

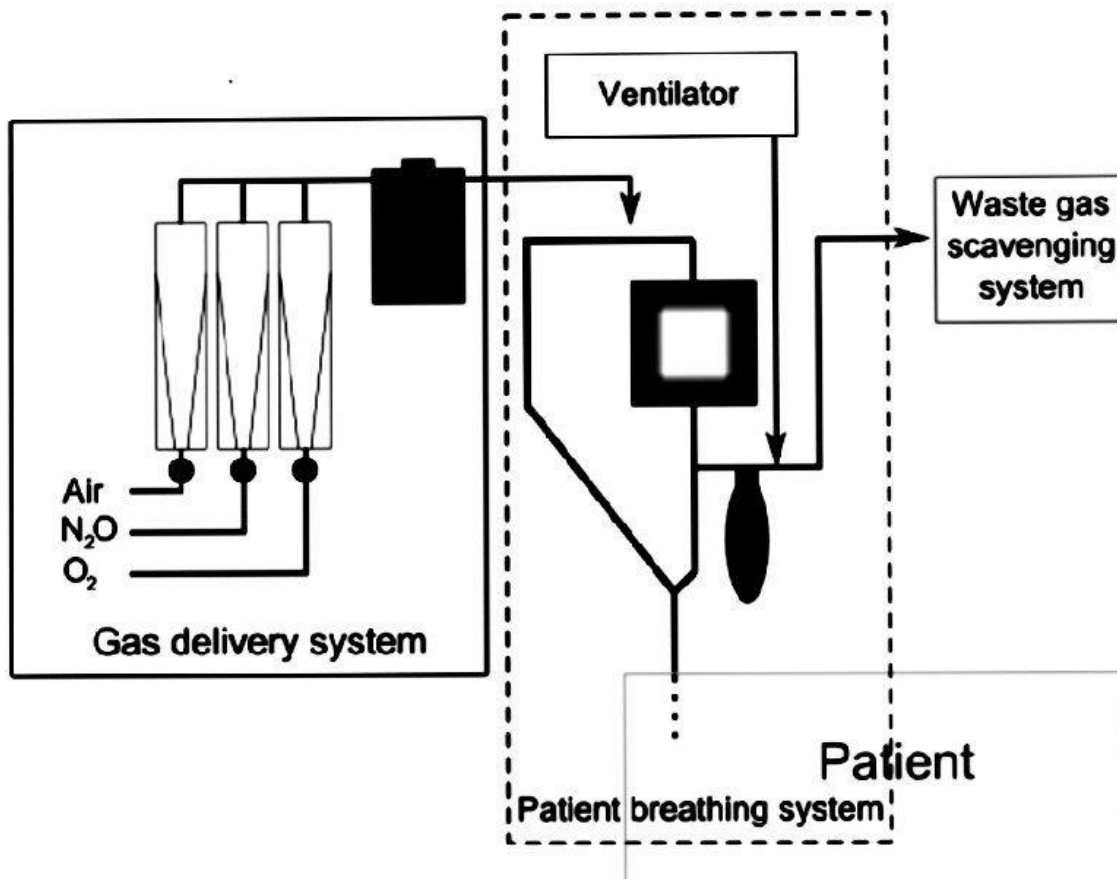
Chapter 7.1 Anaesthetic Machines

Function

The anaesthetic machine (or anaesthesia machine in America) is used by anaesthesiologists and nurse anaesthetists to support the administration of anaesthesia. The most common type of anaesthetic machine is the continuous-flow anaesthetic machine, which is designed to provide an accurate and continuous supply of medical gases (such as oxygen and nitrous oxide), mixed with an accurate concentration of anaesthetic vapour (such as halothane or isoflurane), and deliver this to the patient at a safe pressure and flow. Modern machines incorporate a ventilator, suction unit, and patient monitoring devices.

How it works

Oxygen (O_2), nitrous oxide (N_2O) and sometimes air sources are connected to the machine. Through gas flowmeters (or rotameters), a controlled mixture of these gases along with anaesthetic vapour passes through a vaporizer and is delivered to the patient. Sometimes a ventilator is also connected with the machine for re-breathing thus making it a closed circuit. With ventilators or a re-breathing patient circuit, soda lime canisters are used to absorb the exhaled carbon dioxide and fresh gases are added to the circuit for reuse. Pressure gauges are installed on the anaesthesia machine to monitor gas pressure. Generally, 25% (or 21%) oxygen is always kept in the circuit (delivered to patient) as a safety feature. The device which ensures this minimum oxygen in the circuit is called a hypoxic guard. Some basic machines do not have this feature, but have a nitrous lock which stops the delivery of N_2O in absence of O_2 pressure. Machines give various alarms to alert operators.



Troubleshooting – Anaesthesia Machines

Fault	Possible Cause	Solution
1. Equipment is not running	No power at mains socket	Check power switch is on. Replace fuse with correct voltage and current rating if blown. Check mains power is present at socket using equipment known to be working. Contact electrician for rewiring if power not present.
	Electrical cable fault	Refer to electrician for repair
2. No gas output	No O ₂ pressure in cylinder / gas supply.	Restore gas supply or replace gas cylinders.
	Check pressure gauges for gas pressure (about 4 bar or 4 kg/cm ²)	Replace O ₂ cylinder and/or N ₂ O cylinder in case of low pressure.
3. O ₂ failure alarm not working	Alarm battery is low.	Call biomedical technician to fix the problem.
	Alarm device is not working	
4. Machine has leaks	Poor seal (commonly occurring around tubing connections, flow valves and O ₂ / N ₂ O yokes)	Clean leaking seal or gasket, replace if broken. If leaks remain, call technician for repair.
	Cylinders not seated in yokes properly	Refit cylinders in yokes and retest. If leaks remain, call technician for repair.
5. Flowmeter fault	Over tightening of the needle valve or sticking of the float / ball	Refer to biomedical technician
6. Electrical shocks	Wiring fault	Refer to electrician immediately

User Maintenance Checklist – Anaesthesia Machines

Daily	
Cleaning	<ul style="list-style-type: none"> ✓ Remove any dust / dirt with dry cloth ✓ Remove water and waste matter from inside
Audio-Visual checks	<ul style="list-style-type: none"> ✓ If any leak is audible, check with soapy solution ✓ Check all seals, connectors, adapters and parts are tight ✓ Check all moving parts move freely, all holes are unblocked
Function checks	<ul style="list-style-type: none"> ✓ Report any faults to technician immediately ✓ After use, depressurize system and replace all caps / covers

Weekly	
Cleaning	<ul style="list-style-type: none"> ✓ Clean inside and outside with damp cloth and dry off
Audio-Visual checks	<ul style="list-style-type: none"> ✓ Check connections for leakage with soap solution and dry off ✓ Check all fittings for proper assembly ✓ Replace soda lime if it has turned blue ✓ Replace any deteriorated hoses and tubing ✓ If seal, plug, cable or socket are damaged, replace
Function checks	<ul style="list-style-type: none"> ✓ When next used, check pressure gauges rise ✓ When next used, check there are no leaks

