

PORTER NITROUS OXIDE MXR UNIT

The Porter MXR nitrous oxide system is designed as a portable nitrous oxide delivery unit. The unit (Figure 1) comprises of:

- Oxygen, nitrous and scavenging hose
- MXR flow metre – adjusts concentrations and gas flows
- Connection for 2 litre reservoir bag
- Gas scavenging unit (scavenger cylinder encased in a protective metal cover)
- Base with wheels

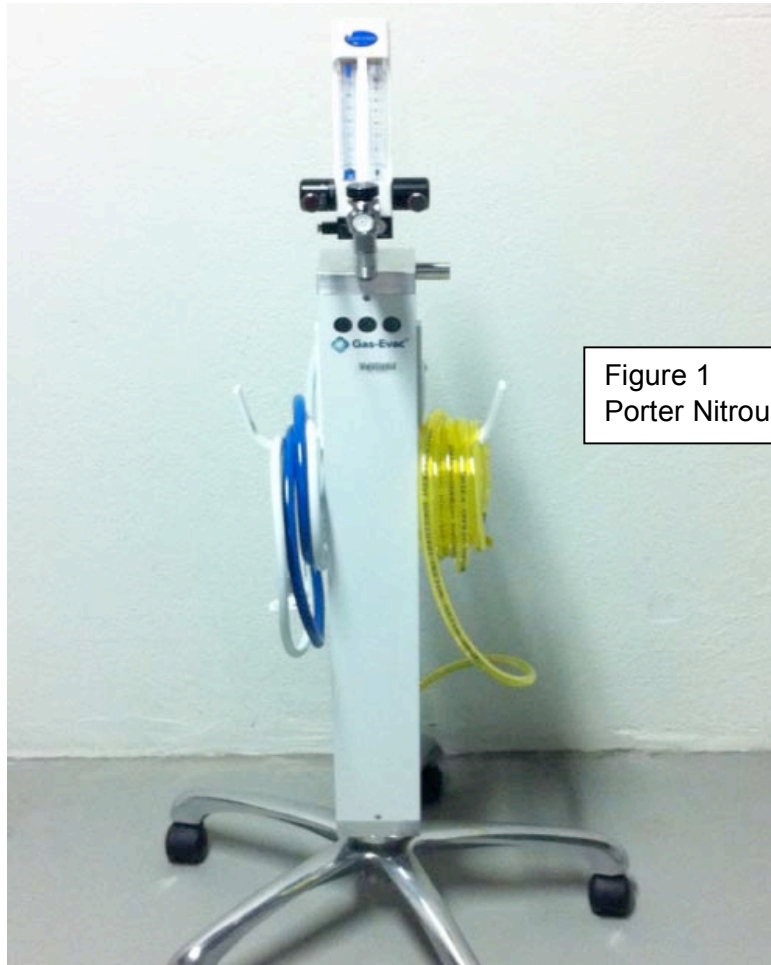


Figure 1
Porter Nitrous Oxide MXR Unit

Maintenance and Servicing

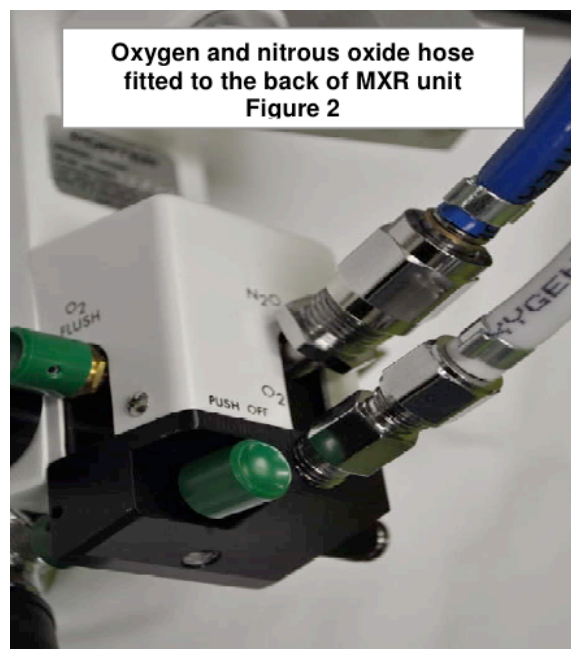
MXR units will have regular service checks as per scheduled arranged by the Biomedical Engineering Department.

