AQUARIUS
TECHNOLOGIES PTY LTD
WATER QUALITY CONTROL

Quality System

Quality Endorsed Company ISO 9001 Lic. No. 5403

AQUARIUS
Generox - Chlorine Dioxide Units

Chlorine Dioxide solution generating units using the 3 chemical technique or gas Chlorine with precursor - using PLC control for complete management ensures maximum conversion of the generation process.

pH monitoring of the generated Chlorine Dioxide solution to ensure correct conditions for maximum conversion efficiency

In built safety features to ensure the highest degree of safety during generation

Advanced Technology For The New Millennium

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Generox - Chlorine Dioxide Units

Functions of the Generox Units

The Generox units are designed for the efficient generation of chlorine dioxide solutions using the three chemical technique, namely Sodium hypochlorite, Sodium Chlorite and Hydrochloric acid solutions are injected in controlled amounts into carrier water, and allowed to react in the mixing chamber resulting in a chlorine dioxide solution of up to 2.5 gms/litre exiting the mixing chamber.

The units consists of the controller enclosure, the regeneration chamber and manifold. The controller enclosure includes the function switches and indicators as well as the pH monitor.

For positions of these controls and indicators refer to the picture below.

Although the pH is presented only for monitoring purposes, all features of the DP100 pH controller are included on the following page.

Auto / Off / Manual switch. This switch is used to select the mode of operation of the Generox Unit. In AUTO mode, operation of the unit can be initiated by an external 240 Vac signal (typically from an ORP controller). In MANUAL mode, the Generox unit will operate independent of the external control. In OFF mode, all operation is stopped.

Emergency Stop switch. This switch is used as an emergency stop switch. In NORMAL mode, the Generox unit will operate as per the settings of the Auto / Off / Manual switch. In ISOLATE mode, dose pump operation is inhibited.

Pumps Status. This green indicator will be illuminated whenever the dosing pumps have been set to operate.

Flow Alarm Status. This red indicator will be illuminated whenever the flow solenoid has been energised but no flow or low flow of carrier water is detected by the flow meter

Models Available

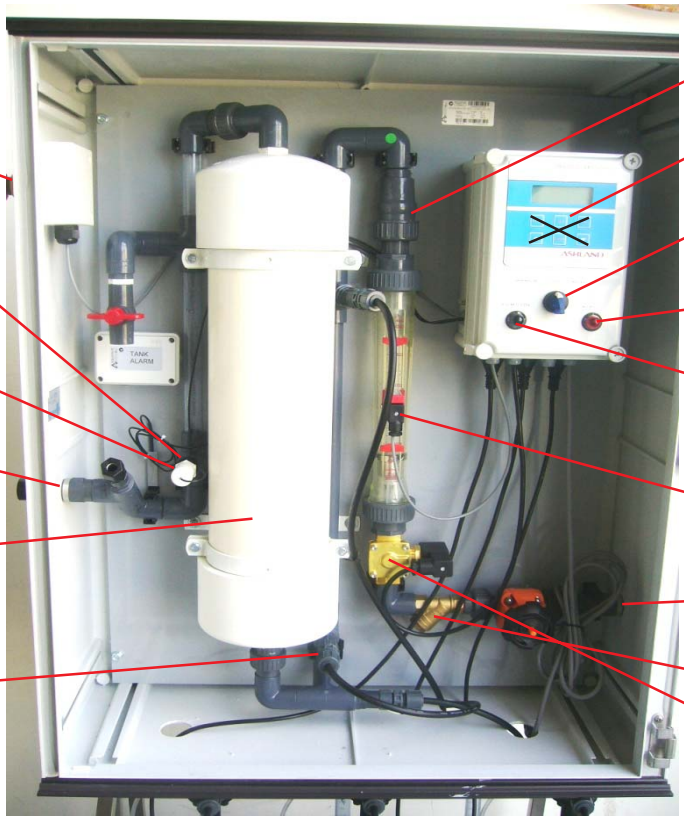
Generox - ENS Generox - ENS is presented in a thermoplastic enclosure and mounted on a stainless steel skid, complete with calibration tubes - but without the dosage pumps. Units are supplied in wooden crates to ensure a pristine unit is delivered to site.

