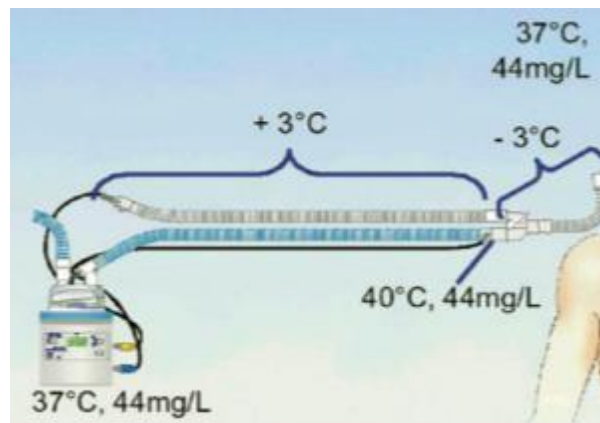


How to...

Problem Solving the MR850 Humidifier

Problem solving the Astral and humidifier will get easier with experience, but here are some general points:

1. **Your child comes first:** If you are having problems with equipment, always check your child is okay first.
2. **Be prepared:** If you are having technical problems, check you have everything you need in case the problem gets worse and/or you need to take your child to hospital.
3. **Safe learning:** With experience, you will recognise most problems and know how to fix them. Your health team will help you safely learn.
4. **Be systematic:** Some problems require you to carefully check things in a systematic way. Starting with your child, the circuit, accessories and other parts of setup, and then the ventilator. Does this resolve the problem? If you keep a diary or observation chart, write down details of any problems and how you resolved them.
5. **Get help:** Contact your health team or technical support. The more information you can give them, the better they can help. If there were alarms or error messages, write down the exact words (or take a photo with your smartphone). Try to describe exactly what was happening. Sometimes describing what else was going on at the time and any recent changes in setup, can be vital clues.



Problem Solving the MR850 Humidifier

General MR850 humidifier problem solving:

- **Consider the environment.** Optimum performance is with an ambient temperature of 18-26°C. Outside of this range, you may either get reduced humidification (no water droplets beading on the inside of the chamber) or excessive 'rainout' (water/condensation) in the breathing circuit. Cold air (fan/air conditioning) on the circuit tubing may also lead to excessive rain out.
- **Check the setup** including that there is enough water in the chamber, the placement of the temperature probes, and the heating wire leads. If condensation has formed on the probes – dry and re-insert them. Check the MR850 for warning lights. Temperature probe and heating wires are the most common components of the humidifier to fail. Consider replacing them.
- Always keep the humidifier chamber and circuit below the height of your child's mask/tracheostomy.
- Remember that while humidification is desirable, your child is not dependent on it in the short term. The MR850 can be left off or you can consider alternative means of humidification (HME or nebulisation).



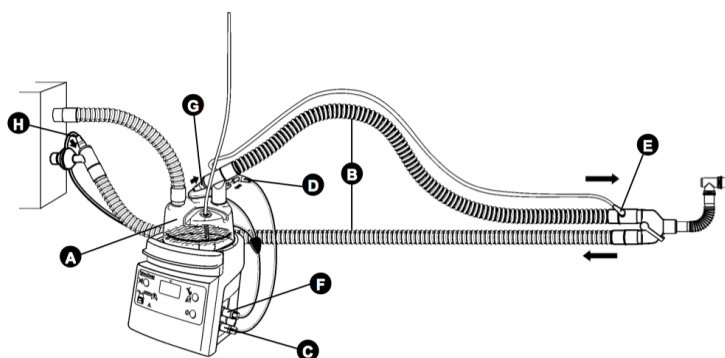
How to...

