



CENTURION 1500⁺

SERVICE & MAINTENANCE MANUAL
P/N 98-2012
REV. E

CONTENTS

1.0	PREFACE	1
2.0	CONTACT US	2
3.0	HEALTH AND SAFETY	3
3.1	Explanation of labels	3
3.1.1	Rear panel labels	5
3.2	Safety considerations	7
3.3	Intended Use	8
3.4	Operating staff	8
3.5	Residual dangers	9
3.6	Handling	9
3.7	Bringing the unit to an immediate STOP	9
3.8	Disposal of device/consumables/replacement parts	10
3.9	Unauthorised conversion and manufacturing replacement parts	10
3.10	Warranty claims and liability	10
4.0	ABOUT YOUR CENTURION 1500+	11
4.1	General views of the Centurion 1500+ unit	11
4.2	Overview	11
4.3	Standard features	11
4.4	Detailed features and process of operation	12
4.5	Explanation of rear connections	13
5.0	INSTALLATION AND COMMISSIONING	14
6.0	OPERATING THE TOUCHSCREEN	14
6.1	Explanation of buttons	14
6.1.1	Using the touch screen	14
6.1.2	“MENU” button	15
6.1.3	“START” button	15
6.2	Operation	16
6.2.1	Initial Start up Procedure	16
6.2.2	Starting the unit	16
6.2.3	Stopping the unit during normal operation	16
6.2.4	Operation of screen buttons	16
6.3	Explanation of the mimic screen	17
6.3.1	Mimic symbols	17
6.3.2	Inlet solenoid	17
6.3.3	Mains water break tank/heater tank	18
6.3.4	RO boost pump	18
6.3.5	Reverse Osmosis (RO) module	18
6.3.6	Permeate solenoid	19
6.3.7	Drain Solenoid	19
6.4	Explanation of displayed functions	19
6.5	Safety features and alarms	20
6.5.1	Supporting Information	20
6.5.2	Tank low level	20
6.5.3	Service due	20
6.5.4	Poor Permeate Quality	21
6.5.5	High pump pressure	21
6.5.6	Low pump pressure	22
6.5.7	Permeate line cell error	22
6.5.8	Temperature high	22
6.5.9	Temperature sensor error	22

6.5.10	Level switch error.....	22
6.5.11	Leak	22
6.5.12	Tilt	22
6.6	Processing modes	22
6.6.1	External Standby.....	22
6.6.2	Power On /Timed standby	23
7.0	MENUS AND SETTINGS	24
7.1	USER menu	24
7.1.1	USER menu screen	24
7.1.2	Set Time and Date	25
7.1.3	Pre-Filter replacement date	26
7.1.4	Product Information.....	27
7.2	Engineer Menu	27
7.2.1	Language.....	27
7.2.2	Units.....	27
7.2.3	Alarms.....	28
7.2.4	Maintenance	28
7.2.5	Data logging.....	29
7.2.6	Setup	30
7.3	Settings Menu	35
7.4	Menu structure diagrams.....	36
7.5	Factory default settings	40
8.0	CHEMICAL CLEANING AND HEAT DISINFECTION.....	42
8.1	Chemical cleaning	42
8.2	Heat disinfection	42
9.0	MAINTENANCE AND CHECKS.....	44
9.1	Planned routine checks	44
9.1.1	Electrical safety inspection and test protocol	44
9.2	Planned preventative maintenance schedule	46
9.2.1	Conductivity Calibration	46
9.3	Unplanned minor maintenance and repairs.....	47
9.3.1	Replacement of RO Membrane	48
9.3.2	Replacement of RO boost pump.....	50
9.3.3	Replacement of inlet solenoid.....	51
9.3.4	Replacement of drain valve solenoids #1 & #2).....	51
9.3.5	Replacement of the chemical draw valve.....	51
9.3.6	Replacement of the permeate valve	51
9.3.7	Replacement of the blend valve.....	52
9.3.8	Replacement of the equalize valve	52
9.3.9	Replacement of the turbine flow sensor.....	52
9.3.10	Replacement of Internal electrical box fuses	52
9.3.11	Replacement of the external fuses.....	53
9.3.12	Uploading new software.....	55
9.3.13	Removing and replacing the main lead.....	57
9.4	Location of spare parts	58
9.5	Replacement of consumables	60
9.5.1	Removal and replacement of the Ultra-filter.....	60
9.5.2	Consumable replacement frequency	61
9.6	Pre-Dialysis checks	61
9.7	Cleaning external surfaces	62
9.8	Storage and preservation recommendations.....	63

10.0 TROUBLESHOOTING.....	64
10.1 Troubleshooting Guide	65
10.1.1 Warning & alarm messages (Processing Mode)	65
10.1.2 Electrical & mechanical faults	70
10.1.3 Water quality non-compliance.....	71
11.0 CONSUMABLES AND SPARES	72
11.1 Consumables	72
11.2 Recommended spares list	72
11.2.1 Minor spares listing	72
11.2.2 Major spares listing	73
12.0 TECHNICAL SPECIFICATION.....	74
12.1 Technical specification	74
12.1.1 Electrical specifications/connections.....	74
12.1.2 Fuse rating/type	75
12.1.3 Main PCB battery specification	75
12.1.4 IP Rating	75
12.1.5 Alarm port connection details.....	75
12.1.6 Water quality and performance	75
12.1.7 Feed water requirements	76
12.1.8 Water services connections	76
12.1.9 Raw water break tank	76
12.1.10 Weights and dimensions	76
12.1.11 USB mass storage device	76
12.2 Environmental data.....	77
12.3 Guidance on electromagnetic emissions	77
12.4 Guidance on electromagnetic immunity.....	78
12.5 Guidance on electromagnetic immunity for non-life supporting equipment	79
12.6 Separation distances for RF devices and Centurion	80
12.7 Classification and standards applied	80
13.0 CERTIFICATE OF COMPLIANCE UL/CAS	81
14.0 APPENDICES.....	82
14.1 How to use the push-fit connectors	82
14.2 E-Waste.....	83
14.3 Circuit board connection schedule	83
14.4 Flow Schematic	86
14.5 Electrical circuit diagram.....	87

1.0 PREFACE

Note: The **Centurion 1500+** is an accessory in a **Medical Electrical (ME) System** in which the dialysis equipment comprises the **Medical Electrical Equipment**.

This ***Service & Maintenance Manual*** provides all of the information and instructions needed for trained renal technicians to perform basic service and maintenance on the **Centurion 1500+** single patient reverse osmosis unit.

Please read the instructions carefully and make sure that you fully understand the information given before carrying out any servicing or repairs.

Details on how to install & commission the **Centurion 1500+** can be found in the ***Installation & Commissioning Guide***. Installation of the unit would always be carried out by your Healthcare provider or an approved trained technician.

Once trained and approved to do so by your Healthcare provider a detail step by step guide on how to chemically clean and carry out routine heat disinfection cycles can found in the ***Chemical Cleaning & Heat Disinfection Instructions*** document.

For users of the unit (Home patients) an ***Operating Manual*** details in simple terms how to operate the unit for home dialysis.



Warning: Before operating the unit always check to see that the water and electrical connections are secure and not likely to cause a trip hazard.

2.0 CONTACT US

Should you require any additional information relating to the servicing, maintenance, spares and consumables, contact or **AmeriWater** or refer to the relevant accompanying manuals and guides detailed in **Section 1 PREFACE** :

AmeriWater: Tel No. 800-535-5585

(Or your local authorized **AmeriWater** distributor)

Useful Telephone Nos.

Distributor:

Tel No.....Contact Name:.....

Tel No.....Contact Name:.....

3.0 HEALTH AND SAFETY

CAUTION: Explanation of expressions



WARNING

This symbol is used to alert the user not to take a certain action, which if taken could cause a potential hazard and result in a serious adverse reaction, injury or even death. The warning symbol may also be used to alert the user to take a certain action to avoid a potential hazard. In all cases within this document, where this symbol is used it is important that you familiarise yourself with the nature of the potential HAZARD and any action that needs to be taken.

Note:

A reminder or useful information that can be used to help explain a command or action or give guidance

3.1 Explanation of labels

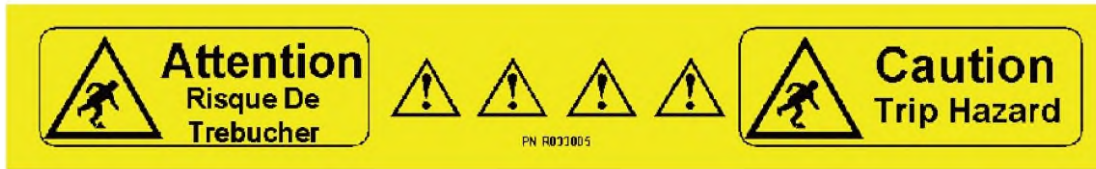
There are a number of labels applied to the outside of the *Centurion 1500+* unit which identify hazards, advise caution or instruct the user to seek reference before proceeding with an action. These are identified below.



No Pushing: The unit has been designed as a stationary device during normal operation. Do not push the unit when in operation as this may cause the integral tilt detector to shut the unit down.



Refer to Manual: is used when reference should be made to the manual to obtain advice and or information before carrying out a task. Please read the information given in the operating instructions carefully before proceeding. If in doubt contact, **AmeriWater** for advice and assistance.



Trip Hazard: there are a number of water and electrical connections from the rear of the unit to the renal replacement equipment and general services. To warn anyone from inadvertently tripping over these service lines a Trip Hazard label is used as a visual warning.



Hot Surface: This label is used to indicate that the surface labelled may be hot to touch under certain circumstances during the operation of the unit and in particular during the heat disinfection cycle. Avoid handling any part with this label during heat disinfection or take suitable measures to protect yourself from the heat.



DO NOT SIT: Under no circumstances should the unit be sat on or objects placed on the top sloping cover as the stability of the unit may be affected.




DO NOT STEP: The unit should under no circumstances be stood upon or used as step.

Note: The **Centurion 1500+** unit is supplied with several detachable parts. Only use those parts that are identified with the following labels. **DO NOT** use alternative parts or this may invalidate the warranty or compromise the performance of the unit. Refer to **Section 3.9 “ Unauthorized conversion and manufacturing replacement parts”**



3.1.1 Rear panel labels

**DO NOT OBSTRUCT
NE PAS COUVRIR**

Placed above the main cooling fan, the label is used to warn users not to cover the vent.

CENTURION 1500+ UF
PURITE Ltd, Bandet way
 Thame, Oxon, UK, OX9 3SJ
SERIAL NO. 40000
PART NO. L998374 
 2012
 FEED WATER 30 - 90 PSI
 34 - 95 °F
 ELECTRICAL SUPPLY
 115 VOLTS 12 AMPS 60 Hz

This label identifies the model of the unit, its part number, unique serial no., year of manufacture, the original manufacturer's details, supply mains rating, feedwater pressure range and temperature.

**KEY SWITCH POSITION
POSITION CONTACTEUR A**
 **SERVICE
PRODUCTION**

**CLEAN
NETTOYER**

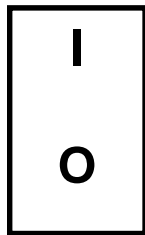
For safety a key is provided to operate the unit and prevent the unit accidentally being placed into a clean. This label identifies the position of the key. When approved/trained to do so always refer to the “**Chemical cleaning and heat disinfection Instructions**” if unsure about when and how to use this key.

ALARM  **ALARME**

External DIN socket connection. To be used by your Healthcare provider for connection to an external alarm device. **DO NOT** connect any unapproved devices to this point. Refer to Section **12.1.5** for further details.



The black cap provides protection of the USB outlet used for essential programming and downloading of recorded data. **DO NOT** remove the cap during normal operation or connect to any external device or mass storage device not specified within this manual. Refer to **Section 12.1.11** for detail of compatible mass storage devices.



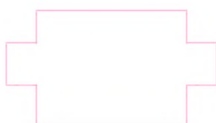
Mains On/Off isolating switch

I = Power On

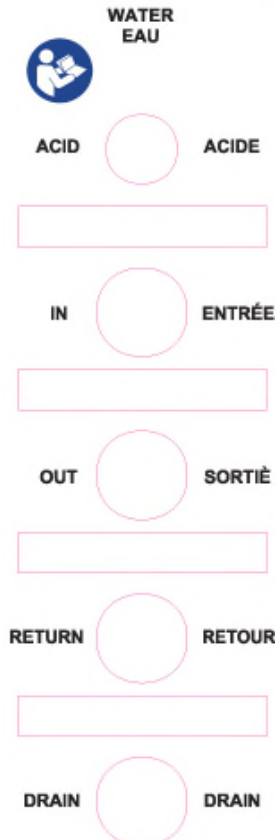
O = Power Off



This label identifies the position of the unit's two external fuses. Refer to **Section 12.1.2** for Fuse details and **Section 9.3.10** for replacement instructions.



The supply mains electrical power lead is plugged in at this point. The label gives details of the electrical supply rating suitable to operate the unit. See **Section 12.1.1** and **Section 9.3.13** for replacement instructions.



This label provides details of all the water connections. The “**Refer to manual**” symbol advises anyone connecting or disconnecting the water lines to refer to the relevant **Installation and Commissioning guide** for more details.

ACID/ACIDE Cleaning chemical injection port.

IN/ENTRÉE Main feedwater connection.

OUT/SORTIÈ Purified water outlet to dialysis machine.

RETURN/RETOUR Purified water return from dialysis machine.

DRAIN/DRAIN Waste water from unit to be connected to drain.

3.2 Safety considerations

Requirements, standards and regulations specific to the country in which the unit is used must be observed. Contact the local regulatory body for confirmation of these regulations and standards.

CAUTION: When used as a medical device Federal Law restricts this device to sale by or on the order of a physician as per 21CFR 801.109(b)(1).



Warning:

- The unit is not for use in explosive or oxygen rich atmospheres.
- The unit is for indoor use only and must not be washed down.
- The unit must not be allowed to freeze or be stored at temperatures below 41°F or above 158°F.
- Always operate in a well ventilated area and ensure the cooling fan vents are not covered.
- **DO NOT** sit on the unit, place items on top of it or use it as a step. Always operate the unit on a firm and level surface.
- **DO NOT DRINK** the purified water produced by the unit; it should only be used for the purposes intended as stated in **Section 3.3 “Intended Use”**
- Do not sit on the unit, place items on top of it and always operate on a firm and level surface.
- On no account must the unit be connected to the electrical supply when the side panels have been removed unless you have been trained to service or repair the unit.
- If the unit's performance becomes impaired and any remedial work is outside the scope of this manual, do not operate the unit and seek advice from **AmeriWater**.
- The unit must only be service and maintained by **AmeriWater** or by suitably trained/authorized technician.
- Failure to observe the instructions contained in this manual may compromise the safety, performance and reliability of the unit and may void any warranties.
- The unit must only be use in accordance with its **“Intended Use”** to feed hemodialysis equipment as specified in **Section 3.3**



Note:

- It is possible that equipment/devices located in close proximity to the RO unit may affect the operation of the unit due to emitted electromagnetic radiations or other interferences. If this is so relocate the relevant equipment away from the unit. Refer to **Section 12.6**.
- Care must be taken not to place near the RO unit any source of RFI/EMI, which is liable to cause electromagnetic disturbance. If the RO is affected by such disturbance, the source must be suppressed or moved.

3.3 Intended Use

The AmeriWater **Centurion 1500+** Reverse Osmosis Systems are water treatment systems intended for use in hemodialysis applications. They are designed to pre-treat and purify potable water for use in making dialysate for hemodialysis and to meet current AAMI and Federal (U.S.) standards. The device is intended to be a component in a complete water purification system, and is not a complete water treatment system. It must be preceded by pre-treatment devices, and may need to be followed by post-treatment devices as well to meet current AAMI and Federal (U.S.) standards. The Centurion 1500+ Reverse Osmosis System is intended for use in a hospital, clinic, dialysis center, or for home care for single patient use. The device includes an integrated heat sanitization process.

The **Centurion 1500+** unit is a **Class III (Health Canada) / Class II (USA) Medical Device** intended for use in hemodialysis applications. It should only be used to feed hemodialysis equipment that complies with the current IEC 60601-2-16 standard.

The unit has been designed to pre-treat and purify potable water for use in the preparation of dialysate solution suitable for hemodialysis and related therapies in accordance with current **AAMI/ANSI/ISO** and Federal (US and Canadian) standards.

The **Centurion 1500+** unit is intended as a stationary device for indoor use only in hospitals, clinics, dialysis centres or for home care for single patient use as part of a **Medical Electrical (ME) system**. The unit should not be stacked on top of or placed directly adjacent to other electrical/electronic equipment.

The **Centurion 1500+** water purifier works on the principle of reverse osmosis and Ultra-filtration to provide purified water suitable for both hemodialysis and Hemodiafiltration and has been designed for continuous operation.

3.4 Operating staff



Warning:

The unit must only be operated/serviced/maintained and installed by persons who have been suitably trained and have studied the instructions within this manual and supporting documents and who are familiar and confident with the operation of the unit.

Service and maintenance of the unit is limited to authorized and trained technicians approved by **AmeriWater** or their appointed distributor.

It is essential that in the event of an emergency the location of the Circuit Breaker or other isolation device protecting the equipment is known and that the mains plug is accessible at all times as this can be used as a method of isolation.

If at any time you are unsure about the electrical safety of the unit or have reason to believe that it is potentially unsafe to use you should switch the unit off and isolate the unit at the Circuit Breaker.

3.5 Residual dangers



Warning:

Electrical Shock.

With the side covers removed for servicing or maintenance activities take necessary precautions to avoid electrical shock.

Mechanical force.

With the side covers removed and under normal operating conditions some parts of the system can be under pressure of up to 215 psi (15 bar).

Hot Surfaces. During the heat disinfection cycle some of the internal and external surfaces/components/pipework will become hot to touch.

3.6 Handling



Warning:

The unit has been specifically designed as a stationary device. Should the unit need to be relocated it must be decommissioned before moving. Refer to **Section 4.14 “Decommissioning for relocation procedure”** in **Installation & Commissioning Guide**. The dry weight of the unit is 86 pounds. A transport cart or other suitable device should be used when moving the unit. Precautions should be taken to secure the unit from toppling during relocation.

Do Not pick the unit up by the side covers; they are not designed to take the weight of the unit. Support the unit by holding the underside of the chassis while steadying the body.

When relocating the unit always ensure the unit has performed its full drain down routine. To do this switch the unit on, isolate the incoming mains water supply, press “**START**” and run the unit until it stops due to ‘**Low Tank Level**’ then switch off.

Do Not move the unit while it is still in operation.

3.7 Bringing the unit to an immediate **STOP**

If you need to stop the unit quickly and immediately at any time, simply press the black rocker switch on the back of the unit. Then as a precaution, if needs be turn off the water supply. Alternatively press the red “**STOP**” button on the touch-screen twice.

Unless safe to do so **Do Not** restart the unit until you have checked that it safe to do so. If the original fault that required the unit to be shut down cannot be resolved contact **AmeriWater** for advice or assistance, contact telephone numbers can be found in **Section 2**.

3.8 Disposal of device/consumables/replacement parts

Refer to **Section 14.2** for details regarding disposal of the device, its replacement parts and consumables.

3.9 Unauthorised conversion and manufacturing replacement parts

DO NOT under any circumstance, modify, or replace parts with unauthorized parts on the unit or attempt to change/alter its operation or functionality.

If following replacement with approved parts or following repair the unit still does not function/operate in the correct manner contact **AmeriWater** or their locally approved distributor.



Warning:

The **Centurion 1500+** unit should only be used in accordance with its intended use and should be maintained and operated according to the instructions contained within this Service & Maintenance manual. **AmeriWater** will not accept any responsibility for any damage or injury resulting from improper use, maintenance, unauthorised repair or use of any un-approved parts.

3.10 Warranty claims and liability

This product has been manufactured in accordance with ISO 9001:2008 and ISO 13485:2012 procedures, after which it was subjected to a quality control process. If, however, you are unsatisfied with the unit, please contact **AmeriWater** or your Healthcare provider. Any warranties guaranteed by **AmeriWater**/Healthcare provider with respect to the **Centurion 1500+** will be voided if the equipment is not installed/operated/serviced or maintained in accordance with the written instructions provided within the accompanying product manuals, or if the unit is serviced and maintained by a third party not approved or recognised by **AmeriWater** or the location of the unit is changed without notification to **AmeriWater**.

