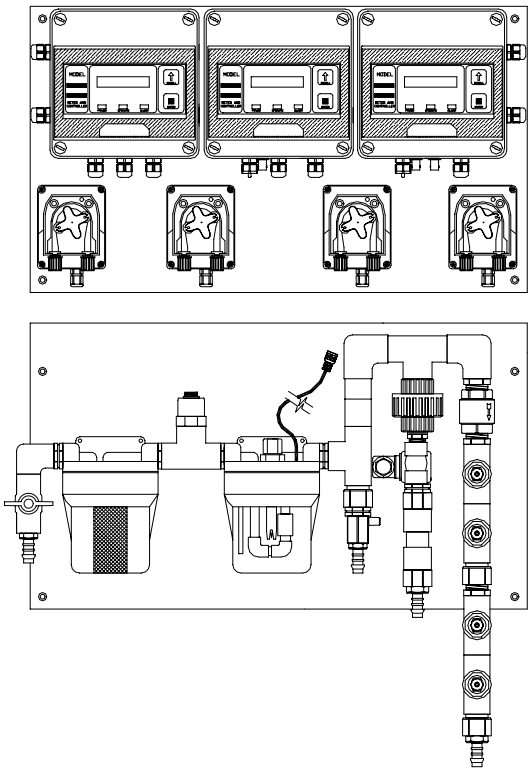
Instruction **Manual**

- **DIGICHEM®-PHRX2A-P**
- **DIGICHEM®-PHRX2A-B**
- **DIGICHEM®-APHRX2A-P**
- **DIGICHEM®-APHRX2A-B**



COOLING TOWER DOSING PACKAGES

Supplied by:

Convergent Water Controls Pty Ltd
2/4 Huntley Street
Alexandria NSW 2015
Tel: (02) 9698 3131
Fax: (02) 9698 3210
www.cwc.com.au
info@cwc.com.au

Manufacturer: Convergent Water Controls Pty Ltd, Sydney Australia.

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.

TABLE OF CONTENTS

1. INTRODUCTION

One complete system for cooling towers, incorporating the DIGICHEM, DCON-RX2A & DCON-PH2A controllers – TDS, ORP & pH control, Inhibitor & Dual Biocide Dosing with manifold on PVC panel – ready for installation – ready to control. The integrated conductivity controller maintains the tower TDS via its bleed solenoid valve. Corrosion Inhibitors are dosed on bleed, on a cycle or proportional to make-up. Primary (oxidising) biocide chemical is dosed to maintain a pre-set ORP (mV level). Secondary (non-oxidising) biocide (DIGICHEM-APHRX2A units only) is dosed via 7-day timer programs, and whilst dosing, the condenser pump can be configured to automatically run.

The DIGICHEM controls the system water to a pre-determined conductivity/TDS. This is done by regulating the solenoid valve to bleed system water to drain, causing make-up water to dilute the system. The setpoint is entered via the menu as an actual number. The bleed rate can be slowed down with the programmable bleed cycle. This can eliminate flooding if the drain tends to block, by creating a slower bleed-off. The manifold has check valves to ensure that injected chemical does not interfere with the TDS or ORP measurements. The hysteresis (ie. deadband) is fixed at 3% to prevent rapid switching of the bleed solenoid valve.

The DCON-RX2A controls the ORP of the system water to a pre-determined mV level as read by the ORP (Redox) electrode. This is done by regulating the dosing pump (-P version) or dosing solenoid valve (-B version). The dose rate can be slowed down with the programmable dose cycle. This ON/OFF cycle reduces overshoot when there is a time lag between dosing and when the probe measures a change in ORP. To improve control, the dose rate automatically increases if the ORP drops more than 25% below the setpoint, bringing the mV level up quickly. The hysteresis (ie. deadband) is variable from 1% to 90% to prevent rapid switching of the dosing pump or dosing solenoid valve. 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.

The DCON-PH2A controls the pH of the system to a pre-determined pH level as read by the pH electrode. This is achieved by regulating the dosing pump (usually dosing acid). The dose rate can be slowed down with the programmable dose

cycle. This ON/OFF cycle reduces overshoot when there is a time lag between dosing and when the probe measures a change in pH. To improve control, the dose rate automatically increases if the pH rises more than 25% above the setpoint, bringing the pH level down quickly. The hysteresis (ie. deadband) is variable from 1% to 90% to prevent rapid switching of the dosing pump.

