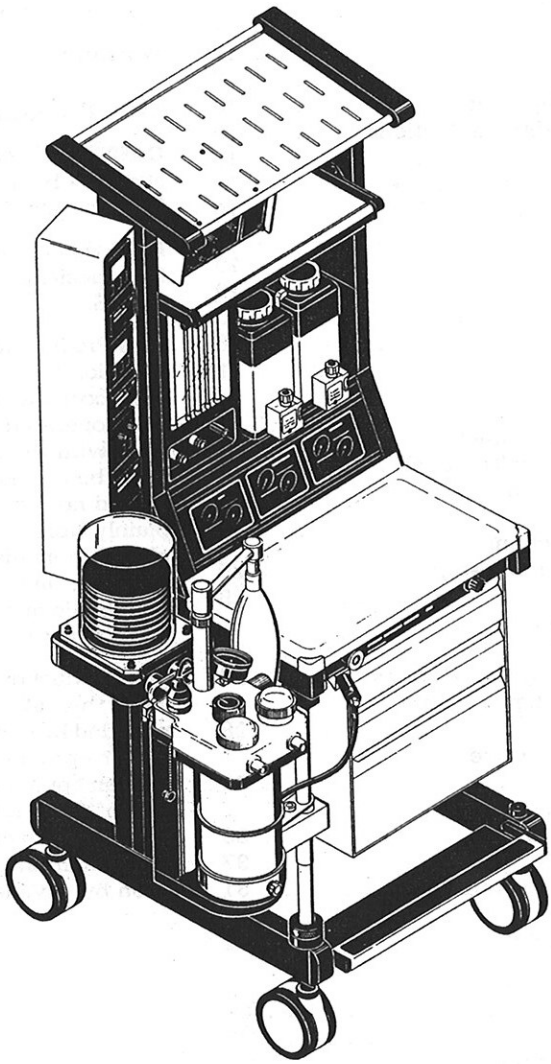
Ohmeda

Ohmeda Excel 110 and 210 Anesthesia System

Operation and Maintenance Manual



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User Responsibility

CAUTION: Federal law in U.S.A. and Canada restricts this device to sale by or on the order of a licensed medical practitioner.

Read this manual before operating the equipment. Pay special attention to all WARNINGS and CAUTIONS.

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 Regional Service 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 Safety 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.

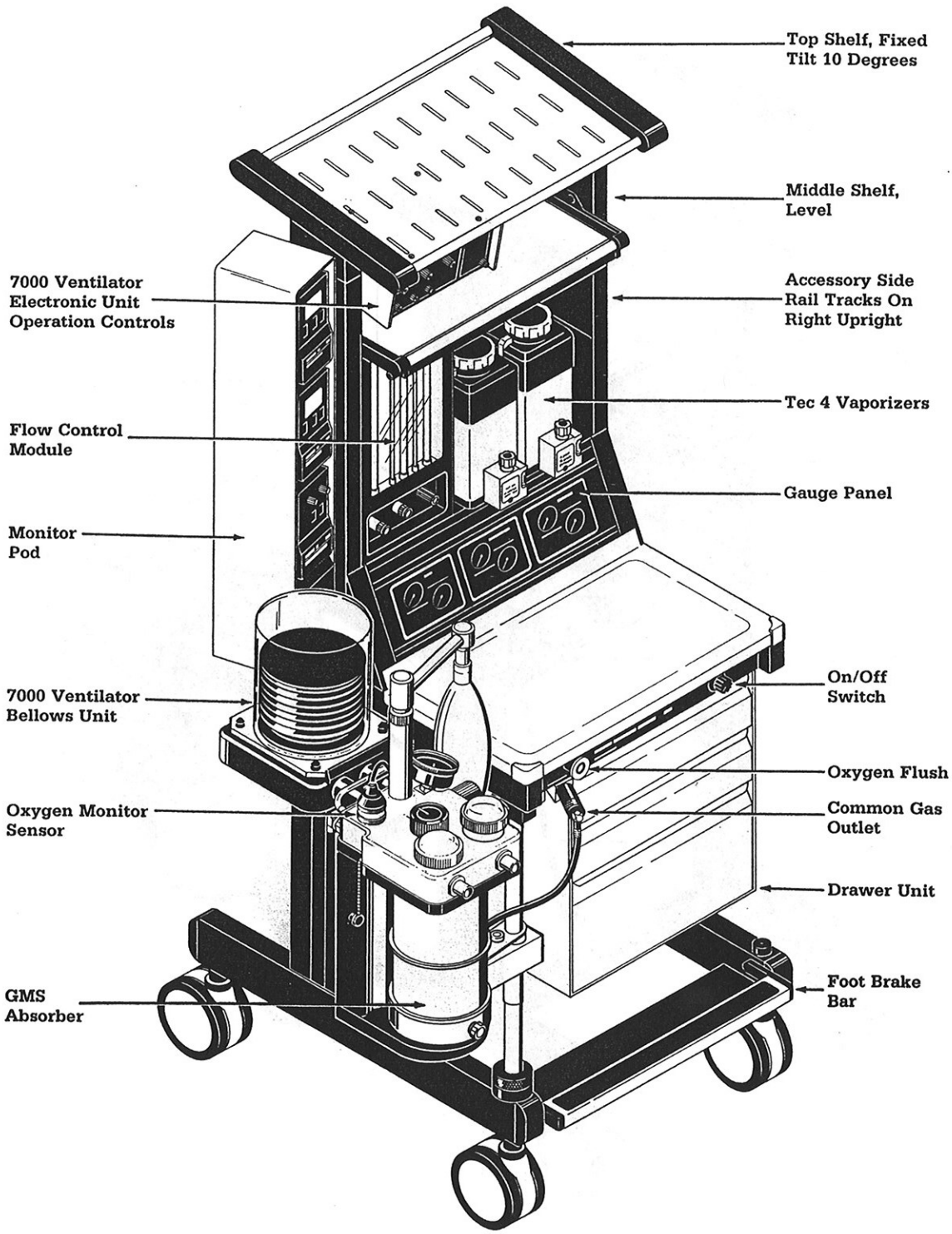


Figure 2
Ohmeda Excel Model 210 Anesthesia System–Front View

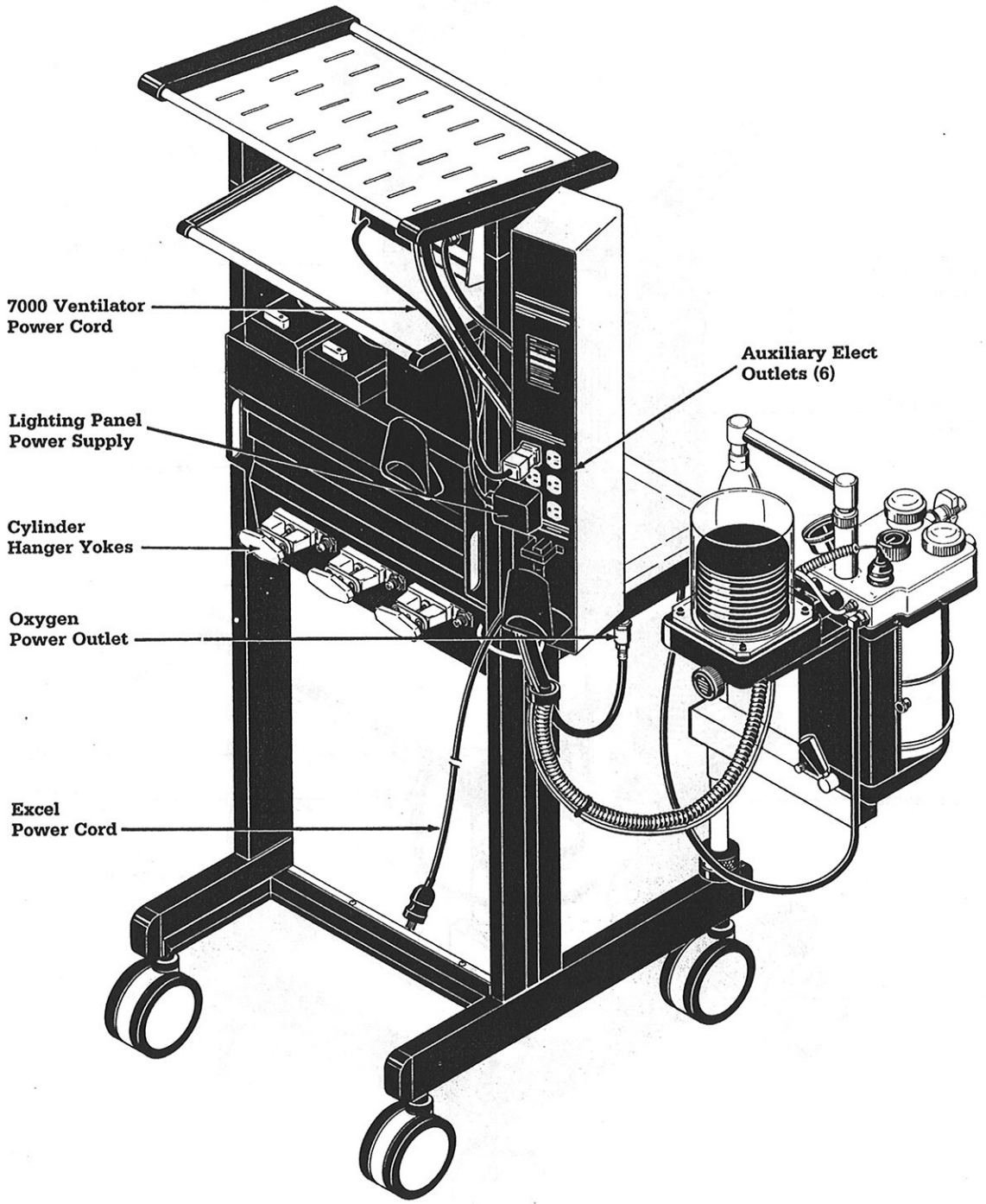


Figure 3
Ohmeda Excel Model 210 Anesthesia System–Back View

C. Gas Supply Modules

See Figure 4.

Gas enters the system's pneumatic circuitry through a Gas Supply Module which incorporates:

1. a DISS pipeline inlet fitting,
2. a gas cylinder hanger yoke,
3. a regulator, with built in high-pressure relief valve
4. a pressure gauge for cylinder gas pressure, and
5. a pressure gauge for pipeline gas pressure.

All gauges have white on black dual calibration scales (psig and kPa) and a red indicator needle. The gauge dials appear within a gas color coded and labeled gauge identification plate.

Gas Supply Modules are mounted in the openings on the panel at the back of the stand. Pressure gauges and identification plates can be viewed in the window panel at the front of the stand. The upper gauge indicates the pipeline pressure while the lower gauge indicates the cylinder pressure.

Pipeline inlet fittings and cylinder hanger yokes extend through the back mounting panel.

The number of yoke mounting locations and gauge displays varies with the model:

- 210 has three locations, O_2, N_2O and Air
- 110 also has three locations, O_2, N_2O with an additional yoke for a reserve tank of either O_2 or N_2O.

All Gas Supply Modules are pin-indexed in accordance with C.G.A.* standards so that only properly indexed, cylinders of the appropriate gas may be installed. Each pipeline inlet and cylinder yoke is labeled with the name of the gas supplied.

A cylinder valve ratchet wrench is attached to the back panel with bead chain.

Hospital pipeline gases must be supplied to the pipeline inlets at nominal 50 psig (345 kPa). Pipeline inlet fittings have internal check valves which minimize loss or back flow of gases. All pipeline inlets are DISS (Diameter Index Safety System) fittings in accordance with C.G.A. standards. High pressure hoses with DISS fittings must be used to connect the hospital gas supply outlets to the Gas Supply Module inlets. These hoses are not included with the system.

* Compressed Gas Association

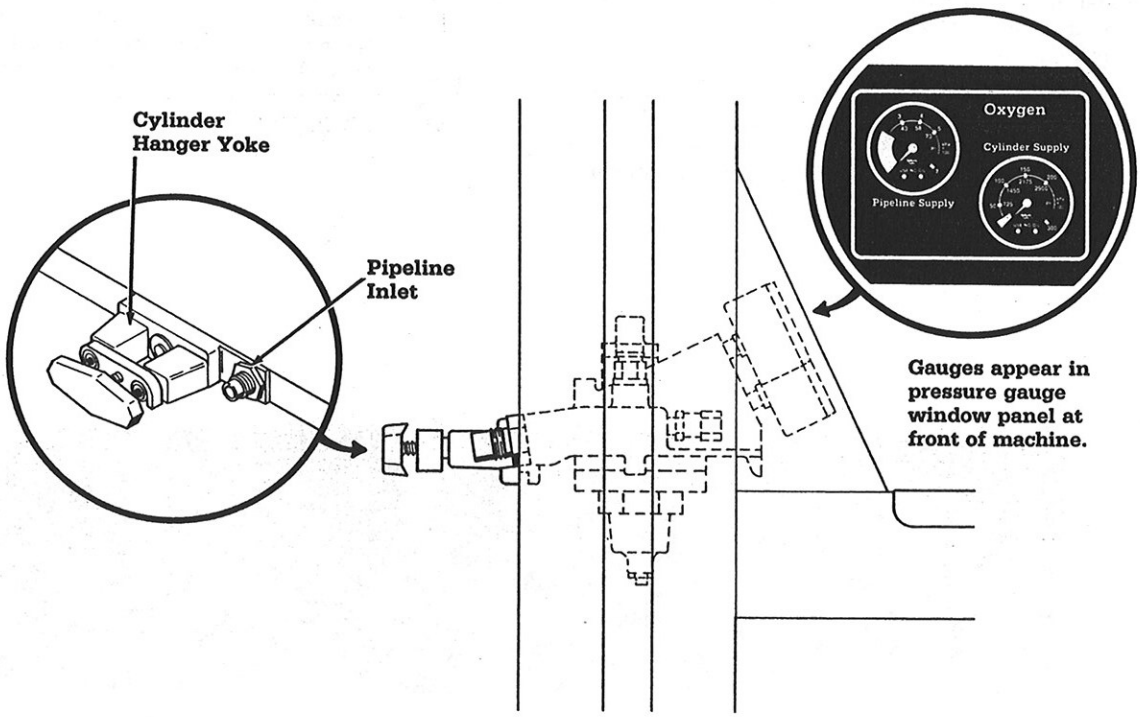


Figure 4
Mounted Gas Supply Module

D. Gauge Layout

The gauge layout on each system follows a standard pattern. Pipeline pressure gauges are arranged along the upper level of the panel while cylinder pressure gauges are arranged along the lower level. The gauges are arranged in a gas sequence conforming with the gas module and flowmeter arrangements.

Each pressure gauge window displays the gauge(s) for one Gas Supply Module. The order of display is as follows:

See Figure 5.

1. oxygen gauges are always in the window to the right,
2. nitrous oxide gauges are in the center window, and
3. gauges for medical air (model 210 only) are in the window to the left.

The right to left sequence of the pressure gauges within the window panel directly corresponds to the right to left sequence of respective flowmeter modules and flow control valves within the Flow Control Assembly.

E. Flow Control Assembly

See the flow schematics in Figure 30 and 31.

Flowmeter unit flow tubes are mounted in a sequence conforming with the gas supply module/pressure gauge mounting sequence. Each calibrated flow tube measures the flow of one specific gas.

A preferential oxygen flow system, incorporated in the flowmeter, ensures that oxygen is delivered into the mixture downstream of all other gases.

Each gas system includes a flow control valve mounted below its associated flowmeter. Each valve is installed with a gas-color, symbol-coded, control knob and the oxygen control knob is fluted for touch identification.

Each flow control valve knob must be turned fully counterclockwise to obtain maximum flow or fully clockwise to obtain zero flow for all gases except oxygen which maintains a flow of 0.17 to 0.25 L/min. The oxygen and nitrous oxide flow control valves are mechanically connected by a chain link system ensuring that all oxygen/nitrous oxide mixtures contain at least a nominal 25% oxygen concentration. The chain link system applies to oxygen/nitrous oxide mixtures only, it does not in any way affect any other gas mixtures.

WARNING: When using any other gas in addition to oxygen and nitrous oxide, or when operating at low oxygen flow rates, the proportions of all gases must be carefully adjusted in accordance with accepted clinical practice.

The oxygen flow control valve has a mechanical stop to ensure that a continuous flow of 0.17 to 0.25 L/min is maintained when the valve is turned fully clockwise to the minimum flow position.

The following sections describe modules and components housed within the Flow Control Assembly.

1. **The Pressure Sensor Shutoff Valve System:** Pressure Sensor Shutoff Valves are pilot operated, normally closed valves which shut off all other gas flow (including Air) if the oxygen supply pressure fails (falls to approximately 20 psig {138 kPa}).

   The Oxygen Supply Failure Alarm activates when the oxygen supply pressure drops below 30 psig (207 kPa). The alarm sound is constant and has at least a seven second duration. The alarm also briefly activates immediately after the pneumatic circuit is turned on or off.

2. **Second Stage Pressure Regulators:** Both the oxygen and nitrous oxide supply lines are equipped with secondary pressure regulators. The secondary regulators minimize bobbing of the flowmeter floats when high flows from other sources cause pressure fluctuations in the supply lines.

3. **Gas Distribution Manifold:** Gas delivered from the secondary circuitry enters the gas distribution manifold where each individual gas flow is metered before introduction into the total anesthetic gas mixture. The gas distribution manifold is the juncture for the second stage circuitry and the flow control components.