4.0 ABOUT YOUR CENTURION 1500⁺

4.1 General views of the Centurion 1500⁺ unit



Side view



Front view



Rear view

4.2 Overview

The **Centurion 1500⁺** water purification unit has been specifically designed as a single patient, reverse osmosis (RO) unit to supply purified water suitable for hemodialysis or renal replacement therapies.

The unit is capable of producing purified water up to 0.40 GPM (1.5 litres per minute) based on a feedwater supply at 50°F.

The unit is fitted with an internal pump that pressurises the water supply and forces it through a membrane which then separates out all of the impurities from the feedwater. Purified water passing through the membrane, termed “permeate”, goes to the dialysis machine and the rejected impurities are flushed to drain.

4.3 Standard features

- Product water output up to 23.7 gallons/hr (0.40 gallons/min)
- Product water exceeding all recognised hemodialysis standards.
- Integrated hot water disinfection up to point of use.
- Multi-colored touch screen display for easy control.
- Instrumentation providing display of water quality, temperature, flow, pressure and salt rejection.
- Quiet running option.
- Audible alarm.
- Data logging facility.
- Internal leak and water loss detection system.
- Recirculation up to point of use.
- Ultra-filter

- Tilt warning detection.
- Built in backflow prevention.
- Semi-automatic chemical cleaning program.

4.4 Detailed features and process of operation

All external water and electrical connections can be found at the back of the unit to reduce the risk of accidental damage.

The feed water enters the unit, passes through the inlet solenoid valve and fills the internal feed water break-tank. The level in the tank is controlled by three level switches, one at high level and one at mid-level. The mid-level switch controls the opening of the inlet solenoid and the high-level switch controls the closing of the inlet valve.

If the feed water stops for whatever reason, or there is insufficient flow, the third bottom level switch turns off the high-pressure Reverse Osmosis (RO) boost pump to protect it from running dry and damaging itself.

The (RO) pump takes water from the internal break tank and boosts the water pressure to the RO membrane. There is a pressure sensor situated immediately after the pump, which will display a warning message on the touch screen, should the maximum system pressure be exceeded.

The pressurized water is forced through the membrane which then separates out up to 98% of the impurities. The purified or "Permeate" water then goes on to feed the dialysis machine. The water containing the rejected impurities is flushed to drain.

The quality, temperature and flowrate of permeate produced from the RO module is monitored and displayed on the touch screen.

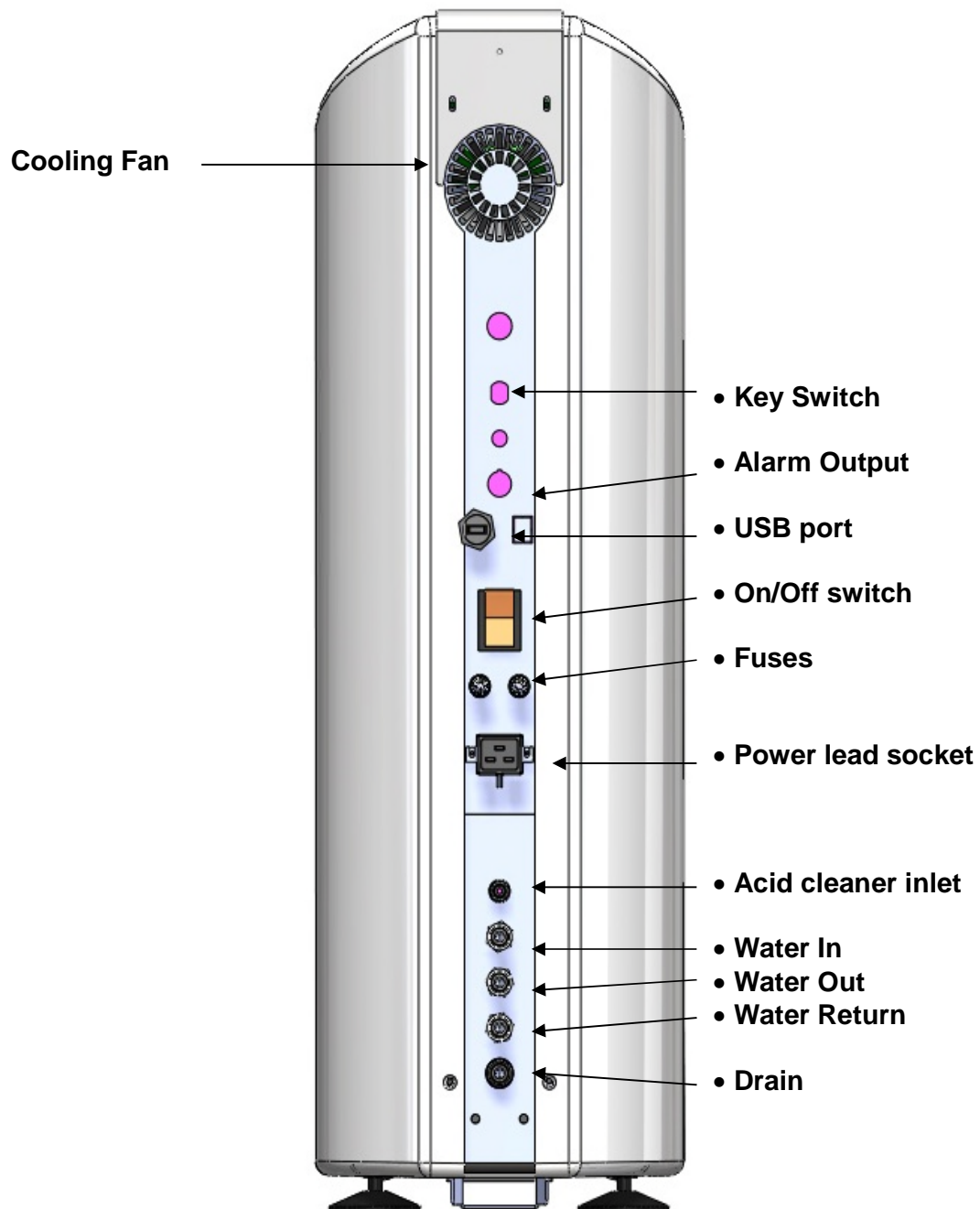
For some Hemodialysis applications such as Hemodiafiltration, the permeate is further purified by the Ultra-filter to reduce the endotoxin level to less than 0.03 EU/ml and a TVC of <0.1cfu/ml.

To ensure the quality of water is maintained every time the unit starts up it carries out a flush to clear the unit of any standing water before producing fresh permeate water.

The microprocessor control system constantly monitors the unit's performance and water quality. If any parameter is exceeded at any time the unit will respond with a warning or advisory message on the touch screen giving advice.

If the unit detects an unsafe condition it will automatically shut down in a safe and controlled manner.

4.5 Explanation of rear connections



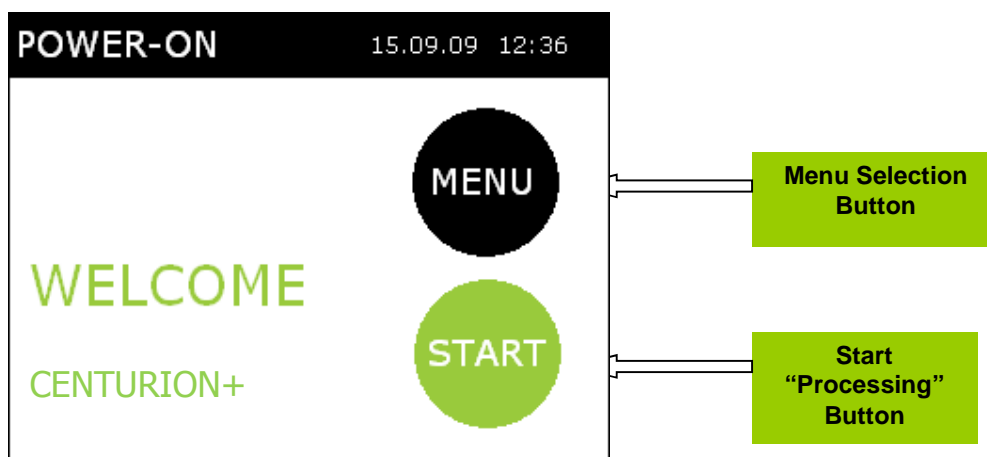
5.0 INSTALLATION AND COMMISSIONING

For comprehensive instructions on how to install and commission the unit refer to the “**Installation and Commissioning Guide**”

6.0 OPERATING THE TOUCHSCREEN

6.1 Explanation of buttons

The operation of the **Centurion 1500+** is controlled via the touch screen display which can be found on the top of the unit. The picture below shows an interpretation of the display.



6.1.1 Using the touch screen

In normal operation the screen will display a diagram which mimics the flow path of the water purification along with any messages. **See Section 6.3** for more details.

To select an action simply touch the screen on the appropriate button once with your finger.

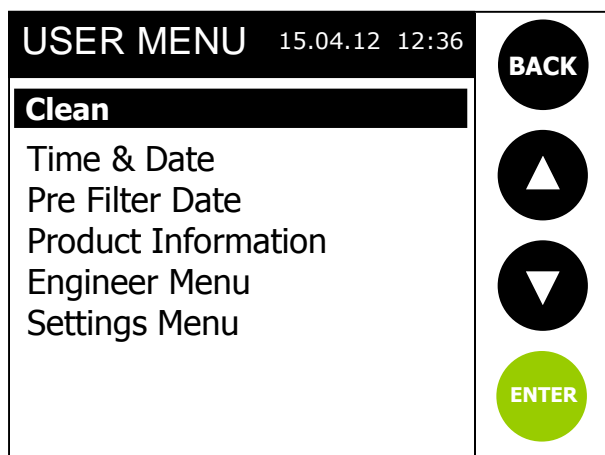
Note:

Do Not use sharp or pointed implements, such as pens, pencils etc... to operate the screen as this will damage the sensitive surface of the display, always operate the screen using your fingertips.

Do Not press more than one button at a time

6.1.2 “MENU” button

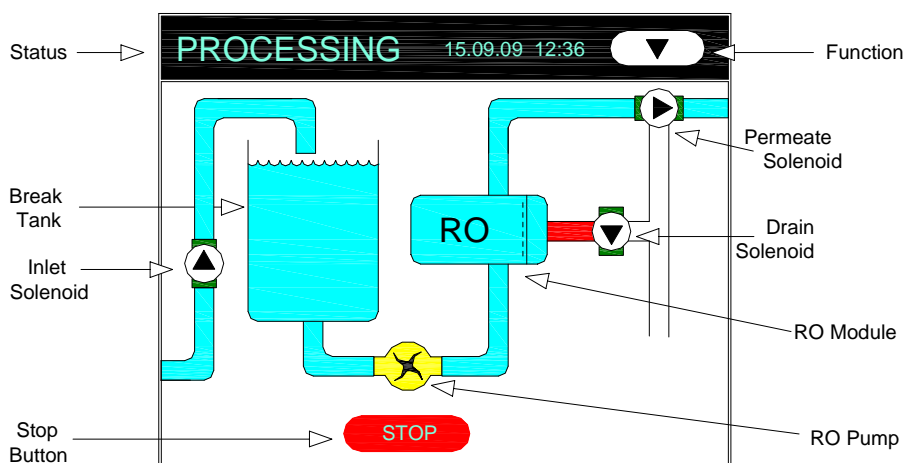
Pressing the “MENU” button will bring up the following “USER MENU” screen will appear.



For details on each of the sub-menus and how to access them go to **Section 7**

6.1.3 “START” button

Pressing the “START” button the unit will go into “PROCESSING” mode and start to produce purified water and the screen below will be displayed.



Refer to **Section 6.3** for explanation of the mimic screen symbols.

6.2 Operation

6.2.1 Initial Start up Procedure

Carryout the Pre-Dialysis checks listed in **Section 9.6**

Once you have completed the above checks switch on the unit using the, **I/O** on/off switch at the rear of the unit. Switch to the **"I"** position.

When powered the unit's HMI screen will illuminate and display both text and a visual mimic of the units operation.

The touch screen will initially display **"Intialization"** for a few seconds before showing the **Power On** screen, which displays the current date, time, model type and any active messages.

During "Initialization" the unit will sound two "bleeps" indicating that the audible alarm is functioning.

6.2.2 Starting the unit

To start the unit select the **"START"** button, the screen will then change to the **"PROCESSING"** screen which will display a mimic of the unit's operation.

The unit will then carry out a high flow flush to drain, followed by an internal permeate rinse. After 90 seconds, the permeate will automatically flow to the dialysis machine, if connected.

6.2.3 Stopping the unit during normal operation

To stop the unit at any time press the **"STOP"** button on the screen. If the unit has been running for two hours or more, the unit will perform a shut-down flush which directs a high concentrate flow across the membrane to the drain for 30 seconds. After the 30 second shut-down flush the screen will revert to the **"Power On"** display.

During the shut-down flush pressing the **"STOP"** button twice from the processing screen will stop the unit immediately terminating the flush. **(Refer to Section 3.7)**



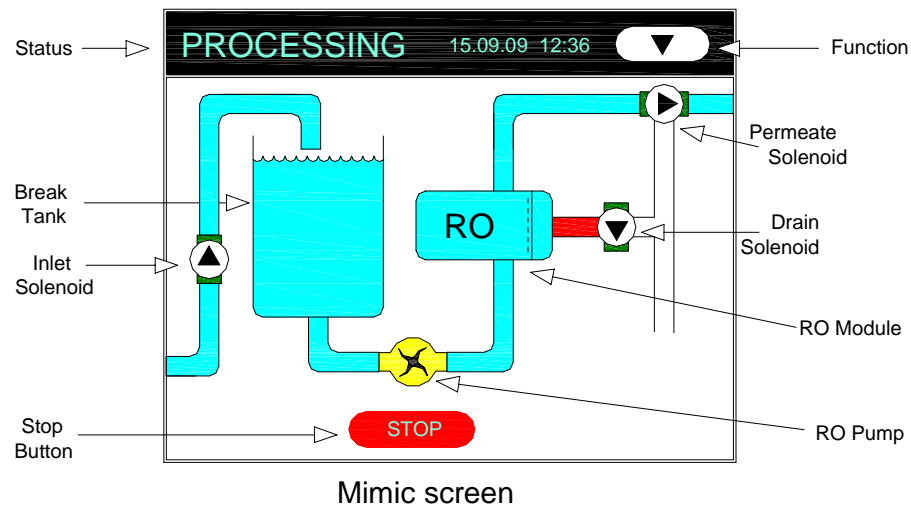
Warning: The supply mains isolation switch is located at the rear of the unit, ensure that it is accessible at all times and remains clear from obstruction.
Ensure that the wall plug is accessible at all times as this can be used as a method of isolation.

6.2.4 Operation of screen buttons

To access text about the current process, while the mimic screen is displayed, press the function button ▼ at the top right of the screen. This will in turn, display **"Permeate Quality"**, **"Temperature"**, **"Flow Rate"**, **"Pump Pressure"**, **"Feed Quality"** and **"Salt Rejection"**.

6.3 Explanation of the mimic screen

This screen is displayed during normal processing.



6.3.1 Mimic symbols

The symbols are presented on the screen below the “status bar”. The text indicates the current operation and the stage reached within that operation. This text will alternate with any warning or advisory messages that may be present.

The symbols represent the main components within the unit. Anything coloured red indicates that it is closed or stopped. If the symbol is moving or flashing it indicates it is working.

These symbols are:

- * Inlet solenoid.
- * Mains water break tank/heater tank
- * RO boost pump
- * RO module
- * Permeate solenoid
- * Drain solenoid

6.3.2 Inlet solenoid

The inlet solenoid is a normally closed valve that opens when energised. This is indicated by the black triangle pointing in the flow direction and the blue shading after the valve showing water is flowing.

Water droplets falling into the break tank also indicate that the solenoid is energised and water is flowing through the valve and into the break tank.

6.3.3 Mains water break tank/heater tank

The water level in the top break tank is monitored by a three float sensor. Four level positions are shown within the tank symbol directly reflecting the sensed level.

- Bottom level
- Low level
- Mid-level
- High level

a) On falling water level:

With the top, mid and bottom switches sensing water the mimic displays high level.

With the mid and bottom switches sensing water the mimic displays high level.

With the bottom switch only sensing water the mimic displays mid-level.

With no switches sensing water the mimic displays bottom level.

b) On rising water level:

With no switches sensing water the mimic displays bottom level.

With the bottom switch sensing water the mimic displays low level.

With the mid and bottom switches sensing water the mimic displays mid-level.

With the top, mid and bottom switches sensing water the mimic displays high level.

c) Level switch fault conditions:

With the top and bottom switches sensing water, but not the mid-level switch, the inlet solenoid is closed and the boost pump stops.

With the mid switch sensing water but not the high or low switches, the inlet solenoid is open and the boost pump is stopped.

If a water level error condition is detected an appropriate error message is displayed (see **Section 10.1.1**).

The error conditions are:

Water sensed on high-level switch only.

Water sensed on mid-level and high-level switches only.

Water sensed on low-level and high-level switches only.

Water sensed on mid-level switch only.

6.3.4 RO boost pump

When the pump is running an animated rotor revolves inside the pump symbol.

6.3.5 Reverse Osmosis (RO) module

A shaded box represents the RO module with the water inlet, drain and permeate connections shown. The box symbol provides no indication of status.

6.3.6 Permeate solenoid

The Permeate solenoid is open when energised. This is indicated by the triangle pointing in the flow direction and blue shading after the valve indicating that water is flowing.

6.3.7 Drain Solenoid

The unit has two Drain solenoids but the display gives a general indication of operation only. The Drain valves open when energise and the black triangle indicates direction of flow and the blue shading after the valve shows that water is flowing.

6.4 Explanation of displayed functions

Each time you press the Function button, ▼, at the top right hand edge of the screen you will be able to display information relating to the performance of the unit. The information will be in the form of numbers and text and displayed on the “status bar”. This information may be required by your Healthcare provider when diagnosing a possible fault.

There are 6 different functions an explanation of each is given in the table below.

Displayed Function	Explanation
Flow Rate	This is the volume of permeate the unit is producing and is measured in “ gallons/min ”
Permeate Quality	This value indicates the quality of the permeate water and is measured in “ microsiemens/cm ” or µS/cm .
Temperature	This tells you the temperature of the water being produced and is displayed in, °F .
Pump Pressure	The unit contains a pump to process the water and this displays the pressure the pump is running at in “ psi ”.
Feed Quality	If enabled the unit will constantly measure the quality of the incoming water supply and display the reading in “microsiemens/cm” or µS/cm .
Salt Rejection	Again if enabled the “ Salt Rejection ” compares the quality of the purified water to the feed water and expresses it as a “%”. This will be used by your Healthcare provider to check the performance of the unit.



Warning:

It is recommended that the key used to select CLEAN:SERVICE positions is removed to prevent anyone from accidentally switching the unit to the wrong mode during use. The key is only required for use during either Heat disinfection or chemical clean.
Having the key switch in the wrong position could interrupt dialysis or the cleaning/disinfection of the unit.

6.5 Safety features and alarms

6.5.1 Supporting Information

(Also refer to **Section 10.1.2** for Troubleshooting)

6.5.2 Tank low level

If at any time the water in the integral tank falls to the low level the process is interrupted, the RO boost pump stops and the inlet solenoid valve remains open. A **Tank Low Level** alarm message is displayed on the screen which alternates with the process message and selected function message.

Once the water level is restored to the mid-level sensor, the unit will automatically restart and the alarm message will clear.

6.5.3 Service due

This alarm will only be active in “**Processing**” when the Permeate Solenoid is energised/on.

Should the permeate water quality go above the ‘Set Quality Alarm’ value, refer to Factory Default settings **Section 7.5**, for a continuous period of 10 seconds, a *Quality Alarm* shall be generated.

The *Quality Alarm* will invoke a “**Service Due**” message on the **STATUS BAR**.

The *Quality Alarm* condition will sound the audible alarm (if enabled, refer to **Section 7.2.3**). Touching any part of screen will mute the audible alarm.

Once muted the audible alarm will re-activate after 3minutes if the *Quality Alarm* is still present.

Once invoked the permeate water quality value must drop to 5uS below the ‘Set Quality Alarm’ to reset/clear the *Quality Alarm* condition (providing a 5uS hysteresis).