Generox - ENS is primarily intended for stand alone duty out in the open in close proximity to the intended treatment source. The unit is weatherproof to IP65 standard.

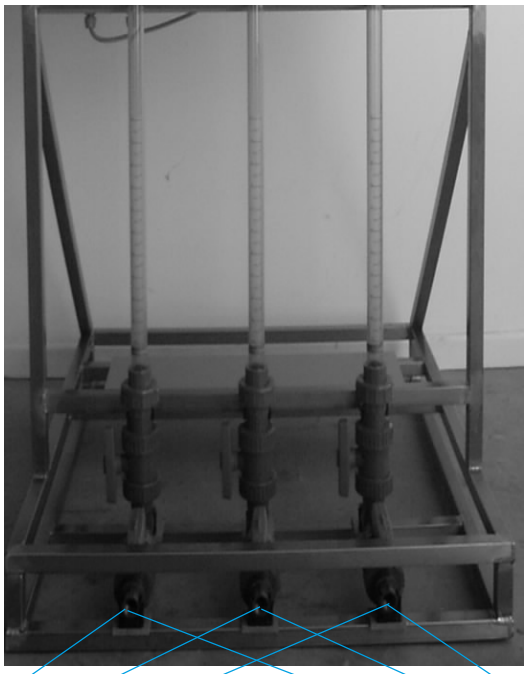
Generox - B Generox - B is presented as the basic bare unit - controller enclosure, manifold and reaction chamber mounted on a 10 mm PVC backboard and is primarily intended for wall mounting in a suitable chemical plant room.

Please refer to picture of Generox - B on next page as this unit is supplied without enclosure, calibration tubes, or dosage pumps.

Reaction Chamber and Manifold - Major Components



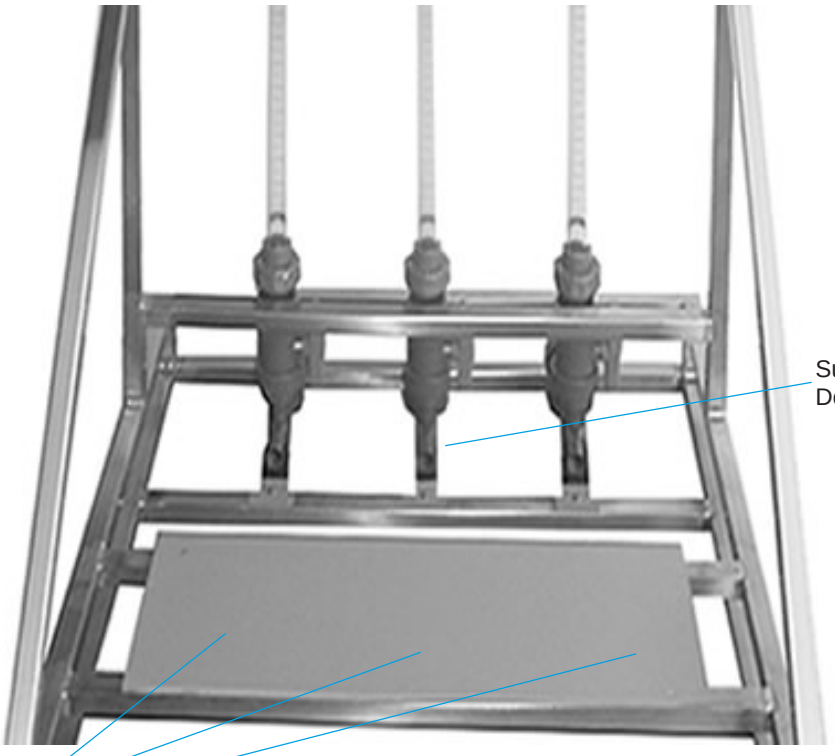
Dosage Pumps - Calibration Tubes
Back view