Problem Solving the MR850 Humidifier

SET UP

1. Slide humidification chamber (A) onto humidifier base and connect breathing circuit (B) (refer to humidification chamber and breathing circuit operating instructions for further details).
2. Connect the temperature probe plug (C) (REF 900MR86X) to the blue socket on the humidifier base until an audible click is heard.
3. Push the chamber probe (D) and airway probe (E) into the breathing circuit. Make sure the chamber probe is correctly located in its key-way and that both probes are pushed home. The probe lead can be restrained using breathing circuit clips.
4. Connect the heater wire adaptor plug (F) (REF 900MR8XX) to the yellow socket on the humidifier base until an audible click is heard.
5. Connect the other end(s) of the heater wire adaptor to the breathing circuit socket(s) (G) and (H).
6. The humidification system is now set up and ready for use. After power on, the humidifier will default to invasive mode.

ATTENTION: Refer to operating instructions which accompany each accessory.



THE FOLLOWING ACCESSORIES ARE REQUIRED:

- Humidification Chamber (e.g. MR290)
- Breathing Circuit (e.g. RT100)
- Temperature Probe (e.g. 900MR869)
- Heater Wire Adaptor (e.g. 900MR800)
- Mounting Bracket (to suit ventilator)

Choice will depend upon application. Please contact your local Fisher & Paykel Healthcare representative for recommendations.

OPERATION

MUTE

The mute button silences the humidifier's audible alarm for at least two minutes. The muted time depends on the alarm condition and the severity of its cause.

SET-UP INDICATORS

Chamber & Airway Probes
Lights if either the chamber probe or the airway probe is not inserted into the breathing circuit correctly.

Heater Wire
Lights if the heater wire adaptor or breathing circuit has not been connected, or is damaged.

Temperature Probe
Lights if the temperature probe is not correctly plugged into the MR850, or the probe is faulty.

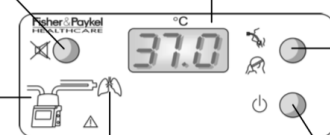
Water Out
Lights when there is insufficient water in the chamber. Check water supply. Maximum time to alarm of 20 minutes.

See Manual
The humidifier and all accessories should be immediately replaced and sent for servicing.

TEMPERATURE DISPLAY

Displays the saturated gas temperature (the lower of the airway and chamber temperatures in °C) delivered to the patient. This display will normally show the chamber temperature (around 37 ± 0.5 °C for invasive mode, and 31 ± 0.5 °C for noninvasive mode).

By pushing and holding the mute button for one second, the chamber outlet temperature is displayed. The display will then revert to normal operation.



LOW HUMIDITY ALARM

An audible alarm and flashing temperature display showing **35.5 °C or lower** (in invasive mode only). Caused by cold/draughty conditions or very high or low gas flows.

If the circumstances causing the low humidity alarm cannot be changed then the audible alarm acts as a reminder that the patient is receiving inadequate humidity and may require further intervention to maintain airway clearance.

HIGH HUMIDITY ALARM

A flashing temperature display showing **41 °C or higher**. The humidifier will discontinue heating of the chamber and circuit until the temperature decreases to within normal limits.

MODE BUTTON

This button switches between invasive and noninvasive mode.



Invasive Mode

This mode is for patients with bypassed airways. The humidifier delivers gas as close to body temperature saturated (37 °C, 44 mg/L) as possible.

Under cold or draughty conditions the chamber temperature may drop as low as 35.5 °C in order to maintain a dry breathing circuit.

WARNING: Ensure that invasive mode is set for patients that have bypassed airways



Noninvasive Mode

This mode is for patients receiving face mask or headbox therapy, and delivers a comfortable level of humidity.

ON/OFF BUTTON

The humidifier will power ON if this button is held down briefly, but must be held down for one second to turn the humidifier off. The humidifier will always default to invasive mode when it is turned on.

ROUTINE MAINTENANCE

Refer maintenance to qualified service personnel. A full technical description including routine maintenance and service data is contained in the Technical Manual which is available from your supplier or Fisher & Paykel Healthcare (REF 185041340)