The *Quality Alarm* feature can be disabled by setting the ‘Set Quality Alarm’ menu option to ‘0’ (Disabled), refer to **Section 7.2.3**

6.5.4 Poor Permeate Quality

If at any time during **Processing** when the Permeate Solenoid is energised, the permeate water quality value rises above 200µS/cm for a continuous period of 20 seconds “**Poor Quality**” Alarm message will be displayed.

The “**Poor Quality**” alarm will cause the Permeate Solenoid to de-energise/close.

The “**Poor Quality**” alarm condition will sound the audible alarm (if enabled, refer to **Section 7.2.3**). Touching any part of screen will mute the audible alarm.

Once muted the audible alarm will re-activate after 3minutes if the “**Poor Quality**” alarm is still present.

The Permeate Solenoid will remain closed until the quality value goes below 100µS/cm. When the Permeate Solenoid energises/opens, the “**Poor Quality**” message will clear from the display.

If the permeate water conductivity value remains above 100µS/cm for 10 minutes, an ‘Active’ *Quality Alarm* will be generated.

An “Active”, *Poor Quality Alarm* will invoke the **Power On** state, with any outputs on going off and stop the unit. A message “Quality Alarm” will be displayed on the STATUS BAR.

Pressing the “**START**” button will reset the *Poor Quality Alarm* condition, allowing the unit to run in a *Processing* condition.

The feature can be able to be disabled by setting the “Set Quality Alarm” menu option to ‘0’ (“Disabled”)

6.5.5 High pump pressure

If at any time during normal service the system pressure exceeds 15 bar (218 psi) for more than three seconds, a **High Pressure** alarm message will be displayed and the alarm sounded if the audible alarm has been enabled. See **section 10, Troubleshooting**, for possible causes.

If the pressure continues to rise and exceeds 15.5 bar (225 psi) the unit will shut down and the display will revert to the **Power-On** mode and continue to show the alarm message **High Pressure**.

If at any time during cleaning, the system pressure exceeds 15 bar (218 psi) for more than three seconds the cleaning cycle will stop, a **High Pump Pressure** alarm message will be displayed and sounded. Press anywhere on the screen to mute the buzzer. Once the high-pressure condition has been cleared select the **Restart** option to resume the clean cycle from the point at which it was interrupted.

6.5.6 Low pump pressure

Should the system pressure fall below 1 bar (15 psi) for a few seconds during normal processing, the unit will shut down and the display will revert to the **Power-On** screen, showing the message **Low Pressure**. Pressing the start button will restart the unit and the alarm will clear if the pump pressure has returned to normal.

6.5.7 Permeate line cell error

If the permeate line cell senses an open circuit condition the permeate flow is interrupted and the display produces the message, **Out-Line Cell Error**. This is usually the result of a faulty or disconnected line cell. Once corrected the flow resumes.

6.5.8 Temperature high

If the water temperature of the permeate is higher than the set temperature, the display produces a **Temperature High** alarm message. The default temperature setting is 95°F and can be accessed and changed via the settings menu; refer to **Section 7.2.3**

6.5.9 Temperature sensor error

If the measured temperature is out of range, the displayed value will be “===”. Also a ‘Temperature Sensor Error’ message will be displayed.

6.5.10 Level switch error

A **Level Sensor Error** message is displayed if the input to the control board from the three level sensors in the break tank is not one of the possible water level states.

6.5.11 Leak

If water is sensed in the bottom of the unit the unit will revert to the power on screen, and a leak detection alarm message will be shown.

6.5.12 Tilt

If the unit, while turned on, is tipped from the vertical by more than 15° for 0.5 seconds or more the unit will stop, the display will revert to the **Power-On** screen and sound its alarm. Switch the unit off and on at the mains plug to restart.

6.6 Processing modes

6.6.1 External Standby

When in external standby state the unit shuts down and the message **STBY;EXT** (external standby condition) is displayed. This occurs in response to a signal from an external switch, timer, dialysis machine or the remote key switch connected via the jack plug at the rear of the unit;

6.6.2 Power On /Timed standby

For either function to operate and for the status bar to be displayed, both **Power On Standby** and **Timed Standby** have to be enabled in the menu structure.

Power on standby

When this mode is enabled the unit performs a 10 minute rinse cycle every 2 hours after the stop button has been pressed. The purpose is to ensure the system remains clean and ready for use when next required.

Timed standby


When this mode is enabled the unit may be programmed to allow the rinse cycle of 'Power on standby' between predetermined 'Stop' and 'Start' times. This is of benefit to patients during sleeping hours.

Pressing the start button at any time will override these functions and place the unit back into normal operation supplying water for dialysis.


If an external signal is used for control of the unit (external standby) this overrides the programmed standby times.

Standby messages displayed on the status bar:


In POWER-ON (with Timed Standby enabled):

“ Timed Standby Enabled” is toggled with “POWER-ON”.


During the 10 minute run period;

“ Timed Standby Enabled” is toggled with “STANDBY RUN”.

In processing (with Timed standby enabled and a signal present on the external input);

“ Timed Standby Enabled” is toggled with “STBY:EXT”

During the 10 minute run period;

“ Timed Standby Enabled” is toggled with “STANDBY RUN”.

The “ Timed Standby Enabled” message is a warning that the unit will periodically start and run automatically.

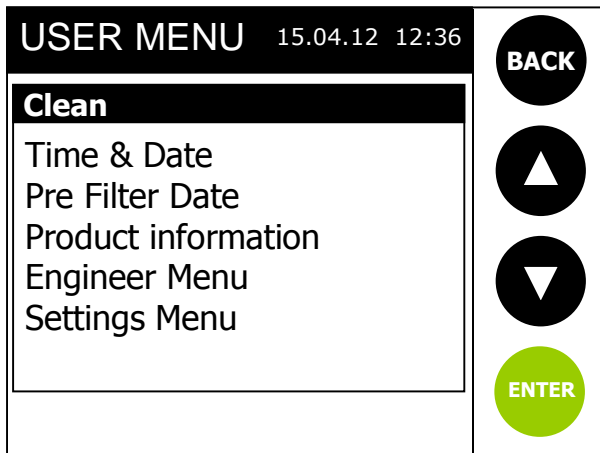
7.0 MENUS AND SETTINGS

7.1 USER menu

Pressing the **"MENU"** button from the **POWER-ON** screen will reveal the **"USER MENU"**. The menu is typically for use by the Patient or Nursing staff.

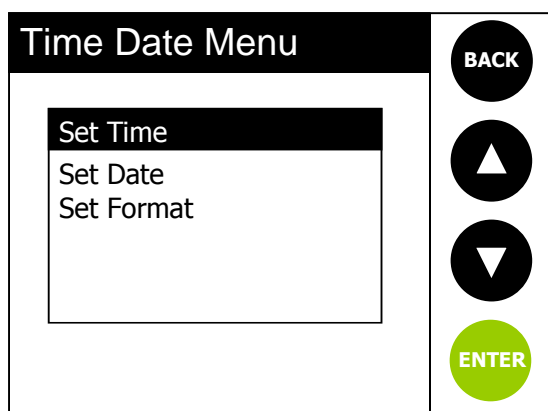
There are six sub menus which will allow you to start a **"Clean"** (see Section 8), adjust the **"Time & Date"** (see Section 7.1.2), reset the internal Pre-filter replacement date (see Section 7.1.3), for **"Product Information"** refer to Section 7.1.4. The **"Engineer menu"** (Section 7.2) and **"Settings Menu"** (Section 7.3), are PIN number protected and should only be accessed by trained/approved personnel.

7.1.1 USER menu screen



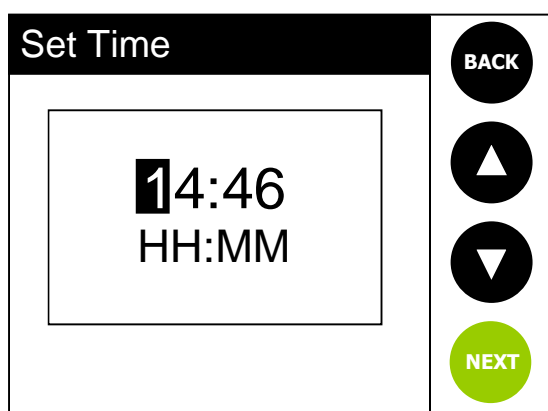
7.1.2 Set Time and Date

From the USER MENU and by using the ▲/ ▼ buttons select “**Time & Date**”, then press the “**ENTER**” button. The first screen below will be displayed.



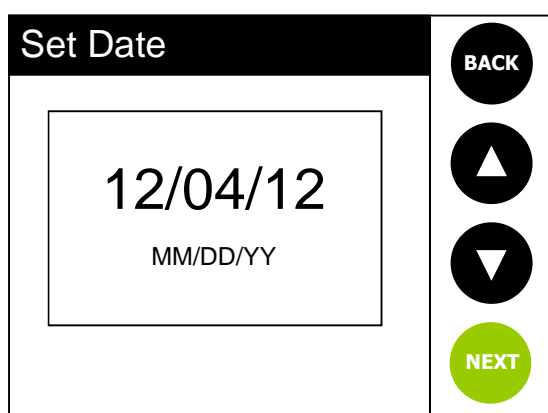
Again by using the ▲/ ▼ buttons select from one of the entries listed and press “**ENTER**”

To return to the main “**USER MENU**” simply press the “**BACK**” button



If you select “**Set Time**” the screen opposite will be displayed. The flashing cursor identifies which digit you can adjust.

By using the ▲/▼ buttons you can either increase or decrease the number value. Once the correct number has been selected, press “**NEXT**” to move to the next number. **On pressing “NEXT”** on the final number a confirmation screen will pop up, stating “**Done**” and after a few seconds the screen will revert back to the “**Time Date Menu**”



To select “**Set Date**” from the menu use the ▲/▼ buttons and press “**ENTER**”. The date will be displayed and the cursor will flash on the first number.

Use the ▲/▼ buttons to change the number to the correct value, then press “**NEXT**” to move to the next one. On pressing “**NEXT**” on the final number a confirmation screen will pop up and after a few seconds the screen will revert back to the “**Time Date Menu**”

Set Format

☐ DD/MM/YY
☐ DD/MM/YYYY
☐ MM/DD/YY
☐ MM/DD/YYYY

BACK

ENTER

Should the format of the date be wrong, by selecting the “**Set Format**” menu and by pressing “**ENTER**” the “**Set Format**” menu will be displayed. Touch the box that matches the correct format. A tick will appear to confirm your selection. Press “**ENTER**” a confirmation screen will pop up and after a few seconds the screen will revert back to the “**Time Date Menu**”

Note: Pressing the “**BACK**” button prior to pressing the “**ENTER**” button will cancel changes currently being made and return you to the “**USER MENU**”

7.1.3 Pre-Filter replacement date

(Centurion 1500+UF variant L998374 only)

The Pre filter replacement date should be reset when the Ultra-filter is replaced during maintenance. This would normally be carried out by your Healthcare provider and will ensure that the Centurion unit will provide a prompt message when the next filter change becomes due.

Pre Filter Date

12/04/12

6 MONTH INTERVAL

BACK

RESET

Pre Filter Date will be used to provide users with a reminder to replace the Ultra-filter inside of the Centurion. The reminder shall be set to a 6 month interval

7.1.4 Product Information

Product Information		BACK
Type:	Centurion 1500	
Serial Number:	000000	
Unit ID:	00	
Unit Version:	R.1.2	
Pod Version:	R.1.2	
Commission Date:	01/01/09	
Memory Checksum:	0x5108	
Data Memory Full:	2%	
Address:	02	

This screen shows the product details and software version numbers and is for information only.

7.2 Engineer Menu



Warning:

The 'Engineer Menu' is only accessible for use by trained and authorised personnel. If any data held within this menu is altered the performance/safety of the unit and/or water quality may be seriously affected. An access PIN number is required to enter this menu.

Refer to "Engineer menu" structure chart in **Section 7.4** which provides details of the sub-menus.

7.2.1 Language

There are 4 language options available, English UK, English US, French and German. To select the desired option simply press the corresponding box. A tick in the box will confirm selection.

7.2.2 Units

Select either "**Imperial units**" or "**Metric units**". To select the desired option simply press the corresponding box. A tick in the box will confirm selection.

If "**Imperial units**" selected;

- i) Temperature values in °F
- ii) Pressure values in (psi)
- iii) Flow rate in GPM (US gallons)

If "**Metric units**" selected;

- i) Temperature values in °C
- ii) Pressure values in (psi)
- iii) Flow rate in litres per min (L/m)

7.2.3 Alarms

“Audio Alarm enabled”, select either “Disabled or Enabled”. If enabled a buzzer will sound if an alarm condition should occur. The default setting will be “Enabled”

“Set Quality Alarm”, the value for this will be factory pre-set. The value can be adjusted by using the ▲/▼ buttons. The value inputted relates to the permeate water quality and the level at which the unit will alarm should the water quality exceed this value.

The selectable range available will be between 5 and 100 µs/cm. The default setting will be set at 70 µs/cm. Entering a value of “0” will disable the alarm.

“Set Temp Alarm”, the value for this will be factory pre-set. The value can be adjusted by using the ▲/▼ buttons. The value inputted relates to the temperature of the permeate water and the level at which the unit will alarm should the water temperature exceed this value.

The selectable range available will be between 68 to 95 °F. The default setting will be 95°C. Entering a value of “0” will disable the alarm.

If the measured water temperature should exceed 122°F the unit will shut down and return to “Power-on”.

7.2.4 Maintenance

(Refer to separate “Maintenance Menu structure in **Section 7.4 Table-1**)

“Pump run hours”, displays the number of hours the RO boost pump has been running. The option exists to reset this value to zero should a new pump be fitted by accepting the “Reset” command..

“Pump On/Offs”, displays the number of times the RO boost pump has cycled on/off. Can be used as a diagnostic tool when troubleshooting pump problems. The option exists to reset this value to zero.

“Solenoids On/Off”, records the number of times the “Inlet” solenoid has cycled on/off, or open/closed. The option exists to reset this value to zero should a new pump be fitted by accepting the “Reset” command.

“Data transfer”, there are three sub routines associated with this entry:-

“Upload Files”, this option allows for the downloading of stored processing data to be transferred to a USB memory device. On selecting this function and accepting the “Send” command stored logged data will be sent to the USB device. If no USB memory device is inserted the unit will display the following message **“Memory Device Not detected”**.

The USB memory device should be plugged into the USB port located at the rear of the unit, (see **Section 4.5**)

Only use USB memory devices specified in **Section 12.1.11**.

“Clear Logger”, if you wish to clear the stored logged data, press **“Clear”** then **“yes”** and the contents of the memory will be cleared.

“Set Log Frequency”, this function allows for the setting of the data logging interval. The selectable range is between 0 and 120 minutes, the default setting is set at 30 minutes. Entering a value of “0” will disable the function.

“Software update”, there are three sub routines associated with this entry:-

“Update Display”

“Update Controller”

“Update GUI”

This function allows for the uploading of new software code. To upload new code insert a USB memory device, with the appropriate new code loaded, into the USB port at the rear of the unit.

Select the relevant item that requires new code and then select **“Yes”**. The new software file will then be uploaded, the progress being displayed on a percentage scale. Uploading of new code can take several minutes.

7.2.5 Data logging

All operating conditions and values are monitored and stored/recorded within the unit's internal memory. The data is saved as a CSV (comma separated variable) file which can be uploaded onto a USB data stick.

The logger will save all the relevant data to the unit's 1MB of internal logging memory. The data saved will include all status changes, alarms and process values.

The duration between when values get updated are be adjustable. By default this Log Frequency time shall be 30 minutes, but can be adjusted within the Engineer Menu (see **Section 7.2.4**). With the default Log Frequency of 30 minutes set, the internal memory can easily store 6 months of data, potentially less if the Log Frequency is reduced.

The unit will continue to save data to the internal memory until the memory becomes full. When full any additional data will not be saved. The Product Information screen (see **Section 7.1.4**) will display the status of the internal memory as a 'data memory full percentage'.

The stored logged data files can be uploaded to a USB data stick whenever required. This can be carried out by selecting a “Data Transfer”. The Data Logger screen presented will enable you to either Upload Files to the external USB device, or Clear Logger of all saved data. Before the unit's logger memory is erased an “Are You Sure?” option shall be presented (see **Section 7.2.4**).

NB:

Before erasing the unit's stored data with the Clear Logger option. It is advised to first check that the upload was successful by viewing the content of the USB device on a PC.

7.2.6 Setup

(Refer to SETUP Menu structure in **Section 7.4** Table-4 for details)

“Calibration”, there are four sub-menus within this function:-

- i) Permeate Line Cell Constant
- ii) Feed Line Cell Constant
- iii) Feed Line Cell Offset
- iv) Flow calibration

Permeate Line Cell Constant: The line cell constant displayed has an acceptable input range set between 0.05 and 1.00. If a value outside this range is entered it will be ignored.

The default value will be set at 0.65

Feed Line Cell Constant: The Feed line cell constant displayed has an acceptable input range set between 0.05 and 2.00. If a value outside this range is entered it will be ignored.

The default value will be set at 1.20

Feed Line Cell Offset: The Feed line cell offset displayed has an acceptable input range set between 0.01 and 1.00. If a value outside this range is entered it will be ignored.

The default value will be set at 0.10

The value changes the gain of the Feed quality circuit which is used to compensate for any component tolerance issues. A value of 0.10 represents unity (no gain adjustment)

Flow Calibration: This menu option displays a five digit value; this value represents the number of pulses per litre provided from the flow sensor.

Any value between, 0 to 60000 can be entered and saved.

If a value outside the allowable range is entered, the value will be ignored, and the previous value retained.

The pre-set default value is “22000”.

If a value of “00000” is entered, the flow rate display will be disabled, i.e. the “Flow Rate” text and associated value will not be selectable or displayed on the STATUS BAR during *Processing*.

“Quality Options”, there are four sub-menus within this function:-

- i) Salt Display

- ii) Feed Quality Display
- iii) Leak shutdown
- iv) Leak Value Display

Salt Display: displays the % Salt rejection performance. The % Salt rejection is the ratio of the permeate quality to the inlet feed quality expressed as a %. It provides a method of determining the performance of the reverse osmosis membrane. The default for this option is set at **“Enabled”**.

Feed quality Display: If **“Enabled”** the feed water quality displayed in $\mu\text{S}/\text{cm}$ will be displayed on the status bar during normal **“Processing”**. The default option is set at **“Disabled”**.

Leak Shutdown: this option provides the option to stop the unit running should a leak be detected. If **“Enabled”** the unit will stop running. The volume of water required to trigger the leak detector is 300-400 mls. The default setting for this option is **“Enabled”**.

“Boost Pump Speed”, the Boost Pump Speed is adjustable. There are three sub-menus within this function:-

- i) Processing Speed %
- ii) Heat San Speed %
- iii) Chem Draw Speed %

Processing Speed %: Refers to the speed at which the RO boost pump runs during all normal **“Processing”** states, including **“Standby Run”** mode. The default setting for Processing speed is set at **80%**.

Heat San Speed %: Refers to the speed at which the RO boost pump runs during the Heat sanitisation process, including **Processing rinse**. The default setting for Heat San speed is set at **50%**.

Chem Draw Speed %: Refers to the speed at which the RO boost pump runs during the **chemical draw** stage, including **rinse pipe** routine. The default setting for Heat San speed is set at **80%**.

“Clean Options”, there are two sub-menu options within this function:-

- i) Chem Draw Time
- ii) Hold Time

Chem Draw Time: refers to the time in seconds set for the drawing of chemical during a chemical clean routine. The time should be adjusted to draw the contents of the 250 ml chemical bottle. The selectable range available is 0 to 99 seconds. The default settings being 45 seconds.

Hold Time: refers to the duration of the **Recirculation** (Temperature Hold) period within the **Heat sanitisation** routine.

Two options are available, 10 or 30 minutes. The default time is set at 30 minutes.

“Setup Options”, there are six sub-menu options available within this function:-

- i) Drain On Stop
- ii) Rear Fan Enabled
- iii) Switch Settings
- iv) Logo
- v) Standby
- vi) Auto Restart
- vii) Reminders

Drain On Stop: This options provides the ability to enable or disable the **“Drain Down”** feature.

If “Enabled” on switching the unit off and returning to Power-on mode the unit will drain down to low level. The default setting is **“Enabled”**

Rear Fan Enabled: This option provides the ability to enable or disable the continuous running of the main rear fan. If “Disabled” the rear fan will only run during heat sanitisation routine, if **“Enabled”** the fan will run continuously whenever power is applied to the unit.