If suspected fault or gas leak the unit should be removed from clinical use and sent to Department of Biomedical Engineering for servicing.

Equipment

Gas hoses and connection points

Check: oxygen hose (white) and the nitrous hose (blue) are securely connected to the back of MXR nitrous oxide unit (Figure 2)



Attach the pinwheels by threading the “oxygen” (white) hose to the wall outlet (Figure 3) and “nitrous oxide” (blue) hose to the nitrous oxide cylinder. (Figure 4)

Safety mechanism: each medical gas has a specific threading pattern to prevent the wrong gas being connected to a gas source. E.g. oxygen pinwheel will not connect to nitrous oxide.

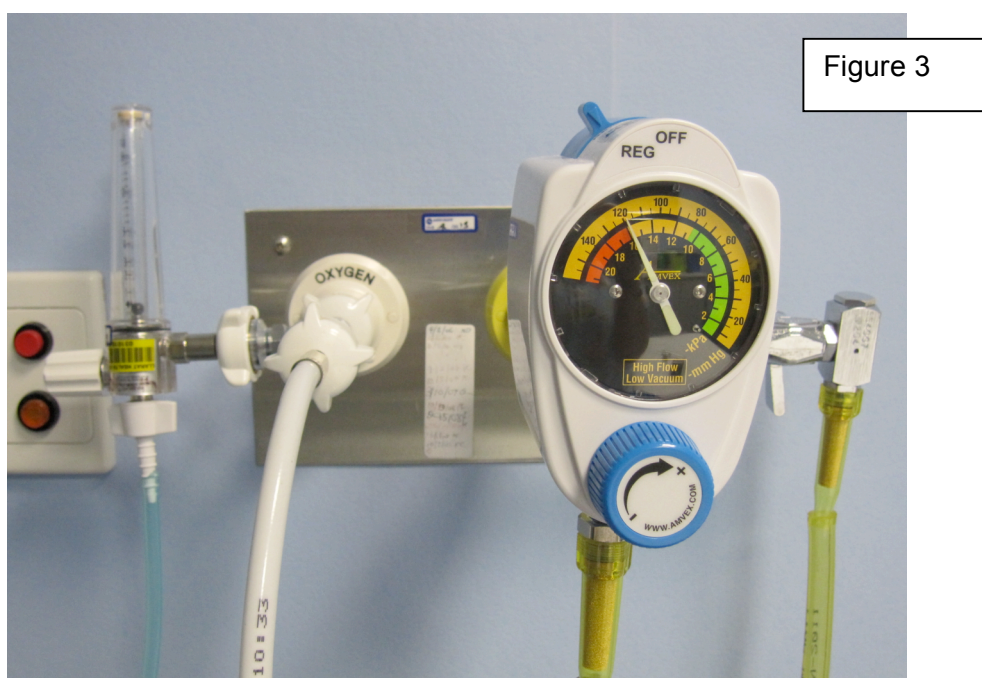


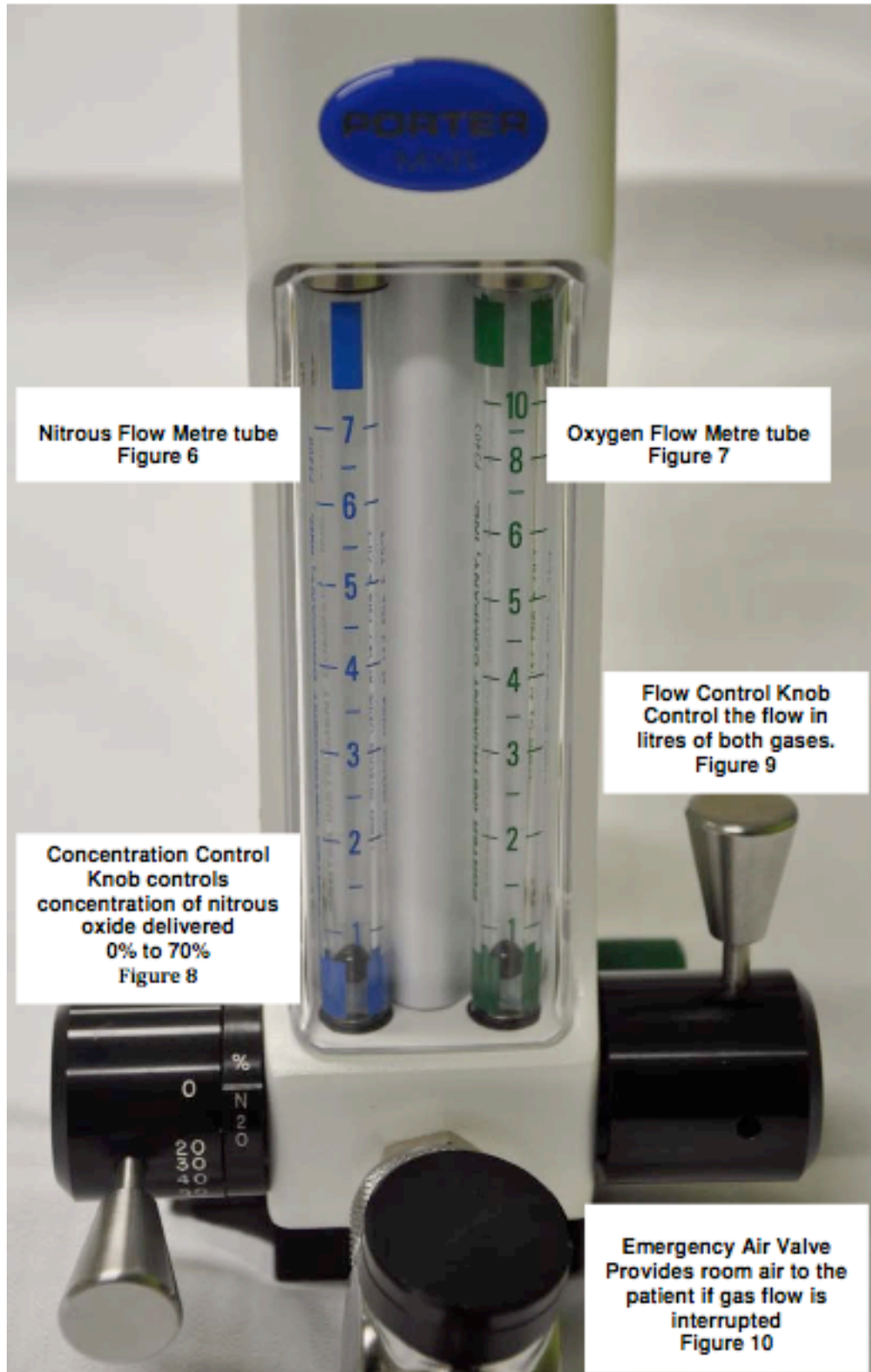
Figure 4

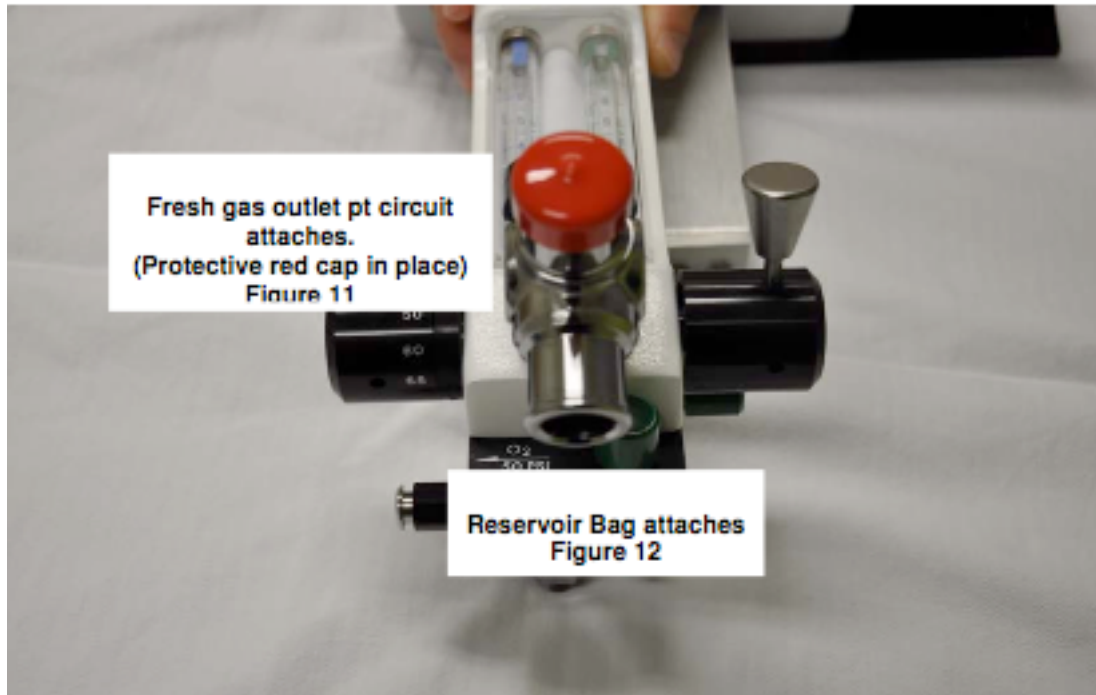


Scavenger system

