

AQUARIUS

DR100 ORP Controllers

Microprocessor Circuitry
ORP or Redox
with P.I.D. output
for accurate control in
Commercial and/or
Industrial Environments



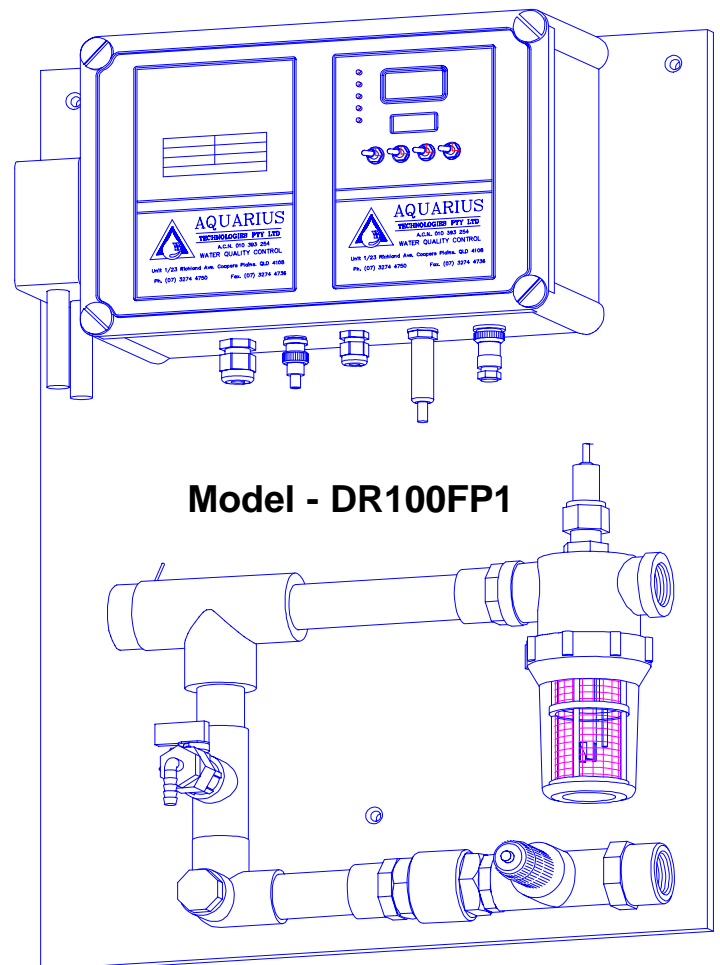
- ✓ P.I.D. Control on ORP dosing
- ✓ Alarms - with delay
- ✓ Lockout on ORP dosage
- ✓ Large Digital Readout Display
- ✓ For Commercial & Industrial Applications

Options Available Include -

- ✓ Manifold with Flow sensor
- ✓ and Clear View Strainer
- ✓ Peristaltic Dose Pumps

Optional Data Acquisition Package -

- ✓ Loop Isolated 4 - 20 mA. output
- ✓ plus Opto - Events outputs



ADVANCED TECHNOLOGY FOR THE NEW MILLENIUM

Aquarius DR100 ORP Controllers

Features and Benefits

1. "State of the Art" - Microprocessor Control with embedded custom software for control and dosage on ORP or REDOX millivolt levels, with P.I.D. (Proportional, Integral & Derivative) output control on ORP to give dosage proportional to the set point, and the varying demand, and maintain very tight control to the set points.
2. The ORP sensor input is via very high impedance differential amplifiers, with a ground reference electrode to ensure high accuracy readings, free from any "ground loops" or other industrial electrical interferences. Where Flow manifold models are selected, the ORP sensor is housed in the manifold in a clear view bowl which is - non draining to ensure sensors are constantly wet, and has suitable flow and velocity paths across the sensor for accurate readings.
The flow manifold houses (i) flow sensor, which prevents any dosage under NO flow conditions, and can record hours of operation via the data log outputs (ii) clear view bowl strainer - 80 mesh, for collection of debris and their easy removal, which prevents fouling of the sensor, flow switch, or non return valve & injection points
3. A comprehensive alarms system is designed into package - High & Low alarm facilities can be set on ORP levels, - Lockout facility to prevent overdosing on ORP control and if locked out flashes both high & low alarm leds and signals via a common alarm and - the Common No Volt Alarm relay facility is delayed for 5 minutes to prevent false alarms on start ups or change overs
4. Optional BCMS output capabilities can be included in the package allowing for - Loop Isolated 4 - 20 mA. analog output signal on the ORP value and optically isolated event outputs on ORP, Flow and Common Alarm relays, for - Data log to a Lap top, or to a PC with appropriate software.- Remote data acquisition and monitoring via a modem and appropriate software. - Historical hard copy record of actual ORP values is possible.
5. The peristaltic dosage pumps are - Excellent for dosage of most liquid oxidants & reductants - reliable delivery - Pumps rated to 250 kPa. and dosage as either 1.0 Lt./hr. or 5.0 Its./hr. - reliable and long lasting dosage pumps for most ORP dosage application.
6. Controllers are manufactured to ISO 9001 standards from a water treatment background and designed to meet and exceed the requirements of AS/NZS 3666, and other applicable Australian standards.

Packages available in the DR100 series and Major Applications are

1. Model - DR100

Basic controller for ORP or Redox control where the ground reference & sensor are remotely located and the controlled output socket is used to control existing dosage equipment such as peri or magnetic dose pumps for "hypo" or other solutions, solenoids for chlorine, or SO₂ gas control,

2. Model - DR100WP1 & DR100WP5

- have either 0.85 lt/hr, or 4.5 lt/hr, peristaltic dose pumps built into the package for dosage of oxidant or reductant, and these models are used where the sensor, and dose injection is remotely located

3. Model - DR100FP1 & DR100FP5 or (DR100FS = socket outputs only)

- have either 0.85 lt/hr, or 4.5 lt/hr, peristaltic pumps built in and utilise the Flow Manifold with flow sensor, clear view bowl, sensor, and injection points, with flow being directed through the manifold, allows for ease of service, and the dosage controlled ONLY when flow is ON.