The default setting is **“Disabled”**.

Switch Settings: This option is further categorized into setting up, *External Standby Switch Polarity* and *Tank High Level Switch Polarity*. In both cases the option exists to select the switch to be Normally Open (NO) or Normally Closed (NC).

The default settings for both options is set at (NO). Refer to AmeriWater for advice on selecting the correct option.

Logo: Contact AmeriWater:

“Standby”: ***This feature provides two modes of standby:-***

- i) Power on Standby
- ii) Timed Standby

Power On Standby: This feature shall operate if the “Standby / Power On” menu option has been “Enabled”. Also the Standby: Timed menu option shall need to be “Enabled”. When both Standby options have been enabled, the unit shall run in a *Processing* state, after first performing a Start Up sequence, for 10 minutes every 2 hours. This periodic run sequence shall continue while the time is between the programmed “Standby / Time”, *On Time* and *Off Time*.

The POWER ON screen shall remain during both *Standby off periods* and *Standby run periods*.

Whenever both “Standby / Power On” and “Standby / Timed” are “Enabled”, a message “! Timed Standby Enabled” shall be displayed on the STATUS BAR.

Whenever the unit runs, during a *Standby run period*, a message “STANDBY RUN” shall be displayed on the STATUS BAR.

Timed Standby: Operates in the *External Standby* and *Power On Standby* states, if the “Timed Standby” menu option has been “Enabled”.

The Timed Standby option shall provide the ability to set an On/Start Time and an Off/End Time.

Outside of the entered time range, the unit shall not automatically start up and run in a *Power On* or *External Standby* state. Within the entered time range the unit shall automatically start up and run periodically whenever in an *External Standby* state, and in a *Power On* state if the “Standby / Power On” menu option is “Enabled”.

With the Timed Standby option “Enable” and the unit in an *External Standby* state, the unit shall periodically run between the programmed *On Time* and *Off Time*. After every 2 hour period the unit shall run for 10 minutes. During the 2 hour period all outputs shall be off, a message “Timed Standby Enabled” shall be displayed on the STATUS BAR.

After a 2 hour ‘off period’, the unit shall start up and run in a *Processing* state after first performing a Start Up sequence, this ‘run period’ shall continue for 10 minutes before going back into a 2 hour ‘off period’. During the 10 minute ‘run periods’ a message “STANDBY RUN PERIOD” shall be displayed on the STATUS BAR.

Auto restart: When the Auto Restart menu option has been “Enabled”, the unit shall go back into the mode it was in prior to the power interruption (i.e. *Processing*, *Processing Standby* or *Power On*).

With Auto Restart – “Disabled” (default), the unit shall always go to POWER ON state after a power interruption (except when in a *Chemical Clean* routine,

Reminders: There are three sub menu options available in this feature:-

- i) Filter Replacement Interval
- ii) Heat San Interval
- iii) Chemical Clean Interval

Filter Replacement Interval: This menu option provides the ability to enable and select the interval for filter replacement. The options provided are given below:

Disabled
3 Month Interval
6 Month Interval
12 Month Interval

The default for this option is “Disabled”.

The “Filter Date” be able reset within this menu option every time a new filter is installed.

Heat Sanitisation Interval: This menu option provides the ability to enable and select the interval for heat sanitisation reminders. The options provided are given below:

Disabled
1 Week Interval
2 Week Interval
3 Week Interval

The default for this option shall be “Disabled”.

Chemical Clean Interval: This menu option provides the ability to enable and select the interval for chemical clean reminders. The options to be provided are given below:

Disabled
1 Month Interval
2 Month Interval
3 Month Interval

“Commission Setup”: This function has four sub menu options available, **Commission Date**, **Set Unit ID**, **Serial Number** and **Restore Defaults**.

Commission Date: This menu option displays the Commission Date of the unit, in the selected format.

The date should be set to the current date after the Time and Date option have been entered after a Transit Mode, see below.

The date can be changed should the unit every be decommissioned and then re-used at a later date.

The default Date for this option is 01/01/01.

Set Unit ID: This option shall offers a two digit ‘ID’ number to be entered.

The ID number shall be used to uniquely identify a unit. This two digit ID number shall also form part of any Data Logged file name.
The default value for this option is ‘00’.

Serial Number: This option allows for a six digit “Serial Number” to be entered.

The number can be viewed and changed.

The default value for this option is “000000”.

Restore Defaults: When this option is selected, all the adjustable/selectable options will revert to the default options/values.

Refer to **Section 7.5 “Default Values”** for default options/values.

Transit Mode: The *Transit Mode* shall can be enabled and disabled

If the *Transit Mode* has been enabled, the “Set Time” and “Set Date” menu options will be displayed after *Initialisation*.

While the setting Time and Date menus are being displayed, “Transit Mode” shall be displayed on the STATUS BAR.

Only after the Time, Date and the Filter Date options screens have been exited shall the POWER ON screen be presented.

The unit will be set in Transit mode on leaving the manufacturer.

7.3 Settings Menu



Warning:

The ‘Settings Menu’ is only accessible for use by trained and authorised personnel. If any data held within this menu is altered the performance/safety of the unit and/or water quality may be seriously affected. An access PIN number is required to enter this menu.

On selecting “Settings Menu”, you will require a PIN number to gain access. (Refer to “Main menu” structure chart **Section 7.4 Table-2** for details)

Within “Settings menu there are two user standby functions:-

“Power On”

“Timed”

For both of the above standby options refer to **Section 7.2.6 Set Up & Section 6.6.2**

7.4 Menu structure diagrams

ENGINEER MENU STRUCTURE													
Table -1													
Level 1		Level 2		Level 3		Level 4		Level 5		Level 6		Notes	Manual ref:
Power On	▶	MENU	▶	Clean								See Table-2	Section 8.0
	▶		START	▶	Time & Date							See Table-2	Section 7.1.2
			▶	Pre-Filter Date								See Table-2	Section 7.1.3
			▶	Product Info								See Table-2	Section 7.1.4
			▶	Engineer Menu	▶	Enter PIN	▶	Language	▶	English UK		Select option	Section 7.2.1
						(9721)			▶	English US		Select option	"
									▶	French		Select option	"
									▶	German		Select option	"
								▶	Units	▶	Imperial Units	Select option	Section 7.2.2
										▶	Metric Units	Select option	"
								▶	Alarms	▶	Audio Alarm Enabled		Section 7.2.3
										▶	Set Quality Alarm		"
										▶	Set Temp Alarm		"
								▶	Maintenance	▶	Pump Run hours	See Table-3	Section 7.2.4
										▶	Pump On/Offs	See Table-3	"
										▶	Solenoids On/Offs	See Table-3	"
										▶	Data Transfer	See Table-3	"
										▶	Softw are Update	See Table-3	"
								▶	Setup	▶	Calibration	See Table-4	Section 7.2.6
										▶	Quality Options	See Table-4	"
										▶	Boost Pump Speed	See Table-4	"
										▶	Clean Options	See Table-4	"
										▶	Setup Options	See Table-4	"
										▶	Comission Setup	See Table-4	"
										▶	Transit Mode	See Table-4	"
			▶	Settings Menu					▶	Enter PIN		See Table-2	Section 7.3

USER MENU STRUCTURE

Table -2

Level 1	Level 2	Level 3	Level 4	Level 5	Notes	Manual ref:
Power On	▶ MENU*	▶ Clean	▶ Chemical Clean ▶ Heat Sanitisation ▶ Heat San Result			Section 8.1 Section 8.2
		▶ Time & Date	▶ Set time ▶ Set Date ▶ Set Format		Input correct time Input correct date select from 4 formats	Section 7.1.2 Section 7.1.2 Section 7.1.2
		▶ Pre-Filter Date ▶ Product Info ▶ Engineer Menu ▶ Settings Menu	▶ Power On ▶ Timed	▶ Timed Standby Enabled ▶ Set on Time ▶ Set off Time	auto set by unit Displays table of data See Table-1 Select Disabled/Enabled Select Disabled/Enabled set HH:MM set HH:MM	Section 7.1.3 Section 7.1.4 Section 7.3 Section 7.3 Section 7.3 Section 7.3
	▶ START					

MAINTENANCE MENU STRUCTURE

Table-3

Level 1	Level 2	Level 3	Notes	Manual reference
Maintenance	▶ Pump run hours		displayed in "hours"	Section 7.2.4
	▶ Pump On/Offs		displayed as "cycles"	Section 7.2.4
	▶ Solenoid On/Offs		displayed as "cycles"	Section 7.2.4
	▶ Data Transfer	▶ Upload Files		Section 7.2.4
		▶ Clear Logger		Section 7.2.4
		▶ Set Log Frequency		Section 7.2.4
	▶ Software Update	▶ Update Display		Section 7.2.4
		▶ Update Controller		Section 7.2.4
		▶ Update GUI		Section 7.2.4

SETUP MENU STRUCTURE					
Table-4					
Level 1	▶ Level 2	▶ Level 3	▶ Level 4	Notes	Manual reference
Set Up	Calibration	Line Cell Constants	▶ Permeate Line Cell	Factory set value	7.2.6
			▶ Feed Line Cell	Factory set value	"
			▶ Feed line Cell Offset	Factory set value	"
		▶ Flow calibration ▶ Touch screen calibrate		Factory set value	"
				Do not adjust	"
	Quality Options	▶ Salt Display		Select Disabled/Enabled	"
		▶ Feed Quality Display		Select Disabled/Enabled	"
		▶ Feed Error Shutdown		Select Disabled/Enabled	"
		▶ Leak Shutdown		Select Disabled/Enabled	"
		▶ Leak Value display		Select Disabled/Enabled	"
	▶ Boost Pump Speed	▶ Processing Speed %		Set from 10-100%; "0 or 100" Disables.	"
		▶ Heat San Speed %		Set from 10-100%; "0 or 100" Disables.	"
		▶ Chem Draw Speed %		Set from 10-100%; "0 or 100" Disables.	"
		▶ Nocturnal Speed %		Set from 10-100%; "0 or 100" Disables.	"
	▶ Clean Options	▶ Chemical Draw Time		Factory Set time in "Secs"	"
		▶ Hold Period		Select 10 or 30 minutes	"
	▶ Setup Options	▶ Drain On Stop		Select Disabled/Enabled	"
		▶ Rear Fan Enable		Select Disabled/Enabled	"
		▶ Switch Settings	▶ Ext Stby Switch Pol.	Select NO/NC	"
			▶ Tank High Switch Pol.	Select NO/NC	"
		▶ Logo		Enter PIN	"
		▶ Standby	▶ Power-On		"
			▶ Timed		"
		▶ Auto Restart		Select Disabled/Enabled	"
		▶ Reminders	▶ Filter Replacement Int	Select, Disable, 3, 6 or 12 months	"
			▶ Heat San. Interval	Select Disable, 1, 2 or 3 weeks	"
			▶ Chem Clean Interval	Select, Disable, 1, 2 or 3 months	"
	▶ Commission Setup	▶ Commission Date		Set date on commissioning	"
		▶ Set Unit ID		Set on commissioning	"
		▶ Serial Number		Input unit serial no. on unit	"
		▶ Restore Defaults		confirm yes/no	"
	▶ Transit Mode			Select Disabled/Enabled	"

7.5 Factory default settings

Engineer menu	Default Values
Language	
English UK	✓
English US	-
French	-
German	-
Units	
Imperial	-
Metric	✓
Alarms	
Audible Alarm Enable	Enabled
Set Quality Alarm	70uS
Set Temp Alarm	95.0°F
Maintenance	
Pump Run Hours	0 Hours
Pump On/Offs	0 Cycles
Inlet Solenoid On/Offs	0 Cycles
Data Transfer	-
Upload Files	-
Clear Logger	-
Set Log Frequency	30 minutes
Software Update	-
Update Display	-
Update Controller	-
Update GUI	-
Setup	
Calibration	
Line Cell Constants	-
Permeate Line Cell	0.65
Feed Line Cell	1.20
Feed Line Cell Offset	0.10
Flow Calibration	22000
Touchscreen Calibration	-
Quality Options	
Salt Display	Enabled
Feed Quality Display	Enabled
Feed Error Shutdown	Disabled
Leak Shutdown	Enabled
Leak Value Display	Disabled
Boost Pump Speed	
Processing Speed %	80%
Heat San. Speed %	40%
Chem Draw Speed %	80%
Clean Options	
Chem Draw Time	50 Seconds
Hold Period	
10 Minutes	✓
30 Minutes	-
Set Up Options	
Drain On Stop	Enabled
Rear Fan Enable	Disabled
Switch Settings	

Ext Stby Switch Pol.	Normally Open
Tank High Switch Pol.	Normally Open
Logo	None
Standby	-
Power On	Disabled
Timed	Disabled
Set On Time	06:00
Set Off Time	20:00
Auto restart	Disabled
Reminders	-
Filter Replacement Interval	
Disabled	-
3 Month Interval	-
6 Month Interval	✓
12 Month Interval	-
Heat San. Interval	
Disabled	✓
1 Week Interval	-
2 Week Interval	-
3 Week Interval	-
Chem Clean Interval	
Disabled	✓
1 Month Interval	-
2 Month Interval	-
3 Month Interval	-
Commission Setup	
Commission Date	-
Set Unit ID	01
Serial Number	-
Restore Defaults	-
Transit Mode	Disabled

8.0 CHEMICAL CLEANING AND HEAT DISINFECTION

8.1 Chemical cleaning

To maximize the life and maintain the performance of the unit's reverse osmosis membrane and to ensure the permeate quality meets the requirements for hemodialysis, chemical cleaning of the unit is recommended. Refer to **Chemical Cleaning & Heat Disinfection Instructions** for details on how to carry out a chemical clean on the unit and the recommended frequency of chemical cleans.



Warning:

DO NOT use any other household cleaner unapproved chemical not authorized by **AmeriWater** or referenced in the **Chemical Cleaning and Heat Disinfection Instructions** to clean the unit, only use those cleaners supplied by **AmeriWater**, or you may risk causing severe damage to the unit and its components and pose a serious risk to yourself or the person on dialysis.

8.2 Heat disinfection

Following each dialysis session it is recommended that the unit is put through a heat disinfection cycle.



Warning:

Failure to heat disinfect the unit or carry out recommended chemical cleans could result in a deterioration of the water quality provided by the unit making it unsuitable for hemodialysis.

Refer to “**Chemical cleaning & heat disinfection instructions**” for details on how to carry out a heat sanitisation on the unit and the recommended frequency of heat sanitisation.

AmeriWater recommends that the ultra-filter be replaced every six months when used in the Centurion by AmeriWater. This is based on AmeriWater's recommendation of performing a heat disinfection once per week. More frequent disinfection may result in premature failure of the ultra-filter.

When disinfection is completed more frequently than once per week, AmeriWater recommends that the ultra-filter be replaced after 26 heat disinfection cycles. Swelling of the filter body is expected after heat disinfection. The swelling has no direct effect on the performance of the filter.

Warning:

Exceeding 26 heat disinfection cycles with the ultra-filter greatly increases the risk of breaking the internal fibers in the filter, compromising the integrity of the filter and causing it to lose effectiveness.

Note: For Centurions that have a serial number starting with "40xxxx", adjust the pump speed to 40% for heat disinfection to ensure that 26 heat disinfection cycles can be achieved with no degradation of the ultra-filter.

9.0 MAINTENANCE AND CHECKS

9.1 Planned routine checks

It is recommended that regular checks are carried out on the unit and its performance to ensure safe and uninterrupted operation. Refer to table below for details.

The frequency of performing the checks indicated should be considered as a guide only and will depend on how often the unit is operated over a period of time.

Task detail	Typical range of values	Typical frequency	Comments
Pre-Dialysis checks		Before each dialysis session	Refer to Section 9.6 for details.
Dialysis water quality: Chemical contaminants	Maximums as listed in Tables 1 & 2 of ANSI/AAMI/ISO 13959:2009	Yearly	Refer to Section 10.1.3 if limits unacceptable
Bacterial growth and Endotoxin concentration in dialysis water	<100 cfu/ml Bacteria <0.25 EU/ml Endotoxin (as per ANSI/AAMI/ISO 13959:2009)	Monthly	Refer to Section 10.1.3 if levels are unacceptable.
Purified water output	Min 0.40 USgals/min @ 50°F	Monthly	Refer to Section 10.1.2 if output is unacceptable..
Hot water disinfection	Min temp 176°F Min hold time 10 mins	Once per week (min)*	Record of last heat disinfection cycle can be viewed. Ref to Section 4.3.1, step 13 "Chemical cleaning & heat disinfection instructions" manual.
Chemical clean	N/A	Monthly**	Refer to Section 8.1
Electrical safety inspection		Yearly or following a leak or electrical repair	Refer to Section 9.1.1
Labels	Refer to Section 3.1.1	yearly	Ensure all labels are present and legible.

9.1.1 Electrical safety inspection and test protocol

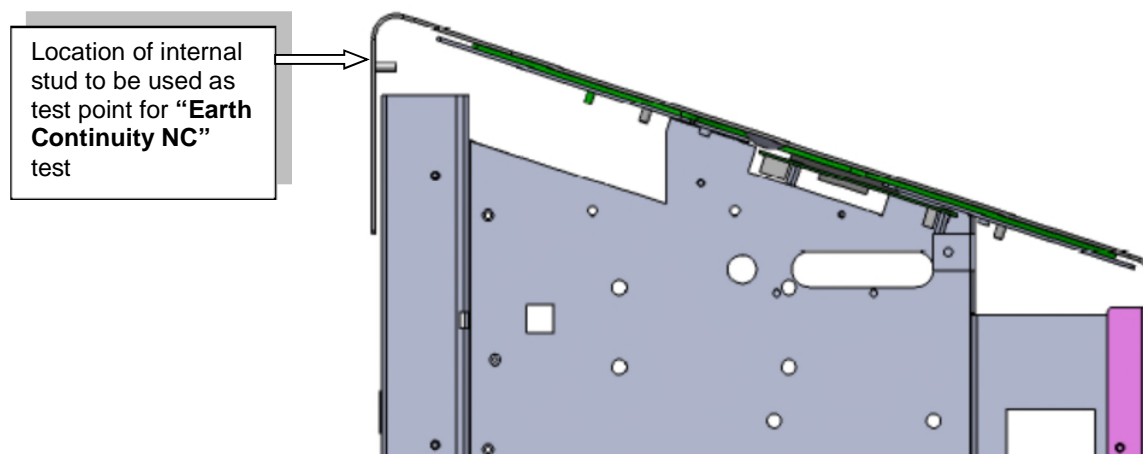
It is recommended that an electrical safety inspection is carried out:

- (i) On newly acquired equipment prior to being accepted for use.
- (ii) During routine planned preventative maintenance.
- (iii) After any repairs have been carried out on equipment.
- (iv) Following repair of a leak.

**Warning:**

1. A patient should never be connected to a piece of equipment that has not been checked.
2. An approved/trained medical equipment safety tester must be used, and capable of performing tests in accordance with the measuring circuits defined in the Medical Electrical Equipment standard 60601-1 (3rd edition)

Test	Notes	Limit
Earth continuity NC	Use test current of 1A or less. With the testers probe connected to the unit's internal stud located on the rear metal cover, refer to stud location diagram.	<0.2Ω
Insulation	Measure between L and N connected together and E, with 500V DC applied.	>20MΩ
Earth leakage current NC	L1 and L2 right way round	<0.5mA
Earth leakage current NC	L1 and L2 wrong way round	<0.5mA
Earth leakage current SFC	Protective earth open circuit	<10mA
Touch leakage NC		<0.1mA
Touch leakage SFC	Protective earth open circuit.	<0.5mA

Earth Continuity Test – location diagram of test stud

9.2 Planned preventative maintenance schedule

The unit has a designed operational life of a minimum of 5 years. We would recommend that during this time certain key components are replaced purely as a preventative measure to ensure continued uninterrupted performance. The chart below details the components identified to be replaced and the time frequency.

