INSTRUCTION & OPERATION MANUAL

OxiMax MC6000

Darwin Water Park

Low Salinity Electrochlorinator



Manufactured by: Water Engineers Australia Pty Ltd

Exclusively for: ProMinent Australia

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			Water Engineers Australia Pty Ltd			

Document Title:

Installation Operation & Maintenance Manual

Project title

Darwin Wave Pool MC6000 Electrochlorinator

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OxiMax MC Series

1. INTRODUCTION:

The OxiMax MC Series of Low Salinity electrochlorinators are specifically designed for large resort pools, water parks, wave pools and a wide variety of water treatment applications. The machines generate a powerful oxidizing solution safely, reliably and economically.

MC Series Power Supplies and Cells are compact and modular, meaning they can easily be expanded and they require a minimum of space in existing plant rooms.

Each machine consists of one or more OxiMax Cells, a Power Supply, a Control System, Pressure, Flow and Temperature Sensors and a number of control valves. MC Series electrochlorinators are available with outputs ranging from 1000 grams – 200 kilograms chlorine equivalent per hour.

The Cells are manufactured with clear acrylic covers, allowing excellent visibility through each cell and the flow lines are designed to give optimum flow over the electrode surfaces, to maximize efficiency. The heart of the system is the Electrodes, which are constructed from 1.5 mm thick Commercially Pure Titanium plate. The anodes are coated with premium SC12 mixed metal oxide, which allows a Cell life in excess of 5 years under normal operating conditions. An acid cleaning system is normally integrated into the electrolyser frame, allowing simple cleaning of any scale build up on the electrodes.

Reliable, high efficiency Power Supplies are used in the MC Series, giving maximum life and minimum operating cost. Each machine has an Allen Bradley ML1100 PLC and a Red Lion HMI to give a combination of accurate process control along with user friendliness of operation. Local / Remote (Automatic) settings allow a range of control inputs and infinitely variable hypochlorite output.

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2. SYSTEM DESCRIPTION:

The MC6000 Electrochlorinator is designed to provide disinfection for the Darwin Water Park Wave Pool and the machine has the ability to produce 6.0 kg/hr equivalent chlorine. Low salinity (4 – 6 g/l) water is supplied through a strainer and a flow meter and then into the electrolyser at a flow of around 20 m3/hr. DC current is applied to the electrolyser and the water flowing through the cells is converted to low strength sodium hypochlorite and hydrogen gas.

The chlorination package has a 3 phase transformer/rectifier with variable DC output which may be controlled in either automatic or manual mode. The rectifier provides the driving current for the operation of the OxiMax MC6000 cells which at design output produce 6.0 kg/hr at 1250 Amps and 42 Volts. The maximum rated power of the machine is 1500 Amps and 45.0 Volts, allowing extra capacity if required. However, it is recommended that the machine is always run at the design settings. Liquid sodium hypochlorite solution is produced at a strength of 300 mg/l and is transferred to the wave pool where the hydrogen is vented to atmosphere.

The system is simple, reliable and is controlled by a PLC which continuously monitors the performance of the machine and makes the appropriate control decisions. ORP, chlorine analysis or time may be used to control the output and operation of the machine.

3. THE PROCESS:

The raw materials for the electrochlorination process are common salt, water and power and while the actual reactions are complex, the key Hypochlorite production reaction can be represented as follows:

$$NaCl + H_2O + energy \rightarrow HOCl + NaOCl + H_2$$

HOCl (Hypochlorous Acid) and NaOCI (Sodium Hypochlorite) are powerful oxidizing agents, which are ideal for disinfection of a wide variety of water treatment systems.

A branch line is taken from the main filtered water return line and the water is diverted through the Cells. The MC Series generates Hypochlorite continuously whenever there is adequate water flow and power is applied to the Cells.

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4. INSTALLATION:

1. The OxiMax MC Series electrochlorinator should be installed indoors in a well ventilated room.

2. The Power Supply is designed to be floor mounted. It should be located adjacent to the Cells and protected from any possible water ingress. Inlet and outlet air vents must be clear for at least 500mm and ambient temperatures should not exceed 30°C in the vicinity of the power supply.

3. The Electrolyser Assembly is designed to be floor mounted. It is important that the flow lines are connected as follows:
   INLET: A branch line should be taken after the seawater strainers allowing clean filtered water (with no particles > 0.5mm) to enter the base of the Cells. The flow should be as per the Specification Sheet and the flow line should be straight for at least 300mm prior to the inlet flange to allow the Flow Sensor to operate correctly.
   OUTLET: This return flow line contains low strength hypochlorite and hydrogen and it is important that the solution flows to the dosing points with no possible areas where Hydrogen may accumulate. (See Hydrogen Section).

4. It is important that the water flowing through the Electrolyser cells is maintained within the correct flow, pressure and temperature range. Operating outside these ranges may cause a hazard and damage to the equipment.

5. Connected power should be 3 phase 380 – 415 volts AC, 50 Hz.

4.1 POWER SUPPLY WIRING:

This work should always be carried out be a suitably qualified electrician and all relevant standards and safety procedures should be observed.

1. The mains supply should be 380 – 415 volts AC and should include 3 active phases, neutral and earth conductors. The rating of the cable should exceed the connected Amps per phase value in the Specification Sheet. A hole may need to be cut the Power Supply enclosure to fit the supply cable and an appropriate cable gland.

2. Carefully connect the mains supply to the 3 Active phases, Neutral and Earth terminals (as marked in the Power Supply Cabinet).

3. Connect the cable lugs from the Cells to the Power Supply DC output terminals, making sure the polarity is correct.

4. Connect leads from field sensors / controllers to the appropriate terminals, having read the Supplier Instruction Manuals (supplied separately) carefully.

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5. START UP and NORMAL OPERATION:

Once all components are in position and water and power are available, the machine should be started in the following sequence.

5.1 CELLS:

1. Close Acid Line Valves V3, V6, V7, V8 and Vent Valve V4 and slowly open Control Valves V2 and then V1.

2. Carefully operate Electrolyser flow line supply valves (or pumps) to allow water to slowly flow through the Cells. Ensure that the supply pressure does not exceed 250 kPa and carefully check all joints for any leaks.

3. Gradually increase the water flow until the recommended flow setting is achieved, checking that the pressure does not exceed the correct operating range.

5.2 POWER SUPPLY:

1. Once the correct flow has been established and has stabilized, the Power Supply can be energized.

5.3 INITIAL START UP:

1. Check that all electrical connections are in the correct sequence and that all connections are tight.

2. Set the key switch to Local and the Output Control to 0.

3. Switch on all Circuit Breakers in turn, checking carefully for any faults or signs of overheating.

4. Press the START Button and then RESET if any indicators illuminate.

5. If any Fault indicators remain illuminated, turn off the Power Supply, correct the fault and the restart.

6. Slowly turn the Output Control until 250 Amps is reached, pause for 5 minutes checking for any signs of faulty operation or overheating. Increase the power in 250 Amp increments pausing for 5 minutes at each point (as above) until the set point of 1250 Amps is reached. In the event of any faults, shut down the Power Supply and report to the supervisor. Do not restart until any faults have been corrected.

7. Once the current set point has been achieved, calibrate the Voltmeter and Ammeter using a Multimeter and DC Clamp meter to ensure the Panel Meters are accurate.

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8. Wait 30 minutes and then take a sample from the electrolyser outlet flow line to check the hypochlorite strength. Read the flow and multiply by the strength (using Titration or a Colourimiter) to ensure the output meets specifications.

9. Check power readings, flows, temperatures and pressures to ensure all values meet specifications. Record and report any inconsistencies.

10. Slowly turn the Output Control back to zero and shut the machine down.

5.4 NORMAL OPERATION:

1. Set the key switch to Remote and the Output Control to 0.

2. Switch on all Circuit Breakers in turn, checking carefully for any faults or signs of overheating.

3. Press the START Button and then RESET if any indicators illuminate.

4. Once correct operation of all field instruments and chlorine analyser is established, use the Red Lion HMI to control the system according to the Control Philosophy (attached).

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6. FLOWMETER:

The Burkert 8032 Flow Indicator / Switch is installed in the inlet flow line. It consists of a paddle type flow indicator with a relay output. It is factory set for the correct flow range. Lack of flow will light the Flow Fault indicator and shut the system down. Refer to the separate Instruction Manual.

7. TEMPERATURE SENSOR:

A Temperature Sensor is fitted in the outlet flow line and for normal operation it should be set at 40°C. High water temperature will shut the system down and indicate a Temperature fault.

8. HYDROGEN SEPARATION:

During the electrochlorination process, Hydrogen will be produced in quantities as shown in the Specification Sheet. It is important that the flow lines after the Cells do not allow Hydrogen to accumulate and all lines should be inclined, returning to the pool in the shortest distance. The Hydrogen will be returned to the pool where it is vented to atmosphere.

It should be noted that Hydrogen is lighter than air and if allowed to accumulate at levels above 5% in air, there is the possibility of ignition and the potential for an explosion.

Notes:

a) Smoking or naked flames are not permitted in the vicinity of the machine or near the Hydrogen outlet.

b) It is important that the plant room has adequate ventilation (particularly from the roof or ceiling space) so that Hydrogen cannot accumulate under any circumstances.

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9. MAINTENANCE:

Warning: The following general maintenance procedures must be conducted in accordance with this Manual and the relevant Occupational Health and Safety Acts.