Every six months	
Biomedical Technician check required	

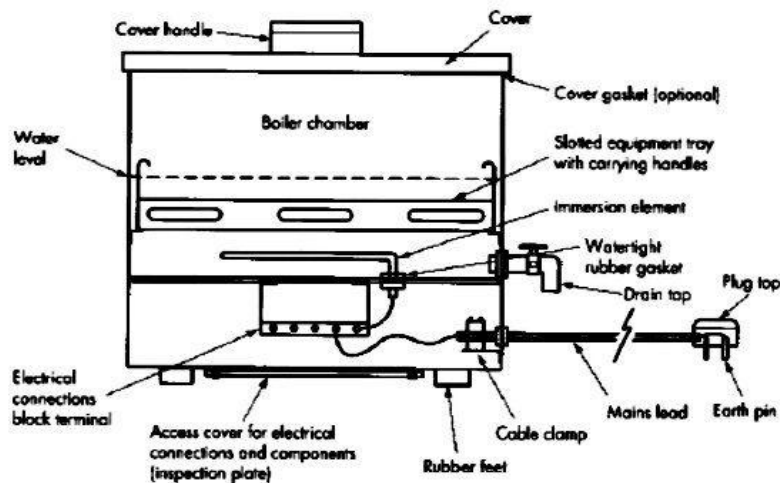
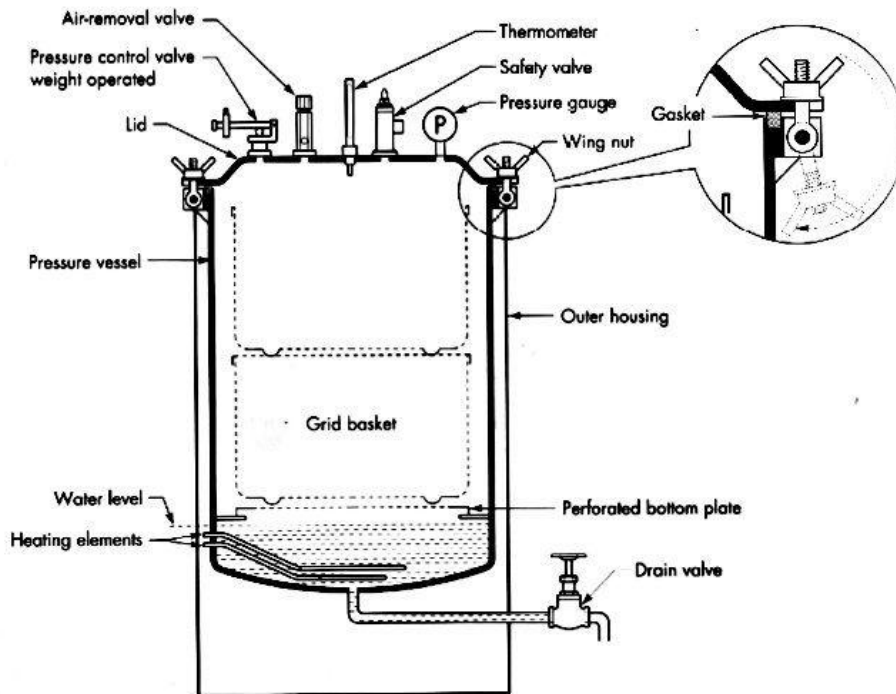
Chapter 7.2 Autoclaves and Sterilizers

Function

Sterilization is the killing of microorganisms that could harm patients. It can be done by heat (steam, air, flame or boiling) or by chemical means. Autoclaves use high pressure steam and sterilizers use boiling water mixed with chemicals to achieve this. Materials are placed inside the unit for a carefully specified length of time. Autoclaves achieve better sterilization than boiling water sterilizers.

How it works

Heat is delivered to water either by electricity or flame. This generates high temperature within the chamber. The autoclave also contains high pressure when in use, hence the need for pressure control valves and safety valves. Users must be careful to check how long items need to be kept at the temperature reached.



Troubleshooting – Autoclaves and Sterilizers

Fault	Possible Cause	Solution
1. Equipment is not heating	<p>No power at mains socket</p> <p>Electrical cable fault</p> <p>Damaged heating element</p>	<p>Check power switch is on. Replace fuse with correct voltage and current rating if blown. Check mains power is present at socket using equipment known to be working. Contact electrician for rewiring if power not present.</p> <p>Try cable on another piece of equipment. Contact electrician for repair if required.</p> <p>Replace if broken</p>
2. Pressure rises above the marked level	Blocked valve	<p>Clean the pressure regulating valve, safety valve.</p> <p>Pressure vessel may be over filled.</p> <p>Retest autoclave under pressure with water only.</p>
3. Steam is constantly escaping	Poor seal	<p>Clean leaky valve and hole, replace if defective.</p> <p>Clean leaking seal or gasket, replace if broken.</p>
4. Electrical shocks	Wiring fault	Refer to electrician

User Maintenance Checklist – Autoclaves / Sterilizers

Daily

- | | |
|----------|------------------------------------------------------|
| Cleaning | ✓ Remove any dust / dirt with damp cloth and dry off |
| | ✓ Remove water and waste matter from inside |

- | | |
|---------------|---------------------------------------------------------------|
| Visual checks | ✓ Check all screws, connectors and parts are tightly fitted |
| | ✓ Check all moving parts move freely, all holes are unblocked |

- | | |
|-----------------|-----------------------------------------------|
| Function checks | ✓ Use troubleshooting guide if problems occur |
|-----------------|-----------------------------------------------|

Weekly

- | | |
|----------|----------------------------------------------------------------|
| Cleaning | ✓ Unplug, clean inside and outside with damp cloth and dry off |
|----------|----------------------------------------------------------------|

- | | |
|---------------|--------------------------------------------------------|
| Visual checks | ✓ Check internal heating element connections are tight |
| | ✓ Replace heating element if covered with limescale |
| | ✓ If plug, cable or socket are damaged, replace |

- | | |
|-----------------|------------------------------------------------------------|
| Function checks | ✓ When next used, check pressure / temperature gauges rise |
| | ✓ When next used, check there are no leaks |

Every six months

Biomedical Technician check required

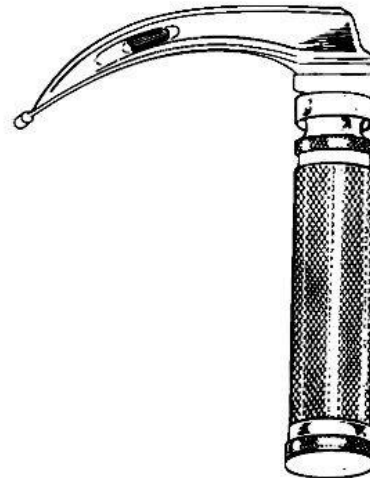
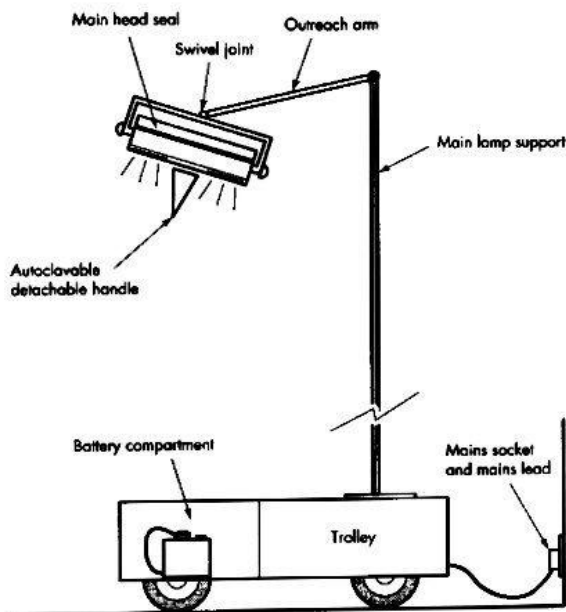
Chapter 7.8 Lamps

Function

There are many kinds of sources of light used in medicine. This chapter deals with large lights for operating theatres or delivery suites, ultraviolet or infrared phototherapy units, ophthalmic slit lamps, handheld and head worn lamps for ENT clinics and domestic torches. However, the principles here will help in the maintenance of any kind of light source. Endoscopes are dealt with separately in chapter 7.6.

