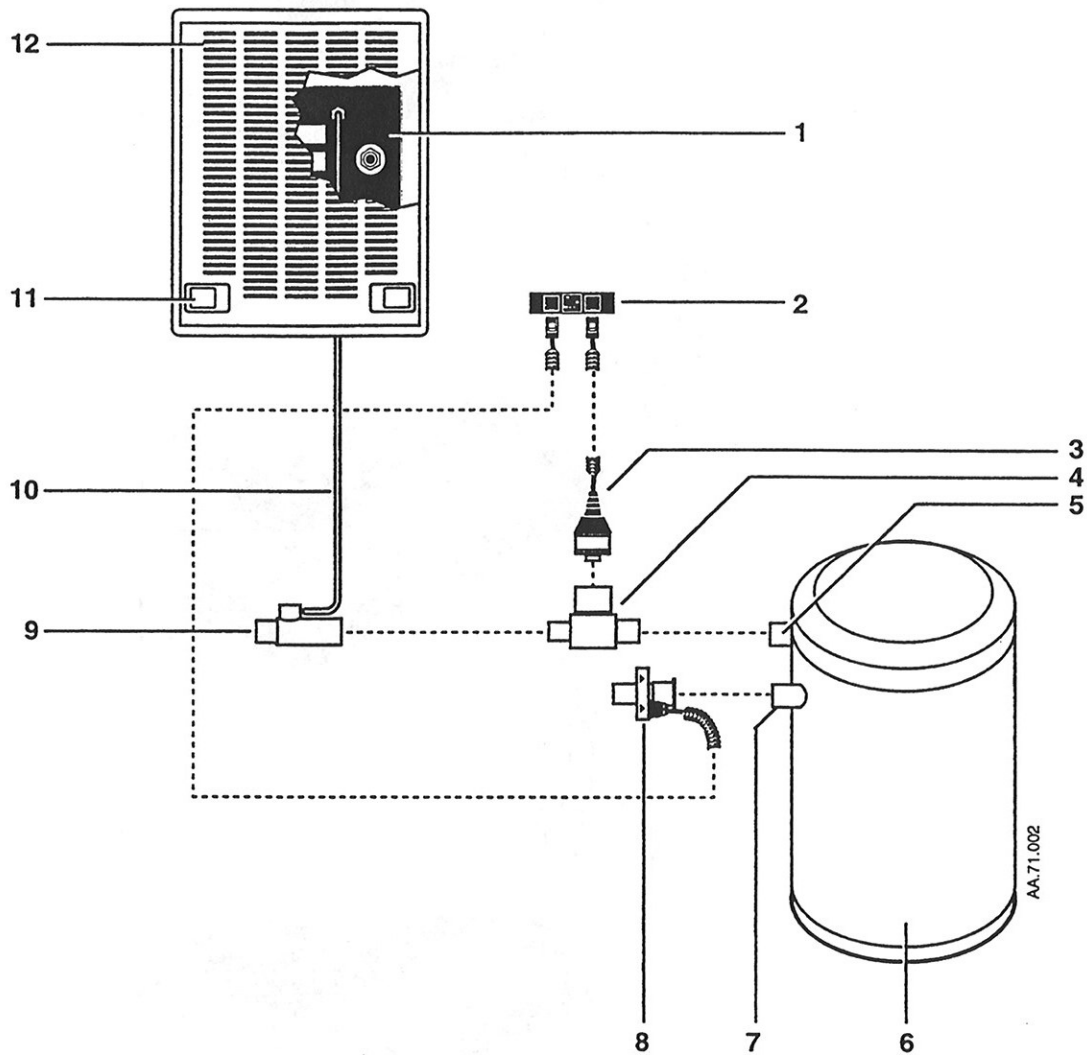


1. Interface Panel (Side of the Excel)
2. O<sub>2</sub> Sensor
3. Rear Panel (Excels With A Mid Shelf)
4. 7800 Ventilator (Rear View)
5. Latches (Excels With A Mid Shelf)
6. Inspiratory Pressure Sensing Line
7. GMS Absorber
8. Expiratory Flow Sensor
9. Expiratory Port GMS Absorber

**Figure 3-4**

Sensor connections for a 7800 Ventilator with a GMS Absorber

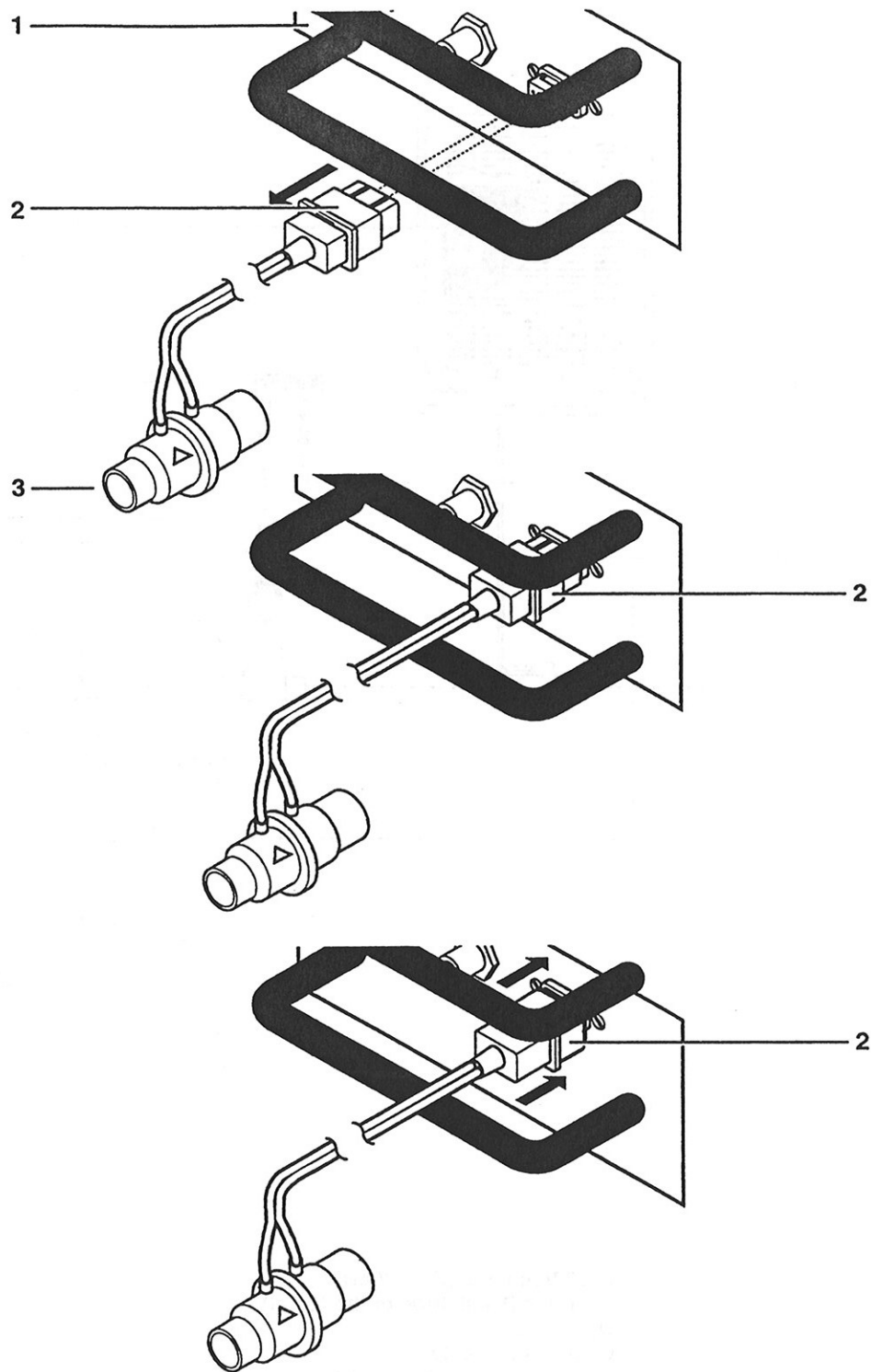




1. 7800 Ventilator (Rear View)
2. Interface Panel (Side of the Excel)
3. O<sub>2</sub> Sensor
4. O<sub>2</sub> Sensor Adapter
5. Inspiratory Port (Absorber)
6. Absorber
7. Expiratory Port (Absorber)
8. Expiratory Flow Sensor
9. Pressure Line Adapter
10. Inspiratory Pressure Sensing Line
11. Latches (Excels With A Mid Shelf)
12. Rear Panel (Excels With A Mid Shelf)

**Figure 3-5**

Sensor connections for a 7800 Ventilator with a basic absorber



AA.15.248

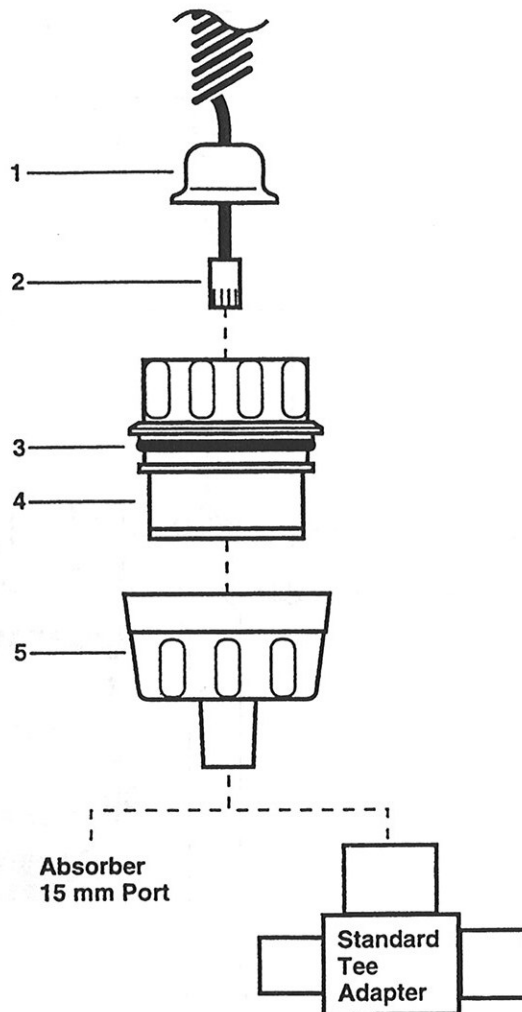
**Note:** The arrows on the flow sensors point up.

- 1. Interface Panel (Side of the Excel)
- 2. Sleeve
- 3. Flow Sensor

**Figure 3-6**

How to connect the 7900 Ventilator flow sensors

### 3/Setup

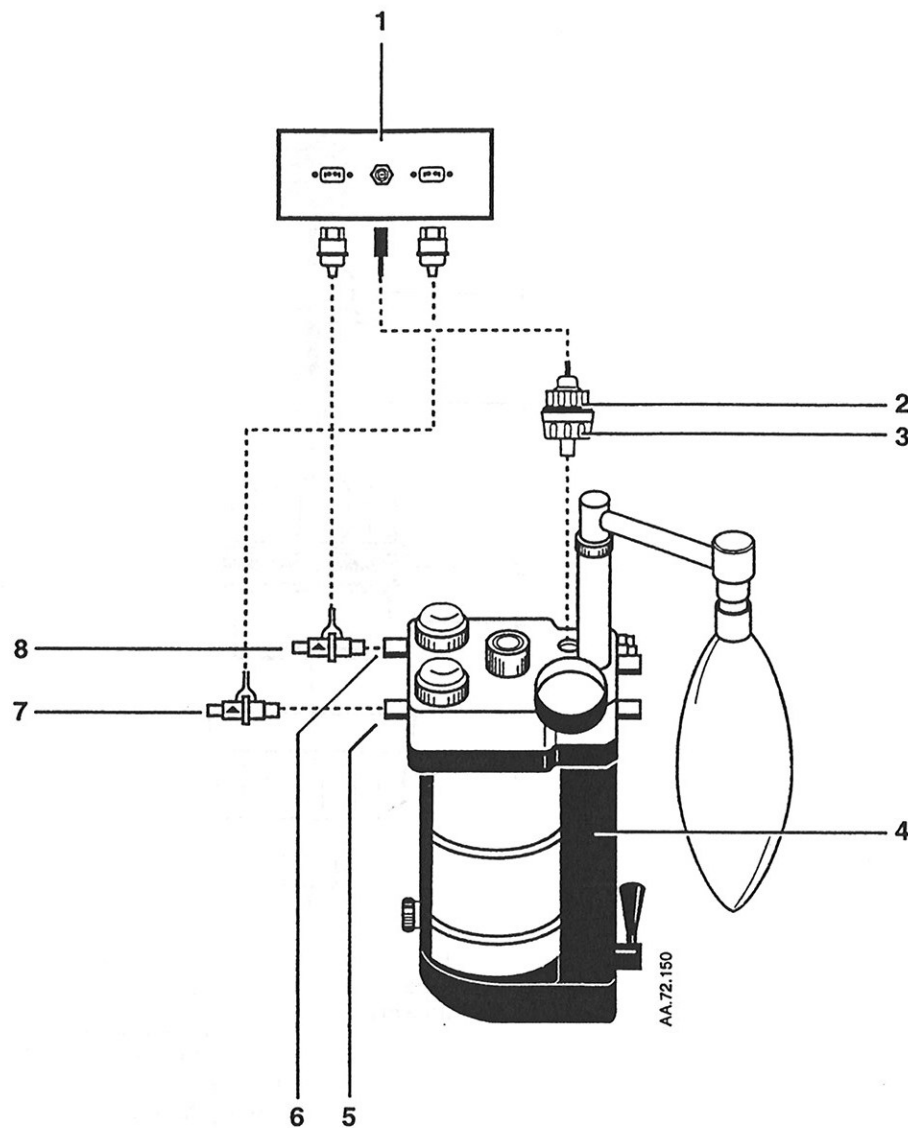


1. Sleeve
2. Cable connector
3. O-Ring
4. O<sub>2</sub> Sensor
5. 15 mm adapter

Note: Always push the sleeve over the connector to protect it from liquid.

**Figure 3-7**

How to assemble O<sub>2</sub> Sensor adapters for a 7900 Ventilator

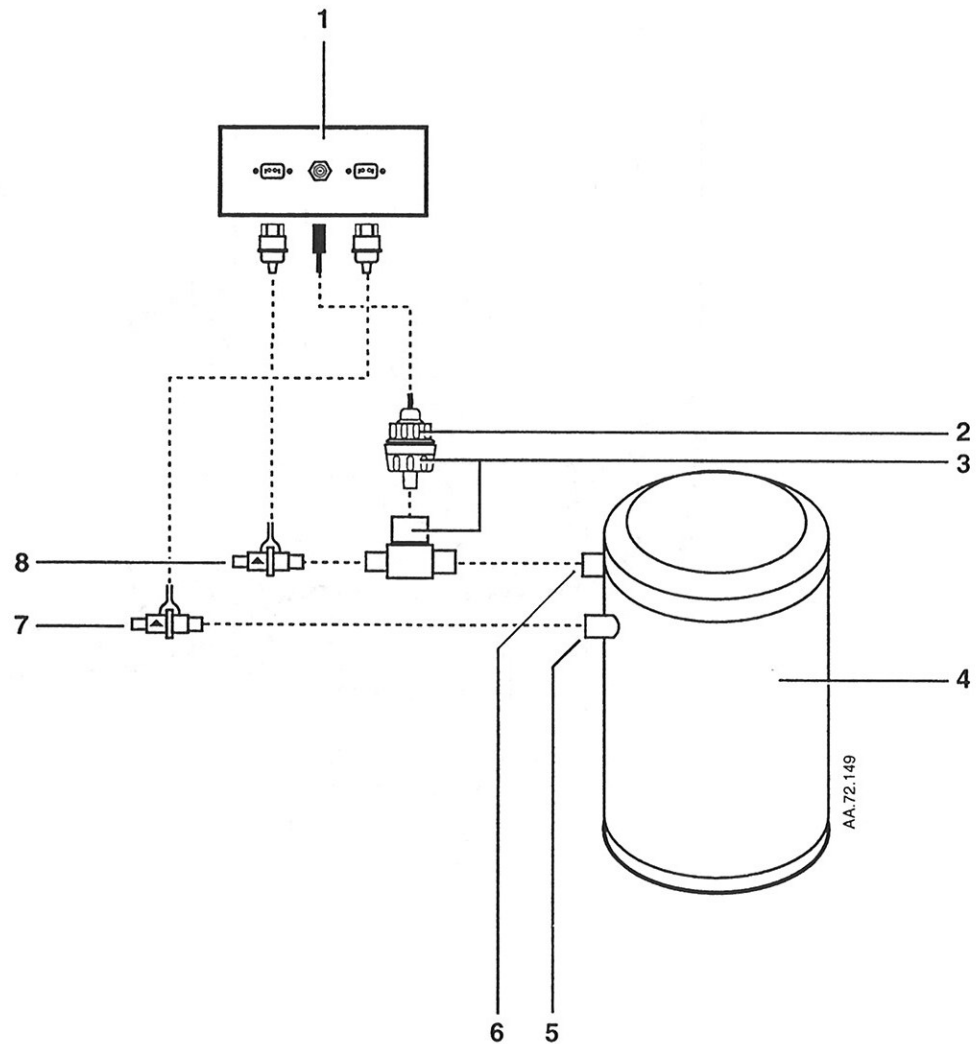


Note: The arrows on the flow sensors point up.

