

Instruction Manual

- **DCON-RX2**
- **DCON-RX2A**
- **DCON-RX2-P**
- **DCON-RX2-B**
- **DCON-RX2-B-02**
- **DCON-RX2-B-03**
- **DCON-RX2-B-04**



ORP MONITORING & DOSING CONTROLLER (with Earth Probe for elimination of ground loop interference)

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Note: On-going product development at Convergent Water Controls may lead to changes in the specifications of this product.

Warranty: This product is guaranteed for a period of 12 months from installation date. The warranty applies to manufacturing or component defects which may cause the unit to malfunction under specified conditions. The guarantee does not cover damage due to abuse, tampering or improper installation.

Disclaimer: Convergent Water Controls will not be held liable for any consequential damage or loss arising resulting from product malfunction.

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1. INTRODUCTION

The DCON-RX2 measures and controls the Oxidation Reduction Potential (ie. ORP) as read by an ORP (Redox) electrode. To ensure stable readings free from any ground loop interference, the unit measures ORP with respect to an earth probe which eliminates any spurious signals. This earth probe is supplied with the unit and must be inserted with the ORP electrode in the solution. When an oxidising agent, such as chlorine or bromine, is dosed into the measured solution, it will cause an increase in ORP. When the measured solution is diluted (ie. some of the oxidising agent removed or consumed), or a reducing agent is added, then the ORP electrode will report a decrease in ORP.

The DCON-RX2 controller can be programmed to dose either an oxidant or a reductant. When a dosing pump, injecting oxidant, is connected to the DCON-RX2, the pump will dose when the ORP drops below the ORP setpoint (ie. mV setpoint) until the setpoint (+ the hysteresis %) is reached again. Programmable alarms will warn the operator if any part of the system fails.

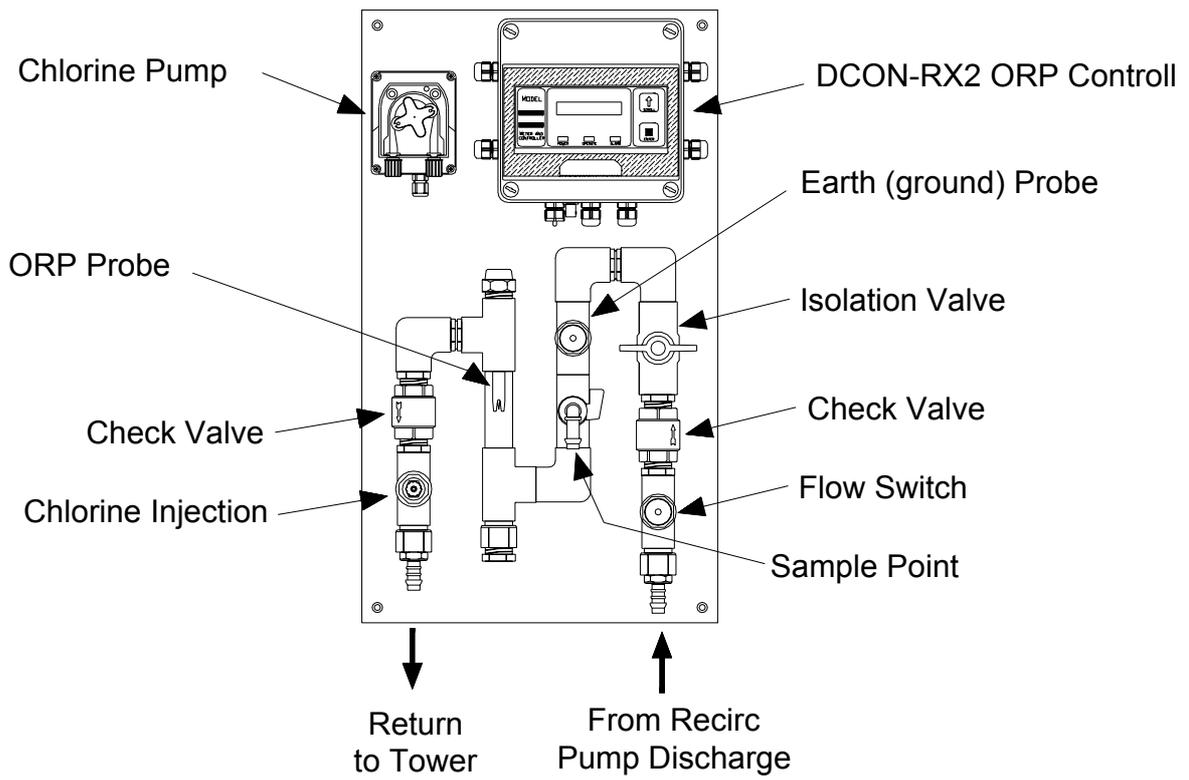
Components of an ORP Control System (dosing an oxidising agent) are:

1. ORP controller (eg. DCON-RX2)
2. ORP probe (eg. IH30) & probe holder (eg. PRM-H2-V)
3. Earth Probe
4. Suitable Dosing pump (eg. LMI) or Brominator (eg. BROM-02) sized large enough to deliver enough oxidising agent to perform suitable ORP correction. If a brominator is used, the DCON-RX2 will activate a N/C solenoid instead of a dosing pump.