4. Model - DR100FV

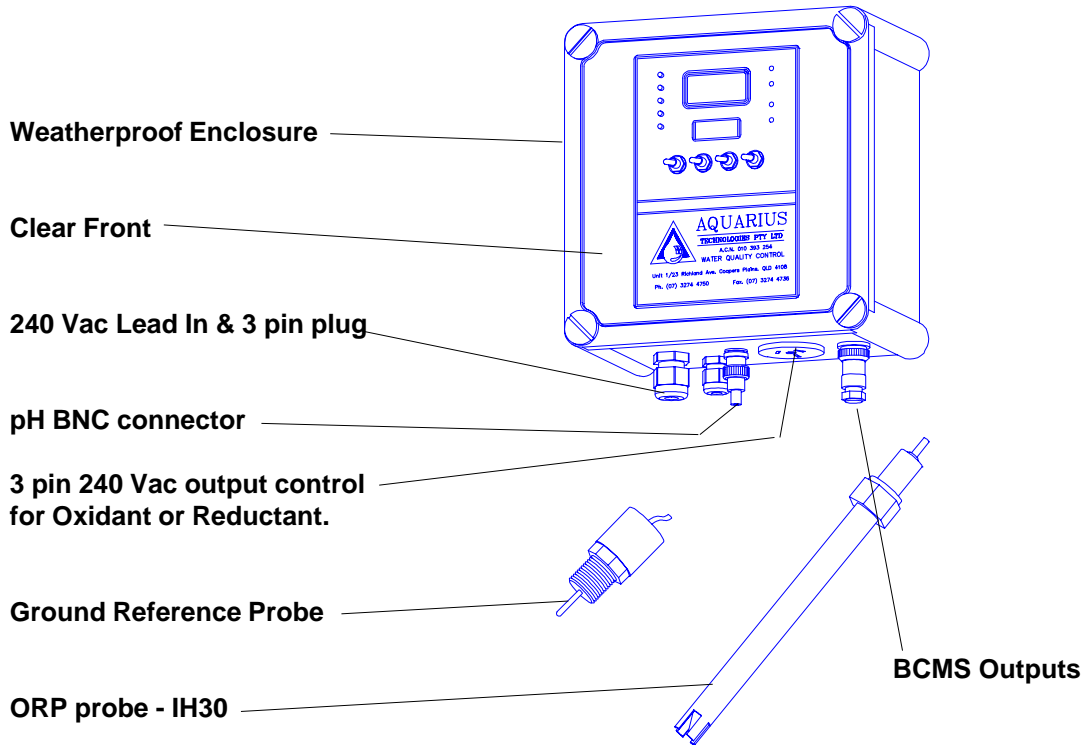
- is similar to above, but specifically for control of BCD - (bromine tablets) dosage, - has flow manifold as above and is fitted with a 15 mm solenoid to control water flow for dissolution of the BCD tablets in a feeder such as a BCD16 or BCD33 prior to discharge to the system.

5. OPTIONS to above models - add --/BMS

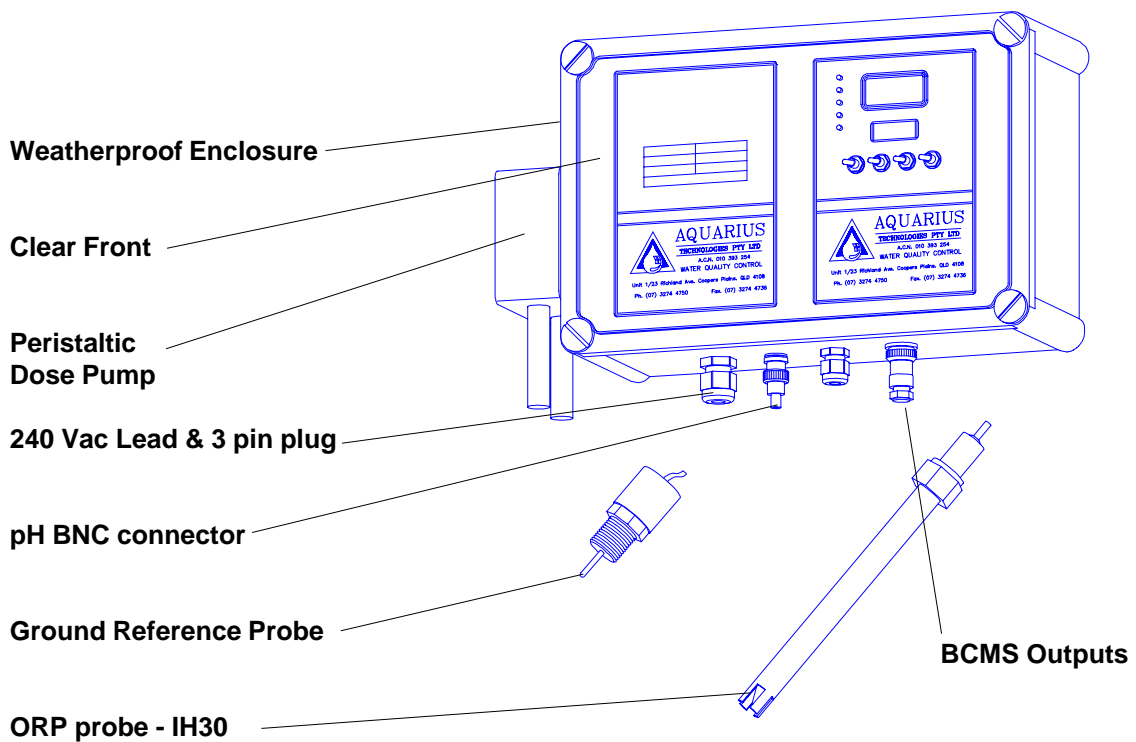
for inclusion of the BMS outputs PCB package - Loop Isolated 4 - 20 mA. output proportional to ORP value, and optically isolated event no volt relays to signal status on ORP relay, Flow relay and common alarm relay, for data acquisition to BCMS, DDC, PC or Lap top computer.

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Model - DR100 Basic Controller