Thread the gas scavenger pinwheel to the attachment on the suction hose outlet on the wall panel (Figure 5). Check to ensure the scavenger tubing is connected to the nipple at the top of metal box that encases the scavenger unit. Turn scavenging system ON by turning the blue switch to REG on the attachment. Suction can be adjusted by turning the blue dial on the front of the attachment.







Disposable Circuits

The disposable circuit (Blue and pink tubing) attaches to fresh gas outlet and to the connector on the scavenger outlet (Figure 14)

The disposable circuits have a built in bacterial filter and a one-way valve that allows exhaled gas to be scavenged away from the patient.

A facemask or mouthpiece is the only additional equipment added to the circuit.

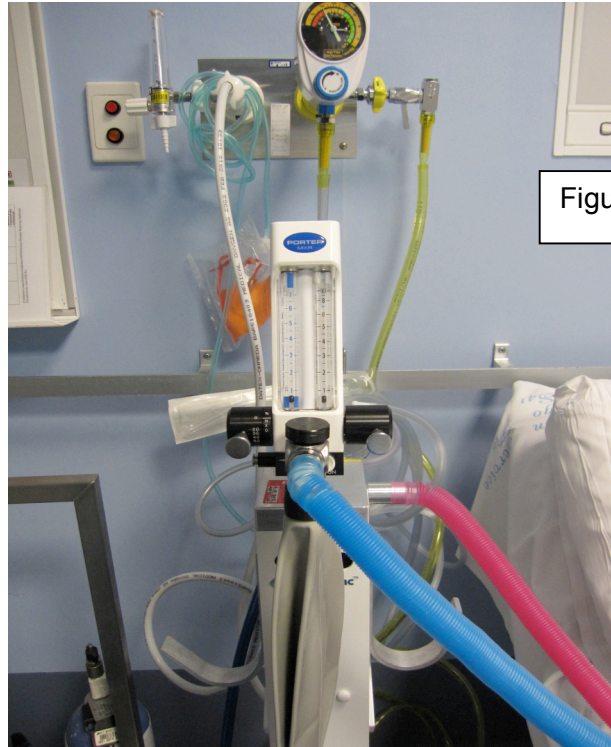


Figure 14

Equipment Checks

Prior to the start of the procedure check the MXR delivery unit, gas hoses, scavenger and emergency equipment to ensure it is functional. For all procedural sedations the sedater must know the exact location of closest “resuscitation trolley” and emergency buzzer.

Equipment check process

Check connections for both gases are:

- Secured at the back of the MXR unit.
- Secured at the wall outlet and cylinder

Check Scavenging System:

- Connected at suction attachment
- Yellow tubing is connected to nipple located at the top of the scavenger unit.
- Blue switch at top of attachment is turned to REG – you will hear it working when switched on

Check nitrous oxide fail-safe mechanism

- Positive Switch - Off position – The “white” switch pushed away from the operator toward the back of machine (Shown as green switch in Figure 13)
- Position the Flow Control Knob to zero (litres) and position the Concentration Knob to zero %.