The OxiMax MC Series machines operate reliably and need little regular maintenance. However, it is recommended that weekly inspections are carried out to ensure correct function of all components.

The following items should be checked:

- All water flows are correct and sensors are functioning correctly.
- The Volts and Amps readings are correct (see the Specification Sheet).
- There is no physical damage, leaks or any signs of corrosion or overheating.
- Check all Fans for correct operation. Replace any worn or defective parts.
- Clean or replace any ventilation filters.
- Inspect the Cells for any signs of Calcium / Magnesium deposits on the electrode plates. If the deposit is greater than 1 mm thick, acid cleaning is required (see Acid Cleaning).

It is recommended that a Log Book be kept on site to regularly record machine readings (Amps, Volts, Run Hours, Flows, Pressures, Temperatures) plus any maintenance or service work.

9.1 50,000 HOUR MAINTENANCE:

After every 50,000 hours, or 5 years operation, a major service should be carried out. This includes servicing of all major components and will ensure continued reliable service from the equipment:

1. Replace all Fans and Filters.
2. Carefully inspect all wiring, electrical connections and circuit boards for any signs of corrosion, overheating or incorrect function. Replace as required.
3. Clean and service Power Supply, replacing any corroded or faulty parts.
4. Refurbish Cell electrodes.
5. Carefully check the performance of all sensors and replace as required.
6. Carefully check the performance of the PLC and HMI, repair or replace as required.

Note: All maintenance should be carried out by suitably qualified personnel and all relevant Occupational Health and Safety practices must be observed.

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9.2 ACID CLEANING PROCEDURE:

Warning: This procedure must be carried out with care in a well ventilated area. Read and observe the relevant Material Safety Data Sheet (MSDS) and always wear Hydrochloric Acid resistant protective clothing, gloves, a face shield and a mask. Observe all relevant O.H. & S. procedures.

Notes:

1. The Acid Pump is locked out and it must not be started when the Electrolyser is in operation.

2. The Electrolyser Cells must NEVER be energized when acid cleaning is in progress or whenever any acid is present in the Cells.

3. The Hydrochloric Acid solution can be reused several times before needing replacement, at which time it should be neutralized and dumped in an environmentally sound manner.

4. The number of times the acid can be reused can be determined by measurement of the acid strength (by standard titration), or more simply by observing when the cleaning effect on the Cells declines to the point where the Cells are not cleaned after 20 minutes of circulation.

5. Never leave Hydrochloric Acid in contact with the Cells for any more than 30 minutes, or permanent damage to the electrodes may occur.

Depending on the duty cycle of the machine, it is expected that acid cleaning will be required once every 7 – 21 days.

Make up a solution of about 5% Hydrochloric Acid in the Acid Tank by adding concentrated Hydrochloric Acid (30 – 35%) to water in the ratio 1 part acid to 5 parts water. Always carefully add acid to water and make sure all relevant safety procedures are followed.

1. Turn OFF power to the Electrolyser and close Control Valves V1 and then V2.
2. Open Drain Valves V3, V7, V8 and then Vent Valve V4 to allow the water to drain from the system to waste.
3. Once the Cells have drained, close Drain Valves V7, V8 and Vent Valve V4.
4. Open Acid Inlet Valves V3, V6 and Acid Return Valve V5.
5. Open the Acid Tank air vent cap.
6. Turn ON the acid pump and allow the acid to circulate for 10 – 20 minutes, during which time all Calcium and Magnesium deposits should dissolve. If deposits remain after this time, replace the acid and start again.
7. Turn the acid pump OFF, pause for 1 minute then open Vent Valve V4 to allow the acid to drain back into the Acid Tank.
8. Close Acid Line Valves V3, V5, V6 and close Vent Valve V4.
9. Slowly open Control Valve V2 and then V1 to allow water to flow through the Cells.

Turn Power ON and resume normal operation.

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OPERATOR LOG MC6000

Date	Volts	Amps	Hours	Flow	Comments	Name

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APPENDIX A
DATA SHEETS

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Darwin Pool - MC Series 5 g/l salinity

Saturday, 10 November 2007

OxiMax MC Series

Design Chlorine Output (kg/hr)	**6.0**

ELECTROLYSER

No. of Electrolyser Sets	**1**

Electrolyser Specifications (per set)

Electrochlorinator Model	**OxiMax MC6000**
Cell Designation	**MC2000**
No. of Cells	**3**
Configuration	3 Cells wide
Rated Chlorine Output (kg/hr)	**6.0**
Operating DC Amps at Rated Output	1250
Operating DC Volts at Rated Output	30.0
No. of series connections	6

Materials

Anode Material	SC12 coated Ti Plate
Anode Thickness (mm)	1.5
Anode area (sq m)	3.3
Cathode Material	Titanium Sheet
Cathode Thickness (mm)	1.5
Cathode area (sq m)	3.3
Electrode Area (sqm)	6.5
Expected Electrode Life	6 - 8 years
Cell Body	RTM Moulded FRP
Spacers	PTFE
Electrode Gap (mm)	2.5
Cell Cover	Acrylic Plate
Gaskets	Viton
Internal Hardware	Titanium / PVC
External Cell Fasteners	Stainless Steel
External Cell Electrical Hardware	Titanium/Brass/Copper
Flow Lines	80

Specifications

Seawater Flow to each Electrolyser (litres/sec)	5.56
Seawater Flow to each Electrolyser (cub m/hr)	20.0
Hypo strength at required output (mg/l)	300.0
Hydrogen Produced at required output (cub m/hr)	3.5
Max. Operating Pressure (kPa)	350.0
Pressure drop through Electrolyser (kPa)	65.0
Temp. Increase through Electrolyser (C)	1.2
Dimensions Electrolyser (l x w x h)	1.2 x 1.2 x 2.2
Dry weight (kg)	315
Operating weight (kg)	375

POWER SUPPLY

No. of Power Supplies	**1**

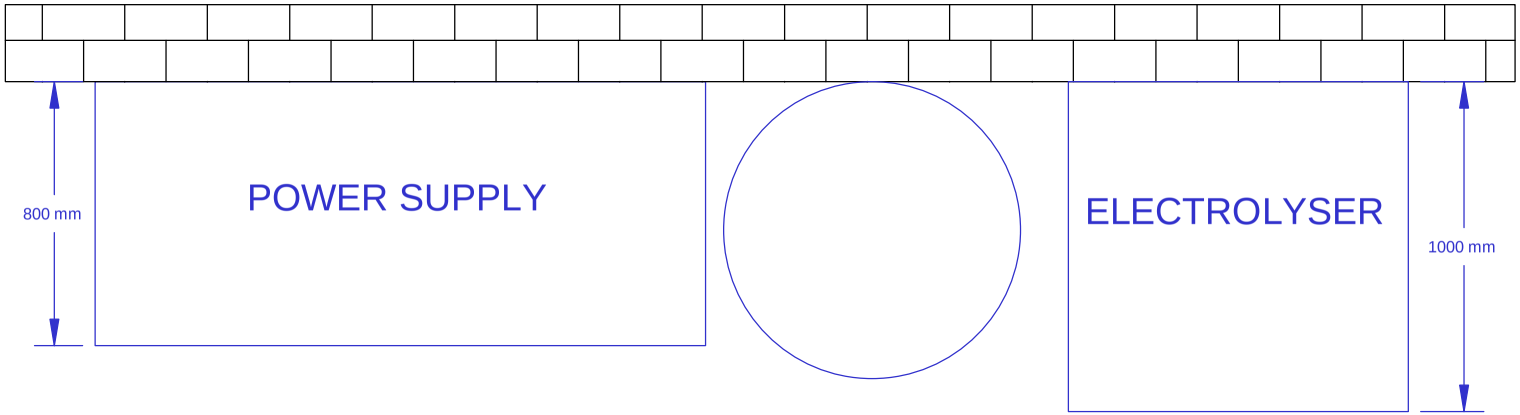
Specifications per Power Supply

Rated DC Amps	1500
Rated DC Volts	45
Rated DC output (kVA)	68
DC Power Consumption at reqiured output (kVA)	38
DC Power Consumption (kWh/kg Cl2)	6.25
Rectifier Efficiency @ Full Load	85%
AC Power Connected (kVA)	79
AC Power Consumption at required output (kVA)	44
Dimensions Power Supply (l x w x h)	1.2 x 0.8 x 1.8
Weight (kg)	630