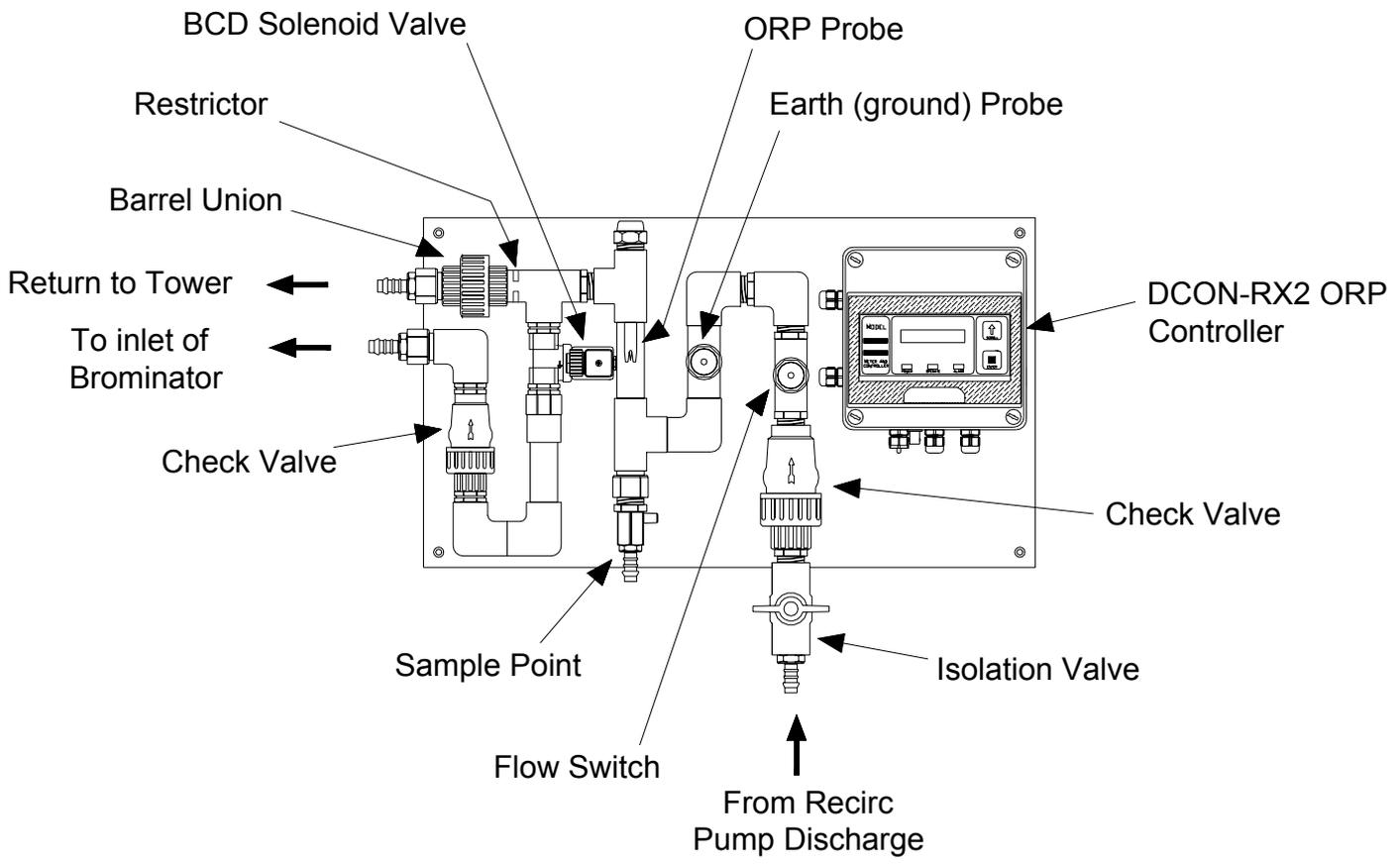
2. INSTALLATION

2.1 Mounting the Controller

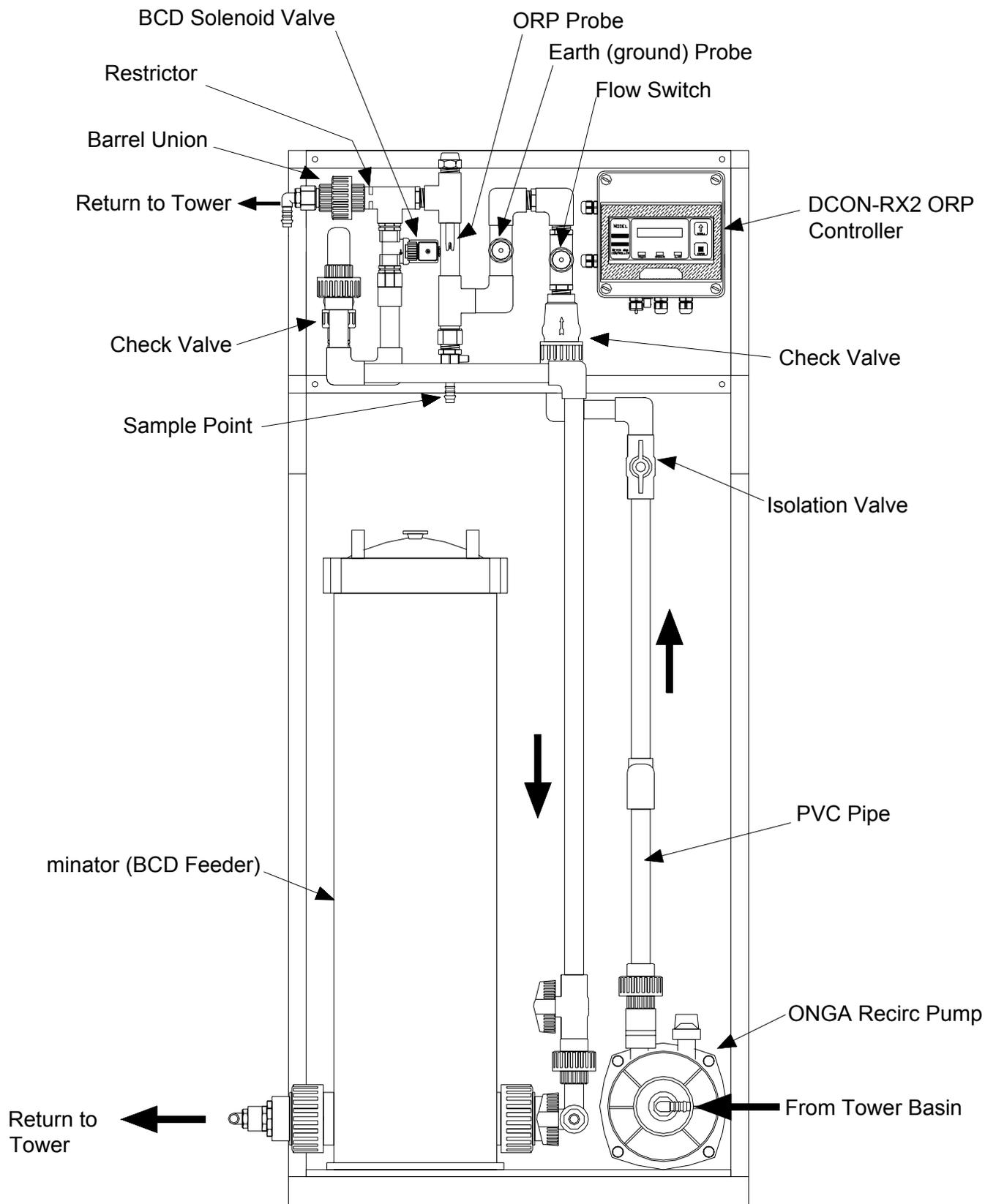
Mount the DCON-RX2 on a flat vertical surface away from extreme heat, humidity or areas where temperature variations are extreme, ideally at eye-level to allow good visibility of the LCD display. Also ensure that a 240VAC mains power point is located nearby. For systems including the DCON-RX2 controller see the following pages for installation:



