Welcome!

• Agenda:
  • Welcome and Sign-in sheet
  • Introductions
  • UAM Animation
  • Bio Med Overview presentation
  • UAM Care and Maintenance Video
  • Common Repair Videos
  • Hands on practice completing a full Preventive Maintenance
• Based in the United States.

• Equips hospitals around the world to deliver anaesthesia safely and economically.

• The mission is to improve access to safe surgery and perioperative care by providing technology, service and training to strengthen anaesthesia capabilities.
Universal Anaesthesia Machine

- Is a state-of-the-art inhalation anaesthesia workstation that creates its own oxygen using electricity yet transitions seamlessly to room air as the carrier gas if no power or compressed oxygen is available.

- It was developed by Dr. Paul Fenton who was working as an anaesthetist in Malawi.

- The UAM is manufactured in the UK and has a CE mark.
UAM is in 23 Countries throughout Africa, Asia, Europe and the Caribbean
Animation Video: How The UAM Works

http://www.gradianhealth.org/universal-anaesthesia-machine/
Integrated Oxygen Concentrator

How the Oxygen Concentrator works:
1. Air filters clean room air
2. Compressor pressurizes room air
3. Zeolite towers remove nitrogen from the air and produces 95% oxygen
4. Storage tank for oxygen to maintain 10 L/minute
UAM Provides 5 Sources of Oxygen:

1. Oxygen Concentrator

2. Pipeline inlet
UAM Provides 5 Sources of Oxygen:

3. Pin-index cylinder

4. Inlet for O₂ from external flow meter

5. Emergency draw over
The Monitor is securely attached to the UAM’s top shelf.
Has a rechargeable internal battery that lasts for 4-6 hours.
Removing it for use without the UAM will void its warranty.
Consumables are not replaced by Gradian.
Overview

1. General description of the UAM
2. Gas Sources
3. Breathing System
4. Electrical System
5. How to obtain Maintenance Support
6. Preventive Maintenance Schedule
7. Common Maintenance Procedures
Gas Sources
Gas Sources

- Oxygen sources should be selected in the following order:
  1. Concentrator
  2. Pipeline
  3. Cylinder

- All backup gas sources should be shut when not being used, otherwise they will slowly deplete.
## Color Identification for Medical Gases

<table>
<thead>
<tr>
<th>GAS</th>
<th>ISO</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>OXYGEN</td>
<td>White</td>
<td>Green</td>
</tr>
<tr>
<td>NITROUS OXIDE</td>
<td>Light Blue</td>
<td>Light Blue</td>
</tr>
<tr>
<td>MEDICAL AIR</td>
<td>Black and White</td>
<td>Yellow</td>
</tr>
<tr>
<td>SUCTION</td>
<td>Yellow</td>
<td>White</td>
</tr>
</tbody>
</table>
Separate fuses for O2 monitor and for O2 concentrator

2 fused receptacles in the back
Internal Automatic Voltage Switcher

Protects the UAM from extreme low and high voltages

- **Low Voltage Cut-off:** 180 V
- **High Voltage Cut-off:** 260 V
- **Blind:** 3 seconds
- **Wait:** 10 seconds

Blind: if voltage falls below cut-off the switch watch for this period to see if this is a momentary brownout. Wait: Minimum period of time voltage is cut off during an event.
Important! Use an External Voltage Stabilizer

- 2000VA
- Use only for UAM and attached monitor
Connecting the UAM’s Oxygen Pipeline Input to an Oxygen Cylinder

Non-adjustable. Single-stage—No flowmeter

Output pressure: Pre-set and fixed at 60 PSI (4 Bar)

Input connector: to fit the hospital’s cylinder connector

Output connector: to fit the UAM’s hose probe

Medical oxygen regulator:

NIST medical oxygen male connector
NIST medical oxygen female connector
Medical oxygen hose
British BS 5682 probe

UAM oxygen pipeline input connector and supplied hose

Cylinder connectors—Common standards

- Germany: DIN 477 № 9
- USA: CGA 540
- Great Britain: BS 341 №3 (bullnose)

Others: France: NF F, Italy: UNI 4406, Netherlands: NEN RF 13, and many more

NOTE: if the available regulators cannot connect to the UAM’s BS 5682 oxygen hose probe, then the hose can be cut and fitted with the appropriate connector (with a 6.5 mm (1/4”) hose barb) using a crimper tool and a hose ferrule.

Medical oxygen regulator:

Input connector
Output connector

Oxygen cylinder

Approx. 2200 PSI
60 PSI
60 PSI

Cylinder output

connector with 6.5 mm (1/4”) hose barb
1/4” crimper tool

hose ferrule
Ventilator Connections
**Electrically Driven Bellows**
Requires no compressed gas and consumes little power

**Battery Backup**
Operates on rechargeable batteries for up to 6 hours

**Measurements**
Real time measurement of Minute Volume, Tidal Volume, Peak Pressure, Mean Pressure, and PEEP

**Settings**
Easy to change ventilation parameters

**Ventilation Modes**
Volume Controlled, Pressure Controlled and Spontaneous

**Waveforms**
Real-time displays of pressure vs. time, flow vs. time, and compliance loops in all ventilation modes
We highly recommend a **voltage stabilizer** between the UAM and the electrical outlet to guard against spikes and brownouts.

- If you don’t use a voltage stabilizer the UAM will shut off to protect itself against power outage as well as fluctuation in the electricity.