From Chemical Storage Tanks

15mm BSP fem

Dosage Pumps - Calibration Tubes
Front view



Suction to each Dosage Pump

Mount Three suitably rated Dosage Pumps

Generox - Chlorine Dioxide Units

Generox - ENS & Generox - B - Dosage Injection Points

Hydrochloric Acid
Injection Point
OR
Plug Off if using
Chlorine gas/water

Sodium Hypochlorite
Injection Point
OR
Chlorine Gas/Water
Injection

Sodium Chlorite
Injection Point

Generox - ENS - Front View
Minus Front Door

Generox - ENS - Back View

Generox - Chlorine Dioxide Units

Generox - B

Intended for wall mounting internally in a suitable plant room

Specifications

Power Requirements - 220 -250 Vac, 50/60 Hz. and 10 Amp, continuous supply

Pressure Rating - Maximum pressure rating is 1000 kPa at 25 ^{0}C - downrate pressure for higher temperatures

Three Chemical Method -

Carrier Water - Potable grade water at a minimum pressure 250 kPa. and a flow rate of 10 litres per minute are minimum requirements. Backflow prevention on the inlet line is a requirement of all Australian authorities, and suitable backflow prevention devices should be installed to comply with local regulations.
Chemicals Required - Suitable supply of Sodium Hypochlorite, Sodium Chlorite solution and Hydrochloric acid are required, and suitable bunding for both Generox and Chemicals is reccommended, if not a regulation
Chemical Dosage Pumps - Suitable sized dosage pumps capable of a minimum pressure of 1000 kPa. and operating on voltages as above are required for satisfactory chemical delivery to the Generox units

Gas Chlorine Method

Carrier Water - the water containing dissolved chlorine is injected into the Hypochlorite injection point, by removal of the 20 x 15 mm bush and inserting the 20 mm hose tail supplied. This is the carrier water in this method. The hydrochloric acid injection point is plugged using the 15 mm plug provided.
Chemicals Required - supply of chlorine gas, supplied to Generox as chlorine water and liquid Sodium Chlorite solution.
Chemical Dosage Pump - A suitable sized dosage pump rated to 1000 kPa is required only for dosage of Sodium Chlorite Solution.

Capabilities of the units in kgs/hr of ClO_2 for 3 chemicals and Gas Chlorine methods are provided on following pages.

Generox - Chlorine Dioxide Units

Capacity of Generox and Generox B models when using the three chemical technique

To Generate at 3.0 gms/litre ex Generox ENS or Generox B Model

Carrier Water IN lts/min	33% HCl Acid lts/hr	11% Sod. Hypo lts/hr	25% Sod. Chlorite lts/hr	Reaction Time in Seconds	Chlorine Dioxide generation as kgs/hr	Chlorine Dioxide Conc. as gms/l	Dosage Pump Capacity Rated at 10 Bar pressure HCl lts/hr	Hypo lts/hr	NaClO2 lts/hr
10	4.76	6.95	8.11	67	1.86	3.00	5	10	10
15	7.15	10.43	12.16	45	2.79	3.00	10	20	20
20	9.53	13.91	16.22	33	3.72	3.00	10	20	20
30	14.29	20.86	24.33	22	5.58	3.00	20	30	30
40	19.06	27.81	32.44	17	7.44	3.00	20	30	40
50	23.82	34.76	40.55	13	9.30	3.00	30	50	50
60	28.59	41.72	48.76	11	11.16	3.00	40	60	60