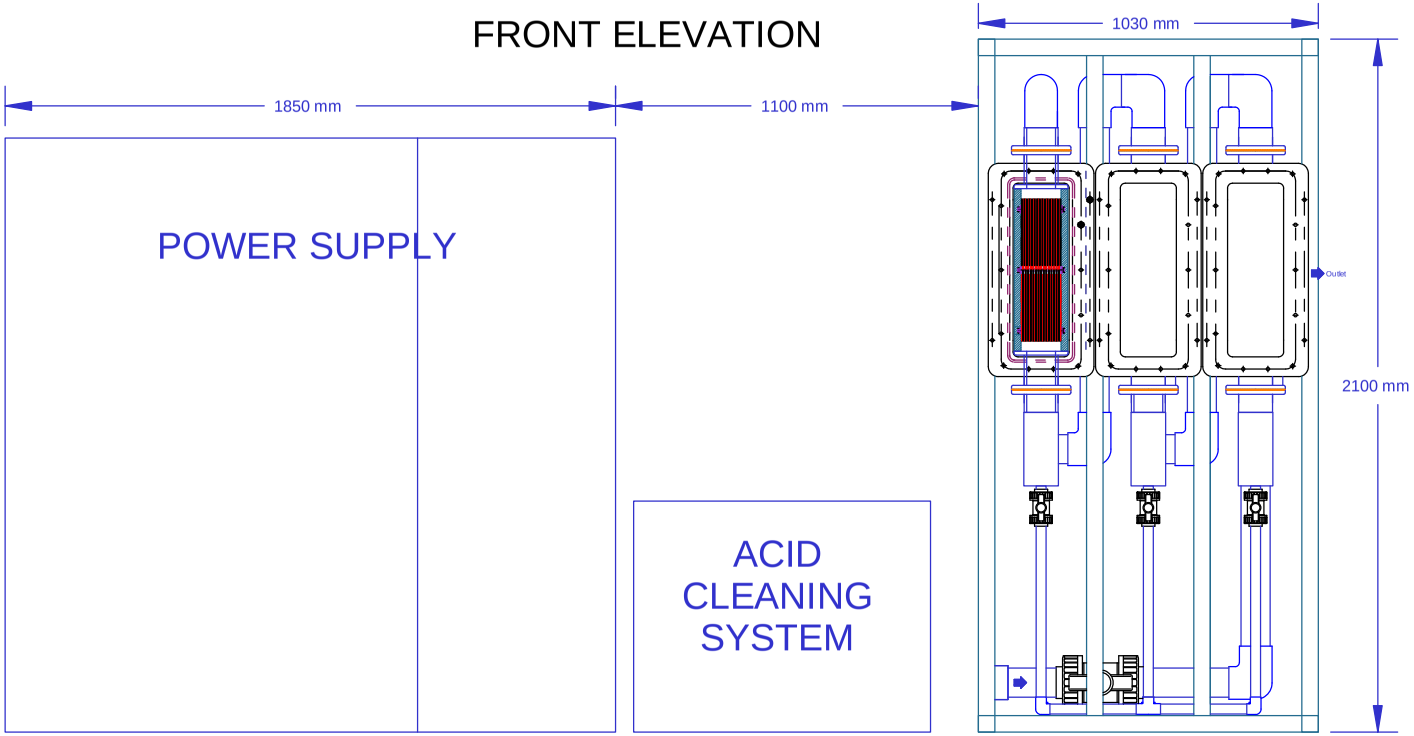
APPENDIX B
DRAWINGS

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PLAN VIEW



FRONT ELEVATION



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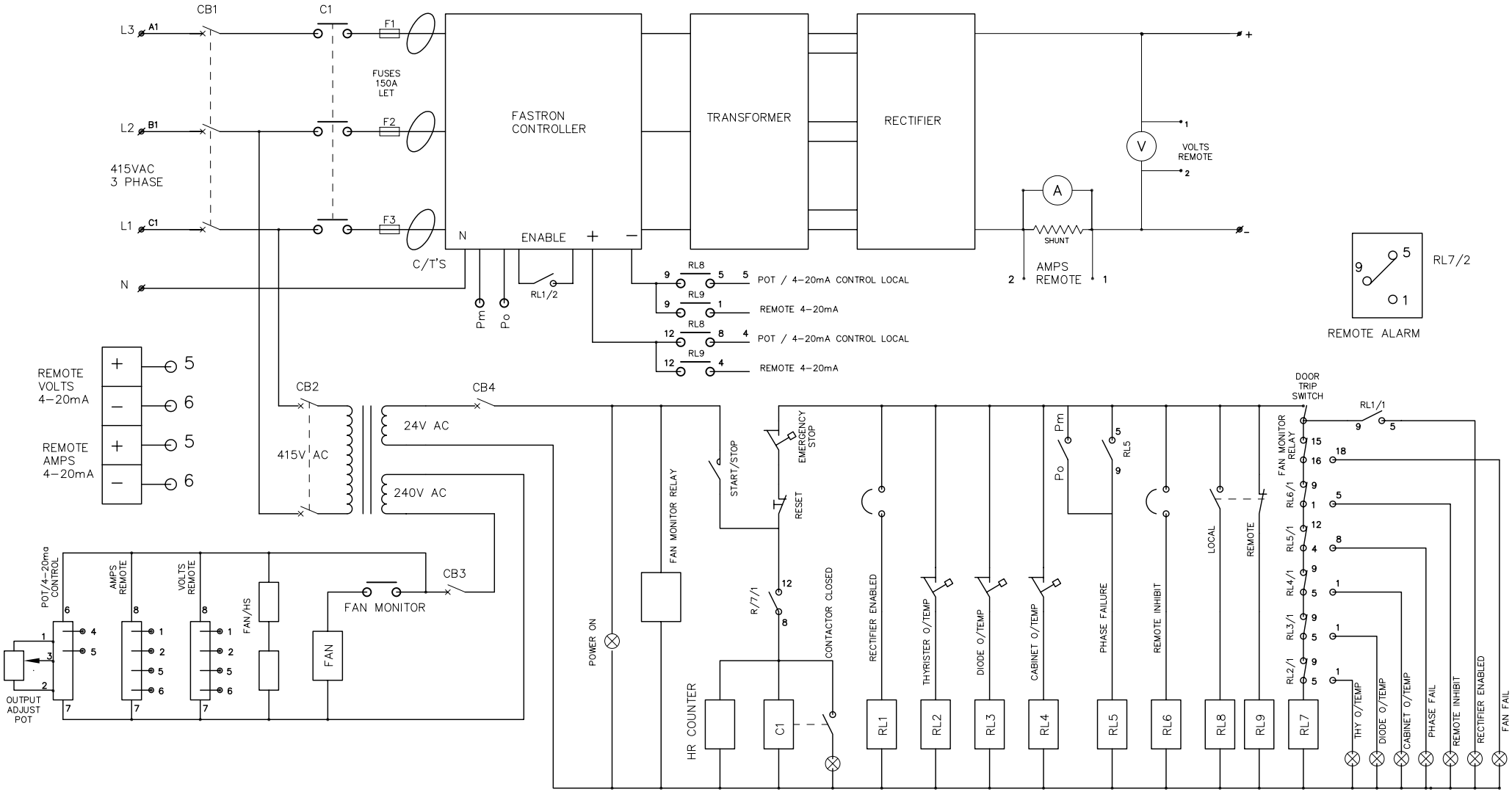
REVISIONS

REV.	REVISION DESCRIPTION	DRAWN	DESIGN	CHECKED	DATE
	PRELIMINARY ISSUE				

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PROJECT: OxiMax MC6000/3

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K. V.	VARIOUS		
DATE	SCALE	DRAWING No.	SHEET
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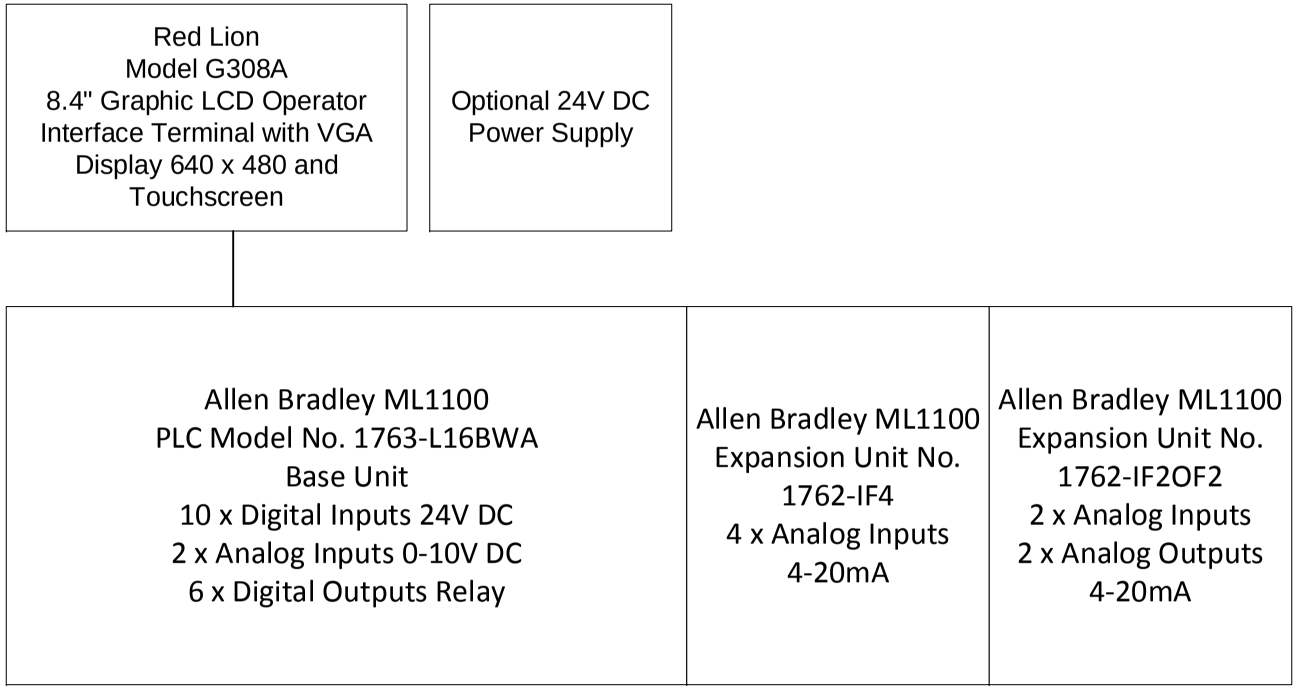
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SeaFord Transformers
A.C.N. 078 836 843 Phone +61 7 5422 9933 PTY. LTD.

