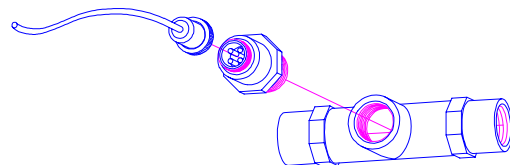
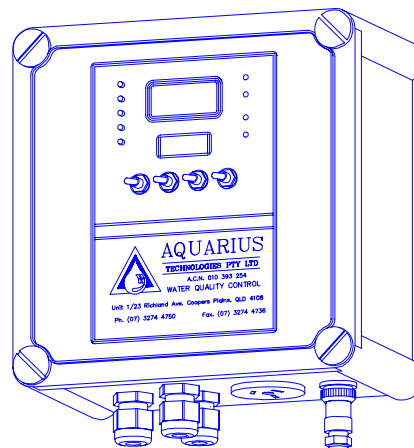


AQUARIUS

DC100 Conductivity Controller

Automatic Dosage
based on
Conductivity
with
P.I.D controlled output
and with an optional
Data Acquisition package

Model - DC100



- ✓ Microprocessor Control
- ✓ Digital Readout Display
- ✓ P.I.D. Controlled Output
- ✓ Alarms - High & Low Levels
- ✓ Lockout - to prevent over dose
- ✓ Weatherproof Enclosure
- With Optional**
- ✓ Data Acquisition Package
- ✓ Loop Isolated 4 - 20 mA. outputs
- ✓ 4 x Opto Digital Events Outputs



ADVANCED TECHNOLOGY FOR THE NEW MILLENIUM

Aquarius DC100 Conductivity Control

Features and Benefits

1. "State of the Art" - Microprocessor Control with embedded custom software for control of Nutrient Levels (Hydroponic applications) or Conductivity Levels.

2. P.I.D. (Proportional, Integral & Derivative) output control to give dosage and control proportional to the varying demand, and maintain very tight control to the set point.

3. A comprehensive alarms system is designed into the package

- High & Low alarm facilities are available on conductivity level and signals via a NO VOLT common alarm relay. The Common Alarm facility is delayed for 5 minutes to prevent any false alarms.

4. Comprehensive computer Data Acquisition output capabilities are an OPTION available on all models.

- Loop Isolated 4 - 20 mA. analog outputs on Conductivity Values.

- Optically isolated event outputs on ON/OFF relay, PID relay, Flow and Common Alarm relay

- Data log to a Lap top, or to a PC with appropriate software

- Remote data acquisition and monitoring via modem and appropriate software.

- Historical hard copy record of water treatment chemistry.

5. Manufactured under a Quality Assurance system to ISO 9001 standards, from a life time experience in water treatment, with many years experience in design of dosing and control equipment, and designed to meet and exceed the requirements of AS3666 and other applicable Australian Standards.

DC100 controller with probe & Tee

Weatherproof Enclosure

Clear View Front

Digital Readout

Probe Lead Gland

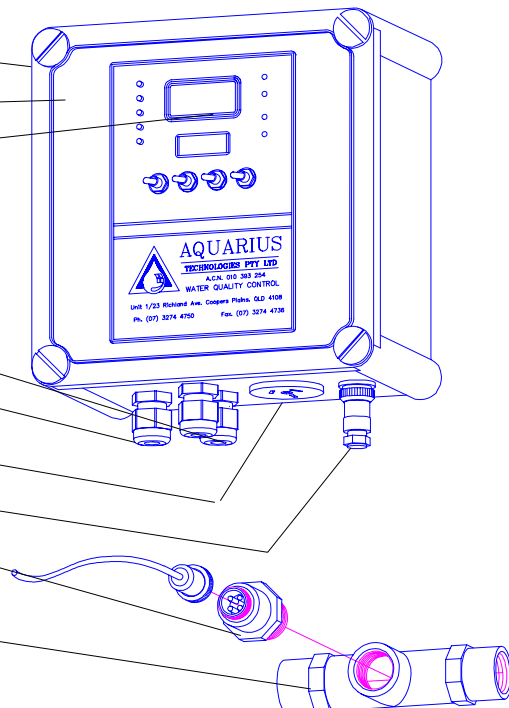
240 Vac Lead & 3 pin plug

Control Output Socket

BMS outputs connection

Conductivity Sensor - 15 mm BSP

Tee - PVC - 15 mm BSP Fem.



Aquarius DC100 Conductivity Control

INTRODUCTION

Aquarius DC100 Series Conductivity Control Systems have been designed with the benefit of a life time background of water treatment chemistry and are the fourth generation designed over a period of almost 15 years, and utilising the latest microprocessor chip technology.