DCON-RX2-P



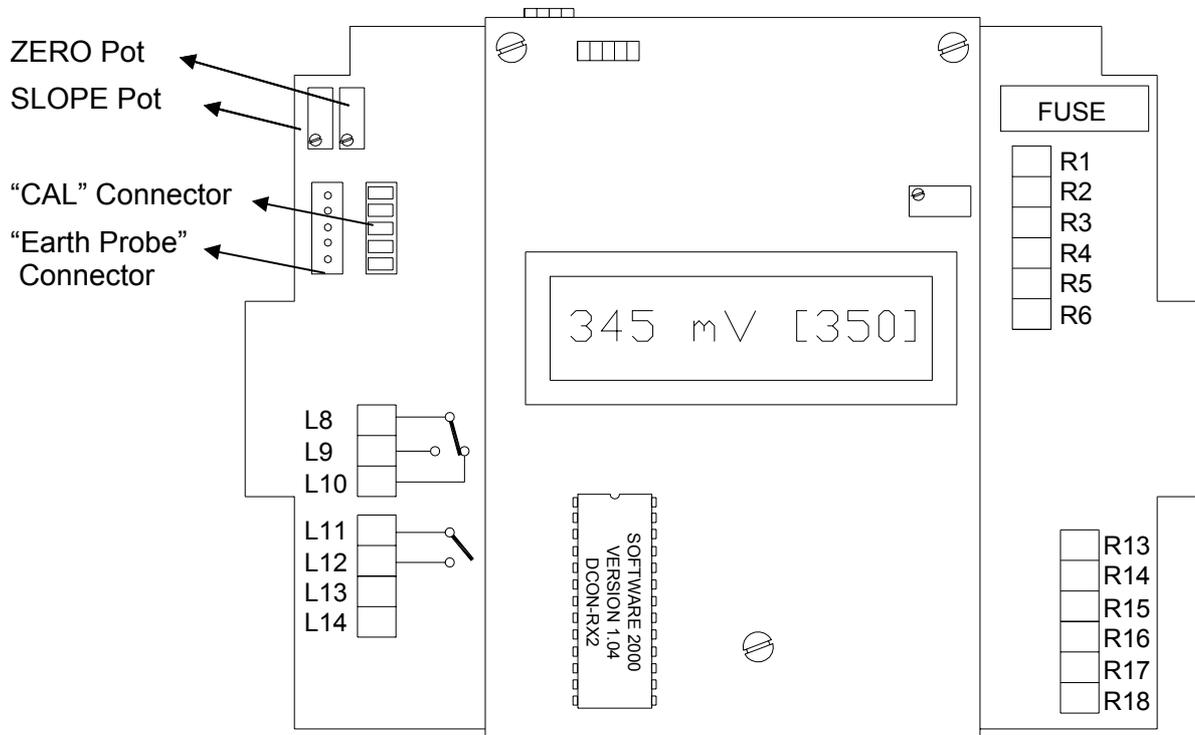
DCON-RX2-B with option AF04



DCON-RX2-B-02 with option AF04

2.2 Electrical Wiring Information

The diagram below shows the motherboard of the controller, which is located below the processor board.



L8+ L9: Alarm Relay N/O volt-free
 L8+ L10: Alarm Relay N/C volt-free
 L11 + L12: O/P ON Relay N/O volt-free
 This relay only fitted to DCON-RX2A to transmit flow switch signal to another controller. The contact is closed when L13 & L14 are bridged (i.e. the flow switch is closed).
 L13 + L14: Flow switch link to enable pump/solenoid valve

R1: Mains Active 240VAC (power supply)
 R2: Mains Neutral
 R3: Auxiliary Active 240VAC (eg. for AF09 4-20mA card)
 R4: Auxiliary Neutral
 R5: Pump/solenoid valve Active 240VAC
 R6: Pump/solenoid valve Neutral

R13 – R18: Earth

Fuse: 2A/250VAC (M205, 20mm x 5mm diameter)

Notes on Alarm Relay Contacts :

1. Alarm relay is energised (ie. L8 connected to L9) during normal operation of the unit.
2. Alarm relay de-energises (ie. L8 connected to L10) when an alarm is raised or when the unit loses power.

Notes on Flow Switch Connections

(switch fitted with ordering option AF04 in “-B” systems – supplied standard with “-P” systems):

1. The unit is supplied with a link between L13 & L14
2. To disable pump/solenoid valve on no flow, remove link between L13 & L14 and replace with N/O flow switch (i.e. flow switch contact closes when there is flow).
3. The O/P ON relay contact, L11 + L12 also closes when there is flow (i.e. L13 & L14 closed). This contact can be used to enable/disable a second controller's output on flow/no flow (DCON-RX2A only).

NOTE: The BNC connection for the ORP electrode and the connection for the Earth Probe are situated on the outside of the enclosure at the bottom left hand side.

2.3 Probe Installation

The ORP electrode is the heart of the system. Please take extra care in determining the type and location of the probe. The ORP electrode has a very high output impedance and is susceptible to interference if not installed correctly.

Plan the installation such that the ORP electrode is as close as possible to the controller. If the probe needs to be located further away from the ORP controller, an extension cable must be obtained. The further the probe is away from the controller, the greater the effect of electrical interference will be. This may degrade the signal from the probe and causes incorrect readings. Never attempt to extend the probe cable by means of a terminal block or soldered connection. This will leave the connection open to interference or moisture, which will affect the accuracy of the system. Always have the connection (when using an extension cable) in a waterproof junction box.

The Earth Probe supplied must be inserted into the same solution as the ORP electrode. The controller uses common mode rejection technology to eliminate any electrical interference on the ORP electrode.