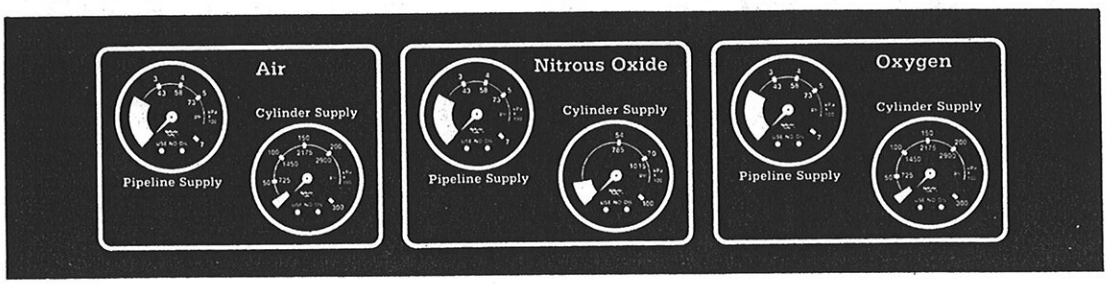


Figure 5
Gauge Panel Layout

See Figure 6.

4. **Flow Control Valves:** There is one flow control valve for each gas. Each flow control valve has a gas color and symbol coded control knob. The oxygen control knob is fluted for identification by touch. The Link-25 Proportion Limiting Control System interconnects the flow control valves for oxygen and nitrous oxide. The purpose of the system is to make sure there is at least a nominal 25% oxygen concentration in any oxygen-nitrous oxide mixture. A stop on the oxygen flow control valve keeps oxygen flow above a nominal 0.2 L/min.

WARNING: The Link-25 Proportion Limiting Control System only ensures that oxygen-nitrous oxide mixtures will have at least a nominal 25% oxygen concentration. *Hypoxic mixtures may be delivered if gases other than oxygen, nitrous oxide and/or air are used, or when operating at low oxygen flow rates.*

WARNING: *Never* increase the gas flow rate to the patient using the N_2O Flow Control Valve....*Always* increase the gas flow using the O_2 Flow Control Valve and decrease the gas flow using the N_2O Flow Control Valve.

5. **Flowmeter Modules:** Each flowmeter module contains a flowtube and color coded background for metering the flow of one gas. Flowmeter scales are individually calibrated for accuracy. All ranges are in liters per minute and scales are indicated on the tubes. Oxygen and nitrous oxide flowmeter modules have double flowtubes. Always read flowmeters directly across from the top edge of the float.

When viewed from the front:

a. the oxygen flowmeter module is always installed on the right,
b. the nitrous oxide flowmeter module is always installed in the center, and
c. the flowmeter module for medical air (model 210 only) is installed on the left.

A transparent plastic shield helps protect the flowmeter modules from damage.

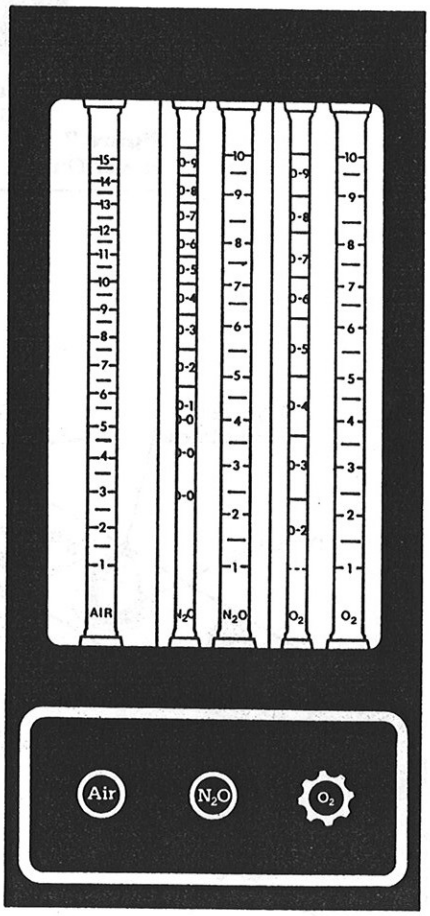


Figure 6
Flow Control Assembly, Model 210

See Figure 7.

6. **Oxygen Power Outlet:** An oxygen power outlet is located under the table top on the left hand side of the lower frame assembly behind the O_2 Flush button. It provides the nominal 50 psig (345 kPa) source of oxygen required to pneumatically power an anesthesia ventilator. The power outlet has a male DISS fitting. A dedicated high pressure hose must be used to connect the power outlet to the ventilator.

   The outlet fitting has an internal connection-actuated check valve which reduces the chance for oxygen supply loss when the power outlet is not in use.

   Oxygen is delivered to the power outlet whenever an oxygen supply is connected to the oxygen Gas Supply Module.

F. Selectatec SM (Series Mounted) Vaporizer Manifold and Interlock

The vaporizer manifold is located within the upper framework to the right of the Flow Control Assembly. On the models 110 and 210 One or two Ohmeda Cyprane* Tec 4 Continuous Flow Vaporizers can be mounted on the manifold.

See Figure 8.

Mechanisms within the vaporizer and the vaporizer manifold work together to compose the vaporizer interlock system. The purposes of the system are to:

1. make sure the vaporizer is securely locked into the gas circuit,
2. make sure only one vaporizer at a time can be turned on,
3. make sure the gas flow enters only the vaporizer which is turned on, and
4. help eliminate unwanted anesthetic trace vapor after a vaporizer is turned off.

The total flow from the gas distribution manifold enters the vaporizer manifold where:

1. it takes a path bypassing any mounted vaporizer which is OFF, and
2. enters only the vaporizing chamber of the vaporizer which is ON to pick up the adjusted concentration of anesthetic vapor.

The entire gas mixture then flows to the Common Gas Outlet.

If desired, an optional storage bracket is available for mounting a "standby" vaporizer on the back of the machine.

* Trademark, Cyprane Limited.

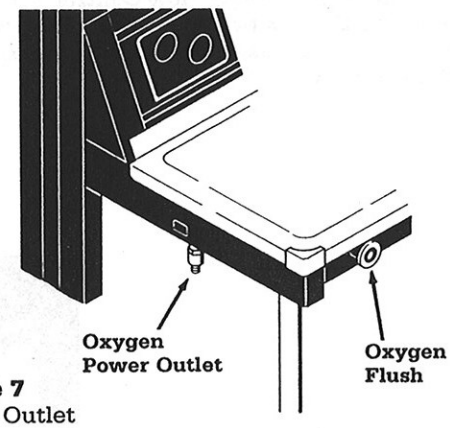


Figure 7
Power Outlet

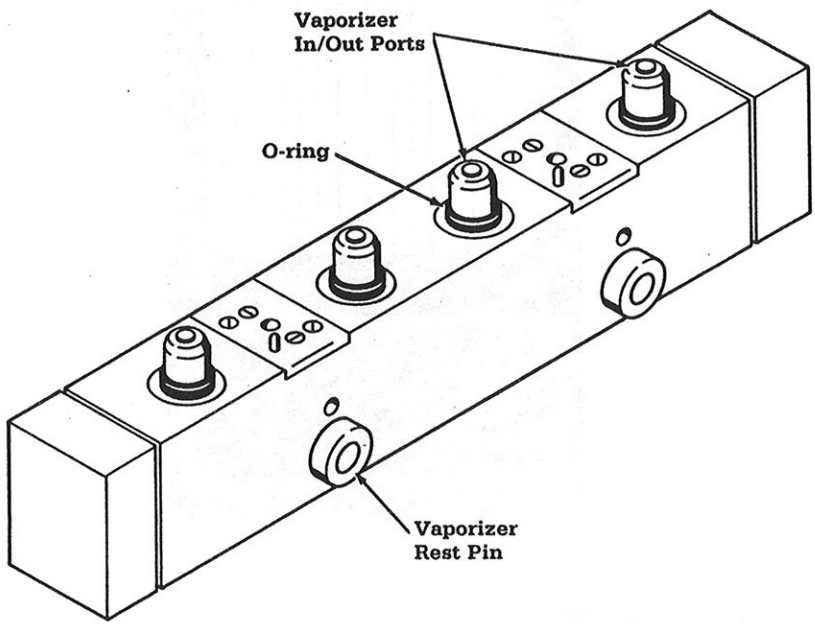


Figure 8
Vaporizer Manifold

G. Common Gas Outlet

See Figure 9.

The Common Gas Outlet is located on the left hand side of the lower frame assembly under the table top below the O_2 Flush button. The outlet uses a latching bayonet connection to help prevent accidental disconnections and to provide a secure leak-tight connection.

See Section 3.6 for complete instructions on making the Common Gas Outlet connection.

H. Oxygen Flush Button

See Figure 9.

The Oxygen Flush push button is located on the left hand side of the lower frame under the front lip of the table top. To minimize the chance for accidental engagement, the button is recessed and self closing. When pushed in, the button opens a valve which supplies a direct flow of oxygen (approximately 45-75 L/min) to the Common Gas Outlet. The Oxygen Flush is operational whenever an oxygen supply is connected to the oxygen Gas Supply Module.

I. On/Off Switch

The On/Off Switch is located on the panel under the table top lip on the right-hand side of the machine. In the Off position the On/Off switch cuts off the oxygen supply to the oxygen failure warning system, which in turn cuts off all gas supplies to the flowmeter unit and consequently the supply to the common gas outlet. The switch does not control the gas supplies to the power outlets or oxygen flush system. The On/Off Switch also turns on the Monitor/Electrical Pod supplying power to the monitors. The auxiliary outlets on the rear panel of the Pod are not controlled by the Power Switch and are energized when the power cord of the pod is plugged into a wall outlet.

CAUTION: In order to minimize the possibility of depleting the oxygen supply, the On/Off switch must be turned Off when the anesthesia system is not in use.

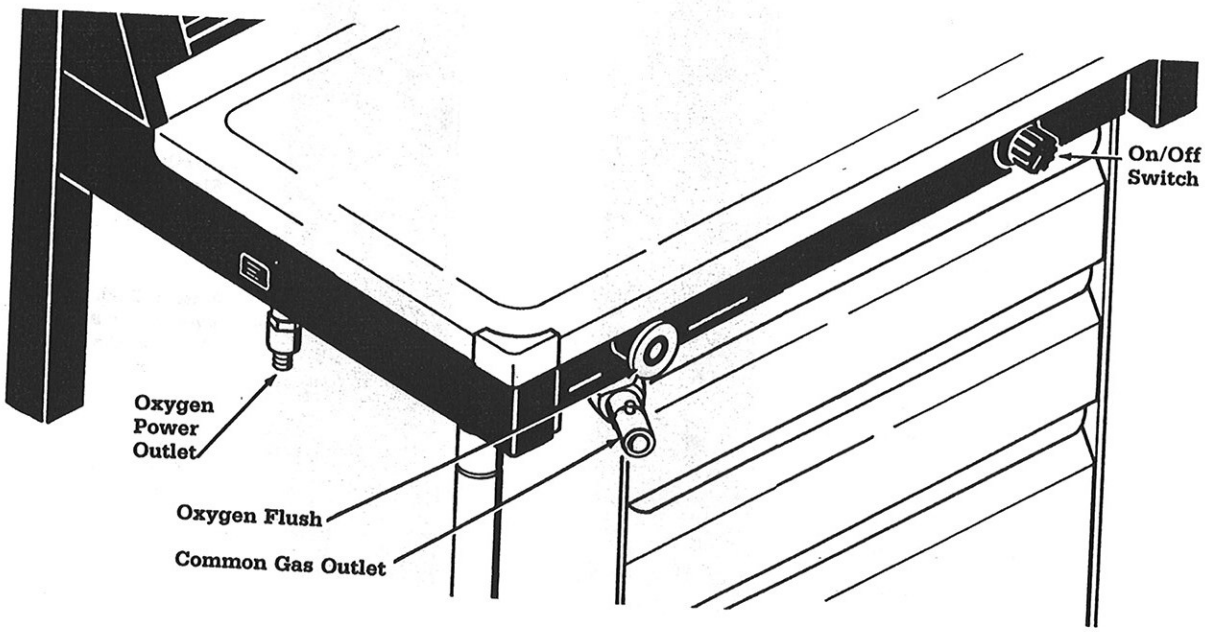


Figure 9
Common Gas Outlet, Oxygen Flush Button and On/Off Switch

J. Monitor/Electrical Pod

See Figure 10.

There are three standard monitors, a blood pressure gauge and a patient connection panel installed in the pod on the left side of the system flowmeter assembly. The pod is set at a fixed viewing angle of 15 degrees for easy observation. The monitor part of the pod is the front section while the electrical part of the pod is directly in back of the monitors. See Figure 10.

Its back panel has:

- Six 120 volt ac outlets for powering the ventilator and additional monitors.
- Two 10A fuses which protect the system's electrical outlets.
- A single 0.5A fuse which protects the system's power supply and internal circuitry.
- Hospital grade electrical power cord and plug.

Note: Make the electrical connection at an appropriate hospital grade receptacle only.

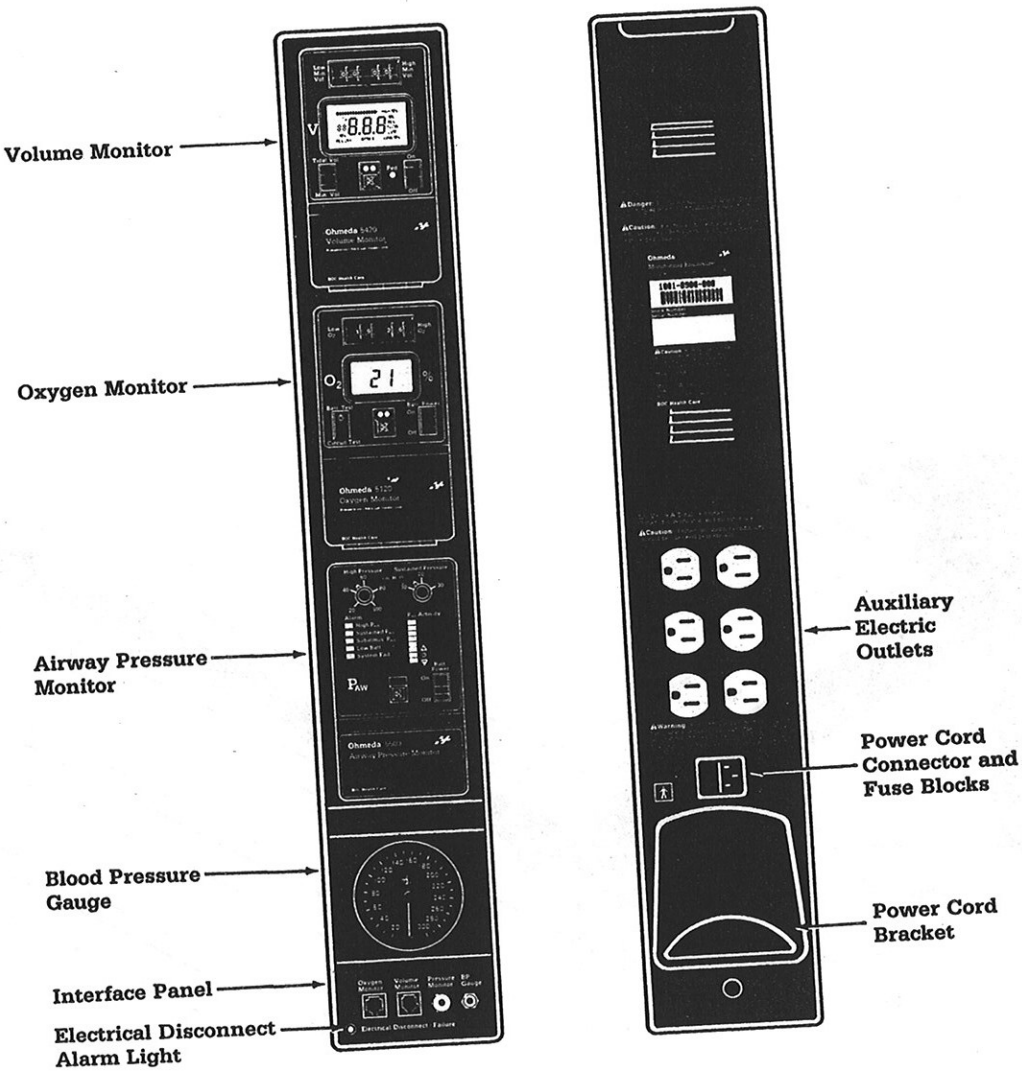


Figure 10
Monitor/Electrical Pod (Front and Rear View)

Each Ohmeda Excel Anesthesia System has three standard monitors and a Blood Pressure Gauge built in to the pod.

From the top.....

- Volume Monitor-first position
- Oxygen Monitor-next position
- Air-way Pressure Monitor-next position
- Blood Pressure Gauge-next position
- On the very bottom is the Patient Interface Panel

Important Note: Each monitor installed in the Ohmeda Excel Anesthesia System has its own operation and maintenance manual. Read the manual for each monitor in the system before operating the system.

Ohmeda Excel Anesthesia System monitors use system power for operation. If system power fails while it is in operation, a system power failure alarm occurs. Monitors with battery backup should be placed in their battery mode of operation. When system power is restored, turn off the battery operation mode to return to system power.

Cables within the system framework connect the monitors to the Patient Interface Panel and system power. The volume, oxygen and pressure monitors are a standard monitor complement present in all Ohmeda Excel Anesthesia Systems along with the blood pressure gauge.

Note: Ohmeda recommends leaving the monitors in the monitor pod for dedicated use in the anesthesia system. Remove monitors only when they require service.

Monitors can be removed and replaced should operator replacement become necessary.