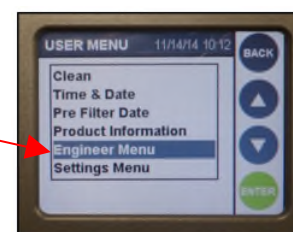
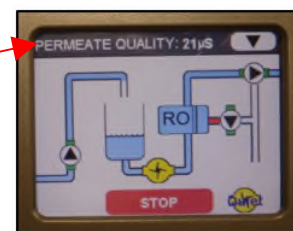
Part Description	Part No.	6	12	24	36
Ultra-Filter	20-0047				
Inlet solenoid assembly	M998002				
Heatsan RO Membrane	R017015				
RO Boost Pump	M998005				
PCB Lithium battery	R083349				

CHEMICAL CLEANING & HEAT DISINFECTION: In conjunction with the above guidance on preventative maintenance we recommend the unit is chemically cleaned and heat disinfected regularly in accordance with the guidelines in **Section 8** of the *“Operating Manual”* and **Section 4** of the *“Chemical cleaning and heat disinfection instructions”*.

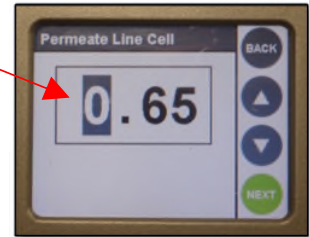
9.2.1 Conductivity Calibration

The Centurion has been calibrated prior to shipment. However, the accuracy of the RO's permeate quality reading should be verified with a calibrated (traceable to NIST standards), hand-held conductivity meter at least annually. If the Permeate Quality displayed is not within 5% of the hand-held meter reading, the RO should be calibrated by following these procedures.

1. Allow the unit to run until the Permeate Quality is stable while the water is running to the drain.
2. Take a water sample from the product hose and test it with a hand-held conductivity meter.
3. Compare the meter results with the permeate quality displayed on the RO.
4. Press the Stop button so the Welcome Screen is displayed.
5. Press the Menu button.
6. Select Engineer Menu and press Enter.
7. Enter the Pin number 9721 and press Next.



8. Select Setup and press Enter.
9. Select Calibration and press Enter.
10. Select Line Cell Constants and press Enter.
11. Select Permeate Line Cell and press Enter. The Permeate Line Cell has a default value of 0.65 and an acceptable input range from 0.05 to 1.00. Values set outside of this range will be ignored.
12. Increase or decrease the Permeate Line Cell in increments of .05 to increase or decrease the Permeate Quality.
13. When complete a "Done" message will appear.
14. Press the Back button until the Welcome Screen is displayed.
15. Repeat these procedures until the Permeate Quality displayed is within 5% of the hand-held meter reading. Log the calibration date in the facility's daily journal.



Note

1. The unit has no serviceable parts. Should one of the components identified as a spare part in **Sections 11.2.1 & 11.2.2** then refer to **Section 9.3** for details on how to remove and replace them.
2. If an item fails that is not listed in the above sections then contact **AmeriWater** for assistance.
3. **AmeriWater** will make available upon request any relevant circuit diagrams, component parts list, calibration instructions or other information necessary that will assist approved/trained service personnel to repair the equipment.

9.3 Unplanned minor maintenance and repairs



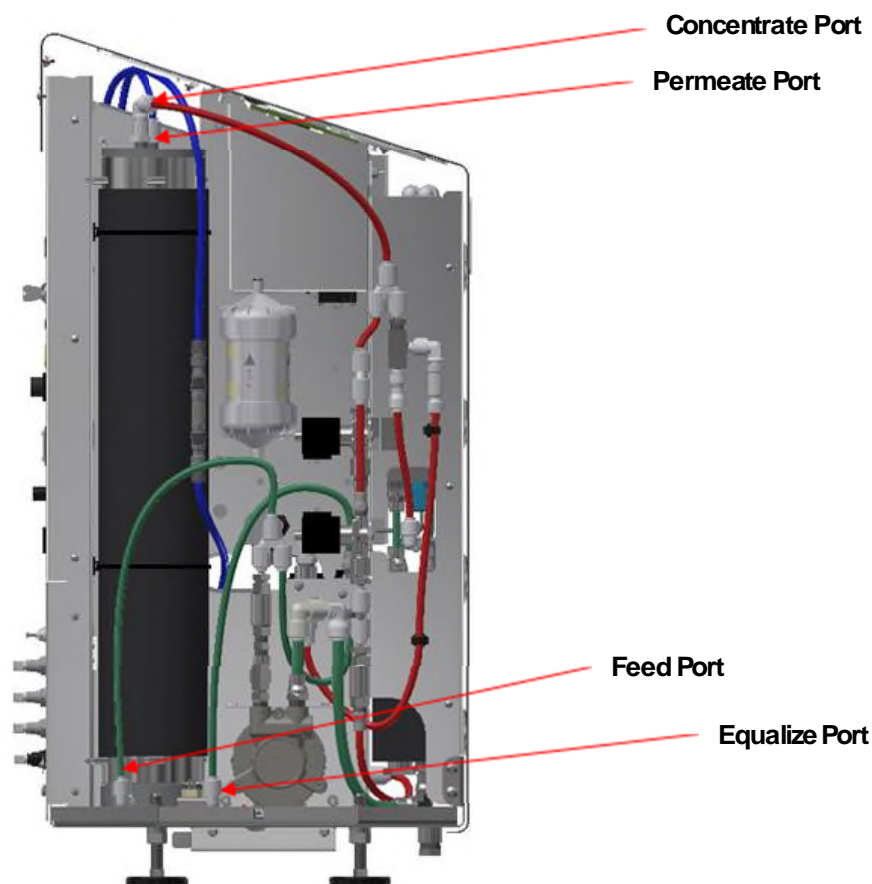
Warning:

1. It is advised that following any repair an electrical safety check on the unit should be carried out, Refer to **Section 9.1.1** for details.
2. When carrying out any repairs ensure that there is no risk to yourself, patients or bystanders.
3. Only carry out the repair if you are authorised and trained to do so.
4. Only use approved spare parts as detailed in **Section 11.2**.
5. Before using the equipment following any repair work always carry out the Pre-dialysis checks as detailed in **Section 9.6**.

9.3.1 Replacement of RO Membrane

(Spare Part no. RR017015)

1. Stop the Centurion if the system is in operation.
2. Power down the Centurion using the switch on the rear of the RO.
3. Unplug the Centurion from the electrical supply and isolate the feed water supply from the RO.
4. Remove the left side (when viewed from front) panel using a small hex key and place the panel along with each of the screws in a safe location.
5. Place a rag around the bottom of the membrane before removing tubing connections to absorb water spilled from the membrane housing.
6. Remove each of the 4 tubing connections from the RO membrane by pressing the small release ring and pulling the tubing out. Water will drain from the bottom 2 ports. Excess water in the lower pan of the Centurion may be removed by removing the drain in the front of the unit and tipping the unit forward to allow the water to drain.



7. Carefully remove the cable ties securing the RO membrane using a small flat head screwdriver. These will be reused to reinstall the RO membrane. Replacement cable ties can be purchased under AMW PN 999-3648.

8. Remove the membrane housing from the Centurion once the cable ties have been removed.
9. With the membrane housing removed, note the top and bottom of the housing.
10. Remove the top and bottom membrane cap from the vessel by removing the U-Shaped pin from the vessel and carefully removing the cap. **DO NOT PULL ON THE PLASTIC FITTINGS TO REMOVE THE CAP.**
11. Remove the old membrane from the vessel. Note the orientation of the Brine seal in the vessel.
12. Clean all of the O-rings on the end caps and lubricate with a small amount of O-ring lubricant.
13. Unpack the new membrane (lubricant included in package) and lubricate the Brine seal. Insert the membrane into the feed side of the vessel with the Brine seal opening toward the feed (bottom) side of the vessel.



14. Reinstall the membrane vessel caps and U-shaped pins in the same location as they were removed.
15. Reinstall the membrane into the Centurion and secure the housing to the chassis using the existing cable ties.
16. With the membrane vessel reinstalled, power on the Centurion and reapply water to the system.
17. Navigate to menu>engineer menu>setup>boost pump speed>processing speed and turn the pump speed down to 50%.
18. Turn on the Centurion and allow the membrane to operate at low pressure for 5 minutes.
19. After 5 minutes, shut the Centurion off and return the boost pump speed to the factory default setting of 80% (return to previous value if not 80%).
20. Allow the Centurion to operate and discard the first hour of product water.
21. Perform a Heat disinfection of the system before returning it to service and obtain a product water sample for AAMI analysis.

9.3.2 Replacement of RO boost pump

(Spare Part no. M998005)

1. Ensure unit is in “**Power On**” mode.
2. Turn the unit off by using the rear isolation rocker switch, ensure switch is in the “**O**” position and then isolate the unit from the electrical mains supply by removing the power cord from the wall socket or from the connection at the rear of the unit.
3. Turn off the incoming water supply to the unit.
4. Remove the left hand side cover and store safely.
5. Disconnect the 8mm tubing from the “tee” connector located on the outlet side of the pump head.
6. Disconnect the 12mm tubing from the inlet connector
(NB: you may require a suitable container to collect any water loss when disconnecting this tubing. Refer to **Section 14.1 “How to use the push-fit connectors”**, for details on how to remove tubing from the push fit connectors).
7. Unscrew the 4 off nuts located at the rear of the pump bracket that secure the bracket to the anti-vibration mounts.
8. Withdraw the pump and bracket assembly from the chassis until you can gain access to the pump power cord.
9. Remove the waterproof sleeve and disengage the white power cord connectors from one another.
10. To remove the pump, from the bracket unscrew the 4 off retaining bolts.
11. Refit the new pump to the bracket.
12. Slide the waterproof sleeving supplied with the new pump onto the power cord and reconnect. Ensure the sleeving completely covers the power cord connector blocks.
13. Locate the bracket back onto the anti-vibration studs and secure.
14. Remove the three red blanking plugs from the pump’s inlet/outlet and refit the water tubes.
15. To check the new pumps operation, with the side cover still removed, turn on the water supply and switch on the mains power supply to the unit by selecting the “**I**” position on the rear isolation switch.
16. Select “**START**”, the unit should run, it may require several restarts as the unit refills with water. Once running continuously checks around the water connections for any leaks.
17. Finally refit the side cover.
18. If required dispose of the pump according to the instructions in **Section 14.2 “E-Waste”** or **Section 11.3** if the pump requires further investigation as to its failure.

9.3.3 Replacement of inlet solenoid

(Spare Part no. M998002)

1. Ensure unit is in **“Power On”** mode.
2. Turn the unit off by using the rear isolation rocker switch, ensure switch is in the **“O”** position and then isolate the unit from the electrical mains supply by removing the power cord from the wall socket or from the connection at the rear of the unit.
3. Turn off the incoming water supply to the unit.
4. Remove the left hand side cover and store safely.
5. Locate the inlet valve (see drawing) and remove the solenoid coil by unscrewing the central retaining screw.
6. Next remove the valve support bracket from the main chassis by unscrewing the two securing bolts located underneath the valve.
7. Remove the support bracket from the valve.
8. With the aid of the tubing release tool disengage the inlet and outlet tubing from the valve fittings.
9. Reconnect the tubing to the new valve assembly making sure the valve is fitted in the correct flow direction.
10. Re-attach the support bracket and reinstall the assembly on the main chassis.
11. To check for leaks reinstate the power and water supplies and run the unit for at least 15 minutes. If satisfactory, replace the side cover.
12. Refer to **Section 14.2** for disposal of the valve or **Section 11.3** if the valve requires further investigation as to its failure.

9.3.4 Replacement of drain valve solenoids #1 & #2)

(Spare Part no. Drain Valve #1:- M998003
 Drain Valve #2:- M998010)

1. Ensure unit is in **“Power On”** mode.
2. Isolate from mains power supply using the rear isolation rocker switch, ensure switch is in the **“O”** position.
3. Turn off the incoming water supply to the unit.
4. Locate the inlet valve (see drawing) and remove the solenoid coil by unscrewing the central retaining screw.

9.3.5 Replacement of the chemical draw valve

(Spare Part no. M998001)

1. Ensure unit is in **“Power On”** mode.
2. Isolate from mains power supply using the rear isolation rocker switch, ensure switch is in the **“O”** position.
3. Turn off the incoming water supply to the unit.

9.3.6 Replacement of the permeate valve

(Spare Part no. M998004)

1. Follow the same procedure as detailed in Section 9.3.2

9.3.7 Replacement of the blend valve

(Spare Part no. M998009)

1. Follow the same procedure as detailed in Section 9.3.2

9.3.8 Replacement of the equalize valve

(Spare Part no. M998008)

1. Ensure unit is in “**Power On**” mode.
2. Isolate from mains power supply using the rear isolation rocker switch, ensure switch is in the “**O**” position.
3. Turn off the incoming water supply to the unit.

9.3.9 Replacement of the turbine flow sensor

(Spare Part no. M998006)

1. Ensure unit is in “**Power On**” mode.
2. Turn the unit off by using the rear isolation rocker switch, ensure switch is in the “**O**” position and then isolate the unit from the electrical mains supply by removing the power cord from the wall socket or from the connection at the rear of the unit.
3. Turn off the incoming water supply to the unit.
4. Remove the left hand side cover.
5. Locate the flow sensor (see drawing) and remove the electrical connector by unscrewing the central retaining screw.
6. With the aid of the tubing release tool disengage the inlet and outlet tubing from the flow sensor fittings.
7. Reconnect the tubing to the new assembly making sure the sensor is installed in its correct flow direction.
8. To check for leaks reinstate the power and water supplies and run the unit for at least 15 minutes. If satisfactory, replace the side cover.
9. Refer to **Section 14.2** for disposal of the old assembly or **Section 11.3** if the flow sensor requires further investigation as to its failure.
10. There is no requirement to re-calibrate the new flow sensor.

9.3.10 Replacement of Internal electrical box fuses

(Spare Part no. R082006)

Note: It is advised that irrespective of which fuse has failed that both fuses are replaced at the same time.
--

1. Ensure unit is in “**Power On**” mode.
2. Turn the unit off by using the rear isolation rocker switch, ensure switch is in the “**O**” position and then isolate the unit from the electrical mains supply by removing the power cord from the wall socket or from the connection on the rear of the unit.
3. Turn off the incoming water supply to the unit.
4. Remove the left hand side cover.
5. Locate the fuses (see drawing).
6. To remove a fuse from its holder simply unscrew the black cap by inserting a suitably sized flat ended screwdriver into the slot on the fuse holder cap and turning

anti-clockwise. Once fully unscrewed withdraw the holder to expose the small cartridge type fuse.

7. Remove the fuse from its holder and replace with a new one, always check that the replacement fuse is off the correct rating. See **Section 12.1.2** for details of fuse ratings. Repeat for the second fuse.

8. When both fuses have been replaced refit the side cover. If the initial fault still persists refer to **Section 10.1.4**.

9.3.11 Replacement of the external fuses

(Spare Part no. R082025)

1. Ensure unit is in “**Power On**” mode.

2. Turn the unit off by using the rear isolation rocker switch, ensure switch is in the “**O**” position and then isolate the unit from the electrical mains supply by removing the power cord from the wall socket or from the connection on the rear of the unit.

3. Turn off the incoming water supply to the unit.

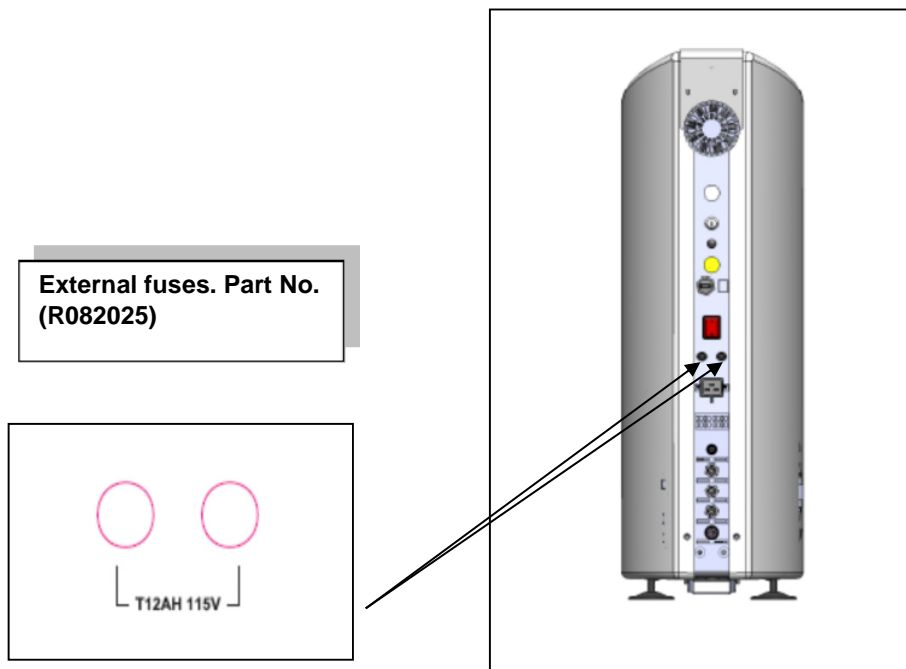
4. Locate the fuses (see drawing).

6. To remove a fuse from its holder simply unscrew the black cap by inserting a suitably sized flat ended screwdriver into the slot on the fuse holder cap and turning anti-clockwise. Once fully unscrewed withdraw the holder to expose the small cartridge type fuse.

7. Remove the fuse from its holder and replace with a new one, always check that the replacement fuse is off the correct rating. See **Section 12.1.2** for details of fuse ratings. Repeat for the second fuse.

8. When both fuses have been replaced check the operation of the unit. If the initial fault still persists refer to **Section 10.1.4**.

Location of external fuses



Replacing the main PCB lithium battery

(Spare Part No. R083349)

Note: The battery has a five year life, but **AmeriWater** recommend that it is replaced every three years.

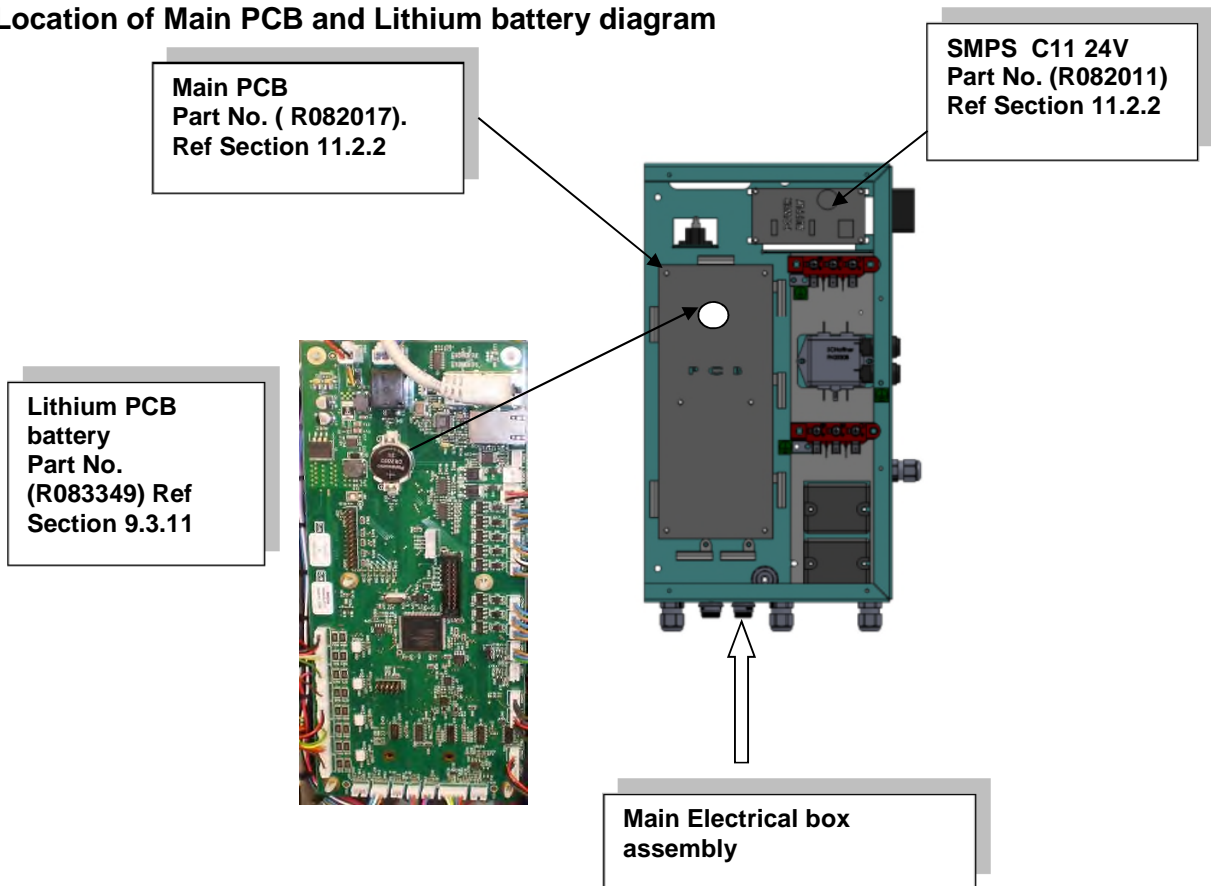
1. Ensure unit is in “**Power On**” mode.
2. Turn the unit off by using the rear isolation rocker switch, ensure switch is in the “**O**” position and then isolate the unit from the electrical mains supply by removing the power cord from the wall socket or from the connection on the rear of the unit.
3. Turn off the incoming water supply to the unit.
4. The battery is located within the main PCB which is accessed via removal of the right hand side cover. (See “*location of main PCB and Lithium battery diagram*”)
5. Using a cross head screwdriver remove the retaining screws that secure the lid of the electrical box.
6. Once removed the battery can be clearly seen on the main PCB, prise the battery out of its holder.
7. Refit the new battery ensuring the, (+) positive side is facing upwards, the battery should be pressed gently until the four clamps in the retainer “snap” over the battery fully. Refer to **Section 12.1.3** to check details of battery before fitting.
8. Dispose of the old battery according to guidelines in **Section 14.2**.
9. Refit electrical box cover and right hand side cover.
10. Reinststate the mains power supply and check the operation of unit.