How it works

Each type of lamp will have a power source with switch and a bulb. Some will also have controls for the brightness or focus of the light, while others will also have lenses to direct the light where required. Some lights operate off mains electricity, while others use batteries instead. Some lights have both, using the batteries for back-up power in case of mains supply failure. Electric bulbs and batteries have limited life and will need regular checking. A stock of spares should be kept of all the correct voltages and wattages (ratings) of parts.



Troubleshooting – Lamps

Fault	Possible Cause	Solution
<p>1. No light or 'power on' visible</p>	No power at mains socket	<p>Check power switch is on. Replace fuse with correct rating of voltage and current if blown. Check mains power is present at socket using equipment known to be working. Contact electrician for rewiring if power not present.</p>
	Dead battery	Charge or replace batteries
	Blown bulb	Replace bulb with correct voltage and wattage
	Battery leakage	Remove batteries, clean battery terminals and replace with new battery
	Electrical cable fault	Try cable on another piece of equipment. Contact electrician for repair if required.
<p>2. Fuse / bulb keeps blowing</p>	Fuse or bulb is wrong rating	Replace with correct rating
	Power supply or cable fault	Refer to electrician
<p>3. Light cannot be made bright enough</p>	Dirt on lens or tube	Clean area with dry, clean cotton
	Poor power supply	Check power line or replace batteries
	Wrong bulb rating	Check bulb rating is correct
	Control malfunction	Refer to electrician
<p>4. Electrical shocks</p>	Wiring fault	Refer to electrician

User Maintenance Checklist – Lamps

Daily	
Cleaning	<ul style="list-style-type: none"> ✓ Wipe dust off exterior and cover equipment after checks
Visual checks	<ul style="list-style-type: none"> ✓ Check all fittings and accessories are mounted correctly ✓ Check there are no cracks in glass / covers or liquid spillages
Function checks	<ul style="list-style-type: none"> ✓ If in use that day, run a brief function check before clinic

Weekly	
Cleaning	<ul style="list-style-type: none"> ✓ Unplug, clean outside with damp cloth and dry off ✓ Clean any filters, covers and battery compartment
Visual checks	<ul style="list-style-type: none"> ✓ Tighten any loose screws and check parts are fitted tightly ✓ Check mains plug screws are tight ✓ Check mains cable has no bare wire and is not damaged
Function checks	<ul style="list-style-type: none"> ✓ Check all switches operate correctly ✓ Remove or charge batteries if out of use

Every six months	
Biomedical Technician check required	

Chapter 7.9 Nebulizers

Function

A nebulizer is a device used to administer medication in the form of a mist inhaled into the lungs. Nebulizers are commonly used for treatment of cystic fibrosis, asthma and other respiratory diseases. The reason for using a nebulizer for medicine to be administered directly to the lungs is that small aerosol droplets can penetrate into the narrow branches of the lower airways. Large droplets would be absorbed by the mouth cavity, where the clinical effect would be low.

How it works

The common technical principle for all nebulizers is to use oxygen, compressed air or ultrasonic power as means to break up medical solutions or suspensions into small aerosol droplets. These are passed for direct inhalation either through the mouthpiece of the device or a hose set. Gas powered devices use a small pump to force the gas through the solution and will normally have a filter for the gas inlet. Ultrasonic devices use a small crystal to generate vibrations in the solution that cause droplets to break off.



Troubleshooting – Nebulizers

Fault	Possible Cause	Solution
1. Equipment is not working	<p>No power from mains socket</p> <p>Electrical cable fault</p>	<p>Check power switch is on. Replace fuse with correct voltage and current if blown. Check mains power is present at socket using equipment known to be working. Contact electrician for rewiring if power not present.</p> <p>Try cable on another piece of equipment. Contact electrician for repair if required.</p>
2. Machine is working but flow is absent or low	<p>Filter is blocked</p> <p>Pipe is twisted or nebulizer chamber / mouthpiece is blocked.</p> <p>Worn out pump tubing</p> <p>Compressor (or air source) is broken obstructed or leaking</p>	<p>Clean filter</p> <p>Connect pipe properly, clean chamber / mouthpiece</p> <p>Replace tubing</p> <p>Remove any blocking material or call biomedical technician to fix the problem.</p>
3. Inadequate nebulizing amount	<p>Output adjustment not correctly set</p> <p>Mouthpiece cracked</p> <p>Internal fault</p>	<p>Adjust output as directed in user manual</p> <p>Replace mouthpiece</p> <p>Refer to biomedical technician</p>
4. Electrical shocks or fuse keeps blowing	<p>Wiring fault</p>	<p>Refer to electrician</p>

User Maintenance Checklist – Nebulizers

Daily	
Cleaning	<ul style="list-style-type: none"> ✓ Clean and sterilize mouthpiece and medicine chamber ✓ Wipe dust from machine and replace cover after checks
Visual checks	<ul style="list-style-type: none"> ✓ Check all parts are present and tightly fitted ✓ Check all moving parts move freely, all holes are unblocked
Function checks	<ul style="list-style-type: none"> ✓ Check the whole system function before use

Weekly	
Cleaning	<ul style="list-style-type: none"> ✓ Unplug, clean outside with damp cloth and dry off ✓ Clean filter and air chamber of compressor
Visual checks	<ul style="list-style-type: none"> ✓ Clean chamber and tube seals, replace if damaged ✓ If mains plug, cable or socket are damaged, replace them
Function checks	<ul style="list-style-type: none"> ✓ When next used, check for adequate nebulization. ✓ Check compressor fan is working without excessive noise.

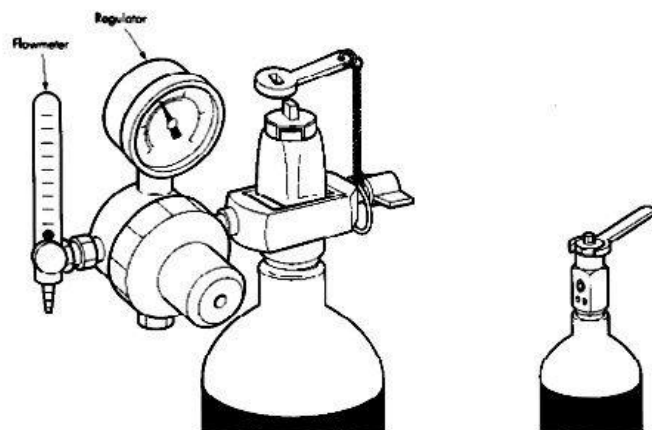
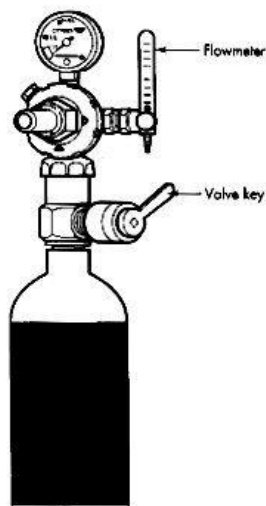
Every six months	
Biomedical Technician check required	

Chapter 7.11 Oxygen Cylinders and Flowmeters

Function

Medical gases such as oxygen, nitrous oxide etc. are intended for administration to a patient in anaesthesia, therapy or diagnosis. An oxygen cylinder is a cylindrically shaped metal container used to store oxygen that has been compressed to a very high pressure. Oxygen cylinders, which come in different sizes, are usually black coloured with a white top; in some cases, it may be a small cylinder that is entirely black. The black colour helps to differentiate it from other substances that are stored in similar containers. Cylinders are fitted with customized valves (either 'bullnose' or 'pin index' type) with valve guards, which are opened with valve keys.