1. Firmly grasp the monitor near the top of the unit.
2. Pull the monitor straight forward until the ball/socket latch releases.
3. Tilt the monitor forward out of the pod.
4. Remove the tubes and/or sensor cables from the back of the monitor. Ensure that cables and tubes are identified for replacement.
5. Remove the ball-joint connector from the back of the monitor removed. This connector will be required on the replacement monitor.
6. To reinstall or replace a monitor, connect all the proper tubes, cables and ball-joint connector, as removed in the previous steps.
7. Install the monitor by positioning it squarely in the proper opening and pushing the unit straight back into the pod. Test the monitor, as indicated in its respective operation and maintenance manual, for proper operation after installation.

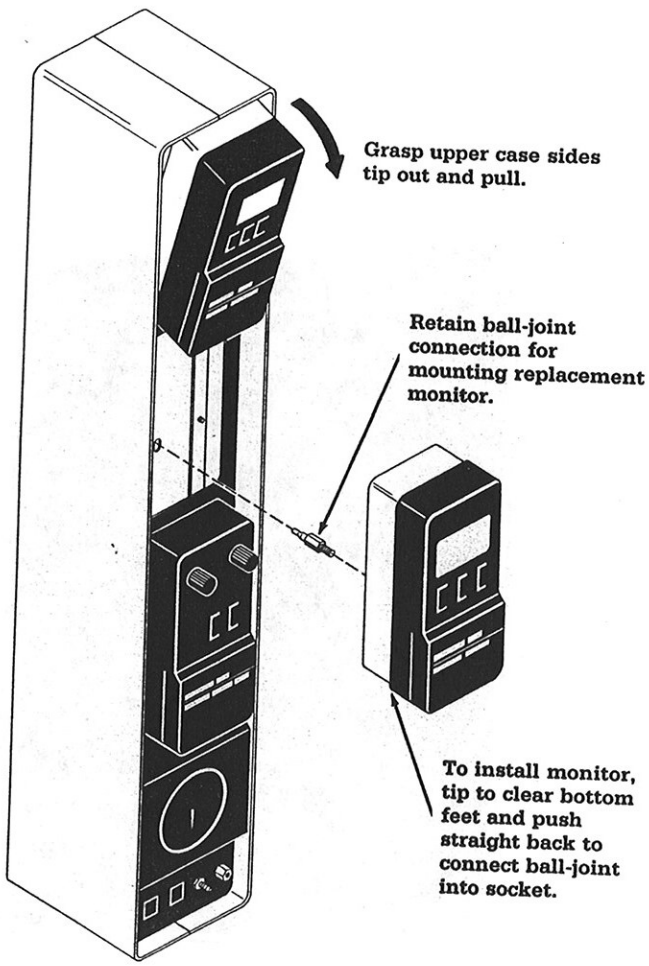


Figure 11
Monitor Removal from Pod

See Figures 10 and 12.

1. **Patient Interface Panel:** The Patient interface Panel is located at the very bottom of the Monitor/Electrical pod.

   Connectors for monitor-to-patient cables and hoses are consolidated in the panel. Each connector is labeled to show its use.

See Figure 13.

2. **5420 Volume Monitor:** The Ohmeda 5420 Volume Monitor measures gas flow volume routed within the patient circuit. The cables for power and connections to the Patient Interface Panel are routed within the machine framework.

   Read the Ohmeda 5420 Volume Monitor Operation and Maintenance Manual (Stock Number 6050-0000-204) prior to operating the monitor.

WARNING: Use only Ohmeda specified sensor cables, hoses and tubing when making connections at the patient connection panel. Failure to use Ohmeda specified cables, hoses or tubing could result in faulty monitor readings and damage to the system and monitors.

CAUTION: Connect cables correctly: each cable routed to the monitor pod is labeled with the name of the monitor to which it connects. If cables are cross connected the system will not operate properly and components could be damaged.

A. Volume Monitor Connections

a. Fit a Volume Monitor sensor cartridge between the absorber Exhalation port and the exhalation limb of the patient circuit tubing as shown.
b. Snap the sensor onto the cartridge. Be careful: its arrows must point in the direction of gas flow (into the absorber).
c. Plug the other end of the sensor cable into the patient connection labeled Volume Monitor.

B. System Power Failure

If the external power source is removed or fails when the monitor is operating, the system power interrupt alarm sounds and the monitor turns off. When this happens, switching the monitor to battery power requires turning the monitor off then on again.

When the monitor is operating on the battery pack only (no Ohmeda Excel System power or battery charger power in operation), the sensor heater, used to help prevent condensation from forming in the sensor clip, is automatically shut off to conserve battery power.

When the monitor is installed in a Ohmeda Excel System, do not use battery power unless there is an external power failure.

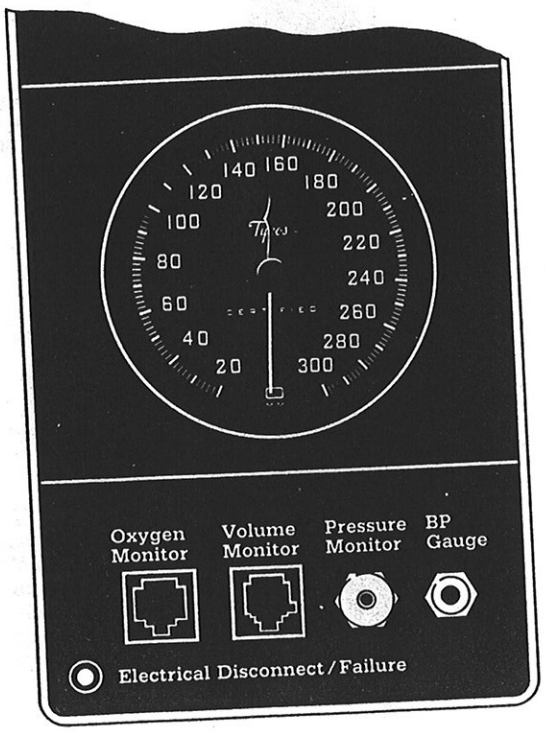


Figure 12
Patient Interface Panel

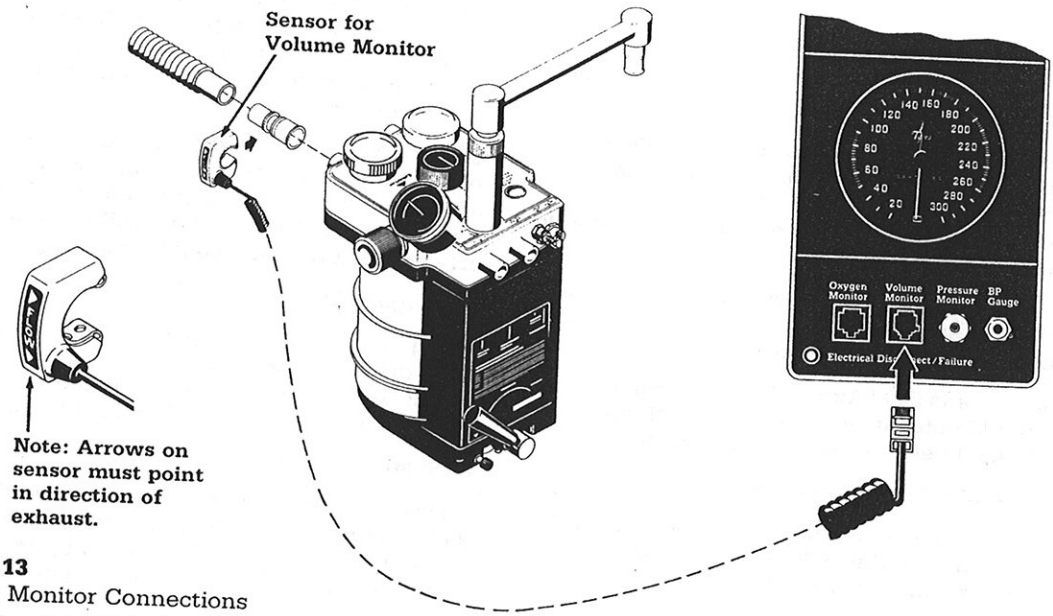


Figure 13
Volume Monitor Connections

See Figure 14.

3. **5120 Oxygen Monitor:** The Ohmeda 5120 Oxygen Monitor measures the concentration (in percentage) of oxygen in the inspired total gas flow. Cables routed within the system framework connect the monitor to system power and a modular jack in the patient connection panel.

   Read the Ohmeda 5120 Oxygen Monitor Operation and Maintenance Manual (Stock Number 0178-1757-000) before operating the monitor.

A. Oxygen Monitor Connections

WARNING: Use only Ohmeda specified sensor cables, hoses and tubing when making connections at the patient connection panel. Failure to use Ohmeda specified cables, hoses or tubing could result in faulty monitor readings and damage to the system and monitors.

CAUTION: Connect cables correctly: each cable routed to the monitor pod is labeled with the name of the monitor to which it connects. If cables are cross connected the system will not operate properly and components could be damaged.

See Figure 14.

a. Insert the oxygen sensor into the sensing port of the patient circuit.
b. Plug the other end of the cable into the patient connection labeled Oxygen Monitor

B. System Power Failure

If system power fails while it is in operation, a system power failure alarm occurs. Place the Batt. Power switch of the 5120 in the On position. When system power is restored, return the switch to Batt. Power.

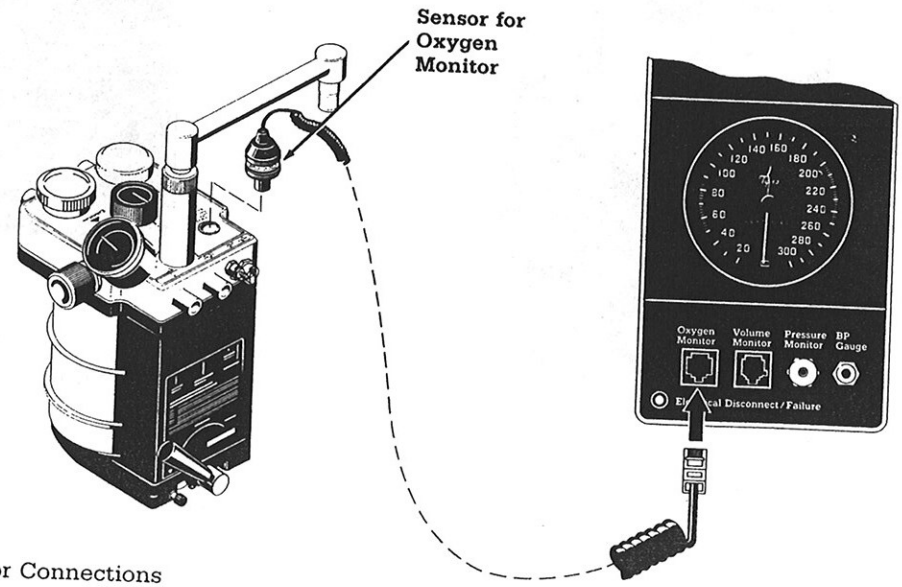


Figure 14
Oxygen Monitor Connections

See Figure 15.

4. **5500 Airway Pressure Monitor:**

The Ohmeda 5500 Airway Pressure Monitor provides warning signals when:

a. circuit pressure is above a selected high value.
b. circuit pressure (sustained pressure) is above a selected value for a pre-set time period.
c. circuit pressure is below a pre-set sub-atmospheric value.

Cables routed within the system framework connect the monitor to system power and a connector outlet in the patient connection panel.

Read the Ohmeda 5500 Airway Pressure Monitor Operation and Maintenance Manual (Stock Number 6050-0000-461) before operating the monitor.

A. Pressure Monitor Connections

A kit with instructions, adapter connections and tubing is included with the 5500 Airway Pressure Monitor, Stock Number 0236-6152-870.

WARNING: Use only Ohmeda specified sensor cables, hoses and tubing when making connections at the patient connection panel. Failure to use Ohmeda specified cables, hoses or tubing could result in faulty monitor readings and damage to the system and monitors.

CAUTION: Connect cables correctly: each cable routed to the monitor pod is labeled with the name of the monitor to which it connects. If cables are cross connected the system will not operate properly and components could be damaged.

See Figure 15.

a. Slip one end of the tubing over the coupling nipple of the pressure gauge.
b. Fasten the free end of the tubing to the Pressure Monitor nipple on the Patient Interface Panel.

B. System Power Failure

If system power fails the system power interrupt alarm sounds. Place the Batt. Power switch of the monitor in the On position. When system power is restored, return the switch to the Off position.

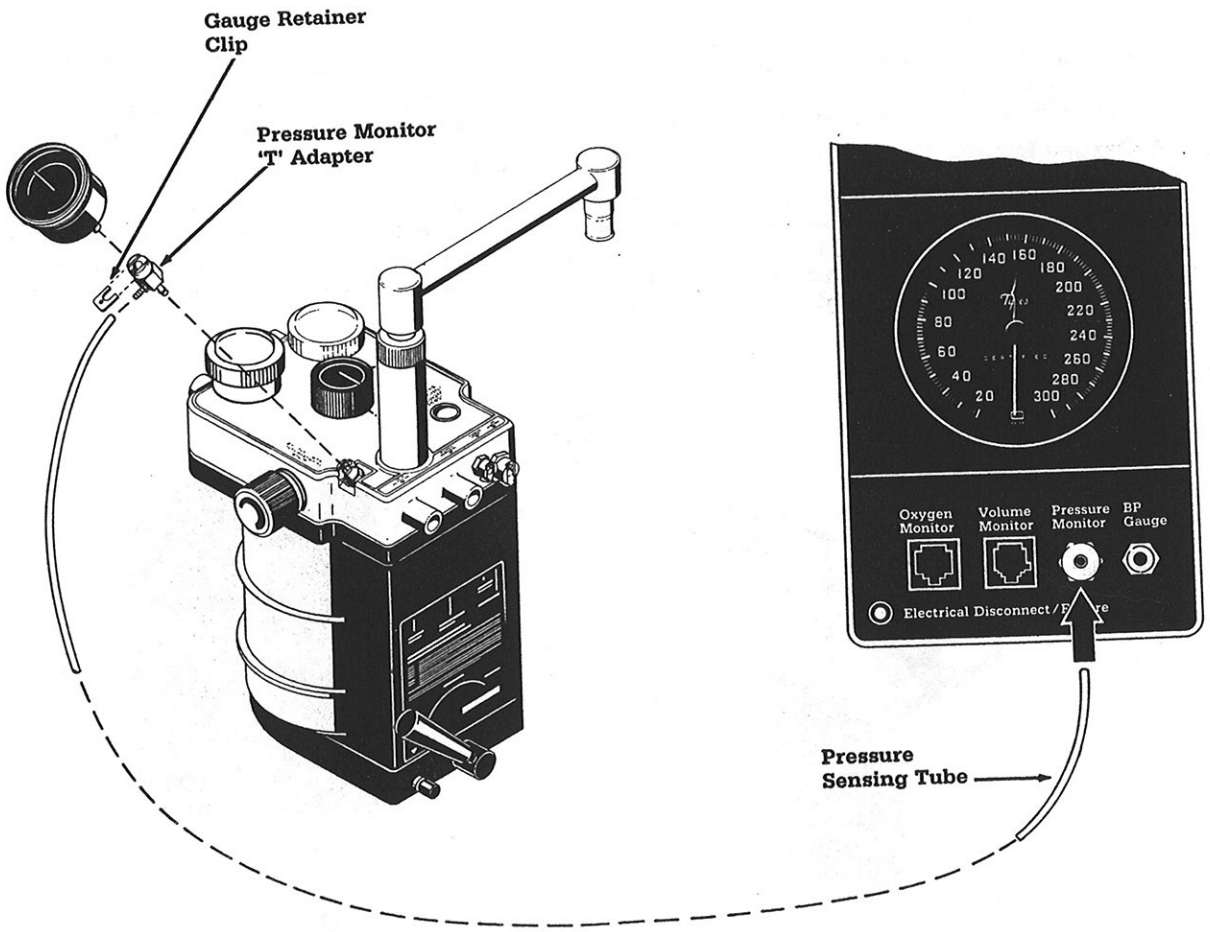


Figure 15
Pressure Monitor Connections

See Figure 16.

5. **Blood Pressure Gauge:** A manually operated blood pressure gauge is installed as an integral system component. Hoses routed within the system framework connect the Gauge Module inlet to a cuff connector.

K. System Alarms

1. **Oxygen Supply Failure Alarm:** An alarm sounds for at least seven seconds when the oxygen supply falls to a nominal 30 psig (207 kPa). This alarm also sounds briefly immediately after the pneumatic circuit is turned on or off.

2. **Electrical Disconnect/Failure Alarm:**

   Note: This alarm is operational only when the machine is plugged into a power source and the power switch is in the **On** position. If the power switch is in the **Off** position, the alarm will not indicate an unplugged power cord.

   When electrical power fails or is disconnected, an alarm activates. Upon activation, the red light in the lower left corner of the Patient Interface Panel blinks intermittently and a two-tone, intermittent alarm sounds (3 seconds on, 12 seconds off).

   An electrical power failure does not deactivate the pneumatic circuit. Gases continue to flow unless there is also a problem in the pneumatic circuit (see the Oxygen Supply Failure Alarm section).

   Section 3.8, B explains what to do when the Electrical Disconnect/Failure Alarm activates.

3. **Monitor Alarms:** Each system monitor has one or more alarm conditions. The operation and maintenance manual for each monitor gives detailed information on alarm conditions and how the monitor alerts the operator to these conditions.