Warning:

Incorrect fitting of the battery could cause irreversible damage to the main PCB. Ensure the **(+) positive** side of the battery is facing upwards. Always use the recommended battery, Part No. R083349. The battery has a five year life, but **AmeriWater** recommend that it is replaced every three years.

Location of Main PCB and Lithium battery diagram



9.3.12 Uploading new software

1. With power applied to the unit, disable any Standby options that may be selected as Enabled (Make a note of the original selections so they can be restored after programming):
 - a. Select MENU – Standby – Power On – ENTER. Select the Disabled option if not already selected – ENTER
 - b. Select – Timed – ENTER. Select the Disabled option if not already selected – ENTER
2. With the power to the unit removed, connect the Memory Stick loaded with the appropriate three files into the units USB connector. This connector is located on the rear panel.
3. Apply mains power to the unit.

Select MENU–System Menu–Data Transfer–Clear Logger–ENTER–YES.
Press the BACK button until the POWER-ON / WELCOME screen is displayed.

4. Select MENU–Systems Menu–Engineer Menu (enter PIN)–Software Update

- a. Select Update Display–ENTER-YES. The Display file should now start loading.
 - b. When the POWER-ON / WELCOME screen is displayed (ignore any 'Communication Error' message), remove the mains power from the unit.
 - c. After approximately 10 seconds re-apply the power.
5. Select MENU–Systems Menu-Engineer Menu (enter PIN)–Software Update.

Select Update GUI–ENTER-YES. The Graphic files should now start downloading. When the POWER-ON / WELCOME screen is displayed (ignore any 'Communication Error' message), remove the mains power from the unit.

After approximately 10 second re-apply the power.

6. Select MENU–Systems Menu-Engineer Menu (enter PIN)–Software Update.
 - a. Select Update Controller–ENTER-YES (Note: this file will take several minutes to load).
 - b. When the POWER-ON / WELCOME screen is displayed (ignore any 'Communication Error' message), remove the mains power from the unit.
7. Wait approximately 10 seconds then remove the Memory Stick from the unit.
8. Apply mains power to the unit.

Check that the correct files have successfully loaded:

- a. Select MENU–System Menu-Product Information
 - b. Check that the data presented in the following fields matches the data on the relevant Software Release Note.
 TYPE:
 UNIT VERSION:
 POD VERSION:
 MEMORY CHECKSUM
9. Press the BACK button several times until the POWER-ON / WELCOME screen is displayed.

The re-programming is now complete.

10. If necessary re-enable the Standby options that have been Disabled as appropriate:
 - a. Select MENU – Standby – Power On – ENTER . Select Enabled, if previously enabled – ENTER

- b. Select MENU –Timed – ENTER. Select Enabled, if previously enabled – ENTER
11. Press the BACK button several times until the POWER-ON / WELCOME screen is displayed

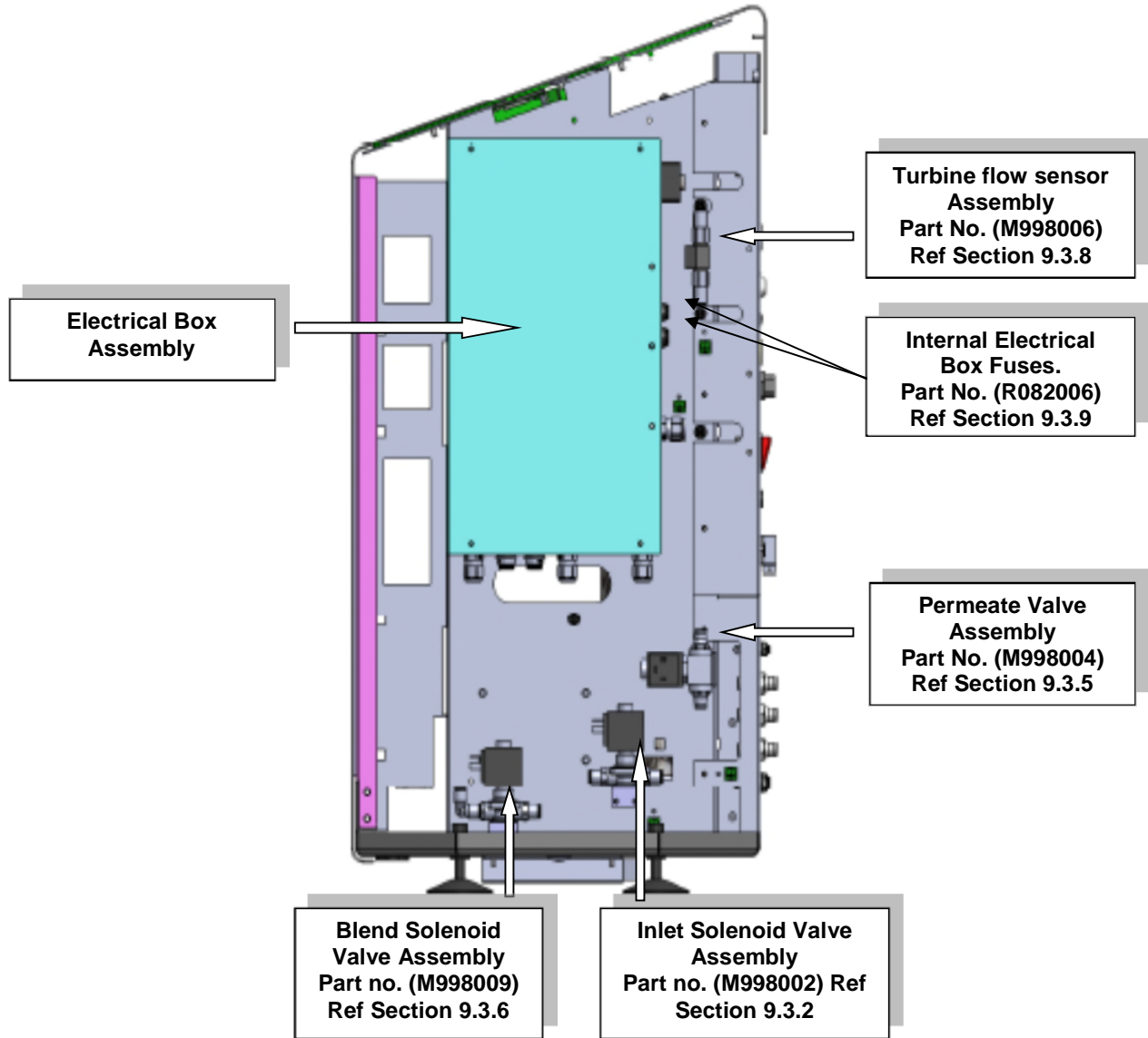
9.3.13 Removing and replacing the main lead

Spare Part No. (Fixed installation) R082008

Spare Part No. (Non-fixed installation) R082007

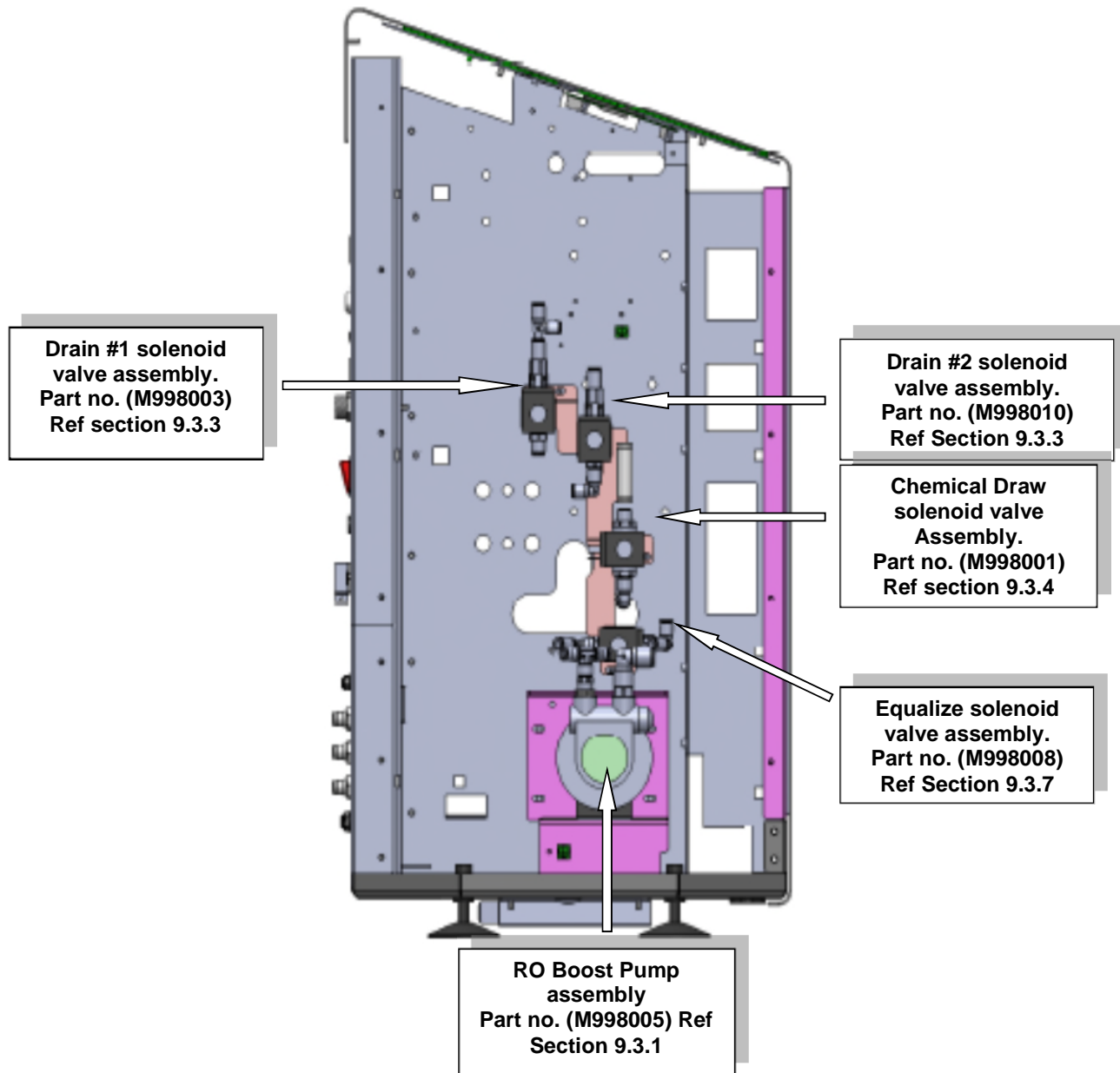
1. For fixed installation a qualified electrician must disconnect the lead from the wall socket. For non-fixed installations the lead is supplied with a plug which can be simply disconnected from the wall socket. The procedure below relates to (Fixed installation).
2. Switch the unit off using the rocker switch at the rear of the unit and isolate from the mains supply via circuit breaker or other isolation device.
3. Turn off the water supply.
4. To disconnect the plug end at the unit unscrew the securing connecting clamp. Once unscrewed pull away the plug.
5. Push the plugged end of the new lead into the rear socket on the unit. Attach the clamping device and secure by tightening the two retaining screws. When secure gently pull on the cord to ensure it is fully retained.
6. Re-wire the other end of the lead into the wall socket.
7. Before operating the unit an electrical integrity check should be carried out to check the safety of the unit.

9.4 Location of spare parts



(Right hand side view of Centurion 1500+)

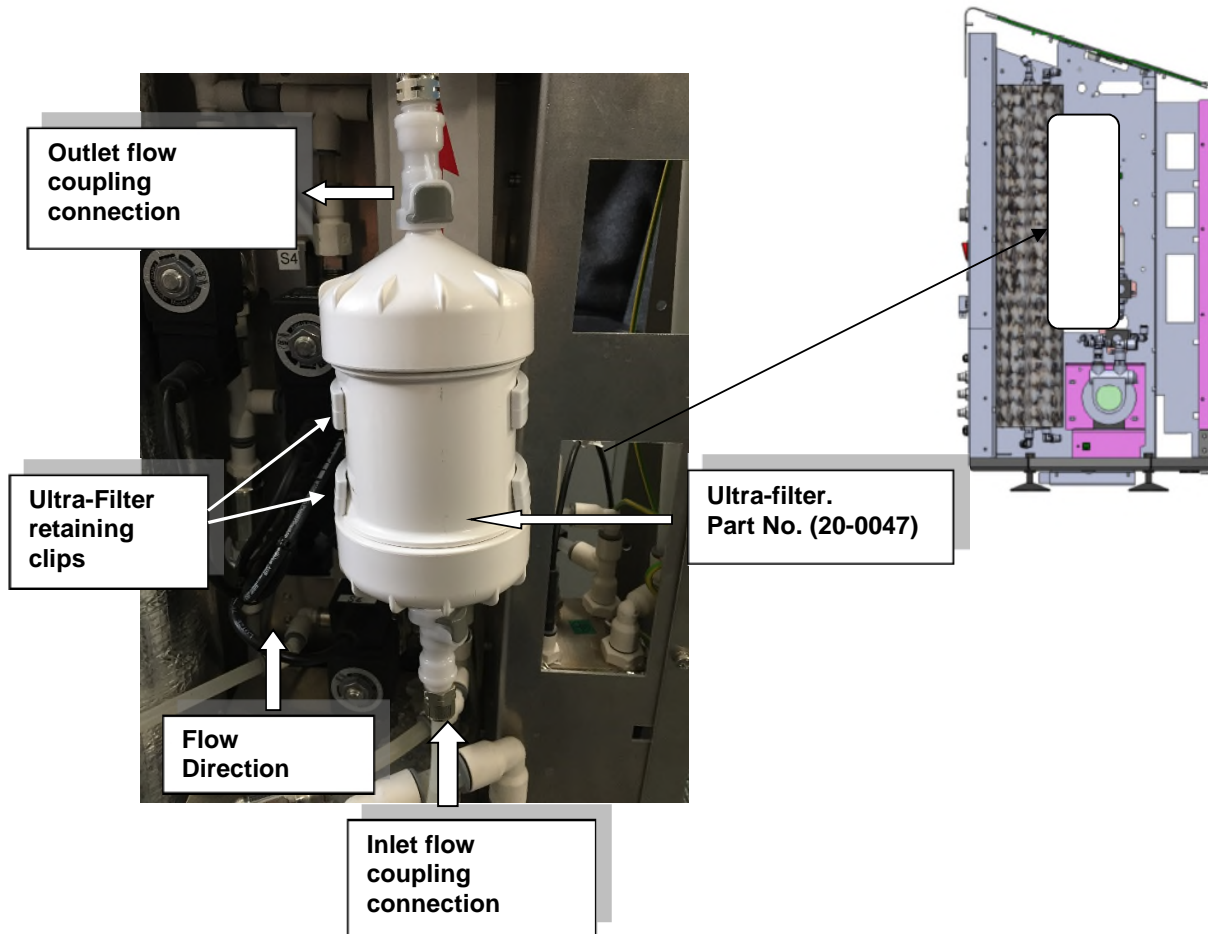
Location of spare parts.....Cont.



(Left hand side view of Centurion 1500+)

9.5 Replacement of consumables

9.5.1 Removal and replacement of the Ultra-filter



1. Ensure unit is in “**Power On**” mode.
2. Turn the unit off by using the rear isolation rocker switch, ensure switch is in the “**O**” position and then isolate the unit from the electrical mains supply by removing the power cord from the wall socket or from the connection on the rear of the unit.
3. Turn off the incoming water supply to the unit.
4. Remove the left hand side cover by removing the two rear retaining screws.
5. Gently pull the Ultra-filter from the two black retaining clips and move away from the unit.
6. Disconnect the inlet and outlet flow couplings by pulling back the outer retaining sleeves and gently pulling apart.

Note: There will be some water loss from the Ultra-filter as it is disconnected so ensure you have a suitable container to collect any spillages.

7. Dispose of the used Ultra-filter device in accordance with local disposal requirements.
8. Remove the new Ultra-filter element from its packaging and place filter in bracket.
9. Reconnect both couplings.
10. Reinstall the water and power supplies to the unit. Restart the unit and run for 10-15 minutes to check for any water leaks.
11. If there are no leaks refit the side cover.

Note: When handling the new Ultra-filter element we recommend the wearing of protective gloves to prevent any contamination.
Following installation of the new filter we recommend that the unit is heat sanitised.

9.5.2 Consumable replacement frequency

The Ultra-filter should be replaced every 6 months, based on typical usage of dialysing 3-4 times per week, 4-5 hours per session. See **Section 8.2** for more detail.

9.6 Pre-Dialysis checks

Following any repair/servicing, maintenance or prior to each dialysis session or following storage of the unit It is recommended that the following checks are carried out

- Check that the electrical mains lead is securely clipped in place on the unit and at the wall socket and that the lead is not damaged or likely to cause anyone to trip over it.
- All the water connections are in place, not kinked and show no signs of leaks.
- The “**Blue**” water tubing is connected to the “**In/Entrée**” port, the “**Black**” water tubing is connected to the “**Drain**” port.
- The water supply is turned on.
- There are no warning messages displayed on the touch-screen. (Refer to **Section 10, “Troubleshooting”** if any messages are displayed.
- The unit sounds and runs quietly, if the unit sounds un-usually noisy or you are concerned about its operation refer to **Section 10 “Troubleshooting”** for guidance.
- The unit has been signed off as safe for use by an approved person.

- Check the conductivity of the purified water using an independent conductivity meter. Ensure that the quality is acceptable.
- There are no signs of any leaks.



Warning:
Do Not start dialysing if the unit appears to have a fault.

9.7 Cleaning external surfaces

Use a clean damp cloth to wipe the exterior surface of the unit. Take care not to get excess liquid on the control panel areas.

Do not use any solvent-based cleaners on the covers or front display. To remove more persistent marks and to disinfect surfaces, you should be provided with suitable surface disinfectants by your Healthcare provider. If unsure ask, or contact **AmeriWater** for advice.

Take the necessary precautions when wiping up any bodily fluids.

Note: The unit has an IP rating =21, refer to **Section 12.1.4** for details

9.8 Storage and preservation recommendations

Use the guide below to determine the best method to store your unit if it is not be used for any length of time.

Note: To reduce the risk of water loss if the unit is to be left unattended without the standby option enable it is advised to turn off the incoming water supply and isolate the unit from the mains electrical supply by either removing the power cord from the wall socket or disconnecting at the rear of the unit.

