



GRADIAN UAM BMET TRAINING



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



Gradian Health Systems



- 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

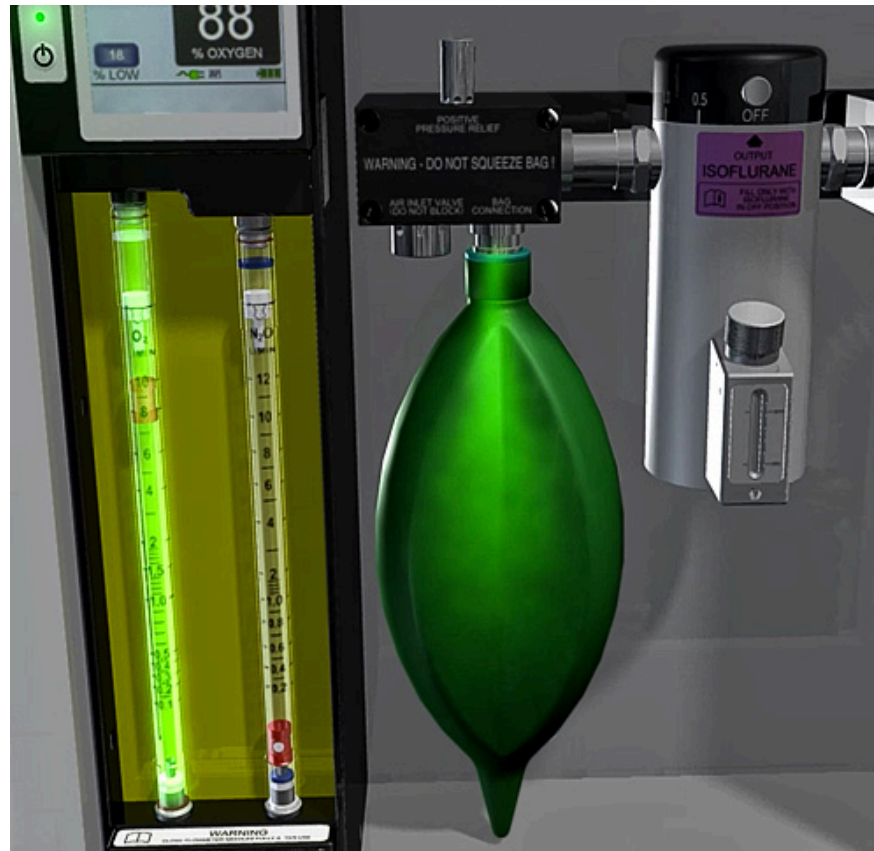


- Is a state-of-the-art inhalation anaesthesia workstation that creates its own oxygen using electricity yet transitions seamlessly to room air as the carrier gas if no power or compressed oxygen is available.
- It was developed by Dr. Paul Fenton who was working as an anaesthetist in Malawi.
- The UAM 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



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

UAM Patient Vital Signs Monitor



- Temp 1 probe connector
- Temp 2 probe connector
- ECG/ RESP cable connector
- SpO2 probe connector
- NIPB hose connector
- Battery compartment

- The Monitor is securely attached to the UAM's top shelf.
- Has a re-chargeable internal battery that lasts for 4-6 hours.
- Removing it for use without the UAM will void its warranty
- Consumables are not replaced by Gadian