1. Interface Panel (Side of the Excel)
2. O<sub>2</sub> Sensor
3. Adapter for O<sub>2</sub> sensor
4. GMS Absorber
5. Expiratory Port GMS Absorber
6. Inspiratory Port GMS Absorber
7. Expiratory Flow Sensor
8. Inspiratory Flow Sensor

**Figure 3-8**

Sensor connections for a 7900 Ventilator with a GMS and a circle breathing circuit

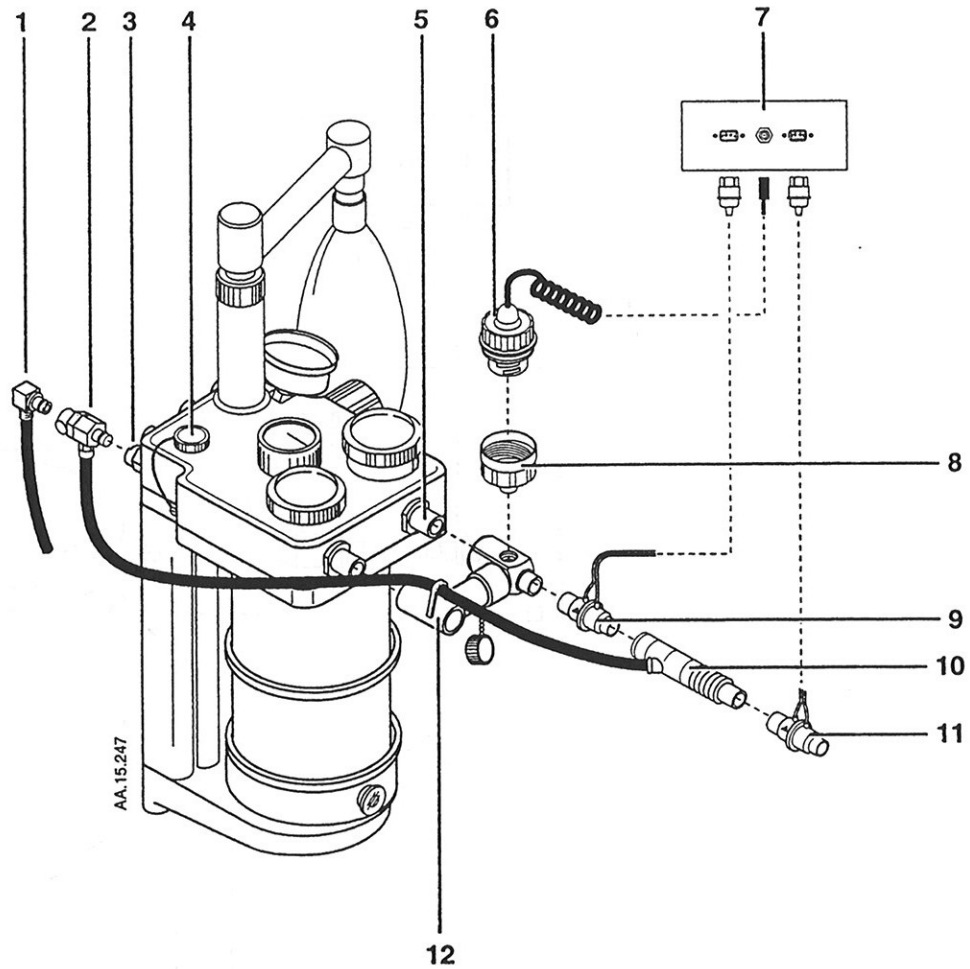


Note: The arrows on the flow sensors point up.

1. Interface Panel (Side of the Excel)
2. O<sub>2</sub> Sensor
3. O<sub>2</sub> Sensor Adapters (2)
4. Absorber
5. Expiratory Port (Absorber)
6. Inspiratory Port (Absorber)
7. Expiratory Flow Sensor
8. Inspiratory Flow Sensor

Figure 3-9

Sensor connections for a 7900 Ventilator with a basic absorber and a circle breathing circuit



**Note:** The arrows on the flow sensors point up.

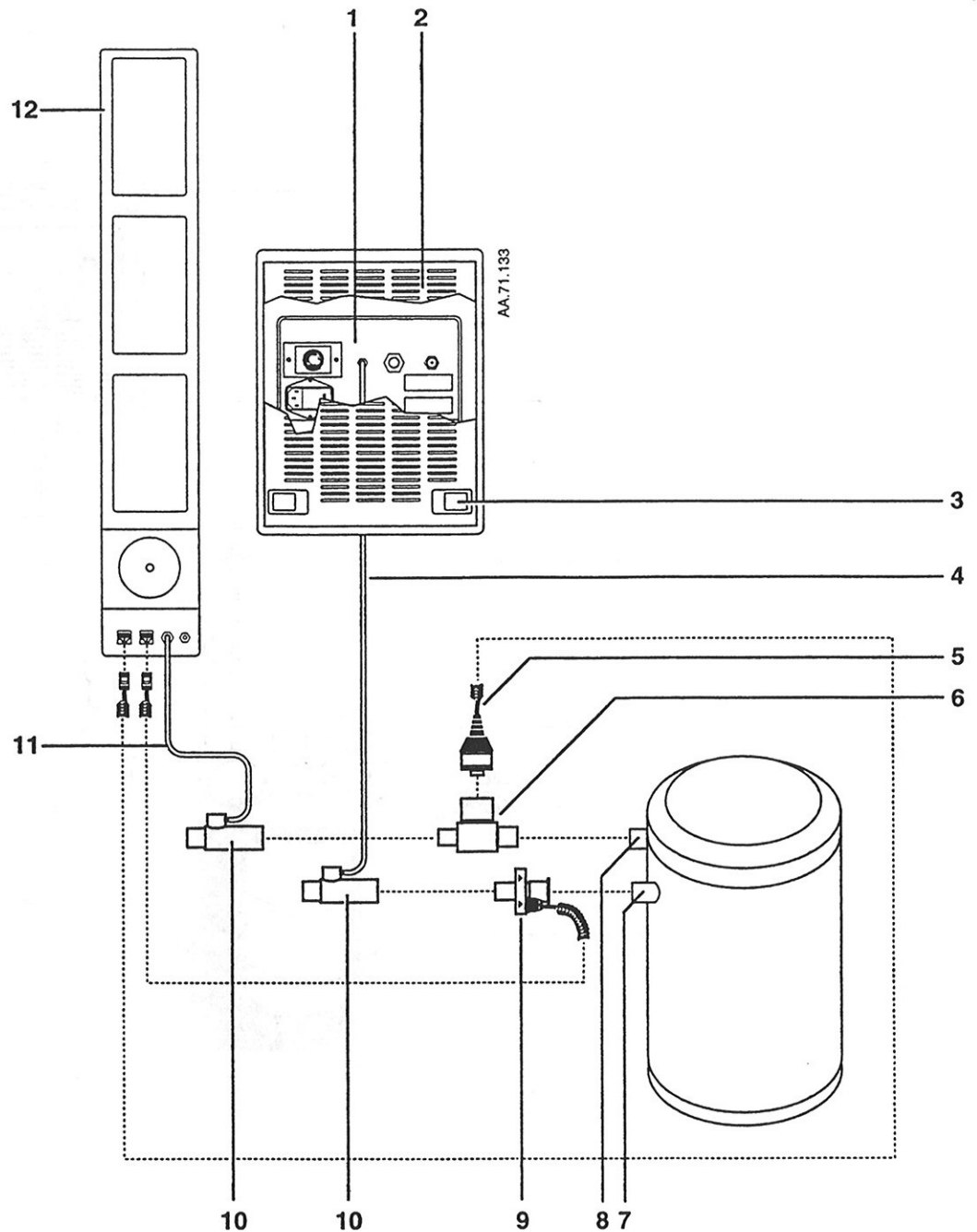
1. Fresh Gas Hose (From the Excel)
2. Fresh Gas Tee
3. Fresh Gas Inlet
4. Plug (O<sub>2</sub> Sensor Port)
5. Expiratory Port (GMS absorber)
6. O<sub>2</sub> Sensor
7. Interface Panel (Side of the Excel)
8. Adapter for O<sub>2</sub> sensor
9. Inspiratory Flow Sensor
10. Bain Circuit
11. Expiratory Flow Sensor
12. Bain Adapter

With other types of Bain or Mapleson-D circuits:

- Connect inspiratory sensors upstream of the fresh gas connection.
- Connect expiratory sensors between the fresh gas connection and the patient.

**Figure 3-10**

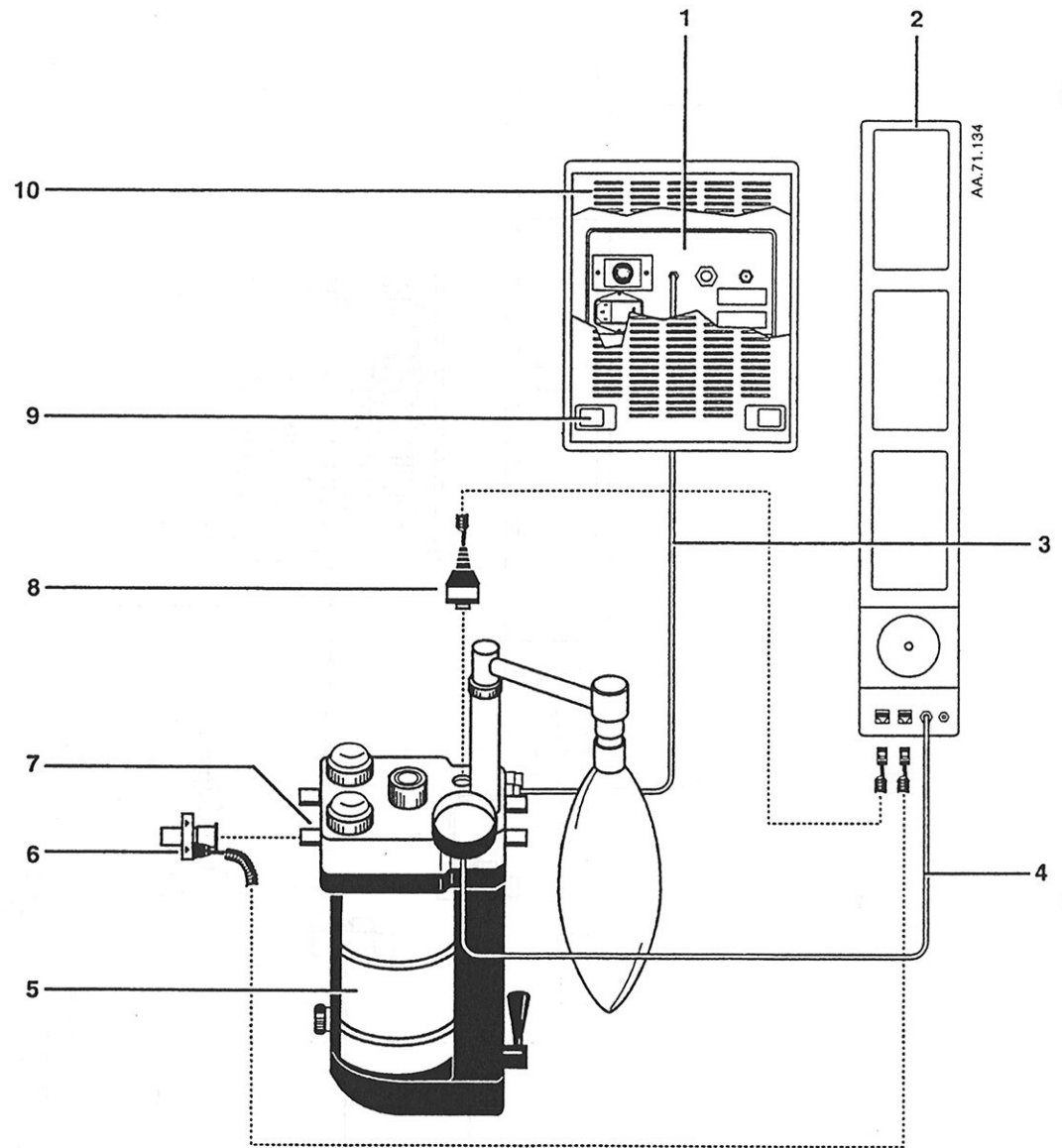
Sensor connections for a GMS Bain circuit



1. 7000 Ventilator (Rear View)
2. Rear Panel (Excels With A Mid Shelf)
3. Latches (Excels With A Mid Shelf)
4. Expiratory Pressure Sensing Line
5. O<sub>2</sub> Sensor
6. O<sub>2</sub> Sensor Adapter
7. Expiratory Port (Absorber)
8. Inspiratory Port (Absorber)
9. Expiratory Flow Sensor
10. Pressure Line Adapter
11. Inspiratory Pressure Sensing Line
12. Monitor Pod

**Figure 3-11**

Sensor connections for a 7000 Ventilator and Monitor Pod with a basic absorber and a circle breathing circuit



1. 7000 Ventilator (Rear View)
2. Monitor Pod
3. Expiratory Pressure Sensing Line
4. Inspiratory Pressure Sensing Line
5. GMS Absorber
6. Expiratory Flow Sensor
7. Expiratory Port (Absorber)
8. O<sub>2</sub> Sensor
9. Latches (Excels With A Mid Shelf)
10. Rear Panel (Excels With A Mid Shelf)

**Figure 3-12**

Sensor connections for a 7000 Ventilator and Monitor Pod with a GMS absorber and a circle breathing circuit



## 3/Setup

### WARNINGS

- ⚠ Use a ventilator that has a high pressure alarm and a relief system to keep the airway pressure at a safe level.
- ⚠ Use a reinforced Ohmeda tube between the ventilator and the bellows. Other tubes can close off or kink.
- ⚠ Drain the ventilator and the absorber tubes regularly.
- ⚠ Blocked or kinked exhaust or gas scavenging hoses can increase the pressure in the breathing circuit.
- ⚠ Use a gas-scavenging valve that has a positive and a negative pressure relief valve.
- ⚠ Make sure that the fresh gas hose is correctly attached to the common gas outlet and the absorber.