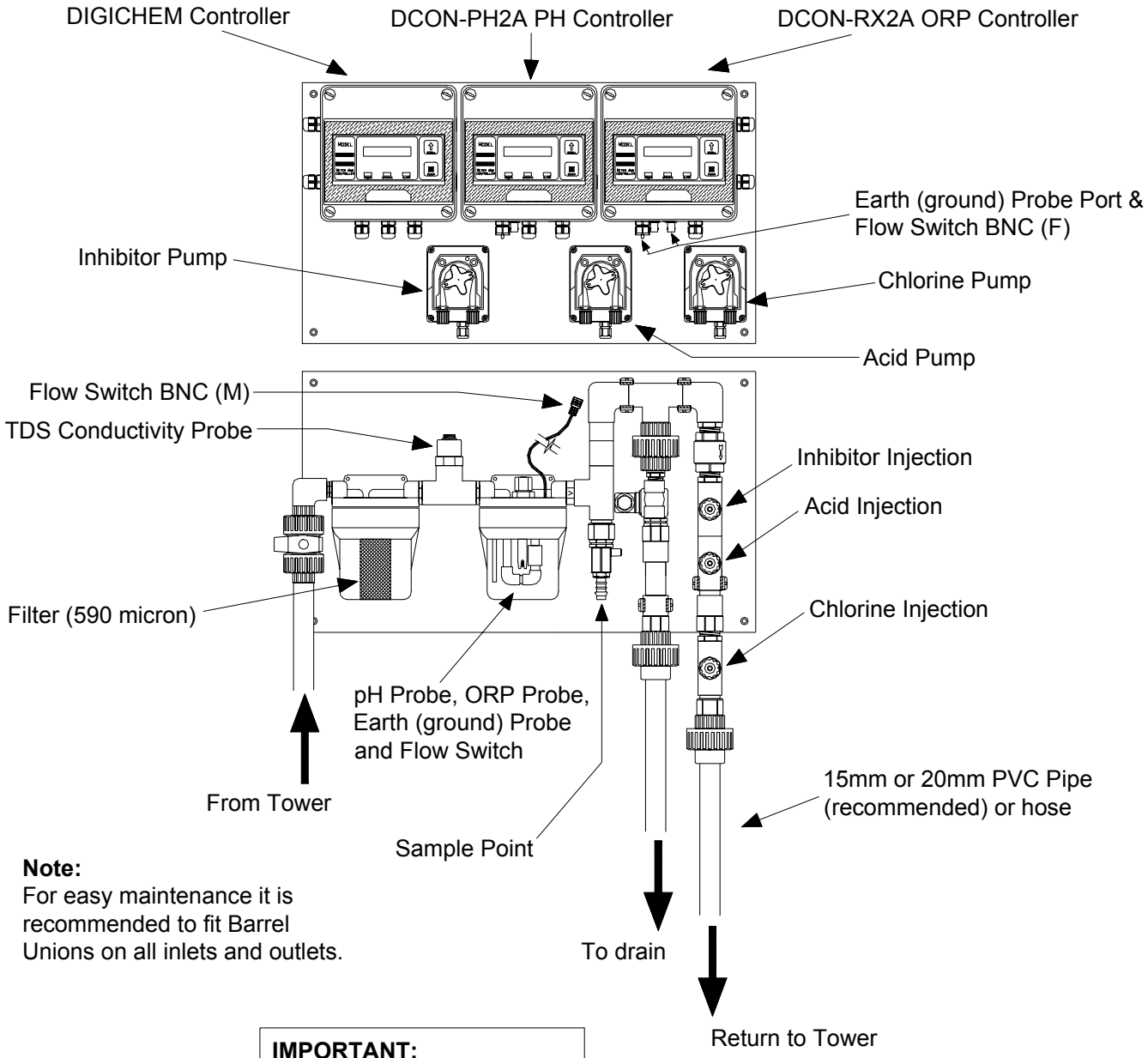
1.1 Features

- Bleed Control for reducing scale formation - via solenoid valve
- Inhibitor Dosing Control for reducing corrosion – dosed on bleed, on cycle or proportional to make-up (via water meter)
- Dual Biocide Dosing Control for system disinfection
- Primary (Oxidising) Biocide Dosing - ORP controlled via Pump or Brominator
- Secondary (Non-oxidising) Biocide Dosing – via 10 independent 7-day timer programs with programmable pre-bleed & bleed lockout
- pH control (via acid pump)
- Easy to program and calibrate
- LCD displays TDS, ORP & setpoints
- Manual priming & testing via menu
- Intelligent electronic cleaning of electrodes of TDS probe
- Fail-safe alarm relays with remote power failure detection
- Condenser pump override facility with delay-off timer - ensures flow through manifold during & after secondary biocide dosing
- Flow switch can be configured to disable different combinations of outputs on no-flow
- Weatherproof - can be mounted outside

2. INSTALLATION

2.1 Mounting the System

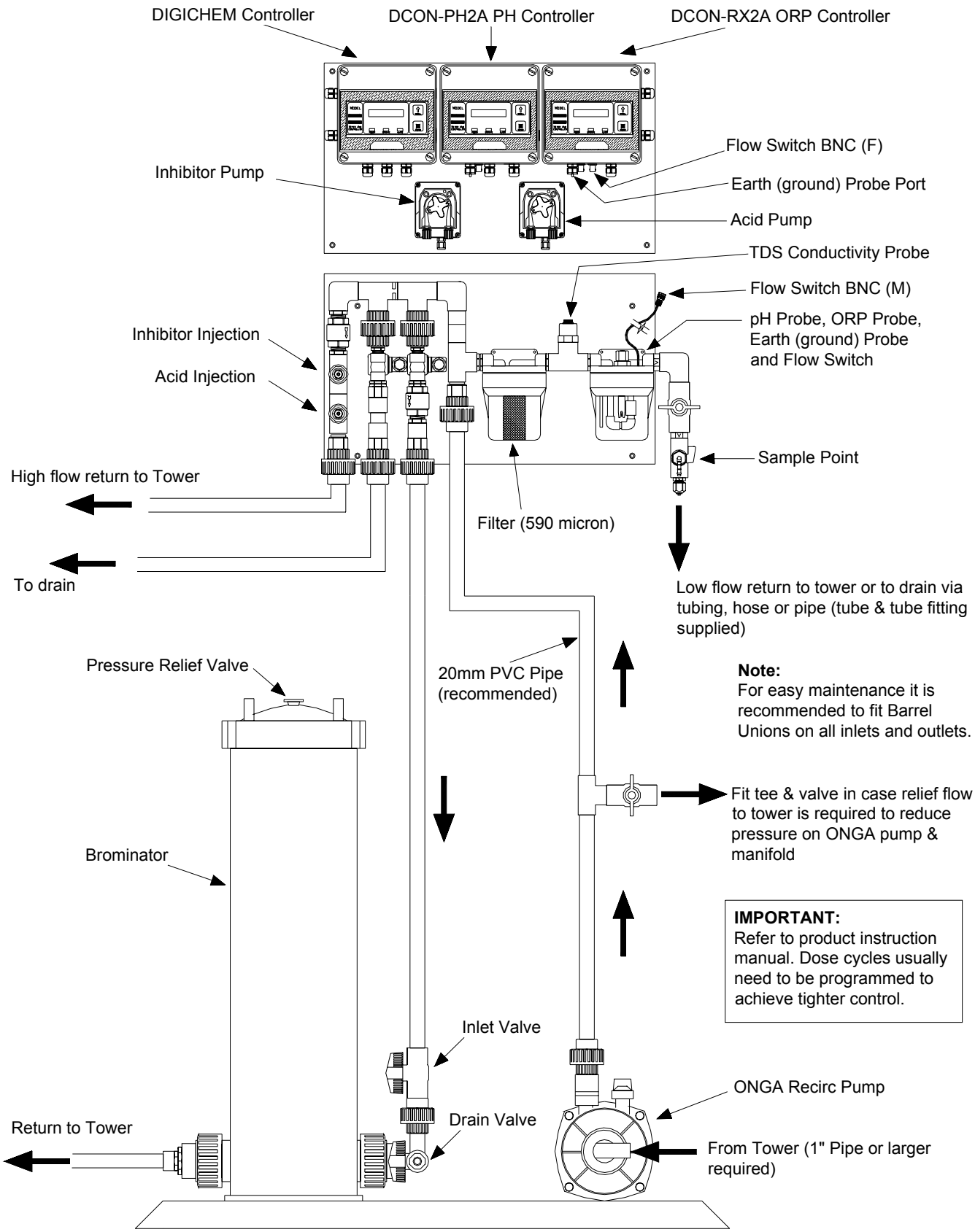
1. Fit barrel unions (not supplied) to the inlet & outlet ports. Alternatively use hosetails provided.
2. Mount the system panels one below each other on a flat vertical surface near the cooling tower.
3. Mount the panels such that the electronic controllers are at eye-level to allow for good visibility of the LCD displays.
4. Connect into the water system as indicated in the illustrations over the next four (4) pages:



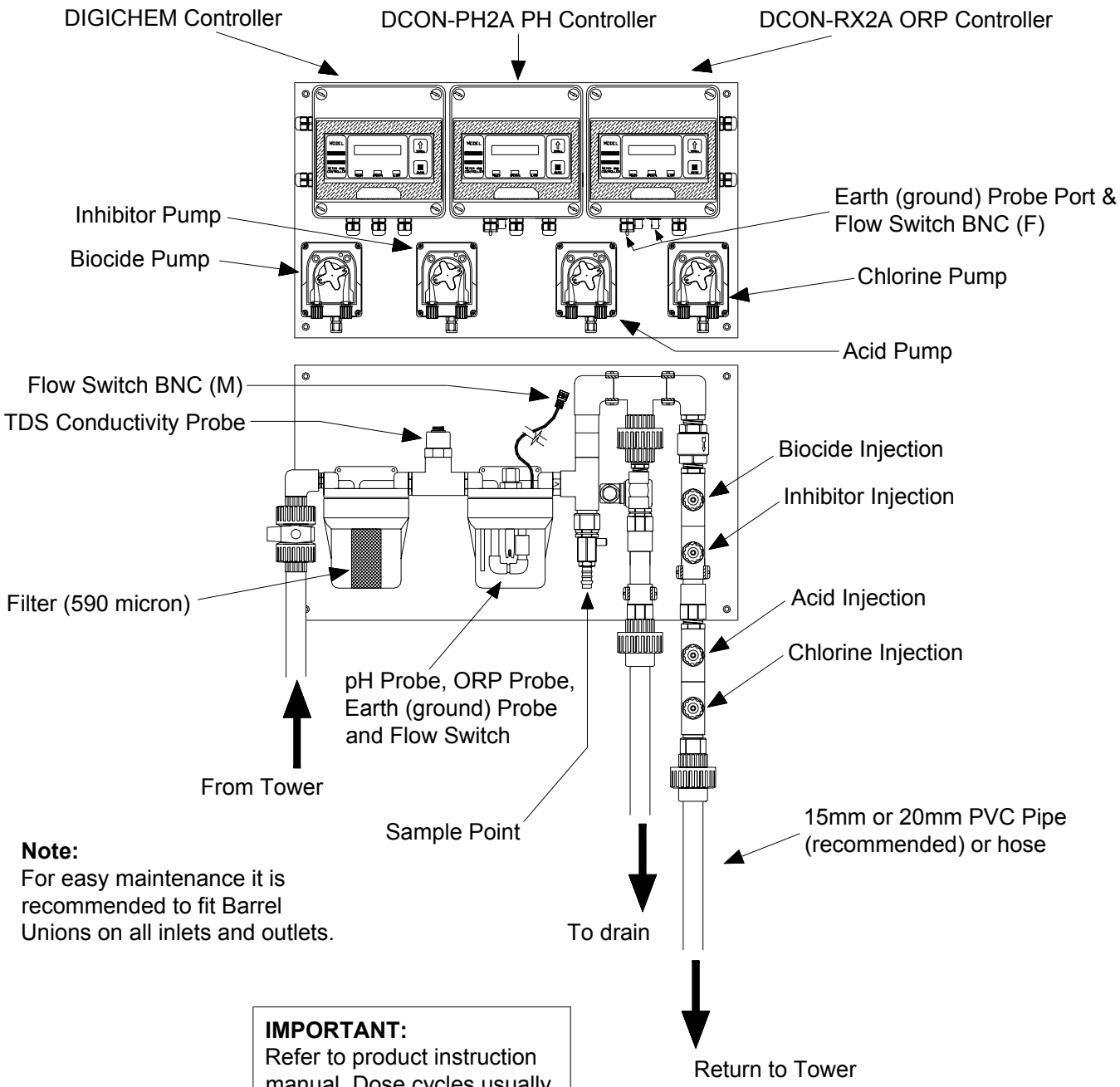
Note:
For easy maintenance it is recommended to fit Barrel Unions on all inlets and outlets.

IMPORTANT:
Refer to product instruction manual. Dose cycles usually need to be programmed to achieve tighter control.

DIGICHEM-PHRX2A-P



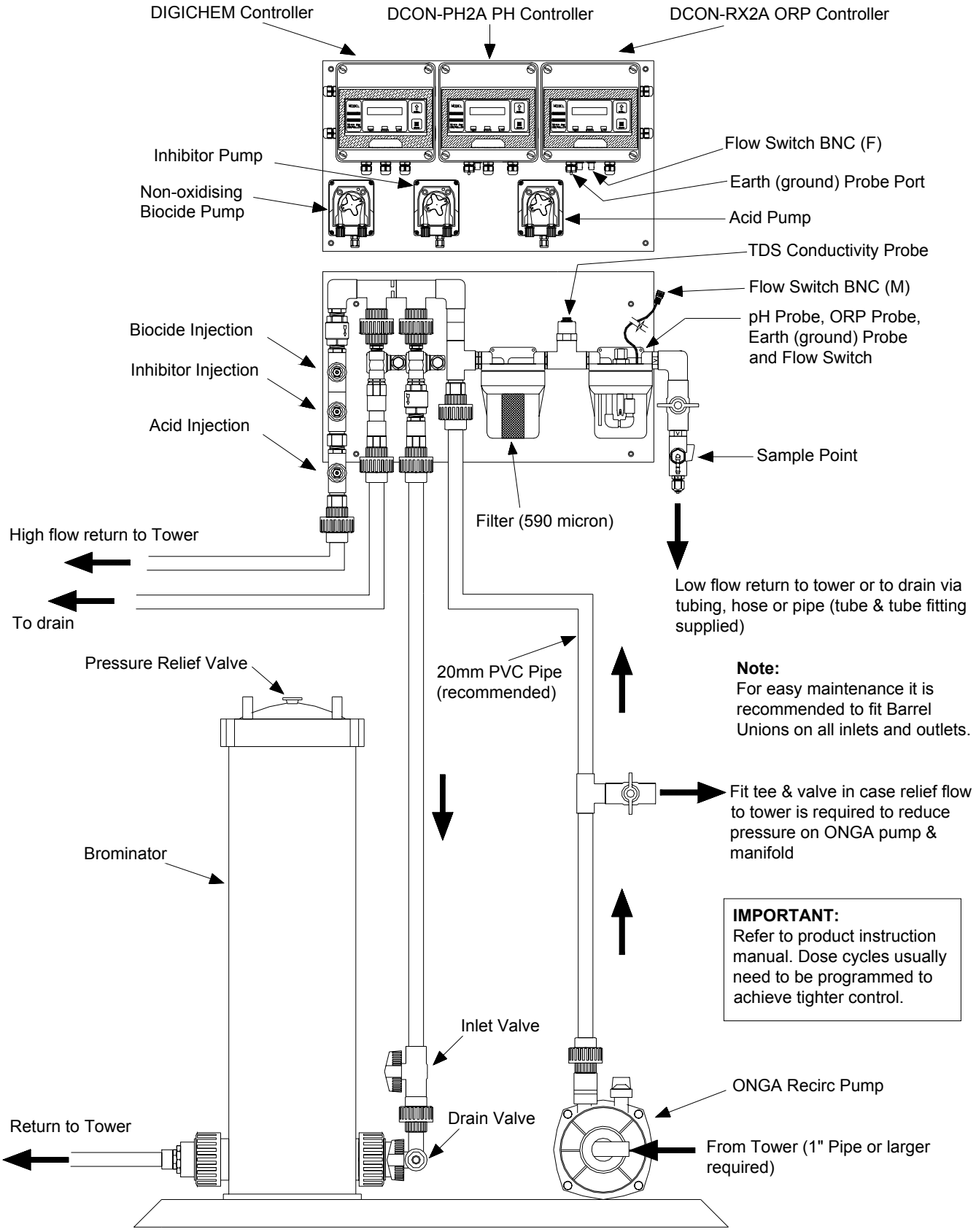
DIGICHEM-PHRX2A-B
with AF04, BROM-02, AF50 and AF52