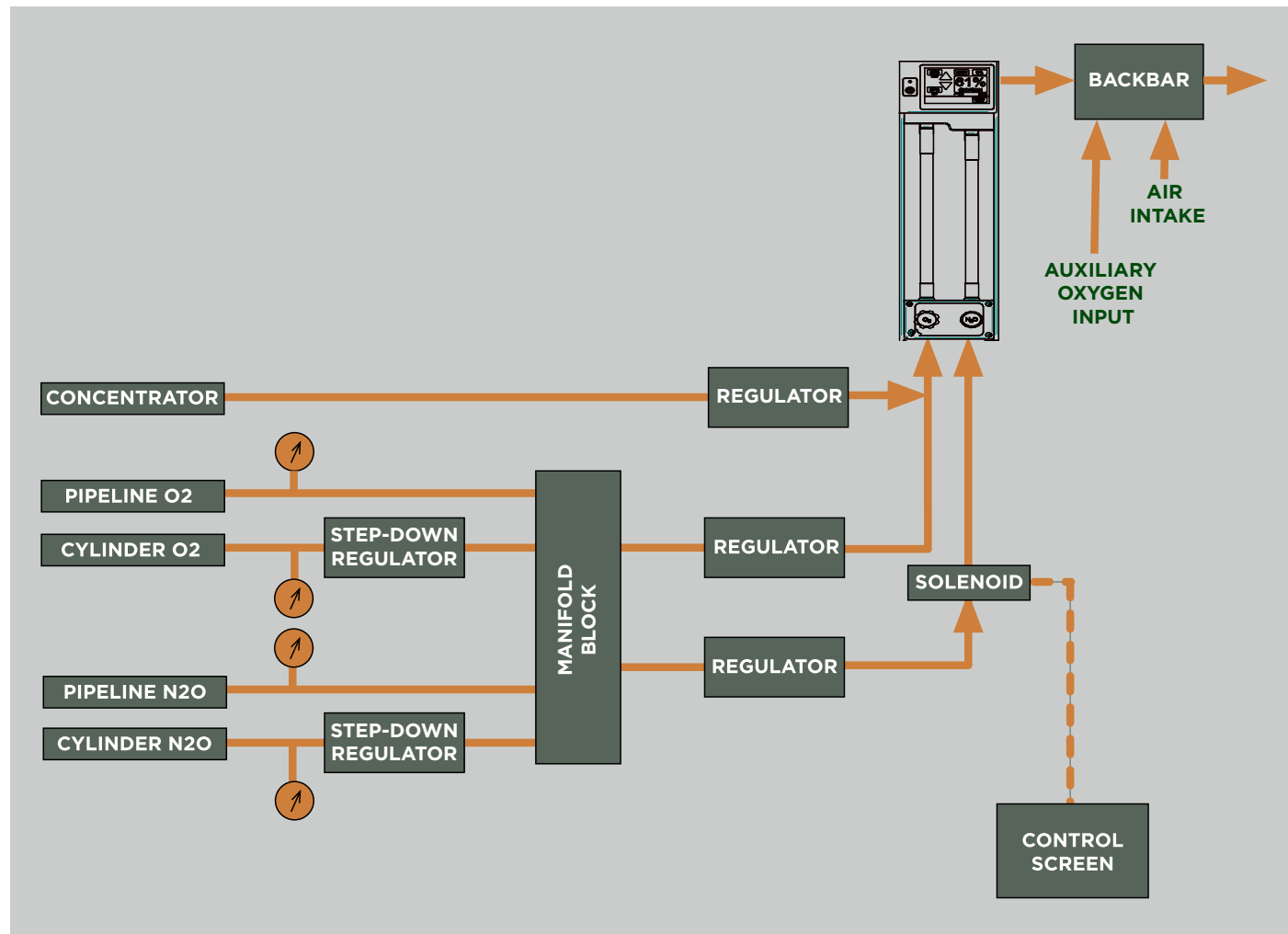


Overview



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

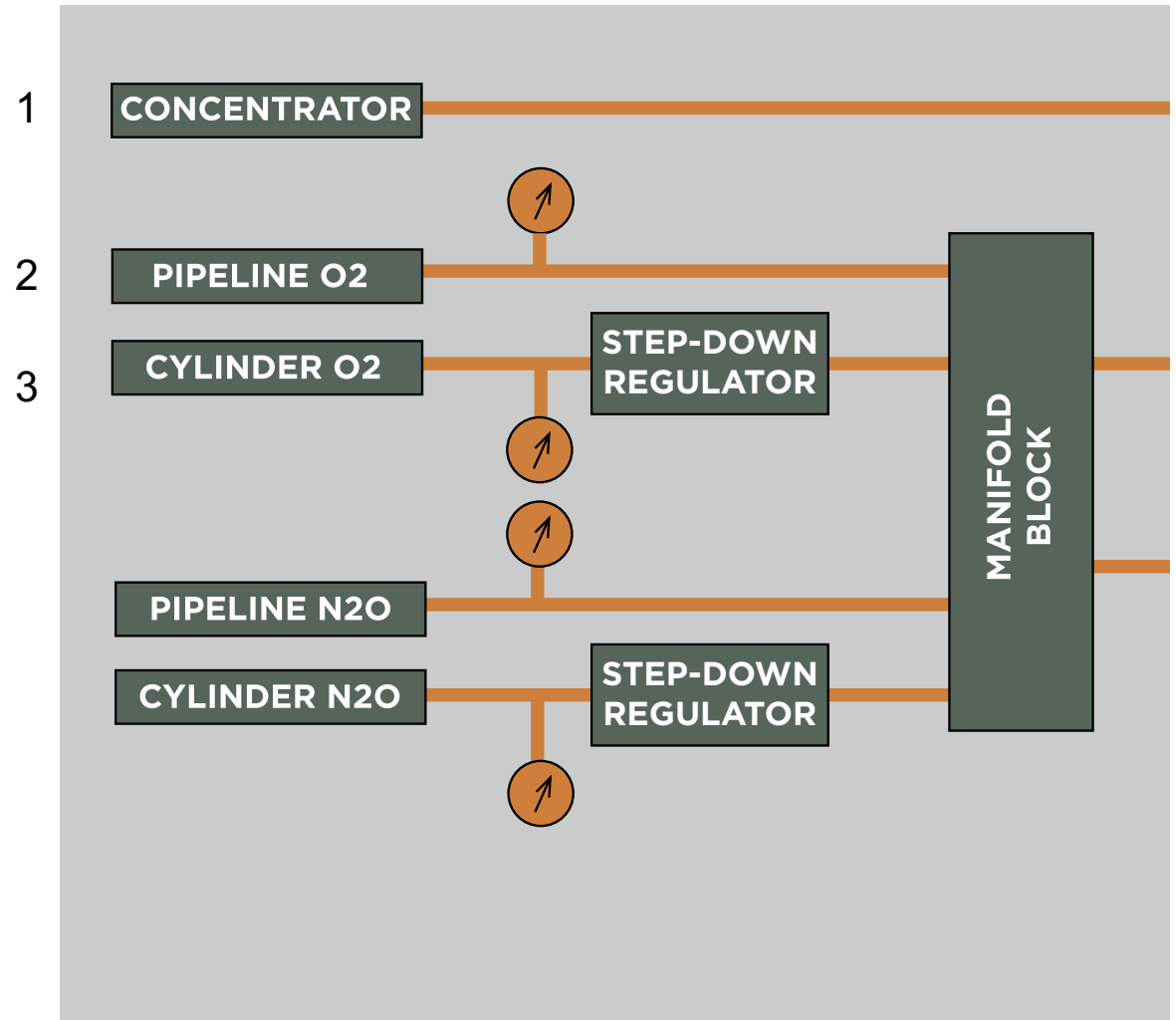
Gas Sources



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.