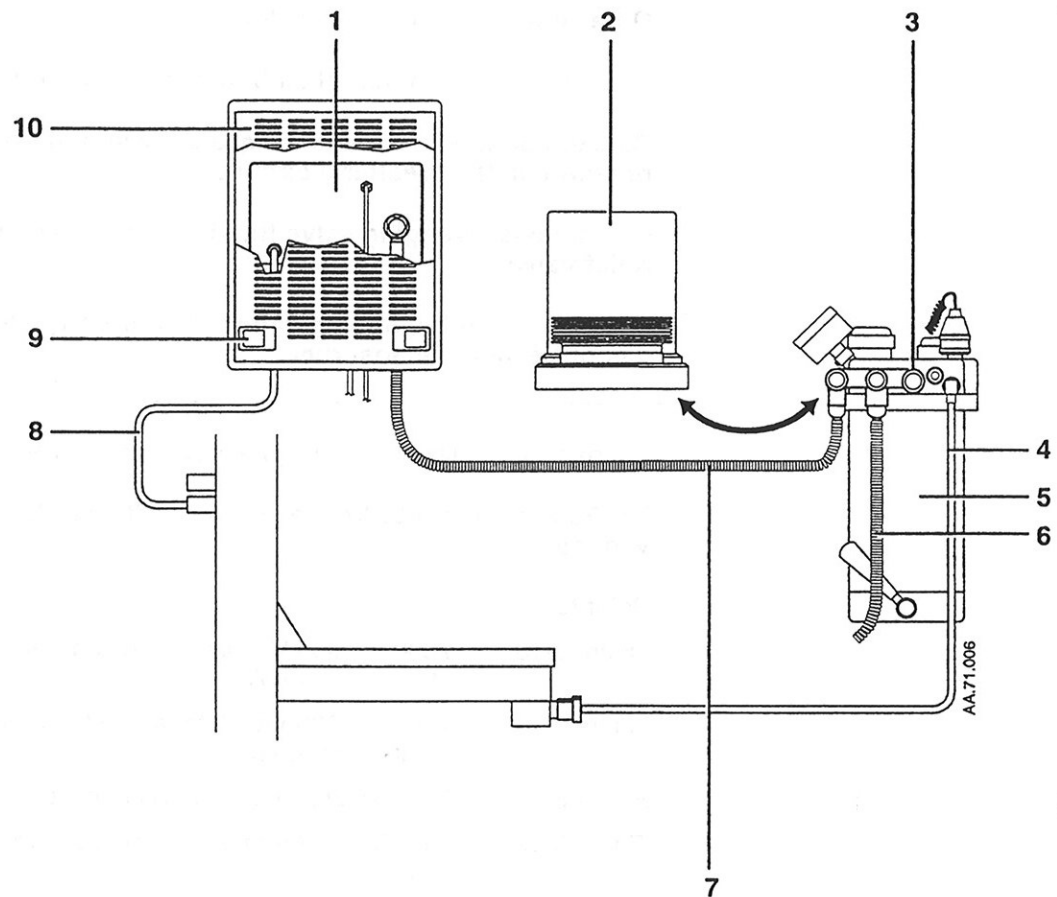
5. Connect the ventilator and the gas-scavenging system.

The 7800 and the 7000 Ventilators use a different absorber manifold than the 7900 Ventilator.

Refer to:

- |             |   |
|-------------|---|
| Figure 3-13 | 7800 or 7000 Ventilator and GMS absorber connections with an absorber manifold    |
| Figure 3-14 | 7800 or 7000 Ventilator and GMS absorber connections without an absorber manifold |
| Figure 3-15 | 7900 Ventilator and GMS connections with an absorber manifold                     |
| Figure 3-16 | 7900 Ventilator and GMS connections without an absorber manifold                  |

The 7900 Ventilator has more exhaust flow than older Ohmeda ventilators. Always use the new waste gas-scavenging valve with a 7900 ventilator.

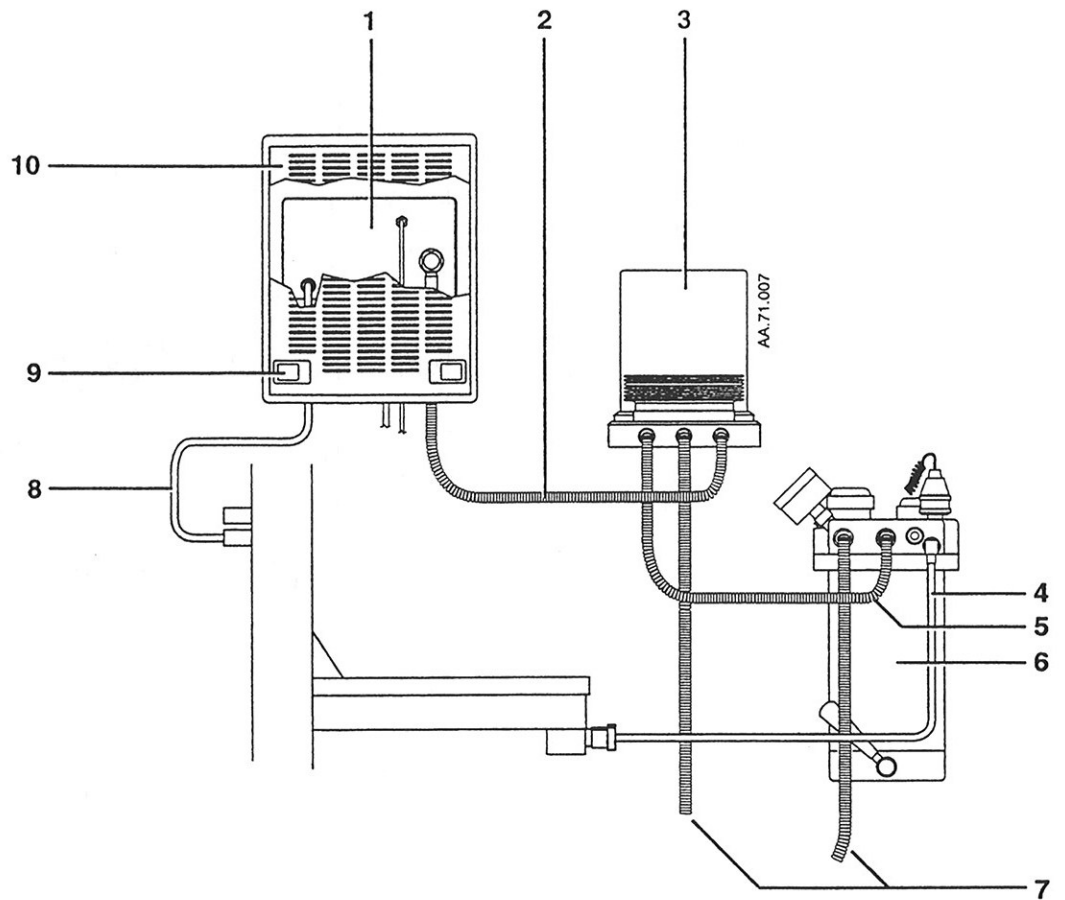


1. Ventilator (7800 Rear View)\*
2. Bellows Assembly
3. Interface Manifold (Connects to Absorber)
4. Fresh Gas Hose (Connects to Common Gas Outlet)
5. Absorber
6. Exhaust (to Gas-scavenging Valve)
7. Ventilator Drive Gas\*
8. Ventilator Supply (Connects to Pneumatic Outlet)\*
9. Latches (Excels With A Mid Shelf)
10. Rear Panel (Excels With A Mid Shelf)

\* 7000 Ventilators have the connectors in different locations. Refer to the labels on the ventilator.

**Figure 3-13**

7800 or 7000 Ventilator and GMS absorber connections with an absorber manifold

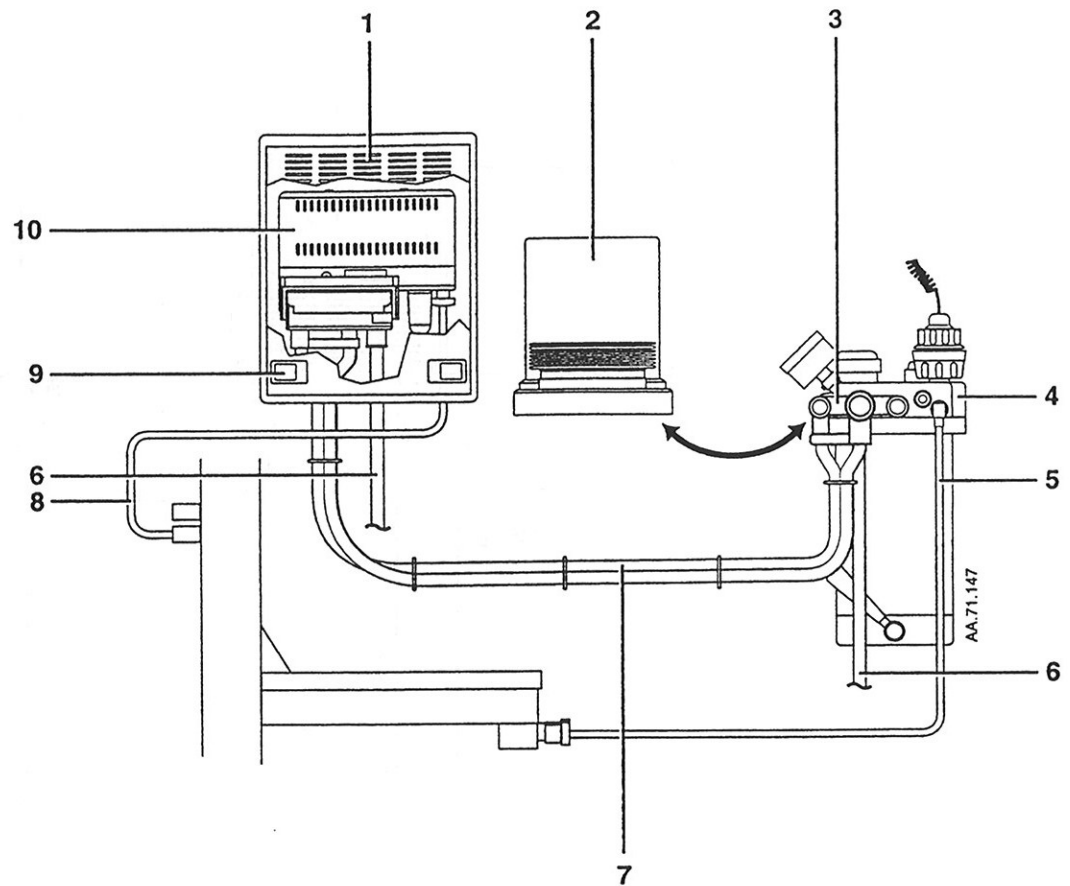


1. Ventilator (7800 Rear View)\*
2. Ventilator Drive Gas\*
3. Bellows Assembly
4. Fresh Gas Hose (Connects to Common Gas Outlet)
5. Absorber Ventilator Port
6. Absorber
7. Exhaust (Connects to Gas-scavenging Valve)
8. Ventilator Supply (Connects to Pneumatic Outlet)\*
9. Latches (Excels With A Mid Shelf)
10. Rear Panel (Excels With A Mid Shelf)

\* 7000 Ventilators have the connectors in different locations. Refer to the labels on the ventilator.

**Figure 3-14**

7800 or 7000 Ventilator and GMS absorber connections without an absorber manifold



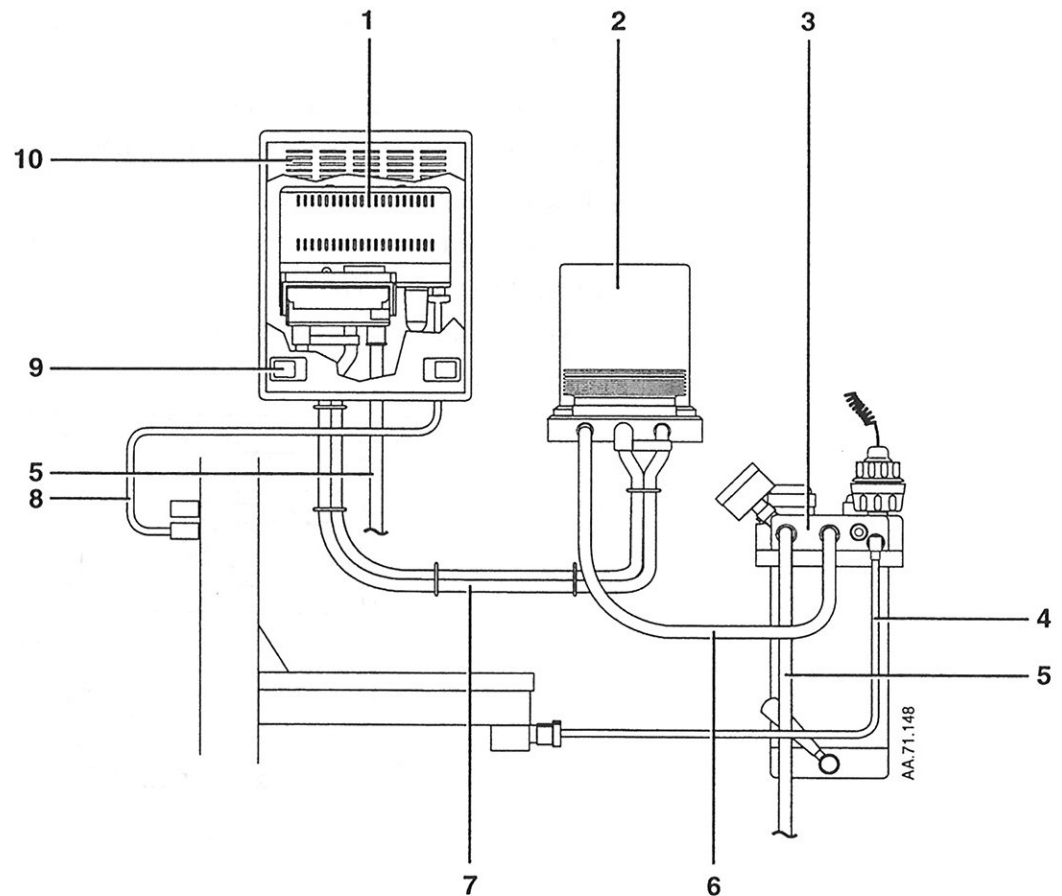
To correctly install the 30 to 19 mm adapter on the ventilator exhaust (item 6):

- Push the adapter on the exhaust port.
- Continue to push and turn the adapter both ways.
- Make sure that the adapter stays in position.

1. Rear Panel (Excels With A Mid Shelf)
2. Bellows Assembly
3. Manifold (Connects to the Bellows)
4. Absorber
5. Fresh Gas Hose (Connects to Common Gas Outlet)
6. Exhaust (to Gas-scavenging Valve)
7. Ventilator Drive Gas and Exhaust
8. Ventilator Supply (Connects to Pneumatic Outlet)
9. Latches (Excels With A Mid Shelf)
10. Ventilator (7900 Rear View)

**Figure 3-15**

7900 Ventilator and GMS connections with an absorber manifold



To correctly install a 30 to 19 mm adapter on the ventilator exhaust (item 5):

- Push the adapter on the exhaust port.
- Continue to push and turn the adapter both ways.
- Make sure that the adapter stays in position.

1. Ventilator (7900 Rear View)
2. Bellows Assembly
3. Absorber
4. Fresh Gas Hose (Connects to Common Gas Outlet)
5. Exhaust (Connects to Gas-scavenging Valve)
6. Absorber Ventilator Port
7. Ventilator Drive Gas and Exhaust
8. Ventilator Supply (Connects to Pneumatic Outlet)
9. Latches (Excels With A Mid Shelf)
10. Rear Panel (Excels With A Mid Shelf)

**Figure 3-16**

7900 Ventilator and GMS connections without an absorber manifold

# 3/Setup

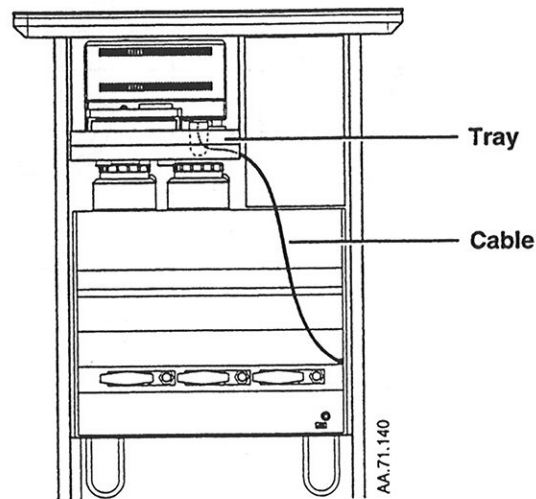
## WARNING

⚠ If the Excel interface cable is disconnected from the 7800 or 7900 Ventilator, monitor operation and ventilation stop.

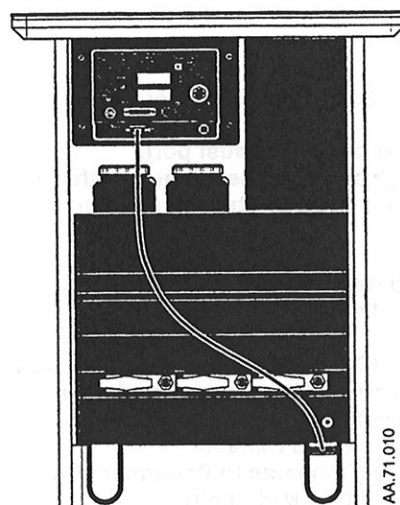
6. With a 7800 Ventilator, a 7900 Ventilator, or a Monitor Pod, connect the interface cable.