Note:
For easy maintenance it is recommended to fit Barrel Unions on all inlets and outlets.

IMPORTANT:
Refer to product instruction manual. Dose cycles usually need to be programmed to achieve tighter control.

DIGICHEM-APHRX2A-P

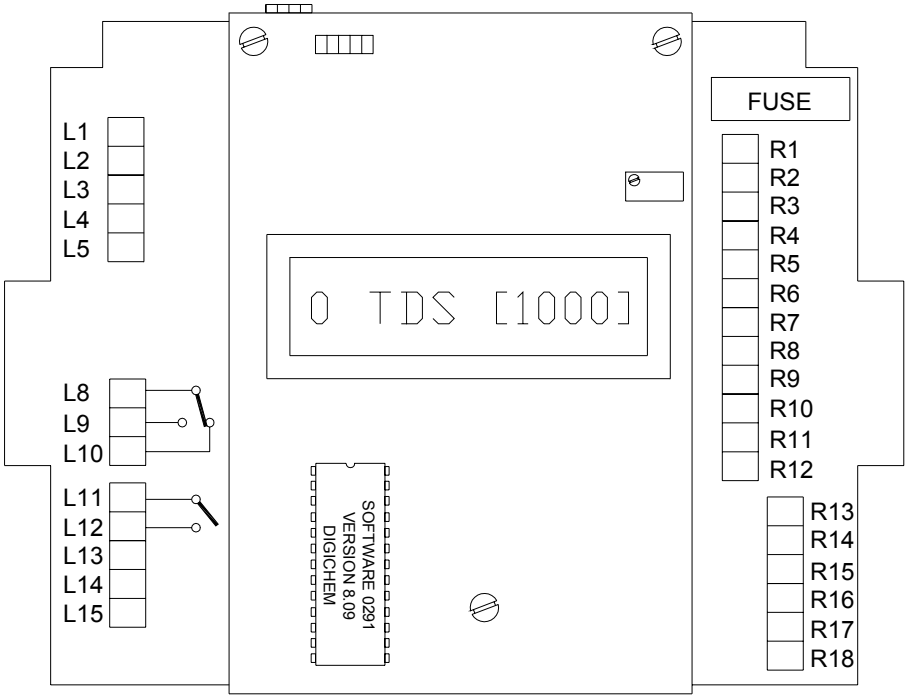


DIGICHEM-APHRX2A-B
with BROM-02, AF50 and AF52

5. Plumb a water line from the pressure side of the circulating/condenser pump to the Inlet hosetail of the manifold via a hose (or PVC pipe). If an Onga recirculation pump is fitted, the take-off point should be the tower basin. A relief valve should be fitted on the discharge side of the Onga pump to be plumbed back to the tower basin. The bore of the manifold is much less than that of the Onga pump discharge, so this return flow relieves the back pressure on the Onga pump as well as the manifold pressure.
6. In a similar fashion, fit a hose (or PVC pipe) to the bleed solenoid valve hosetail and run to drain.
7. The return line of the manifold is to be plumbed to the tower basin.
8. The return line can alternatively be returned to the circulating/condenser pump suction line. However, the pressure on the manifold must not exceed the pressure rating of the peristaltic pumps.
9. Fit a hose (or PVC pipe) with isolation valve from the Brominator dosing solenoid valve to the Inlet of the Brominator (-B systems only).
10. The return line of the Brominator is to be plumbed to the tower basin (-B systems only).
11. When the system is fully installed and the tower is running, open the valve in the water supply line to the system and check that the water flows through the manifold without any leaks. Also ensure that the maximum pressure rating of the pumps is not exceeded. This pressure can be measured by temporarily screwing a pressure gauge into the sample valve port.
12. Fit the tubes supplied to the pumps and to the foot valves.
13. Insert the tubes with foot valves into the Biocide and Inhibitor tanks.
14. **Plug the power lead into a 240VAC mains socket which MUST be continuously powered.**
15. Switch on. The green POWER ON LEDs should illuminate.
16. Prime the pumps as outlined in section 3.8.
17. Set the correct time and day as outlined in section 4.9. Allow 24 hours for the internal backup battery to charge up fully.
18. If the DIGICHEM, DCON-RX2A & DCON-PH2A have not been pre-programmed, please program as outlined in Sections 4 & 5 & 6.

2.2 Electrical Wiring Information – DIGICHEM Controller

The diagram below shows the connections to the DIGICHEM controller circuitry.



L1 & L2:	Water Meter (not polarity sensitive)
L3:	Conductivity Probe PR+ (brown)
L4:	Conductivity Probe PR- (yellow)
L5:	Conductivity Probe CM+ (blue)
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
L13 + L14:	Flow switch link to enable Biocide A & Biocide B outpus
L13 + L15:	Connection to DCON-PH2A flow switch transmit output (i.e. L11 + L12 in DCON-PH2A) to enable Inhibitor C Pump & Solenoid valve on flow

R1:	Mains Active 240VAC (power supply)
R2:	Mains Neutral
R3:	Auxiliary Active 240VAC (eg. for AF09 4-20mA card)
R4:	Auxiliary Neutral
R5:	Biocide B Active 240VAC (not used)
R6:	Biocide B Neutral (not used)
R7:	Biocide A Active 240VAC (DIGICHEM-APHRX2A only)
R8:	Biocide A Neutral (DIGICHEM-APHRX2A only)
R9:	Solenoid Valve Active 240VAC
R10:	Solenoid Valve Neutral
R11:	Inhibitor C Active 240VAC
R12:	Inhibitor C Neutral

R13 – R18: Earth

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

Notes on Alarm Relay Contacts :