A flowmeter is an instrument used to measure the flow rate of a liquid or a gas. In healthcare facilities, gas flowmeters are used to deliver oxygen at a controlled rate either directly to patients or through medical devices. Oxygen flowmeters are used on oxygen tanks and oxygen concentrators to measure the amount of oxygen reaching the patient or user. Sometimes bottles are fitted to humidify the oxygen by bubbling it through water.



Troubleshooting – Oxygen Cylinders and Flowmeters

Fault	Possible Cause	Solution
1. No oxygen is flowing	Empty cylinder Flow meter knob or cylinder valve is closed. Faulty regulator	Replace cylinder Open valves, then check flow meter registers flow Close all valves and replace regulator
2. Leakage from cylinder or flowmeter	Cylinder is not connected to pressure regulator properly Faulty or missing washer between regulator and cylinder Flowmeter seal damaged or loose Cylinder faulty	Tighten all fittings Replace washer Tighten flowmeter Label 'Faulty' and return to manufacturer
3. Leakage cannot be located	Leakage too small to be heard	Apply detergent solution (NOT oily soap) to joints. Bubbles will show at leak point. Clean/replace washer and tighten at that joint.
4. Flowmeter ball not moving, yet oxygen is flowing	Faulty flow meter	Close all valves, disconnect flowmeter and clean inside. Reconnect and test. If problem persists, replace flowmeter
5. Pressure gauge does not show pressure, yet oxygen is flowing	Faulty pressure gauge	Refer to biomedical technician for replacement

User Maintenance Checklist – Oxygen Cylinders and Flowmeters

Daily

Cleaning	<ul style="list-style-type: none">✓ Ensure delivery tubes and masks are sterile✓ If humidifier bottle is used, refill with clean water
Visual checks	<ul style="list-style-type: none">✓ Check cylinder is correct type and marked oxygen✓ Check all parts are fitted tightly and correctly
Function checks	<ul style="list-style-type: none">✓ Before use, ensure cylinder is filled and flow is present✓ Close cylinder valve after each use.

Weekly

Cleaning	<ul style="list-style-type: none">✓ Clean cylinder, valve and flowmeter with damp cloth
Visual checks	<ul style="list-style-type: none">✓ Check for leakage: hissing sound or reduction in pressure
Function checks	<ul style="list-style-type: none">✓ Remove valve dust with brief, fast oxygen flow✓ Check flow can be varied using flow control

Every six months

Biomedical Technician check required

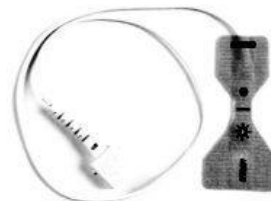
Chapter 7.12 Pulse Oximeters

Function

A pulse oximeter is a device that non-invasively monitors the oxygen saturation of a patient's blood. It measures the amount of oxygen in a patient's arterial blood during operations and diagnosis. This level of oxygen, or 'oxygen saturation' is often referred to SpO_2 , measured in %, and this is displayed on the pulse oximeter. A pulse oximeter also displays pulse rate.

How it works

The coloured substance in blood, haemoglobin, is carrier of oxygen and the absorption of light by haemoglobin varies with the amount of oxygenation. Two different kinds of light (one visible, one invisible) are directed through the skin from one side of a probe, and the amount transmitted is measured on the other side. The machine converts the ratio of transmission of the two kinds of light into a % oxygenation. Pulse oximeter probes can be mounted on the finger or ear lobe.



Troubleshooting – Pulse Oximeters

Fault	Possible Cause	Solution
1. Equipment is not running	No power from mains socket	Check power switch is on. Replace fuse with correct voltage and current if blown. Check mains power is present at socket using equipment known to be working. Contact electrician for rewiring if power not present.
	Battery (if present) is discharged	Recharge or replace battery
	Electrical cable fault	Try cable on another piece of equipment. Contact electrician for repair if required.
2. SpO ₂ or pulse rate not displayed or unstable	Probe is not mounted correctly	Connect probe and cable properly
	Probe not able to read through dirt, nail polish, etc.	Remove grease, dirt, nail polish and clean probe
	Patient movement	Request patient to remain still
	Patient's SpO ₂ value is too low to be measured	Further clinical examination of patient. Resite probe if necessary
	Internal malfunction	Call biomedical technician.
3. "Probe off" displayed on screen	Probe is not connected properly	Connect the sensor
	The connection between the probe and oximeter is loose	Refer to biomedical technician for repair
4. "Error" displayed on screen	Faulty probe or control circuit	Refer to biomedical technician
5. Continuous alarm sounds	Alarm limits set too low or high	Set appropriate alarm limits
	Power disconnected	Connect power cable
	Internal malfunction	Refer to biomedical technician
6. Electrical shocks	Wiring fault	Refer to biomedical technician immediately

User Maintenance Checklist – Pulse Oximeters

Daily	
Cleaning	<ul style="list-style-type: none"> ✓ Remove any dust / dirt and replace equipment cover ✓ Remove any tape, paper or foreign body from equipment ✓ Clean probe with alcohol wipe after each use
Visual checks	<ul style="list-style-type: none"> ✓ Check all parts are present and connected ✓ Check cables are not twisted and remove from service if any damage is visible
Function checks	<ul style="list-style-type: none"> ✓ Check operation on healthy subject before use

Weekly	
Cleaning	<ul style="list-style-type: none"> ✓ Unplug, clean outside with damp cloth and dry off
Visual checks	<ul style="list-style-type: none"> ✓ Tighten any loose screws and check parts are fitted tightly ✓ If plug, cable or socket are damaged, replace
Function checks	<ul style="list-style-type: none"> ✓ Check operation of all lights, indicators and visual displays ✓ Check probe disconnection alarm.

Every six months	
Biomedical Technician check required	

Chapter 7.13 Scales

Function

Measuring patient weight is an important part of monitoring health as well as calculating drug and radiation doses. It is therefore vital that scales continue to operate accurately. They can be used for all ages of patient and therefore vary in the range of weights that are measured. They can be arranged for patients to stand on, or can be set up for weighing wheelchair bound patients. For infants, the patient can be suspended in a sling below the scale or placed in a weighing cot on top of the scale.

How it works

Mechanical scales have a spring deflected by patient weight. The spring pushes a pointer along a display or rotates a disc to indicate weight. Electronic scales have a sensor that bends under patient weight and the circuitry converts this to displayed digits.