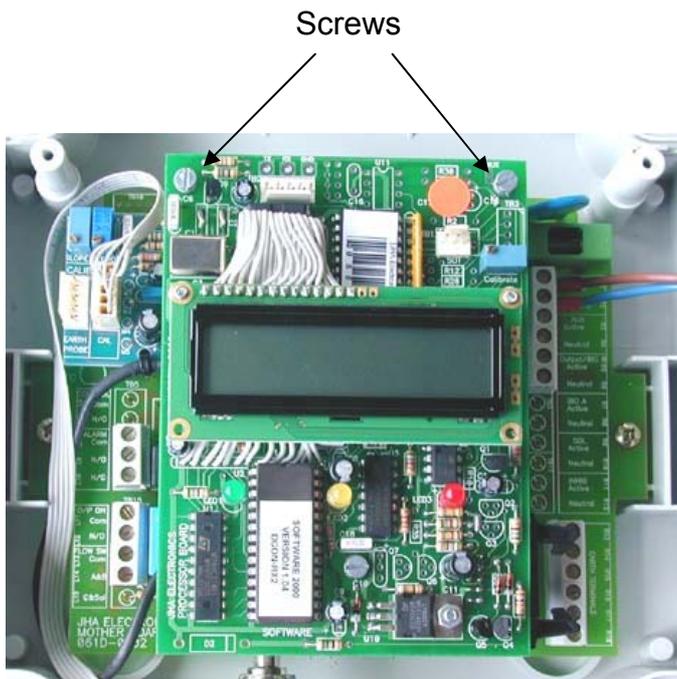
2.4 Adding Optional 4-20mA Card (ordering code AF09A)

The DCON-RX2 controller can be fitted with an optically isolated 4-20mA interface card to provide an output to a data logger, chart recorder or building management system. The interface card is an ordering option and can be retro-fitted to the DCON-RX2 controller, or can be supplied factory fitted.

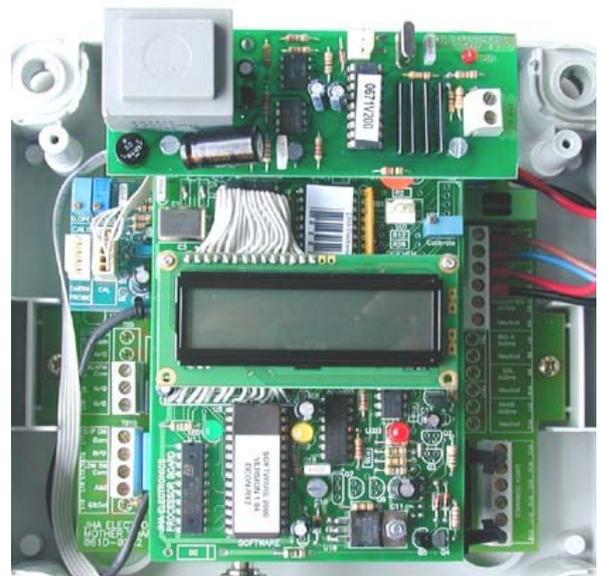
The AF09A optional kit consists of the following:

1. Optically isolated 4 – 20mA card
2. Interconnecting communications cable.
3. 2 x 15mm metal spacers.

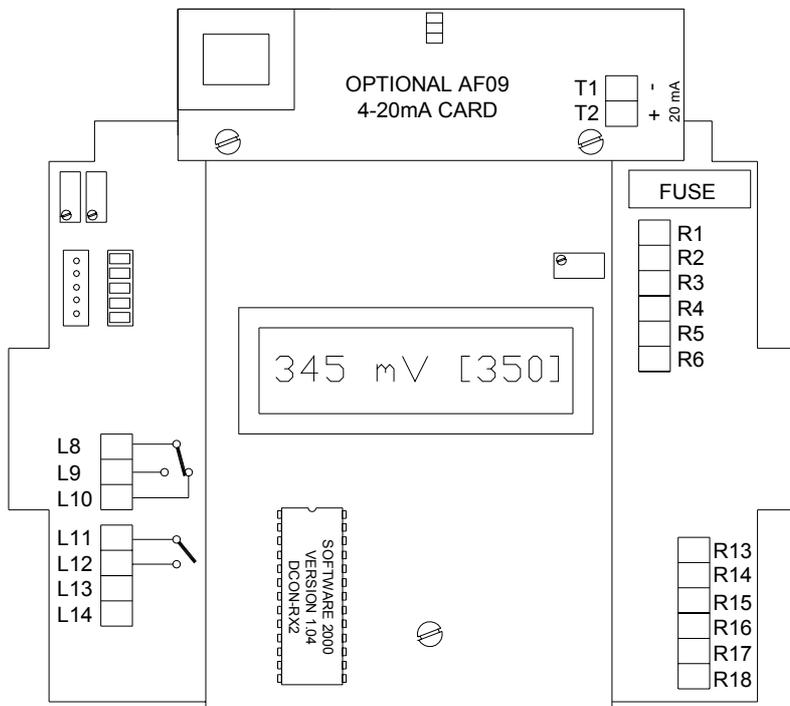
You may skip this section if the card is factory fitted.



CIRCUIT WITHOUT THE 4-20mA CARD



CIRCUIT WITH THE 4-20mA CARD



T1: 4-20mA output –ve
 T2: 4-20mA output +ve

Max 4-20mA O/P impedance: 750 Ω

R3: 4-20mA card Active 240VAC
 R4: 4-20mA card Neutral

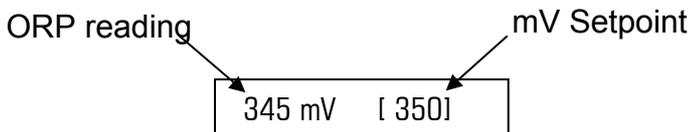
1. Make sure that the power is switched off and the controller is unplugged from mains power.
2. Remove cover of enclosure.
3. Locate the two screws as indicated in the diagram above and remove. Do not discard these screws.
4. Plug the interconnecting cable into the USB socket.
5. Screw the 2 metal spacers into space where the screws were removed.
6. Locate the two mounting holes on the interface card.
7. Use the screws removed in step 2 and fasten the card to the 2 metal spacers (installed in step 5).
8. Connect the RED wire of the interface card to terminal 3.
9. Connect the BLACK wire of the interface card to terminal 4.
10. Connect the +ve and –ve terminal of the 4-20mA card to your chart recorder, data logger or building management system. It is important to observe the correct polarity of these connections.
11. Replace cover of enclosure, ensuring that the seal is in place and no wires are trapped between the lid and the base.
12. Plug into mains and switch on.

NOTE: The 4-20mA signal transmitted spans the ORP range: 0-1000mV

3. COMMISSIONING

3.1 Start-Up

After power-up, the DCON-RX2 controller is ready to perform ORP indication and control. All the relevant information is displayed on the LCD display as explained below.