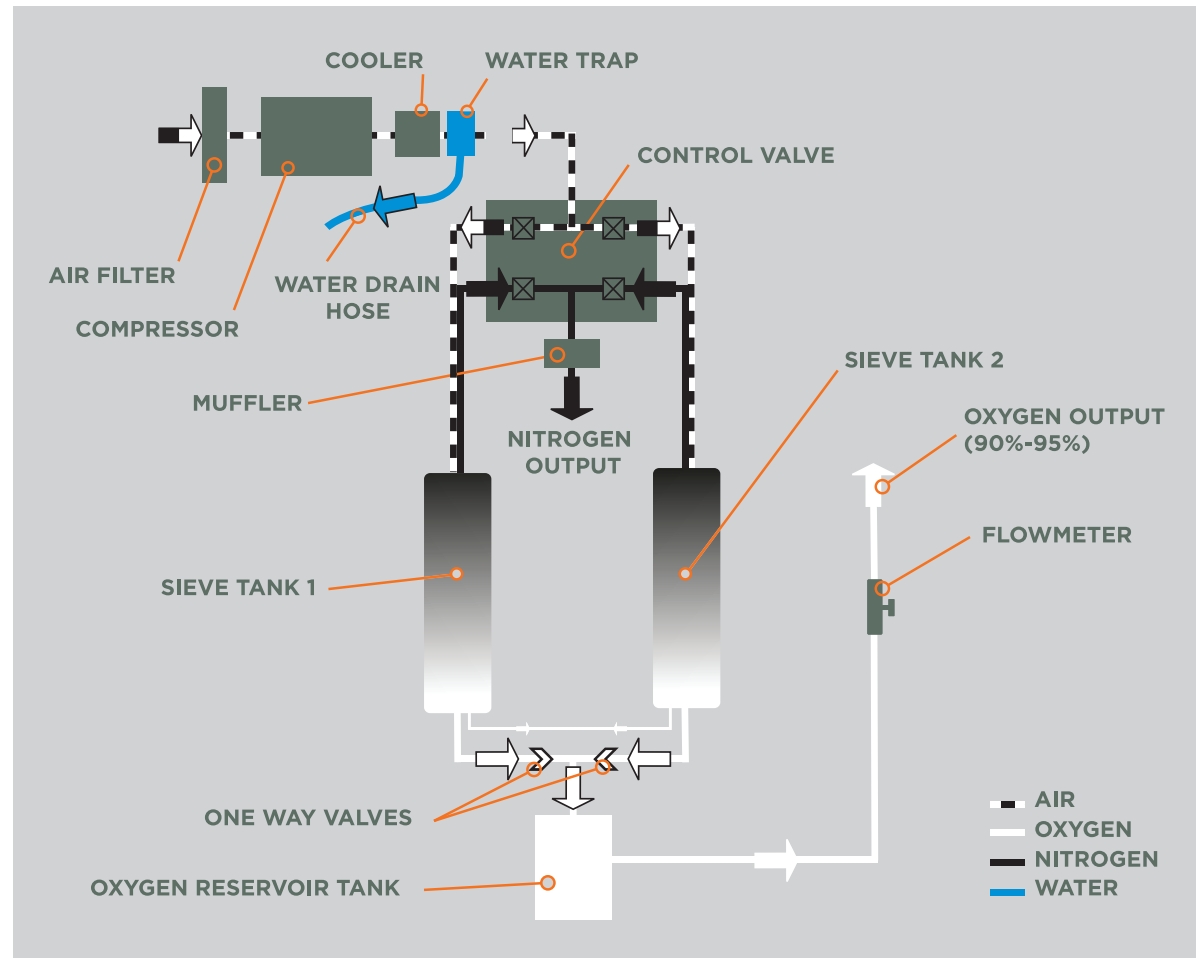
Color Identification for Medical Gases



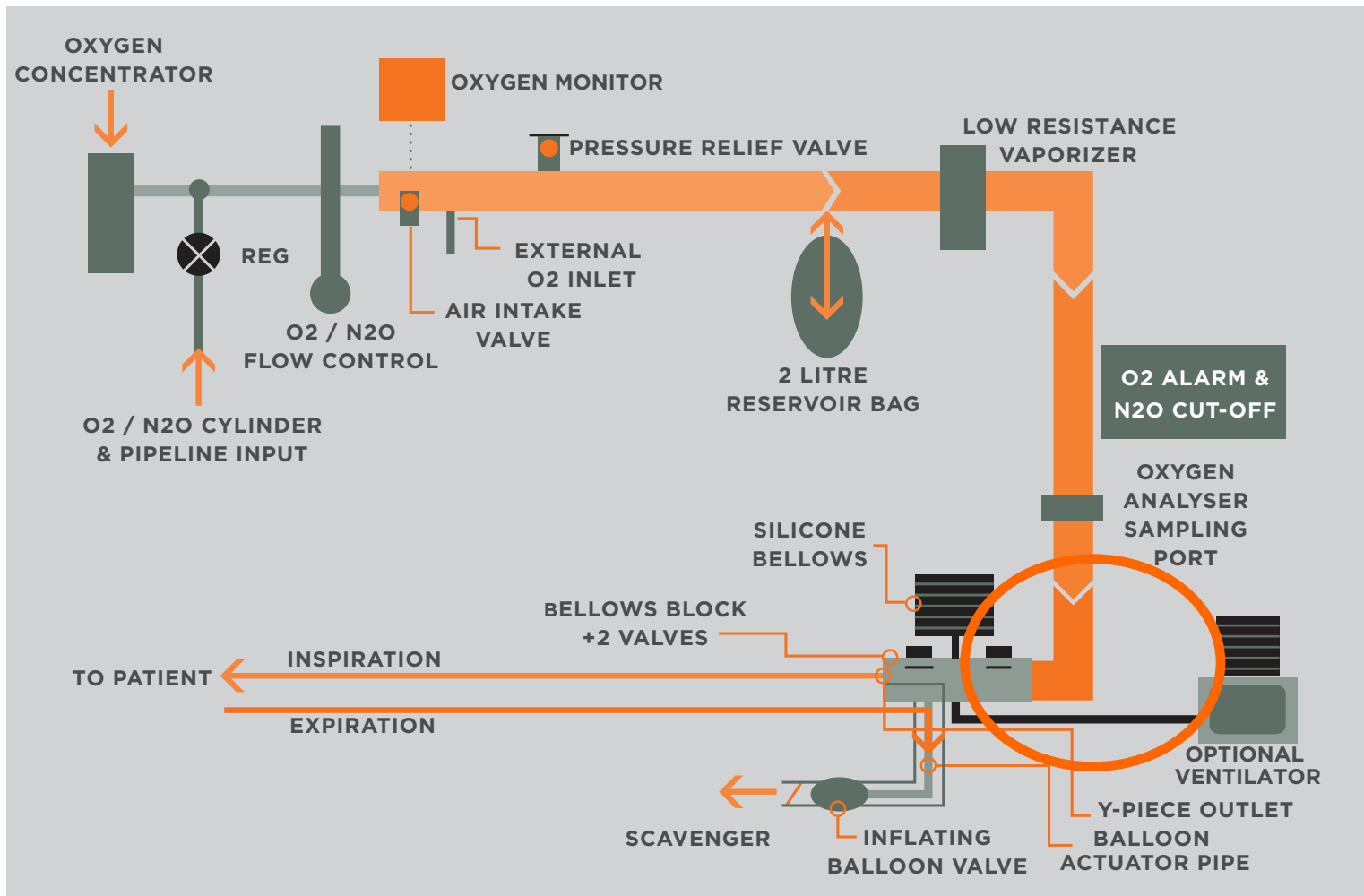
| GAS | ISO | USA |
|----------------------|-----------------|------------|
| OXYGEN | White | Green |
| NITROUS OXIDE | Light Blue | Light Blue |
| MEDICAL AIR | Black and White | Yellow |
| SUCTION | Yellow | White |