For a 7900 Ventilators installed on an Excel without a mid shelf:

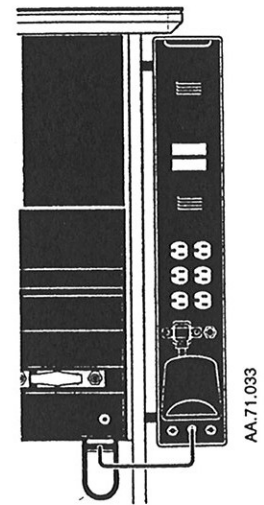
- Pull back on the knobs on the bottom of the tray.
- Pull the tray out about an inch.
- Connect the cable and put it through the hole on the side of the tray.
- Push the tray back into position.
- Make sure that the tray is locked in position.



7900 Ventilator on Excel SE without a Mid Shelf



7800 Ventilator



Monitor Pod

**Figure 3-17**  
Interface cables

## 3/Setup

---

7. Connect all power cables to electrical outlets.
8. If the Excel has a mid shelf, close the ventilator shroud:
  - Move the latches to the center.
  - Install the rear panel.
  - Release the latches.
9. Install an O<sub>2</sub> cylinder if necessary.
10. Turn all flow controls fully clockwise (minimum flow).
11. Continue with Section 4, "Preoperative Test Procedure."

# Notes

---



# 4/Preoperative Test Procedure

## In this section

Read this before you test the system .....	4-1
Initial tests .....	4-1
Electrical connections .....	4-2
Vaporizer installation .....	4-4
Test the vaporizer back pressure .....	4-4
Test the cylinder and pipeline supplies .....	4-5
Low-pressure leak test .....	4-6
Flow control tests .....	4-7
Breathing system tests .....	4-8
Monitor and ventilator tests .....	4-9

## Read this before you test the system

Refer to the applicable operation and maintenance manuals for complete instructions.

### WARNINGS

- ⚠ **Do not use the Excel 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 the Excel system:**
  - Remove all caps and plugs from the absorber and the vaporizer ports. The only plugs or caps permitted are on the Ohmeda gas-scavenging valve.
  - 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.**

## Initial tests

### WARNING

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

### CAUTION

- ⚠ **The shelf weight limits are:**
  - Excel 210 SE (With Mid Shelf) – Mid Shelf: 34 kg (75 lb); Top Shelf: 45 kg (100 lb)
  - Excel 210 SE (Without Mid Shelf) – Top Shelf: 56 kg (125 lb)
  - Excel 110 SE – Mid Shelf: 11 kg (24 lb); Top Shelf: 23 kg (50 lb)

## 4/Preoperative Test Procedure

---

1. Make sure that:
  - The casters are not loose.
  - All components are correctly attached.
  - The brake operates correctly.
  - The breathing circuit is correctly connected and not damaged.  
The total weight on each shelf is less than the weight limit.
  - The absorber contains sufficient CO<sub>2</sub> absorbent.
  - A gas-scavenging system is connected and the vacuum is set correctly.
2. Remove all caps and plugs from the absorber and the vaporizer ports. The only plugs or caps permitted are on the Ohmeda gas-scavenging valve.
3. Install the vaporizers if necessary. If the system has a Tec 6 Vaporizer, put it in the right hand position (next to the upright).
4. Make sure that these parts are not damaged:
  - Cylinder yokes
  - Pipeline inlets
  - Flowmeter and flow control valves
  - Pressure gauges
  - Vaporizers
  - Monitors and cables
  - Absorber
  - Ventilator
  - All hoses and tubing
5. Install the cylinders if necessary.
6. Make sure that a cylinder wrench is attached to the Excel.
7. Set the brake.
8. Make sure that necessary emergency equipment is available and in good condition.

## Electrical connections

---

### WARNINGS

- ⚠ To decrease the risk of electrical shocks:
  - Use a hospital-grade, grounded outlet.
  - Do not use extension cords or electrical adapters.
  - Make sure that the power cable is in good condition.
  - Regularly test the ground continuity.
- ⚠ If the ground connection is defective, equipment connected to the outlet box can increase the leakage current to more than 100µA on 120 VAC models or 500µA on 220/240 VAC models.

## 4/Preoperative Test Procedure

---

1. Set the system switch to Standby.
2. Connect the outlet box to an electrical outlet.
3. Connect the ventilator power cable to an electrical outlet.
4. Set the ventilator controls to decrease the number of alarms:

### **For the 7800 Ventilator:**

Tidal Volume: 200 mL

Rate: 10 breaths/min

Inspiratory Flow: 10 L/min

Inspiratory Pressure Limit: 50 cm H<sub>2</sub>O

Mechanical Ventilation: OFF

Low Minute Volume: 0.0 L/min

Low O<sub>2</sub>: 18%

High O<sub>2</sub>: 00%

### **For the 7900 Ventilator:**

*Touch switches:*

Apnea Monitor: OFF

Volume Monitor: Standby

Mechanical Ventilation: OFF

PLimit: 100 cm H<sub>2</sub>O

*Alarm menu:*

Low O<sub>2</sub>: 21%

High O<sub>2</sub>: OFF

Low Minute Volume: OFF

High Minute Volume: OFF

Low Minute or Tidal Volume: OFF

High Minute or Tidal Volume: OFF

### **For the 7000 Ventilator:**

ON/OFF Switch: OFF

5. Connect the interface cable to the Monitor Pod or the 7800 or 7900 ventilator.

# 4/Preoperative Test Procedure

## Vaporizer installation

### WARNINGS

- ⚠ Use only the Tec 4, Tec 5, and Tec 6 vaporizers. These are the only vaporizers that work with the interlock system to prevent agent mixtures.
- ⚠ 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 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.
- ⚠ The vaporizer storage bracket is not part of the vaporizer manifold. You cannot use a vaporizer while it is on the bracket.

1. If the top of a vaporizer is not horizontal, remove the vaporizer and install it again.
2. Set each vaporizer lock lever to the locked position.
3. Try to lift each vaporizer off of 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 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 come ON and the alarm speaker starts.
  - Release the alarm silence switch.
  - Do not continue until the operational indicator comes 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.

## Test the vaporizer back pressure

### WARNING

- ⚠ Anesthetic agent comes out of the common gas outlet during the low-pressure leak 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.

## 4/Preoperative Test Procedure

---

1. Connect the system power cable to an electrical supply.
2. Set the system switch to ON.  
  
Monitor, Excel, and ventilator alarms can occur.
3. Set the O<sub>2</sub> flow to 6 L/min. Make sure that the O<sub>2</sub> flow stays constant and the float moves freely.
4. Adjust the vaporizer concentration from 0 to 1% one click at a time. The O<sub>2</sub> flow must not decrease more than 1 L/min through the full range.  
  
If the O<sub>2</sub> flow decreases more than 1 L/min:
  - Install a different vaporizer and try this step again.
  - If the O<sub>2</sub> flow decreases less than 1 L/min with a different vaporizer, the malfunction is in the first vaporizer.
  - If the O<sub>2</sub> flow also decreases more than 1 L/min with a different vaporizer, the malfunction is in the Excel.
5. Complete steps 3 and 4 for each vaporizer.

### Test the cylinder and pipeline supplies

1. Disconnect the pipeline supplies and close all cylinder valves.
2. If the pipeline and the cylinder pressure gauges are not at zero:
  - Connect an O<sub>2</sub> supply.
  - Set the system switch to ON.
  - Set the flow controls to mid range.
  - Make sure that all gauges but O<sub>2</sub> go to zero.
  - Disconnect the O<sub>2</sub> supply.
  - Make sure that the O<sub>2</sub> gauge goes to zero.

As pressure decreases, alarms for low O<sub>2</sub> supply pressure can occur.

---

#### CAUTION

⚠ To prevent damage:

- Open the cylinder valves slowly.
  - Do not force the flow controls.
- 

3. Make sure that the cylinders are full:
  - Open each cylinder valve.
  - Make sure that each cylinder has sufficient pressure. If necessary, close the cylinder valve and install a full cylinder.
4. Test one cylinder at a time for high pressure leaks:
  - Record the cylinder pressure.
  - Close the cylinder valve.
  - Record the cylinder pressure after five minutes.

## 4/Preoperative Test Procedure

- If the pressure decreases more than 100 psig (690 kPa) there is a leak:  
Install a new cylinder gasket and tighten the tee handle.  
Do this step again. If the leak continues, do not use the system.
- 5. Connect the pipeline supplies.
- 6. Make sure that the pipeline pressure is approximately 45-55 psig (310-380 kPa).

### Low-pressure leak test

1. Test the leak test device:
  - Put your hand on the inlet of the leak test device. Push hard for a good seal.
  - Remove all air from the bulb.
  - If the bulb inflates in less than 60 seconds, replace the leak test device.
2. Set the system switch to Standby. This stops gas flow.

If the system uses a pneumatic alarm for low O<sub>2</sub> supply pressure, you will hear the alarm.
3. Turn all vaporizers OFF.

#### WARNING

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

4. Leak test the low-pressure circuit in the Excel:
  - a. Turn the flow controls one and a half turns counterclockwise.
  - b. Connect the test device to the common gas outlet.
  - c. Compress and release the bulb until it is empty.

The vacuum causes the floats to move. This is usual.
  - d. If the bulb inflates in 30 seconds or less, there is a leak in the low-pressure circuit.
  - e. Disconnect the test device.
  - f. For each vaporizer:
    - Set the vaporizer to 1%.
    - Do steps b, c, d, and e again.
    - Turn the vaporizer OFF-ON-OFF to remove the vacuum.
  - g. Keep the test device with the Excel.
  - h. Turn all flow controls fully clockwise (minimum flow). Do not tighten too much.

#### WARNINGS

- ⚠ **Agent mixtures from the low-pressure leak test stay in the Excel. Always flush the system with O<sub>2</sub> 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.**

## 4/Preoperative Test Procedure

---

5. Flush the system with O<sub>2</sub>:
  - Connect the common gas outlet to the breathing circuit and the scavenging system.
  - Set the system switch to ON.
  - Set the O<sub>2</sub> flow to 1 L/min.
  - Continue the O<sub>2</sub> flow for one minute.
  - Turn the O<sub>2</sub> flow control fully clockwise (minimum flow).
  - Set the system switch to Standby.

### Flow control tests

---

#### WARNINGS

- ⚠ **The Link 25 system cannot replace an O<sub>2</sub> monitor. Sufficient O<sub>2</sub> in the fresh gas does not prevent hypoxic mixtures in the breathing circuit.**
  - ⚠ **Incorrect gas mixtures can cause patient injury. If the Link 25 system does not supply O<sub>2</sub> and N<sub>2</sub>O in the correct proportions, do not use the Excel.**
  - ⚠ **During operation, use the O<sub>2</sub> flow control to increase total gas flow and the N<sub>2</sub>O flow control to decrease total gas flow.**
- 

1. Connect the pipeline supplies or slowly open the cylinder valves.
2. Turn all flow control valves fully clockwise (minimum flow).
3. Set the system switch to ON.

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

4. The O<sub>2</sub> flowtube must show approximately 200 mL/min.
  5. The other flowtubes must show no gas flow.
- 

#### WARNING

- ⚠ **Keep the link 25 system engaged during steps 6 and 7:**
    - **Adjust only the test control (N<sub>2</sub>O in step 6 and O<sub>2</sub> in step 7).**
    - **Test the flows in sequence.**
    - **If you adjust the test control too far, set the flow controls to their initial positions and do the step again.**
- 

6. Test the N<sub>2</sub>O flow control:
  - Turn the N<sub>2</sub>O and O<sub>2</sub> flow controls fully clockwise (minimum flow).
  - Set the N<sub>2</sub>O flow to the rates shown in the table.
  - The O<sub>2</sub> flow must be between the maximum and the minimum limits.

## 4/Preoperative Test Procedure

### Set the N<sub>2</sub>O flow control to:

0.9 L/min  
1.5 L/min  
3.0 L/min  
6.0 L/min  
9.0 L/min

### The O<sub>2</sub> flow must be:

#### Minimum Maximum

0.24 L/min 0.36 L/min  
0.40 L/min 0.61 L/min  
0.79 L/min 1.22 L/min  
1.58 L/min 2.44 L/min  
2.37 L/min 3.66 L/min

#### 7. Test the O<sub>2</sub> flow control:

- Set the N<sub>2</sub>O flow to 9.0 L/min.
- Set the O<sub>2</sub> flow to 3 L/min or higher.
- Set the O<sub>2</sub> flow to the rates shown in the table.
- The N<sub>2</sub>O flow must be between the maximum and the minimum limits.

### Set the O<sub>2</sub> flow control to:

3.0 L/min  
1.0 L/min  
0.5 L/min  
0.3 L/min

### The N<sub>2</sub>O flow must be:

#### Minimum Maximum

7.36 L/min 11.41 L/min  
2.46 L/min 3.80 L/min  
1.23 L/min 1.90 L/min  
0.74 L/min 1.14 L/min

8. Set the flow controls to mid range and make sure that the flowtube floats move smoothly.
9. Stop the O<sub>2</sub> supply. Disconnect the pipeline supply or close the cylinder valve.
10. Make sure that:
  - A low O<sub>2</sub> supply alarm occurs.
  - All gas flows stop. The O<sub>2</sub> flow stops last.
  - Gas supply alarms occur on the ventilators.
11. Turn all of the flow controls fully clockwise (minimum flow). Do not turn the controls too tight.

## Breathing system tests

Refer to the applicable operation and maintenance manuals. At a minimum:

1. Make sure that the auxiliary equipment (PEEP valve, humidifier, etc.) operates correctly.
2. The inspiratory gas does not have an odor.
3. Make sure that the absorber check valves work correctly.
4. Test the ventilator circuit for leaks:

(Refer to the ventilator operation and maintenance manual if the system does not use a standard Ohmeda bellows assembly with an absorber.)

- Set the Bag/APL-Ventilator switch to Ventilator.
- Set all flow controls to minimum.



# 4/Preoperative Test Procedure

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

- 
- Close the breathing circuit at the patient connection. Use your hand or an approved test plug.
  - Push flush to fill the bellows.
  - The pressure must not increase to more than 15 cm H<sub>2</sub>O.
  - Set the system switch to Standby.
  - If the bellows falls more than 100 mL/min, it has a leak. Refer to the ventilator operation and maintenance manual.
  - Set the system switch to ON.

### 5. Test the Bag/APL circuit for leaks:

With a GMS Absorber

- Set the Bag/APL-Ventilator switch to Bag/APL.
- Close the APL valve.
- Close the patient connection (hand or test plug) and inflate the bag (flush) to 30 cm H<sub>2</sub>O.
- Release the flush button.
- The pressure must not decrease.

### 6. Test the APL valve:

- Set the Bag/APL-Ventilator switch to Bag/APL.
- Fully open the APL valve.
- Make sure that the value on the inspiratory pressure gauge decreases to approximately zero.
- Push the flush button and make sure that the value on the inspiratory pressure gauge stays near zero.
- Set the O<sub>2</sub> flow to minimum and make sure that the value on the inspiratory pressure gauge does not decrease below 0 cm H<sub>2</sub>O.

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

## Monitor and ventilator tests

### Important

Ohmeda strongly recommends that you use O<sub>2</sub> monitoring with this equipment. Refer to local standards for mandatory monitoring.

Refer to the applicable operation and maintenance manuals for more instructions.

1. Make sure that all monitors operate correctly. Examine sensors, connections, and monitor accessories (ECG leads, BP cuff, temperature probes, etc.)

# 4/Preoperative Test Procedure

2. Make sure that the O<sub>2</sub> sensor operates correctly:

At a minimum, make sure that:

- The O<sub>2</sub> concentration is 21% in room air.
- The low O<sub>2</sub> alarm operates correctly. Set the alarm limit to 50% with the sensor in room Air. A low O<sub>2</sub> alarm must occur.
- After two minutes in 100% O<sub>2</sub>, the O<sub>2</sub> concentration is approximately 100%.