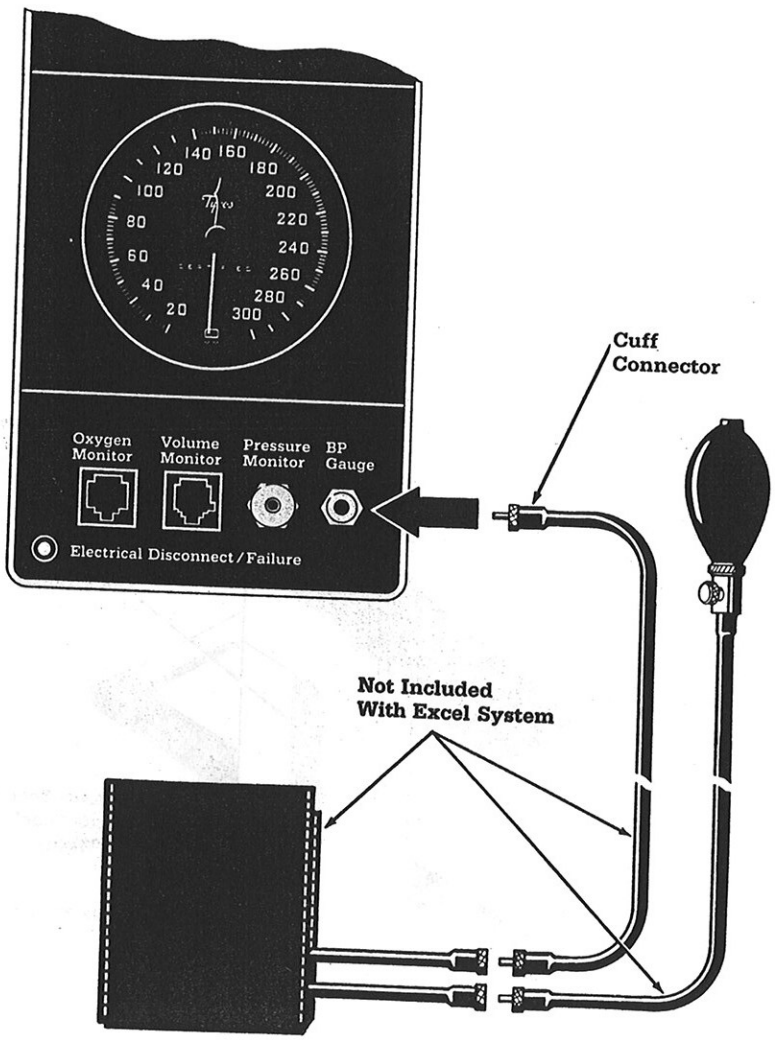


Figure 16
Blood Pressure Gauge Connections

L. Other Standard Equipment

1. **Shelves:** Two shelves are mounted on the upper framework. The middle shelf is level and is mounted above the vaporizer manifold. The other shelf is mounted above the upper framework and is tilted 10 degrees forward, in a fixed position, to provide a better viewing angle. The top shelf has a hook-and-loop fastener strap and a set of retaining clips to help secure equipment. Slots in the shelves allow the straps to be installed to accommodate various sizes of equipment. The middle shelf has no hook-and-loop fastener set up. See Section 3.1 for shelf and strap adjustment instructions.

CAUTION: Do not exceed the maximum weights specified for each shelf; top shelf, 50 lbs (25 kg.) – middle shelf, 24 lbs (11 kg.)

2. **Side Rail Mounting Tracks:** All systems have mounting tracks on either side of the upper framework. The rail system on the left side is used to mount the monitor pod. With the appropriate bracket, additional equipment (such as shelves or suction units) can be mounted in these tracks.
3. **Absorber Post Mounting Assembly:** The absorber post mounting assembly is located at the left front corner of the stand. A push button elevating mechanism adjusts and locks the 14-inch (35.5 cm) long swivel arm from a height of 10 to 26 inches (25.4 to 66 cm) from the floor. A knurled knob secures the absorber in the desired horizontal position. See Section 3.4 for Ohmeda GMS Absorber mounting instructions.
4. **Low Pressure Leak Testing Device:** Part of the routine checkout of the system is a leak test of the pneumatic circuit. The Low Pressure Leak Testing Device is used for that purpose, and must be stored in one of the drawers when not in use. Section 4.4 describes use of the device.

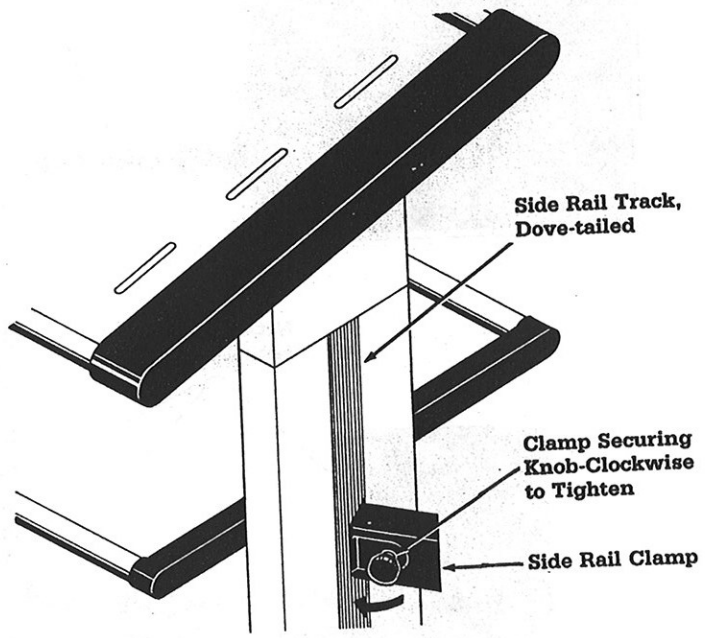


Figure 17
Rail System Mounting Tracks

2.2 Accessories and Additional Options

A. Vaporizers

Use only Tec 4 Continuous Flow Vaporizers on the Ohmeda Excel Anesthesia System vaporizer manifold.

See Section 3.7 for mounting instructions.

Read the Tec 4 Continuous Flow Vaporizer Operator's Manual (Stock Number 205-7106-300) before using the vaporizers.

If desired, an optional extra vaporizer mount is available for mounting a spare vaporizer on the back of the two-vaporizer 110 and 210 Excel models.

B. Absorber and Bain Circuit Adapter

The Ohmeda GMS (Gas Management System) Absorber is the Ohmeda Excel Anesthesia System's companion unit.

The Ohmeda GMS Bain Circuit Adapter is available for exclusive use with the GMS Absorber.

Read the following before using the absorber or Bain Circuit Adapter.

- The GMS Absorber Operation and Maintenance Manual, Stock Number 0178-1742-000
- The GMS Bain Circuit Adapter Operation and Maintenance Manual, Stock Number 0178-1752-000

C. Ventilator

Ohmeda highly recommends use of the 7000 Electronic Anesthesia Ventilator with the Ohmeda Excel Anesthesia System.

The kit allows the ventilator bellows to be mounted on the GMS Absorber so that the bellows and absorber ports interface directly (see Section 3.4). This arrangement reduces the chance of cross connections in the circuit. Only the GMS Absorber and the 7000 Electronic Anesthesia Ventilator with the remote bellows can be interfaced using the kit. Figures 23 and 24 show systems set up using the interface arrangement.

Read the 7000 Electronic Anesthesia Ventilator Operation and Maintenance Manual (Stock Number 0178-1732-000) before operating the ventilator.

D. Waste Gas Scavenging

Ohmeda recommends use of the Waste Gas Scavenging Interface Valve Assembly. Use this assembly with active (high vacuum) or passive (low vacuum) gas disposal systems.

Read the Waste Gas Scavenging Interface Valve Assembly Operation and Maintenance Manual (Stock Number 0178-1728-000) before using the assembly.

E. Lighting Panel See Figure 18.

Systems have a lighting panel installed along the middle shelf's bottom front edge. The panel provides illumination for the Flow Control Assembly and components encompassed by the system's upper framework.

A three-setting control switch provides two levels of brightness and turns the lights off independently of the master switch.

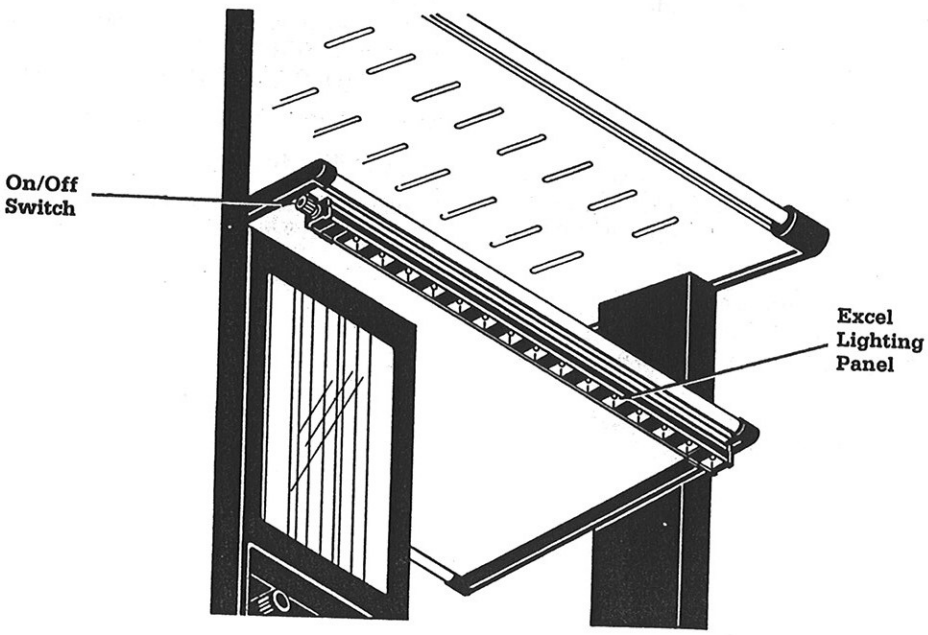


Figure 18
Lighting Panel

2.3 Specifications

A. Physical:

Overall System:

Shipping Weight (approximate): 300 lb. (135 kg)

Weight Added by Options:

One Vaporizer; 17 lb. (7.6 kg)
Absorber; 21 lb. (9.5 kg)
Ventilator; 19 lb. (8.5 kg)

Dimensions: Each Model has a common frame height and depth.

Height: 66 in. (168 cm) from floor to upper most part (back edge) of top shelf.

Depth: 30 in. (76 cm) with casters and brake bar.

Machine Width with Monitor Pod:

Model 110 – 27 in. (68 cm)
Model 210 – 29 in. (73.6 cm)

Middle Shelf:

Maximum Shelf Load; 24 lb. (11 kg)

Shelf Size;

Model 110 – 16.6 in. (42 cm) wide by 12.5 in. (31.7 cm) deep

Model 210 – 17.7 in. (45 cm) wide by 11.5 in. (29 cm) deep

Front Clearance Height; 6.2 in. (16 cm) maximum

Tilted (Top) Shelf:

Maximum Shelf Load; 48 lb. (22 kg)

Shelf Size;

Model 110 – 17.4 in. (41.2 cm) wide by 13.8 in. (35 cm) deep

Model 210 – 19 in. (48.2 cm) wide by 13.8 in. (35 cm) deep

Tabletop:

Height from Floor; 33 in. (84 cm)

Size; Model 110 – 20 in. (50.8 cm) wide by 11.2 in. (28 cm) deep

Model 210 – 21.7 in. (55 cm) wide by 11.2 in. (28 cm) deep

Drawer Cabinet:

Contains three 14 in. (35.5 cm) deep, 15 in. (38 cm) wide, rubber lined, ball bearing slide drawers. Bottom drawer is 8 in. (20.3 cm) high. Two top drawers are 4 in. (10.1 cm) high.

Absorber Post Mounting Assembly:

Absorber Swivel Arm Length 14 in. (35.5 cm)

Push Button Vertical Adjustment 10 to 26 in. (25.4 to 66 cm) from floor.

Range of Horizontal Adjustment 6.5 in. (16.5 cm) minimum; 11 in. (28 cm) maximum

Casters:

5 in. (12.7 cm) diameter; non-conductive; front casters have a foot-operated brake-bar lock.

Common Gas Outlet:

Equipped with a latching, positive engagement, bayonet type connector. The Common Gas Outlet connector will also accept standard 22 mm OD or 15 mm ID conical friction fit connectors.

B. Pneumatics

Oxygen Pressure Sensor Shutoff Valve System:

Pressure Sensor Shutoff Valves shut off all other gas flows if oxygen supply pressure falls to approximately 20 psig (138 kPa).

Oxygen Supply Failure Alarm:

An alarm sounds for at least 7 seconds when oxygen pressure falls below 30 psig (207 kPa).

Pipeline Supply Pressure:

A nominal 50 psig (345 kPa) pressure supply is required for all pipeline gases.

Gas Supply Modules:

Pipeline Inlet Connections – DISS (diameter index safety system) inlets are standard for oxygen, nitrous oxide and AIR connections. Ohmeda Excel Anesthesia Systems are equipped with check valves on the pipeline inlet connectors to help prevent gas flow from machine back into the pipeline.

Cylinder Hanger Yokes – Safety pin-indexed, locking gate style requiring CGA standard medical gas cylinders with pin-indexed, post-type valves. Built-in, one-way check valves minimize loss of cylinder gas.

Cylinder Pressure Regulators – Set at nominal 45 psig (310 kPa) for all gases. Primary regulator diaphragm minimum burst pressure is 250 psig (1,750 kPa).

Gas Pressure Gauges – White on black, dual-scale gauge faces within color coded and labeled identification plates. Cylinder gauge scales range from 0 to 3,000 psig (0 to 20,680 kPa). Pipeline gauge scales range from 0 to 100 psig (0 to 689 kPa).

Safety Relief Valves – Set at 75 psig (517 kPa)

Oxygen Flush:

Recessed, self-closing push button provides a flow of 45-75 L/min when fully depressed.

Calibrated Ranges Of Flowmeters

Oxygen, Double Tube: 0.2-0.95 L/min and
1.0 L/min-10 L/min

Nitrous Oxide, Double Tube: 0.04-0.9 L/min and
1.0 L/min-10 L/min

Air (optional): 1-15 L/min

Flowmeters Calibrate at 68F (20C) and 760 mmHg (101.3 kPa)

Percent of Flow Full Scale	Percent of Reading Accuracy ±
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

Note: Actual machine output at the Common Gas Outlet will vary due to breathing circuit pressure, barometric pressure and temperature.

Link-25 Proportion Limiting Control System:

Provides nominal 25% oxygen concentration for gas mixtures containing only oxygen and nitrous oxide.

Minimum Oxygen Flow:

The oxygen flow control valve is set to deliver a minimum flow of 0.2 L/min (nominal) when the system On/Off switch is turned to On.

C. Electrical

Maximum Internal Power Requirements – Standard System:

Unit with Monitor Pod and Monitors:
35 Watts at 100/120V ac
with Ohmeda 7000 Anesthesia Ventilator added,
60 Watts at 100/120V ac

Line Voltage Outlets:

10A maximum available at 100/120V ac

Leakage Current:

Less than 100 uA at 100/120V ac

Fuses:

Two 10A, 5 by 20mm fuses for line voltage outlets;
One 0.5A, 5 by 20mm fuse for internal circuitry at 100/120V ac

Electrical Failure Alarm:

An intermittent alarm sounds for 3 seconds on, 12 seconds off, when line voltage fails.

3.1 Shelves and Mounting Brackets

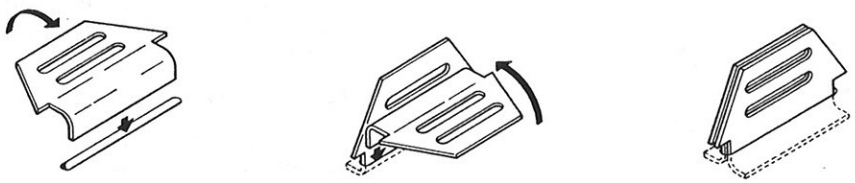
CAUTION: Do not exceed the maximum weights specified for each shelf; Top shelf, 50 lb. (25 kg) – Middle shelf 25 lb. (12 kg).

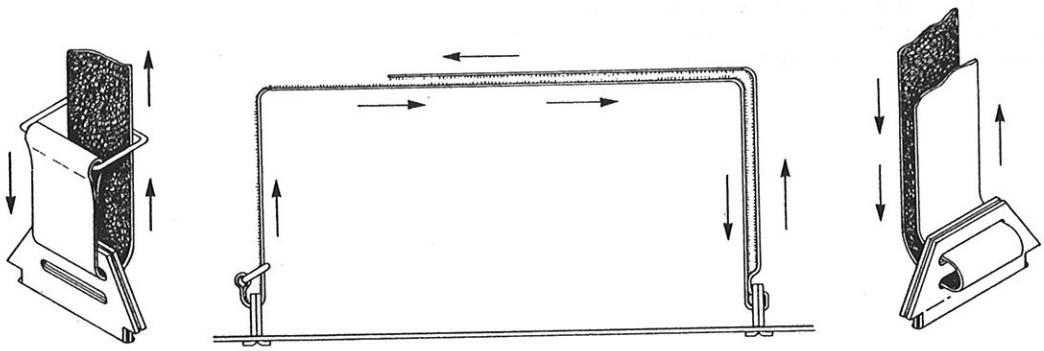
A. Securing Equipment on Top Shelf

See Figure 19.

To secure the equipment using the clips and straps provided, do the following:

1. Determine where the equipment is to be placed on the shelf.
2. Place two clips through the closest slot on each side of the equipment. Make sure the clips are held securely in the slots.
3. Place the strap through the clips and secure the equipment as shown in Figure 19.