- Leave the UAM on (green main isolator switch on the back) to trickle charge the patient monitor, oxygen monitor, and ventilator.

- Every 3 months perform full function tests and preventive maintenance procedures as described in the UAM maintenance manual on page 43.
Service and Preventive Maintenance

• All UAMs come with at least a 2-year warranty that includes:
  • Every 6 months one of our technicians will conduct an in-depth preventative maintenance check.
  • Provide any spare parts needed
    • Consumables not included

• Gradian Service team is always available to assist you!
1. If you have a distributor in your country contact them first
2. If there is no distributor in your country then send an email to: service@gradianhealth.org or WhatsApp: +1929-280-0210
   Please supply the following information:
   1. Serial number of UAM
   2. Detailed description and pictures of problem
   3. Actions taken to try to solve the problem
The Warranty offered by Gradian will only be valid if the maintenance checks and procedures are performed in accordance to the schedule and instructions contained in the UAM Maintenance Manual.
A full list of resources is available at: http://www.gradianhealth.org/resources/
Resources

A collection of articles and other resources that we find valuable with topics ranging from safe anesthesia and surgery, global health policy, technology and innovation, healthcare and upcoming events.

Please email us any articles, links or resources that you might find useful for this page.

Gradian/UAM Resources

- UAM User Guide
- UAM Maintenance Manual
- Gradian Health Systems (UAM) Brochure
- UAM Service Record
- Video: An Animation of the UAM
- SDAN Monitor specifications
- UAM Spec Sheet
- Photo: The Universal Anaesthesia Machine

UAM Service Notes

- Service Note #1: New UAM Maintenance Manual
- Service Note #2: Checking and cleaning the air filter and after-cooler
- Service Note #3: Pre-Operative Checklist
- Service Note #4: UAM Preventative Maintenance and Inspection Schedule

Articles and documents...
Dear UAM User,

It is very important to check the condition of the air filter in your UAM every 6 months, and more often if the environment is very humid. If the filter is dirty then it must be cleaned with a vacuum cleaner and washed. When cleaning it make sure not to bend the metal fins.

Failure to perform these checks and cleaning procedures will result in a decrease in oxygen levels and overheating of the concentrator.

The picture below on the left shows a dirty filter on the top and a clean one on the bottom. The picture on the right shows a dirty after-cooler coil on the top and a clean one on the bottom.

Download here: UAM Pre-Operative Checklist
## Recommended Maintenance Schedule

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>ACTION</th>
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<tbody>
<tr>
<td>Daily or prior to use (user)</td>
<td>Perform operational check (see UAM User Manual and Checklist on the UAM)</td>
</tr>
<tr>
<td>Every 3 months</td>
<td>Perform full function test</td>
</tr>
<tr>
<td>Every 6 months</td>
<td>Perform full function test</td>
</tr>
<tr>
<td></td>
<td>Check air filter- clean or replace if needed</td>
</tr>
<tr>
<td>Every 12 months</td>
<td>Perform full function test</td>
</tr>
<tr>
<td></td>
<td>Check air filter- clean or replace if needed</td>
</tr>
<tr>
<td></td>
<td>Replace oxygen sensor</td>
</tr>
<tr>
<td></td>
<td>Replace oxygen concentrator loss of power battery (9V)</td>
</tr>
<tr>
<td></td>
<td>Remove and inspect Fenton balloon</td>
</tr>
<tr>
<td>Every 3 years</td>
<td>Replace oxygen monitor battery</td>
</tr>
<tr>
<td>Every 5 years</td>
<td>Contact Gradian Health Systems for a complete maintenance check</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:service@gradianhealth.org">service@gradianhealth.org</a></td>
</tr>
</tbody>
</table>

**NOTE:** High levels of relative humidity in the environment will affect the performance of the UAM. It is recommended that the UAM be used in areas where the humidity can be controlled. After operating the UAM in humid environments water drainage should be observed underneath the machine once the concentrator is turned off and has depressurized.
Common Maintenance Procedures

1. Cleaning and replacing the air filter
2. Calibrating and replacing the oxygen sensor
3. Removing and replacing the Fenton Balloon
4. Removing and replacing the circuit board
5. Replacing the concentrator power loss battery
6. Replacing control screen (oxygen monitor) battery
7. Removing and replacing the concentrator
8. Removing and replacing the vaporizer
Required Tools and Materials

- Metric hex wrenches: 3 mm, 4 mm, 6 mm, 8 mm
- Needle nose pliers
- Medium Phillips screwdriver
- Multimeter
- Pry bar
- Adjustable wrench
Access Panels
Cleaning and Replacing the Air Filter
Cleaning the After-Cooler
Replacing the Oxygen Sensor
Calibrating the Oxygen Sensor
Removing and Replacing the Fenton Balloon
Removing and Replacing the Circuit Board
Replacing the loss of power battery
Replacing the control screen battery

YUASA NPT1.2-12
12V, 1.2 Ah
Removing and replacing the Oxygen Concentrator
Removing an replacing the Vaporizer
Cleaning the Positive Pressure Relief Valve (PPRV)
Cleaning the Positive Pressure Relief Valve (PPRV)
Cleaning the Positive Pressure Relief Valve (PPRV)
For comments or questions about service or training please contact us at:

service@gradianhealth.org

Or

WhatsApp: +1929-280-0210