TRANSFORMER RECTIFIER UNIT
45 VOLT, 1500 AMPS

SCHEMATIC

DRG.No. SFTR45V1500A01 | REV. 0



TITLE

MC6000 Prominent Darwin
Seawater Feed
PLC Hardware Layout

DATE ORIGINAL	Sheet
8/09/2007	1 of 7

LATEST REVISION	Designed	CHECKED	DRAWN
29/09/2007	C Sloane	K Varcoe	C Sloane

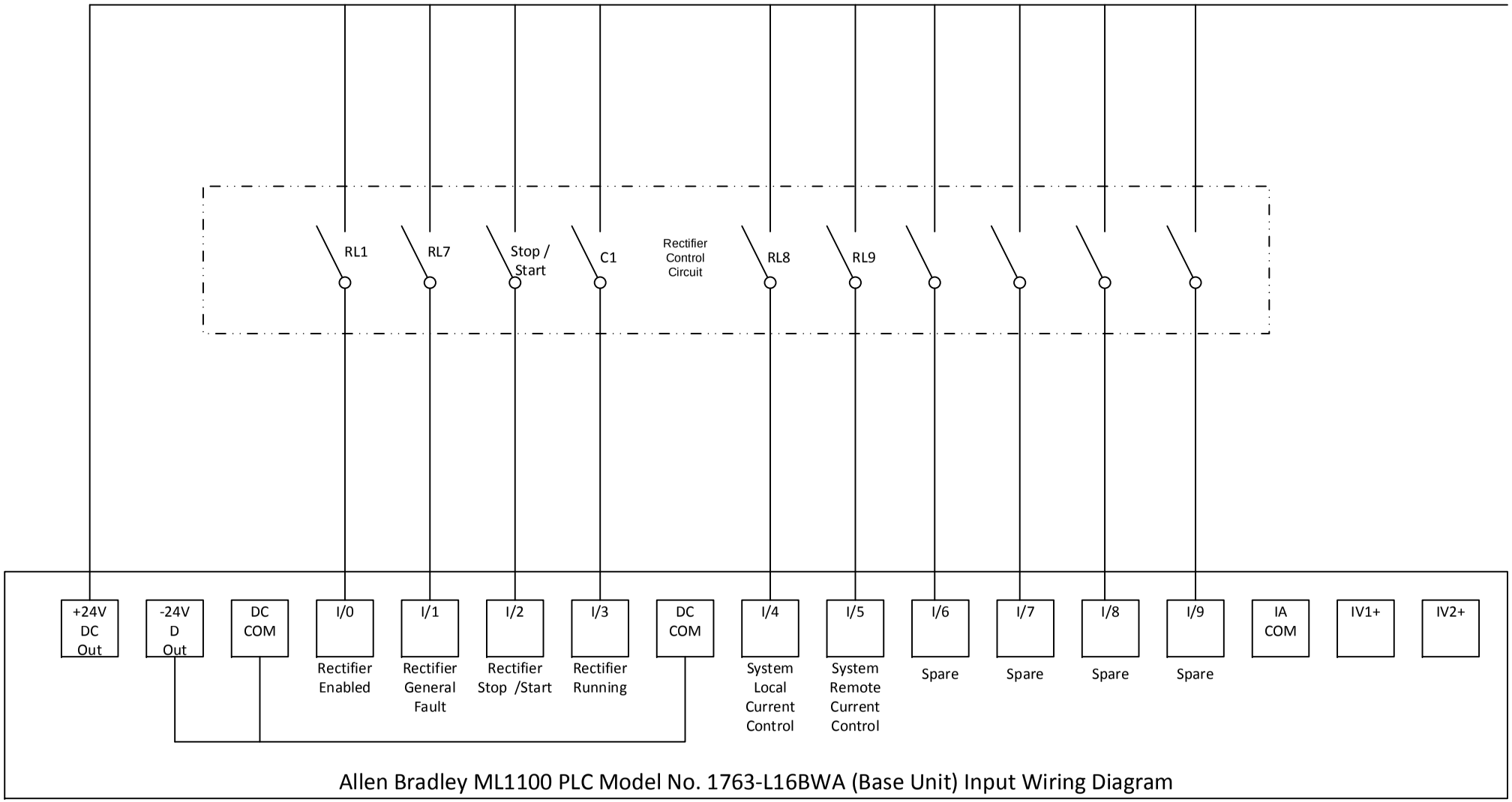
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Allen Bradley ML1100 PLC Model No. 1763-L16BWA (Base Unit) Input Wiring Diagram

TITLE: MC6000 Prominent Darwin Seawater Feed Digital Inputs Control Circuit Diagram		REVISIONS	
DATE ORIGINAL: 8/09/2007	Sheet: 2 of 7		
LATEST REVISION: 29/09/2007	Designed: C Sloane	CHECKED: K Varcoe	DRAWN: C Sloane

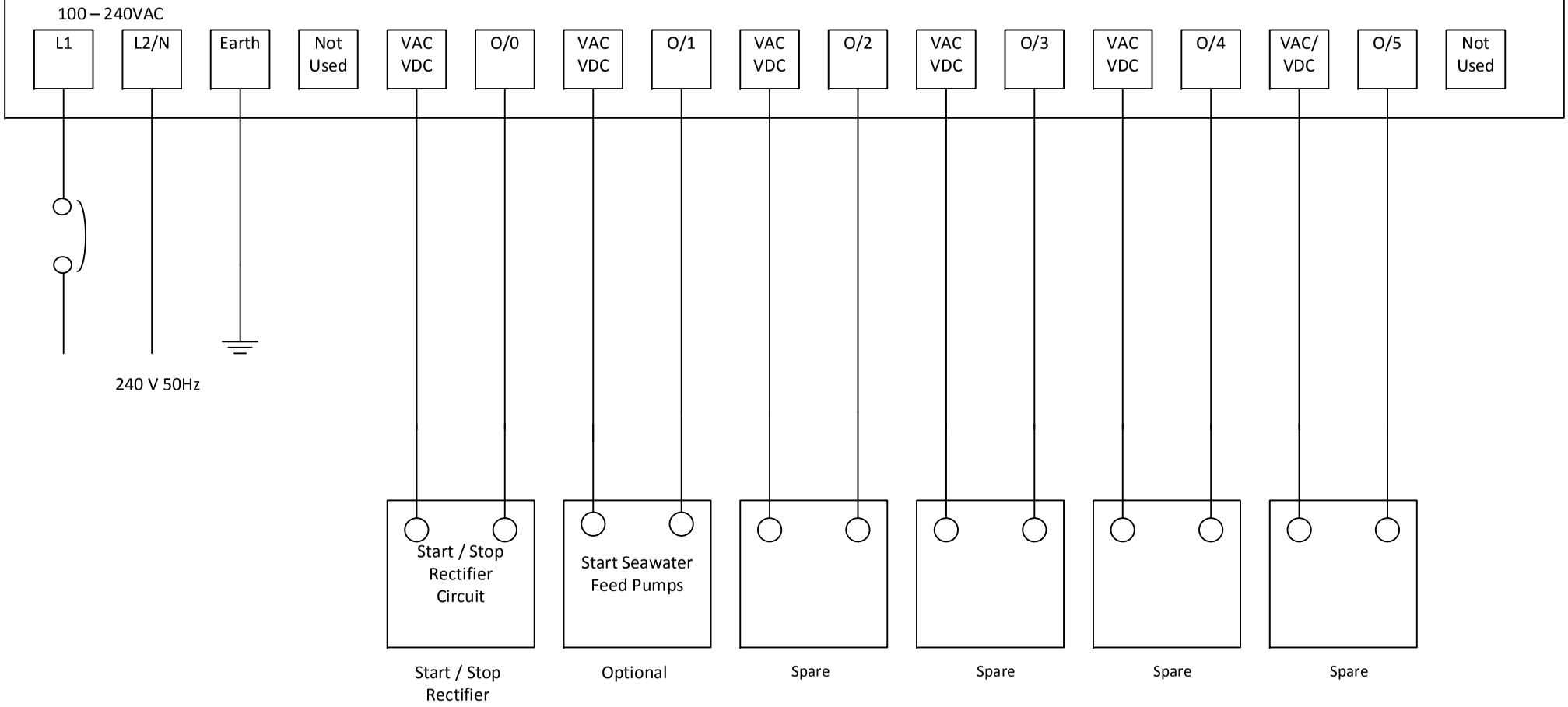
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Allen Bradley ML1100 PLC Model No. 1763-L16BWA (Base Unit) Output Wiring Diagram