With a Monitor Pod, open the lower front panel of the O<sub>2</sub> monitor and complete the tests instructions on the inner surface.

3. Make sure that the ventilator operates correctly and test the alarms:

With a 7900 Ventilator:

- a. Connect a test lung to the patient connection.
- b. Set the controls:

**Vent. Menu**

Mode: Volume control

**Vent. Touch Switches**

Mech.Vent: ON  
Tidal Vol: 400 mL  
Rate: 12 breaths/min  
I:E ratio: 1:2  
PLimit: 40 cm H<sub>2</sub>O  
PEEP: OFF

**Excel**

Excel: 200 mL/min O<sub>2</sub>

**Absorber**

Bag APL/Vent switch: Vent

- c. Make sure that:
  - A sub atmospheric pressure alarm does not occur.
  - The ventilator displays the correct data.
  - The bellows inflate and deflate during mechanical ventilation.
- d. Set the O<sub>2</sub> flow on the Excel to 5 L/min.
- e. Make sure that:
  - The end expiratory pressure is approximately 0 cm H<sub>2</sub>O.
  - The ventilator displays the correct data.
  - The bellows inflate and deflate during mechanical ventilation.
- f. 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.
- g. Test the high airway pressure alarm:
  - Set PLimit to less than the peak airway pressure.
  - Make sure that the high airway pressure alarm occurs.
  - Set PLimit to the correct level.

## 4/Preoperative Test Procedure

---

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

- i. Test the sustained airway pressure alarm:

- Set the controls:

**Vent. Panel**

Mech. Vent:      OFF

**Absorber**

Bag-APL/

Vent Switch:      Bag-APL

APL Valve:      Closed

- Close the patient connection and push the Flush button.
- Make sure that the sustained pressure alarm occurs.

With ventilator other than the 7900, make sure that:

- a. With 200 mL/min O<sub>2</sub> on the Excel, airway pressure is positive.
  - b. With 5 L/min O<sub>2</sub> on the Excel, there is no sustained end expiratory pressure.
  - c. Ventilator alarms work correctly.
  - d. The ventilator operates correctly.
  - e. The bellows inflate and deflate during mechanical ventilation.
- 4. Set the ventilator controls and alarm limits.
  - 5. With the monitor pod:
    - a. Set the pressure monitor switch to OFF.
    - b. Set the O<sub>2</sub> monitor switch to ON.
    - c. Set the volume monitor switch to OFF.
    - d. Set the system switch to ON.
    - e. On the pressure monitor make sure that:
      - You hear a brief alarm and all indicators come ON.
      - Only the zero indicator stays ON.
      - The system failure indicator does not come ON.
    - f. Open the bottom front panel of the volume monitor. Complete the test on the label.
  - 6. If the Excel will not be used immediately, set the system switch to "Standby" and close all cylinder valves.
  - 7. Make sure that you have:
    - Equipment for: airway maintenance, manual ventilation, tracheal intubation, and IV administration.
    - Applicable anesthetic and emergency drugs.

## 4/Preoperative Test Procedure

---

8. Prepare the system:

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

---

### WARNINGS

- ⚠ **Make sure that the breathing circuit is correctly connected and not damaged.**
  - ⚠ **Before you connect a patient, flush the anesthesia machine with 5 L/min of O<sub>2</sub> for at least one minute. This removes unwanted mixtures and byproducts from the system.**
-

# 5/Maintenance

## In this section

Minimum maintenance schedule .....	5-1
Operator service .....	5-2
Ohmeda approved service .....	5-3
How to clean and sterilize this equipment .....	5-3
To clean .....	5-4
To sterilize .....	5-5
Rubber items .....	5-6
How to replace Monitor Pod monitors .....	5-6
How to close circuit breakers .....	5-8
Monitor Pod circuit breaker .....	5-8
Outlet box circuit breaker .....	5-9

### WARNING

#### **⚠ To prevent fires:**

- Use lubricants approved for anesthesia or O<sub>2</sub> equipment, such as Krytox®.
- Do not use lubricants that contain oil or grease. They burn or explode in high O<sub>2</sub> concentrations.
- All covers used on the Excel system must be made from antistatic materials. Static electricity can cause fires.

## Minimum maintenance schedule

These schedules show the minimum frequency. You will have to service the equipment more frequently if you:

- Use it in unusual conditions (dirty gas supplies, high temperature, high humidity, etc.)
- Use it more frequently.

Before you clean or sterilize the equipment, refer to the section "How to clean and sterilize this equipment."

# 5/Maintenance

## Operator service

This schedule lists the minimum frequencies for operator service. Examine all components and do the maintenance procedures more frequently if necessary.

Frequency	Maintenance
Daily	<ul style="list-style-type: none"><li>• Clean the external surfaces</li><li>• Calibrate the O<sub>2</sub> sensor in room air (21% O<sub>2</sub>)</li><li>• Make sure that the airway pressure reads zero at atmospheric pressure.</li></ul>
Two weeks	<ul style="list-style-type: none"><li>• Drain the vaporizers and discard the agent.</li></ul>
Monthly	<ul style="list-style-type: none"><li>• Calibrate the O<sub>2</sub> sensor with 100% O<sub>2</sub></li><li>• Put Krytox on all tee handle threads.</li></ul>
Annually	<ul style="list-style-type: none"><li>• Adjust the gain of the pressure monitor (Monitor Pod)</li><li>• Replace the external o-rings on the vaporizer ports</li><li>• Replace the supply gas filter (7900 Ventilator)</li><li>• Replace the expiratory valve block o-rings, diaphragm, gasket, and port gasket (7900 Ventilator)</li></ul>
As necessary	<ul style="list-style-type: none"><li>• Install new cylinder gaskets on cylinder yokes.</li><li>• Replace the absorbent in the absorber.</li><li>• Replace the O<sub>2</sub> sensor or sensor cartridge.</li><li>• Calibrate the flow transducers (7900 Ventilator)</li><li>• Replace the flow sensors on the 7900 Ventilator.</li><li>• Replace the volume sensor cartridge on the 7800 Ventilator, or the Monitor Pod.</li><li>• Replace autoclavable bellows components.</li><li>• Ventilator leak test (7900 Ventilator after you service or clean the expiratory valve)</li><li>• Drain the bowl on the water trap (7900 Ventilator)</li><li>• Charge the Ventilator battery.</li><li>• Drain the GMS Absorber.</li><li>• Replace the O<sub>2</sub> monitor battery (Monitor Pod)</li><li>• Charge the volume monitor battery (Monitor Pod)</li><li>• Charge the pressure monitor battery (Monitor Pod)</li></ul>

## 5/Maintenance

---

### Ohmeda approved service

Frequency	Maintenance
As scheduled	<ul style="list-style-type: none"><li>• Have an approved service person complete the service level tests and scheduled service maintenance on all system components.</li><li>• Send Ohmeda Tec 4, Tec 5, and Tec 6 Vaporizers to an approved Ohmeda service center for maintenance.</li></ul>

## How to clean and sterilize this equipment

---

### WARNING

- ⚠ Obey applicable safety precautions:
- Read the material data sheet for each cleaning agent.
  - Read the operation and maintenance manual for all sterilization equipment.
  - Isolate items sterilized with ethylene oxide. They give off ethylene oxide gas (poisonous) for many hours.
  - Wear gloves and safety glasses. The potassium hydroxide in the O<sub>2</sub> sensor can cause burns.
  - Do not breathe the fumes.
- 

### CAUTION

- ⚠ To prevent damage:
- If you have questions about a cleaning agent, refer to the manufacturer's data.
  - Do not use organic, halogenated, or petroleum based solvents, anesthetic agents, glass cleaners, acetone, or other harsh cleaning agents.
  - Do not use abrasive cleaning agents (such as steel wool, silver polish or cleanser).
  - Keep all electronic parts away from liquids.
  - Do not permit liquid to go into the equipment housings.
-

# 5/Maintenance

## To clean

Refer to the applicable operation and maintenance manuals for complete instructions.

Item	Procedure
External surfaces	Use a moist cloth and a neutral detergent (pH 7 to 10.5).
Sensors (Monitor Pod or 7800 Ventilator)	<p>Disassemble the sensors if necessary.</p> <p>Sensor housings: Use a moist cloth. Do not put the volume sensor clip and the part of the O<sub>2</sub> sensor housing with the cable into the cleaning solution.</p> <p>Volume sensor cartridge: Clean the external surfaces with a moist cloth or soak it in a cleaning agent. Dry the cartridge before you use it. To prevent damage, do not drop the volume sensor cartridge or use a brush to clean it.</p> <p>O<sub>2</sub> sensor cartridge: Do not put the cartridge in a cleaning solution. Clean it with a cloth moist with distilled water or isopropyl alcohol. The cartridge contains potassium hydroxide (caustic).</p>
Sensors (7900 Ventilator)	<p>O<sub>2</sub> sensor adapter: Use a moist cloth or soak it in a cleaning solution.</p> <p>O<sub>2</sub> sensor: Do not put the O<sub>2</sub> sensor in cleaning solution. Clean it with a cloth moist with distilled water or isopropyl alcohol. The sensor contains potassium hydroxide (caustic).</p> <p>Flow sensors: Use a damp cloth on external surfaces. Do not put the cloth into the sensor.</p>
Bellows assembly (Ventilator)	Disassemble first. Clean each part separately. Use a neutral detergent (pH 7 to 10.5).
Expiratory valve (7900 Ventilator)	Remove and disassemble first. Clean each part separately. Use a neutral detergent (pH 7 to 10.5).



## 5/Maintenance

### To sterilize

Refer to the applicable operation and maintenance manuals for complete instructions.

Item	Sterilization Procedure
Ventilator control module and Monitor Pod	Do not sterilize
Bellows Assembly (Ventilator)	Autoclave (Autoclavable Bellows Assembly only). Disassemble first. Some parts cannot be autoclaved.
Expiratory valve (7900 Ventilator)	Remove from the ventilator and autoclave.
Sensors (7900 Ventilator)	Flow sensors: Use cold ethylene oxide gas. Do not autoclave.  O <sub>2</sub> sensor: Do not autoclave or put the O <sub>2</sub> sensor in cleaning solution. Refer to the cleaning instructions.  O <sub>2</sub> sensor adapter: Ethylene oxide
Sensors (Monitor Pod or 7800 Ventilator)	Volume sensor cartridge: Ethylene oxide Liquid cleaning agents: Clean the external surface with a moist cloth or soak it in a disinfectant. Dry the cartridge before you use it. To prevent damage, do not drop the volume sensor cartridge or use a brush to clean the inner surface.  Volume sensor clip: Use a moist cloth with disinfectant. Do not put the volume sensor clip into the disinfectant solution.  O <sub>2</sub> sensor cartridge: Do not autoclave or put the O <sub>2</sub> sensor cartridge in cleaning solution. Refer to the cleaning instructions.  O <sub>2</sub> sensor housing: Ethylene oxide (front half of housing only) Liquid cleaning agents: Use a cloth moist with disinfectant. Do not put the rear O <sub>2</sub> sensor housing (the part with the cable) into the disinfectant solution.
Hoses & reusable breathing circuits (7900 Ventilator)	Autoclave
Rubber or plastic	Ethylene oxide, liquid cleaning agents, or autoclave (if the part has a 134°C mark)

## 5/Maintenance

---

Item	Sterilization Procedure
GMS Absorber	Ethylene oxide – disassemble first.
Manifold for GMS Absorber	Autoclave

### Rubber items

To extend the life of rubber items:

- Before you put them away, remove all the metal connectors.
- Keep them in the dark, away from ozone sources (fluorescent lights, electrical motors, and diathermy machines) and high O<sub>2</sub> concentrations.
- Keep them away from ether, mineral or vegetable oils, phenols, cresols, terpenes, hydrocarbon solvents, chlorinated hydrocarbons, esters, or oxidizing agents.

### WARNING

**⚠ Do not use talc, zinc stearate, calcium carbonate, corn starch or equivalent materials to prevent tackiness. These materials can go into the patient's respiratory tract and cause irritation or injury.**

---

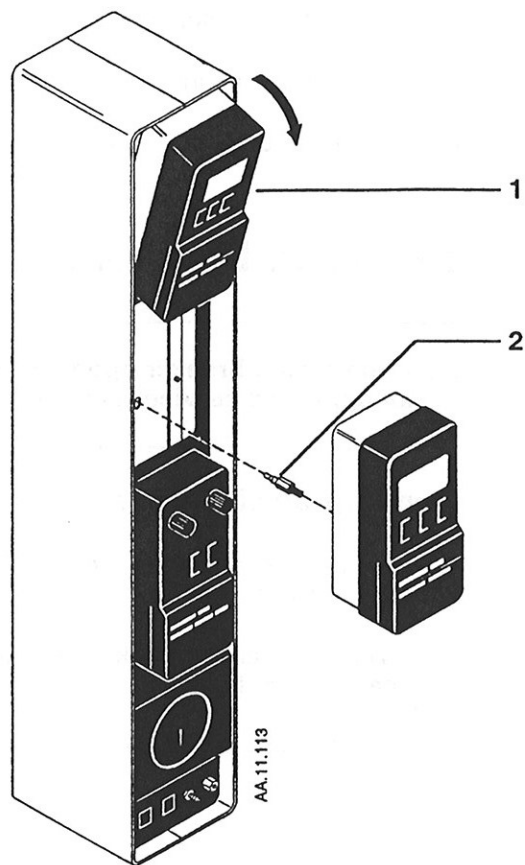
Examine all rubber items regularly and replace them when you find:

- Swelling
- Tackiness
- Cracks

The electrical conductivity of conductive rubber decreases with time.

## How to replace Monitor Pod monitors

1. Hold the monitor near the top and pull it forward until the latch releases.
2. Pull the monitor out at an angle.
3. Disconnect the cables and all tubes from the monitor.
4. Remove the ball joint and install it on the new monitor.



1. Monitor
2. Ball Joint

**Figure 5-1**  
How to replace a monitor

### WARNING

⚠ Always look at the label on the cable before you connect it to the monitor. Incorrect connections cause incorrect values and damage to the monitors.

5. Connect the cables and tubing:

Monitor	Connector Label
O <sub>2</sub>	Sensor
Volume	Sensor
Airway Pressure	Power
Airway pressure	Clear tube (no label)

## 5/Maintenance

6. Position the monitor at an angle and align the ball joint connector.
7. Push the monitor into the pod until it locks into position.
8. Complete Section 4, Preoperative Test Procedure, before you use the Excel System.

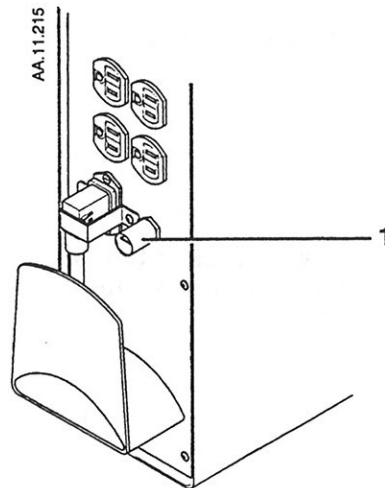
### How to close circuit breakers

#### WARNING

- ⚠ If the circuit breaker opens frequently, do not use the Excel system. Have an approved service representative repair the Excel system.

#### Monitor Pod circuit breaker

1. Look at the circuit breaker on the rear panel. If the toggle switch points down, the circuit breaker is open.
2. To close the circuit breaker, push the toggle switch up, in the direction of the arrow near the circuit breaker.
3. The total current must be less than 9 amps or the circuit breaker will open again.