Aquarius DC100 systems are offered as the solution to a growing demand for good automatic control of Conductivity levels, and to very tight set point specifications

TECHNICAL DESCRIPTION

At the heart of the **DC100 series controller** is a microprocessor based Printed Circuit Board which processes the inputs from the various front panel controls and conductivity sensor, and sets outputs according to the results of this processing.

All electronics is housed in an IP65 rated enclosure which enables the unit to be used in all weather conditions.

The **DC100 controller** utilises **a very accurate temperature compensated conductivity sensor** to accurately measure from 0 - 10,000 uS/cm (0 - 10.00 mS/cm). Control is via 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 period (Delta). This algorithm which allows for P.I.D. type control has the capability to vary Duty Cycle in less than 1% steps to maintain conductivity or nutrient set point levels with unsurpassed accuracy.

The microprocessor also produces an ON/OFF output where the process loop dictates that conductivity overshoots cannot be tolerated. This output has an inherent hysteresis of approximately 2.5% of the set point to eliminate output chatter.

No Volt Alarm contacts are provided on all **DC100 controllers** to signify High and Low Alarm conditions, 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.

An in built AUTO-TEST facility allows for full checking of the entire PCB. The AUTO-TEST is initiated simply by disconnecting the conductivity sensor (Quick Release Plug pulled out of the socket). Under this condition, the controller should operate as if sensing a conductivity of approximately 5.00 mS. All functions can then be easily checked by varying the Bleed Set Point above and below the Self Test Conductivity value (0 - 5.00 mS/cm).

Four switches on the front panel control the modes of operation and information displayed, while five indicator LEDS quickly identify the status of the output signals, the High and Low alarm, and the current manifold flow conditions.

Aquarius DC100 series controllers can be supplied as an **OPTION with a Data Acquisition output package** to allow for remote monitoring performance to a BMS or to a laptop computer. An eight pin socket fitted to the base of the enclosure provides for a loop isolated 4-20 mA. signal proportional to the conductivity value. In addition optically isolated outputs report the status of the various relay outputs. Refer to the Electrical Wiring Requirements drawing on page 7.

Major Applications

When combined with a suitable dosage pump

1. Hydroponics - automatic dosage of nutrients
2. Chilled Water Systems - auto dose of Inhibitors
3. Printing Solutions - auto dosage of solutions
4. Plating Industry - auto adjustment of solutions.

When combined with a solenoid valve

1. Rinse Controller - minimise water wastage.
2. Bleed Controller - automatic bleed off.

Aquarius DC100 Conductivity Control

SPECIFICATIONS

Controllers

Conductivity Module

Module designation

DC100

Operating Range	0 - 10.00 mS/cm
Resolution	0.01 mS/cm
Accuracy	+/- 0.02 mS/cm
Repeatability	+/- 0.02 mS/cm
Alarm Range	+/- 20%
Dead Band	2.5 %
Control Relays	1 @ 8 Amps
Control Type	P.I.D. or ON/OFF.
Probe or Sensor Part No.	PR522
Probe or Sensor Rating	500 kPa. @ 60 °C
Electrical Supply	220 -240 Vac. 10 Amps. 50/60 Hz.
Enclosure Rating	IP65 Electrical enclosure.