Display **during normal operation:**

ORP of solution as reported by ORP electrode as well as SETPOINT (shown between square brackets)

Display **during programming:**

Programming information

Display **if alarm is reported:**

Displays which alarm is activated.

3.2 Calibration

Calibration should not be necessary, as the unit is factory calibrated. Should the readout on the screen differ from the titration measured or the reading seems to have drifted up or down, try cleaning the electrode tip first. Should calibration still be necessary, the following can be performed, BUT ONLY by a qualified technician:

IMPORTANT: AS THE UNIT NEEDS TO BE POWERED, BE VERY CAREFUL NOT TO TOUCH ANY OF THE SCREW TERMINALS OR THE CIRCUIT BOARDS, AS THEY MAY BE LIVE, AND CAN RESULT IN ELECTRIC SHOCK, OR EVEN DEATH.

1. Remove the lid of the controller
2. Move the plug from the “Earth Probe” connector to “CAL” connector.
3. The display will read: 345 mV [Cal.] (**Note:** 345mV is an example value)
4. Locate the SLOPE potentiometer on the left-hand side of the motherboard.
5. Slowly turn the pot until the desired reading is obtained.
6. Move the plug from the “CAL” connector back to the “Earth Probe” connector.
7. Replace the controller LID, ensuring the gasket is in place.

NOTE: Instead of moving the plug from the “Earth Probe” connector to the “CAL” connector in order to calibrate, a short circuit between the external Earth Probe connector and the chassis of the BNC, will product the same effect.

3.3 Priming Pump / Testing Solenoid

Press the SCROLL pushbutton  for at least 2 seconds. The display will read:

Testing Output ...

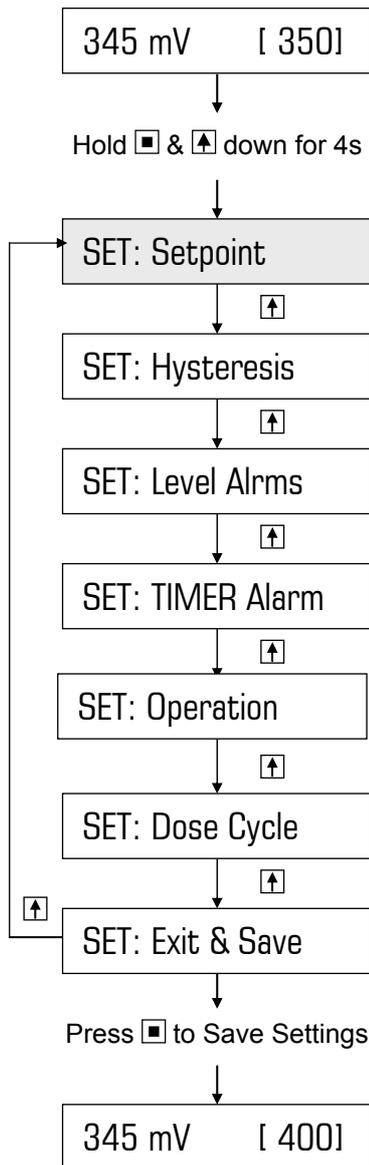
The pump will activate for approximately 2 minutes before reverting to normal mode.

However, to stop testing before then, press SCROLL  again.

4. PROGRAMMING STEPS IN DETAIL

NOTE: These instructions assume that you are dosing an oxidising agent with a pump. If you are dosing a reducing agent, then the logic is reversed.

4.1 Set mV Setpoint



Item flashing on display:

- [up arrow] Press to Scroll
- [square] Press to Select/Enter

Note: Shading represents flashing

This is the desired ORP value of the process. To determine the setpoint, proceed as follows:

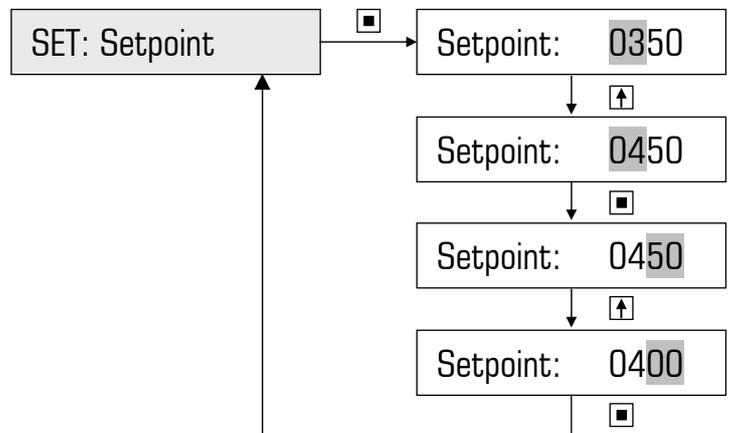
With the ORP electrode installed, ensure that a stable reading is displayed.

Slowly add the oxidising agent by hand. The reading on the LCD display should increase. Titrate the solution and keep on adding the oxidising agent until the desired level of ORP is reached. This level relates to the desired concentration (ie. ppm).

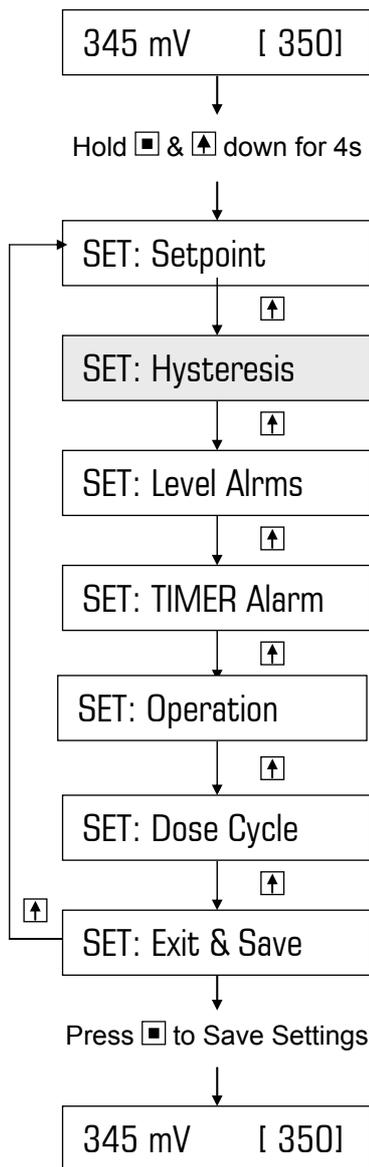
Record the readout on the display (left-hand side) and program this value as the Setpoint.