1. Circuit Breaker

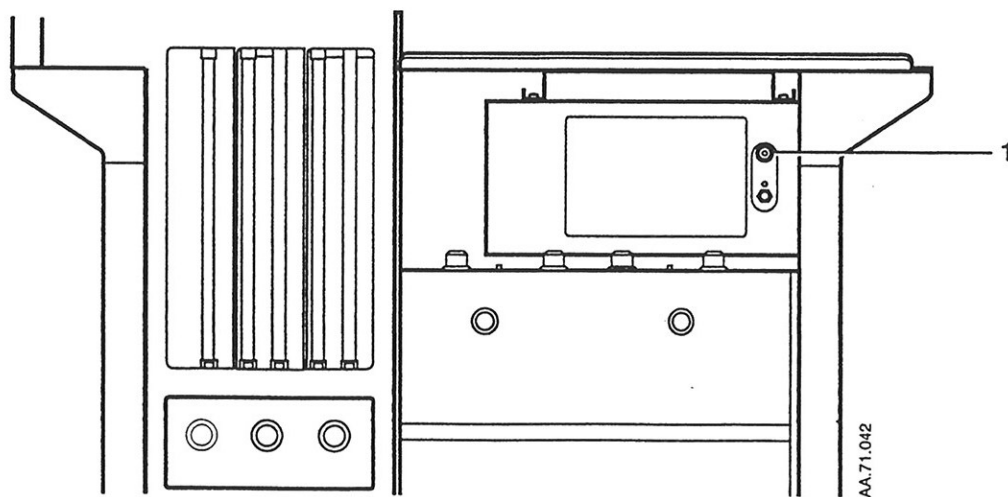
**Figure 5-2**

How to close the Monitor Pod circuit breaker

## 5/Maintenance

### Outlet box circuit breaker

1. Look at the circuit breaker on the outlet box. If the button comes out from the panel, the circuit breaker is open.
2. Push the button in to close the circuit breaker.
3. The total current must be less than 9 amps or the circuit breaker will open again.



1. Circuit Breaker

**Figure 5-3**

How to close the outlet box circuit breaker

# Notes

---

# 6/Troubleshooting

## In this section

Repair policy .....	6-1
Pneumatics problems .....	6-1
Electrical problem – Monitor Pod Excel System .....	6-2
Electrical problem – Outlet box systems .....	6-3

## Repair policy

Do not use malfunctioning equipment. Make all necessary repairs, or have the equipment serviced by an Authorized Ohmeda Service Representative. After repair, test the equipment to ensure that it is functioning properly, in accordance with the manufacturer's published specifications.

To ensure full reliability, have all repairs and service done by an Authorized Ohmeda Service Representative. If this cannot be done, replacement and maintenance of those parts listed in this manual may be undertaken by a competent, trained individual having experience in the repair of devices of this nature.

### CAUTION

⚠ No repair should ever be attempted by anyone not having experience in the repair of devices of this nature.

Replace damaged parts with components manufactured or sold by Ohmeda. Then test the unit to ascertain that it complies with the manufacturer's published specifications.

Contact the Ohmeda Field Service Support Center for service assistance. In all cases, other than where Ohmeda's warranty is applicable, repairs will be made at Ohmeda's current list price for the replacement part(s) plus a reasonable labor charge.

## Pneumatics problems

Symptom	Problem	Solution
Low-pressure leak test failure with a vaporizer ON.	Incorrectly installed vaporizer.	Correctly install the vaporizer.
	The vaporizer fill spout is loose (fill port type vaporizers)	Tighten the fill port.
	Vaporizer port o-rings (external) are not installed or are damaged.	Install new o-rings.
	A vaporizer malfunction (the leak stops if you use a different vaporizer).	Send the vaporizer to an Ohmeda Service Center.
	A port valve malfunction (the leak continues if you use a different vaporizer in the same manifold position).	Contact an approved service person to repair the vaporizer manifold.

## 6/Troubleshooting

Symptom	Problem	Solution
High pressure leak or a ventilator gas supply failure (ventilator alarm).	The cylinder is not correctly installed (only one gasket, gasket is in good condition, the tee handle is tight).	Correctly install the cylinder.
	The pneumatic outlet connections have a leak.	Correctly connect the outlet. Replace the hose if it has a leak.
	Internal high pressure leak .	Have a service representative repair the Excel.

### Electrical problem – Monitor Pod Excel System

Symptom	Problem	Solution								
Power failure alarms do not occur.	The Monitor Pod battery is weak.	Connect the Monitor Pod to an electrical socket and charge the battery for 14 hours.								
The system switch does not turn the monitors ON.	The monitor ON/OFF switches are not set correctly.	Set switches: <table><tr><th>Monitor</th><th>Switch</th></tr><tr><td>Volume</td><td>ON</td></tr><tr><td>O<sub>2</sub></td><td>OFF</td></tr><tr><td>Pressure</td><td>OFF</td></tr></table>	Monitor	Switch	Volume	ON	O <sub>2</sub>	OFF	Pressure	OFF
	Monitor	Switch								
	Volume	ON								
O <sub>2</sub>	OFF									
Pressure	OFF									
	The Monitor Pod cable is not connected to the Excel.	Connect the cable.								
	The Monitor Pod battery is weak.	Charge the battery. Refer to the Monitor Pod section.								
Power failure alarms occur, the light, monitors and electrical outlets do not have power.	The Monitor Pod power cable is not connected.	Connect the Monitor Pod power cable.								
	The circuit breaker is open.	Close the circuit breaker.								
	The power cable is damaged.	Replace the power cable.								
	The electrical socket the power cable connects to has no power.	Use a different electrical socket.								
Power failure alarms occur and monitors do not work but electrical outlets have power.	The internal fuse is open.	Set the monitor switches for battery operation: <table><tr><th>Monitor</th><th>Switch</th></tr><tr><td>Volume</td><td>Cycle Standby to ON</td></tr><tr><td>O<sub>2</sub></td><td>ON</td></tr><tr><td>Pressure</td><td>ON</td></tr></table>	Monitor	Switch	Volume	Cycle Standby to ON	O <sub>2</sub>	ON	Pressure	ON
	Monitor	Switch								
Volume	Cycle Standby to ON									
O <sub>2</sub>	ON									
Pressure	ON									
		Have an approved service person replace the fuse.								



## 6/Troubleshooting

Symptom	Problem	Solution
The circuit breaker opens more than one time.	Equipment connected to the electrical outlets uses more than 9 amps.	Use a different power supply for some of the equipment.
The light does not come ON but the system has power.	The light switch is set to OFF.	Set the light switch to ON.
	The light cable is disconnected.	Connect the light transformer.

### Electrical problem – Outlet Box Systems

Symptom	Problem	Solution
The light will not come ON.*	The light switch is set to OFF.	Set the light switch to ON.
	The light cable is not connected.	Connect the cable.
	The internal fuse is open.	Have a service representative repair the Excel.
The system switch does not turn ON the 7800 or 7900 Ventilator (no power failure alarms).	The Excel/Ventilator cable is disconnected.	Connect the cable.
Power failure alarms occur. The light, the ventilator and the electrical outlets do not have power.	The outlet box power cable is disconnected.	Connect the power cable.
	The power cable is damaged.	Replace the power cable.
	The electrical socket the power cable connects to has no power.	Use a different electrical socket.
	The circuit breaker is open.	Close the circuit breaker.
Ventilator power failure alarm occurs but the electrical outlets have power.	The ventilator power cord is disconnected.	Connect the ventilator power cord to the outlet box.
The circuit breaker opens more than one time.	Equipment connected to the electrical outlets uses more than 9 amps.	Use a different power supply for some of the equipment.
	The system switch is set to Standby.	Set the switch to ON.
	The Excel/Ventilator cable is disconnected.	Connect the cable.
	The Excel/Ventilator cable is damaged.	Replace the cable.

\* Some models do not have a light.

# Notes

---

## 7/Illustrated Parts

For tubing and sensor components, refer to the applicable operation and maintenance manual.

### Excel parts

Part	Stock Number
Vaporizer port o-ring (external) set of 6	1102-3016-000
Fresh gas hose (bayonet type)	0236-0042-800
Cylinder gasket	0210 5022-300
Handle for yoke tee	0219-3372-600
Yoke plug	0206-3040-542
Neg-low-pressure leak test device	0309-1318-800
Excel 7900 Ventilator interface cable	1503-3075-000
Excel 7800 Ventilator interface cable	1500-3348-000
Light transformer (light w/ Monitor Pod)	1001-3948-000
Excel Monitor Pod interface cable	1001-7938-000
GMS Mounting Pin	1010-8074-000
Test lung	0219-7210-300
Test plugs	2900-0001-000
Krytox	1001-3854-000

### System operation and maintenance manuals (English)

Manual	Stock Number
7000 Ventilator	1502-0008-000
7800 Ventilator	1500-0062-000
7900 Ventilator	1503-0140-000
5120 Oxygen Monitor	0178-1757-000
5500 Airway Pressure Monitor	6050-0000-461
5420 Volume Monitor	6050-0000-204
GMS Absorber	0178-1742-000
GMS Bain Adapter	0178-1752-000
GMS PEEP Valve	0178-1753-000
Tec 5 Vaporizer	1105-0100-000
Tec 6 Vaporizer	1107-0102-000
Gas Scavenging Valve	0178-1728-000

# Notes

---

# Appendix

## Pneumatic circuits

Excel parts include:

- The gas supply modules
- The system switch
- The shutoff valves
- The flowtubes and the flow controls
- The vaporizer assemblies
- The flush valve
- The alarm for low O<sub>2</sub> supply pressure
- Pneumatic outlets

The usual gas supply module has two pneumatic circuits, pipeline and cylinder. The pipeline circuit has a pipeline connection, a filter and a pipeline pressure gauge. The cylinder circuit has a cylinder connection, a filter, a cylinder gauge, and the primary regulator. The two circuits use the same pressure relief valve.

Plugs help prevent leaks when cylinders are not connected.

The Excel can use cylinder and pipeline supplies at the same time. When you use pipeline supplies, close the cylinder valves to keep cylinder supplies for emergencies.

O<sub>2</sub> and air flow directly to the pneumatic outlets to supply drive gas for pneumatic accessories.

Shutoff valves control the flow of N<sub>2</sub>O and the optional gas (air or heliox) to the flow control valves. Oxygen pressure at a control port opens the shutoff valves. When the system switch is set to "Standby" the valves are closed. When the system switch is set to "ON," O<sub>2</sub> pressure opens the shutoff valves. As long as the O<sub>2</sub> control pressure is higher than the minimum level, the shutoff valves stay open. If pressure decreases to less than the minimum level, the shutoff valves close and flow stops.

When the system switch is "ON," a minimum 200 mL/min of O<sub>2</sub> (approximate value) flows through the Excel.

Secondary regulators decrease the O<sub>2</sub> and N<sub>2</sub>O pressures to the levels necessary for the flow controls. The optional gas goes directly from the shutoff valve to the flow control. A chain linkage on the N<sub>2</sub>O and O<sub>2</sub> flow controls helps keep the O<sub>2</sub> concentration higher than 25% (approximate value) at the common gas outlet for O<sub>2</sub> and N<sub>2</sub>O mixtures. A system of mechanical stops limits the maximum and minimum flows.

The mixed gas output of the flowmeter assembly goes through the vaporizer that is ON to the common gas outlet and into the breathing circuit. A pressure relief valve on the common gas outlet sets the maximum outlet pressure.

The flush valve supplies high flows of O<sub>2</sub> to the common gas outlet when you push the flush button. This gas does not go through the system switch.

Excels sold without a 7900 Ventilator use a pneumatic alarm for low O<sub>2</sub> supply pressure. The same pilot pressure that opens the shutoff valves fills the alarm canister. The alarm regulator keeps the O<sub>2</sub> in the canister as long as supply pressure is higher than the alarm limit. If the O<sub>2</sub> supply pressure is less than the alarm limit, gas exits the canister through the alarm regulator to a flow regulator and a reed alarm.

Excels sold with a 7900 Ventilator use a ventilator alarm for low O<sub>2</sub> supply pressure. The same pilot pressure that opens the shutoff valves, closes a switch. If the O<sub>2</sub> supply pressure is less than the alarm limit, the switch opens and an alarm occurs on the 7900 Ventilator.

# Appendix






## Key to Subassembly Abbreviations

CGO	Common Gas Outlet
CYL	Cylinder Yoke
GSM	Gas Supply Module (O <sub>2</sub> , N <sub>2</sub> O, Air, Heliox)
FM	Flowmeter
PA	Pneumatic Alarm (triggers at 30 psig, 207 kPa)*
PL	Pipeline Connection (50 psig, 345 kPa)*
PO	Power Outlet (O <sub>2</sub> ) Located on rear
VM	Vaporizer Manifold

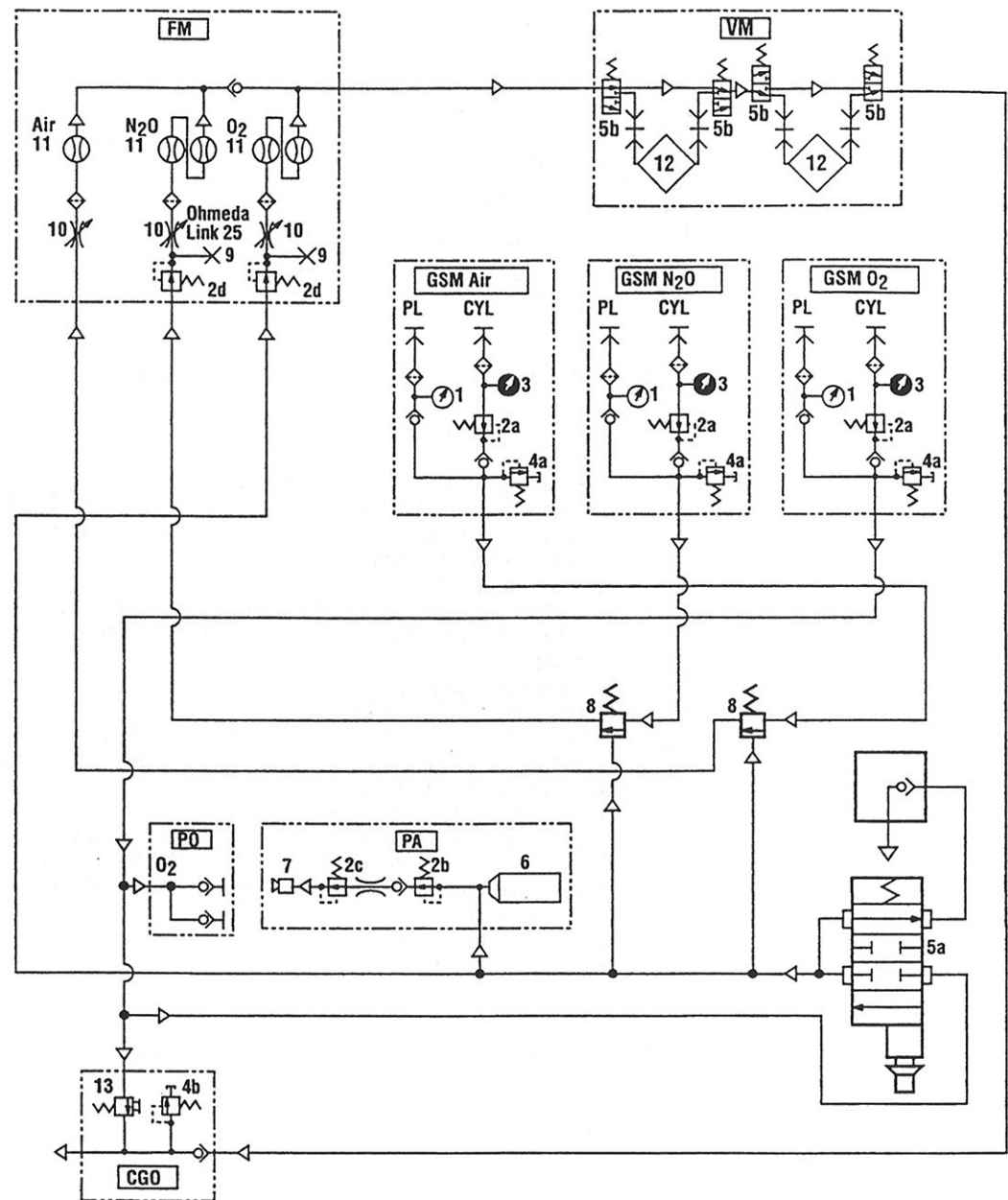
## Key to Numbered Components

1. Pipeline Pressure Gauge
2. Regulators
  - a. Primary Regulator (45 psig, 311 kPa)\*
  - b. Alarm Regulator (set threshold)
  - c. Flow Regulator (alarm duration)
  - d. Secondary Regulators ( $38 \pm 0.5$  psig,  $262.2 \pm 3.5$  kPa for N<sub>2</sub>O;  
 $20.75 \pm 3.75$  psig,  $145.2 \pm 25.9$  kPa for O<sub>2</sub> at 2 L/min)
3. Cylinder Pressure Gauge
4. Pressure Relief Valves
  - a. 65 to 75 psig (448-517 kPa); open by 120 psig, closed by a min of 65 psig
  - b. 4 to 5.5 psig (205-285 kPa) at 200 mL/min
5. Switches
  - a. System Master Switch
  - b. Vaporizer Selector Switch
6. Alarm Reservoir
7. Whistle
8. Shutoff Valve (Stops flow before O<sub>2</sub> Pressure <20 psig, 138 kPa)
9. Secondary Regulator Test Points
10. Flow Control Needle Valves  
(maximum flows: O<sub>2</sub> 10-14 L/min (10-12 L/min Canada); N<sub>2</sub>O 10-12 L/min;  
Heliox 15-17 L/min; Air 15-17 L/min.)  
(minimum flows: 175 to 225 mL/min O<sub>2</sub>; 0 mL/min all other gases)
11. Flowtube Assembly
12. Anesthetic Vaporizer
13. Flush Button/Valve