Shipping & Weights

1. DC100

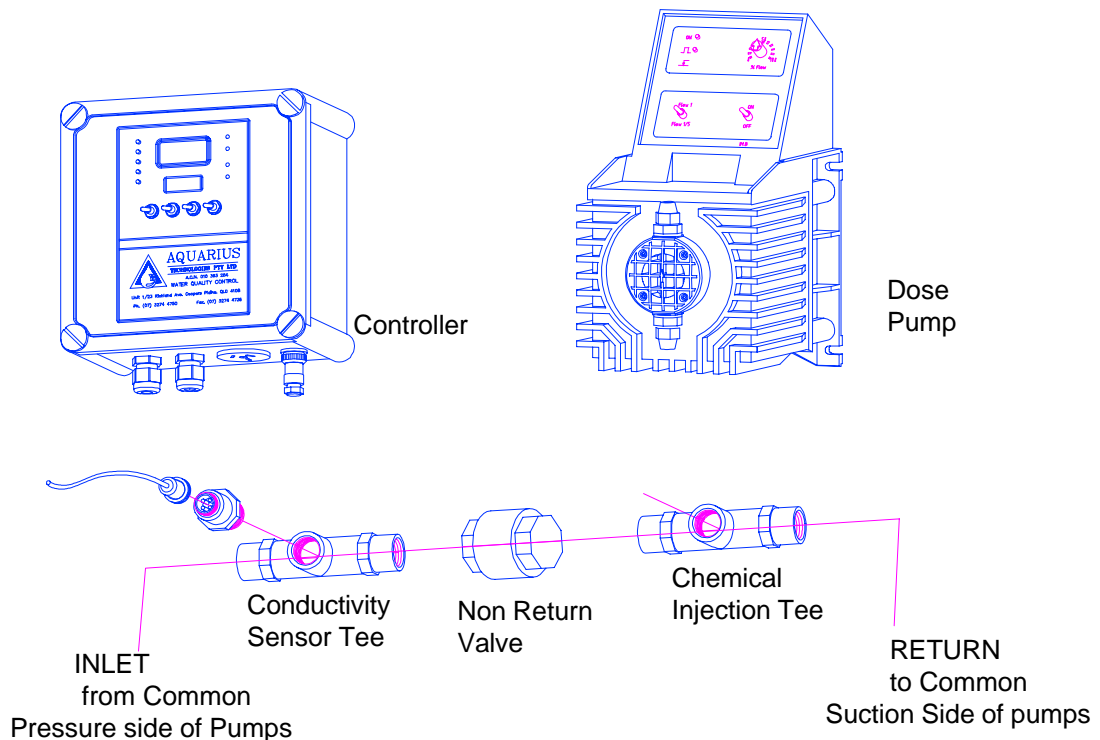
Weight

3 kgs.

Dimensions

200 mm H x 200 mm W x 100 mm D

Schematic Installation on a Chilled Water System



Aquarius DC100 Conductivity Control

Installation, Commissioning & Operating Instructions

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Aquarius DC100 Conductivity Control

INSTALLATION and PLUMBING GUIDELINES

Select a suitable location for installation of the package, - preferably in close proximity to the system being controlled, shielded from the public, and extremes of the environment. The controller LCD displays should be protected from direct sunlight.

A wall area of approx. 0.5 m. wide by 0.5 m high is ideal for mounting the **Aquarius DC100** series control gear, at eye level, with a suitable floor space for any chemical tanks if 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 controller and plumb in the Conductivity Tee piece as per the drawing on page 2 in this brochure.

3. Refer to page 7 for electrical wiring for power and wiring connections to the **Optional** computer Data Acquisition outputs.

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

5. The **Aquarius DC100** series system is now ready for commissioning and commencement of the control programme

6. Liaise with your chemical specialist, or department, 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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Aquarius DC100 Conductivity Control

ELECTRICAL WIRING REQUIREMENTS

DC100 series control 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 chassis sockets on the right hand side of base of the controller provide for **loop isolated 4-20 mA. analog signals** for Conductivity 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 or Lap top computer systems without further conditioning.**

BMS sockets outputs on the DC100 series Controllers are as follows: -

BMS Socket

1. Analog 4 - 20 mA. = Conductivity Value as 0 - 10.00 Millisiemens/centimetre
2. Analog 4 - 20 mA. = Current return to the DC100
3. Flow Sensor Status = High = ON
4. P.I.D. Solid State Relay status = High = ON
5. ON/OFF Solid State Relay status = HIGH =ON
6. Not Used in this application
7. Common Alarm relay status = either High or Low alarm on either pH, ORP or Cond. = Alarm ON
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.**

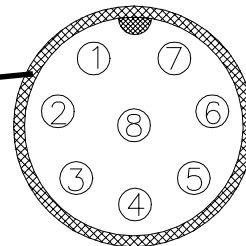
SHIELD. - should be connected to GROUND at the computer or BMS system **ONLY and NOT connected at the conductivity & ORP - controllers** to minimise any interference to the low voltage signals being sent to the computer.

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 enclosure.

FRONT OF ENCLOSURE



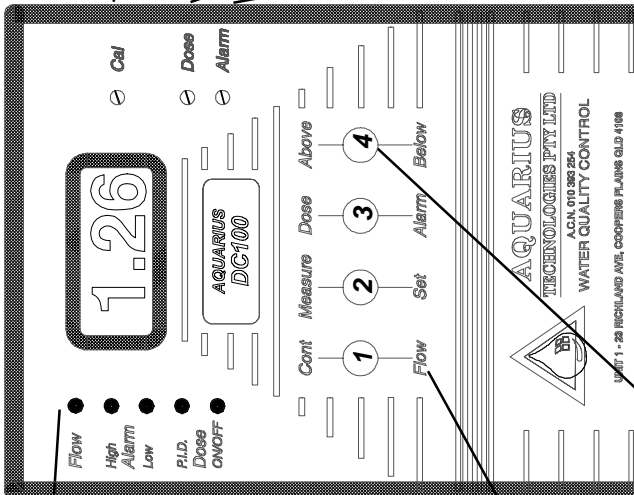
Contact Aquarius for software and a package to allow for data acquisition to a lap top computer for either verification of conditions & chemistry after commissioning or for trouble shooting later.