Baby weighing scale, dial type



Baby weighing scale, spring type



Troubleshooting – Scales

Fault	Possible Cause	Solution
1. Zero point cannot be set	Scales are not level	Set scales on level ground and retest
	Zero control broken or internal part jammed	Send for repair
2. Movement is stiff or jerky	Dirt lodged inside	Remove any visible dirt or foreign body and retest
	Internal blockage	Send for repair
3. Reading is inaccurate	Zero not properly set	Reset zero and retest
	Calibration error	Recalibrate or send for repair
4. Electronic display is blank	Battery / power failed	Replace battery or power supply and retest
	Internal error	Send for repair

User Maintenance Checklist – Scales

Daily	
Cleaning	<ul style="list-style-type: none"> ✓ Wipe off dust and replace dust cover after checks ✓ Clear away any dirt or hair on controls and feet
Visual checks	<ul style="list-style-type: none"> ✓ If bent, cracked or damaged, send for repair
Function checks	<ul style="list-style-type: none"> ✓ Check zero at start of day and before each patient

Weekly	
Cleaning	<ul style="list-style-type: none"> ✓ Clean exterior with damp cloth and dry off ✓ Clean off then repaint any exposed or rusted metal
Visual checks	<ul style="list-style-type: none"> ✓ Tighten any loose screws and check parts are fitted tightly
Function checks	<ul style="list-style-type: none"> ✓ Check reading is accurate using a known weight ✓ Send for repair if inaccurate or sticking ✓ Replace battery if display shows low battery

Every six months
Biomedical Technician check required

Chapter 7.14 Sphygmomanometers (B.P. sets)

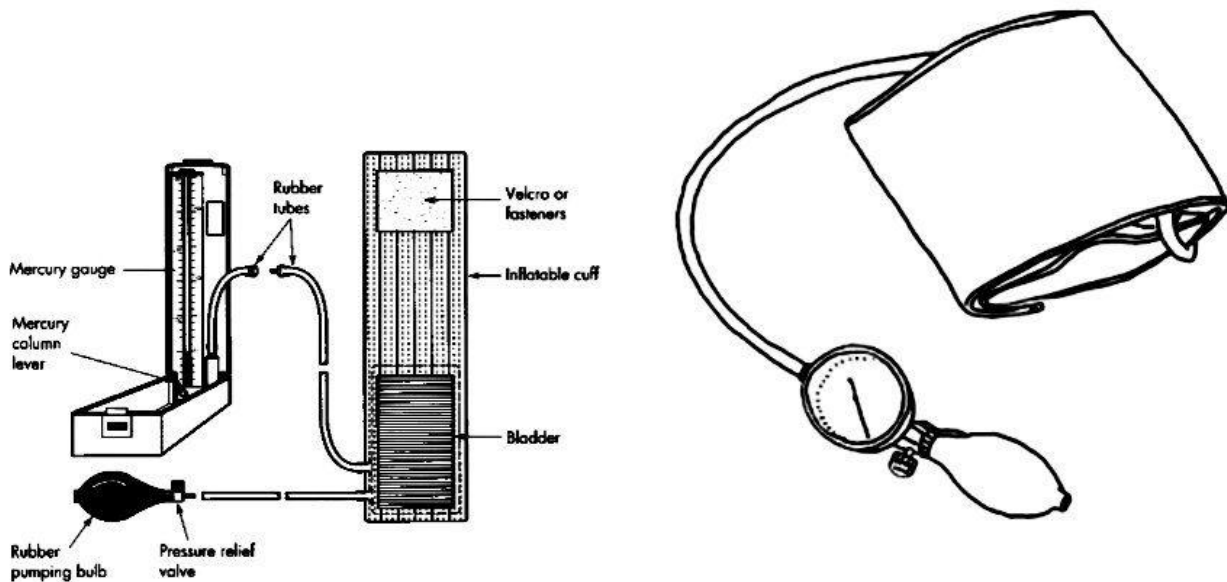
Function

Blood pressure is an indicator of several diseases as well as of general health. It is an easy screening test using simple equipment. A sphygmomanometer can be used to measure the blood pressure at the high point (systolic) and low point (diastolic) of the cardiac pressure cycle. Pressure is usually measured using a cuff on the upper arm.

How it works

The cuff on the arm is inflated until blood flow in the artery is blocked. As the cuff pressure is decreased slowly, the sounds of blood flow starting again can be detected. The cuff pressure at this point marks the high (systolic) pressure of the cycle. When flow is unobstructed and returns to normal, the sounds of blood flow disappear. The cuff pressure at this point marks the low (diastolic) pressure.

Pressure can be measured using a meter with dial (aneroid type), a mercury column or an electronic display. The sounds are normally detected using a stethoscope, but some electronic equipment uses a different, automatic technique with pressure sensors. The two methods do not always give the same results and the stethoscope method is generally seen to be more accurate for all types of patient.



Troubleshooting – Sphygmomanometers (B.P. sets)

Fault	Possible Cause	Solution
1. Mercury leakage OR Mercury not at zero level	Mercury leakage or overfilling	Refer to technician for correction
2. Mercury is dirty	Oxidation of mercury	Refer to technician for cleaning
3. Pressure does not increase easily OR Pressure increases after inflation	Valve or tube blockage	Remove and clean all valves and tubes. Reassemble and test
4. Aneroid instrument does not return to zero	Zero setting has moved	Rotate collar on base until zero setting achieved and tighten. If still malfunctioning, refer to technician
5. Pressure does not remain steady	Leakage of air	Isolate leak by closing off parts of tubing. Replace leaking section and retest

User Maintenance Checklist – Sphygmomanometers (B.P. sets)

Daily	
Cleaning	<ul style="list-style-type: none"> ✓ Check equipment is safely packed ✓ If mercury is spilled, seal unit and send to technician
Visual checks	<ul style="list-style-type: none"> ✓ Ensure all parts are present and are tightly fitted ✓ Check display is zero when cuff deflated
Function checks	<ul style="list-style-type: none"> ✓ Before use, check pressure rises and returns to zero

Weekly	
Cleaning	<ul style="list-style-type: none"> ✓ Remove all dust and dirt with damp cloth or by hand
Visual checks	<ul style="list-style-type: none"> ✓ Remove or replace any cracked rubber parts
Function checks	<ul style="list-style-type: none"> ✓ Check correct operation of inflation bulb and valves ✓ Remove any batteries if not in use for more than one month ✓ Inflate to 200 mmHg and check leakage is not faster than 2 mmHg in 10 seconds

Every six months	
	<ul style="list-style-type: none"> ✓ Biomedical Technician check required ✓ Check calibration of aneroid devices against mercury device

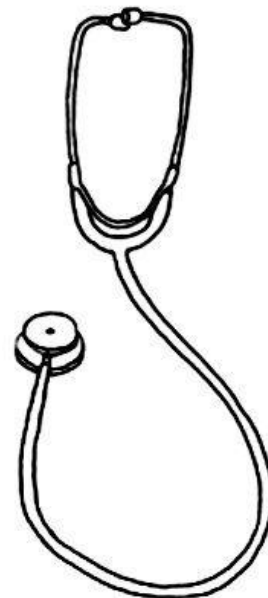
Chapter 7.15 Stethoscopes

Function

A stethoscope is used to listen to sounds within the body. These might be sounds generated by breathing, coughing, blood flow or the stomach. The sounds are picked up and transmitted to the ears of the medical staff for diagnosis.

How it works

A membrane on the stethoscope head picks up the vibrations caused by internal sounds and transmits them to the stethoscope tube. The sounds pass up the tube through the earpiece to the user. The stethoscope head also contains an open bell which is used to pick up lower frequency sounds. The head picks up the sound from a wide area so it sounds loud to the user. Care must therefore be taken not to hit or shout into the stethoscope while in use.