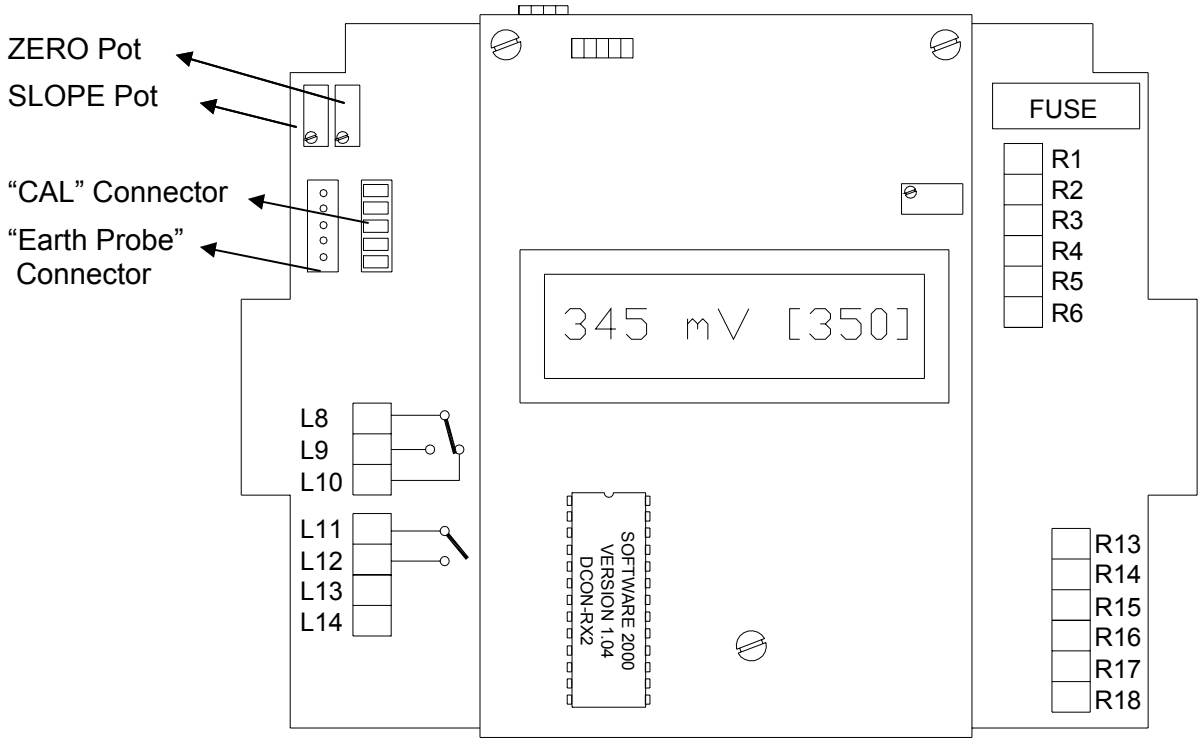
1. Alarm relay is energised (ie. L8 connected to L9) during normal operation of the unit.
2. Alarm relay de-energises (ie. L8 connected to L10) when an alarm is raised or when the unit loses power.

Notes on Flow Switch Connections

1. The unit is supplied with a link between L13 & L14 and a connection to the DCON-PH2A controller via L13 & L15.
2. The flow switch is fitted to the DCON-RX2A controller, but enables/disables the outputs of all 3 controllers on flow/no flow.

2.3 Electrical Wiring Information – DCON-RX2A controller

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 transmits the flow switch signal to the DCON-PH2A controller. The contact (i.e. L11 + L12) is closed when L13 & L14 are bridged (i.e. the flow switch is closed). This in turn links terminals L13 + L14 in the DCON-PH2A controller and enables the acid, inhibitor pump & solenoid valve.
L13 + L14: Flow switch 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.

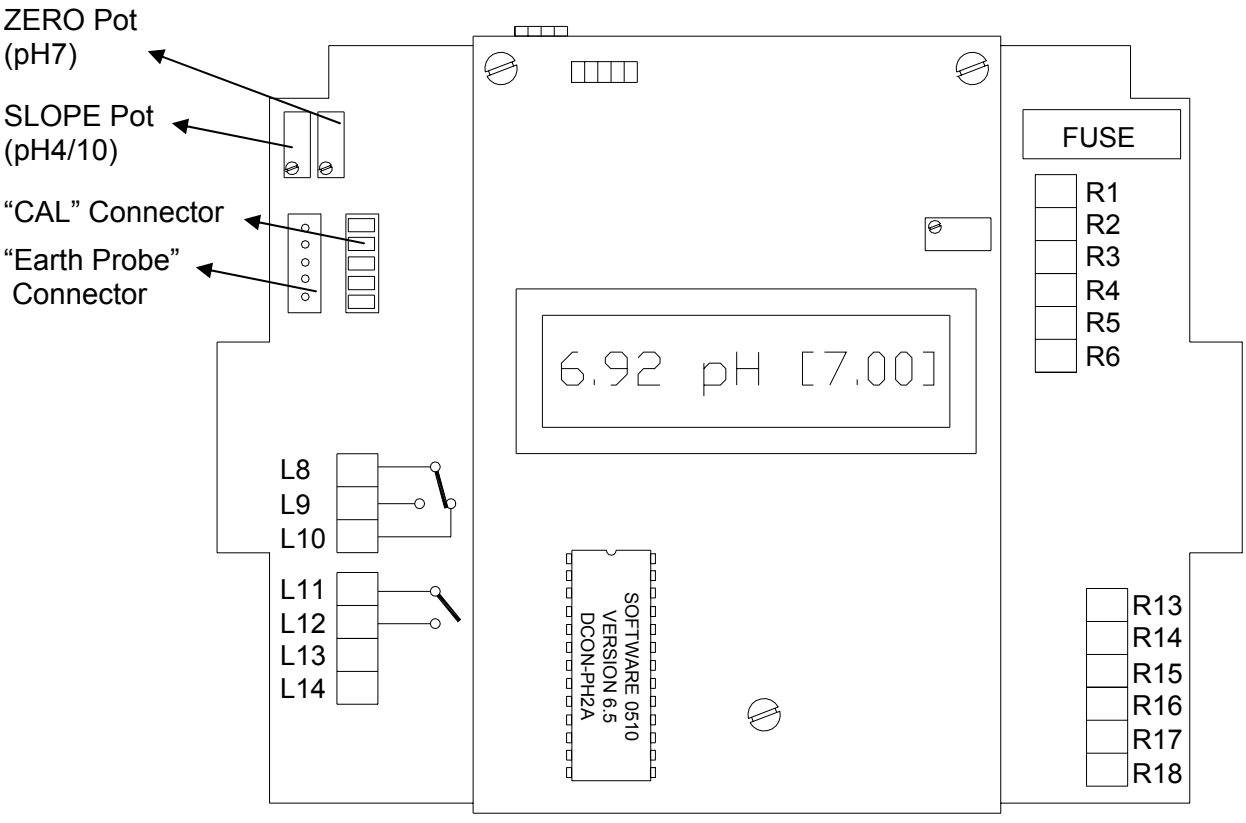
Notes on Flow Switch Connections

1. The flow switch is connected to L13 & L14
2. The O/P ON relay contact, L11 + L12 also closes when there is flow (i.e. L13 & L14 closed). This contact is used to enable/disable the DIGICHEM's Inhibitor & bleed output on flow/no flow, as well as the acid pump.