Example:

Increasing factory default setpoint of 350 mV to a new setting of 400 mV



4.2 Set Hysteresis



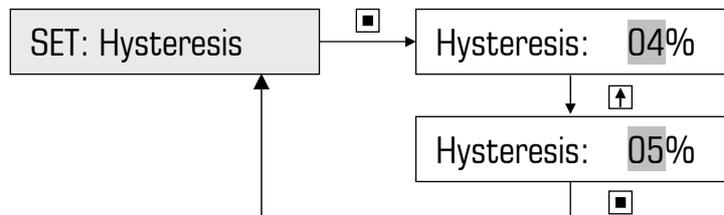
Hysteresis prevents rapid switching of the pump/dosing valve on and off when the system ORP hovers around the setpoint. 'Hysteresis' is the difference in mV level at which the pump/dosing valve starts and the pump/dosing valve stops.

The pump/dosing valve will dose when the mV readout drops below the SETPOINT. Dosing will stop once the readout rises above the SETPOINT plus a percentage. (This percentage is the hysteresis value and is a percentage of the SETPOINT).

For example, if the SETPOINT is 360mV and the hysteresis value is 5% then the calculated hysteresis value is 18mV and when added to the Setpoint will be 378mV. When the readout reaches 378mV, dosing will stop.

Example:

Increasing factory default hysteresis of 4% to a new setting of 5%

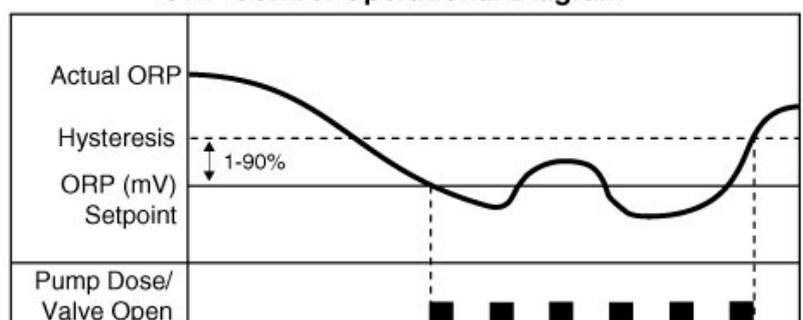


Item flashing on display:

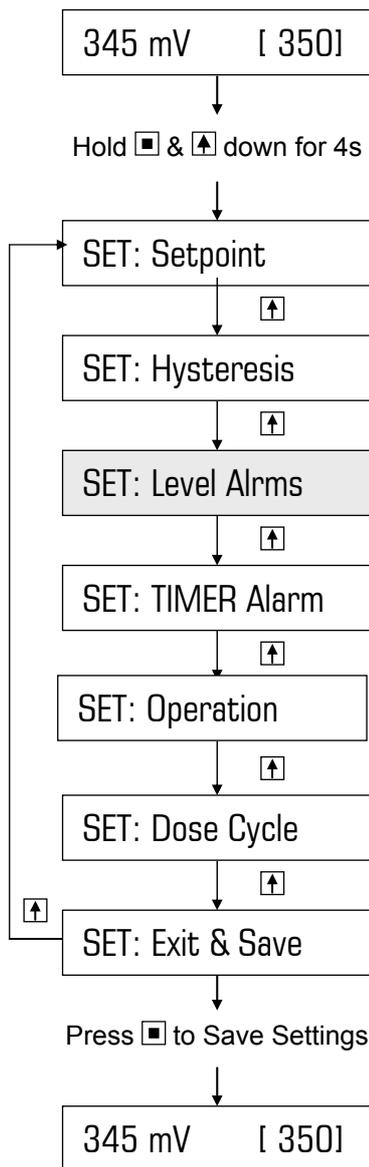
- Press to Scroll
- Press to Select/Enter

Note: Shading represents flashing

ORP Control Operational Diagram



4.3 Set High & Low mV Alarms



Item flashing on display:

- Press to Scroll
- Press to Select/Enter

Note: Shading represents flashing

To leave the alarms in their disabled state, ie. factory default settings of 0000, proceed to section 4.4.

Enabling one or both of the alarms requires you to program a HIGH ORP Alarm level (higher than the mV Setpoint) and/or a LOW ORP Alarm level (lower than the mV Setpoint).

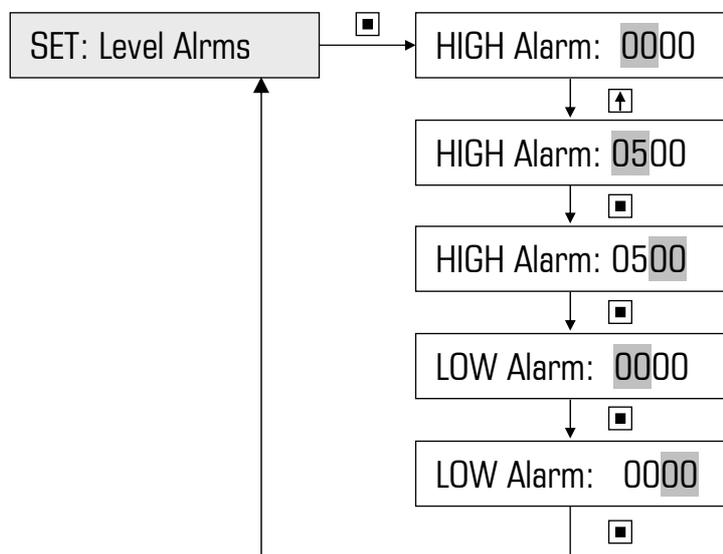
If the system ORP rises above the HIGH alarm level, the HIGH alarm activates. Similarly, if the system ORP drops below the LOW alarm level, the LOW alarm activates. The alarm LED will illuminate and the display will alternate between the alarm and the normal display. For instance, if HIGH Alarm = 500mV, the display will alternate between “Alarm !! [HIGH]” and “520mV [350]“, assuming 520mV is the measured ORP.

Either alarm condition can be reset by pressing & holding the ENTER button (until the Alarm LED switches off) or will automatically cancel if the system ORP is again between the HIGH and LOW alarms levels.