Troubleshooting – Stethoscopes

Fault	Possible Cause	Solution
1. Faint or no sound heard	Leakage or blockage	Remove all parts and check for leakage and blockage. Assemble and retest
2. Tube connector does not stay in headpiece	Broken locking mechanism	Refer to technician for repair
3. Parts damaged or faulty	Broken part	Replace with part taken from other units

User Maintenance Checklist – Stethoscopes

Daily

- | | |
|-----------------|----------------------------------------------------------------------------------------------------------------------|
| Cleaning | <ul style="list-style-type: none">✓ Check equipment is safely packed✓ Remove any dirt visible |
| Visual checks | <ul style="list-style-type: none">✓ Check all parts are present and tightly fitted |
| Function checks | <ul style="list-style-type: none">✓ Tap gently before use to check operation |

Weekly

- | | |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cleaning | <ul style="list-style-type: none">✓ Remove all dirt with damp cloth or by hand✓ Remove earpieces and clean inside with warm water |
| Visual checks | <ul style="list-style-type: none">✓ Remove or replace any cracked rubber parts✓ Replace membrane if broken |
| Function checks | <ul style="list-style-type: none">✓ Check tube holder rotates easily within headpiece✓ Check sound can be heard from both sides of headpiece |

Every six months

Biomedical Technician check required

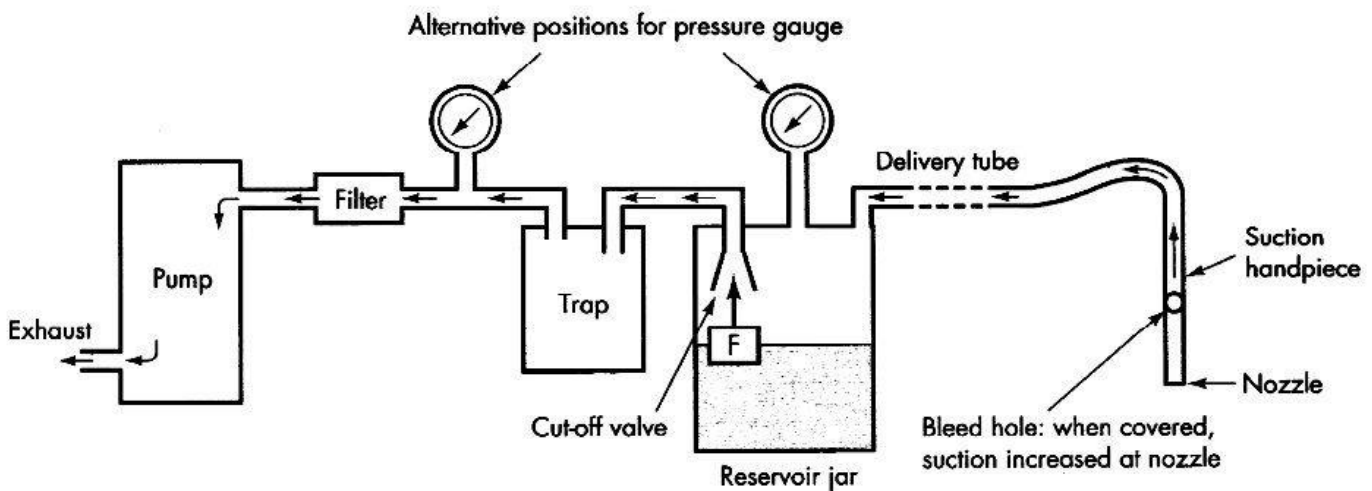
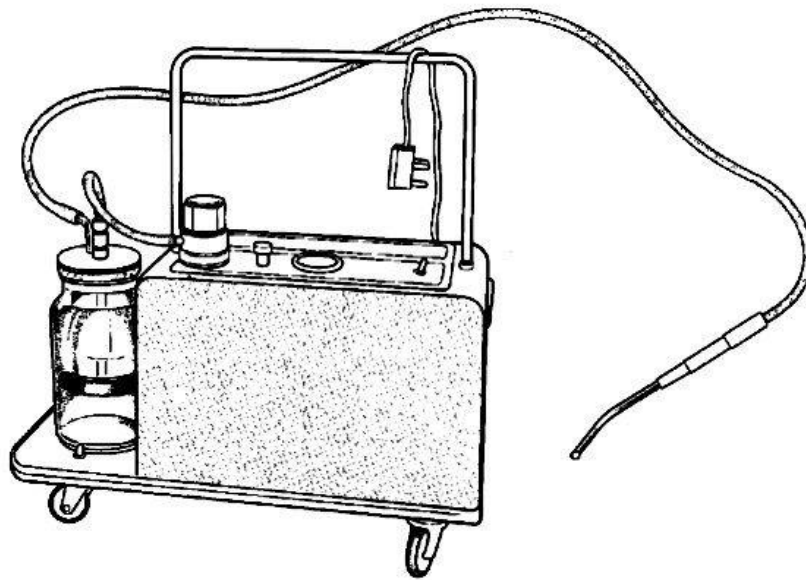
Chapter 7.16 Suction Machines (Aspirators)

Function

Suction machines (also known as aspirators) are used to remove unwanted fluid from body cavities. They are found in operating theatres, delivery suites, ENT and emergency departments. Smaller specialised suctions are used in dental departments.

How it works

Suction is generated by a pump. This is normally an electrically powered motor, but manually powered versions are also often found. The pump generates a suction that draws air from a bottle. The reduced pressure in this bottle then draws the fluid from the patient via a tube. The fluid remains in the bottle until disposal is possible. A valve prevents fluid from passing into the motor itself.



Troubleshooting – Suction machines

Fault	Possible Cause	Solution
1. Machine is not running	No power from mains socket	Check power switch is on. Check mains power is present at socket using equipment known to be working. Contact electrician for rewiring if power not present.
	Fuse blown	Check for leaks or wire causing fuse to blow and correct this. Replace fuse with correct voltage and current rating. Test operation.
	Electrical cable fault	Try cable on another piece of equipment. Contact electrician for repair if required.
	Internal wiring or switch fault	Refer to electrician
2. Poor fluid flow, pressure gauge low	Tube /seal / bottle leaking or disconnected	Close different tubes by bending. When pressure gauge changes, leakage point has been passed. Replaced damaged tube or seal.
	Air outlet valve blocked	Clean outlet valve
	Control valve stuck	Operate control valve through full range. Send for repair if stuck
	Internal or control error	Refer to technician
3. Poor fluid flow, pressure gauge high	Blocked filter or tube	Disconnect each tube one at a time. When air flow is stopped, blockage has been passed. Replace filter or unblock tube.
4. Filter discoloured	Floating valve broken	Change filter, clean or replace floating valve
5. Electrical shocks	Wiring fault	Refer to electrician
6. Manual suction is jammed	Internal slider stuck	Refer to technician for greasing

User Maintenance Checklist – Suction Machines

Daily

Cleaning	<ul style="list-style-type: none"> ✓ Wipe dust off exterior and cover equipment after checks ✓ Wash bottle and patient tubing with sterilising solution
Visual checks	<ul style="list-style-type: none"> ✓ Check all fittings and accessories are mounted correctly ✓ Check filter is clean
Function checks	<ul style="list-style-type: none"> ✓ If in use that day, run a brief function check before clinic