MR950 Humidifier for tracheostomy ventilation

QUICK GUIDE and TROUBLESHOOTING

Starship Respiratory Physiology

Level 3 outpatients, Starship Hospital

email: ssresplab@adhb.govt.nz

Ph: 09 307 4949 ext 22295

Mob: 021 938 256

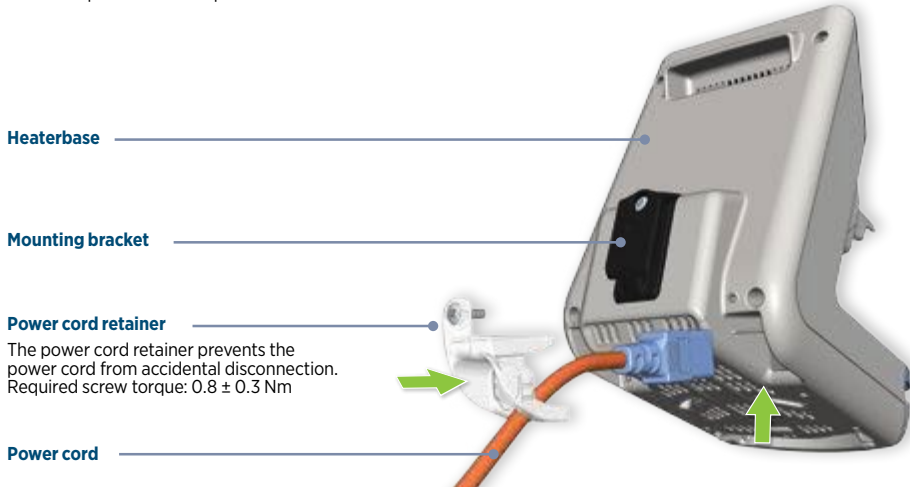
Fax: 09 375 7037 ext 23237

Note lab hours are 8am - 5pm Mon-Fri



F&P 950 Respiratory Humidifier set-up - Part One

Attach the power cord and power cord retainer to the heaterbase.



Attach the sensor cartridge to the heaterbase.



Set up the breathing circuit as described in the user instructions provided with the selected circuit kit.



WARNING

The heaterbase must be mounted on a trolley, pole or table capable of supporting 4 kg and lower than child or ventilator. Failure to do so may result in harm to the child and/or damage to the equipment.

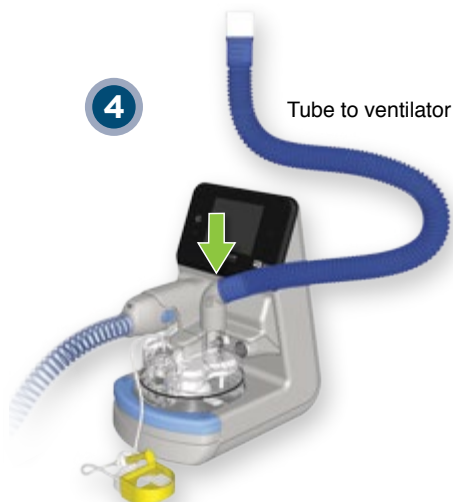
NOTE: Ensure the table/trolley/pole does not block access to the power supply outlet.

F&P 950 Respiratory Humidifier set-up - Part Two

Never transport or move the humidifier with water in the chamber. This is dangerous for your child and ventilator.

When using, always place the humidifier at a height lower (>20cm) than both your child and the ventilator to ensure water won't accidentally flow down the tubing to them.

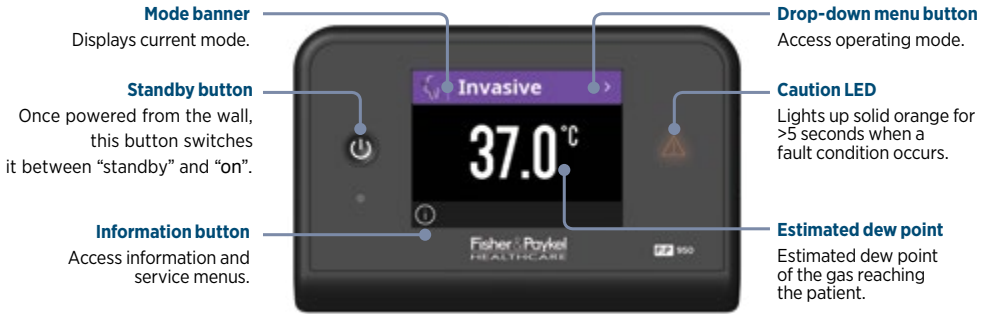
Set up the breathing circuit as described in the ventilator Circuit Guides



Connect the circuit elements to the chamber as shown.