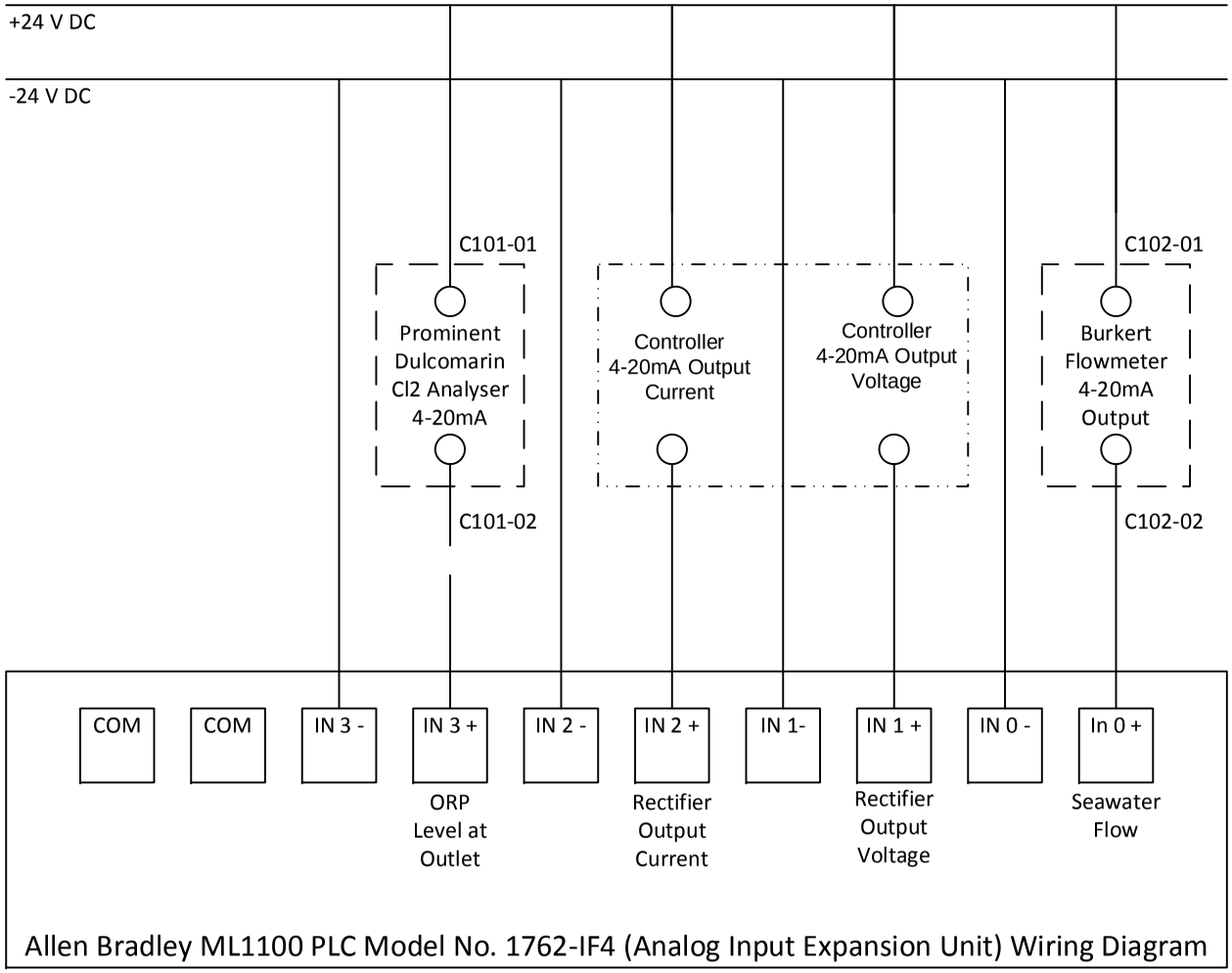


TITLE: MC6000 Prominent Darwin Seawater Feed Digital Outputs Control Circuit Diagram		REVISIONS			
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		B	29/9/07	For Approval	
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Allen Bradley ML1100 PLC Model No. 1762-IF4 (Analog Input Expansion Unit) Wiring Diagram

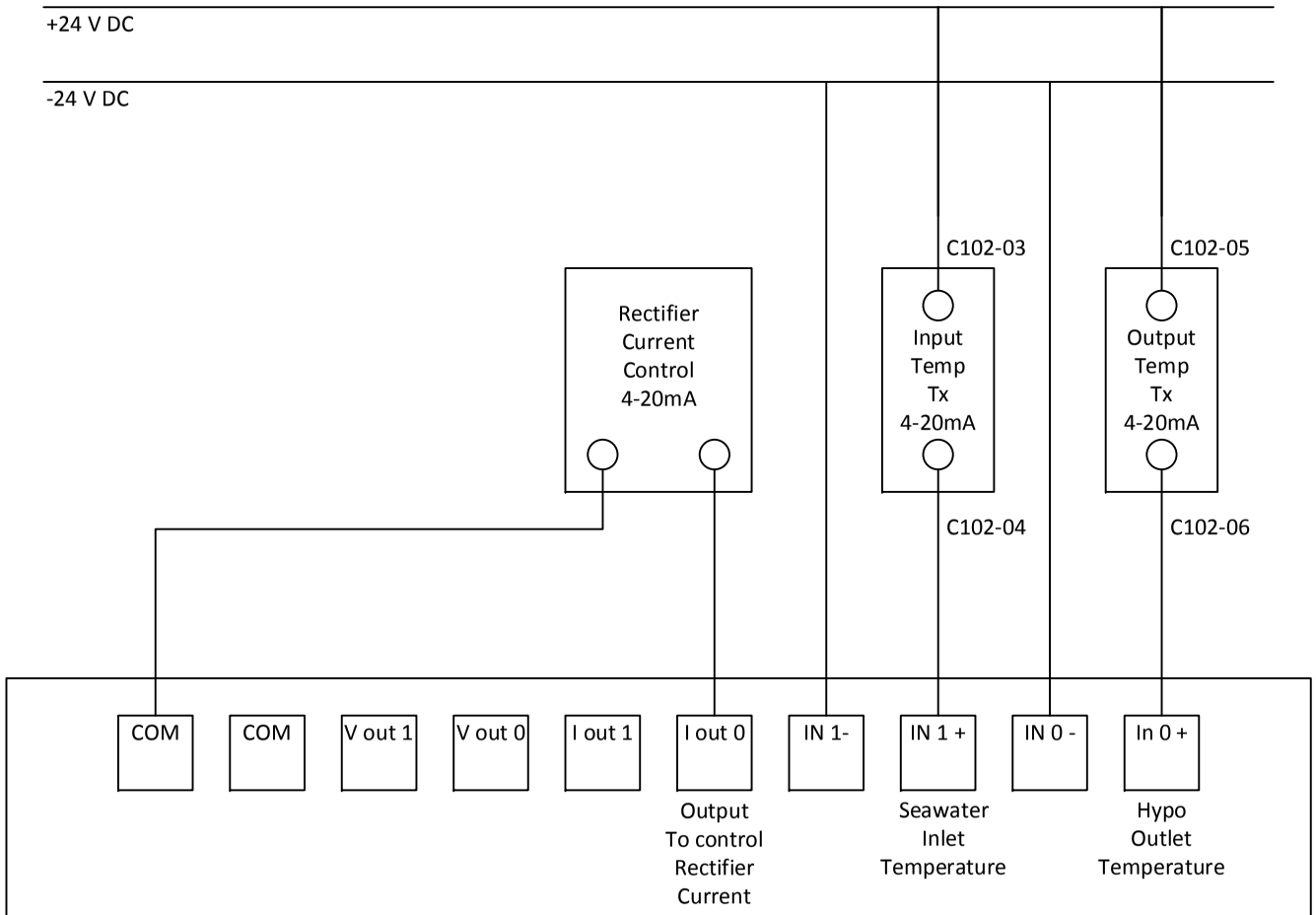
TITLE: MC6000 Prominent Darwin Seawater Feed Analog Inputs Control Circuit Diagram		REVISIONS	
DATE ORIGINAL: 8/09/2007	Sheet: 4 of 7		
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Allen Bradley ML1100 PLC Model No. 1762-IF2OF2 (Analog In/Out Expansion Unit) Wiring Diagram