To Generate at 2.0 gms/litre ex Generox ENS or Generox B Models

Carrier Water IN lts/min	33% HCl Acid lts/hr	11% Sod. Hypo lts/hr	25% Sod. Chlorite lts/hr	Reaction Time in Seconds	Chlorine Dioxide generation as kgs/hr	Chlorine Dioxide Conc. as gms/l	Dosage Pump Capacity Rated at 10 Bar pressure HCl lts/hr	Hypo lts/hr	NaClO2 lts/hr
10	3.14	4.58	5.34	67	1.23	2.0	5	10	10
15	4.71	6.87	8.01	45	1.84	2.0	5	10	10
20	6.28	9.16	10.68	33	2.45	2.0	10	20	20
30	9.41	13.74	16.03	22	3.68	2.0	20	20	20
40	12.55	18,32	21.37	17	4.90	2.0	20	30	30
50	15.69	22.90	26.71	13	6.13	2.0	20	30	30
60	18.83	27.48	32.05	11	7.35	2.0	30	40	40

To Generate at 1.0 gm/litre ex Generox ENS or Generox B Models

Carrier Water IN lts/min	33% HCl Acid lts/hr	11% Sod. Hypo lts/hr	25% Sod. Chlorite lts/hr	Reaction Time in Seconds	Chlorine Dioxide generation as kgs/hr	Chlorine Dioxide Conc. as gms/l	Dosage Pump Capacity Rated at 10 Bar pressure HCl lts/hr	Hypo lts/hr	NaClO2 lts/hr
10	1.55	2.26	2.64	67	0.61	1.0	2	5	5
15	2.33	3.39	3.96	45	0.91	1.0	2	5	5
20	3.10	4.52	5.28	33	1.21	1.0	5	10	10
30	4.65	6.79	7.92	22	1.82	1.0	5	10	10
40	6.20	9.05	10.56	17	2.42	1.0	10	20	20
50	7.75	11.31	13.19	13	3.03	1.0	10	20	20
60	9.30	13.57	15.83	11	3.63	1.0	10	20	20

Generox - Chlorine Dioxide Units

Capacity of Generox and Generox B models when using Chlorine Gas and 25% Sodium Chlorite

To Generate at 3.0 gms/litre ex Generox ENS or Generox B Models using Chlorine Gas & 25% Sodium Chlorite

Carrier Water IN lts/min	Chlorine Gas as kgs/hr	Chlorine Gas as gms/litre	25% Sod. Chlorite lts/hr	Reaction Time in Seconds	Chlorine Dioxide generation as kgs/hr	Chlorine Dioxide Conc. as gms/l	Sod. Chlorite Pump capacity in litres /hr Rated at 10 Bar		
10	1.04	1.74	10.65	67	2.44	3.00		10	
20	2.09	1.74	21.31	33	4.89	3.00		20	
30	3.13	1.74	31.96	22	7.33	3.00		40	
40	4.18	1.74	42.61	17	9.77	3.00		60	
50	5.22	1.74	53.27	13	12.22	3.00		60	

To Generate at 2.0 gms/litre ex Generox ENS or Generox B Models

Carrier Water IN lts/min	Chlorine Gas as kgs/hr	Chlorine Gas as gms/litre	25% Sod. Chlorite lts/hr	Reaction Time in Seconds	Chlorine Dioxide generation as kgs/hr	Chlorine Dioxide Conc. as gms/l	Sod. Chlorite Pump capacity in litres /hr Rated at 10 Bar		
10	0.52	0.86	5.27	67	1.21	2.0		5	
20	1.03	0.86	10.53	33	2.42	2.0		10	
30	1.55	0.86	15.80	22	3.62	2.0		20	
40	2.06	0.86	21.06	17	4.83	2.0		30	
50	2.58	0.86	26.33	13	6.04	2.0		40	