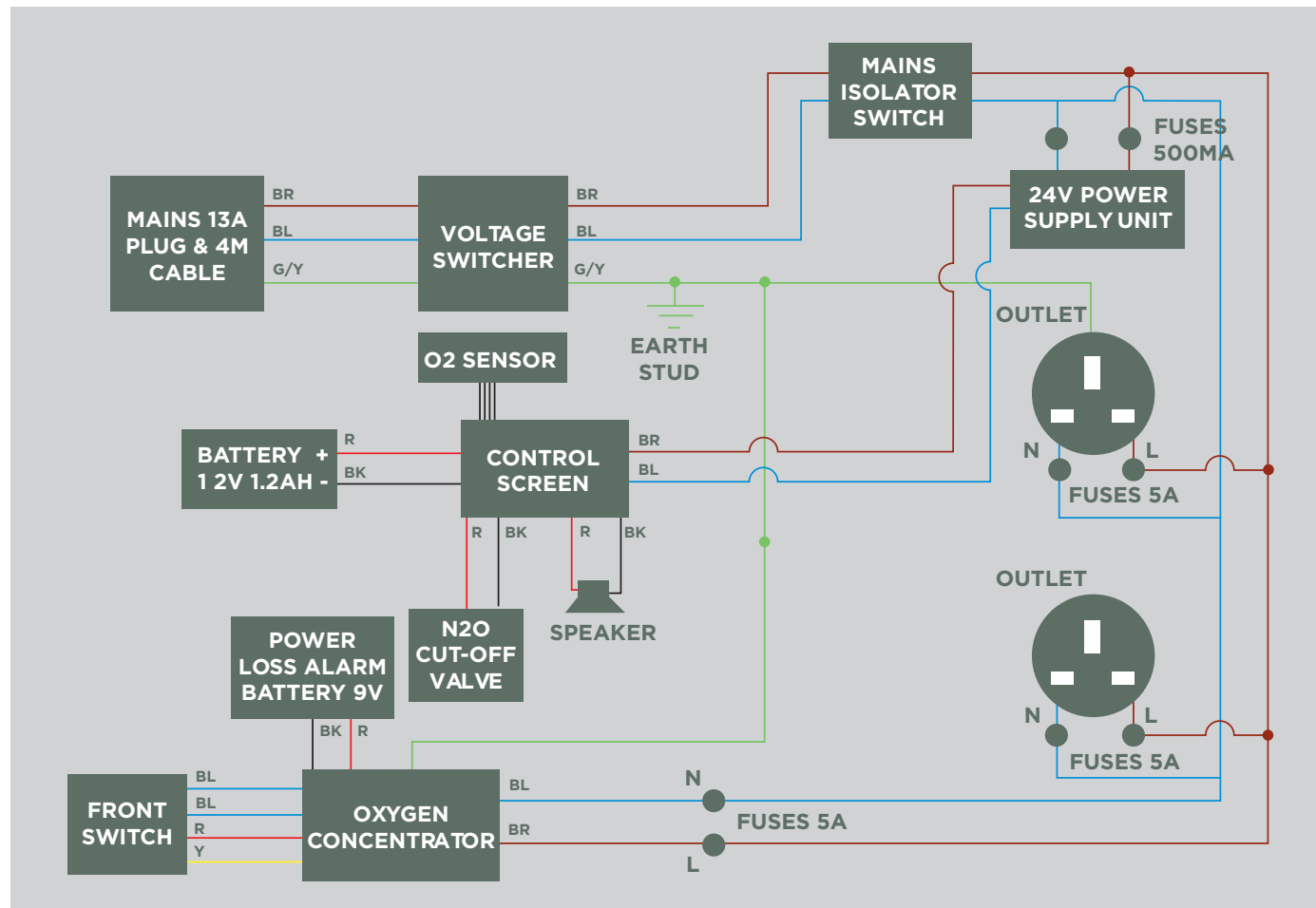
Oxygen Concentrator Flow Diagram



Breathing Circuit Diagram



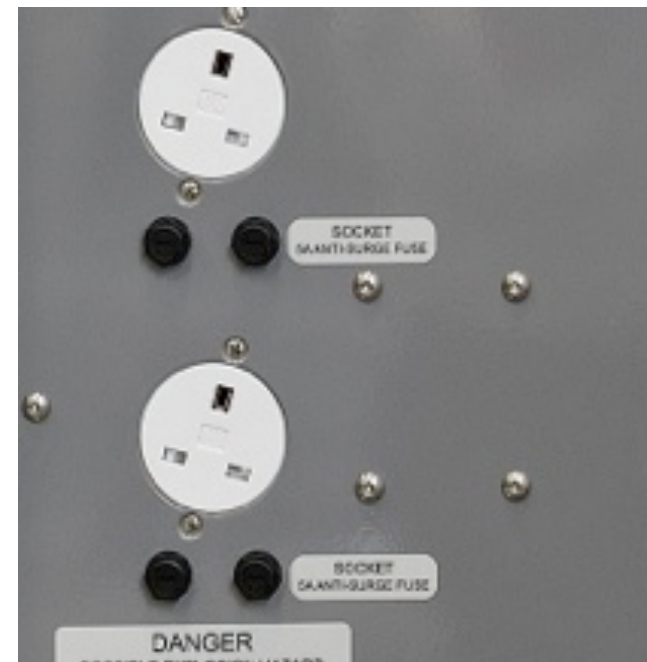
Electrical Diagram



Electrical Supply



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 |

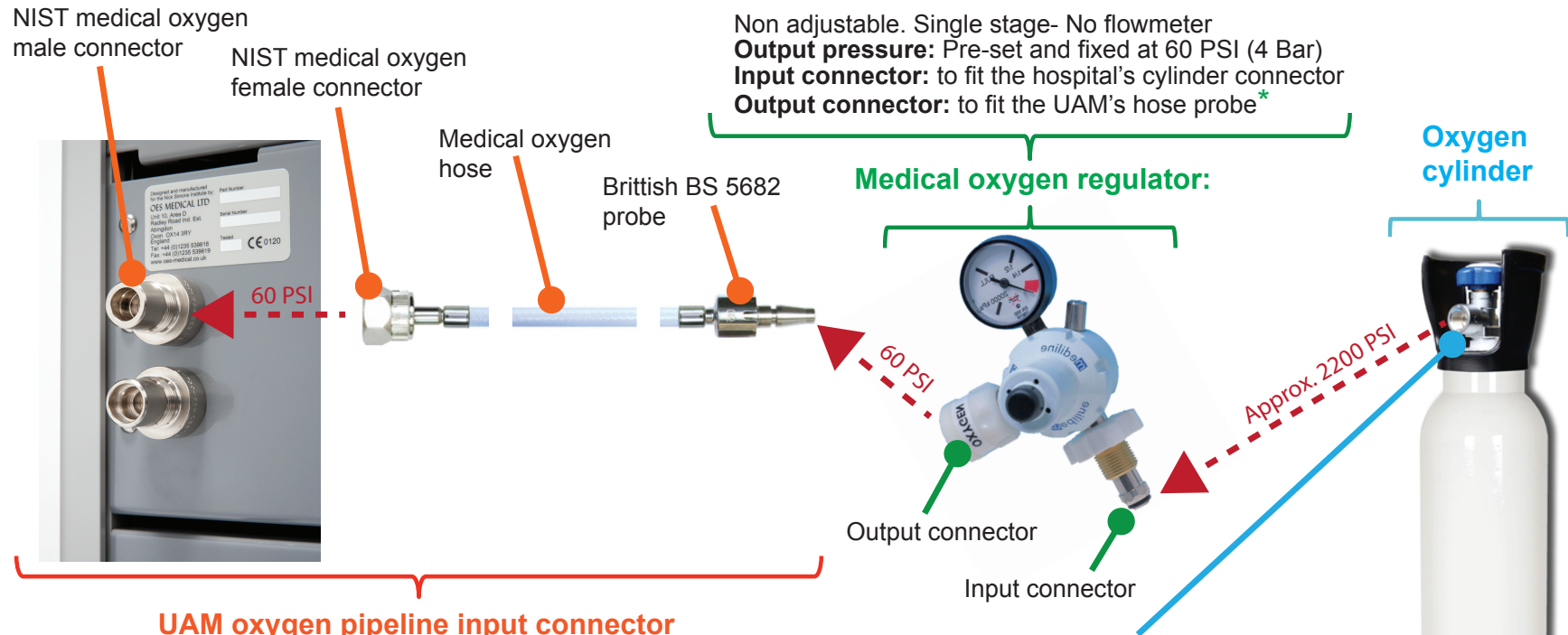
Blind: if voltage falls below cut-off the switch watch for this period to see if this is a momentary brownout.
Wait: Minimum period of time voltage is cut off during an event.