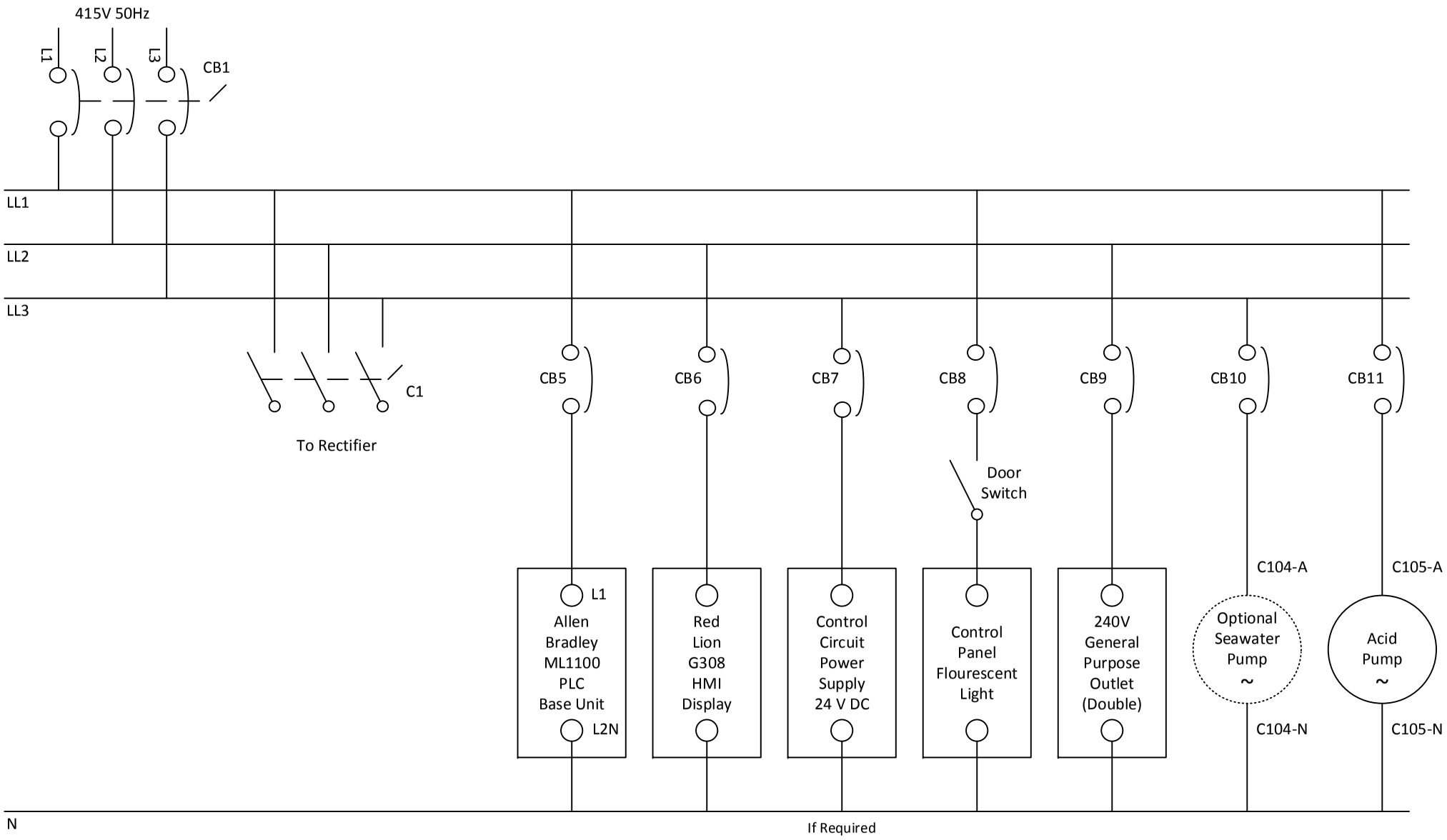
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DATE ORIGINAL: 8/09/2007	Sheet: 5 of 7		
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TITLE: MC6000 Prominent Darwin Seawater Feed Single Line Diagram		REVISIONS	
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Cable No	Pairs	From	To	Note
C100	1	Rectifier	Electrolyser	x V DC y Amps
C101	1	Chlorine Analyser	Control Panel	Feedback from chlorine probe
C102	3	Electrolyser	Control Panel	Analog Inputs use Belden 8761 or equivalent each pair individually shielded
C103	1	Control Panel	Train 1 Electrolyser Assembly	Common the flow switches in Junction Box on the electrolyser.
C104	A, N, E	Control Panel	Seawater Feed Pump	Optional
C105	A, N, E	Control Panel	Acid Pump	Acid Pump On Off

TITLE

MC6000 Prominent Darwin
Seawater Feed
Cable Schedule

REVISIONS

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DATE ORIGINAL	Sheet		
8/09/2007	7 of 7		
LATEST REVISION	Designed	CHECKED	DRAWN
29/9/2007	C Sloane	K Varcoe	C Sloane

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APPENDIX C
CONTROL PHILOSOPHY

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Darwin Wave Pool Prominent

OxiMax MC6000

Low Salinity Feed Straight Through
Control Philosophy

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Introduction

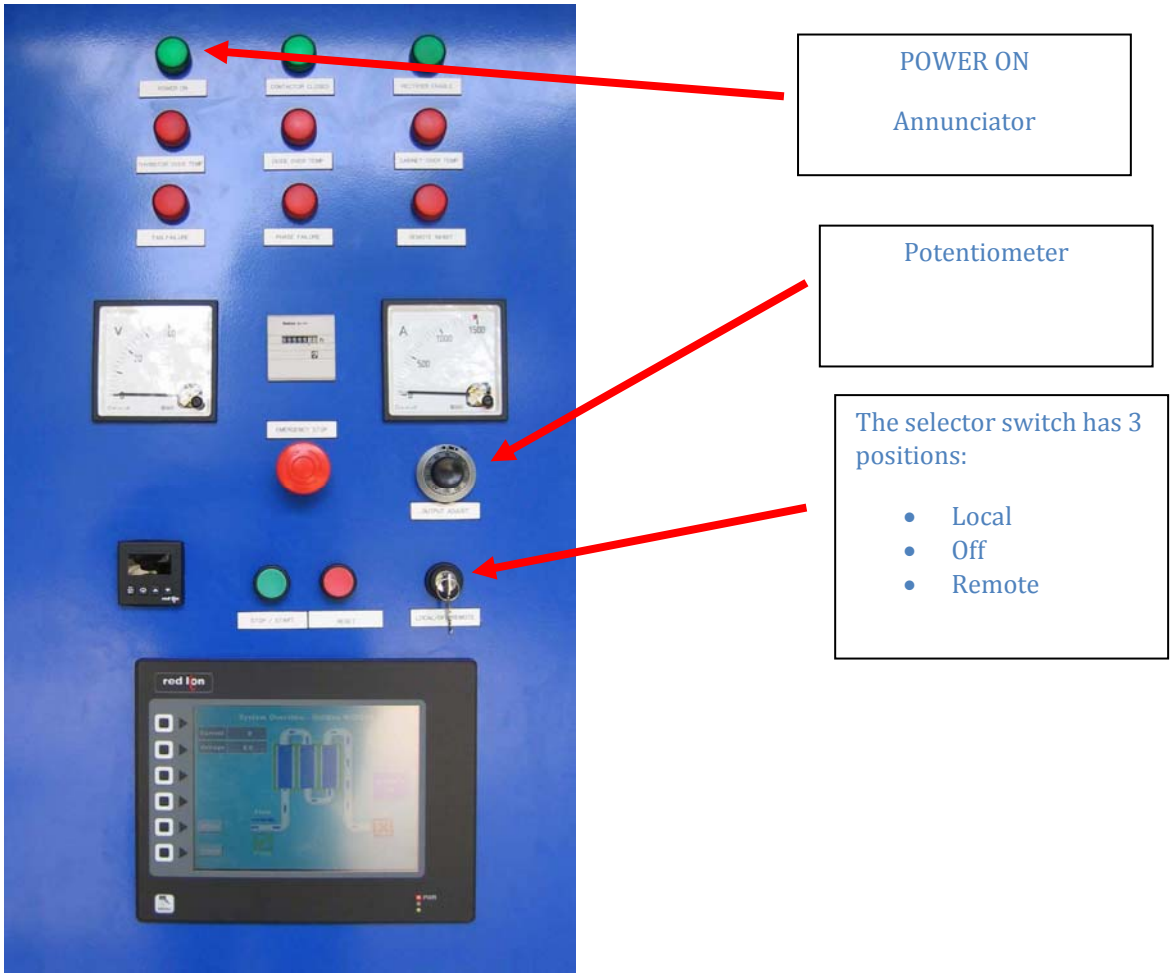
This document will outline the control philosophy for the Oximax MC6000 Series from Water Engineers Australia Pty Ltd. The MC6000 is a system capable of generating Sodium Hypochlorite from a Low Salinity Feed. The pool water is passed across a series of electrolytic cells where energy is applied in the form of low voltage and high current. This process results in the production of Sodium Hypochlorite with a byproduct of Hydrogen.

The Oximax MC6000 is capable of generating 6000 grams of Chlorine equivalent per hour and has a maximum design output of 144 kg/day.

Local Control

Local control is where the operator can set the output of the chlorinator by turning the potentiometer clockwise (to increase output) and counter clockwise (to decrease output).

The mode selector switch on the rectifier panel will be selected to the LOCAL position. The following description assumes power is available and that the POWER ON annunciator is lit.



To start the system the operator will depress the START/STOP pushbutton. This button is captive and will be held in the START position and/or the STOP position. The operator will hear the main contactor energize. The CONTACTOR CLOSED annunciator will light indicating that the rectifier is now running and able to apply power to the electrolyser.