To Generate at 1.0 gm/litre ex Generox ENS or Generox B Models

Carrier Water IN lts/min	Chlorine Gas as kgs/hr	Chlorine Gas as gms/litre	25% Sod. Chlorite lts/hr	Reaction Time in Seconds	Chlorine Dioxide generation as kgs/hr	Chlorine Dioxide Conc. as gms/l	Sod. Chlorite Pump capacity in litres /hr Rated at 10 Bar		
10	0.26	0.43	2.63	67	0.6	1.0		5	
20	0.52	0.43	5.27	33	1.21	1.0		5	
30	0.77	0.43	7.90	22	1.81	1.0		10	
40	1.03	0.43	10.53	17	2.42	1.0		20	
50	1.29	0.43	13.16	13	3.02	1.0		30	

Installation, Commissioning & Operating Instructions

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Installation Guidelines

1. Select a suitable site for installation of the Generox unit, allowing room for chemical supplies and for occasional servicing. Securely fasten the stainless steel skid to the concrete plinth for the Generox - ENS model, or secure the Generox - B model securely to an internal wall at eye level height for the pH display.

2. Having selected three suitable dosage pumps, mount these pumps to the cross member on the stainless skid facing towards each calibration tube. Attach the pump tubing, non return valves using Teflon tape on threads only, securely tighten all fittings, and ensure the correct chemical is dosed to the correct dosage point as outlined in the earlier pictures. With the **Generox - B model,** the dose pumps should be wall mounted below the Generox - B module and then connected up as above.

3. Plumb a 20 mm supply line of potable grade water to the **INLET** point and **install any backflow prevention devices** necessary to comply with local regulations.

4. Plumbing from the **OUTLET** of the Generox units to the treatment source should be in **20 mm corrosion resistant pipe** - uPVC pipe is normally a satisfactory choice, or high quality braided hose for short runs.

5. Plug the dose pumps into the correct plug receptacle on base of controller and power up the unit. Introduce a flow of carrier water via the inlet valve and set flow rate to the desired l/m setting on the flow meter. Ensure the unit is leak free and that flow is discharging to the treatment source

6. Using **MAN**ual mode the dose pumps can now be primed up, calibrated, and then set at the calculated dosage for the carrier water flow rate selected.

7. Return to **AUTO** Mode and ensure the ORP controller (240 Vac signal is ON) is available to activate dosage. After pumps have been pumping for a few minutes, verify that the pH is at desired value - approximately 3.0 pH.

Operating Instructions

The **Generox – ENS and B** model generators have been designed to operate via an **ON/OFF 240 Vac signal** from an ORP controller or similar. Once the signal has been received from the external source the inlet solenoid opens. This activates the flow sensor which is fitted to ensure that dosing cannot occur with no or low flow conditions. The flow sensor or meter is rated to operate at a flow rate in excess of 5 litres per minute.
When this flow is detected, the Duty Cycle timer within the PLC will begin timing.

The **Duty Cycle** feature has been provided for use in smaller application systems where 100% duty may cause excessive dosage, overshoots and/or poor control. The Duty Cycle can be set from 0 - 100% Duty using the "+" and "-" buttons (located to the right of the PLC display) on the PLC and operates on a five minute cycle (80% = 4mins ON : 1min OFF). On the PLC, the text "DUTY CYCLE" will flash whilst all conditions for dosing are met and the pumps are allowed to operate at their user set Duty Cycle.

The solenoid remains open for a user set **Flush** time at the end of **all** doses to flush the reaction chamber free of chemicals. The **Flush** time can be set from 0 – 99 seconds using the "^" and "v" buttons (located to the bottom of the PLC display) on the PLC. As the inlet solenoid remains open while the pumps are dosing on duty cycle, the flush is only necessary when the ORP controller instructs the Generox unit to stop dosing while the pumps are in their "ON" time, or have finished dosing within the Flush time.
On the PLC, the text "**Flush**" will flash whenever the inlet solenoid is open.

A **PHS100 pH** control board is used for monitoring only. This is used to verify the mixing of chemicals in the reaction chamber, to verify that the correct pH value is being maintained within the chamber during the dosing and activation period. For calibration of the pH monitor refer to the operating instructions for calibration of pH sensors.