Adjust Straps According To The Size of the Equipment

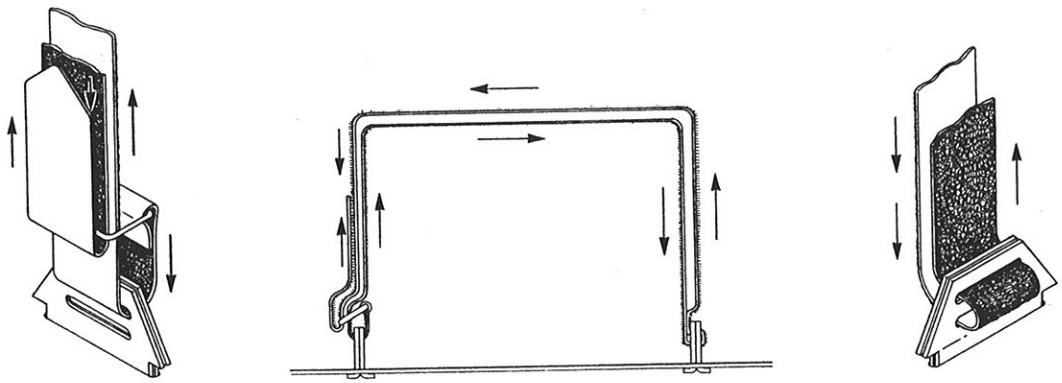


Figure 19
Securing Equipment on Top Shelf

B. Monitor Pod Installation

See Figure 20.

All mounting track brackets, regardless of the equipment they support, have the same mounting track mechanism.

To install the monitor pod in the side rail mounting track do the following:

1. Turn the upper and lower bracket knobs counterclockwise until the lip on the hinged portion retracts.

   Note: Although the following mounting may be accomplished by one person, the pod is somewhat heavy and installation is easier with one person hold the pod in position while the another tightens the upper and lower brackets to hold the pod securely in the grooved tracks provided.

2. Fit the bracket mounting surfaces into the mounting track so that the bracket lips fit into a mounting track groove.
3. Slide the monitor pod to the desired height.
4. Turn both the bracket knobs clockwise to secure the brackets in the track and ensure that the monitor pod is securely positioned.
5. Unwrap the light bar power supply and cord and plug the the transformer unit into an auxiliary electrical outlet on the rear panel of the pod.
6. Unwrap the Excel Machine power cord and it is ready to plug into a hospital grade, 120V ac outlet.
7. If the Excel Gas Machine utilizes an Ohmeda 7000 Anesthesia Ventilator, plug its power cord into one of the auxiliary electrical outlets on the back panel of the pod.

Note: The Monitor Pod's 9 volt, rechargeable, Nicad battery may discharge if stored for longer than two months. After proper installation of the Monitor Pod, the monitors should turn on with the Excel's ON/OFF switch. If they do not, leave the Monitor Pod power cord plugged in overnight to recharge the battery.

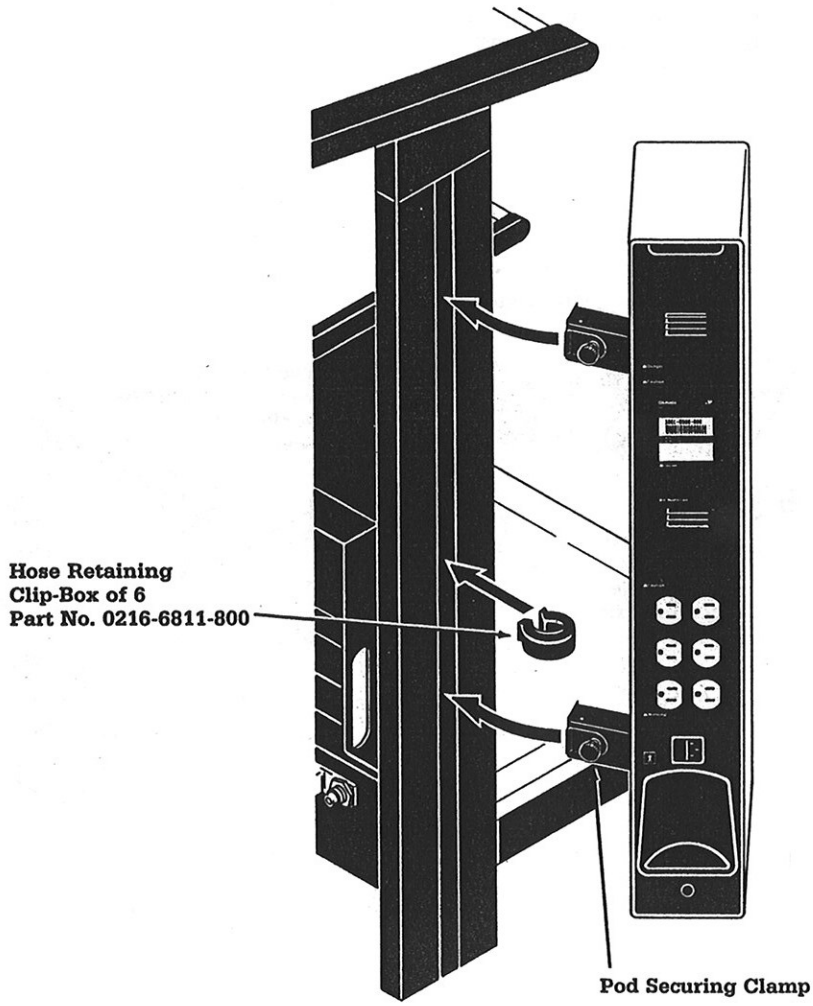


Figure 20
Installing Monitor Pod to Side Rails

3.2 Cylinder Installation

WARNING: Do not leave oxygen cylinders open if the pipeline supply is in use and the system On/Off switch is turned to On. Pressures from both supplies may become equal, and if simultaneously used, cylinder supplies could be depleted; leaving an insufficient reserve supply in case of pipeline failure.

CAUTION: To avoid stripping threads, do not use wrenches on the tee handles.

CAUTION: Always use a yoke plug and cylinder gasket to seal an unused yoke: Yoke check valves alone may not provide a leak-free seal.

See Figure 21.

Note: Use "D" or "E" size gas cylinders.

1. Turn the system On/Off switch to Off.
2. Give the yoke gate tee handle a slight rap with the palm of the hand and swing the right end of the gate up and over to the left.
3. Back out the tee handle until the tip of the screw is flush with the inside surface of the gate.
4. Before installing a cylinder in the yoke make sure there is no dust cap on the cylinder valve.

   Note: Use the correct side of the cylinder wrench when opening and closing cylinder valves. Labels on the wrench tell which side to use for opening and which side to use for closing.
5. Make sure used gaskets are removed from the yoke strainer nipple. Use a fresh gasket each time a cylinder is installed.

CAUTION: Use only one cylinder gasket per yoke. Using more than one gasket could cause cylinder gas leakage.

6. Align and engage the holes in the cylinder post with the safety index pins and strainer nipple.
7. Swing the gate closed and turn the tee handle (by hand only) to hold the cylinder firmly in place. The gate locks shut to help prevent accidental opening.

CAUTION: Open cylinder valves slowly to avoid damaging the regulators.

8. Check for leaks as follows:

a. Disconnect the pipeline gas supply.
b. Momentarily open, then close, the cylinder valve.
c. Watch the cylinder pressure gauge: pressure should drop no more than 50 psig (345 kPa) during the next minute. If pressure drops more than this, the high pressure circuit has an unacceptable leak. Sometimes a defective cylinder gasket or loose tee handle can cause such leaks. Replace the gasket and tighten the tee handle; then repeat the leak check. If the leak is still in evidence, do not use the system and call an Ohmeda Service Representative for repairs.

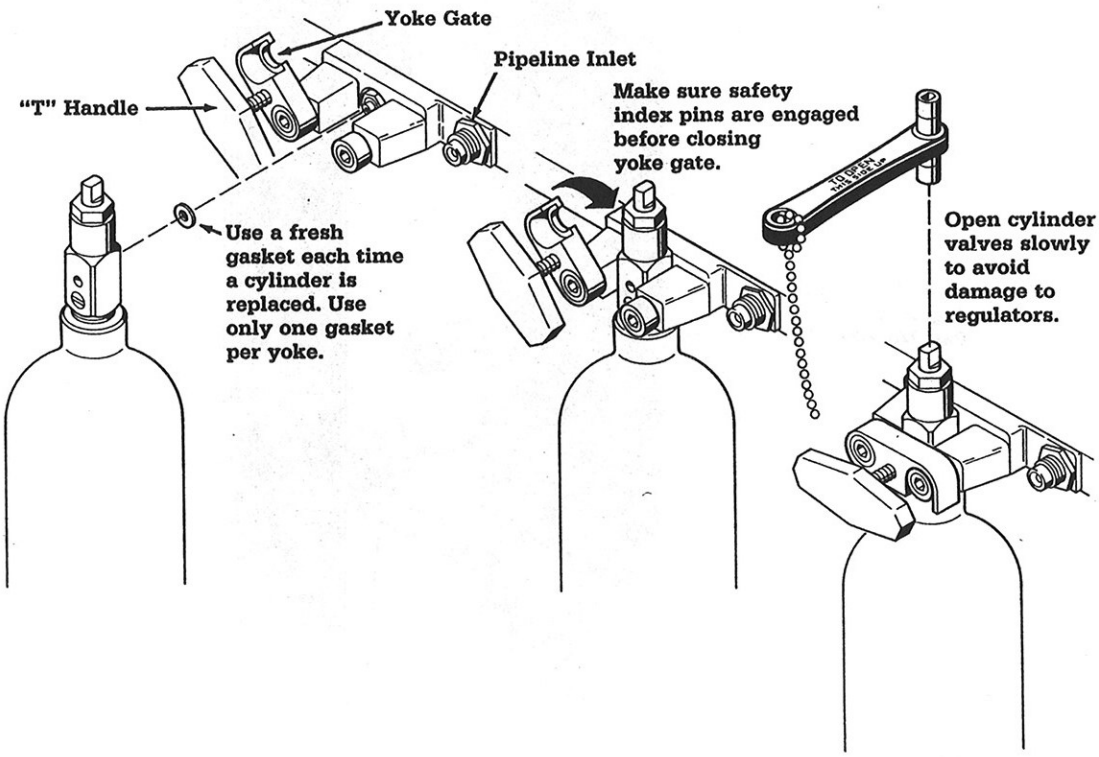


Figure 21
Cylinder Installation

3.3 Pipeline Inlet Connections

Use high pressure hoses to connect the system's oxygen, nitrous oxide, and Air (if present) pipeline inlets to the hospital's pipeline gas outlets. High pressure hoses (not provided) must have DISS fittings at the inlet ends.

3.4 Absorber and Ventilator Setup

Ohmeda recommends the absorber and ventilator setup described in this section because it reduces the chance of making cross connections. Regardless of the setup used, it is essential that the user have a thorough knowledge of each component and its interface with other components so that all anesthesia circuit connections are made correctly. Read the operation and maintenance manual for each component of the anesthesia circuit. Setup and operate all anesthesia equipment in accordance with accepted clinical practice.

A. Absorber Mounting

See Figure 22.

1. Hold the absorber so that the absorber arm's mounting pin fits into the hole in the bottom of the mounting block. Loosen the absorber mounting knob until the block drops fully over the pin.
2. Tighten the absorber mounting knob to secure the absorber in position.
3. Press the vertical adjustment button to raise or lower the absorber. Support the absorber while adjusting its vertical position.

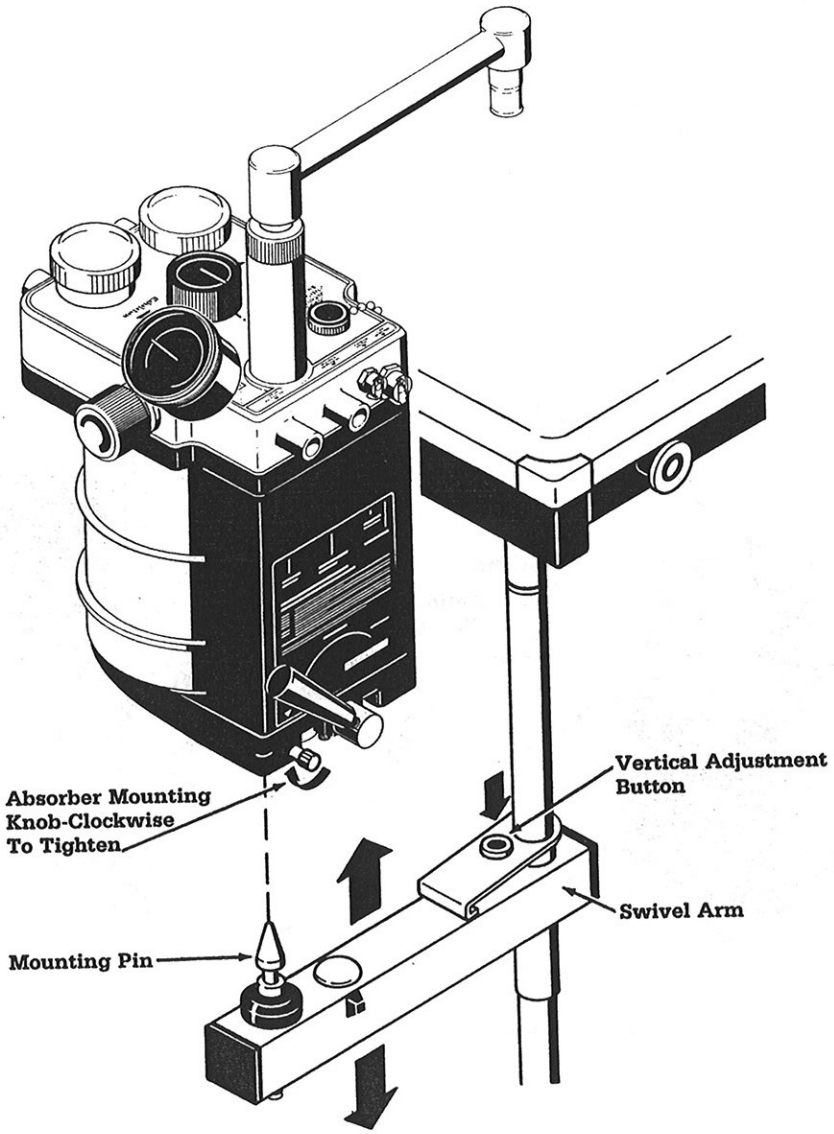


Figure 22
Absorber Mounting

B. Ventilator to Absorber Interface Connections

See Figures 23 and 24.

Note: The setup instructions in this section require that:

1. the 7000 Electronic Anesthesia Ventilator control module is installed above the Flow Control Assembly.
2. the GMS Absorber is mounted on the absorber arm.
3. bellows support pins are installed on the absorber.
4. a bellows support and manifold are installed on the ventilator bellows base.
5. a bellows inlet adapter is installed on the control module inlet.
6. a tubing clip and connector is installed on the left side of the system framework.
7. these items are present:

a. a 4 foot (1.22 meters) long, oxygen, high pressure hose with right-angle DISS fittings at each end.
b. a 35 ½-inch (90 cm) long, ½-inch ID tube
c. a 40 ½-inch (103 cm) long corrugated tube
d. four hanger tabs

Systems ordered to include the 7000 Electronic Anesthesia Ventilator have the installations and items listed above. Systems which did not originally include the ventilator may be adapted for the setup described here. Call an Ohmeda Sales Representative for more information.

To engage the interface manifold:

See Figure 23.

1. Align the two ventilator bellows support guides with the two bellows support pins.
2. Slide the support guides over the support pins until the manifold ports align with and touch the absorber ports.
3. Engage the locking rod with the tapped hole in the bellows support by turning the locking knob clockwise. Continue turning the knob until it stops.

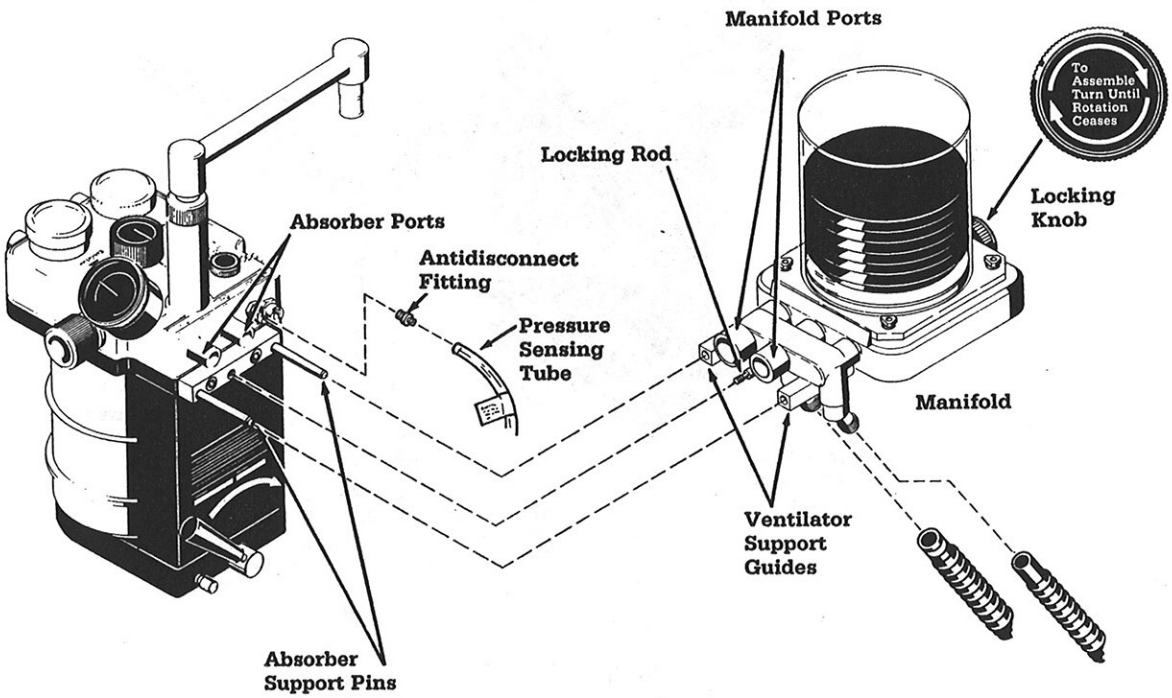


Figure 23
Absorber/Ventilator Interface Connections

See Figure 24.