Important! Use an External Voltage Stabilizer



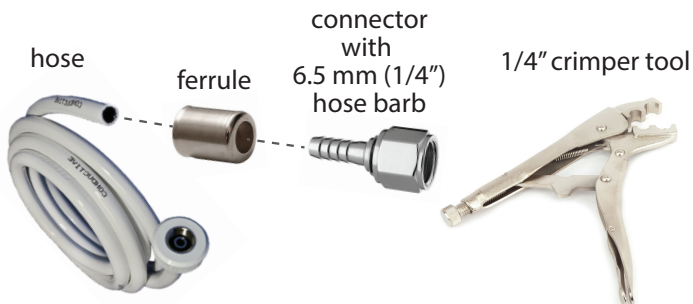
- 2000VA
- Use only for UAM and attached monitor

CONNECTING THE UAM'S OXYGEN PIPELINE INPUT TO AN OXYGEN CYLINDER

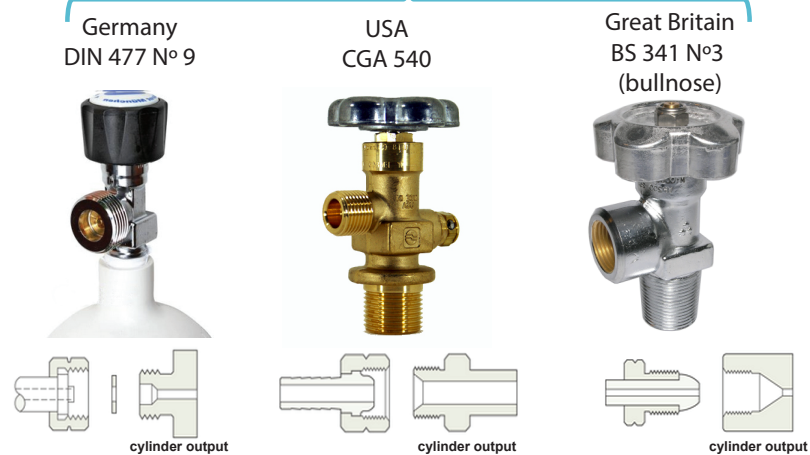


UAM oxygen pipeline input connector and supplied hose

* **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.

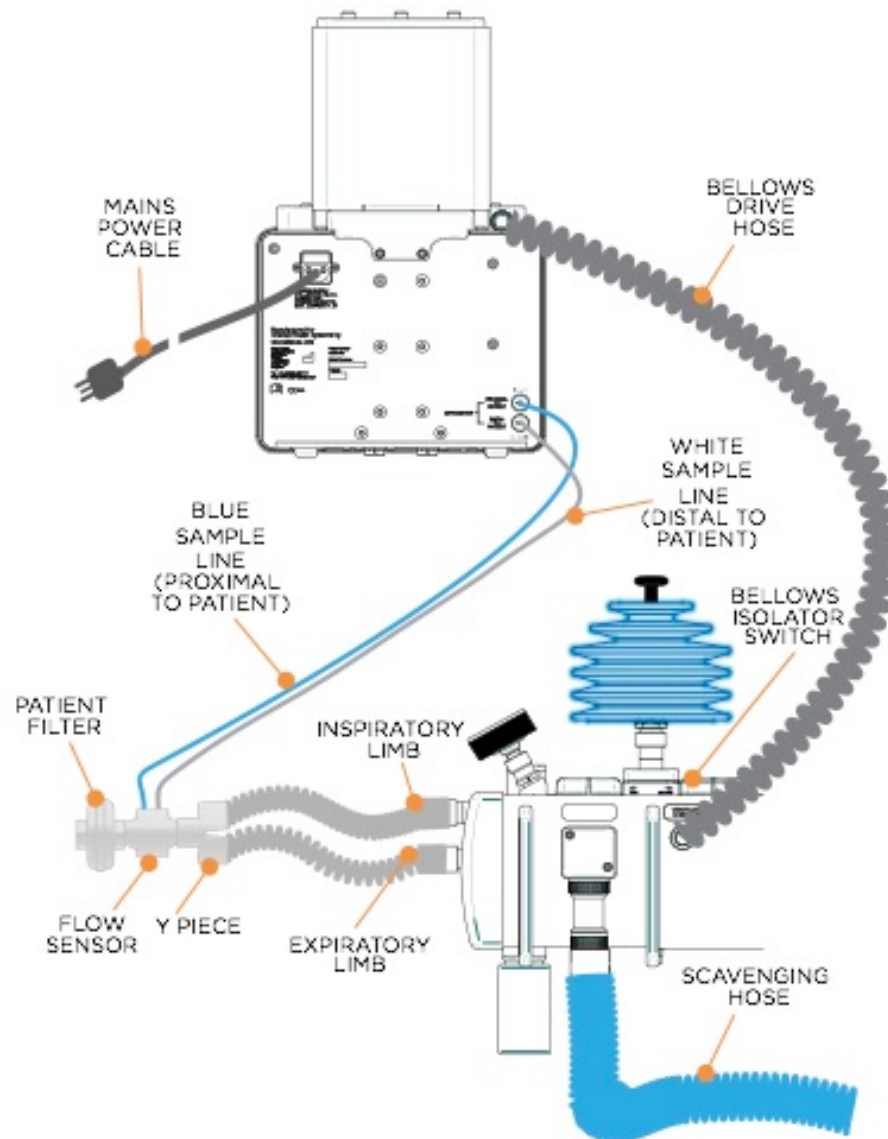


Cylinder connectors- Common standards



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

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

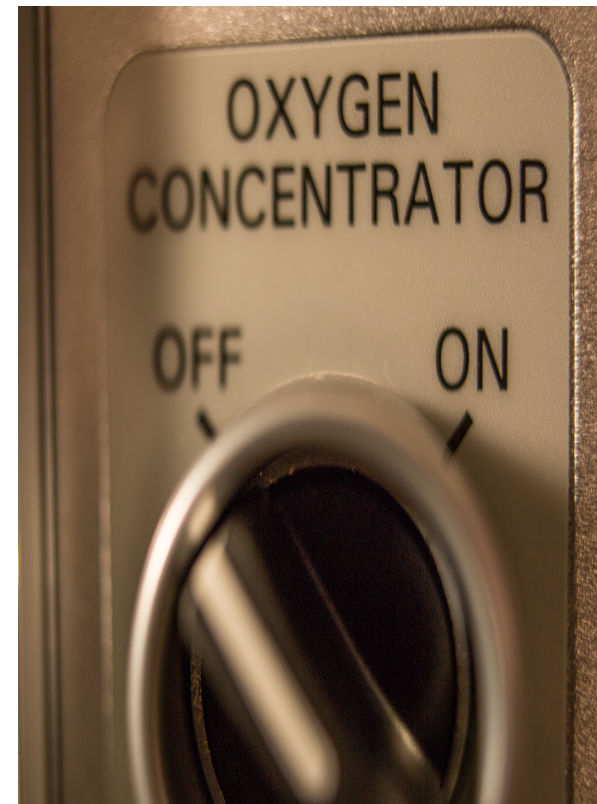
UAM Daily User Maintenance Video



Tips to Preserve the Life of the UAM



- 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!