Time not in use		Recommendations
Up to 1 month	Short term storage	Ideally the unit should be left in Power-On Standby mode such that it will run for 10 minutes every 2 hours. If the unit is to be left ensure the room temperature does not fall below freezing point, 32°F. On starting the unit up after standing run for 10 minutes disconnected from the dialysis machine and carryout a heat disinfection.
>1 month up to 3 months	Medium	Either maintain the unit in the mode above or decommission and preserve the unit with 10%w/v Sodium metabisulphite solution. Before use ensure that the preservative has been fully rinsed out. Following rinsing of the preservative solution carryout a heat disinfection cycle.
>3 months- 6 months+	Long Term	<p>If the unit cannot be operated above then it is recommended that the following storage /preservation procedure is applied.</p> <ol style="list-style-type: none"> 1. Run preservative solution through the unit then drain the unit fully. 2. Remove the RO membrane 3. Remove the UF filter (if fitted) 4. Seal the unit in a plastic bag and store in its original packaging (if present) 5. When the unit is recommissioned refit new RO membrane/UF, run for 1 hour and then perform a heat sanitisation cycle. 6. Carry out electrical safety check (see Section 9.1.1)

10.0 TROUBLESHOOTING



Warning:

There are several safety features built into the controls of the unit and they are designed to protect the unit from damage and to warn of any malfunction.

Pay attention to warning messages and follow the instructions, warnings, cautions and notes given in this manual

If the unit develops a fault, follow the instructions in **Section 6.2.3** to shut the unit down safely and in a controlled manner.




In the event of an emergency follow the instructions in **Section 3.7** to shut the unit down quickly.






Once the unit has been safely shut down and the water supply turned off, make a note of any messages that were displayed on the screen as these may be helpful in diagnosing the fault.






If the fault cannot be rectified or is outside the scope of this manual then refer to **AmeriWater** or their local approved distributor for advice.






10.1 Troubleshooting Guide





10.1.1 Warning & alarm messages (Processing Mode)

Displayed Message or notification	Reason	Checks	Proposed Actions
 "Tank Low Level"	The internal water break tank has insufficient water to run the unit.	1. Make sure the feedwater supply is turned, flowing and within the pressure range specified. 2. Check for restriction in the inlet solenoid or flow restrictor up stream of the break tank.	1. If the feedwater supply is not a problem and the unit still does not run due to insufficient make up flow, remove and check the inlet solenoid and flow restrictor for any possible restrictions.
 "High Pressure"	The unit has detected an unsafe operating pressure.	1. There are no checks to made, simply switch the unit off using the switch at the rear and turn off the water supply.	1. DO NOT try to run the unit in this condition, contact AmeriWater for assistance.
 "Low Pressure"	The unit has detected insufficient pressure to operate.	1. Check that the feedwater is still flowing. 2. Check that there are no leaks. 3. Check for any other messages on the display.	1. If the checks do not show any problems, press the "Start" button after a few minutes, if the pressure in unit has returned to normal the unit will run. If the message returns then switch the unit off, turn off the water supply and contact AmeriWater for advice.

	"Perm-Line Cell Error"	The unit has detected a fault with the meter measuring the water quality.	1. There are no checks to be made.	1. For safety the unit will have stopped running as the quality of water being produced cannot be monitored accurately. Contact AmeriWater for advice.
	"Temperature High"	The water being produced has a temperature above the entered set point of 95 Deg F	1. Check the temperature of the incoming water supply. 2. Check that the unit is not next to a source of heat, eg, radiator or room heater. 3. Check that the unit is in "Processing" mode.	1. If the feedwater has a high temperature, investigate or change supply. 2. Remove any local external heat source. 3. If the problem persists contact AmeriWater for advice.
	"Temperature Sensor Error"	There is a fault with the temperature sensor.	1. Make a note of any other messages displayed on the screen.	1. The unit can still be operated but if the fault persists contact AmeriWater before you next dialyse or carryout a heat disinfection.
	"Level Switch Error"	The unit has detected a problem with the level sensors in the internal water break tank.	1. Ensure the unit has no other displayed messages. 2. Check the unit is level and not tilted over.	1. To prevent the possibility of water leakage due to the internal tank overflowing for safety it will have stopped running. 2. No other warning messages are displayed and the unit appears to be as normal but the problem persists, call AmeriWater for assistance.
	"Water leak"	The leak detector in the bottom of	1. The unit has developed an	1. If the unit has been toppled some water may have

	<p>the unit has detected water. The unit will stop running and the buzzer will sound.</p>	<p>internal leak, check that the unit is upright and level and has not been recently toppled or knocked.</p> <p>2. Check to see if water is leaking from the unit at a constant rate.</p> <p>3. Check for excessive feedwater pressure causing splashing.</p>	<p>overflowed from the internal water break tank. Drain the water off from the unit. At the front underside of the unit is a black drain plug, unscrew the plug and let any water drain from the unit Then press “Start”.</p> <p>2. If draining the unit does not clear the message call your Healthcare provider.</p> <p>3. If the unit is losing a lot of water turn of the water supply and contact AmeriWater for assistance.</p>
	<p>“Tilt”</p>	<p>The unit has been moved or knocked whilst running to such an extent that the internal tilt switch has been activated.</p>	<p>1. Check that the unit is upright and standing on a firm flat surface.</p> <p>2. Make sure that there is nothing located near the unit that might knock it .</p> <p>3. Check that the unit is not placed next to a door or could be knocked over by children or pets.</p>
		<p>1. Check that the unit is upright and standing on a firm flat surface.</p> <p>2. Make sure that there is nothing located near the unit that might knock it .</p> <p>3. Check that the unit is not placed next to a door or could be knocked over by children or pets.</p>	<p>1. At the front underside of the unit is a black drain plug, unscrew the plug and let any water drain from the unit, then with the unit upright and all potential hazards removed, switch the unit off and on using the on/off power switch at the back of the unit, the unit should now run. If not and the message remains call AmeriWater for advice.</p>
	<p>“Reset Error”</p>	<p>The unit has switched on and off more than 3 times in one minute.</p>	<p>1. Make sure the mains electrical lead is secure at the connection to the unit at the wall socket.</p> <p>2. Check that you’re household circuit breaker has not tripped out or has a fault.</p> <p>3. Are you experiencing power cuts to your property?</p> <p>4. Is the unit being serviced and the Engineer has switched the unit off many times to repair a fault.</p>
		<p>1. Ensure that the mains electrical lead is secure and fixed.</p> <p>2. Check the condition of your circuit breaker and any other household appliances being used. This may have to be carried out you’re your Healthcare provider.</p> <p>3. Check with your local power company if they are experiencing any power losses in your area.</p> <p>4. If the problem persist and none of the above are the cause then contact AmeriWater for assistance.</p>	
	<p>“Feed-Line Cell Error”</p>	<p>The unit has detected a fault</p>	<p>1. Check that there are no other</p> <p>1. Contact AmeriWater and give them the details of all</p>

		with the line cell used to measure the quality of the incoming feedwater supply.	displayed alarm messages, if there are make a note of them.	messages displayed in order for them to diagnose the problem and advise you if the unit can be operated with this fault.
	"Clean Due"	The time period set by your Healthcare provider for the next chemical clean has expired and the unit now requires a chemical clean.	No checks required.	If you are trained and approved to do so carryout a chemical clean on the unit at the next convenient time.
	"HeatSan Due"	The time period set by your Healthcare provider for the next Heat disinfection has expired and the unit now requires full heat disinfection.	No checks required.	If you are trained and approved to do so carryout a heat disinfection on the unit at the next convenient time.
	"Service Due"	The unit has detected that the quality of the water being produced by the unit has exceeded the set limit.	<ol style="list-style-type: none"> 1. Using the touch screen check the water conductivity reading. 2. Check that the feedwater complies with the requirements as detailed in Section 12.1.7. 	<ol style="list-style-type: none"> 1. If the water quality does not recover contact AmeriWater for advice.
				
	"Poor Water Quality"	The unit has detected that the		

	<p>quality of the permeate water is above 200µS/cm</p>	<p>Refer to “Service Due” message previously detailed. Note: Should the permeate quality reach a value of 200 µS/cm for a period of more than 20 seconds, the flow will be interrupted and returned to the integral tank.</p>	<p>If the water quality does not recover contact AmeriWater for advice.</p>
 <p>Poor Permeate Quality”</p>	<p>The unit has failed to recover the water quality back to acceptable limits and has as a matter of safety shut down.</p>	<p>Refer to “Poor Water quality”. If after 10 minutes the quality does not improve and remains above 100 µS/cm the unit will shut down and display the ‘Quality Alarm’. Should the quality fall below 100 µS/cm, within 10 minutes the unit will return to normal operation.</p>	<p>If the water quality does not recover contact AmeriWater for advice.</p>
	<p></p>	<p></p>	<p></p>
 <p>Over Temperature</p>	<p>During heat disinfection the unit has detected a temperature of the circulating water that is above the maximum limit and has aborted the cycle for safety.</p>	<p>1. The fault may lie with the heater, circulating pump or one of the temperature sensors. Only your Healthcare provider can check these items. 2. To help check to make sure that the unit’s ventilation fan is not obstructed or the unit covered by anything and placed in a well ventilated area at ambient temperature away from any heat sources.</p>	<p>1. Advise your Healthcare Provider immediately, do not try to carry out another heat disinfection cycle.</p>
<p></p>	<p></p>	<p></p>	<p></p>



indicates that a buzzer will sound

10.1.2 Electrical & mechanical faults

Observed Fault	Reason/s	Checks	Proposed Actions
The unit will not switch on and the screen is blank.	<ol style="list-style-type: none"> 1. The mains incoming power supply has been disconnected. 2. The circuit breaker or other isolation device in your house has tripped out. 3. The power cord on the unit has become disconnected from either the unit or the wall socket. 4. The unit has developed a fault that requires assistance from your Healthcare provider. 5. Either the Internal or External fuses have "blown" 	<ol style="list-style-type: none"> 1. Check that your area is not experiencing power cuts. 2. Check to see if the circuit breaker or other isolating device in your house has tripped and check other household appliances being used as they may be responsible for interrupting the power supply. 3. Check that the power cord is secure at both ends and check that it has not been damaged or cut. 	<ol style="list-style-type: none"> 1. If checks 1 – 3 have not proved to be the cause then contact AmeriWater for advice. DO NOT attempt to fix the fault or remove the side covers. 2. Check Internal and External fuses and replace if required.
There is insufficient flow to run the dialysis machine.	<ol style="list-style-type: none"> 1. A fault has occurred with the unit that has either stopped the unit or intermittently interrupts the production of purified water. 2. The incoming mains water supply has been cut off or has reduced pressure. 3. If fitted an external pre-treatment filter may have become blocked. 4. The reverse osmosis membrane may have become blocked or fouled. 5. The incoming feedwater supply temperature has dropped significantly. 6. One of the internal pressure sustaining valves may be incorrectly set or at fault. 	<ol style="list-style-type: none"> 1. Check for any displayed warning or alarm messages. Make a note of any displayed and refer to Section 9.2.1 for details. 2. Check your tap water to see if it is still running at a rate that seems to be normal and at an expected pressure. 3. If any pre-treatment filters or devices are fitted check to see if there are any leaks or faults. By disconnecting the feed water to the unit, there should be a flow after the pre-treatment equipment. 4. Check when the last time the unit was chemically cleaned and make a note of the date. 5. Only during extreme winter months would reduced water temperature be an issue. 	<ol style="list-style-type: none"> 1. If the unit is not showing any displayed messages but the problem persists carry out the checks 2-5. If any of the checks reveal a fault or you are not sure of what you have seen or feel the unit should be cleaned then contact AmeriWater with all the details and they will assist you. 2. If the fault is not related to items 1-5 then it may be due to the internal pressure sustaining valves, contact your Healthcare provider for assistance
The unit will not run when pressing the "START" button	<ol style="list-style-type: none"> 1. The key switch at the rear of the unit is in the "CLEAN" position or there is a fault with the key switch itself. 	<ol style="list-style-type: none"> 1. Check the position of the key at the rear of the unit. 	<ol style="list-style-type: none"> 1. Turn the key to the "SERVICE" position. If the key is in the correct position and the unit still does not run, contact your Healthcare provider.

10.1.3 Water quality non-compliance

Non-compliance	Possible causes	Checks	Proposed actions
Bacterial count and/or Endotoxin levels in dialysis water exceed recommended guidelines	<ol style="list-style-type: none"> 1. Period between chemical disinfection/clean too long. 3. Increase in bacterial levels in feedwater. 4. Unit left for long periods idle. 5. RO membrane damaged. 6. Contaminated sample or poor sampling technique. 	<ol style="list-style-type: none"> 1. Refer to Section 10.1 for recommendations regarding frequency of chemical disinfection/clean. 3. Obtain samples of feedwater for analysis and/or contact local water supplier for updates on water quality. 4. Refer to Section 9.4 "Storage and preservation" for guidance when not using the unit. 5. Refer to section 10.6 "Pre-dialysis checks" to assess RO membrane performance. 6. Repeat analysis to confirm result. 	<ol style="list-style-type: none"> 1. It will be the responsibility of your healthcare provider to carry out these checks and diagnose the problem/s and rectify any faults founds. DO NOT use the unit if the water quality is unacceptable until you are told to do so by your Healthcare provider.
Dialysis water quality: One or more of the Chemical contaminants exceed their permitted maximum concentration	<ol style="list-style-type: none"> 1. Excessive increase in concentration of contaminant/s in feedwater. 2. RO membrane damaged 3. Contaminated sample or poor sampling technique. 4. Malfunction of pre-treatment system 5. Recommended Chemical clean frequency not being followed or change in chemical cleaner required. 	<ol style="list-style-type: none"> 1. Obtain sample of feedwater to assess level of contaminants. Contact local water authority if outside standards for drinking water. 2. Refer to section 10.6 Pre-dialysis checks to assess performance of RO membrane. 3. Repeat samples to confirm levels. 4. Check pre-treatment is functioning correctly. 5. Refer to Section 10.1 for detail of chemical clean frequency. 	<ol style="list-style-type: none"> 1. It will be the responsibility of your healthcare provider to carry out these checks and diagnose the problem/s and rectify any faults founds. DO NOT use the unit if the water quality is unacceptable until you are told to do so by your Healthcare provider.

11.0 CONSUMABLES AND SPARES

11.1 Consumables

Consumable Part no.	Description
20-0047	Ultra-filter (Refer Note 1)
AmeriClean A	Refer Note 2
AmeriClean B	Refer Note 2
Peracidin	Refer Note 2

Notes:

1. Only applicable to L998374 **Centurion 1500*UF** model*.
2. Refer to, “**Chemical cleaning and heat disinfection instructions**”, **Section 4** for details.

*Refer to **Section 9.5.1** for details on how to replace the Ultra-filter and **Section 9.5.2 & 8.2** for recommended replacement frequency.

11.2 Recommended spares list

11.2.1 Minor spares listing

The minor spares listing has been classified as those spare parts that can be removed and replaced in less than 1 hour, that require minimal retesting, are low risk and can be carried out by a trained/authorised technician without reference to **AmeriWater**.

*Instructions on how to replace/refit these items can be found in **Section 9.3** “Unplanned minor maintenance and repairs”.

Part No.	Part Description	Contain a batch controlled component Y/N
RM998001*	Chemical draw valve assembly	Y
RM998002*	Inlet valve assembly	Y
RM998003*	Drain#1 valve assembly	Y
RM998004*	Permeate valve assembly	Y
RM998005*	RO boost pump assembly	Y
RM998006*	Turbine flow assembly	Y
RM998008*	Equalize valve assembly	Y
RM998009*	Blend valve assembly	Y
RM998010*	Drain#2 valve assembly	Y
RR082008*	Lead, mains C19-bare	N
RR082006*	20mm, 5A fuse, electrical box	N
RR083349*	Lithium battery, main PCB	N
RR082007*	Lead, mains, C19/US	N
RR082025*	12A, fuse, external	N
08-0025	8mm, clear, tubing	N
RR121007	4mm, blue, tubing	N

0012-0001	Distribution Loop c/w bio sample point	N
16-0106	Walther .38 BSPP Stainless Steel Q-Con	N
16-0107	Q-Con, Hose Barb, Walther, PVDF	N
044-0126	Valve, Sanitary Sampling Port, SST	N
10-L380	LEGRIS Male Con, 8 mm T x .125 BSPT	N
10-0059	LEGRIS Stainless Steel Tubing Support	N
90-0133	Manifold, Adapter, Centurion PVDF	N
RPM00149	Distribution Loop (Plain)	N
0121-0052	Ultra-filter bypass, Centurion	N

11.2.2 Major spares listing

Major spares are classified as those spares/assemblies that could require significant downtime to complete and may require assistance from **AmeriWater** due to their sensitivity. If you need to replace one of the items/assemblies listed in the table below, contact **AmeriWater** for specific instructions.

Part No.	Part Description	Contain a batch controlled component Y/N
RM998007	Level switch assembly	Y
RM998011	Touch screen assembly	Y
RR082017	Main PCB	Y
RR082011	SMPS C11 24V	Y
RR082001	Inverter 120V 60Hz	Y
RR082002	Heater lead assembly	Y
RR017015	Heat Sanitisable membrane	Y

Batch controlled spares

Note:

1. Any person replacing an assembly or individual item that is batch controlled as identified in the tables in **Section 11.2** must request from **AmeriWater** that they are supplied with a clearly identifiable batch number.
2. In order to retain traceability the replacement of any batch controlled assembly/spare should be recorded on a suitable log sheet against the serial no. of the unit it was fitted to.
3. Any batch controlled spare that has prematurely failed within its warranty period must be returned to **AmeriWater** for further investigation.
4. Any component that has failed and caused a potential risk to the patient, Technician or bystander must be reported back to **AmeriWater** for investigation and analysis.

12.0 TECHNICAL SPECIFICATION

12.1 Technical specification

12.1.1 Electrical specifications/connections

Mains supply

Electrical supply	Operation	Max Power consumption (Watts)
Single phase 115V 60Hz plus earth	Standby	10
	Normal operation	160
	Heated disinfect operation	1000



Warning: To avoid risk of electric shock, this equipment must be connected to a supply main with protective earth.
For permanent installations the mains supply must be provided with a Branch Circuit Breaker, refer to **Section 4.6.2** of the **Installation & Commissioning Guide** for details of rating and specification of Branch Circuit Breaker.

12.1.2 Fuse rating/type

External: (Located at the rear of the unit)
Type: 2 off 12 Amp **T12AH115V**- 5mm x 20mm, Ceramic, time delay:

Internal: (Located in main electrical tray)
Type: 2 off 5 Amp **T5AH115V** – 5mm x 20mm, Ceramic, time delay

Note: Fuses must only be replaced with those approved and supplied by AmeriWater
--

12.1.3 Main PCB battery specification

Voltage: **3V**
Type: **Lithium, CR2032**

12.1.4 IP Rating

The unit has an **IP21** rating.