- Turn the Flow Control Knob to 3-4 litres/min of oxygen. (Figure 9)
- Turn Concentration Control Knob to 50% nitrous oxide. (Figure 8)

Note: both flow metres should have equal amounts of flow in each of the flow metres

- The reservoir bag is inflated and check for cracks or perforations in the bag. Replace the bag if cracks or perforations appear.
- Interrupt the O₂ supply by carefully loosening the Oxygen Pin Wheel at the wall outlet.

The gas will make a “hissing noise. The nitrous oxide fail-safe valve should initiate and the nitrous flow metre should **drop as the oxygen flow decreases and stops completely.**

- Reconnect the O₂ hose at the wall outlet.
- Return the Concentration Control Knob and Flow Control Knob to zero.

Connect the circuit

- Connect the disposable patient circuit
- Blue limb- to patient side - front adaptor
- Pink limb- to scavenger – white adaptor

Note:

All nitrous oxide equipment is designed with fail-safe mechanism to ensure that when oxygen source is interrupted the unit will shut down automatically. The fail-safe mechanism is designed to prevent hypoxemia and tissue death. The minimum amount of oxygen concentration delivered is 30%. At no time should a patient receive 100% nitrous oxide. Confirmed or suspected malfunctions; remove the MXR unit, secure a note identifying the equipment as faulty and send the unit to Department of Biomedical Engineering.

Operating MXR unit

- Complete equipment check and connect the disposable circuit to the MXR unit.
- Turn Positive Switch “ON” this is accomplished by pushing white button forward toward the operator.
- Set the flow rate using the Flow Control Knob to: 5-6 litres for a child and 6-8 litres an adolescent. The reservoir bag should be $\frac{3}{4}$ full. At this time check the bag for perforations or cracks.
- During the sedation period adjustments may need to be made to the flow; this is done by turning the Flow Control Knob clockwise to increase the flow or counter clockwise to decrease the flows.
- Use the Concentration Control Knob located left hand side of machine and incrementally increase the nitrous oxide to the desired concentration level. Concentration Increments located on the face of the Concentration Control Knob.
- At the end of the procedure decrease the nitrous oxide concentration incrementally to 0 %.
- Administer 100% oxygen for 3-5 min until the patient returns to baselines level of sedation. Some patients may require 100% oxygen for 5-10 minutes before returning to baselines level of sedation.
- Turn the Positive Switch “OFF” by pushing the “white” button away from operator.
- Disconnect the nitrous, oxygen and scavenger connections from the wall outlets and cylinder. Secure the hoses and store the portable unit in the storeroom. Nitrous oxide must be stored in locked area.
- Do not use the Power Flush button to deliver 100% oxygen, if oxygen is required for emergency purposes use facemask or bag/mask as per BLS guidelines.

Troubleshooting MXR Unit

| Problem | Possible Cause | Action |
|---|--|--|
| No oxygen and or nitrous oxide gas flow. | Gas supply is not connected properly. Interruption or leak in the gas supply. | Check oxygen and nitrous oxide connections at the wall panel and back of MXR unit. Turn the ON/OFF switch to the ON position. |
| Nitrous oxide flow metre working but no oxygen flow noted in oxygen flow metre. | Failsafe mechanism malfunctioning | Remove unit from clinical area immediately and send to Biomedical Engineering. |
| Gas leaking from the On/Off switch | Damage to the O ring inside the ON/OFF switch | Remove unit from clinical area immediately and send to Biomedical Engineering |
| Gas is leaking around the pinwheel of the oxygen or nitrous hose. | Damage to the pinwheel threads or the gas hose. | Remove unit from clinical area immediately and send to Biomedical Engineering |
| Reservoir bag fails to inflate | Inadequate gas flows or patient hyperventilating. Tear or perforation in the reservoir bag. | Check adequate flow of oxygen and nitrous, increase flows litres/min and check the reservoir bag. If the reservoir bag is damaged, remove and replace. |
| Reservoir bag over inflating | Gas flows need adjusting or patient hypo ventilating. | Reduce gas flows and or nitrous oxide concentration. . Assess patient's respiratory status and UMSS score. If Issue does not resolve: stop the procedure Remove unit from clinical areas immediately and to Biomedical Engineering. |
| High pitched whistle sound heard | Emergency air valve initiated due to loss in oxygen gas flow/source. | Check oxygen and nitrous oxide connections at the wall panel, cylinder and back of MXR unit. |