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.

2.4 Electrical Wiring Information – DCON-PH2A Controller

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 transmits the flow switch signal to the DIGICHEM controller. The contact (i.e. L11 + L12) is closed when L13 & L14 are bridged (i.e. the flow switch is closed). This in turn links terminals L13 + L15 in the DIGICHEM controller and enables the inhibitor pump & solenoid valve.
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 AF09B 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:

1. L13 & L14 are connected to L11 & L12 of the DCON-RX2A controller
2. The O/P ON relay contact, L11 + L12 is connected to L13 & L15 of the DIGICHEM controller

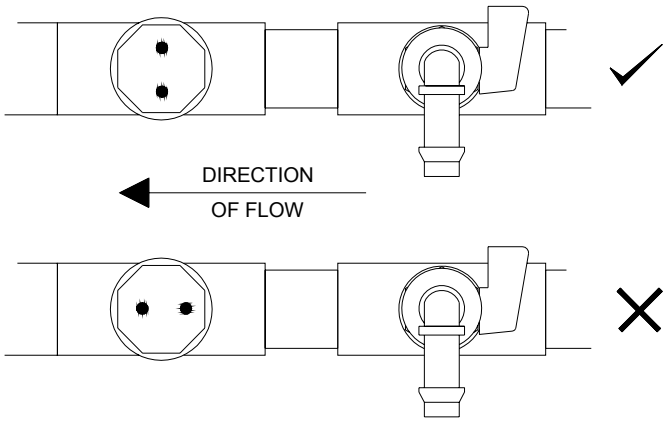
This configuration enables one flow switch signal to be relayed between all 3 controllers.

NOTE: The BNC connection for the pH electrode is situated on the outside of the enclosure at the bottom left hand side.

THE EARTH (GROUND) PROBE PORT IS UNUSED IN THE DCON-PH2A

2.5 Conductivity Probe Installation

The probe is supplied screwed into the manifold such that the electrode tips are submerged in the water flowing through the manifold. The probe should be positioned with the black markers on the probe aligned with the black markers on the manifold Tee. This ensures that the 2 electrodes of the probe are positioned symmetrically with respect to the direction of water flow. See the photograph and diagrams below:



2.6 Conductivity Probe Maintenance

The probe's electrodes should periodically be cleaned to maintain accurate TDS measurements. The frequency of cleaning required will vary from one application to another. In a new installation, it is recommended that the probe be cleaned after 2 weeks of service.

To clean the probe, first unplug the probe lead and unscrew the probe from the manifold. The probe can normally be cleaned using a cloth or paper towel. Occasionally the probe's carbon electrodes may be coated with substances which requires more vigorous cleaning (this coating may not always be visible). To clean a coated electrode, use a fine grit abrasive, such as emery paper.

After cleaning, apply more Teflon® tape to the probe thread and screw back into the manifold. The controller should always be calibrated after probe cleaning.

2.7 ORP, pH & Solution Ground Probe Installation

Fit the IH20 pH and IH30 ORP probes in the EMEC PED4 flow cell. Plug the IH20 BNC into the DCON-PH2A controller. Plug the IH30 BNC into the DCON-RX2A controller. Connect the stainless steel solution ground probe to the earth probe port on the DCON-RX2A controller. The earth probe port on the DCON-PH2A is unused.

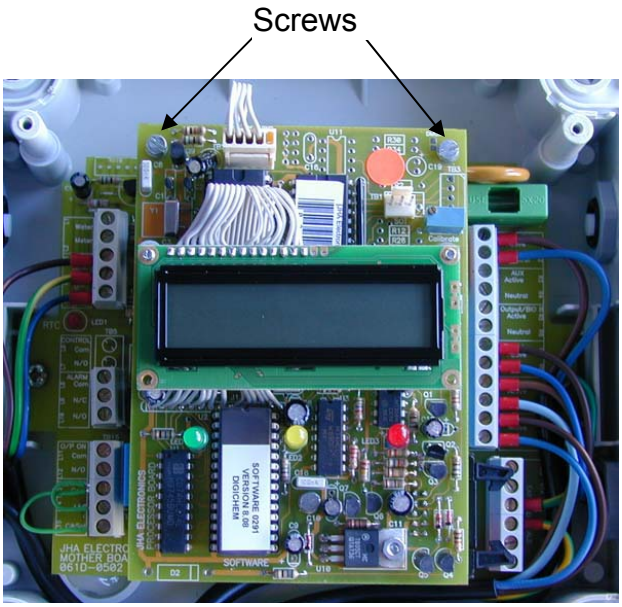
Plug the flow switch BNC plug from the EMEC PED4 flow cell into the BNC connector at the bottom of the DCON-RX2A controller (i.e. RHS BNC connector)

2.8 Adding Optional 4-20mA Card to DIGICHEM (code AF09 or AF09-3)

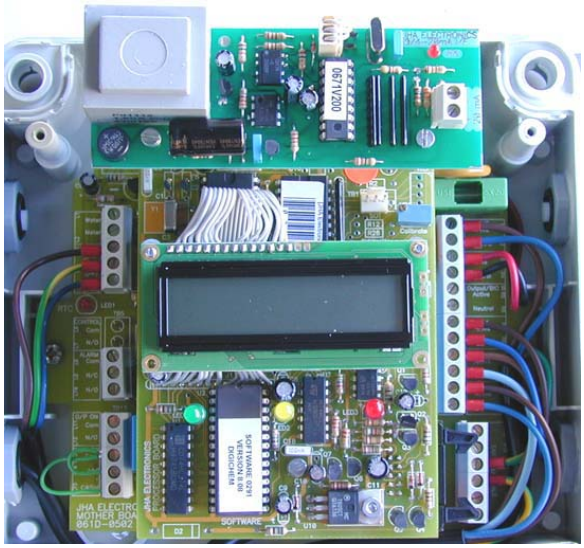
The DIGICHEM can be fitted with optically isolated 4-20mA interface card to provide an output to a data logger, chart recorder or building management system. The interface card is an ordering option and can be retro-fitted to the DIGICHEM , or can be supplied factory fitted.

The AF09 optional kits consist of the following:
1. Optically isolated 4 – 20mA card
2. Interconnecting communications cable.
3. 2 x 15mm metal spacers.