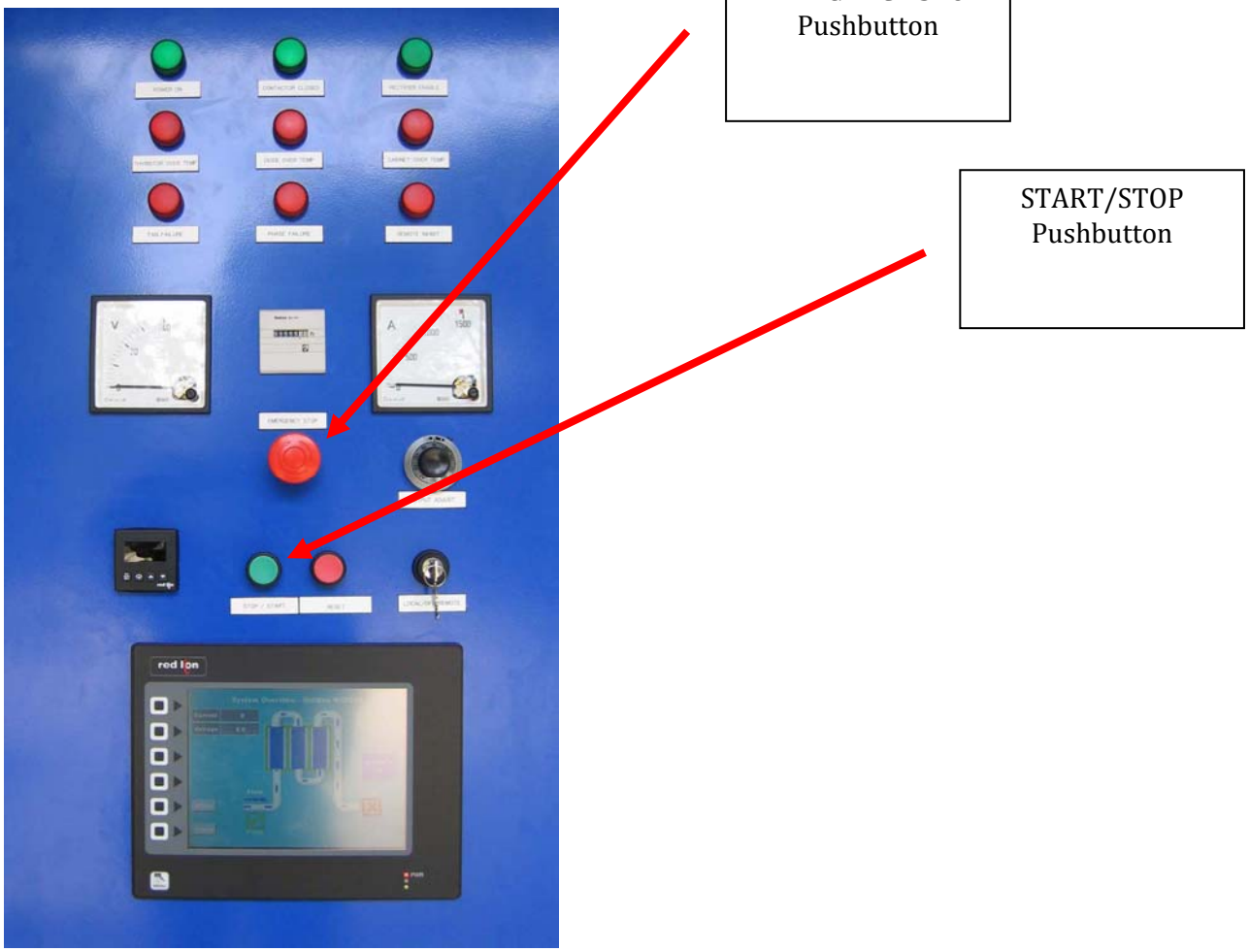
The PLC will check that the output temperature and flow. The PLC will also check that there are no rectifier or system faults. If all parameters are within range then the PLC will generate an output that enables the rectifier.

The RECTIFIER ENABLED annunciator will light.

Note: The system will not give an enable output if there are any rectifier faults i.e. thyristor or diode overtemp etc.

Now that the system is running, it will run until:

- The START/STOP pushbutton is pressed on the front of the rectifier panel, or
- There is a fault in the rectifier i.e. thyristor overtemp etc or,
- The Emergency Stop pushbutton is depressed



The operator can now turn the potentiometer in a clockwise direction to increase the current output from the rectifier to the electrolyser. It is recommended that the operator increase the current by no more than 50 Amps per second to the operating current of 1250A.

Note: When stopping the system, it is highly recommended that the operator decrease the current gradually (50 – 100Amps per second) by turning the potentiometer in a counterclockwise direction prior to depressing the STOP pushbutton.

Once the system has stopped for any failure, restarting the system will require the operator to depress the START/STOP pushbutton to the STOP position to reset faults in the PLC. To restart, push the START/STOP pushbutton again. To RESET any rectifier faults i.e. diode overtemp, please push the RESET pushbutton on the panel.

The system will shut down automatically:

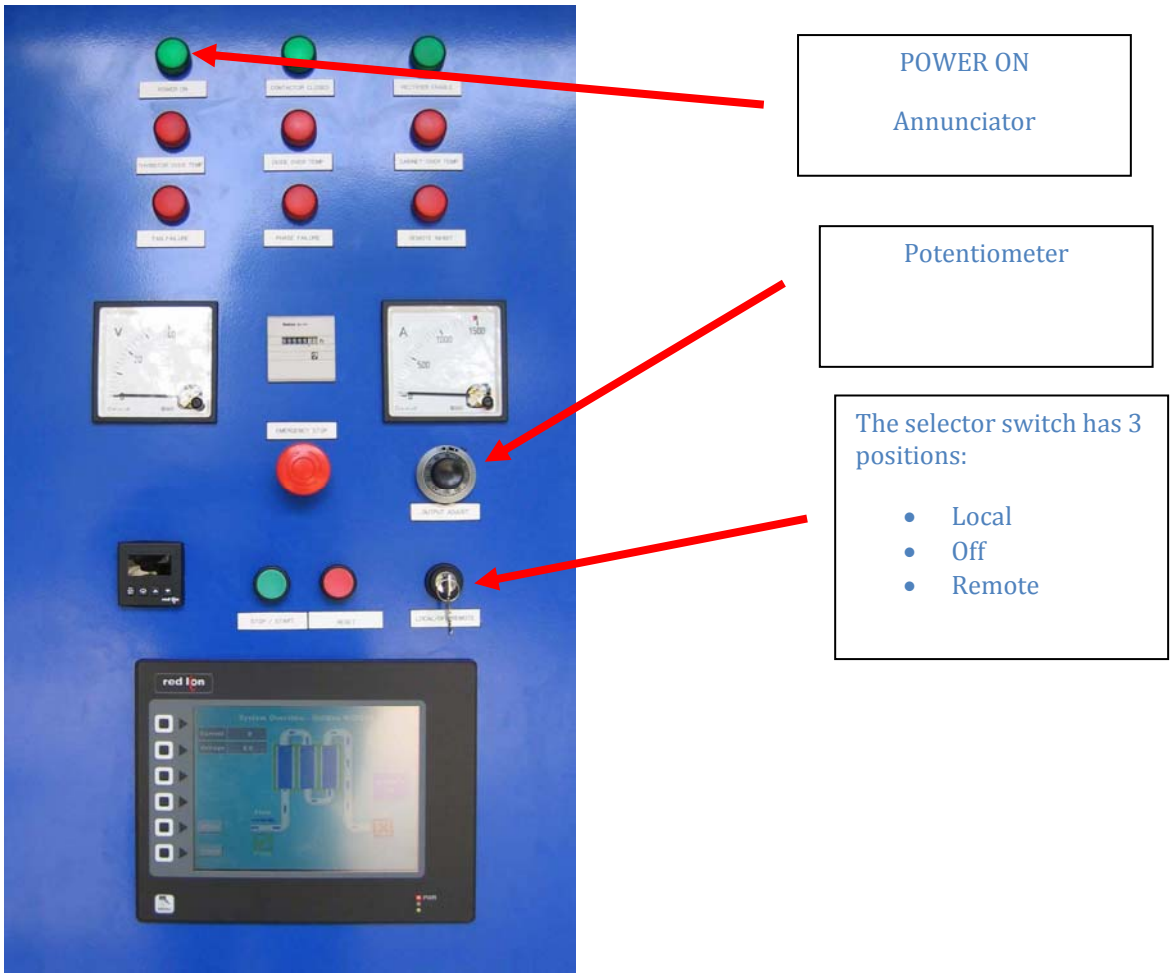
- If a fault in the rectifier is detected
- If insufficient water flow detected
- If the volts rise beyond 120% of normal operation
- If the outlet water temperature is >40^{o}C
- If the EMERGENCY STOP button is depressed
- The mode selector switch is changed from Local to another position.

Remote (Auto)

Remote control is where the PID loop in the PLC controls the output of chlorine dependant on the process variable measurement of the chlorine analyser. The PLC will attempt to maintain a constant value of chlorine (the set point) as measured by the chlorine analyser and alter the output of the OxiMax MC6000 accordingly.

The operator can alter the Set point on the HMI.

The mode selector switch on the rectifier panel will be selected to the REMOTE position. The following description assumes power is available and that the POWER ON annunciator is lit.



To start the system the operator will depress the START/STOP pushbutton. This button is captive and will be held in the START position and/or the STOP position. The operator will hear the main contactor energize. The CONTACTOR CLOSED annunciator will light indicating that the rectifier is now running and able to apply power to the electrolyser.