The unit has only two external controls – The **AUTO/ OFF/MAN** switch (**AUTO** – control via an external ORP signal / OFF / **MAN** – manual on for dose pump tests, or for pump calibration, etc), and the **Emergency Stop or PUMP ISOLATE/STANDBY** switch.

There are also two indicator lamps – **GREEN = Dose Pumps are ON,** and **RED = Solenoid ON**, open and without a no flow or low flow (alarm).

Maintenance and Calibration of Sensors

Foulants can lead to inaccurate sensor readings. Flow and pH Sensors should be cleaned and calibrated regularly, using the following procedures.

Cleaning of the pH sensor

Allow the reaction chamber to finish a Flush cycle and then isolate flow to the manifold.
Remove the sensors from the manifold by loosening the lock nut and withdrawing the sensor from the probe holder.
Rinse the sensors 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.
Place the sensors in the Electrode Cleaner solution (AS9500) for about 5 minutes to completely dissolve any trace of inorganic foulants.
Remove and rinse thoroughly in fresh water.
Proceed to calibration or verification of sensors as outlined in the commissioning section.

pH Probe Calibration procedure

Please see page 10 of pH Controller Manual for calibration procedure.

Cleaning of Flow Sensor

Allow the reaction chamber to complete a Flush cycle and then isolate the flow to the manifold.

To remove the flow sensor from the manifold:
Carefully unscrew the flow sensor from the manifold.
Remove any debris from the flow sensor.

To replace the flow sensor:
Screw the flow sensor back onto the manifold, ensuring that the flow switch aligns with the direction of flow.

Assessories and Spare parts

Sensor:	
PR_PHRG	pH Electrode
Reagent:	
AS7004	pH 4 buffer solution
AS7007	pH 7 buffer solution
AS9500	Electrode Cleaner
Test Meters:	
HI9813	Portable pH/cond meter
PH/MV CHECKER	Portable pH & mV checker

Routine Testing

Both "Best Practice" and "Duty of Care" responsibilities of the system 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 from the water treatment programme, and safe operation of the dosage equipment.

Routine Maintenance

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

The pH sensor ages with time and temperature, and have a typical life span of 24-36 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 to ensure they continue to work efficiently.

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

Safety Considerations

The Generox units are built to comply with the specifications of Drew Ashland Ltd, and **are intended for use by experienced water treatment professionals** who are trained in the hazards and dangers of chlorine dioxide solution generation and the injection chemicals involved.

Please familiarise yourself with the relevant chemical MSDS sheets and wear suitable protective clothing when in the vicinity of the unit.

New operators should under go extensive training on the possible hazards involved, prior to either operation or service of the Generox units.

Chlorine Dioxide gas (**normally only a 2.0 gm/l solution is produced**) if produced and allowed to escape is a highly poisonous gas by inhalation at low concentrations in air and at concentrations in excess of 2.5 gms/litre has the capacity to liberate chlorine dioxide gas. Chlorine Dioxide gas and certain air mixtures may cause an explosion.

Your water treatment professional should advise you of suitable risk and emergency procedures.

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 that 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.

Aquarius Technologies Pty Ltd.
Commissioning & Warranty Validation Report

This form should be completed by the Equipment OWNER ,
promptly after installation & commissioning
duly signed and faxed to Aquarius on (+617) 3274 4736
to enable the equipment installation date and details
to be logged to our confidential Warranty Database
and to validate your 12 months warranty registration.

Please print all details except for signatures

Model :- ..... Serial No. .....

The above equipment was satisfactorily commissioned for :-

Equipment Owner - Company Name .....

Address.....

State ..... Date of Installation .....

by

Commissioning - Company Name.....

Address.....

State .....

Technician Name ..... Signature.....

Signed for and on behalf of the Equipment OWNER

Name.....

Signature.....

Date.....

We thank you for your very valuable support, purchase and installation