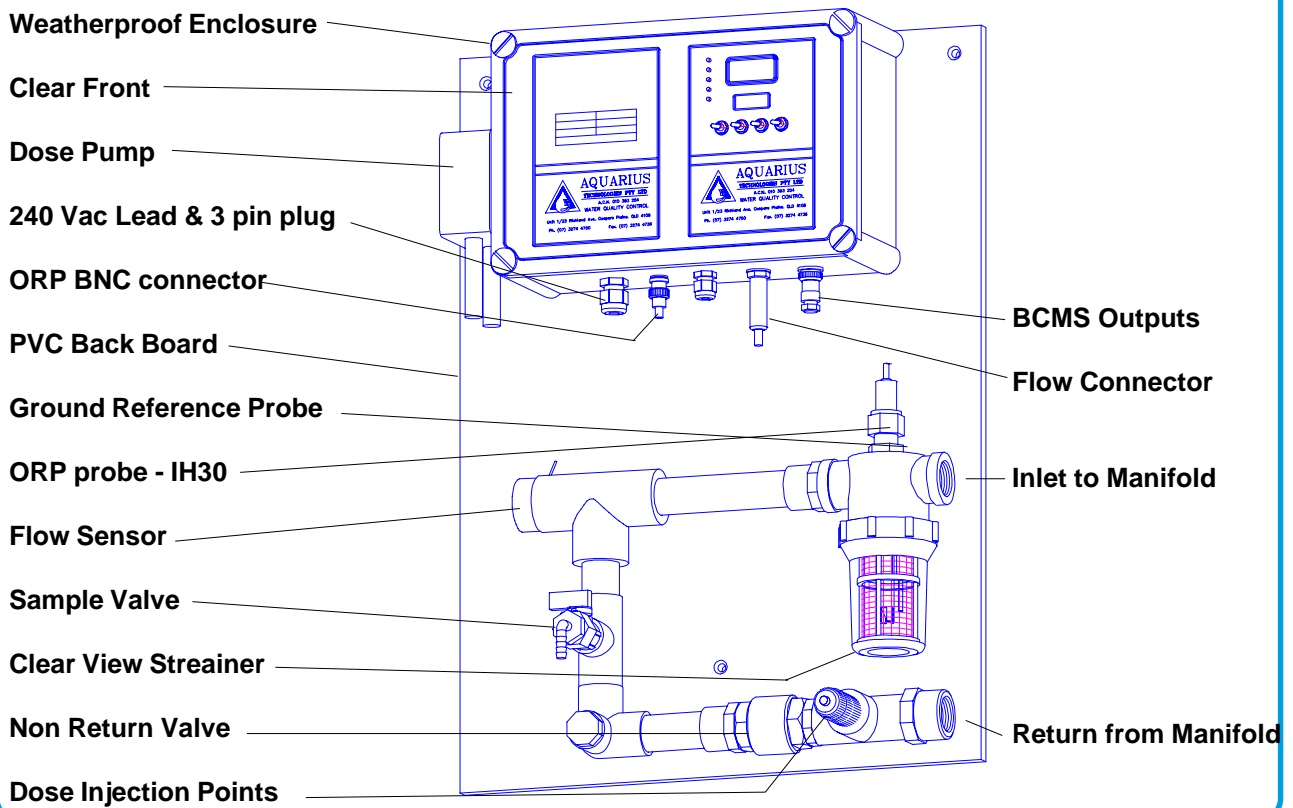


Model - DR100WP1 or 5 Controller and Dose Pump

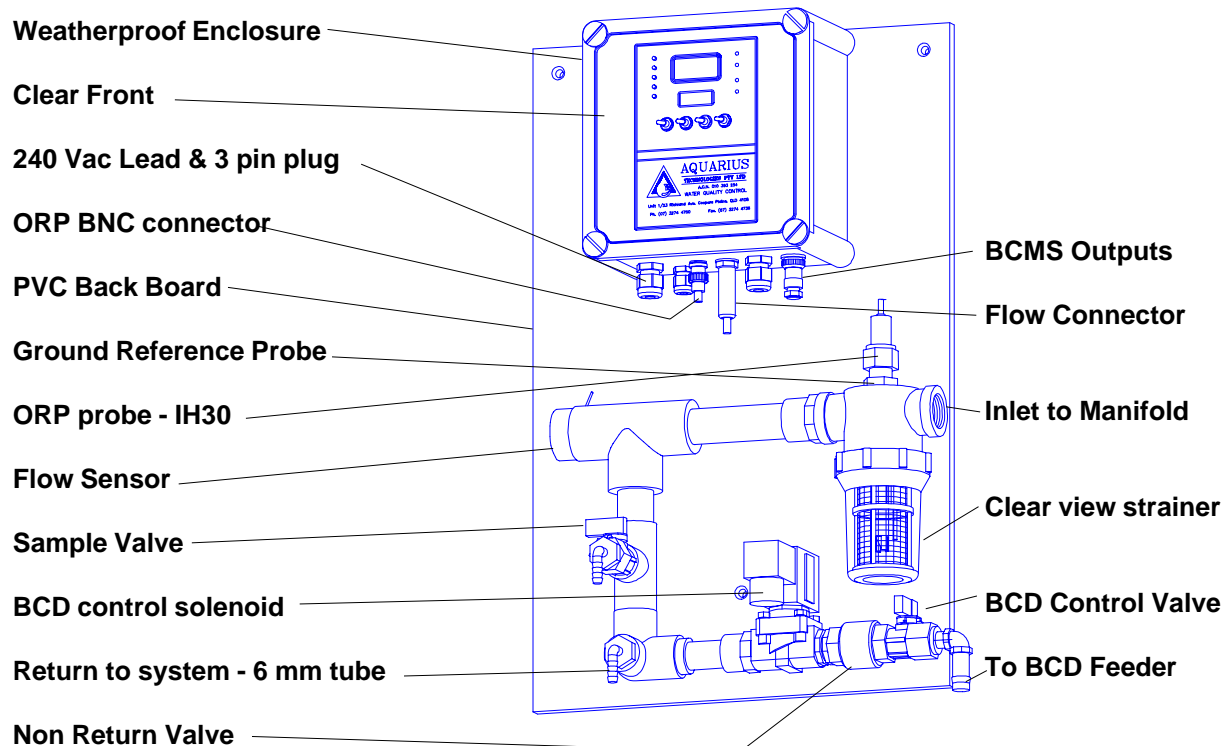


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Model - DR100FP1 or 5 for control with liquid oxidants or reductants



Model - DR100FV for control with Bromine based tablets



Aquarius DR100 ORP Controllers

INTRODUCTION

Aquarius DR100 series controllers have been designed with the benefit of a life time background of water treatment chemistry and many years experience in the design of similar dosing & control systems.

The DR100 series are offered as the solution to a growing demand for good automatic control of ORP or Redox millivolt levels, and to very tight set point specifications.

TECHNICAL DESCRIPTION

At the heart of the **DR100 series controllers** are a microprocessor based Printed Circuit Board for **ORP or Redox control**, housed in an IP65 rated electrical enclosure

The ORP Printed Circuit Board contains a well proven special software algorithm, embedded in the microprocessor chip, which varies the **ON** and **OFF** times of the 240 Vac **Duty Cycle output relay** dependant on, how far away the sensor reading is from the set point, and the amplitude of the sensor value gained or lost from the previous dosing period (**Delta**). This algorithm which allows for **P.I.D. type control** has the capability to vary the dose Duty Cycle in less than 1 % steps to maintain ORP millivolt set point levels with unsurpassed accuracy.

The ORP control module has four switches on its front panel to control the modes of operation and the information displayed, while five indicator Leds quickly identify the status of the 240 Vac outputs, the High and Low alarm and Flow status.

The **DR100 series control** systems can be used on a large range of system sizes, volumes, and a number of different demand applications. To accommodate all these different demand applications, 8 way DIP switches are provided on the ORP Printed Circuit Boards to vary the algorithm constants and provide for tuning of the P.I.D. control to suit the particular system. Refer to the diagram on page 12 for the position of these switches. The 8 way DIP switches are divided into two sections.

Switches 1-4 control the gain of the algorithm, that is, the size of the change of the duty cycle when load conditions change and is directly related to the cooling system volume.

Switches 5 - 8 control the emphasis given to the amplitude of the sensor value gained or lost from the previous dosing period and is directly related to the time taken for the effects of the dose to be fed back and sensed by the particular sensor.

A lockout capability is provided on the ORP Printed Circuit Boards which prevents excessive dosing in the event of a sensor failure. Two jumpers are provided on the circuit boards (refer to the diagram of the circuit boards on page 12.) which are used to select the permissible delay period from the time that 100% duty cycle dosing commences before the controller is locked out

from further dosing. The lockout selections allow for either - no lockout, 5, 50, or 500 minutes delay period before lockout. Once locked out, the ORP Printed Circuit Boards will disable its outputs, **set the No Volt alarm, and flash the High and Low Alarm LEDs** and will remain in this configuration until power is removed and the problem rectified.