To make control module to interface manifold and absorber connections:

1. Fit an end of the ½-inch ID tube over the inlet adapter nipple.

   Note: The adapter is installed on the control module port labeled Connect To Bellows Ass'y Inlet.

2. Slide the free end of the tube through the larger rings of two hanger tabs. Space the tabs on the tube length as shown.

3. Fit the open end of the tube over the top end of the tubing connector clipped to the side of the stand.

   Note: The tubing connector can be pulled out of the clip to make assembly easier. Remember to re-secure the connector when assembly is complete.

4. Slide the clear ⅛-inch ID tube through the smaller rings of the two hanger tabs.

5. Fit the top end of the clear tube over the control module's barbed connector labeled Connect To Distal Sensing Tee.

6. Secure the clear tube (at approximately mid-length) to the side of the stand as shown.

7. Slide the non-secured length of clear tube through the smaller rings of the two remaining hanger tabs.

See Figure 23.

8. Fit the open end of the clear tube over the barbed end of the anti-disconnect fitting provided with the absorber.

9. Place the other end of the anti-disconnect fitting into the absorber port labeled Circuit Pressure.

WARNING: To insure proper function of the ventilator Low Pressure Alarm, clear accumulated condensate from the pressure sensing line immediately.

See Figure 24.

10. Fit an end of the the 17 mm corrugated tube over the bottom end of the tubing connector.

11. Slide the corrugated tube through the remaining hanger tab rings. Space the tabs as shown.

12. Fit the open end of the corrugated tubing over the 17 mm barbed interface manifold connector.

13. Use a length of 19 mm corrugated tubing to connect the remaining (19 mm) barbed interface manifold connector to an appropriate gas scavenging system.

    See Section 2.2, D for setup instructions using the Ohmeda Waste Gas Scavenging Interface Valve.

WARNING: Do not connect the interface manifold directly to a vacuum source. The vacuum may remove required gases from the patient circuit. Read the Ohmeda Waste Gas Scavenging Interface Valve Assembly Operation and Maintenance Manual (Stock Number 0178-1728-000) for further detailed information.

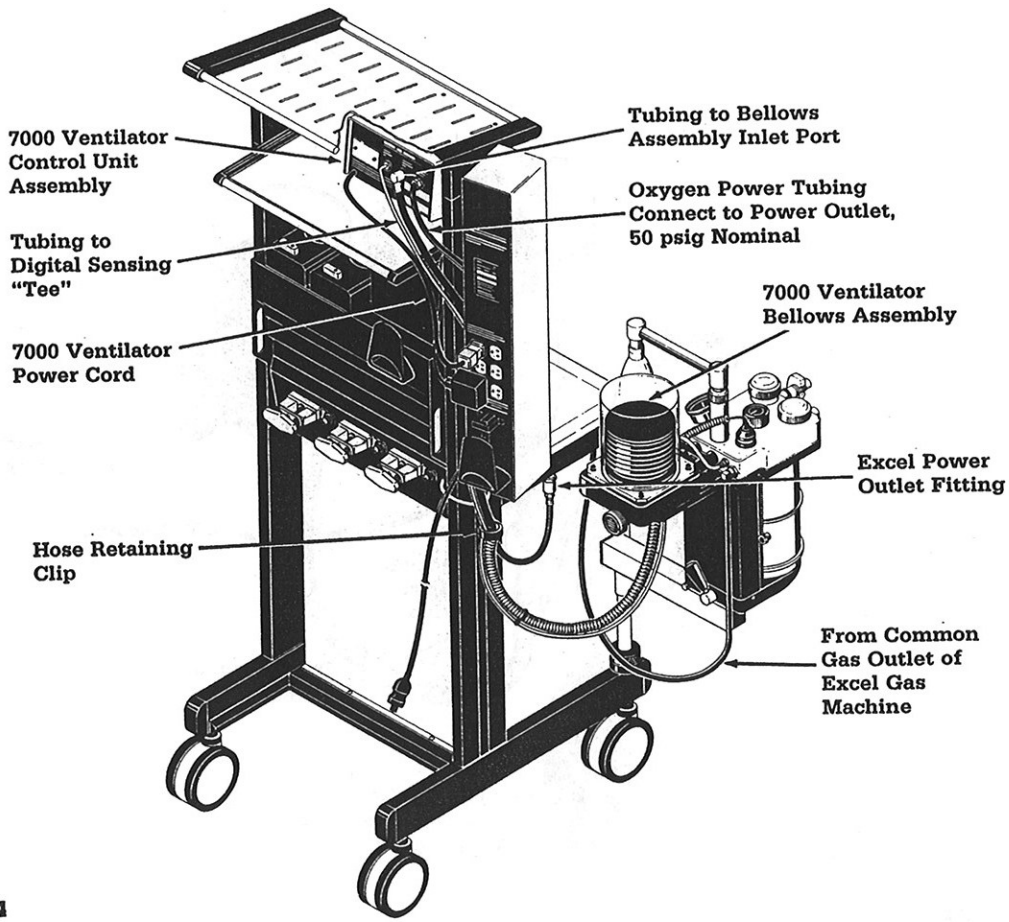


Figure 24
Interface Connections

To make remaining ventilator connections:

1. Plug the ventilator power cord into one of the receptacles on the electrical pod back panel.
2. Use the 4 foot (1.22 meters) long high pressure hose to connect the control module inlet labeled Use Only Oxygen (nominal 50 psig) to the system's oxygen power outlet.

3.5 Waste Gas Scavenging Connections

See Figure 25.

Lengths of 19 mm nominal corrugated tubing and a 19 mm nominal bore 3 liter disposable reservoir bag are provided with the Gas Scavenging Interface Valve Assembly. The tubing and the reservoir bag are marked with yellow bands to indicate their use as a disposable bag for waste gas scavenging.

CAUTION: To help prevent O.R. pollution, make sure all unused Waste Gas Scavenging Valve connectors are capped.

Read the Ohmeda Waste Gas Scavenging Interface Valve Assembly Operation and Maintenance Manual (Stock Number 0178-1728-000) before operating the valve.

A. Setup for Use with a High Vacuum Disposal System

1. Connect a suitable length of 19 mm corrugated tubing from the 19 mm barbed connector on the absorber to bellows interface manifold to the straight side of the double connector extending from the bottom of the Interface Valve Assembly.
2. Connect a yellow banded, 3 liter reservoir bag to the bottom single connector. Make sure the unused connectors are capped.
3. Connect a ¼-inch ID vacuum hose from the barbed swivel connection on the vacuum adjustment needle valve to a vacuum pipeline system (at least 10 inches Hg {254 mm Hg} vacuum required).

B. Setup for Use with a Passive Disposal System

1. Connect a suitable length of 19 mm corrugated tubing from the 19 mm barbed connector on the absorber to bellows interface manifold to the straight side of the the double connector extending from the bottom of the Interface Valve Assembly.
2. Connect a suitable length of 19 mm corrugated tubing from a lower unused connector of the Interface Valve Assembly to the non-recirculating ventilation system. Make sure all unused connectors are capped.
3. Close the vacuum adjustment valve.

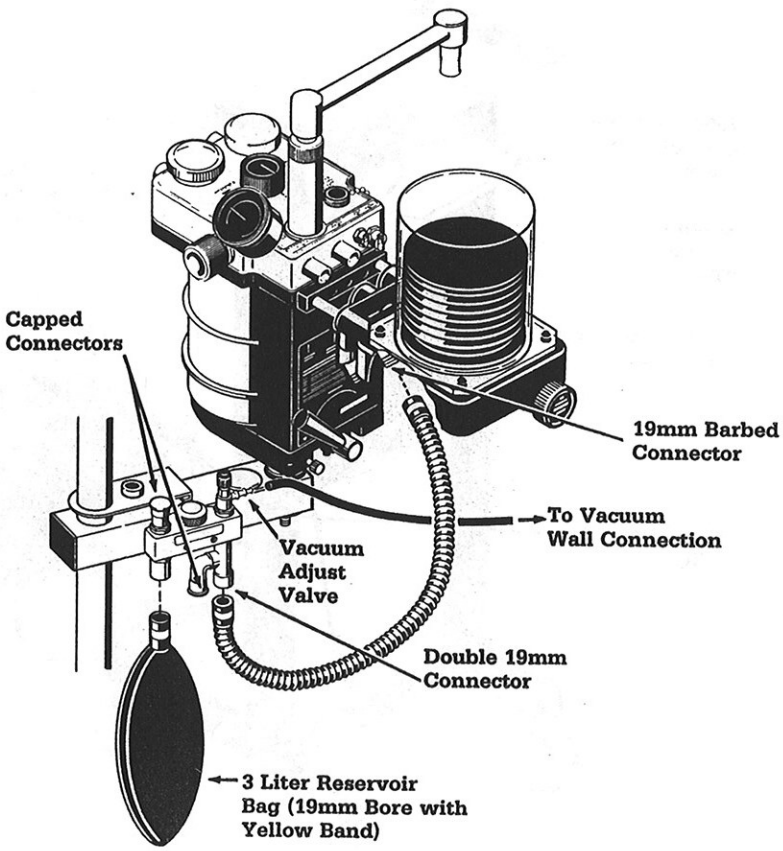


Figure 25
Waste Gas Scavenging Setup

3.6 Common Gas Outlet and Patient Breathing Connections

1. Attach the gas supply tube inlet adapter to the Common Gas Outlet as shown below.
2. Attach the other end of the gas supply tube to the absorber common gas inlet labeled Common Gas. The tube cannot be connected at the absorber inlet unless it has a compatible anti-disconnect fitting.

WARNING: Before use:

1. **the inlet adapter must be placed all the way onto the Common Gas Outlet and turned clockwise until completely secured by both protruding pins (if the inlet adapter is not secured, a spring ejects it out of the Common Gas Outlet),**

   and

2. **the anti-disconnect nipple end must be placed securely into the absorber's Common Gas anti-disconnect fitting.**

   Both ends of the outlet tubing assembly must be secure or no gas will flow to the patient circuit.

See Figure 26.

3. Connect a patient breathing circuit to the absorber.
4. Attach a patient breathing bag to the absorber.

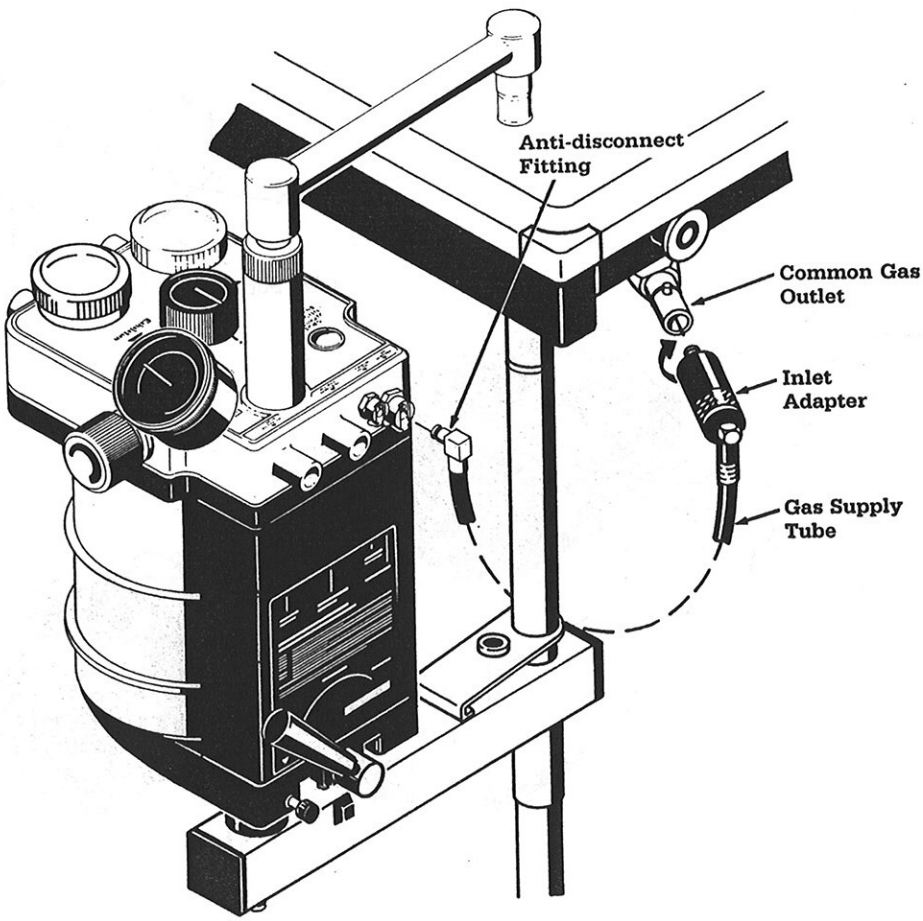


Figure 26
Common Gas Outlet to Absorber Connection

3.7 Mounting a Vaporizer

Note: Ohmeda recommends that each institution establish a standard mounting sequence for all vaporizer manifolds in use. However, when Tec 4 Vaporizers are properly mounted on a Selectatec SM Vaporizer Manifold, gas flow enters only the selected vaporizer. The left to right mounting sequence (for example: Enfluratec, Isotec, Fluotec) has no effect on vaporizer performance.

See Figure 27.

To mount a vaporizer, do the following:

1. Make sure the vaporizer control knob is in the Off setting.
2. Make sure the vaporizer locking lever is turned counterclockwise as far as it will go.
3. Carefully lower the vaporizer onto the manifold location so that the vaporizer's interlock block covers the two manifold port valves.
4. Turn the locking lever clockwise to lock the vaporizer onto the manifold.

To check for proper vaporizer mounting:

1. Visually check to make sure the tops of all vaporizers are level and at the same height. If a vaporizer is visibly misaligned, remove it from the manifold and try mounting it again.
2. When all vaporizers appear level, are at the same height, and have their locking levers in the locked position, attempt to gently lift each vaporizer off the manifold. If a vaporizer can be lifted off the manifold, it is not properly mounted. Try to mount the vaporizer again.

WARNING: Do not use a vaporizer which is visibly misaligned on the manifold or which lifts off the manifold when its locking lever is in the locked position.

To remove a vaporizer, do the following:

1. Turn off the vaporizer which is to be removed. If it is not turned completely to the Off setting, it will not release from the manifold.
2. Turn the vaporizer locking lever counterclockwise to disengage the vaporizer.
3. Carefully lift the vaporizer straight up and off the manifold.

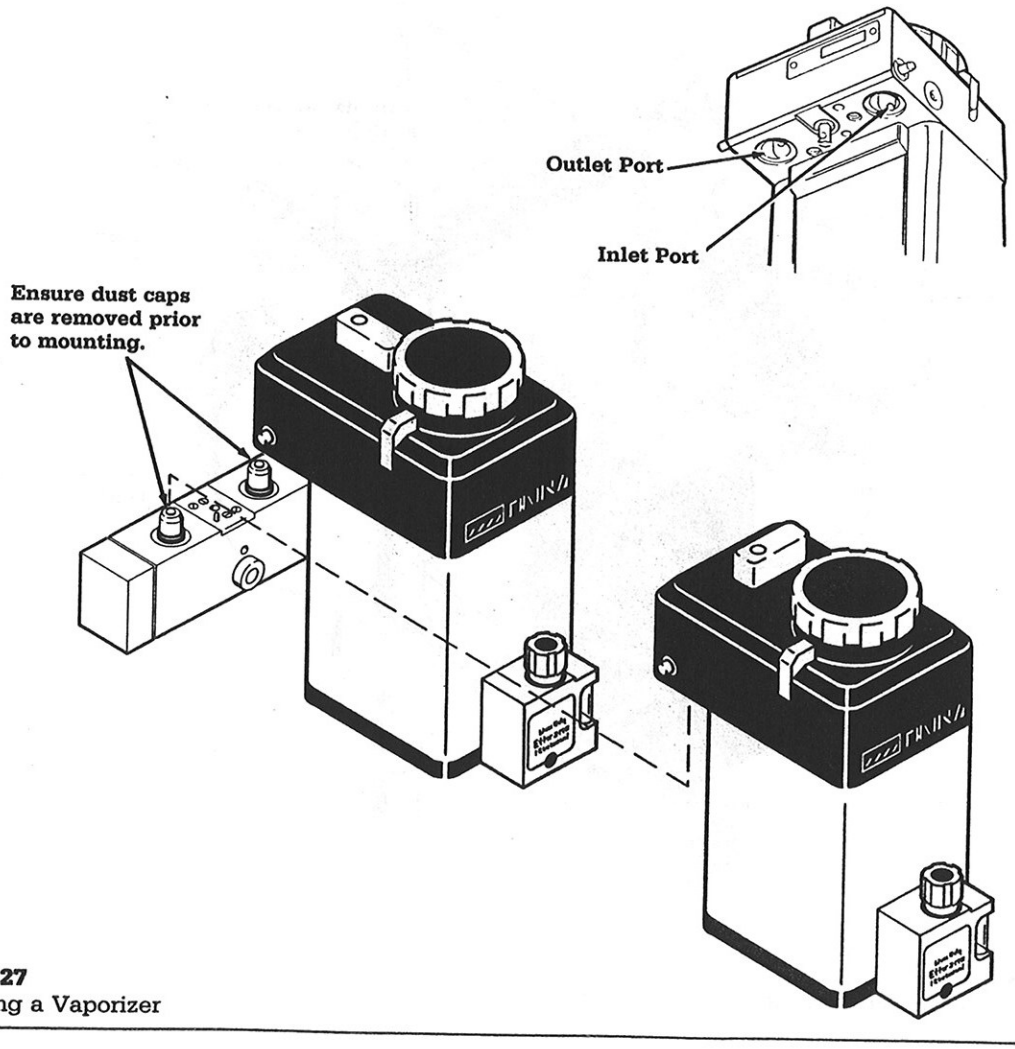


Figure 27
Mounting a Vaporizer

3.8 Setup and Operation System Tests

WARNING: Do not attempt to use the anesthesia system without first ensuring that the complete system, including all accessory equipment, is operating correctly.