To remove a circuit follow these instructions in reverse order.

SCREEN NAVIGATION *For tracheostomy ventilation check it is in 'invasive'*



When turning on the humidifier, an audible single beep sound should be heard.

Dew point is the temperature below which air humidity will turn back into water droplets ('rainout').

ALTERNATIVE SCREEN - NEONATAL DUAL LIMB CIRCUIT

The screen will look like this if in neonatal mode for the specific dual limb neonatal circuit. Humidification provided is the same as 'invasive'.



CLEANING

Weekly and as needed. Always disconnect from the power first. Clean the heaterbase, sensor cartridge, and (if used) the expiratory heater wire with a cloth dampened with a mild detergent or an alcohol wipe. Replace the circuit / chamber when advised by your health team.

Never immerse (or autoclave) any part of the humidifier or sensor cartridge.
Do not spray liquid into the vents or electrical contacts (permanent damage may result).

MAINTENANCE

The MR950 is serviced / checked annually by hospital biomedical engineering.

The sensor cartridge needs replacing every 7 years or 15,000 hours use (whichever first) and the humidifier will warn when this is due.

Alarms

ALARM SIGNALS

Alarms may sound to indicate a problem with how the humidifier is set-up, working or need for maintenance.

Alarm type

Text or animation tutorial

Picture showing what to do.
Also see “alarm conditions”
table on the next page.

Mute/unmute alarm

2 minutes.



ALARM CONDITIONS

These alarms are about humidifier performance not child health/safety (i.e. not ‘monitoring’). It is possible to have multiple alarm conditions occur simultaneously; and the humidifier displays the highest priority alarm.

All alarms have been designed to be detectable within one meter of the humidifier, with the alarm signal being three beeps repeated every five seconds.

CHECKING ALARM SYSTEM FUNCTIONALITY

To check alarm functionality, remove the heated breathing tube at any time while the humidifier is powered on **but not connected to a child**. “Disconnection” should be displayed and an audible alarm sound. If either signal is absent, do not use the humidifier. Contact your **Health Team** for assistance.

In the event of an unexpected shutdown, the humidifier shall resume the operating mode and alarm settings (except algorithm-based alarms) prior to the reset if the interruption is for less than or equal to 30 seconds.

Alarms

ALARM CONDITIONS	REQUIRED ACTION	DELAY
<p>The Disconnection alarm sounds if there is a break in the blue inspiratory circuit..</p>	Check the circuit is set-up correctly and there are no holes or breaks in the circuit.	< 10 seconds
<p>The No Water alarm sounds when the the chamber is empty or almost empty of water.</p> <p>The time-to-alarm signal generation is dependent on operating mode set-point and flow rates as these determine the water evaporation rate.</p>	Replace the empty water bag.	< 60 minutes*
<p>The Low Temperature alarm sounds if the temperature at the patient end of the chamber is continuously lower than intended.</p> <p>The alarm threshold is 2 °C below the set-point temperature.</p> <p>The time-to-alarm signal generation is dependent on the flow rates.</p>	Check the setup is correct. The alarm is most likely to occur if the air flow is higher than intended (hole in circuit, not connected).	> 10 minutes
<p>The High Temperature alarm sounds the temperature at the patient end of the chamber is higher than intended (>43 °C)</p>	Check the ventilator is running and the circuit is set-up correctly.	< 10 seconds
<p>The Cartridge Disconnection alarm activates when the humidifier detects that the sensor cartridge is not electrically connected.</p>	Connect the sensor cartridge.	< 10 seconds
<p>The Tube Fault alarm activates when the humidifier detects a potential fault in the breathing circuit.</p>	Check the circuit is setup correctly. If this doesn't resolved the problem then replace the breathing circuit when safe to do so.	< 10 seconds
<p>The Out of Range alarm activates when the humidifier detects that the patient end or chamber outlet temperature, averaged over a 5 minute period, differs from its respective set-point by more than 2 °C</p>	Check the ventilator is running and circuit correctly set-up.	< 10 seconds

*For flow rates < 1L/min the alarm will be delayed by > 90 minutes upon start-up.