The **DR100** series controllers **utilise very high impedance differential input amplifiers for ORP and a stainless ground reference probe to accurately measure probe voltage**, free from any electrical interference. This allows the DR100 series controllers to be used in industrial environments where ground loop currents may be present which would otherwise effect the probe voltage. The ground reference probes are mounted adjacent to the sensor in the manifold, and a spare connected ground reference is provided for use during calibration.

No Volt Alarm contacts are provided on all **DR100 series controllers** to signify High or Low Alarm, or loss of power.

The microprocessor delays the High or Low Alarm for 5 minutes to avoid unwarranted false alarms resulting from unavoidable operating condition changes (i.e. a stand-by chiller coming on line)

Aquarius DR100 series controllers can be supplied as an **OPTION** with a **Data Acquisition output package** to allow for remote monitoring performance to a BCMS or to a laptop computer. An eight pin socket fitted to the base of the enclosure provides for **loop isolated 4-20 mA. signal proportional to the ORP millivolt values.**

In addition **optically isolated outputs report the status of the ORP, Flow and common Alarm relay outputs.** Refer to the Electrical Wiring Requirements drawing on page 10.

A unique feature of the Aquarius DR100FP & DR100FV series controllers series is the carefully designed manifold, which houses the ORP sensor and dosing points, and includes - a clear view bowl strainer, a robust flow sensor, ORP sensor with ground reference probes in non draining, clear view bowls, non return valve, sample test valve and dosage injection points.

This manifold design allows for easy service, cleaning and calibration of the sensors, etc, and prolongs the sensors life and adds reliability to the entire package. The flow sensor in the manifold can control dosage under Flow = ON conditions, and prevent any dosage when flow or circulation is off.

The **DR100FV** is designed with a 15 mm Solenoid built into the manifold, to control flow to, and dissolution of BCD tablets in a feeder, such as a BCD16 or BCD33, for the control and dosage of "Bromine" tablets in comfort cooling systems, commercial spa pools, hydrotherapy pools, etc.

Aquarius DR100 ORP Controllers

SPECIFICATIONS

<u>Models designation</u>	DR100 DR100FV	DR100WP1 DR100FP1	DR100WP5 DR100FP5
Dosage Pumps	Nil	1 x 0.85 Lt./hr.	1 x 4.5 Lt./hr.
Dose Pump Pressure Rating	N/A	250 kPa.	250 kPa.
Dose Pump Type	N/A	Peristaltic	Peristaltic

<u>Controller</u>	<u>ORP Control Module</u>
Operating Range	0 - 1000 mV.
Resolution	1.0 mV.
Accuracy	+/- 5.00 mV.
Repeatability	+/- 5.00 mV.
Alarm Range	+/- 0 to 250 mV.
Dead Band	N/A
Control Relays	1 @ 8 Amps
Control Type	P.I.D. = standard type or (ON/OFF as a factory option)
Probe or Sensor Part No.	IH30
Probe or Sensor Rating	500 kPa. @ 60 °C
Electrical Supply	220 -240 Vac. 10 Amps. 50/60 Hz..
Enclosure Rating	IP65 Electrical enclosures.

Sensor Manifold - applicable to DR100FP1, DR100FP5 & DR100FV models

Pressure & Temp. Rating	250 kPa. @ 50 °C - down rate pressure at higher temperatures !!
Velocity across manifold	1.0 m/s @ 24 l/min flow rate from manifold
Flow Sensor	ON @ Flow rates greater than 2.0 l/min
Strainer	Wire type 80 mesh with clear view bowl
Plumbing	20 mm BSP female threads and/or 19 mm hose tails
Solenoid	On DR100FV model only - 15 mm, rated at 240 Vac.
Dimensions	Mounted on PVC backboard - see below

Dosing Tanks

Dosing Tanks for liquids are not normally supplied by Aquarius, - they should be corrosion resistant for the particular chemical involved and sized to provide a suitable supply period. 200 Lt. polythene tanks are normally a good choice.

Shipping Weights & Dimensions

Weight

Controller Dimensions

1. DR100 controller and probe.	5 kgs.	220 mm H x 190 mm W x 150 mm. D
2. DR100WP1 or DR100WP5 controller & probe	8 kgs.	220 mm H x 330 mm W x 150 mm. D
3. DR100FP1 or DR100FP5 controller, manifold & probe	12 kgs.	500 mm H x 330 mm W x 150 mm. D
4. DR100FV controller, manifold & probe	10 kgs.	500 mm H x 330 mm W x 150 mm. D

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Installation, Commissioning & Operating Instructions

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INSTALLATION and PLUMBING GUIDELINES

Select a suitable location for installation of the package, - preferably in close proximity to the system and shielded from extremes of the environment.

The controller LCD display should be protected from direct sunlight.

A wall area is ideal for mounting the Aquarius DR100 series control gear, preferably at eye level, with a floor area of approx. 0.6 m x 0.6 m floor space for the chemical dosage tank required.

1. Carefully unpack all the gear and check for any apparent damage in transit. Identify all parts and ensure they are located before discarding the cartons.

2. Wall mount the equipment as per the appropriate drawings (either below or as on the opposite page)

3. Fit the ORP probe to the system in an area of good mixing, or if the Flow manifold is used fit the probe to the strainer bowl assembly and connect probe to the controller BNC connector.

CAUTION: Do not over tighten pH and/or ORP probes into bowl assemblies.. Tighten up the gland nut finger tight, or until the sensor does not move, and then a further 1/4 turn only with a spanner.

4. Fit the stainless ground reference in the water system in close proximity to the ORP sensor, or where flow manifolds models are in use, ensure the blue wire with the spade terminal is connected to the threaded stainless rod in the sensor bowl.