How to Get Maintenance Support



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

Important!



*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**.*



Resources



Universal Anaesthesia Machine PRE-OPERATIVE CHECKLIST

I. Perform at the START of every OPERATING session

INSPECT & TEST

1. Check stability: casters OK, brakes function
2. Connect and check available gas sources: correct pressure, no leaks, tug test on pipelines
3. Check bellows OK: move up and down and observe balloon moves freely
4. Check breathing system: use bellows to inflate 2-litre bag or dummy lung. Check action of balloon while bag inflates/deflates. (If no dummy lung is available, proceed to 5)
5. Check resistance by pushing bellows with patient Y piece blocked (maximum pressure should be 55 cms water)
6. Check the water trap and empty if necessary
7. Check the gas scavenging is configured correctly, if available

VAPORISER

1. Check the volatile agent level in the vaporiser and fill as necessary
2. Check the operation of the vaporiser selector wheel (press silver button to unlock)

POWER

1. Switch on green mains isolator switch on the UAM back (there will be a delay while the system inspects the quality of the electrical power)
2. Press and hold 'On/Off' button next to the oxygen monitor screen until it lights up

OXYGEN MONITOR

1. Using 100% cylinder/pipeline oxygen, set oxygen flow meter to 6 L/minute and wait for maximum reading on monitor
2. Press 'CAL', then 'O2', then 'GO'. When the calibration is finished, press 'EXIT' two times.
3. Turn off the oxygen. Draw room air through the system with the bellows until the reading reaches its lowest setting
4. Press 'CAL', then 'AIR', then 'GO'. When the calibration is finished, press 'EXIT' two times.

OXYGEN SUPPLY

1. Turn on the oxygen concentrator by using the switch on the front of the machine
2. Set oxygen flow to 8 L/minute, wait 1-3 minutes. Oxygen % should be greater than 90%

NITROUS OXIDE

1. Set oxygen flow to 6 litres per minute
2. Set Nitrous Oxide flow to 4 litres per minute
3. Gradually turn down the oxygen flow to reduce FIO₂ to 25% and lower-- nitrous oxide flow should cut off when oxygen concentration is <25%

OVER →

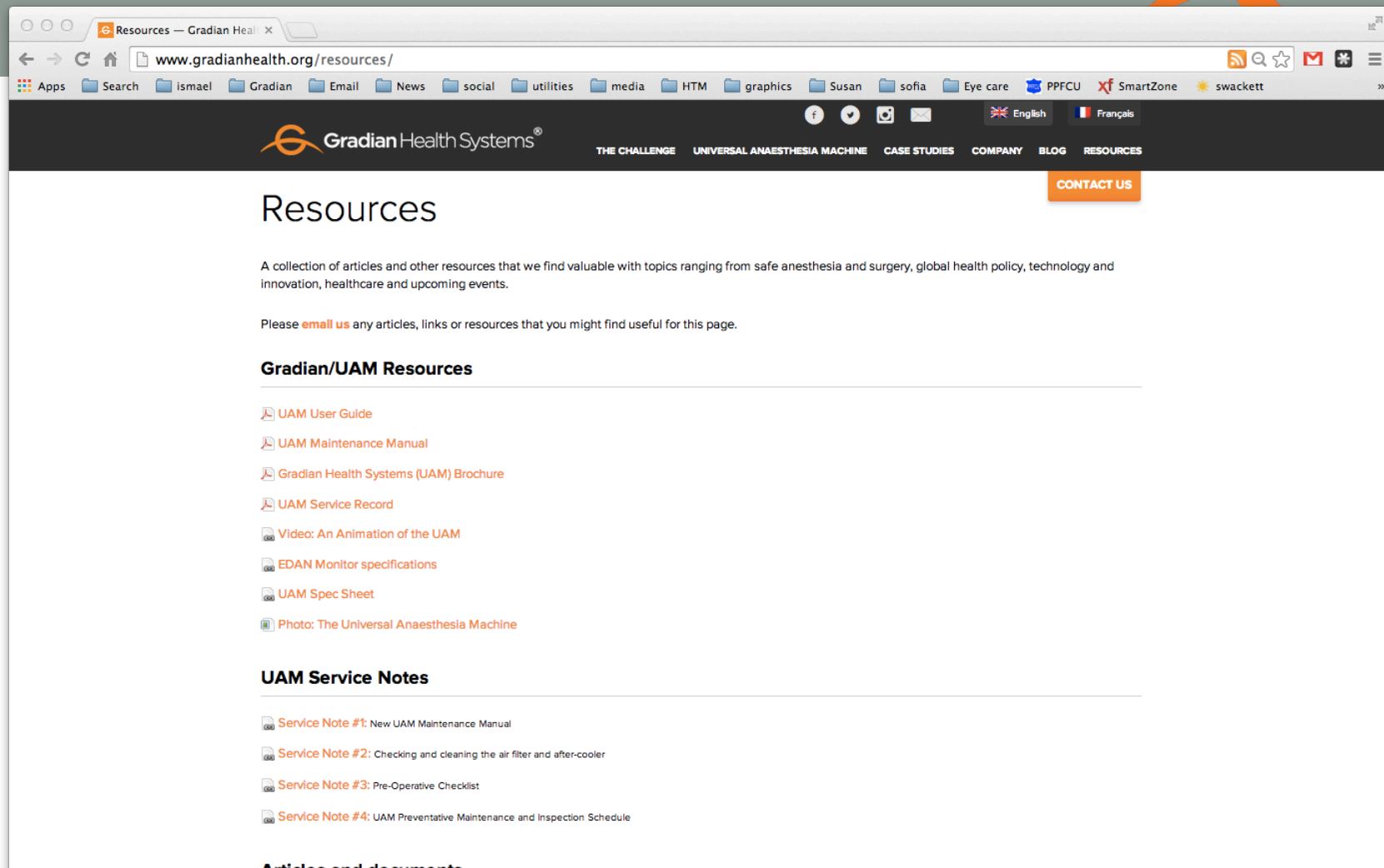
For service issues, please contact **Gradian Health Systems** at service@gradianhealth.org



A full list of resources is available at: <http://www.gradianhealth.org/resources/>

UAM Resources Page

www.gradianhealth.org/resources/











The screenshot shows a web browser window displaying the 'Resources' page of the Gradian Health Systems website. The browser's address bar shows the URL 'www.gradianhealth.org/resources/'. The website's header includes the Gradian Health Systems logo, a navigation menu with links like 'THE CHALLENGE', 'UNIVERSAL ANAESTHESIA MACHINE', 'CASE STUDIES', 'COMPANY', 'BLOG', and 'RESOURCES', and a 'CONTACT US' button. The main content area is titled 'Resources' and contains a paragraph about the collection of articles and other resources. Below this, there is a section titled 'Gradian/UAM Resources' with a list of links to various documents and videos. Another section titled 'UAM Service Notes' lists four specific service notes. The page is designed with a clean, professional layout using a color palette of orange, black, and white.