2 = Protected against solid objects greater than 0.492" (12.5mm)

1= Protected from vertically dripping water

12.1.5 Alarm port connection details

Type: Volt free/dry changeover contacts
Minimum applied Voltage: 34Vdc/24Vac
Maximum applied current: 1 Amp

12.1.6 Water quality and performance

Max drain flow-rate @ 10°C USgals/min	Permeate output @ 10°C USgals/min	Recovery %	Output water quality
0.29	0.4	60%	Will meet the requirements of current AAMI/ANSI/ISO:13959 standard for <i>“water for hemodialysis and related therapies”</i>

12.1.7 Feed water requirements

Pre-filtration	Filtered to 5 microns
Total Hardness	Maximum 400 ppm as CaCO ₃
Temperature	34 – 95°F (1-35°C)
Chlorine (Total)	<0.1 ppm free Cl ₂
Total dissolved solids (max)	1500 mg/l
Fouling index	<5
Feed water pressure	2-6 bar (30-90 psi)*
Feed water flowrate	1-1.5USgals/min (3.8-5.7ltrs/min)

* set to 3 bar on commissioning

12.1.8 Water services connections

Connection	Description	Size	Type
Drain	Unit waste water-out	8mm	Push fit
In	Feedwater supply-in	8mm	Push fit
Out	Permeate-out	8mm	Push fit
Return	Returned permeate-in	8mm	Push fit
Acid	Chemical disinfectant-in	4mm	Push fit

12.1.9 Raw water break tank

Working volume: 0.115USgals (435 mls)

Classification: 20mm air gap to provide backflow prevention

Material: 316 Stainless steel

12.1.10 Weights and dimensions

Weight (Lbs)	Height (inches)	Width (inches)	Depth (inches)
86 (Dry) 99 (Working)	34	11	19

12.1.11 USB mass storage device

Specification: FAT 16 formatted USB memory stick

Memory size: Must be less than 2GB

12.2 Environmental data

Parameter	Normal Operation	Storage	Transport
Temperature range	50-104°F (10 to 40°C)	41 °F-158°F (5 to 70°C)	23°F -158°F (-5 to +70°C)
Relative humidity	30 to 75%	10-100%	10-100%
Atmospheric pressure range (altitude)	80 to 106 KPa (sea level-2000m or 0-6,562 ft)	50 to 106 KPa (sea level-5000m or 0-16,404 ft)	50 to 106 KPa (sea level-5000m or 0-16,404 ft)


12.3 Guidance on electromagnetic emissions

Guidance and manufacturer's declaration – electromagnetic emissions		
The Centurion 1500+ is intended for use in the electromagnetic environment specified below. AmeriWater or Healthcare Provider should assure that it is used in such an environment.		
Emissions Test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The Centurion 1500+ uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment. The Centurion 1500+ is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies building used for domestic purposes.
RF emissions CISPR 11	Class B	
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations / Flicker emissions IEC 61000-3-3	Complies	

12.4 Guidance on electromagnetic immunity

Guidance and manufacturer's declaration – electromagnetic immunity			
The Centurion 1500* is intended for use in the electromagnetic environment specified below. AmeriWater or your Healthcare Provider should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance Level	Electromagnetic environment - guidance
Electrostatic discharge (ESD)	± 6 kV contact	B	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
IEC 61000-4-2	± 8 kV air	A	
Electrical fast transient / burst	± 2 kV for power supply lines	A	Mains power quality should be that of a typical commercial or hospital environment.
IEC 61000-4-4	±1 kV for input / output lines	N/A	
Surge	± 1 kV line(s) to line(s)	A	Mains power quality should be that of a typical commercial or hospital environment.
IEC 61000-4-5	± 2 kV line(s) to earth	A	
Voltage, dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (> 95% dip in U_T) for 0.5 cycle	B	Mains power quality should be that of a typical commercial or hospital environment. If the user of the unit requires continued operation during power mains interruptions, it is recommended that the Centurion be powered from an uninterruptable power supply.
	40% U_T (60% dip in U_T) For 5 cycles	B	
	70% U_T (30% dip in U_T) For 25 cycles	B	
	<5% U_T (>95% dip in U_T) For 5s	B	
Power frequency (50/60 HZ) magnetic field IEC 61000-4-8	3 A/m	A	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

12.5 Guidance on electromagnetic immunity for non-life supporting equipment

Guidance and manufacturer's declaration – electromagnetic immunity			
The Centurion 1500+ is intended for use in the electromagnetic environment specified below. AmeriWater or your Healthcare Provider should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance Level	Electromagnetic environment - guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3V	Portable and mobile RF communications equipment should be used no closer to any part of the Centurion, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = [1.17] \sqrt{P}$ $d = [1.17] \sqrt{P}$ 80 MHz to 800 MHz $d = [2.33] \sqrt{P}$ 800 MHz to 2.3 GHz Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and <i>d</i> is the recommended separation distance in meters (m). Field strength from fixed RF transmitters, as determined by an electromagnetic site survey, ^a should be less than the compliance level in each frequency range. ^b Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3V/m	
NOTE 1 At 80 MHz and 800 MHz, the higher frequency applies.			
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
^a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Centurion is used exceeds the applicable RF compliance level above, the Centurion should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Centurion unit.			
^b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

12.6 Separation distances for RF devices and Centurion

Recommended separation distances between portable and mobile RF communications equipment and the Centurion 1500*.			
The Centurion 1500* is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. AmeriWater or your Healthcare Provider will help prevent electromagnetic interference by calculating and maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Centurion unit as recommended below, according to the maximum output power of the communication equipment.			
Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150 kHz to 80 MHz $d = [1.17] \sqrt{P}$	80 MHz to 800 MHz $d = [1.17] \sqrt{P}$	800 MHz to 2.5 GHz $d = [2.33] \sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.70	3.70	7.37
100	11.70	11.70	23.30
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.			
NOTE 1 At 80 MHz and 800 MHz, the higher frequency applies.			
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

12.7 Classification and standards applied

Electrical	Class I Equipment (see Note1)
Overvoltage category – Fixed installation	Category II
Overvoltage category – Permanently installed	Category III
Pollution degree classification	Degree 2
IP Classification	IP21
Medical class - USA	Class II
Medical class - Canada	Class III
Radio Performance - USA	To FCC Part 18 (industrial, Scientific and Medical)
Radio Performance - Canada	To ICES-001 (Industrial, Scientific and Medical (ISM) Radio Frequency Generators.
Designed in general accordance with the requirements of BS EN 60601-1-2 :2007 Medical Electrical Equipment – Part 1-2: general requirements for basic safety and essential performance	



Warning: Note 1, To avoid risk of electric shock, this equipment must be connected to a supply main with protective earth.

13.0 CERTIFICATE OF COMPLIANCE UL/CAS

CERTIFICATE OF COMPLIANCE

Certificate Number 20131031-E351652
Report Reference E351652-A1-UL
Issue Date 2013-OCTOBER-31

Issued to: PURITE LTD
Bandet Way, Thame
OX9 3SJ UNITED KINGDOM



This is to certify that
representative samples of GENERAL MEDICAL EQUIPMENT
Reverse Osmosis Device – Model Centurion 1500+ / 1500+
UF

Have been investigated by UL in accordance with the
Standard(s) indicated on this Certificate.

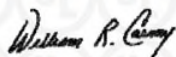
Standard(s) for Safety: ANSI/AAMI ES60601-1 (2005 + C1:09 + A2:10)(Medical
Electrical Equipment - Part 1: General Requirements for
Basic Safety and Essential Performance)
CAN/CSA-C22.2 No. 60601-1 (2008) (Medical Electrical
Equipment - Part 1: General Requirements for Basic Safety
and Essential Performance)

Additional Information: See the UL Online Certifications Directory at
www.ul.com/database for additional information

Only those products bearing the UL Classification Mark for the U.S. and Canada should be considered as being
covered by UL's Classification and Follow-Up Service and meeting the appropriate U.S. and Canadian
requirements.

The UL Classification Mark includes: the UL in a circle symbol:  with the word "CLASSIFIED" (as
shown); a control number (may be alphanumeric) assigned by UL; a statement to indicate the extent
of UL's evaluation of the product; and the product category name (product identity) as indicated in
the appropriate UL Directory. The UL Classification Mark for Canada includes: the UL Classification
Mark for Canada:  with the word "CLASSIFIED" (as shown); a control number (may be
alphanumeric) assigned by UL; a statement to indicate the extent of UL's evaluation of the product;
and the product category name (product identity) in English, French, or English/French as indicated
in the appropriate UL Directory.

Look for the UL Classification Mark on the product.



William R. Carney, Director, North American Certification Programs
UL LLC

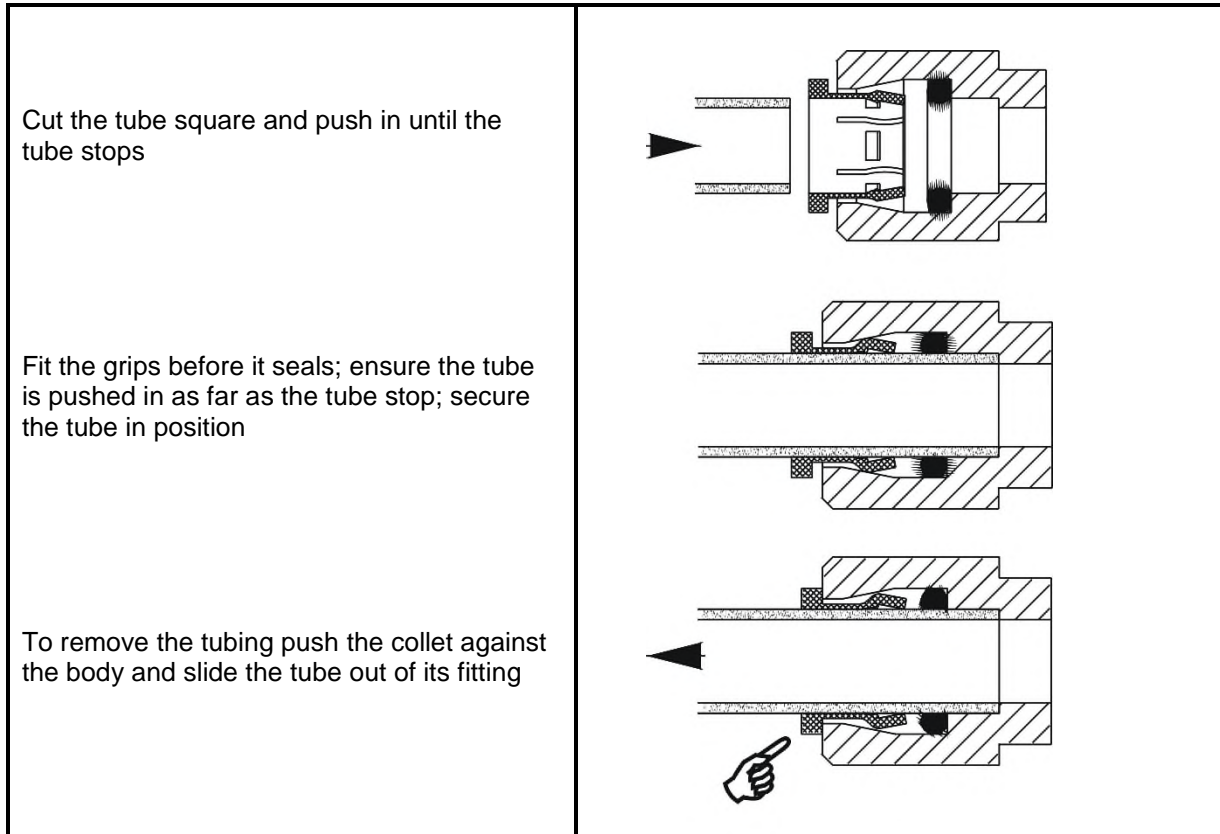
Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please
contact a local UL Customer Service Representative at www.ul.com/contactus



14.0 APPENDICES

14.1 How to use the push-fit connectors

To make a connection, simply push to tube in by hand; the pushfit collet locking system then holds the tube firmly in place without deforming it or restricting flow



14.2 E-Waste



Disposal of the unit or any electrical component from the unit must be in accordance with local requirements in your province or state for the disposal of electrical waste (E-Waste).

Your healthcare provider will be responsible for the disposal of any such items and for the disposal of the unit if required.

Disposal of the device is the responsibility of the Medical Director of the facility. All local codes and regulations regarding the disposal must be followed. **AmeriWater** recommends that the entire device be cleaned/decontaminated prior to beginning the disposal process. Many of the major components may be eligible for recycling in your area, except for the controller and RO/UF membranes. It is recommended that these items be incinerated.

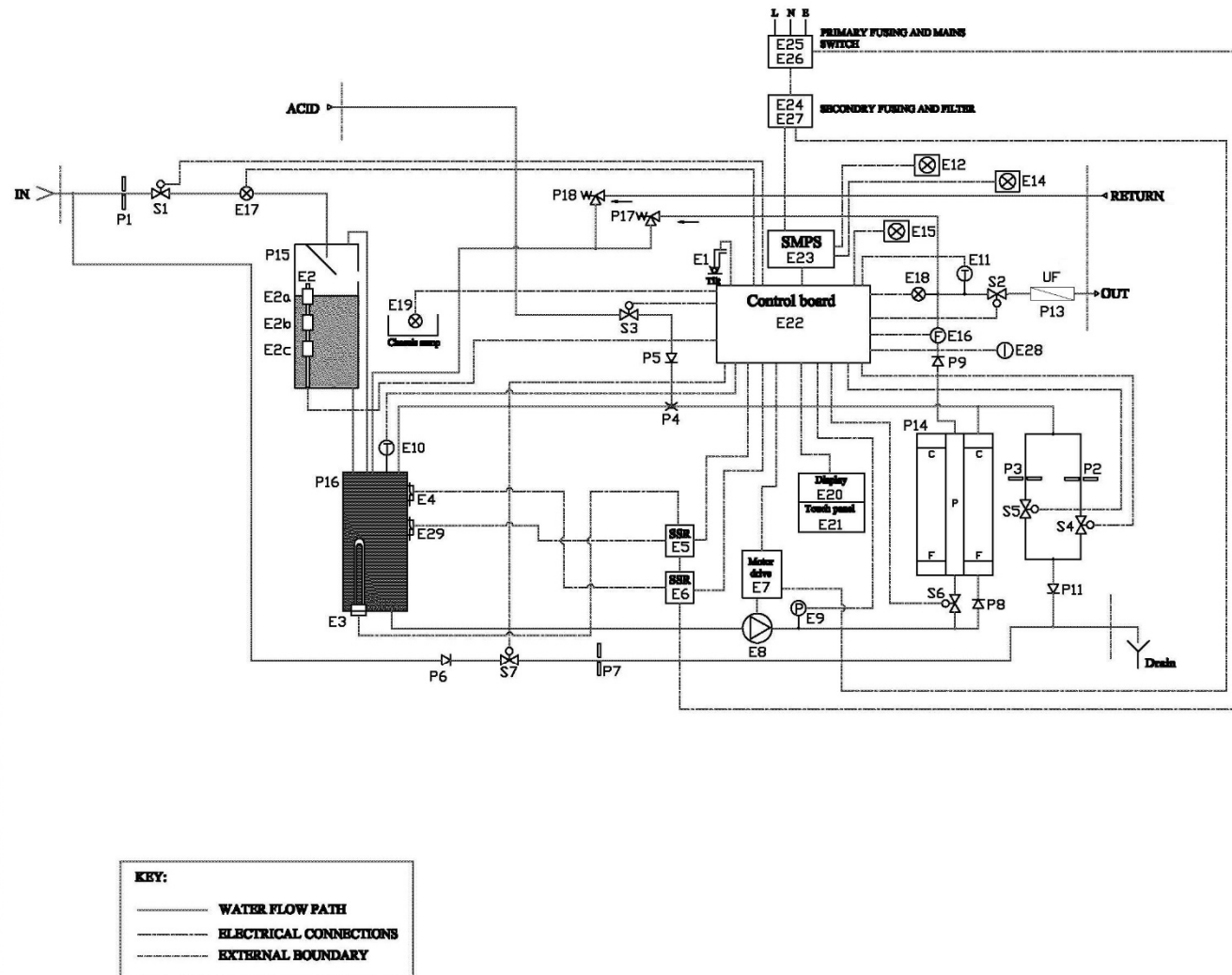
14.3 Circuit board connection schedule

Inputs	Connector	Pin No.
Key Switch	CON17	Pin 3
Common	CON17	Pin 4
Tilt Switch	CON18	Pin 3
Common	CON18	Pin 4
Tank High Level Switch –	CON19	Pin 3
Common	CON19	Pin 4
Tank Mid Level Switch -	CON20	Pin 3
Tank Low Level Switch -	CON21	Pin 3
Over Temperature Switch	CON22	Pin 3
Common	CON22	Pin 4
Feed Line Cell – Red wire	CON10	Pin 1
Feed Line Cell – Black wire	CON10	Pin 2
Permeate Line Cell – Red wire	CON11	Pin 1
Permeate Line Cell – Black wire	CON11	Pin 2
Common/Screen	CON11	Pin 3
Leak Cell – Red wire	CON12	Pin 1
Leak Cell – Black wire	CON12	Pin 2
Common/Screen	CON12	Pin 3
Ring Thermistor – Red wire	CON4	Pin 1
Common – Blue wire	CON4	Pin 2
Tank Thermistor – Red wire	CON5	Pin 1
Common – Blue wire	CON5	Pin 2
Pressure Transmitter Supply – Brown wire	CON7	Pin 1
Pressure Transmitter Signal – White wire	CON7	Pin 2
Pressure Transmitter Common – Blue wire	CON7	Pin 3
Flow Sensor Supply - Red wire	CON9	Pin 1
Flow Sensor Signal – Brown wire	CON9	Pin 2
Flow Sensor Common – Black wire	CON9	Pin 3
Outputs	Connector	Pin No.
Drain #1 Solenoid 24V Common – Red wire	CON23	Pin 1
Drain #1 Solenoid 0V Switched – Black wire	CON23	Pin 2
Inlet Solenoid 24V Common – Red wire	CON24	Pin 1
Inlet Solenoid 0V Switched – Black wire	CON24	Pin 2
Permeate Solenoid 24V Common – Red wire	CON25	Pin 1
Permeate Solenoid 24V Switched – Black wire	CON25	Pin 2

Draw Solenoid 24V Common – Red wire	CON26	Pin 1
Draw Solenoid 24V Common – Black wire	CON26	Pin 2
Rear Main fan	CON27	Pin 2
Drain #2 Solenoid 24V Common – Red wire	CON28	Pin 1
Drain #2 Solenoid 0V Switched – Black wire	CON28	Pin 2
Heater relay	CON29	Pin 2
Boost Pump control	CON30	Pin 2
+5V	CON39	Pin 1
Fault	CON39	Pin 2
Pump run	CON39	Pin 3
0V	CON39	Pin 4
Speed 0-5V	CON39	Pin 5
0V	CON39	Pin 6
Equalize Solenoid 24V Common – Red wire	CON41	Pin 1
Equalize Solenoid 24V Switched – Black wire	CON41	Pin 2
Blend Solenoid 24V Common – Red wire	CON42	Pin 1
Blend Solenoid 24V Switched – Black wire	CON42	Pin 2
Power Supply	Connector	Pin No.
24Vdc Supply – Red wire	CON7	Pin 1
0Vdc Supply – Black wire	CON7	Pin 2
Alarm	Connector	Pin No.
Alarm Contacts Common	CON7	Pin 1
Alarm Contacts N/C	CON7	Pin 2
Alarm Contacts N/O	CON7	Pin 3

14.4 Flow Schematic

ITEM No	DESCRIPTION
SOLENOID VALVES	
S1	INLET
S2	PERMEATE
S3	CHEM. DRAIN
S4	DRAIN 1
S5	DRAIN 2
S6	EQUALISE
S7	BLEND
ELECTRICAL ITEMS	
E1	TILO SWITCH
E2	FLOAT SWITCH ASSEMBLY
E2a	FLOAT SWITCH HIGH LEVEL
E2b	FLOAT SWITCH MID LEVEL
E2c	FLOAT SWITCH LOW LEVEL
E3	HEATER
E4	TEMPERATURE OUT OUT
E5	HEATER OUT OUT RELAY
E6	HEATER CONTROL RELAY
E7	PUMP INVERTER CONTROLLER
E8	MOTOR/PUMP
E9	PRESSURE TRANSMITTER
E10	THERMISTOR TANK
E11	THERMISTOR RING
E12	FAN ELECTRICAL ENG. TOP
E13	NO ITEM FITTED
E14	FAN INVERTER ENG.
E15	FAN MAIN
E16	FLOW SENSOR
E17	LINE CELL FEED QUALITY
E18	LINE CELL PERMEATE QUALITY
E19	LINE CELL LEAK DETECTION
E20	DISPLAY COLOUR TFT SCREEN
E21	TOUCH PANEL
E22	CONTROL BOARD
E23	POWER SUPPLY (SMPS)
E24	MAINS FILTER
E25	PRIMARY MAINS FUSING
E26	MAINS SWITCH
E27	SECONDARY MAIN FUSING
E28	KEY SWITCH
E29	TEMPERATURE OUT OUT
PROCESS ITEMS	
P1	FLOW RESTRICTOR INLET
P2	FLOW RESTRICTOR DRAIN 1
P3	FLOW RESTRICTOR DRAIN 2
P4	CHEMICAL CONDUCTOR
P5	NON RETURN VALVE CHEM. DRAIN
P6	NON RETURN VALVE BLEND 1
P7	FLOW RESTRICTOR 1L/MIN
P8	NON RETURN VALVE RO FEED
P9	NON RETURN VALVE PERMEATE
P10	NO ITEM FITTED
P11	NON RETURN VALVE DRAIN
P12	NO ITEM FITTED
P13	ULTRA FILTER
P14	RO MODULE
P15	WATER BREAK TANK
P16	HEATER TANK
P17	PRESSURE RED VALVE PERMEATE
P18	PRESSURE RED VALVE PERMEATE RETURN



14.5 Electrical circuit diagram

Full electrical circuit diagrams are available upon request from **AmeriWater**.
Contact details can be found in **Section 2, Contact Us**.