## Key to Unnumbered Symbols

	Filter
	Check Valve
	Gas Circuit Fitting
	Gas Circuit Connection
	Direction of Gas Flow

\* Approximate Value



AA.71.003

**Figure A-1**

Excel pneumatic circuit (pneumatic alarm for low O<sub>2</sub> supply pressure)

# Appendix






## Key to Subassembly Abbreviations

CGO	Common Gas Outlet
CYL	Cylinder Yoke
GSM	Gas Supply Module (O <sub>2</sub> , N <sub>2</sub> O, Air, Heliox)
FM	Flowmeter
EA	Electronic Alarm (triggers 30 psig, 207 kPa)*
PL	Pipeline Connection (50 psig, 345 kPa)*
PO	Power Outlet (O <sub>2</sub> ) Located on rear
VM	Vaporizer Manifold

## Key to Numbered Components

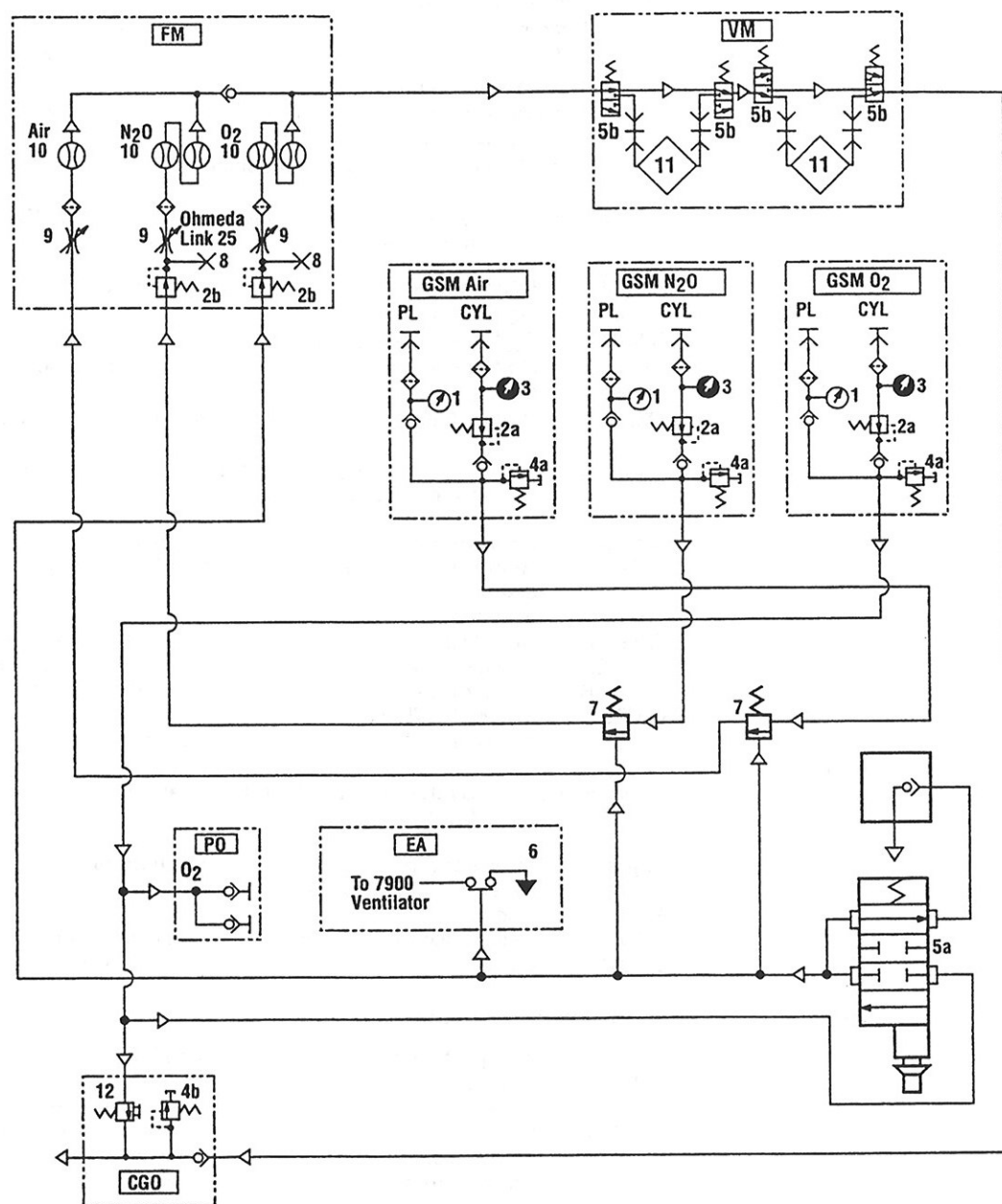
1. Pipeline Pressure Gauge
2. Regulators
  - a. Primary Regulator (45 psig, 311 kPa)\*
  - b. Secondary Regulators (38 ± 0.5 psig, 262.2 ± 3.5 kPa for N<sub>2</sub>O;  
20.75 ± 3.75 psig, 145.2 ± 25.9 kPa for O<sub>2</sub> at 2 L/min)
3. Cylinder Pressure Gauge
4. Pressure Relief Valves
  - a. 65 to 75 psig (448-517 kPa); open by 120 psig, closed by a min of 65 psig
  - b. 4 to 5.5 psig (205-285 kPa) at 200 mL/min
5. Switches
  - a. System Master Switch
  - b. Vaporizer Selector Switch
6. Electronic Alarm for low O<sub>2</sub> Pressure (<207 kPa opens switch)\*
7. Shutoff Valve (Stops flow before O<sub>2</sub> Pressure <20 psig, 138 kPa)
8. Secondary Regulator Test Points
9. Flow Control Needle Valves
  - (maximum flows: O<sub>2</sub> 10-14 L/min (10-12 L/min Canada); N<sub>2</sub>O 10-12 L/min;  
Heliox 15-17 L/min; Air 15-17 L/min.)
  - (minimum flows: 175 to 225 mL O<sub>2</sub>; 0 mL all other gases)
10. Flowtube Assembly
11. Anesthetic Vaporizer
12. Flush Button/Valve

## Key to Unnumbered Symbols

	Filter
	Check Valve
	Gas Circuit Fitting
	Gas Circuit Connection
	Direction of Gas Flow

\* Approximate Value





AA.71.136

**Figure A-2**

Excel pneumatic circuit (electronic alarm for low O<sub>2</sub> supply pressure)

# Appendix

## Signal diagram

### Numbered Components

- |  |  |
|--|--|
| 1. O <sub>2</sub> Sensor                                       | 6. System Master Switch                      |
| 2. Tidal Volume Sensor   | 7. Ventilator Connection                     |
| 3. Patient Interface Connections                               | 8. Ventilator (the 7800 Ventilator is shown) |
| 4. Cable Connection - Patient Interface to Excel or Modulus SE | 9. RS232 Connection                          |
| 5. Excel or Modulus SE Anesthesia Machine                      |  |

### Connector 1. O<sub>2</sub> Sensor Signals--Routed through the Excel or Modulus SE to the Ventilator

Signal	Interpretation	Application
OSHL	O <sub>2</sub> Sensor Shield	-----
OAGND	O <sub>2</sub> Sensor Analog Ground	-----
SENSA	O <sub>2</sub> Sensor Signal	Current proportional to O <sub>2</sub> concentration
SENSB	Not Used	-----
TMPCM	Probe Thermistor Signal	Temperature Compensation

### Connector 2. Tidal Volume Sensor Signals--Routed through the Excel or Modulus SE to the Ventilator

Signal	Interpretation	Application
HTRTN	Return line from heater element	Used to detect presence of tidal volume sensor
SHLD	Shield	-----
TDGND	Digital Ground	-----
PULSEA	Sensor Pulses	Frequency proportional to flow. A leading B is inspiratory. B leading A is expiratory.
PULSEB	Sensor Pulses	-----
VHTR	Nominal 5 VDC	Sensor Supply
VCLIP	Nominal 5 VDC	Sensor Supply

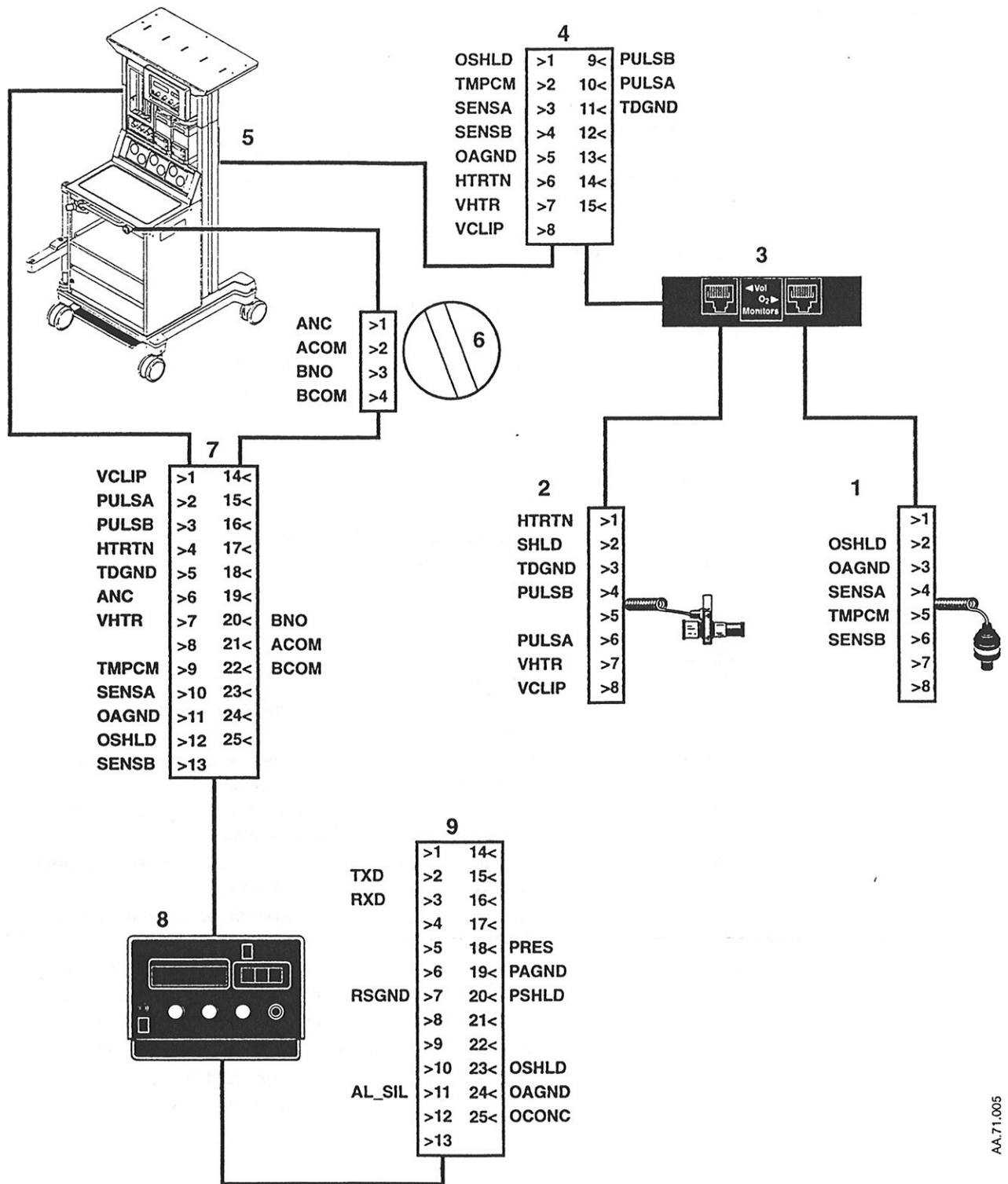
### Connector 6. System Master Switch Signals--Routed through the Excel or Modulus SE to the Ventilator

Signal	Interpretation	Application
ANC	Relay A Normally Closed	Not Used
ACOM	Common	-----
BNO	Relay B Normally Open	Continuity if "ON." Serves as 7800 and 7900 ON/OFF switch.
BCOM	Common	-----

### Connector 9. Ventilator Output

Signal	Interpretation	Application
TXD	Transmit	-----
RXD	Receive	-----
RSGND	RS232 Ground	-----
AL_SIL	Alarm Silence	Logic high indicates ventilator alarm is silenced.
PRES	Analog Pressure	Linear 0-1 Vdc; -20 to 120 cm H <sub>2</sub> O
PAGND	Analog Pressure Ground	-----
PSHLD	Analog Pressure Shield	-----
OCONC	Analog O <sub>2</sub> Concentration	0-1Vdc; 0 to 100%

# Appendix



**Figure A-3**  
 Excel System signals with a 7800 Ventilator

# Appendix

## Signal diagram

### Numbered Components

- |                            |                                |
|----------------------------|--------------------------------|
| 1. Inspiratory flow sensor | 5. Excel/Ventilator connection |
| 2. O <sub>2</sub> sensor   | 6. 7900 Ventilator             |
| 3. Expiratory flow sensor  | 7. Ventilator RS232 connection |
| 4. Excel SE                |                                |

### Connector 1 and 3

Signal	Use
D_GND	Digital Ground
+5 Vdc	Power for flow sensor EPROMS
CLK	Clock signal for flow sensor EPROMS
E2_SDA1	Serial calibration data for the flow sensors
E2_SDA2	

### Connector 2

Signal	Use
O <sub>2</sub> _SENSE+	O <sub>2</sub> concentration ( $57 \pm 13$ mV = 100%)
A_GND	Analog Ground