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](#)
-  [EDAN 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

Service Notes

Sign up to receive them via email by emailing service@gradianhealth.com

Archive: www.gradianhealth.org/resources/

UAM Service Note (#2)

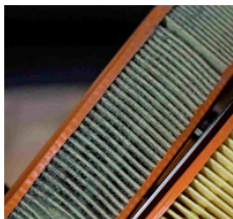
Dear UAM User,

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 air filter is dirty then it must be cleaned with a vacuum cleaner and if cleaned, it should be replaced with a new filter. This procedure is described on pages 17 and 18 of the [Maintenance Manual](#).

When checking the air filter, the after-cooler coil should also be checked for any dust it should be cleaned off with a vacuum cleaner or wiped clean. When cleaning it make sure not to bend the metal fins.

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

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



[View this email in your browser](#)

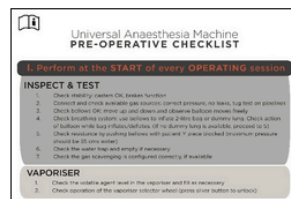


UAM Service Note (#3)

Dear UAM User,

It is extremely important to perform checks on the UAM prior to every operating session, before each case, at the end of each case, and at the end of every operating session by using the checklist included with the UAM. Make sure that the checklist is kept attached to the UAM at all times for easy access.

Download here: [UAM Pre-Operative Checklist](#)



UAM Service Note (#4)

Dear UAM User,

To ensure optimal performance of your UAM it is essential to follow the on and preventive maintenance schedule described in the table on page 15 of the [Maintenance Manual](#).

[click on image for larger view](#)

| COMMENDED UAM MAINTENANCE SCHEDULE | |
|------------------------------------|--|
| FREQUENCY | ACTION |
| Daily or prior to use (user) | Perform operational check (see UAM User Manual and Checklist on the UAM) |
| Every 3 months | Perform full function test |
| Every 6 months | Perform full function test Check air filter- clean or replace if needed |
| Every 12 months | Perform full function test Check air filter- clean or replace if needed Replace oxygen sensor Replace oxygen concentrator loss of power battery (SV) Remove and inspect Fenton balloon |
| Every 3 years | Replace oxygen monitor battery |
| Every 5 years | Contact Gradian Health Systems for a complete maintenance check service@gradianhealth.org +1.212.537.0340 |

The checklist on page 41 of the maintenance manual serves as a guide for making sure that all of the checks are performed and should be filled out and saved in your equipment records.

[click on image for larger view](#)

UAM SERVICE RECORD

Recommended Maintenance Schedule



| FREQUENCY | ACTION |
|------------------------------|--|
| Daily or prior to use (user) | Perform operational check (see UAM User Manual and Checklist on the UAM) |
| Every 3 months | Perform full function test |
| Every 6 months | Perform full function test Check air filter- clean or replace if needed |
| Every 12 months | Perform full function test Check air filter- clean or replace if needed Replace oxygen sensor Replace oxygen concentrator loss of power battery (9V) Remove and inspect Fenton balloon |
| Every 3 years | Replace oxygen monitor battery |
| Every 5 years | Contact Gradian Health Systems for a complete maintenance check service@gradianhealth.org +1.212.537.0340 |

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



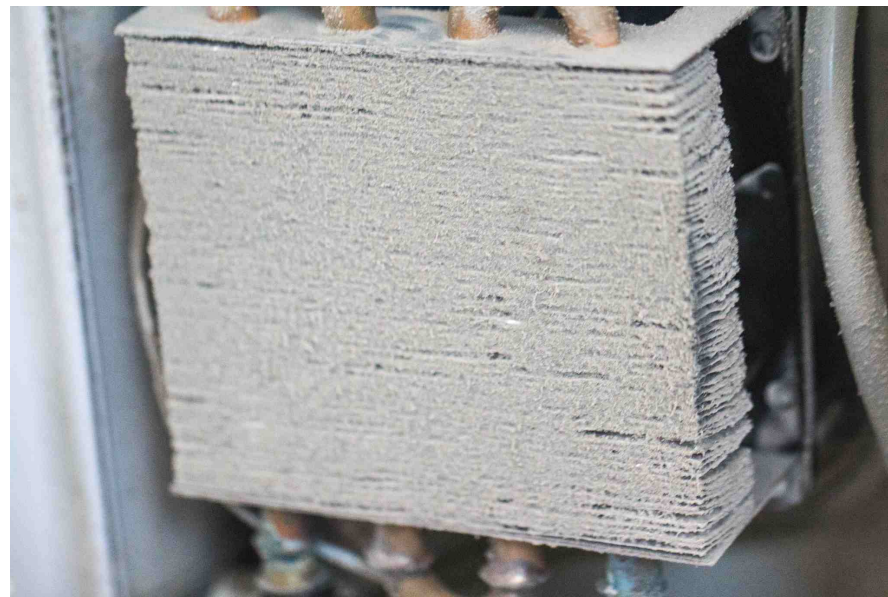
Access Panels



Cleaning and Replacing the Air Filter



Cleaning the After-Cooler



Replacing the Oxygen Sensor



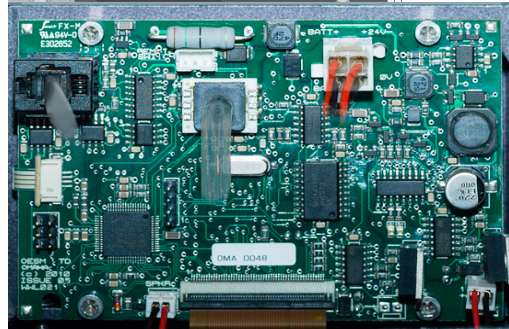
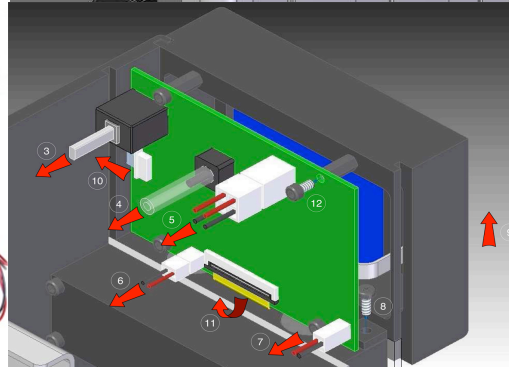
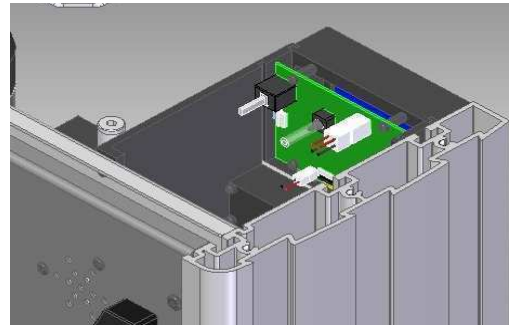
Calibrating the Oxygen Sensor