Perform the following test procedures using the same medical gas and electrical supply source to be used during the clinical procedure.

A. Preparation

1. Ensure that each flow control valve is Off (fully clockwise).
2. With the On/Off switch in the Off position, the gas supplies connected and ready, check that there is no gas flow to any of the flow tubes but that there is an oxygen supply available at both the oxygen power outlet and the oxygen flush valve.

   Push button on "O_2" flush valve and listen for the oxygen flow at the common gas outlet.

   With a ventilator connected to the power outlet, turn it on and watch for the bellows to move.

B. Warning System Checks

1. **Oxygen Failure/Low Pressure Alarm**

a. Turn the On/Off switch to On and ensure that the oxygen supply failure warning system alarm operates for 3 seconds, indicating that the alarm system is operational.
b. If the alarm continues to operate for more than 7 seconds, ensure that the oxygen supply is adequate and that the supply is properly connected. If the supply is adequate and properly connected the system is malfunctioning and requires attention. Contact your nearest Ohmeda Service Office for service and assistance.
c. When the alarm tone ceases to operate, check that there is a continuous standing flow of 0.17 to 0.25 liters/minute indicated on the oxygen flowmeter when the O_2 flow control valve is set fully clockwise.
d. Increase the oxygen flow to approximately 4 liters/minute.

WARNING: Use the system oxygen monitor to verify that the gas flowing from the common gas outlet is 100% oxygen.

e. Turn all other flow control valves counterclockwise until two liters/minute flow is indicated in each flow tube.
f. Turn off the oxygen supply cylinder and disconnect the pipeline supply hose as appropriate to simulate an oxygen supply failure.
g. Check that after the residual oxygen supply has depleted, the oxygen failure warning sounds for a minimum of seven seconds and all other gas supplies cease to flow through their respective flow tubes.
h. Reconnect the oxygen supply and check that the oxygen failure alarm tone ceases and all other gas flows through the flowmeter unit are reinstated.
i. Turn off the nitrous oxide supply cylinder and disconnect the pipeline supply hose. Check that only the flow indicated in the nitrous oxide flow tube decreases to zero. Reconnect the nitrous oxide supply.
j. Repeat the procedure for all other gases to verify that each gas supply is connected to its associated flow tube and to that flow tube only.
k. When all other gas supplies have been verified, turn all flow control valves fully clockwise to their respective minimum flow settings.

2. **Electrical Disconnect Alarm Check**

a. Unplug the power cord with the system On/Off switch turned On. The Electrical Disconnect Alarm must operate, the alarm light in the lower left hand corner of the Patient Interface Panel must flash and an audible tone must sound. The monitors in the monitor/electrical pod and the rear panel auxiliary electrical outlets will de-energize.
b. Plug in the power cord and observe that:

- the alarm light in the lower left hand corner of the Patient Interface Panel stops flashing and the audible tone is silenced.
- all system monitors are on.
- no monitor is in the battery mode.
- the rear panel auxiliary electrical outlets are active.

Note: When external power is restored to the 5420 Volume Monitor, and the On/Off switch is in the On position, it has internal circuitry which automatically turns off the battery backup and switches over to external power. Battery backup power to the other monitors must be manually turned off.

What to do if Electrical Power Fails

If the Electrical Disconnect Alarm activates, do the following:

a. Make certain the system power cord has not been accidentally disconnected.
b. Switch to the Bag/APL mode and begin manual ventilation ("bagging") to the patient.

Note: The Ohmeda 7000 Anesthesia Ventilator does not have a battery backup power supply.

c. Place the system monitors which have alternate battery backup in their battery modes. (Consult the individual monitor's Operation and Maintenance manual for instructions.)

Remember: When power is restored, stop using battery power....it will needlessly discharge the batteries. The 5120 Oxygen Monitor and the 5500 Airway Pressure Monitor require the operator to manually switch off battery power. The 5420 Volume Monitor switches off battery power automatically as long as the On/Off switch is on.

3. **Monitor Alarms**

Read each monitor's Operation and Maintenance manual for detailed instructions on their specific alarms.

5420 Volume Monitor Alarms
(Operation and Maintenance Manual No. 6050-0000-204)

- Apnea
- Minute Volume outside of selected high and low limits
- Reverse Flow in the breathing circuit when the sensor is placed distally with the reverse flow detection circuits turned on
- Monitor malfunctions

5120 Oxygen Monitor Alarms
(Operation and Maintenance Manual No. 0178-1757-000)

- Low and High oxygen concentrations (Minimum set point limit for low oxygen is 18%; an alarm occurs if set point adjustment is attempted below 18%.)
- Two levels of battery condition alarm, low battery and shutdown.
- Sensor component failure or disconnect alarm
- Computer failure alarm
- Battery ON alarm when the Excel Anesthesia System power switch is turned off, if the Oxygen monitor battery power switch is left on.

5500 Pressure Monitor Alarms
(Operation and Maintenance Manual No. 6050-0000-461)

- High Pressure Alarm
- Sustained Pressure Alarm
- Sub-atmospheric Pressure Alarm
- Low Battery Alarm
- System Failure Alarm

Read the Operation and Maintenance Manuals for these monitors prior to any attempt at their operation.

4. **Gas Supply Checks**

a. Ensure that the oxygen flow control valve is turned fully clockwise and then turn the nitrous oxide flow control valve counterclockwise until a flow of one litre/minute is indicated on the nitrous oxide flowmeter.
b. Check that the oxygen flowmeter indicates a flow of 0.3 to 0.4 liters/minute.
c. Increase the nitrous oxide flow to 9 liters/minute and then check that the oxygen flowmeter indicates a flow of 2.7 to 3.3 liters/minute.
d. Turn the oxygen flow control valve counterclockwise until a flow of 6 liters/minute is indicated.
e. Check that the nitrous oxide flowmeter indication remains between 8.5 to 9 liters/minute.
f. Slowly decrease the oxygen flow rate and check that the nitrous oxide flow rate automatically begins to decrease when the oxygen flow decreases to below 2.8 liters/minute.
g. Press the oxygen flush push button and check for an audible indication of oxygen flow from the common gas outlet.
h. Ensure all flow control valves are turned fully clockwise and then turn Off the On/Off switch.

4/Preoperative Checkout and System Shutdown

WARNING: Do not begin use of the Ohmeda Excel Anesthesia System without verifying its correct operation and the correct operation of all associated accessory and optional equipment. Preoperative checkouts should be performed before each case and in the room having the pipeline supply and electrical sources to be used for that case.

The front of the system binder includes laminated preoperative checklist cards for the anesthesia system and each of its options and accessories. Review each card before each case. The cards are intended to serve as reminders only. The Preoperative Checkout Procedures must be performed according to the instructions given in applicable operation and maintenance manuals.

The checkout procedures in this chapter are applicable to the Ohmeda Excel Anesthesia System only. If the system does not check out according to the following procedures, first consult the troubleshooting guide in Section 6.2. The guide gives some simple corrections for problems which may be experienced. If the suggested corrections do not bring the system into compliance, call an Ohmeda Service Representative to make repairs.

WARNING: Do not use a damaged or malfunctioning anesthesia system, patient injury could result.

After daily use, shut down the anesthesia system as instructed in Section 4.7.

4.1 Visual Inspection

1. Check the following for visible damage:

a. Cylinder yokes
b. Pipeline inlets
c. Flowmeters and flow control valves
d. Pressure gauges
e. Vaporizers
f. Monitors and cables
g. All hoses and tubing in the system.

2. Check that cylinders are properly installed.

3. Check that vaporizers are properly installed.

4. Make sure the cylinder wrench is present.

5. Note the system identification number on the anesthesia record.

4.2 Oxygen Supply Verification

CAUTION: Avoid excessive torque when closing flow control valves.

CAUTION: Make sure that all flow control valves are turned fully clockwise to their minimum flow stops before the system master switch is turned to On. If the flow control valve of any gas is not turned clockwise to its minimum flow stop, the flowmeter module may be damaged by the sudden surge of gas when the system master switch is turned to On.

The importance of a reliable oxygen supply for the patient cannot be overemphasized. Before each use of the anesthesia system, verify that oxygen flow is unrestricted, and that oxygen is, in fact, the gas being delivered.

Ohmeda includes with each system, and strongly recommends the use of, an oxygen monitor during each clinical anesthesia procedure. This recommendation is based on growing clinical, regulatory, and legal support for the efficacy of monitoring inspired oxygen concentration in improving patient safety during the delivery of the anesthetic.

There are indications that monitoring during anesthesia can help reduce the occurrence of anesthesia mishaps. The oxygen monitor, which can provide an early warning of the delivery of hypoxic mixtures, is one of the most crucial monitoring devices.

1. When verifying oxygen flow, make sure that:

a. the oxygen monitor is accurately calibrated.
b. the oxygen monitor sensor cable is correctly connected.
c. all vaporizers are off.
d. all vaporizers are full but not overly filled.
e. all flow control valves are at their minimum flow stops (the oxygen flowmeter should show a nominal 0.2 L/min flow).

2. Turn the Master Switch to On.
3. Open the oxygen flow control valve. Oxygen flow must be adjustable over the flowmeter's full range.
4. The oxygen monitor must display 100% oxygen at all levels of flow.

   Note: At low flows, residual gas may require a little time to be flushed out of the circuit. Make allowance for this.

5. Close the oxygen flow control valve.
6. Gradually open the nitrous oxide flow control valve to full scale. As nitrous oxide flow increases, the oxygen flow must increase to maintain an oxygen concentration of at least a nominal 25% of total combined gas flow.
7. Close the nitrous oxide and oxygen flow control valves.
8. Press the Oxygen Flush button: there must be a steady gas flow at the Common Gas Outlet, and the oxygen monitor must display 100% oxygen.
9. Turn the system master switch to Off.

4.3 Verify Adequate Pipeline and Reserve Cylinder Supply

(Includes Leak Checkout to System Master Switch)

1. Make sure an appropriate gas cylinder or cylinder yoke plug is properly and securely mounted in each cylinder hanger yoke.
2. Make certain that the pipeline supply hose is disconnected from the wall outlet. Disconnect pipeline supply hose from gas module inlet.
3. Disconnect the high pressure ventilator hose from the Oxygen Power Outlet.
4. Make sure the system master switch is turned to Off and the flow control valves are fully open.

CAUTION: Open the cylinder valves slowly to avoid damaging the regulators.

5. Open all cylinder valves, one at a time, and verify by observing each corresponding cylinder pressure gauge, that the cylinder supplies are adequate. Note the pressures in all the cylinders.
6. Observe that no gas flow shows in any flowmeter.
7. Close all cylinder valves and observe each cylinder pressure gauge. The cylinder pressure gauges should show no more than a 50 psig (345 kPa) pressure drop over a one minute period. If the pressure drops faster, the high pressure circuit has an unacceptable leak. See the Troubleshooting Guide in Section 6.2 for suggested corrections.
8. Connect all pipeline hoses, one at a time, and verify by observing each corresponding pipeline pressure gauge that pipeline pressures are normal (nominal 50 psig {345 kPa}).

Note: Leave the ventilator hose disconnected while performing the checkout tests in Section 4.4.

4.4 Verify Integrity of Low Pressure Gas Circuitry

Leave the ventilator hose disconnected while performing the checkout tests in this section.

WARNING: Leaking gases and vapors (downstream of the flow control valves and Oxygen Flush valve) may deprive the patient of metabolic gases and anesthetic agent and may pollute the atmosphere. Perform these leak tests frequently. If a leak is detected, reduced it to an acceptable level. Keep the Low Pressure Leak Testing Device with the anesthesia system at all times.

A Low Pressure Leak Testing Device is included with all Ohmeda Excel Anesthesia Systems. Store this device in one of the drawers so it will always be available. The low pressure circuit should be leak tested with cylinders installed.

1. Check the condition of the Low Pressure Leak Testing Device by doing the following:

a. Seal the device's inlet connector and squeeze the bulb until it is collapsed.
b. Release the bulb and observe the time it takes to re-inflate. Replace the leak testing device if re-inflation occurs in less than 60 seconds.

Important Note: The Leak Testing Device's ability to produce a partial vacuum of at least 65 mm Hg should be verified at 6 month intervals by doing the following:

- Connect the device to a suitable vacuum gauge.
- Squeeze and release the bulb to obtain progressively greater displacements. Replace the leak testing device if the partial vacuum produced, when the bulb is still deformed, is not at least 65 mm Hg.

2. Turn the system master switch to Off if this has not already been done.
3. Turn the vaporizers off.
4. Open each gas supply either by slowly opening the cylinder valve or by connecting the pipeline hoses.
5. Fully open (1-½ turns) all flow control valves.
6. Disconnect the gas supply tubing from the Common Gas Outlet.

See Figure 28.

7. Attach the leak testing device to the Common Gas Outlet.
8. Repeatedly squeeze and release the hand bulb until it remains collapsed. If the hand bulb reinflates in less than 30 seconds, the low pressure circuit has an unacceptable leak. If not, continue with the next step.
9. Do the following with each mounted vaporizer:

a. Make sure the vaporizer is properly mounted and that filler and drain valves are closed tightly.
b. Turn the vaporizer concentration control dial to 1%.
c. Repeat step 8. If the circuit does not pass the test, the leak is in the vaporizer. Remove leaking vaporizers from service.
d. Turn off the vaporizer.

10. Remove the low pressure leak testing device from the Common Gas Outlet.
11. With all vaporizers off, purge any residual vapors from the circuit by turning on a 1 L/min oxygen flow for one minute.

WARNING: Do not use the anesthesia system after performing the low pressure leak test until the vaporizer circuits have been purged with oxygen.

4.5 Verify Proper Functioning of the Electrical Systems

1. Unplug the power cord with the system master switch turned to On. The Electrical Disconnect/Failure alarm must activate. Power failure causes the alarm light on the patient interface panel to flash and an alarm tone to sound.
2. Plug in the power cord and observe that:

a. the alarm light stops flashing and the tone is silenced.
b. all system monitors are on.
c. no monitor is in its battery mode.

Note: The Oxygen Monitor and the Pressure Monitor must be manually switched off of battery backup mode. The Volume Monitor will return automatically.

d. the rear panel electrical outlets are active.

Note: Make sure all monitors are properly calibrated according to instructions in their operation and maintenance manuals.

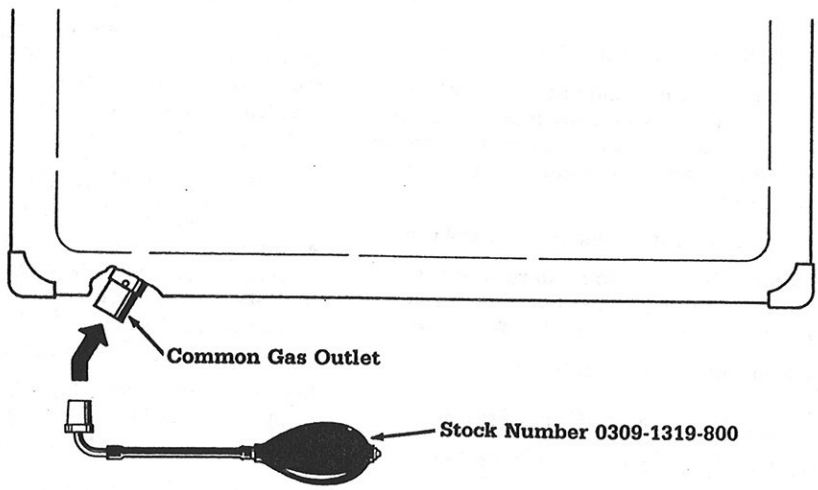


Figure 28
Connection of the Low Pressure Leak Testing Device

4.6 Verify Proper Functioning of The Gas Flow Control Systems

1. Do the following:

a. Close all flow control valves to their stops. Do Not over tighten.
b. Slowly open the cylinder valves or connect the pipeline supplies.
c. Turn the system master switch to On

2. The oxygen flowmeter should show approximately 0.2 L/min. No other flowmeters should show gas flow.

3. Use Tables A and B to verify proper functioning of the Link-25 Proportion Limiting Control System. Do the checks in Table A first. Use the nitrous oxide flow control valve only, and perform the check progressively from low to high flows. Do not overshoot any setting or the test will be invalid. If a setting is overshot, repeat the entire test again beginning with step 1a.

Table A

Set N_2O Flow Control Valve So Flow Reads (L/min)	**O_2 Flow should be:**	
	Minimum	**Maximum**
0.8	0.21	0.33
1.0	0.27	0.41
3.0	0.80	1.22
5.0	1.33	2.04
6.0	1.60	2.45
9.0	2.40	3.66
10.0	2.67	4.07

4. Use the oxygen flow control valve only, and perform the checks progressively from high to low flows. Do not overshoot any setting or the test will be invalid. If a setting is overshot, repeat the entire test again starting with this step.

Table B

Set O_2 Flow Control Valve So N_2O Flow Reads (L/min)	**O_2 Flow should be:**	
	Minimum	**Maximum**
9.0	2.40	3.66
8.0	2.13	3.26
7.0	1.87	2.85
6.0	1.60	2.45
4.0	1.07	1.63
2.0	0.54	0.81
0.8	0.21	0.33

Do not use the anesthesia system if the Link-25 Proportion Limiting Control System does not operate within permitted ranges.