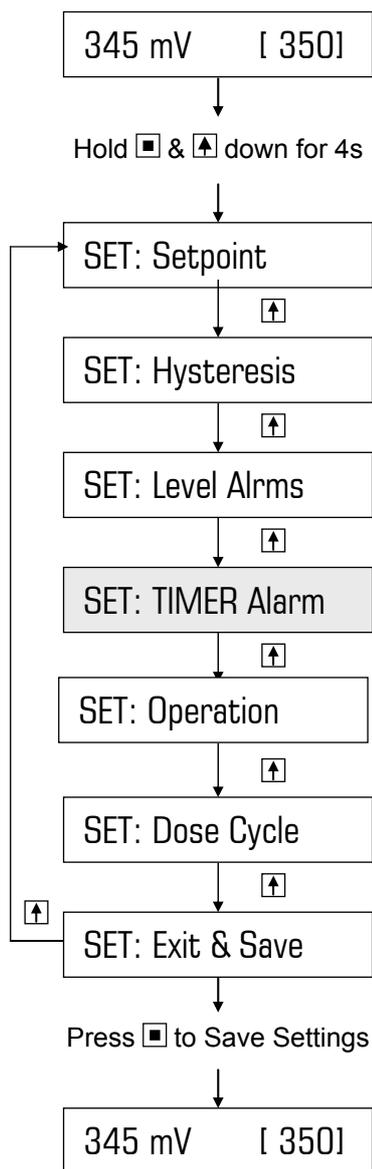
Example:

HIGH Alarm: Change factory default of 0 mV to 500 mV (ie. alarm reported when mV > 500)

LOW Alarm: Leave factory default of 0 mV (ie. alarm disabled)



4.4 Set Timer Alarm



Item flashing on display:

-  Press to Scroll
-  Press to Select/Enter

Note: Shading represents flashing

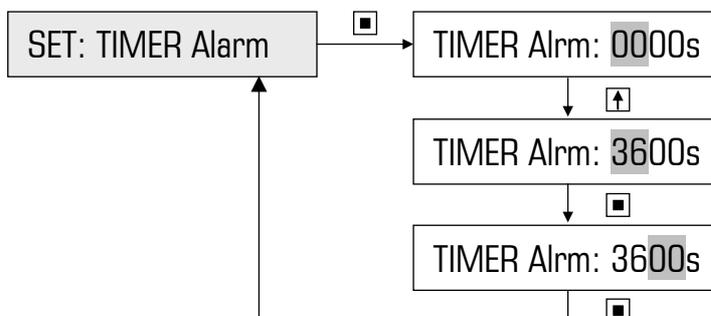
The TIMER alarm is the maximum permissible dose time to reach the SETPOINT. This alarm is designed to protect the system from overdosing in the event of a faulty probe reading a low mV when in fact the mV reading may be much higher than the setpoint. The alarm can also be used to disable the pump should the chemical tank run dry (in “-P” systems only).

To leave the alarm in its disabled state, ie. factory default setting of 0000s, proceed to section 4.5

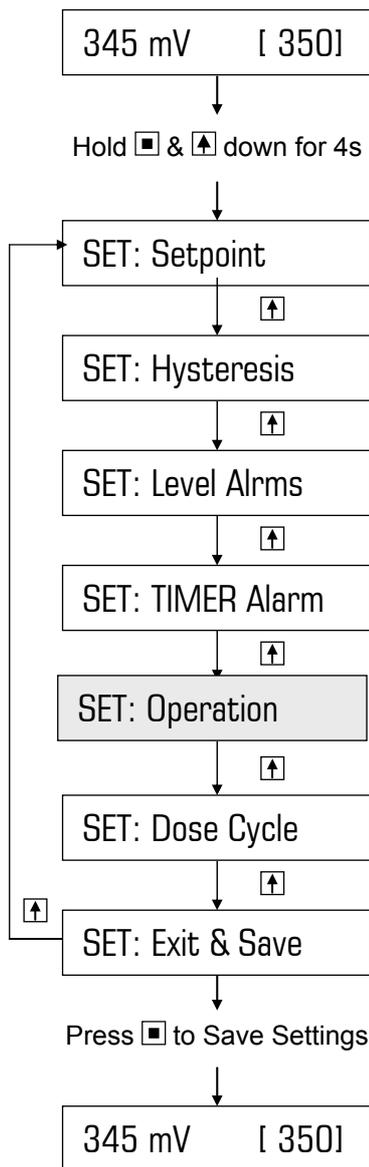
If the system ORP reaches the setpoint within the programmed time, the timer resets. However, if the timer times out before the ORP reaches the setpoint, the pump switches off and remains disabled until the unit is manually reset by holding down the ENTER button. Until then, the alarm LED will illuminate and the display will alternate between the alarm and the normal display. For instance, the display will alternate between “Alarm !! [Timer]” and “125mV [350]“, assuming the ORP reading from the probe is 125mV. Note: Even though the reading from the probe is 125mV in this instance, the actual system ORP may be much higher. Alternatively, the tank could be empty with no dosing and hence no rise in ORP.

Example:

Factory default: 0000s (ie. alarm disabled)
Change to: 1 hour, ie. 3600s



4.5 Set Operation



The controller can be programmed to respond to a rise or drop in ORP. The controller is factory programmed to operate as a dosing controller, dosing an oxidising agent via a dosing pump or N/C solenoid controlling water flow through a brominator.

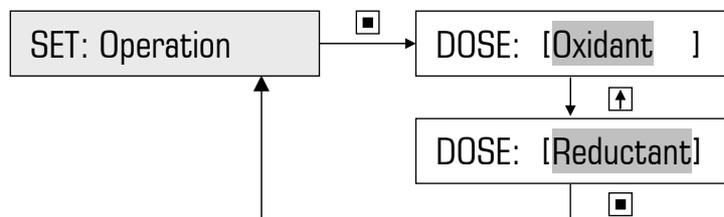
The two programmable options are:

DOSE: Oxidant (factory default)
DOSE: Reductant.

Most applications require dosing an oxidising agent. Hence, this programming step can be bypassed.