Weekly

Cleaning	<ul style="list-style-type: none"> ✓ Unplug, clean outside with damp cloth and dry off ✓ Wipe round bottle seal with damp cloth, replace if cracked ✓ Remove dirt from wheels / moving parts
Visual checks	<ul style="list-style-type: none"> ✓ Check parts are fitted tightly and replace any cracked tubes ✓ Check mains plug screws are tight ✓ Check mains cable has no bare wire and is not damaged
Function checks	<ul style="list-style-type: none"> ✓ Check all switches and vacuum control operate correctly

Every six months

Biomedical Technician check required

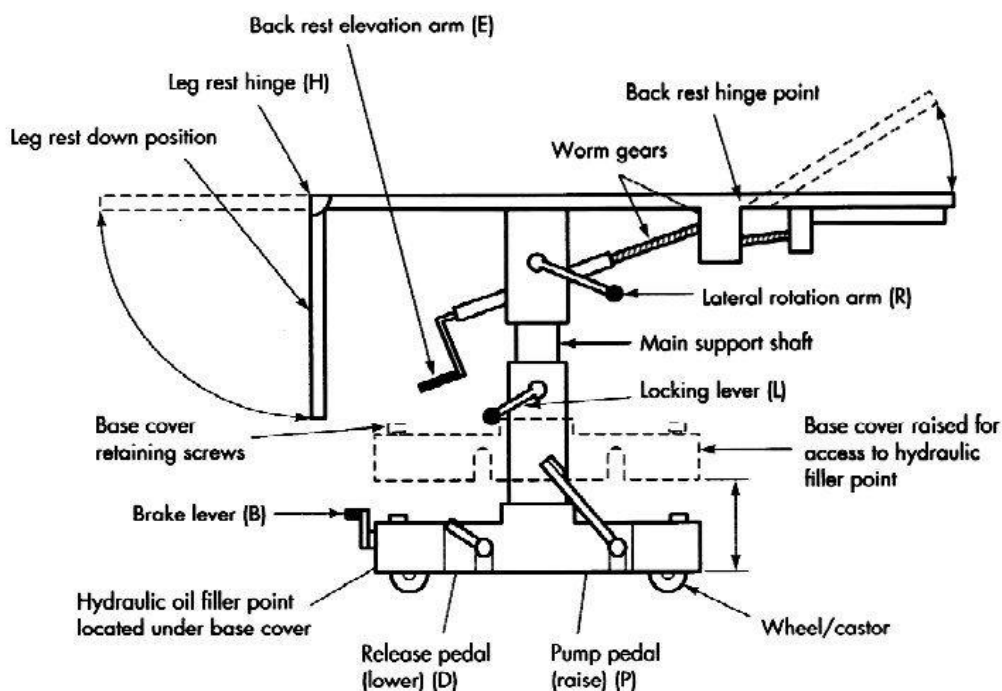
Chapter 7.17 Tables – (Operating Theatre and Delivery)

Function

Tables are required to hold the patient in a position comfortable both for themselves and for medical staff during procedures. They can include dedicated supports for head, arms and legs and often have movable sections to position the patient appropriately. They are made both with wheels and on static platforms and can have movements powered by electric motors, hydraulics or simply manual effort. They can be found in emergency departments, operating theatres and delivery suites.

How it works

Where the table has movement, this will be enabled by unlocking a catch or brake to allow positioning. Wheels have brakes on the rim or axle of the wheel, while locks for moving sections will normally be levers on the main table frame. Care should be taken that the user knows which lever applies to the movement required, as injury to the patient or user may otherwise result. The table will be set at the correct height for patient transfer from a trolley then adjusted for best access for the procedure.



Troubleshooting – Operating Theatre and Delivery Tables

Fault	Possible Cause	Solution
1. Table cannot be relocated	Wheels jammed	Clean wheels, remove obstruction
	Electric motor not operational (electrically driven table)	Check power to table Replace fuse if blown If problem persists, refer to technician
2. Table section or body cannot be moved	Lock or lever is jammed	Clean jammed part, remove rust and dirt, lightly oil and replace
	No power to electric table	Check correct switch is used Check power and fuses
	No oil in hydraulic table	Refill hydraulic oil if needed Check no leakage occurs
3. Oil leakage from hydraulic table	Oil leakage	Locate leak and block it. Clear spillage. Refer to technician.
4. Electric shocks	Wiring fault	Refer to technician immediately

User Maintenance Checklist – Operating Theatre and Delivery Tables

Daily	
Cleaning	<ul style="list-style-type: none"> ✓ Clean, dry and disinfect all parts ✓ Remove all paper, tape and foreign matter
Visual checks	<ul style="list-style-type: none"> ✓ Check all parts are present and tightly fitted ✓ Replace mattress if worn or damaged ✓ Check no oil is leaking from hydraulics
Function checks	<ul style="list-style-type: none"> ✓ Check essential movements before use

Weekly	
Cleaning	<ul style="list-style-type: none"> ✓ Clean and dry table, base and underneath table and base ✓ Wipe off any escaped oil or grease from joints
Visual checks	<ul style="list-style-type: none"> ✓ Fully inspect mattress and table for signs of wear ✓ Replace any worn items and send for repair
Function checks	<ul style="list-style-type: none"> ✓ Check wheel brakes function and wheels rotate ✓ Ensure all moving parts can move, applying grease if needed

Every six months	
Technician check required	

Chapter 7.18 Ultrasound Machines

Function

Diagnostic ultrasound machines are used to give images of structures within the body. This chapter does not deal with other kinds of machine (e.g. therapeutic and lithotripsy). The diagnostic machine probes, which produce the ultrasound, come in a variety of sizes and styles, each type being produced for a particular special use. Some require a large trolley for all the parts of the unit, while the smallest come in a small box with only a audio loudspeaker as output. They may be found in cardiology, maternity, outpatients and radiology departments and will often have a printer attached for recording images. Unlike X-rays, ultrasound poses no danger to the human body.

How it works

The ultrasound probe contains a crystal that sends out bursts of high frequency vibrations that pass through gel and on through the body. Soft tissue and bone reflect echoes back to the probe, while pockets of liquid pass the ultrasound straight through. The echoes are picked up and arranged into an image displayed on a screen. The machine offers a number of processing options for the signal and image and also allows the user to measure physical features displayed on the screen. This requires the machine to incorporate a computer.



Troubleshooting – Ultrasound Machines

Fault	Possible Cause	Solution
1. Equipment is not running	No power from mains socket	Check power switch is on. Replace fuse with correct voltage and current if blown. Check mains power is present at socket using equipment known to be working. Contact electrician for rewiring if power not present.
	Electrical cable fault	Try cable on another piece of equipment. Contact electrician for repair if required.
2. Fuse keeps blowing	Power supply or cable fault	Refer to electrician
3. Probe head damaged or noisy	Possible internal fault	Exchange probe Send for testing and repair
4. Image quality poor	Gel insufficient	Use more ultrasound gel
	Controls set incorrectly	Check controls for correct positioning and operation (refer to user manual)
	Mains voltage is too low	Use voltage stabiliser
	Probe / display problem	Refer to biomedical technician
5. Display / computer error	Software fault	Turn machine off and restart. If problem persists, refer to biomedical technician
6. Electrical shocks	Wiring fault	Refer to electrician

User Maintenance Checklist – Ultrasound machines

Daily	
Cleaning	<ul style="list-style-type: none">✓ Wipe dust off exterior and cover equipment after checks✓ Remove any tape, paper or foreign body from equipment✓ Wipe probe with alcohol-free tissue or cloth
Visual checks	<ul style="list-style-type: none">✓ Check all fittings and accessories are mounted correctly✓ Check cables are not twisted and probe is safely stored
Function checks	<ul style="list-style-type: none">✓ If in use that day, run a brief function check before clinic