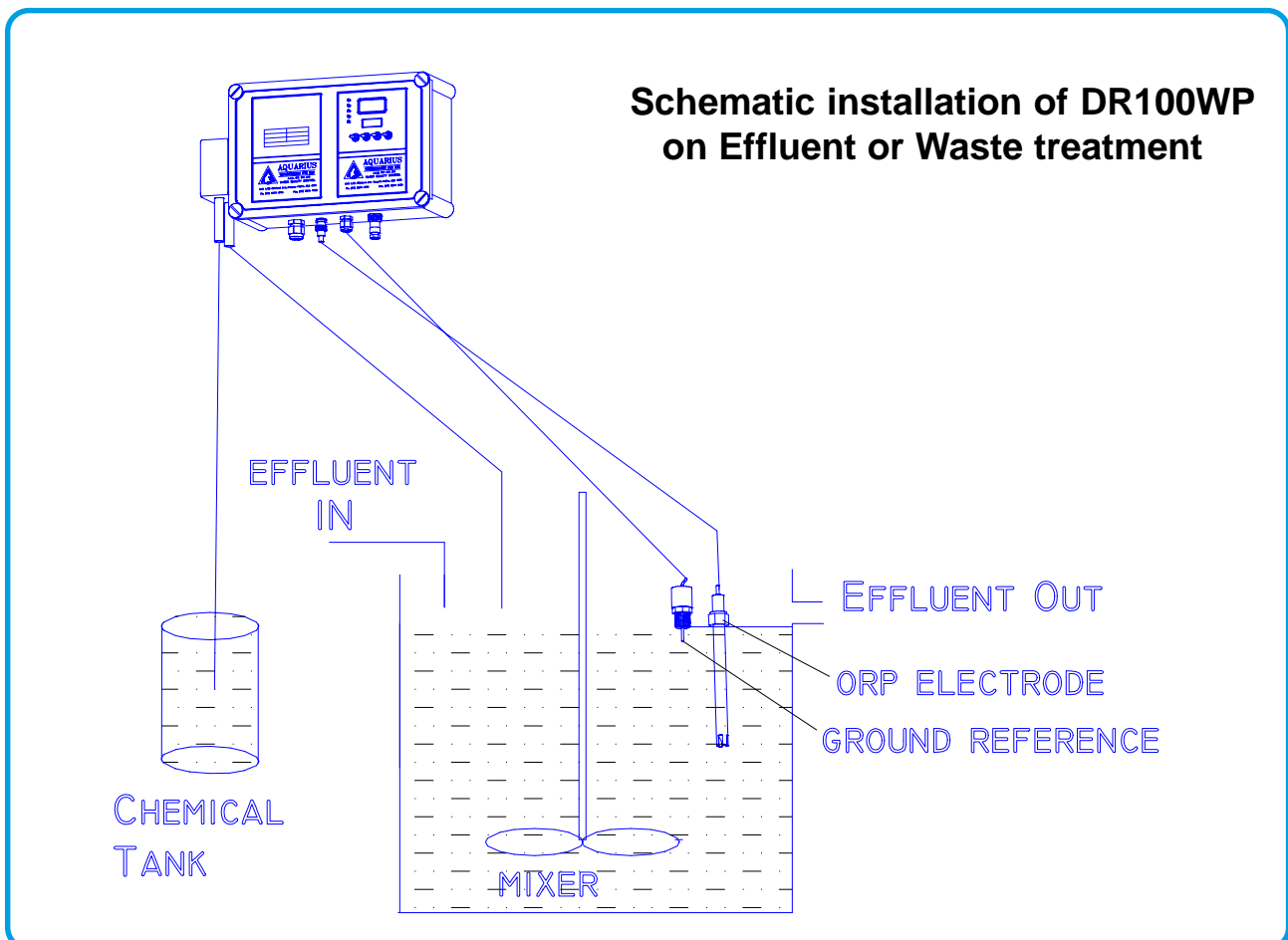
Refer to drawing of various models, manifold & sensor, below and on the following pages.

5. Refer to page 10 for electrical wiring for power and connections to the Optional BCMS system

6 Run a flow of water through the system under normal operating pressures, check for, and repair and eliminate any leaks, etc.

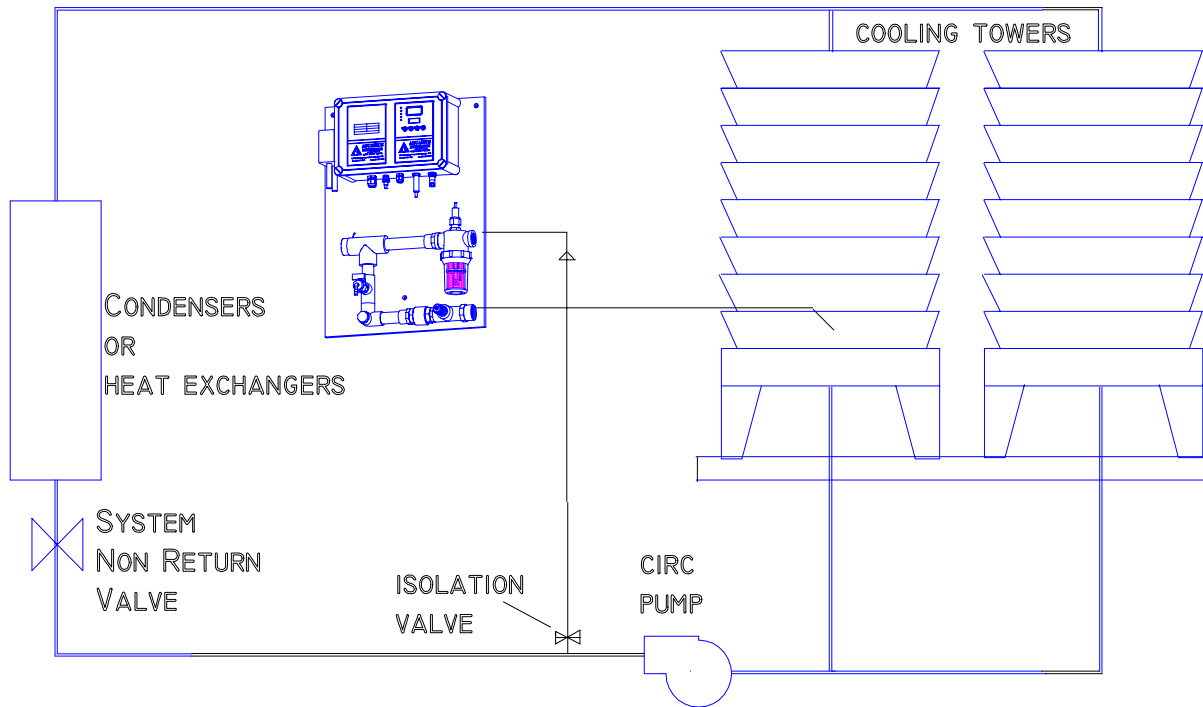
7. The system is now ready for commissioning and commencement of the water treatment programme by your water treatment specialist.

8. Liaise with your water treatment chemical specialist for recommendations regarding - any bunding requirements around the chemical tanks, floor drainage requirements, a fresh water supply in the vicinity of chemical tanks, Local regulations for discharge of trade waste, chemical storage and hazards, etc.