Example 1 – dosing Reducing Agent:

Changing factory default of Oxidant to Reductant



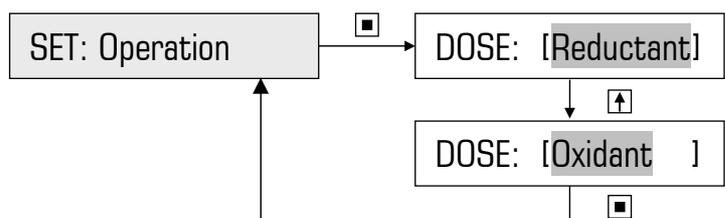
Item flashing on display:

- Press to Scroll
- Press to Select/Enter

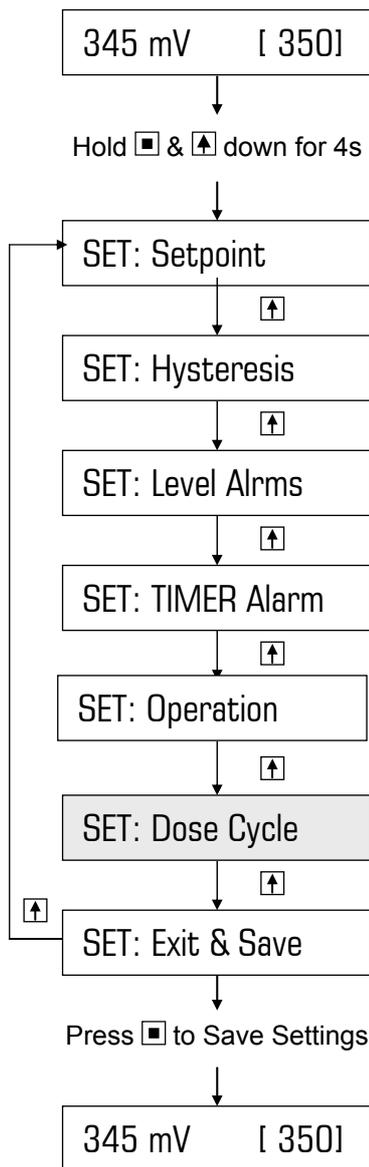
Note: represents flashing

Example 2 – dosing Oxidising Agent:

Changing Setting of Reductant to Oxidant.



4.6 Set Dose Cycle



Item flashing on display:

- [Up] Press to Scroll
- [Select] Press to Select/Enter

Note: Shading represents flashing

To leave the Dose Cycle in its disabled state, Exit & Save. This is the factory default setting of ON/OFF=00s/00s which means that the pump will dose continuously when the system ORP < mV Setpoint.

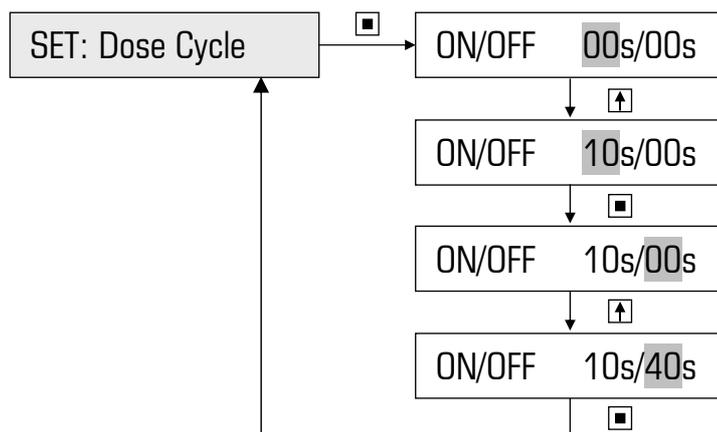
However, when a chemical product is dosed for ORP correction, some time is required for agents to react. Depending upon the location of the dosing point and the volume of water in the system, it may take some time before the chemicals reach the ORP electrode. If the response is slow, overdosing can occur due to the delay between dosing and measurement.

To overcome this problem, the controller has two timers that regulate the duty of the dosing pump. These timers are the ON and OFF times of the DOSE CYCLE. Each ON time is followed by an OFF time and repeated until the setpoint is reached. For instance, the timers can be programmed to operate the pump for say 10 seconds, and then allow 40 seconds for reaction time, before the pump is activated again. This action prevents overdosing. In this example, the DOSE ON/OFF CYCLE would be set to 10s/40s. The pump would, hence, dose for 10s every 50s (ie. 10s+40s) which equates to a 20% duty cycle.

Should the ORP readout drop to less than 25% below the programmed SETPOINT the controller doubles the ON time and halves the OFF time to bring the mV within 25% of the setpoint very quickly. As soon as the ORP readout increases to within 25% of the SETPOINT, normal pump duty cycle (ie. programmed ON/OFF times) will resume.

Example:

Factory default: 00s/00s (ie. pump doses continuously when ORP < mV setpoint).
Change to: 10s/40s (ie. 20% duty cycle)



5. FACTORY SETTINGS / PROGRAMMABLE OPTIONS

Item	Factory Setting	Option	Note
Setpoint	350 mV	1 – 999 mV	Determine mV level that relates to desired system ppm
Hysteresis	4 %	1 – 90 %	Lower value ensures tighter control
High Alarm	0 mV	0 – 999 mV	0 = disabled, or ensure value > Setpoint
Low Alarm	0 mV	0 – 999 mV	0 = disabled, or ensure value < Setpoint
Timer Alarm	0 sec	0 – 9999 sec	0 = disabled
Operation	Dose Oxidant	Dose Oxidant or Reductant	Most applications dose Oxidant
Dose Cycle ON time	0 sec	0 – 99 sec	Dose time 0 = doses continuously when ORP < mV Setpoint
Dose Cycle OFF time	0 sec	0 – 99 sec	Reaction time 0 = doses continuously when ORP < mV Setpoint

6. SPECIFICATIONS

Power Supply:	220 – 240 VAC (50 / 60 Hz)
Inputs:	ORP Probe/Electrode (optional with DCON-RX2/DCON-RX2A controllers) (supplied with other systems) Earth Probe (supplied) Flow switch (option AF04 in “-B” systems)
Standard Outputs:	240VAC applied to Pump Output – 10 Amp rated, resistive load.
Optional Outputs:	AF09A: Isolated 4-20mA card to remotely monitor ORP level AF10A: 4-20mA for ORP, & 3 NPN event O/Ps: ORP Pump (or Brominator Dose Valve), Alarm & Power Failure
Measured ORP Resolution:	1 mV
Control cycle within 25% of setpoint:	Programmed ON/OFF times (ON/OFF = 00s/00s ensures pump is ON continuously when control output is activated)
Control cycle outside of 25% of setpoint:	ON time x 2, OFF time x 0.5
Controller Enclosure rating:	IP55 (ie. completely weatherproof)
Operating Temperature:	0 - 50°C
Memory backup:	EEPROM. Data retention of 10 years min.