Weekly	
Cleaning	<ul style="list-style-type: none">✓ Unplug, clean outside / wheels / rear with damp cloth, dry off✓ Remove, clean and dry external filter if present
Visual checks	<ul style="list-style-type: none">✓ Check mains plug screws are tight✓ Check mains cable has no bare wire and is not damaged
Function checks	<ul style="list-style-type: none">✓ If machine has not been in use, run and test briefly

Every six months	
Biomedical Technician check required	

Chapter 7.19 X-Ray Machines

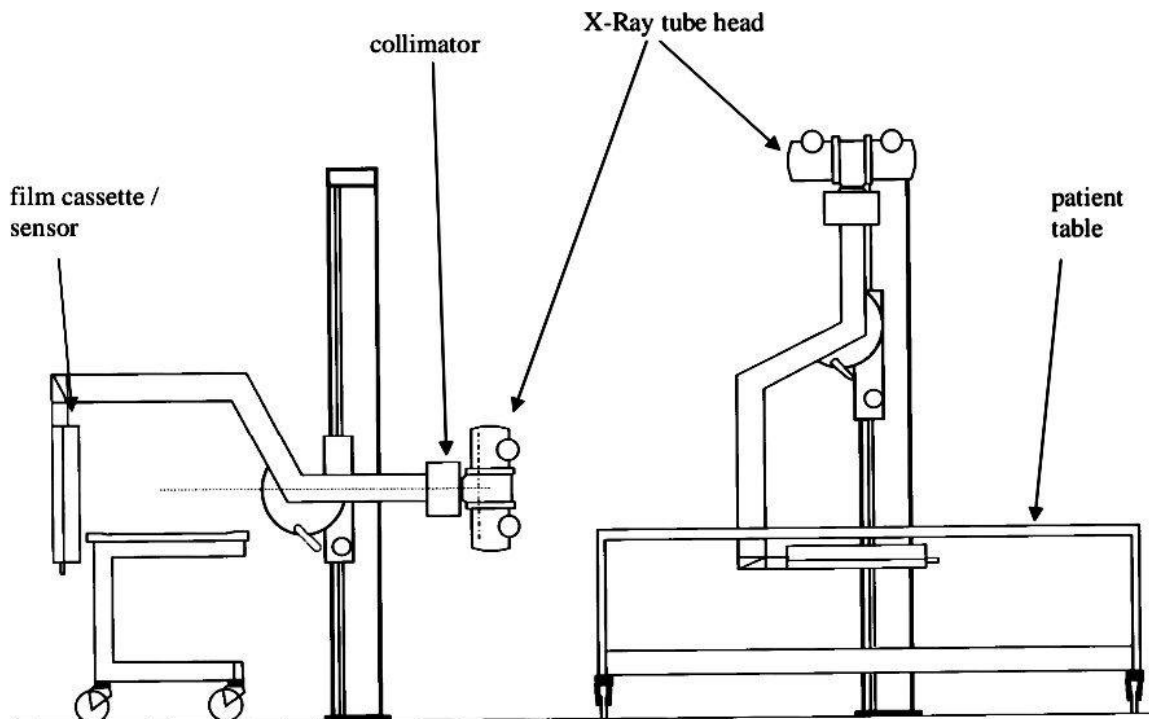
Function

X-Ray machines are used for imaging bones and hard tissues and diagnosing fractures, joint defects, choked lungs etc. Sometimes contrast agents are also used to highlight any defects in the abdomen under X-rays.

How it works

X-rays are high energy electromagnetic waves. The transformer produces a high voltage that directs electrons onto a target in the machine head. X-rays are produced by the target and are directed into beams by a collimator towards the human body. Soft body tissue absorbs less X-rays, i.e., passes more of the radiation, whereas bone and other solids prevent most of the X-rays from going through. A photographic film or electronic sensor displays how much X ray has passed through, forming an image of the interior of the body. Bone appears nearly white, because few X-rays strike the corresponding part of the film, leaving it largely unexposed; soft tissue allows much more radiation to pass through, darkening the film in those places.

Users must ensure proper radiation safety protocols and supervision are in place. See Chapter 11 for suitable references and further information.



(control panel and transformer not shown)

Troubleshooting – X-Ray Machines

Fault	Possible Cause	Solution
1. X-Ray unit does not switch on.	Mains power not connected	<p>Check the machine is plugged into the mains socket and that all switches are on.</p> <p>Replace fuse with correct voltage and current if blown.</p> <p>Check mains power is present at socket using equipment known to be working. Contact electrician for rewiring if power not present.</p>
2. X-Ray machine not exposing, even when power is on.	<p>Safety interlock is on</p> <p>Exposure switch cable problem</p> <p>Internal error</p>	<p>Check safety locks, all switches</p> <p>Check for any loose connection</p> <p>Refer to biomedical technician</p>
3. Poor X-Ray image quality	X-Ray tube problem	Refer to biomedical technician / medical physicist
4. The table does not move.	<p>Table motor or cable problem.</p> <p>Safety switch or fuse problem</p> <p>Control circuit problem</p>	<p>Check all cable connections</p> <p>Check relevant fuse or switch</p> <p>Refer to biomedical technician</p>
5. Electrical shocks	Wiring fault	Refer to biomedical technician immediately

User Maintenance Checklist – X-Ray Machines

Daily	
Cleaning	<ul style="list-style-type: none"> ✓ Clean dust from the unit with a dry cloth ✓ Remove any tape, paper or foreign body from equipment
Visual checks	<ul style="list-style-type: none"> ✓ Check all parts are present and connected ✓ Check cables are not twisted and remove from service if any damage is visible
Function checks	<ul style="list-style-type: none"> ✓ Switch on power and check all indicators function

Weekly	
Cleaning	<ul style="list-style-type: none"> ✓ Clean all dust and dirt from the X-Ray machine and room
Visual checks	<ul style="list-style-type: none"> ✓ If any plug, cable or socket is damaged, refer to biomedical technician ✓ Check all knobs, switches and wheels operate properly ✓ Check lead aprons for any defects ✓ Check table, cassette holder and grids for smooth movement
Function check	<ul style="list-style-type: none"> ✓ If machine has not been in use, wear lead apron and check whether exposure indicator lights on switch operation ✓ Check collimator bulb, replace with correct type if needed

Every six months	
Biomedical Technician check required	

SOP for cleaning of Refrigerator

1.0 OBJECTIVE

To lay down the procedure for cleaning of the refrigerator.

2.0 SCOPE

This SOP is applicable for the procedure for cleaning of the refrigerator.

3.0 RESPONSIBILITY

3.1 Officer/ Executive - Quality Control

4.0 ACCOUNTABILITY

4.1 Manager – Quality Control

5.0 PROCEDURE

5.1 Put off the main switch.

5.2 Remove all the materials (containers) from the refrigerator and carefully store them in air condition room.

5.3 Defrost the refrigerator.

5.4 Mop the inner surface of the refrigerator with water.

5.5 Dry mop the refrigerator and then clean it with soap solution.

5.6 Again mop it with water and clean with dry cloth.

5.7 Switch on the refrigerator and allow the temperature to attain a constant value.

5.8 Transfer all the containers back into the refrigerator.

5.9 Cleaning is to be done once in a quarter.

5.10 After cleaning, record it in cleaning register.

5.11 Check the temperature daily and record it.