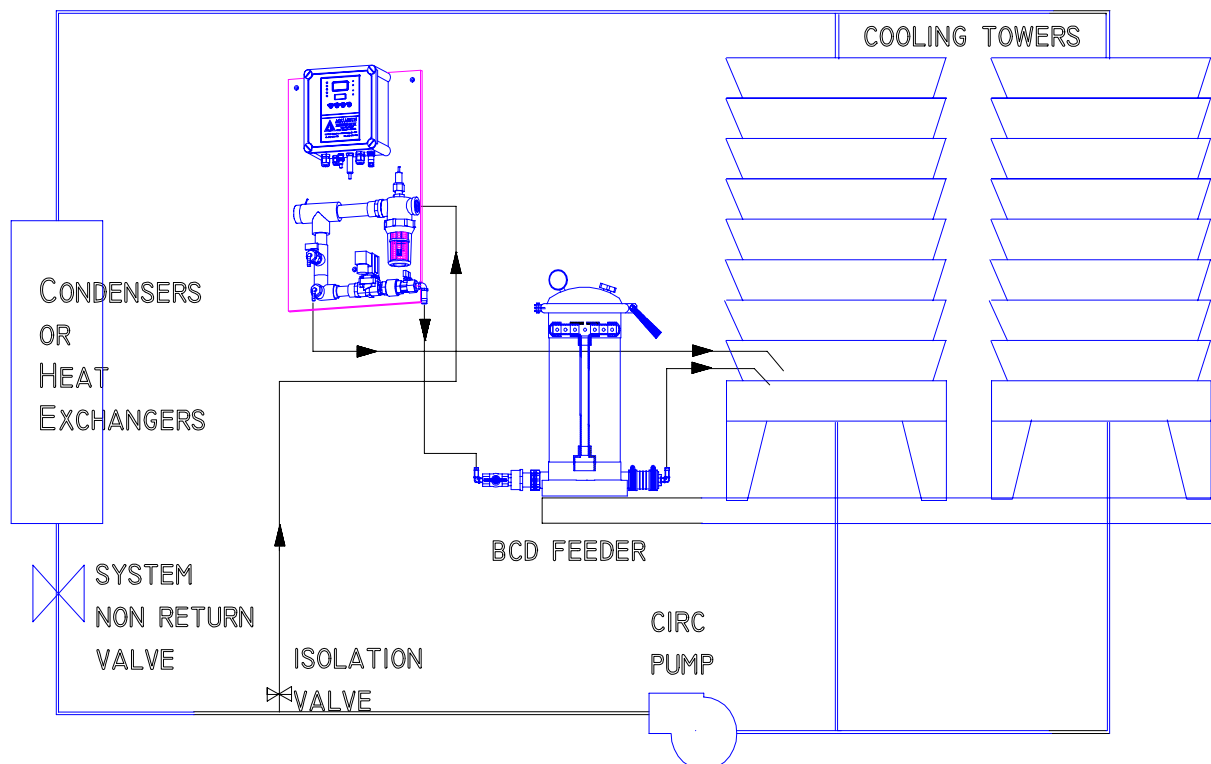


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Schematic Installation of DR100FP on Cooling System



Schematic Installation of DR100FV & BCD Feeder on a Cooling System



Aquarius DR100 ORP Controllers

ELECTRICAL WIRING REQUIREMENTS

Aquarius **DR100** series systems are presented as complete packages, they are internally wired and only require a continuously powered single G.P.O. outlet rated at 220 - 240 Vac, 10 Amps, and 50 or 60 Hz. with a weatherproof G.P.O. recommended for external installations.

The power circuit should be a "clean circuit" free from power surges, spikes and interference, similar to that for computer requirements.

Analog & Events Outputs wiring to BMS or DDC systems

An eight pin MIC chassis socket on the right hand side of base of the controller provides for a **loop isolated 4-20 mA. analog signal** for ORP Millivolt values, as well as event status of the various relays.

These signals are suitable under most industrial conditions for **direct Data Acquisition to computers, such as DDC, BMS, PC's or Lap top computer systems without further conditioning.**

BMS socket outputs on the DR100 series Controllers are as follows: -

1. Analog 4 - 20 mA. = Current **to** the BMS as ORP millivolt value of 0 - 1000 millivolts ORP
2. Analog 4 -20 mA. = Current **return** to the DR100
3. Flow Sensor Status = High = ON
4. ORP - P.I.D. Solid State Relay status = High = ON.
5. Not Used in this application
6. Not Used in this application
7. Common Alarm relay status = High = either High or Low alarm.
- 8.. Either a + 5 or + 12 volt signal **FROM the computer or BMS system as common supply signal for event status in items 1 - 7 above.**

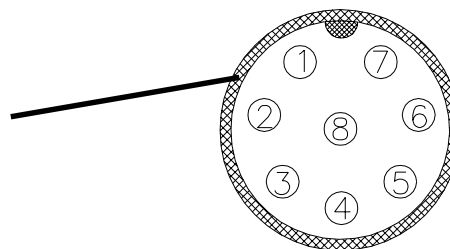
SHIELD. - should be connected to GROUND at the computer or BMS system **ONLY and NOT connected at the controller end** to minimise any interference to the low voltage signals being sent to the computer.

The **Event outputs are optically isolated** and are configured as **NO VOLT** outputs, being supplied or fed by **either a + 5 or + 12 volt supply, from the host computer system.**

BMS outputs wiring diagram

The diagram below shows the MIC socket for BMS plug connections, fitted to the bottom right bottom side of the enclosure and the "pin outs" shown are looking into the socket from the outside of the DR100 enclosure.

FRONT OF ENCLOSURE



Contact Aquarius for software and a package to allow for data acquisition to a lap top computer for either verification of conditions & chemistry after commissioning or for trouble shooting later.

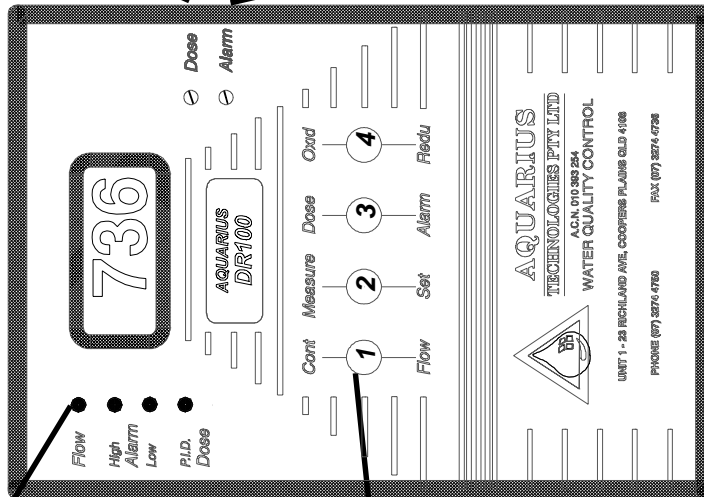
Aquarius DR100 ORP Controllers

FRONT PANEL FUNCTIONS AND FEATURES Module - DR100 - ORP Controller

INDICATOR LEDS

1. **Flow** - gives an indication from a Flow Sensor in the manifold.
2. & 3. **Alarm leds** - High Alarm led is ON when the measured value exceeds the Dose Set Point ORP millivolts plus the Alarm set value.
- Low Alarm led is ON when the measured value is lower than the Dose Set Point minus the Alarm Set value. A 5 minute delay is used before these leds are illuminated, to avoid false signals to the BCMS
4. **Dose Led** - P.I.D. led is ON when the "Delta" proportional pulsed output is energised to dose.

LCD DISPLAY



SET POINTS

Dose Set Points - With switch 2 set to **Set**, switch 3 set to **Dose**, - turn the trim pot to set the ORP millivolt value in the LCD display where dosing is to cease.
Oxidant dosing brings mV. UP the scale.
Reductant dosing brings mV. DOWN the scale.
 e.g. **Cooling Systems** - Set **Oxid** and a Dose Set Point of approx. 350 - 450 mV. to auto dose Chlorine or BCD to achieve 0.5 - 1.0 ppm of free Halogen at typical pH values of 8.5 - 9.0
 e.g. **Swimming Pools** - set **Oxid** and a Dose Set Point of approx. 750 mV. to auto dose liquid chlorine to achieve 2.0 - 2.5 ppm free Chlorine at typical pH values of 7.4 - 7.6
Note that low pH values increase ORP mV. and higher pH values reduce ORP mV. without any change in the measured amount of free Halogen.