Aquarius DC100 Conductivity Control

FRONT PANEL FUNCTIONS AND FEATURES Module - DC100 - Conductivity Controller

INDICATOR LEDS

- Flow** - gives an indication from a Flow Sensor in the manifold.
- & 3. Alarm leds** - High Alarm led is ON when the measured value exceeds the Set Point conductivity value plus the Alarm set value.
- Low Alarm led is ON** when the measured value is lower than the Set Point conductivity minus the Alarm Set value. A 5 minute delay is used before these leds are illuminated, to avoid any false signals to the BCMS
- Dose Led - the P.I.D. led is ON** when the "Delta" proportional pulsed output is energised, this is normal dosing method
- ON/OFF Led Is ON** when the ON/OFF output is energised, this is normal method for bleed or dump via a solenoid



SET POINTS & CALIBRATION POTS

Cal - a 10 turn pot allows for calibration of the probe after cleaning when
 (a) the probe is placed in the appropriate conductivity standard solution for the range involved
 (b) **Switch 2** is set to the **Measure** position
 Calibration is effected by turning the **Cal** trim pot to give the value of the conductivity standard in the LCD display e.g. 2740 uS/cm conductivity standard = 2.74 mS/cm on 0 -10.00 mS/cm range

Dose or Dump Conductivity Set Point - With switch 2 set to **Set**, switch 3 set to **Dose**, - turn the trim pot to set the desired Conductivity value in the LCD display..

With **Switch 4** set to **Above** the relay will be energised when measured conductivity exceeds the set point value, if set to **Below** the relay will be energised when the measured conductivity is less than the set point value

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 20 % of the total range, above or below the Dose set point.

0 - 10.00 mS/cm range (0 - 10,000 uS/cm) has an alarm window of 0 - 2.00 mS/cm (1000 uS/cm)
 0 - 1999 uS/cm range has a window of 0 - 400 uS/cm
 0 -199.9 uS/cm range has a window of 0 - 40.0 uS/cm

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 the relays to energise when the FLOW SENSOR in the manifold is ON for flow - use this setting when ever the manifold is installed to prevent dosing or dumping when the system is off-line.

Switch 2. - Measure/Set - Measure allows the display to show the Conductivity value at the sensor during run mode or calibration. Set allows the display to show the dose or dump set points and or the alarm set points.

Switch 3. - Dose/Alarm - Used with switch 2 to SET mode - Dose allows switch 4 to display the Conductivity value set point for Above or Below operation and Alarm displays the amount + & - to the conductivity set point above, to activate Alarm outputs.

Switch 4. - Above/Below - Set to Above for e.g. Rinse

Tanks - Set Above and a Dose Set Point equal to the maximum desired conductivity to be maintained in the tank or system, above this value the relay will be energised to dump system water via a suitable solenoid until the conductivity falls to slightly less than the set point, and maintain a constant conductivity in the process system.

Set to Below for e.g. Hydroponics - Set Below and a Dose Set Point of approx. 1.50 - 2.50 mS/cm. to automatically dose nutrient or fertiliser solution UP to raise the conductivity up to the set point value level. In this application the relay is energised in P.I.D. or pulsed proportional control for accurate dosage.

Aquarius DC100 Conductivity Control

COMMISSIONING and START UP GUIDELINES

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

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 page 2.

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

1. DC100 - Conductivity module - see front panel functions and features on page 8.

a. Set **the DC100 - Measure / Set** switch to **Measure**.

b. Calibrate **the Conductivity probe to the controller as per the Conductivity calibration procedure** on the following page.

c. Set the appropriate Set Point values, Alarm deviation amounts, Dose Modes etc. for the controller.

Cleaning of Conductivity sensors

1. After isolation, remove the sensor from the manifold, and thoroughly abrade the sensor surface with 300 - 400 grade, wet and dry paper until the surface is clean, the two carbon electrode surfaces are clearly visible and the surface wets out freely.