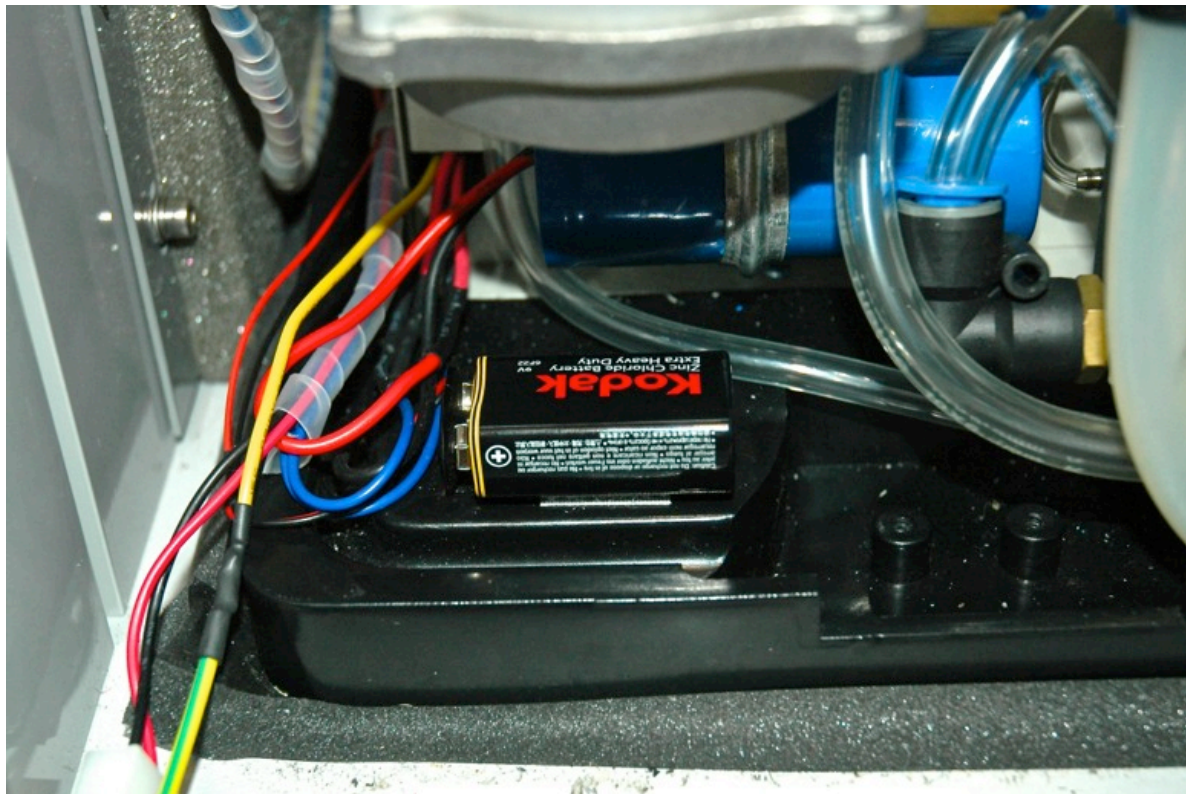
Removing and Replacing the Fenton Balloon



Removing and Replacing the Circuit Board



Replacing the loss of power battery



Replacing the control screen battery

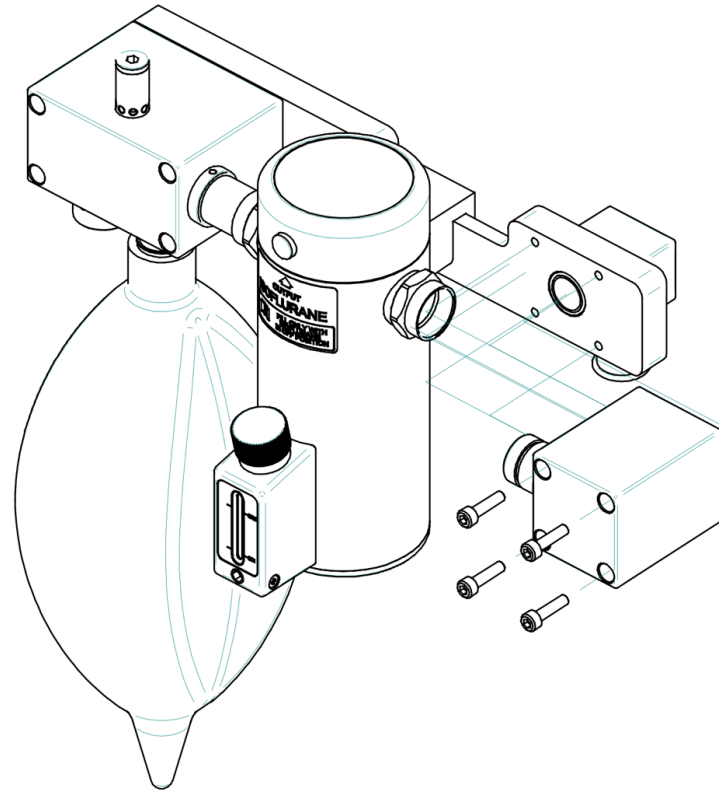


YUASA NP1.2-12
12V, 1.2 Ah

Removing and replacing the Oxygen Concentrator



Removing and replacing the Vaporizer



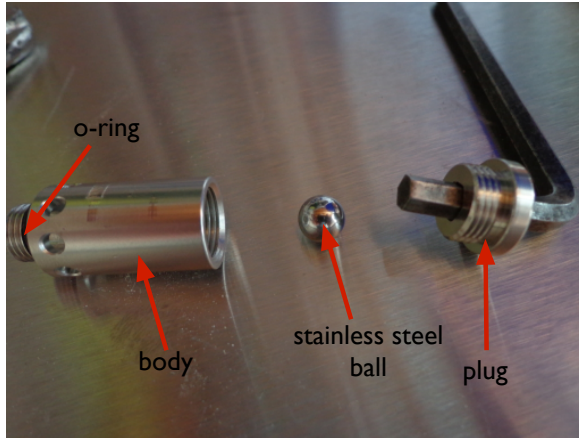
Cleaning the Positive Pressure Relief Valve (PPRV)



Cleaning the Positive Pressure Relief Valve (PPRV)



Cleaning the Positive Pressure Relief Valve (PPRV)



Gradian Health Systems



For comments or questions about service or training please contact us at:

service@gradianhealth.org

Or

WhatsApp: +1929-280-0210