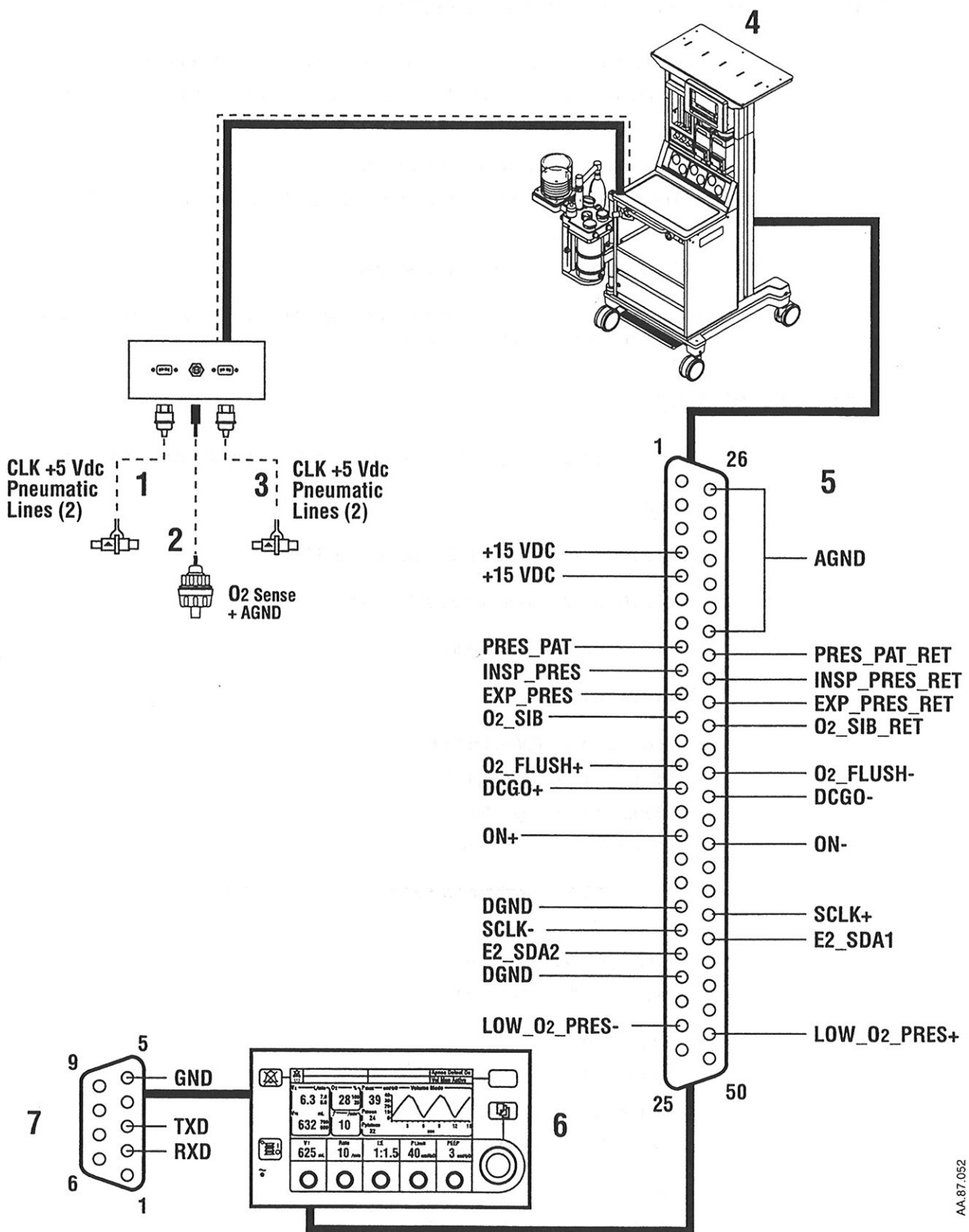
### Connector 5

Signal	Use
+15 Vdc	Sensor and Sensor Interface Board power
PRES_PAT±	Current proportional to the patient airway pressure (0-20 mAmps)
INSP_PRES±	Current proportional to the pressure change across the inspiratory flow sensor (0-20 mAmps)
EXP_PRES±	Current proportional to the pressure change across the expiratory flow sensor (0-20 mAmps)
O <sub>2</sub> _SIB±	O <sub>2</sub> concentration processed by the Sensor Interface Board inside the Excel SE (4 Vdc = 100%)
ON±	Ventilator ON/OFF from the system switch on the Excel (continuity = ON)
DCGO±	The position of the dual common gas outlet on French Excels (continuity = auxiliary outlet)
O <sub>2</sub> FLUSH±	O <sub>2</sub> Flush signal (continuity = you pushed the O <sub>2</sub> flush)
SCLK±	Ventilator clock pulse used by flow sensor EPROMS
LOW_O <sub>2</sub> _PRES±	Switch inside the Excel SE opens and the 7900 Ventilator alarms if the O <sub>2</sub> supply pressure decreases to 207 kPa.^

### Connector 7

Signal	Use
TxD	RS232 Transmit
RxD	RS232 Receive

^ Approximate value



**Figure A-4**  
Excel System signals with a 7900 Ventilator

# Appendix

## Low flow/closed circuit anesthesia

The Excel System permits low-flow and closed-circuit anesthesia with:

- O<sub>2</sub>/N<sub>2</sub>O mixtures in 25%-75% proportions at O<sub>2</sub> flows as low as 200 mL/min.
- Accurate flowtubes
- Vaporizers with linear concentrations
- The Tec 6 Vaporizer for Desflurane (the preferred, low-flow agent).
- Low leak rates
- An absorber that uses less absorbent

To learn more about the Excel and low flow or closed circuit anesthesia, speak with your Ohmeda sales representative.

## Specifications

All specifications are approximate values and can change without notice.

### Weight:

Excel 210 SE (With Mid Shelf): 120 kg (265 lb)

Excel 210 SE (Without Mid Shelf): 116 kg (255 lb)

Excel 110 SE: 122 kg (270 lb)

### Dimensions:

- Excel 210 SE (With Mid Shelf):  
Height: 173.0 cm (68.1 in)  
Depth: 69.9 cm (27.5 in)  
Width: 69.2 cm (27.3 in)
- Excel 210 SE (Without Mid Shelf):  
Height: 158.1 cm (62.3 in)  
Depth: 69.9 cm (27.5 in)  
Width: 69.2 cm (27.3 in)
- Excel 110 SE:  
Height: 166.4 cm (65.5 in)  
Depth: 68.0 cm (26.8 in)  
Width: 50.7 cm (20.0 in)
- Monitor Pod  
Add 17.8 cm (7.0 in) to width

# Appendix

---

## Shelves:

- Excel 210 SE (With Mid Shelf):

### Mid Shelf:

Weight Limit: 34.0 kg (75.0 lb)

Usable Height: 34.3 cm (13.5 in)

Dimensions: 38.1 x 39.3 cm (15.0 x 15.5 in)

### Top Shelf:

Weight Limit: 45 kg (100 lb)

Dimensions: 61.6 x 38.1 cm (24.3 x 15.0 in)

### Table-Top:

Height (above floor): 86.7 cm (34.5 in)

Dimensions: 55.2 x 31.1 cm (21.8 x 12.3 in)

- Excel 210 SE (Without Mid Shelf):

### Top Shelf:

Weight Limit: 56 kg (125 lb)

Dimensions: 68.6 x 37.5 cm (27.0 x 14.8 in)

### Table-Top:

Height (above floor): 86.7 cm (34.5 in)

Dimensions: 55.2 x 31.1 cm (21.8 x 12.3 in)

- Excel 110 SE:

### Middle Shelf:

Weight Limit: 11.0 kg (24 lb)

Usable Height: 15.2 cm (6 in)

Dimensions: 28 x 30 cm (11 x 11.8 in)

### Top Shelf:

Weight Limit: 23 kg (50 lb)

Dimensions: 54.6 x 36.0 cm (21.5 x 14.2 in)

### Table-Top:

Height (above floor): 85.1 cm (33.5 in)

Dimensions: 50.8 x 29.0 cm (20.0 x 11.7 in)

## Drawers & shelf:

- Excel 210 SE:

Drawer: 47.6 x 34.3 x 14.0 cm (18.8 x 13.5 x 5.5 in)

Fixed Shelf: 47.6 x 36.8 cm (18.8 x 14.5 in)

Slide Shelf: 46.5 x 36.8 cm (18.3 x 14.5 in)

- Excel 110 SE:

Two 39.4 x 26.7 x 10.2 cm (15.5 x 10.5 x 4 in.) drawers.

# Appendix

## Absorber & post:

Absorber Arm Length: 30.5 cm (12.0 in)

Vertical Adj (above floor): 36.8 to 78.2 cm (14.5 to 30.8 in)

## Casters:

- Excel 210 SE:  
12.7 cm (5 in) casters with a brake on the rear casters.
- Excel 110 SE:  
12.7 cm (5 in) casters with a brake on the front casters.

## Pneumatics

### Common gas outlet:

Use a bayonet type connector for a positive lock. Standard 22 mm OD or 15 mm ID conical friction fit connectors will also work.

### Gas supplies:

Check valves: All inputs (cylinder and pipeline) have check valves.

Filters: All inputs (cylinder and pipeline) have filters.

Primary regulator diaphragm min burst pressure: 1,750 kPa (250 psig)

Maximum output: approximately 518 kPa (75 psig)

Country	Gases	Pipeline/ Cylinder Pressure*	Pipeline/Cylinder Fittings
ANSI 210 SE	O <sub>2</sub> cyl/pl N <sub>2</sub> O cyl/pl Air cyl/pl Heliox cyl only	pl: 345 kPa (50 psig) cyl: 311 kPa (45 psig)	pl: DISS cyl: Pin indexed yoke
ANSI 110 SE	O <sub>2</sub> cyl/pl N <sub>2</sub> O cyl/pl	pl: 345 kPa (50 psig) cyl: 311 kPa (45 psig)	pl: DISS cyl: Pin indexed yoke
ANSI 210 SE (Canada)	O <sub>2</sub> cyl/pl N <sub>2</sub> O cyl/pl Air cyl/pl	pl: 345 kPa (50 psig) cyl: 311 kPa (45 psig)	pl: Canadian DISS cyl: Pin indexed yoke

### Shutoff valves:

Shutoff valves stop all other gas flows if the O<sub>2</sub> pressure decreases to approximately 20 psig (138 kPa).

\* Approximate value



# Appendix

## Flowmeter:

Flow ranges:

O <sub>2</sub>	Two Tubes 0.2-0.95 L/min and 1.0 L/min to 10 L/min. Minimum O <sub>2</sub> flow 200 mL/min.
N <sub>2</sub> O	Two Tubes 0.04-0.9 L/min and 1.0 L/min-10 L/min.
Air	One Tube 1-15 L/min.
Heliox	One Tube 1-15 L/min.

## Calibration:

Percent of (Full Scale)	Precision (% of flowrate)
100	±1.60%
90	±1.64%
80	±1.70%
70	±1.77%
60	±1.86%
50	±2.00%
40	±2.20%
30	±2.53%
20	±3.20%
10	±5.20%

Calibration conditions are 20°C (68°F) and 760 mm Hg (101.3 kPa). Different breathing circuit pressures, barometric pressures or temperatures change flowtube precision. With some conditions, these changes can be larger than the tolerances.

## Outlet relief:

Valve limits fresh gas to 27.6 to 38 kPa (4.0 to 5.5 psig) at the minimum flow

## Low O<sub>2</sub> alarm:

A n alarm occurs if O<sub>2</sub> supply pressures decrease to less than approximately 30 psig (207 kPa).\*

## Flush button:

With the flush valve fully open, 45-70 L/min of O<sub>2</sub> flows to the common gas outlet. Release the button to stop the flow. A guard helps prevent accidental operation.

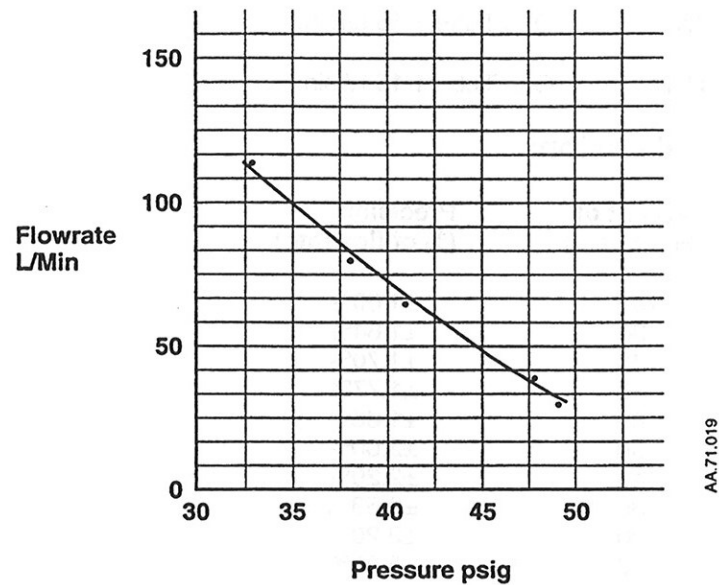
\* Approximate value

# Appendix

## Pneumatic outlet pressures

Graph 1 shows flow through the pneumatic outlets with:

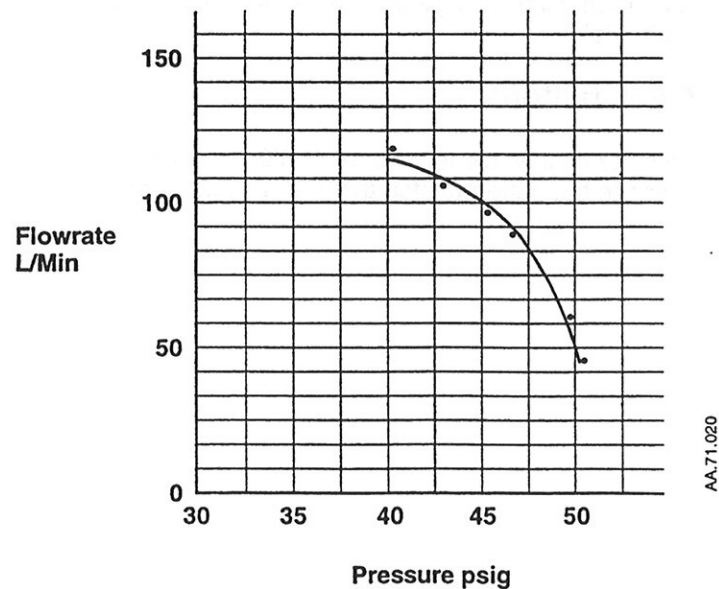
- A cylinder supply
- 10 L/min flow through the common gas outlet
- No flush flow



Graph 1

Graph 2 shows flow through the pneumatic outlets with:

- A pipeline supply
- Minimum gas flow through the common gas outlet
- No flush flow

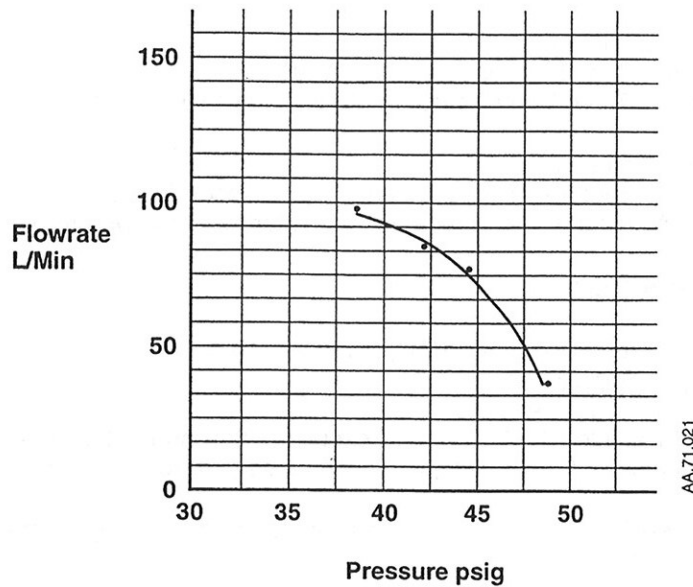


Graph 2

# Appendix

Graph 3 shows flow through an O<sub>2</sub> pneumatic outlet with:

- A pipeline supply
- Minimum gas flow through the common gas outlet
- Flush flow



Graph 3

## Environmental specifications

### Temperature:

Storage: -20 to 70°C (-4 to 158°F)

Operation: 10 to 40°C (50 to 104°F)

### Humidity:

0 to 95% relative humidity (non-condensing)

## Electrical specifications

### Leakage current:

Less than 100 µA for 110/120 VAC Excels

Less than 500 µA for 220/240 VAC Excels

# Appendix

---

## Monitor Pod/7000 Ventilator

### Fuses and Circuit Breakers:

Electrical inlet: 10 A, 250 VAC, double-pole circuit breaker (on the rear panel).

Monitor Pod power: 0.5 A, 250 VAC, time-delay fuse (5 x 20 mm, in the Monitor Pod)

### Electrical Outlets:

Maximum current: 9 A at 110/120 VAC (the light and the Monitor Pod use 1 amp).

### Maximum Power:

Monitor Pod: 35 watts at 110/120 VAC

Monitor Pod & 7000 Ventilator: 60 watts at 110/120 VAC

### Power Failure Alarms:

Monitor Pod: alarm indicator and tone (3 seconds on, 12 seconds off; battery operated).

7000 Ventilator: alarm tone and indicator (battery operated).

## Outlet Box

Input: 110/120/220/240 VAC, 50/60 Hz, 10 A

Output: Supply voltage, 9 A

### Fuses/Circuit Breakers:

Electrical inlet: 10 A, 250 VAC circuit breaker on the line input.

Light fuse: 2 A, 250 VAC, fast acting fuse (5 x 20 mm, in the Outlet Box).

For ventilator or absorber specifications, refer to the appropriate operations and maintenance manual.