Alarm Set Points - with switch 2 set to **Set**, and switch 3 set to **Alarm**, - turn the trim pot to show in the LCD display the amount the Dose set point is to be exceeded by or less than to bring on the **Alarm** relay - the range is 0 - 350 mV. ORP. above or below the Dose set point.

PROGRAM SWITCHES

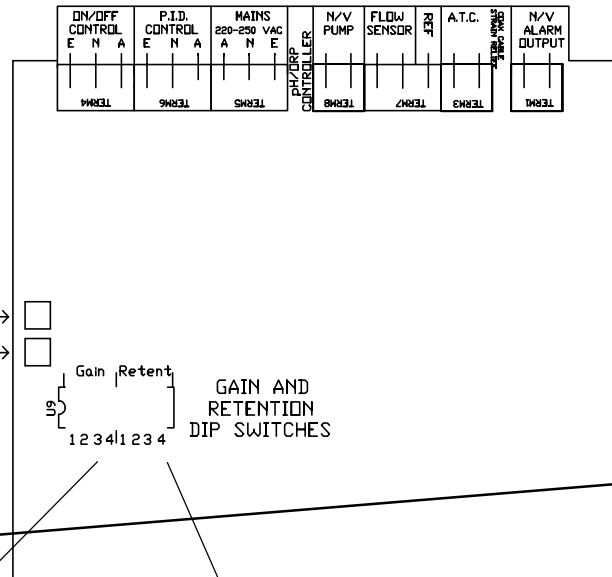
- Switch 1.** - **Cont/Flow** - Cont mode allows the relays and alarm to turn on as required - **use as test mode or where the Flow Sensor is not installed.** **Flow** setting only allows dosing and/or alarm when the **FLOW SENSOR** in the manifold is **ON for flow** - **use this setting when ever the manifold is installed to prevent dosing when the system is off-line.**
- Switch 2.** - **Measure/Set-Measure** allows the display to show the ORP mV. value at the sensor during run mode or calibration. **Set** allows the display to show the dose and or alarm set points.
- Switch 3.** - **Dose/Alarm** - Used with switch 2 to **SET mode** - **Dose** setting displays the mV. **set point for Oxidant or Reductant** and **Alarm** setting displays the amount + & - to mV. set points above.
- Switch 4.** - **Oxid/Redu** - Set for either **Oxidant** or **Reductant** dosage and output control as required for the particular system.
 Oxidants = chlorine, bromine, ozone, etc.
 Reductants = Sodium meta or bisulphite, etc.

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PRINTED CIRCUIT BOARD LAYOUT for DR100 (ORP) PRINTED CIRCUIT BOARDS

POSITIONING OF DIP SWITCH AND LOCKOUT JUMPERS

Removal of the four self tapper screws from the blue electronics front panel allows for exposure of the Printed Circuit Boards, and provides access to, and allows for the setting of Lockout, Gain and Retention features on the pH and ORP printed circuit boards, for the particular system - This is normally only required at the commissioning stage.



SET LOCKOUT FACILITY

TERM10	TERM9	DELAY PERIOD
No jumper	No jumper	= Lockout disabled
No jumper	Jumpered	= 5 minutes
Jumper	No jumper	= 50 minutes
Jumpered	Jumpered	= 500 minutes

Factory setting = Lockout disabled or no lockout

pH and ORP DIP SWITCH SETTINGS

Cooling Towers Plant Capacity (KWR)	GAIN				System Volume (Kilo Litres)	RETENTION			
	1	2	3	4		1	2	3	4
250	Off	Off	Off	On	1	Off	Off	Off	On
500	Off	Off	On	Off	2	Off	Off	Off	On
1000	Off	On	Off	Off	5	Off	Off	On	Off
2000	Off	On	On	Off	10	Off	Off	On	Off
4000	On	Off	On	Off	15	Off	Off	On	On
5000	On	On	On	On	20	Off	On	Off	Off
					40	Off	On	Off	On
					100	On	On	On	On

Factory Settings are 1000 kWR and 10 kL. volume

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COMMISSIONING and START UP GUIDELINES

It is strongly recommended that your professional water treatment specialist carry out the following commissioning of the system and charging of the chemical tanks.

Inspect the installation for completeness and ensure an adequate flow of water is via the manifold and that no leaks are evident.

Check that all dose pumps, solenoids, sensors are plugged into the correct sockets - see pages 8 & 9.

Check that settings for Lockout and Gain & Retention are set correctly for the system - refer to page 12.

Power up the unit and with flow isolated commence to set up the controller functions as follows.

1. DR100 - ORP module - see front panel functions and features on page 11.

a. Set *the DR100 - Measure / Set* switch to **Measure**.

b. Verify *the ORP probe to the controller as per the ORP verification procedure* on the following page.

2. Set the appropriate Set Point values, Alarm deviation amounts, Dose Modes etc. for the Controller.

3. On **DR100FP1, DR100FP5 & DR100FV** ensure that the **Cont/Flow** switch is set to **Flow** setting to prevent any dosage under NO flow conditions, and use **Continuous** mode only for testing and verification when flow is off

4. On **DR100, DR100WP1 & DR100WP5** ensure that the **Cont/Flow** switch is set to **Cont** setting to allow the controller to operate in continuous mode.

5. Ensure that on **all controllers** the **Oxid/Redu** switch is set for the ORP control chemical being dosed, normally Oxidants, set Redu for reducing agents.

6. Charge all chemical tanks as necessary

7. Ensure the **Optional** BMS analog & events outputs are wired back to BMS or DDC system, and verify the values at the BMS or DDC system with the test results obtained for ORP on the circulating water.

CARE of, CLEANING & CALIBRATION OF SENSORS

The information displayed on the digital display is only as accurate as the information sent to it by the sensors.

Hair, dirt, oils, scale, bacteria, etc, all lead to the sensors becoming inaccurate from minor amounts of foulants. Therefore the sensor should be cleaned and calibrated on a regular basis by using the following steps.

Cleaning of ORP sensors

1. Turn off flow to the manifold via the isolation valves & remove sensor from the manifold by loosening the lock nut and withdrawing the sensor.

2. Rinse sensor in fresh tap water and remove any visible fouling. This should be done carefully using your finger nail and/or lightly scrubbing with a tooth brush.

3. Place the sensor in the Electrode Cleaner solution (AS9500) for about 5 minutes to completely dissolve any trace of inorganic foulants.

4. Remove and rinse thoroughly in fresh water.

5. Proceed to verification of ORP sensors as outlined on the following page.

Cleaning of Flow sensors.

After isolation of flow, the internals of the flow sensor can be removed by (a) withdrawing the locking band and (b) pulling the flow sensor from its housing, for cleaning and removal of any debris and physical verification of its correct action. Return the internals to its housing ensuring the locking band is pushed fully home.