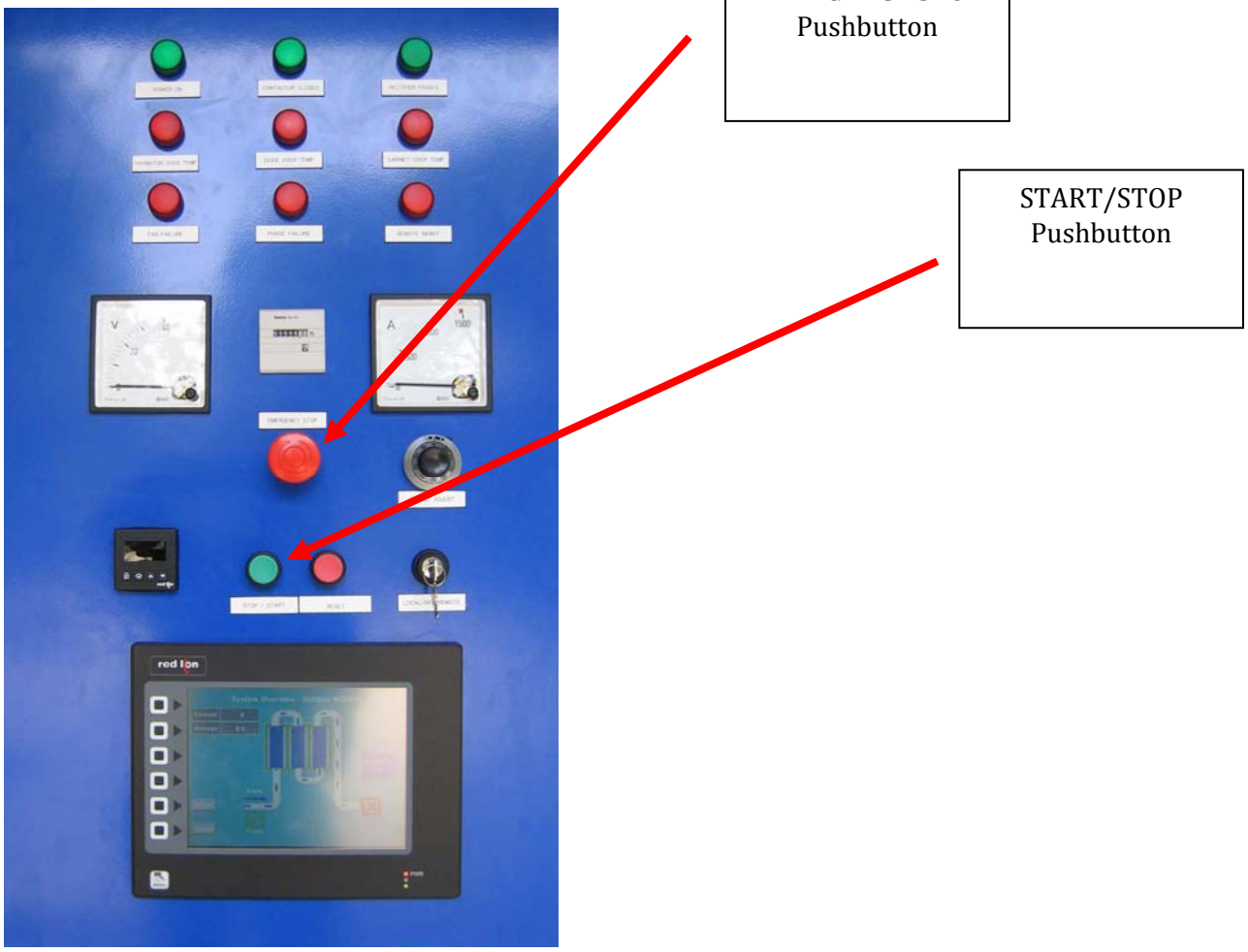
The PLC will check that the output temperature and flow are in the correct range. The PLC will also check that there are no rectifier or system faults. If all parameters are within range, the PLC will generate an output that enables the rectifier.

The RECTIFIER ENABLED annunciator will light. The rectifier will start at the minimum current irrespective of the input to the PLC from ORP or Chorine probe.

Note: The system will not give an enable output if there are any rectifier faults i.e. thyristor or diode overtemp etc.

Now that the system is running, it will run until:

- The START/STOP pushbutton is pressed on the front of the rectifier panel, or
- There is a fault in the rectifier i.e. thyristor overtemp etc or,
- The Emergency Stop pushbutton is depressed



The operator can now change the set point to alter the amount of chlorine produced and measured at the chlorine monitoring point.

If the system has stopped for any failure, to restart the system will require the operator to depress the START/STOP pushbutton to the STOP position to reset faults in the PLC. To restart, push the START/STOP pushbutton again. To RESET any rectifier faults i.e. diode overtemp, please push the RESET pushbutton on the control panel.

The PLC will now check the required Hypochlorite output according to the measurement made by the ORP or Chlorine probe. The PLC will increase / decrease the Hypochlorite output according to the SETPOINT (entered via the HMI by operator).

The system will shut down automatically:

- If a fault in the rectifier is detected
- If insufficient water flow detected
- If the volts rise beyond 120% of normal operation
- If the outlet temperature is >40^{o}C
- If the EMERGENCY STOP button is depressed
- The mode selector switch is changed from Remote to another position.

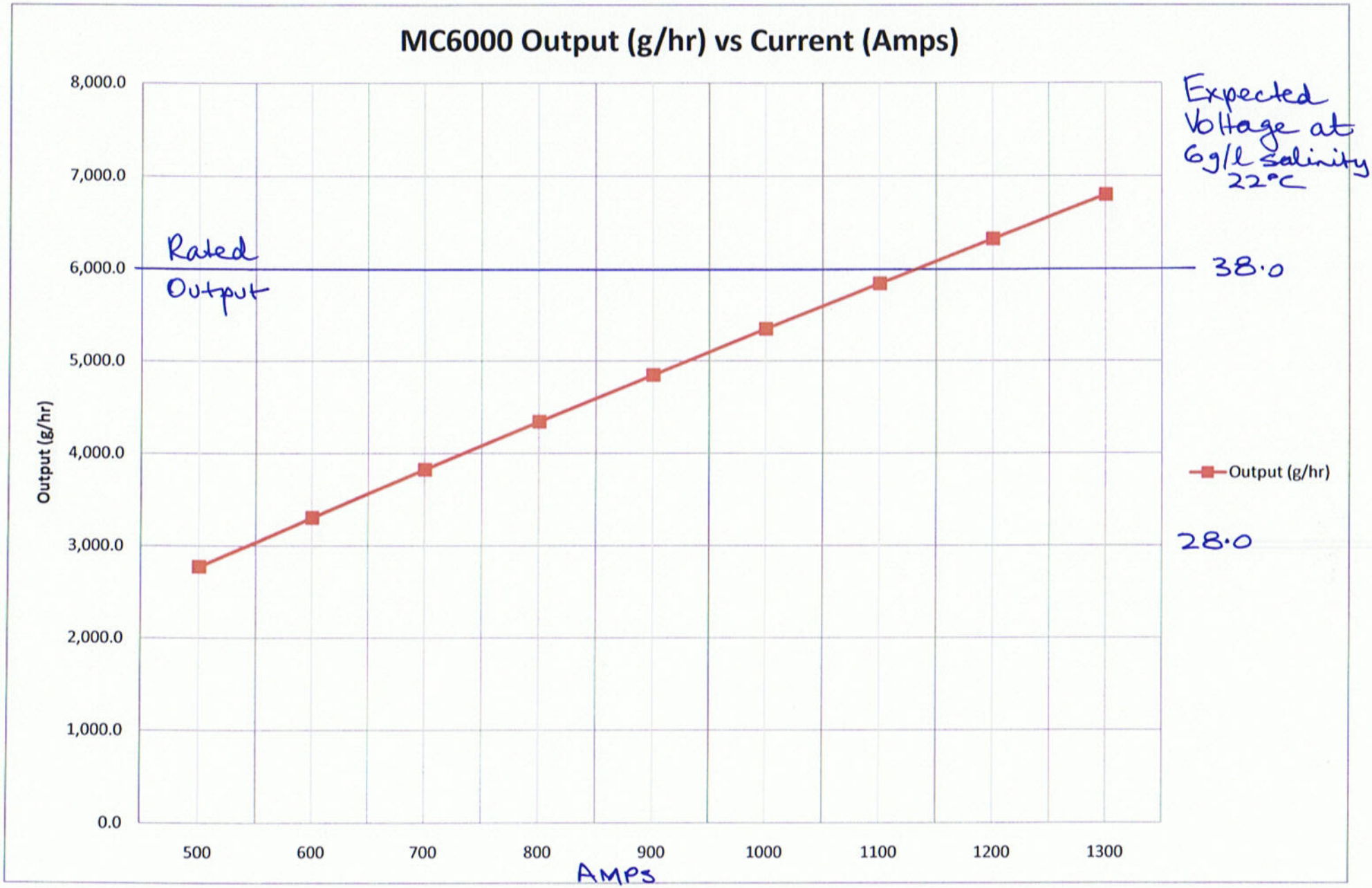
An optional input to the PLC to initiate a shut down from the operators own PLC/SCADA system is also provided.

A request for start via the operators own PLC/SCADA system will see the MC6000 system follow normal start procedure i.e. check flows, temp etc.

END

APPENDIX D
PRECOMMISSIONING
FACTORY ACCEPTANCE TESTING
COMMISSIONING

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MC6000 Output (g/hr) vs Current (Amps)
8,000.0
7,000.0
6,000.0
5,000.0
4,000.0
3,000.0
2,000.0
1,000.0
0.0
Output (g/hr)
500
600
700
800
900
1000
1100
1200
1300
AMPS
Rated Output
Expected Voltage at 6g/l Salinity 22°C
38.0
28.0
Output (g/hr)

Factory Test MC6000/3 Prominent Darwin Wave Pool

Salinity Target	Salinity Actual	Temp Start	Amps Reading 30 Volts	35 Volts	40 Volts	45 Volts	Temp Finish
4.0	4·00	18·4	480·00 251·8	680·00 348·2	880·00 450·6	1090·0 559·5	20·7
5.0	5·00	20·7	605·0 315·3	795·0 437·6	1100·0 564·6	1200·0 617·2 / 41·8V	22·3
6.0	6·00	22·4	730·0 378·9	1025·0 525·9	1220·0 623·1 / 38·1V		23·6

Comments: Total power available ~ 87A/phase ⇒ 1200A max.
Salinity should be kept in range 5–6 g/l. Output @ 1200A ~ 6·2 kg/hr.

Date: 7-9-07 Tested by: Grey B Checked by: Junior Approved by: Ken V

6g/l
21·9°C
30V

Retest & calibrate meters.

140 meter 384/382

recal 30v 25·7

recal 800 meter 408/400

0·5bar