2. Thoroughly rinse the sensor clean, in fresh water and proceed to the section on **Conductivity calibration procedure**.

Conductivity calibration procedure

1. With the **DC100 - Measure / Set** switch set to **Measure** proceed to calibrate as follows

2. After cleaning and rinsing, Calibrate the conductivity probe in **1413 uS/cm standard solution**, (or 2740 uS/cm standard solution) ensuring the probe is clean and wets out evenly. Do not allow the probe connector to enter the solution, and keep the electrode tip at least 10 mm from bottom of beaker.

3. Allow 30 - 60 seconds for temperature stabilisation, then adjust **CAL** trim pot for a reading of **1.41 mS/cm** (or 2.74 mS/cm) on the display.

4 Rinse the probe and return it to its position, secure it in the manifold, and connect the probe cable.

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.

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 may be in use, the appropriate safety equipment should be worn whilst servicing the equipment.

Routine Testing

Whilst the use of an **Aquarius DC100** series will automatically maintain good conductivity control even with wide fluctuations in system load or demand, etc, **both "Best Practice" and "Duty of Care" responsibilities of the owner, dictate that all systems should be routinely serviced and tested chemically on a regular basis and results logged as required to ensure maximum control and performance.**

Recommended Assessories and Spare Parts for DC100 Models

Sensors

PR522 Replacement Conductivity Sensor

Reagents

AS1413 1413 uS/cm solution (500ml)

Peristaltic Pumps

TUBE2N Squeeze Tube
TUBE2NINS White barb tube connectors
A014HD-6V Injection non return fitting
TUBE6 Pink tubing - chemical lines

Test Meters

HI8733 - portable conductivity meter, or equivalent.

Troubleshooting Problems

1. Check the **Conductivity sensor is clean & calibrated**, by following the procedure in Care of, Cleaning & Calibration of Sensors on page 9.

2. Check the **set point** Conductivity value is set at the desired level.

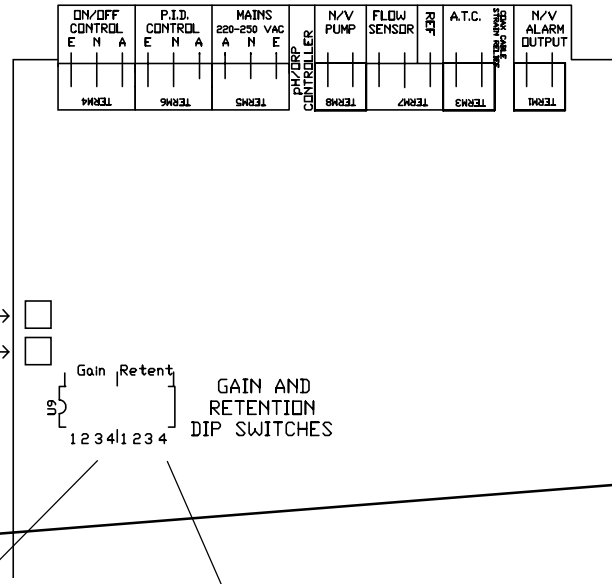
3. The operation of the control output equipment (solenoids, pumps etc) can be checked by performing a self-test. This is initiated by removing the probe lead from the probe. At this point the conductivity reading should be approximately half scale (5mS). Set the **Above/Below switch** accordingly to activate the output device.

Aquarius DC100 Conductivity Control

PRINTED CIRCUIT BOARD LAYOUT for DC100 (EC) PRINTED CIRCUIT BOARD

POSITIONING OF DIP SWITCH AND LOCKOUT JUMPERS

Removal of the four self tapper screws from the electronics front panel allows for exposure of the Printed Circuit Board, and provides access to, and allows for the setting of Lockout, Gain and Retention features 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	= 20 minutes
Jumpered	Jumpered	= 100 minutes

Factory setting = Lockout disabled or no lockout

	GAIN				System Volume (Kilo Litres)	RETENTION			
	1	2	3	4		1	2	3	4
(a) (lowest)	Off	Off	Off	On	1	Off	Off	Off	On
(b)	Off	Off	On	Off	2	Off	Off	Off	On
(c)	Off	On	Off	Off	5	Off	Off	On	Off
(d)	Off	On	On	Off	10	Off	Off	On	Off
(e)	On	Off	On	Off	15	Off	Off	On	On
(f) (highest)	On	On	On	On	20	Off	On	Off	Off
					40	Off	On	Off	On
					100	On	On	On	On

Factory Settings are (f) and 5 kL. volume

Aquarius DC100 Conductivity Control

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.