Cleaning of the wire strainer

After isolation of flow and the strainer bowl is unscrewed, the wire strainer can be withdrawn and cleaned by flushing with water, then reverse the process to reinstall the strainer assembly ensuring the rubber o-ring seal is in place.

ORP sensor verification procedure

1. With the **DR100 - Measure / Set** switch set to **Measure** proceed to verify as follows

2. After removal of the sensor and cleaning, place the ORP sensor and the spare ground reference probe (**stainless rod on the blue wire**) in the 475 mV. solution (AS5475). Agitate in this solution until the display is constant - approx. 30 seconds.

3. This solution should give a reading of 450 -500 mV. on the display if the sensor is good.

4. Remove sensor and rinse thoroughly in fresh water.

5. Now place the sensor and ground reference in the 250 mV. solution (AS5250) and agitate until display gives a constant reading - approx. 30 seconds

6. This solution should give a reading of 200 -250 mV. on the display for a good sensor

7. Rinse the sensor thoroughly in fresh water and repeat the above steps to verify the correct operation of the ORP sensor.

8. Replace the ORP sensor, If in the manifold- **Tighten up the gland nut finger tight, or until the sensor does not move, and then a further 1/4 turn only with a spanner.**

9. Ensure the bowl is immediately refilled with water and the sensor is not allowed to dry out.

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ROUTINE MAINTENANCE

For optimum results and continued accuracy, the complete operation of the controller system should be verified on at least on a monthly service basis, all sensors should be inspected, cleaned and calibrated as necessary every month.

Both pH & ORP sensors age with time and temperature, and have a life span of 12-30 months depending on the application in which they are operating and should be replaced accordingly.

Where fitted, flow sensors, solenoid valves and wire strainers should be checked for correct operation and cleaned of any debris every month so as they work efficiently.

Injection non return valves, and pumps should be cleaned and checked at least annually.

On the peristaltic dose pumps, the squeeze tubes and roller block should be checked at least annually and should be replaced every 12-24 months.

More regular maintenance may be required for 5 l/hr pumps, due to increased pumping rates.

Chemical suction and discharge tubes should be inspected monthly and replaced as necessary

As hazardous chemicals are in use the appropriate safety equipment should be worn whilst servicing.

Safety Considerations of Chemicals

All the chemical products involved with ORP or Redox are somewhat hazardous to say the least,

Please refer to the full MSDS sheets provided by your water treatment chemical specialist and ensure all personnel involved are aware of handling and safety procedures.

Please read and understand all safety warnings on chemical containers before servicing any dosing equipment.

Wear as a minimum - safety goggles and gloves when servicing dosing equipment.

Do not mix concentrated acids and oxidising agents as explosion, and/or toxic and lethal gas may be evolved, and/or fire result.

Keep all chemical containers sealed and free from contamination.

RECOMMENDED ACCESSORIES AND SPARE PARTS

Sensors

IH30 Replacement ORP Sensor

Reagents

AS5475 475 mV. Solution (500ml)

AS5250 250 mV. Solution (500ml)

AS9500 Sensor Cleaner (500ml)

Peristaltic Pumps

TUBE2N Squeeze Tube

TUBE2NINS White barb tube connectors

A014HD-6V Injection non return fitting

TUBE6 Pink tubing - chemical lines

Test Meters

HI8314 - pH/mV./C portable test meter & Probes
pH/mV. Checker - pH & mV. checker

TROUBLE SHOOTING & FAULT FINDING GUIDELINES

INCORRECT ORP LEVEL

1. Check the **set point** ORP value is set at the desired ORP millivolt level.
2. Momentarily swap the position of **Oxid/Redu Switch**, and check to verify that the dose pump is operating.
3. Check that the dosage injection points are clean and free of blockages.
4. Ensure the **Oxid/Redu switch** is in the correct position for desired ORP control - **Redu dosing brings ORP mV. value down** to the set point, **Oxid dosing brings ORP mV. up** to the set point level
5. Check that chemical tanks have not run empty and are filled with the correct chemical.
6. Check the **ORP sensor is clean & verified**, by following the procedure in Care of, Cleaning & Calibration of Sensors on page 14. If it is not possible to verify the sensor, replace it, and retry verification with the new sensor.
7. Use the **PH/MV Checker** to verify the electronics of the DR100 board by plugging into the ORP BNC socket and "injecting" values of millivolts as 0, 168, & 500, (+/- 10.0) mV. Refer to the separate operating instructions with the PH/MV Checker.
8. **Lockout** of the ORP system is indicated by **flashing alarm leds** and requires the power to the system to be turned off momentarily to reset the system, and usually means a sensor has expired, and should be replaced.
9. Whilst ORP can be used to control the dosage of chlorine, bromine, etc. **It is not a specific sensor for chlorine, or bromine**, and does not always agree with DPD test values - see Technical notes on ORP.

Aquarius DR100 ORP Controllers

MANUFACTURER'S PRODUCT WARRANTY

AQUARIUS TECHNOLOGIES PTY. LTD. manufactures a range of equipment under a Quality Assurance system to ISO9001:1994 standards and warrants equipment of its manufacture to be free of defects in material or workmanship.

Liability under this policy extends for 12 months from the date of installation, or 24 months from the date of shipment from our factory, which ever occurs first. The manufacturer's liability is limited to repair or replacement of any failed equipment or part of, which is proven to be defective in material or workmanship upon the manufacturer's examination. This warranty does not include removal or installation costs and in no event shall the manufacturer's liability exceed its selling price of such equipment or part.

Aquarius Technologies Pty Ltd. disclaims all liability for damage to its products through improper installation, maintenance, use or attempts to operate such products beyond their functional capacity, intentionally or otherwise, or any unauthorised repair. Aquarius Technologies Pty Ltd. will not be responsible for any consequential or other damages, injuries, or expense incurred through use of its products.

This warranty is in lieu of any other warranty, either expressed or implied. Aquarius Technologies Pty Ltd. make no warranty of fitness or merchantability. No agent of ours is authorised to provide any warranty other than above.

This warranty does not exclude any condition or warranty implied by the Trade Practices Act 1974 or separate State Laws in Australia and is in addition to any other right that the original purchaser or any subsequent purchaser may have under Australian law.

Should a unit fail to function normally, please contact our Customer Service Department by phone or fax quoting, Model Number, and Serial Number, for initial discussion of the problems encountered, and if it is necessary to return the item to the factory, a Return Authorisation number will be given to facilitate return, and repair or replacement of the item.

The item for return should be carefully packaged to prevent any damage in transit, contain the Return Authorisation identification number, customer identification, and return delivery details, and the freight prepaid to our factory. If in the opinion of our factory, after examination, the failure was due to materials or workmanship, repair or replacement will be made with out charge for parts, labour and return freight. A reasonable service charge will be made for diagnosis and/or repairs due to normal wear, abuse, tampering or damage in transit.

AQUARIUS TECHNOLOGIES PTY Ltd. reserve the right to continue development and improvement of the entire range of our equipment, and therefore minor changes may occur due to these improvements and the continuing development.