WARNING: *Never* increase the gas flow rate to the patient using the N_2O Flow Control Valve....Always increase the gas flow using the O_2 Flow Control Valve and decrease the gas flow using the N_2O Flow Control Valve.

5. Adjust all gas flows to midscale: floats must move smoothly.

6. Turn the system master switch to Off.

The following must occur:

a. The oxygen supply failure alarm sounds briefly.
b. All gas flows fall to zero, with oxygen being the last gas to stop flowing.

7. Close all flow control valves.

After performing the preoperative checkouts, make sure that all anesthesia circuit components are reconnected and that controls are set for the case at hand.

4.7 System Shutdown

After daily use of the Ohmeda Excel Anesthesia System:

1. Make sure vaporizers are off.

2. Disconnect all pipeline supplies.

3. Close all flow control valves.

4. Turn the system master switch to On

5. Fully open each flow control valve.

6. Close the cylinder valves, one at a time (oxygen last), while observing corresponding flowmeters. Allow each float to drop to the bottom of its tube before closing the next cylinder valve.

7. Turn the system master switch to Off

8. Close all flow control valves.

9. Make sure no system monitor is in its battery mode.

Note: The Oxygen Monitor and the Pressure Monitor must be manually switched off of battery backup mode. The Volume Monitor On/Off switch must be turned off.

10. Unplug the system power cord from the wall receptacle.

11. Remove the breathing circuit from the absorber.

5/Routine Maintenance

5.1 Maintenance Schedule

Cleaning:

Painted Areas	Daily, See 5.2
Stainless Steel and Chrome	Daily, See 5.2
Anodized Aluminum	Daily, See 5.2
Clear Plastic Areas	Daily, See 5.2
Rubber and Plastic Components of the Frame	Daily, See 5.2

Lubrication:

Yoke Tee Handle	Monthly, See 5.3

Replacement:

Battery	Yearly, See 5.5

5.2 Cleaning

WARNING: Never cover anesthesia equipment with any type of fabric or plastic covering. Removing the cover may cause static electricity with the possibility that fire may result.

A. Painted Areas

Clean painted or enameled surfaces using a damp cloth and mild soap. Abrasive cleansers will scratch the paint.

B. Stainless Steel and Chrome

Clean stainless steel and chrome surfaces using a damp cloth. For stubborn stains, apply Bon Ami* on a damp cloth, and scrub. A high luster can be restored by buffing the items using a dry towel dusted with Bon Ami.

C. Anodized Aluminum

Clean anodized aluminum surfaces using Bon Ami on a damp cloth. Abrasive cleansers will mar the finish.

D. Clear Plastic Areas

Clean clear plastic surfaces using a soft clean cloth, dampened slightly in warm clean water. To prevent spotting, immediately dry the surface with a soft clean cloth. Cleaning agents (abrasive or non-brasive), glass cleaners, and anesthetic agents will mar or damage the plastic.

E. Rubber and Plastic Components of the Frame

Clean rubber and plastic components of the frame using a soft cloth and warm water. If necessary, a mild alkali detergent may be used to remove stains.

5.3 Lubrication

WARNING: Never oil or grease any anesthesia or oxygen equipment unless the lubricant used is made and approved for this type of service. In general, oils and greases oxidize readily, and in the presence of oxygen, they will burn violently. Vac Kote* is the oxygen service lubricant recommended for use.

Lubricate only the yoke tee handle.

Once a month, apply Vac Kote sparingly to the yoke tee handle threads. This will prolong their life and make cylinder gasket sealing easier.

Vac Kote (Stock Number 0220-0091-300) can be ordered from Ohmeda.

Do not lubricate the absorber post assembly.

* Trademark, Bon Ami Co.
* Trademark, Ball Corporation

5.4 Gas Supply Module Maintenance

Install yoke plugs (Stock Number 0206-7129-525) and gaskets (Stock Number 0210-6460-300) in unused yokes to help prevent check valve leaks and to keep dust and lint from accumulating in the filters.

5.5 Battery Replacement

The battery for the electrical alarm system is located in the monitor pod. For optimum battery reliability, replace this battery at least once a year, or more often if necessary.

Note: The Monitor Pod's 9 volt, rechargeable, Nicad battery may discharge if stored for longer than two months. After proper installation of the Monitor Pod, the monitors should turn on with the Excel's On/Off switch. If they do not, leave the Monitor Pod power cord plugged in over-night to recharge the battery.

Replace as follows:

See Figure 29.

1. Remove the screws from the back of the monitor pod.
2. Tilt out the rear panel of the pod.
3. Unsnap the old battery from its mounting clip and snap in the replacement.

WARNING: Use a 9V rechargeable battery (Stock Number 0690-1000-310 or Eveready Number CH 22) only in the electrical alarm system.

4. Reinstall the monitor pod's rear panel.

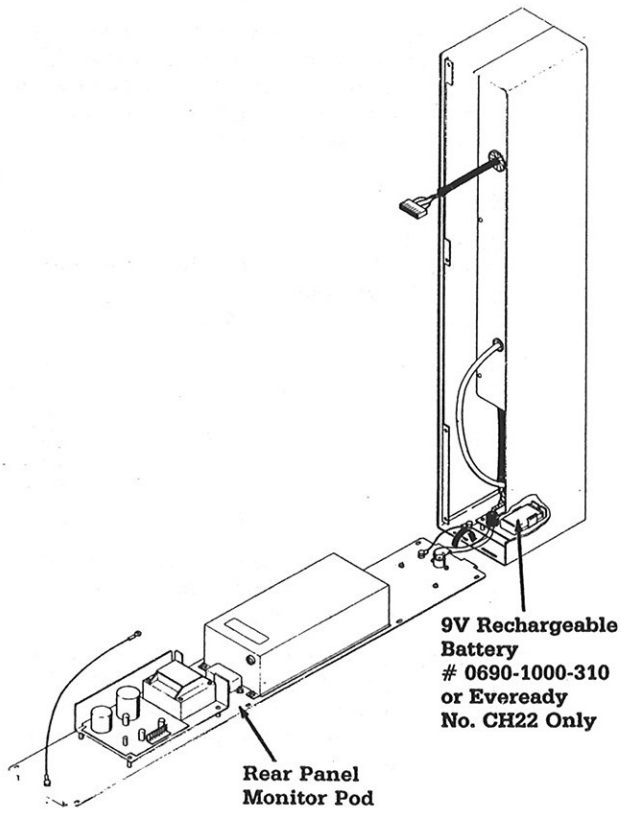


Figure 29
Battery Replacement

Service, other than what is described in this manual, must be performed by a technically competent individual as described in the service manual for this product.

6.1 Repair Policy and Procedure

Do not use malfunctioning equipment. Make all necessary repairs or have the equipment repaired by an Ohmeda Service Representative. Parts listed in the service manual, for this product, may be repaired or replaced by a competent, Ohmeda trained person who has experience in repairing devices of this nature. After repair, test the equipment to ascertain that it complies with the published specifications.

Repair and service of equipment not under warranty using parts listed in the service manual, must be carried out by a competent, Ohmeda trained person with experience in the repair of anesthesia equipment.

Repair and service of equipment under warranty must be performed by an Ohmeda Service Representative or at the Ohmeda National Service Center at the address listed on the back cover of this manual. To contact an Ohmeda Service Representative, call the nearest Ohmeda Regional Service Office, also listed on the back cover of this manual.

CAUTION: Only competent individuals trained in the repair of this anesthesia equipment should attempt to service an Ohmeda Excel Anesthesia System.

CAUTION: Detailed information for more extensive repairs is included in the service manual solely for the convenience of users having proper knowledge, tools and test equipment, and for service representatives trained by Ohmeda.

If you send equipment to the Ohmeda National Service Center, package it securely for protection, and ship it prepaid.

Enclose the following five items:

1. A letter describing in detail any difficulties experienced with the unit.
2. Warranty information – a copy of the invoice or other applicable documentation must be included.
3. Purchase order number to cover repair of units not under warranty.
4. Ship to and bill to information.
5. Person (name and telephone number) to contact for functional questions.

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

6.2 Troubleshooting Guide

If the suggested corrections do not bring the equipment into compliance, call an Ohmeda Service Representative to make repairs.

Problem:	Possible Correction:
1. No Gas Flow	a. Check system master switch: it must be turned to On. b. O_2 supply pressure too low. See Problem 3. c. Replace or install supply cylinder. d. Connect supply hose. e. Remove kinks in supply hose.
2. Electrical/Disconnect Failure Alarm Activates	a. Plug in system power cord. b. Replace the circuit fuses. See Section 6.3.
3. O_2 Supply Failure Alarm Activates	a. Check for pipeline failure: switch to cylinder supply. b. Replace empty O_2 cylinder. c. Remove kinks in supply hose.
4. Excessive High Pressure Circuit Leak	a. Tighten yoke tee handle(s). b. Replace cylinder gasket(s). c. Install yoke plug(s) in unused cylinder yoke(s).
5. Excessive Low Pressure Circuit Leak	Tighten vaporizer filler and drain valves. Check vaporizer mounting.
6. Cannot make a connection to the absorber at one of the anti-disconnect fittings.	Depress the release tab button on the female fitting and try again.
7. Monitor does not come on with system power.	Switch monitor on (if applicable).
8. Monitor Alarms Activate	a. Check for loose or improper monitor and sensor cable connections. b. Refer to the manual for the monitor involved to determine the correct action.
9. Ventilator Low O_2 Supply Pressure Alarm Activates	a. Tighten high pressure hose connection at the O_2 power outlet and ventilator. b. Remove kink from O_2 power outlet hose. c. O_2 supply pressure too low. See problem 3.

6.3 System Fuses

System fuses are located on the electrical pod's back panel. There are two, 250 Volt, 10 Amp fuses that service the system's electrical outlets. A single 250 Volt 0.5 Amp fuse services the internal circuitry of the system. If a fuse blows repeatedly after replacement, remove the Ohmeda Excel Anesthesia System from service until it can be repaired.

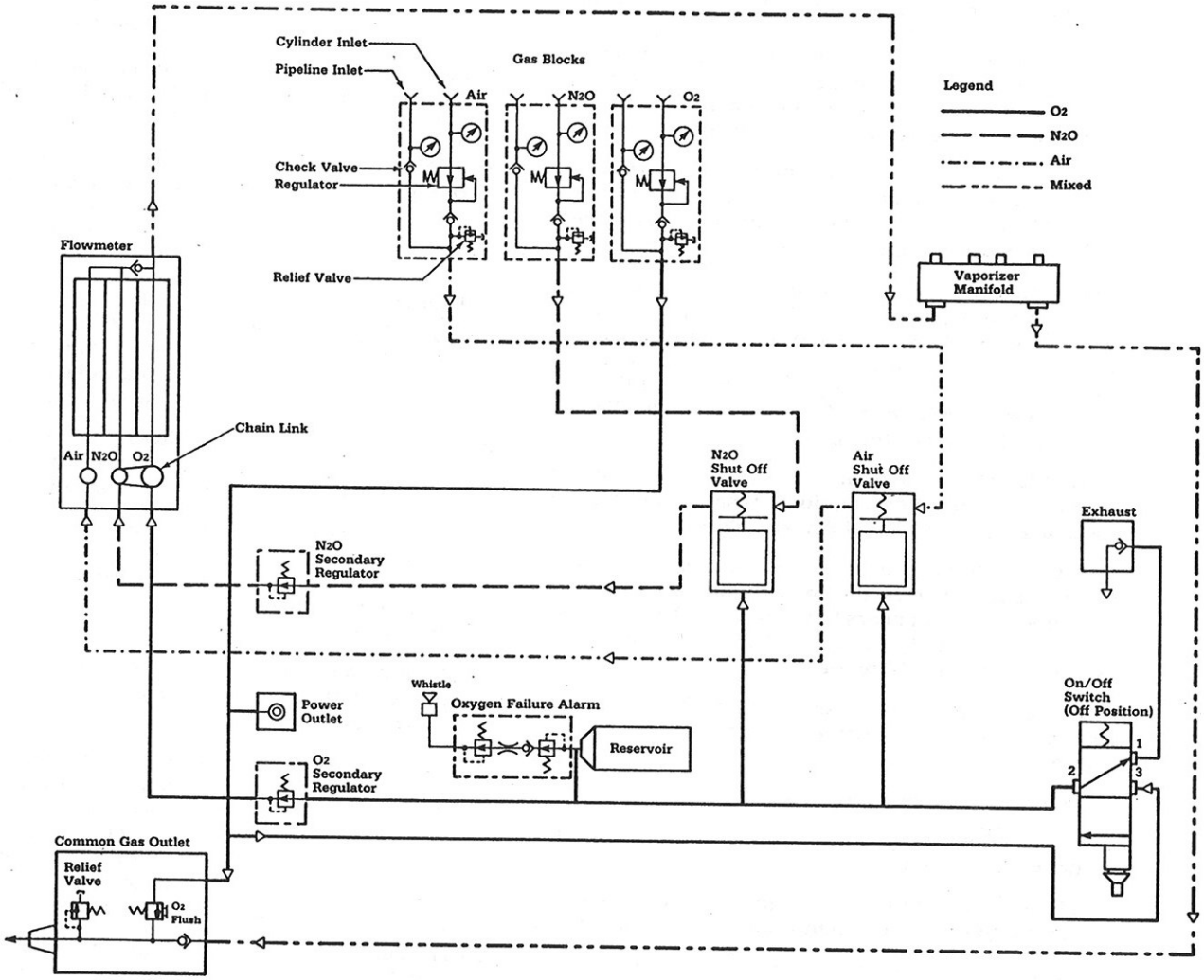


Figure 30
Gas Schematic for 3 Gas, 3 Yoke Ohmeda Excel Model 210 Anesthesia System

Note: the reserved cylinder gases must be either nitrous oxide or oxygen, not both.

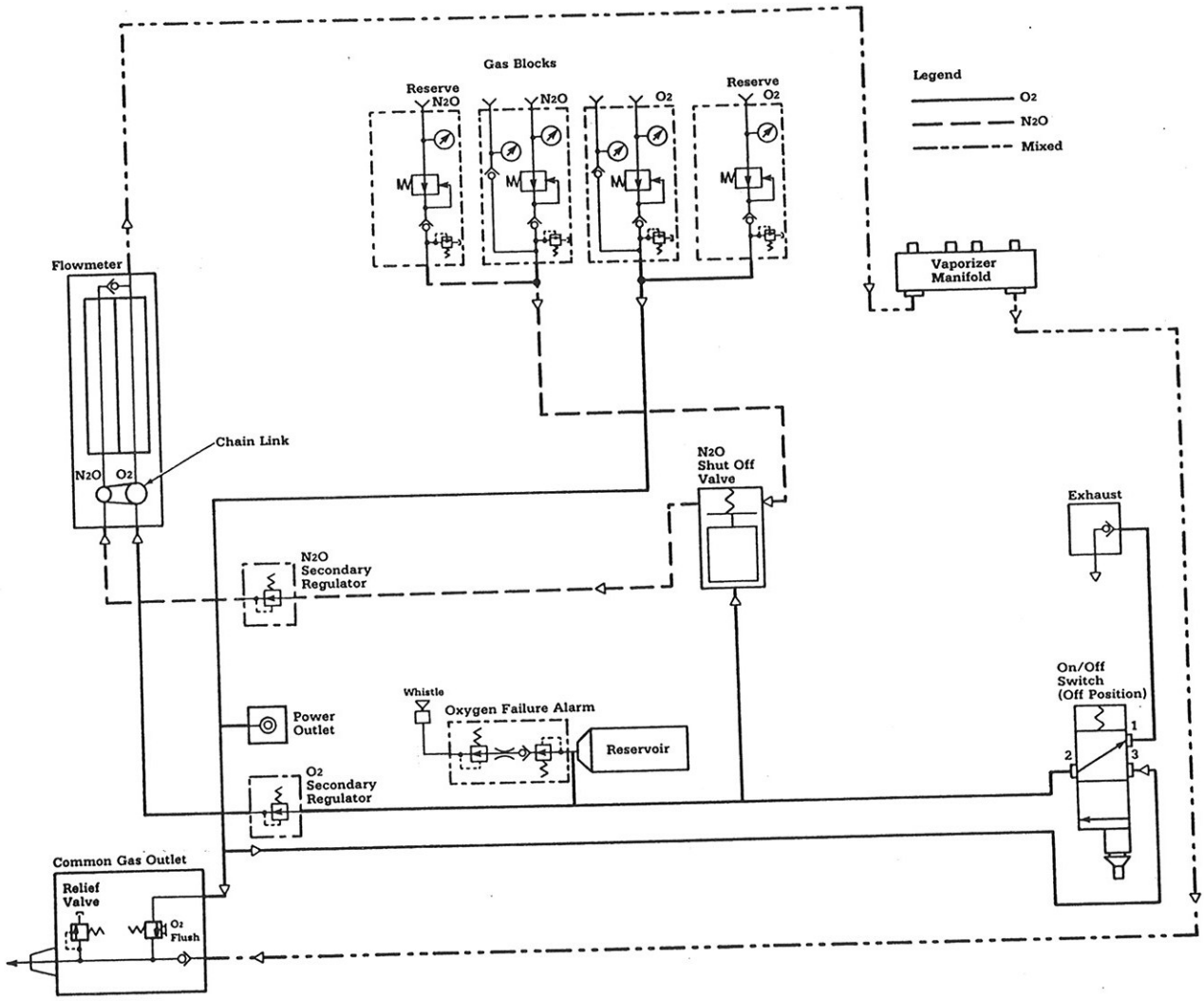


Figure 31
Gas Schematic for 2 Gas, 3 Yoke Ohmeda 110 Excel Anesthesia System

LIST OF ILLUSTRATIONS

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