Alarms

ALARM CONDITIONS	REQUIRED ACTION	DELAY
The Service Required alarm activates when the humidifier detects a potential fault that requires the humidifier to be serviced.	Turn off the humidifier and, if available, use an alternative source of humidification. Contact your health team.	10 seconds to 5 minutes
The Caution Indicator LED light illuminates when the humidifier detects that there is a potential fault with the humidifier and the screen is not operational.	Turn off the humidifier and, if available, use an alternative source of humidification. Contact your health team.	< 10 seconds
The Cartridge Authentication alarm activates when the humidifier does not recognize the sensor cartridge. If this occurs, the user may choose to press "Accept" to acknowledge that the sensor cartridge is not Fisher & Paykel Healthcare approved. A sensor cartridge authentication failure icon will appear at the bottom right of the display.	To remove the sensor cartridge authentication failure icon, contact technician to replace sensor cartridge as soon as appropriate.	
'Usage' - the humidifier will repeatedly advise you of the need to replace the sensor cartridge over it's last 30 days. The Cartridge Service Life alarm will sound when the cartridge has expired.	Press "remind me later" or "Pause Alarm" button to dismiss the alarm screen. Contact your health team to arrange for a replacement sensor cartridge.	7 years from the date of manufacture or after 15,000 hours of use.



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Note lab hours are 8am - 5pm Mon-Fri

QUICK GUIDE 950A40 Circuit

ALSO SEE:

Starship Quick Guide for MR950 humidifier

Starship Ventilator and Circuit Guides

ALWAYS:

Place the humidifier lower (~20cm) than the child and ventilator.

NEVER:

Travel with or move the humidifier with water in the chamber



Starship Respiratory Guide;
pictures from Fisher and Paykel.



Press down blue rail and slide in chamber



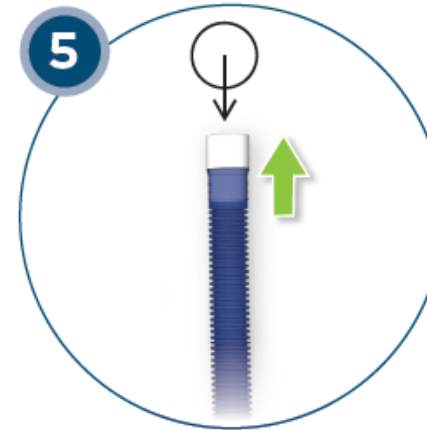
Remove yellow cover. Ensure blue rail pops up.



Attach light blue patient circuit as shown.



Attach the ventilator circuit as shown .



Attach the other end to ventilator (via filter)



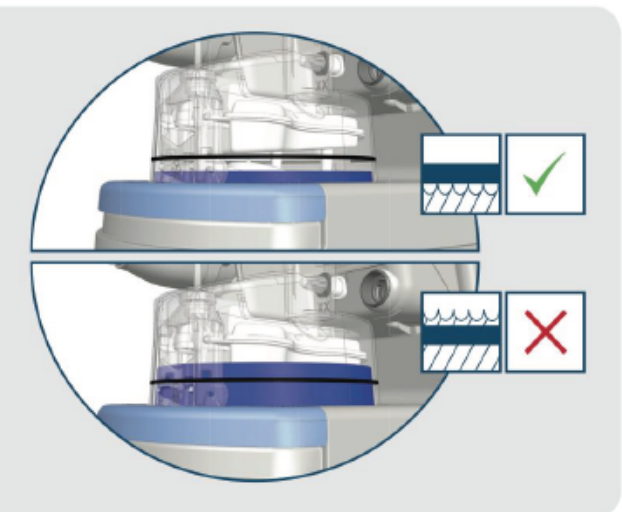
Connect water tubing hose to bag of water



Remove yellow cover and attach
to leak valve and trachea connector.



Clip to bed or clothing
as appropriate



Ensure water is in the chamber but
below the line