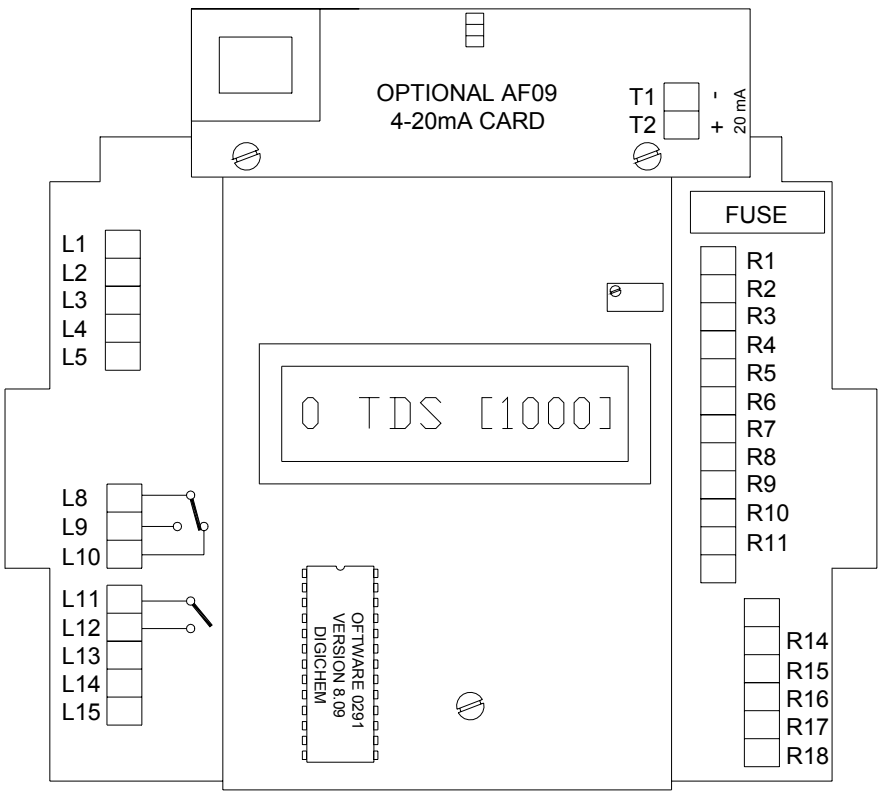
You may skip this section if the card is factory fitted.



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 and photographs above and remove. Do not discard these screws.
4. Remove the interconnecting cable supplied with the controller. This is connected between the RTC socket on the motherboard and the USB socket on the processor board.
5. Plug the new interconnecting cable into the RTC and USB sockets.
6. Screw the 2 metal spacers into space where the screws were removed.
7. Locate the two mounting holes on the interface card.
8. Use the screws removed in step 3 and fasten the card to the 2 metal spacers (installed in step 6).
9. Connect the RED wire of the interface card to R3.
10. Connect the BLACK wire of the interface card to terminal R4.
11. 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.
12. Replace cover of enclosure, ensuring that the seal is in place and no wires are trapped between the lid and the base.
13. Plug into mains and switch on.

NOTE: The 4-20mA signal transmitted spans the conductivity range of 0 to twice the TDS setpoint. For instance, if the setpoint=1000TDS, 4-20mA spans the conductivity range: 0-2000TDS.

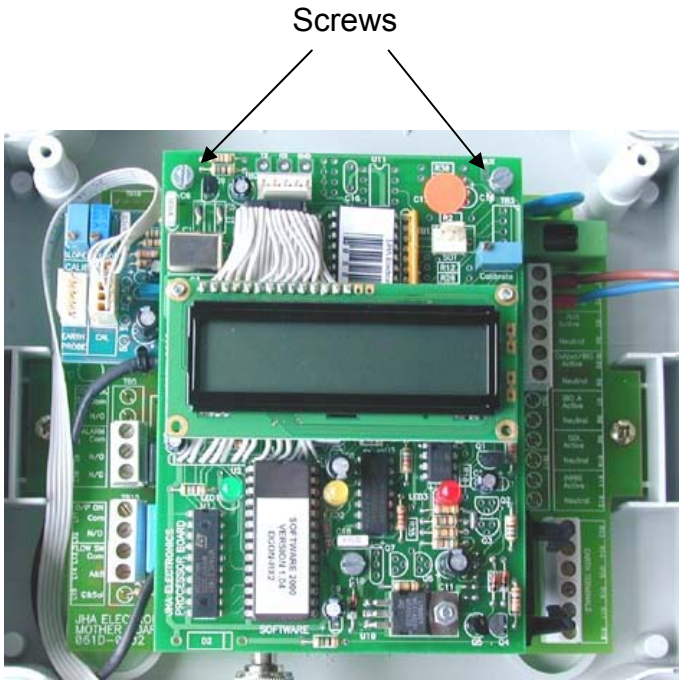
2.9 Adding Optional 4-20mA Card to DCON-RX2A (code AF09A or AF09-3)

The DCON-RX2 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, or can be supplied factory fitted.

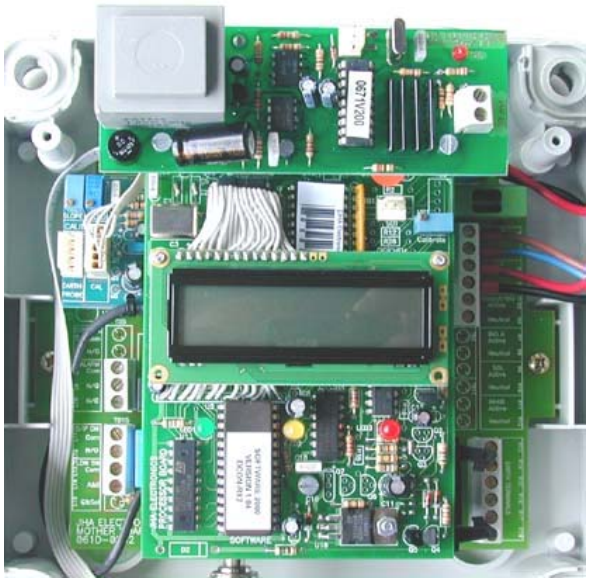
The AF09 optional kit consists of the following:

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

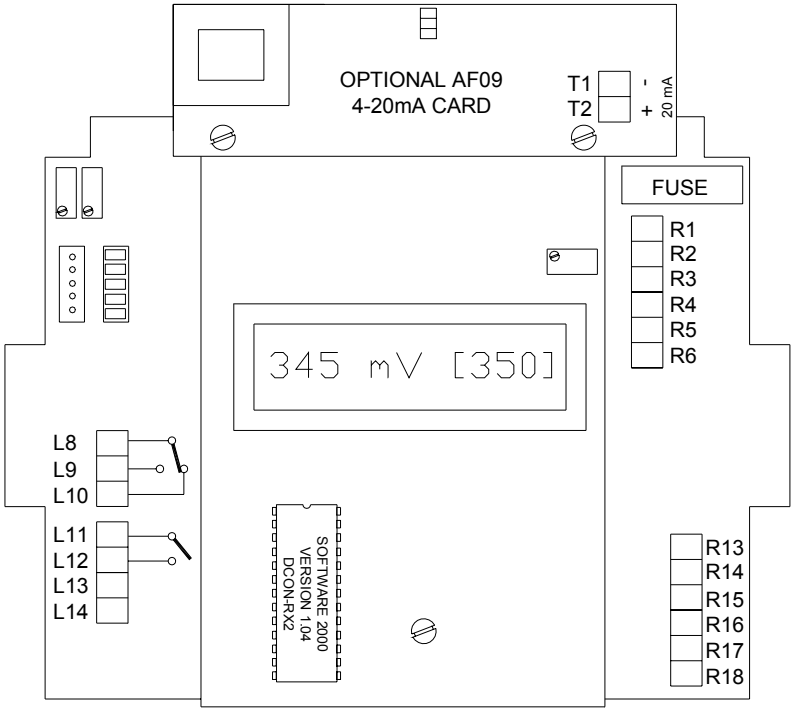
You may skip this section if the card is factory fitted.



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

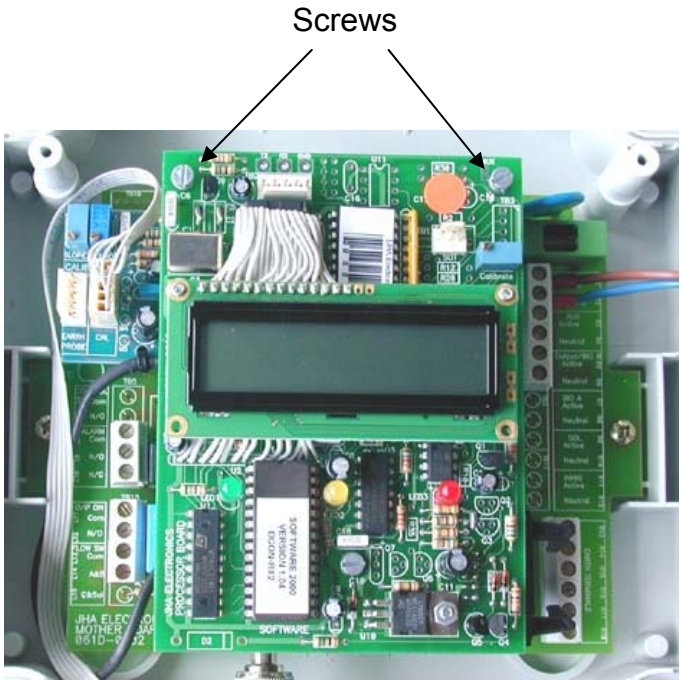
2.10 Adding Optional 4-20mA Card to DCON-PH2A (code AF09B or AF09-3)

The DCON-PH2A 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-PH2, or can be supplied factory fitted.

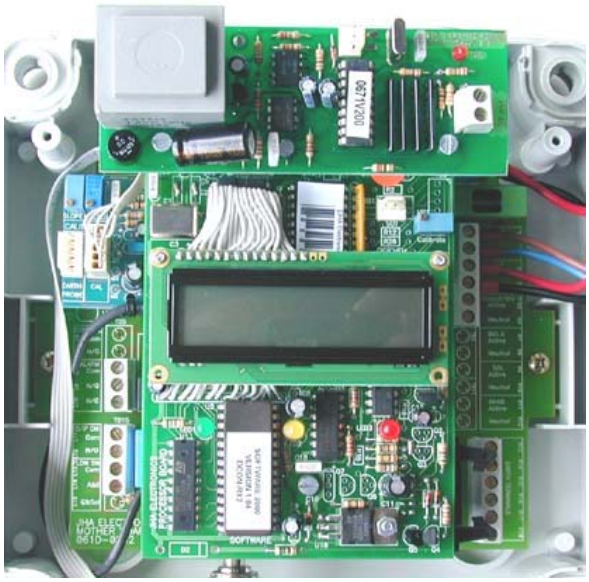
The AF09B optional kit consists of the following:

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

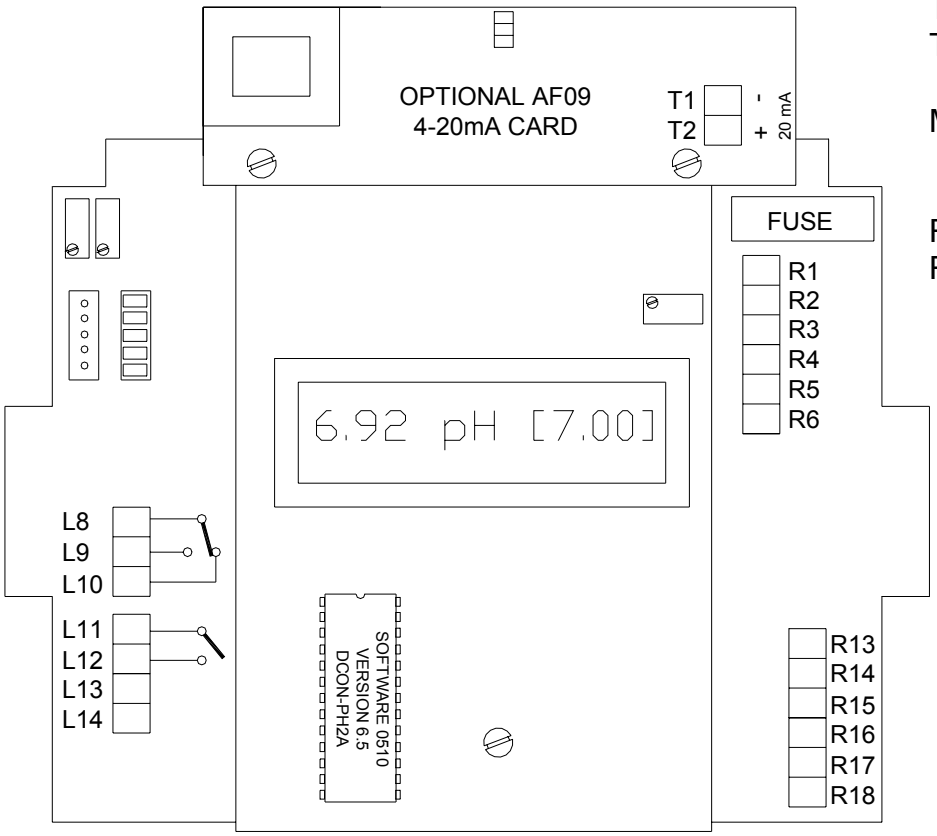
You may skip this section if the card is factory fitted.



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

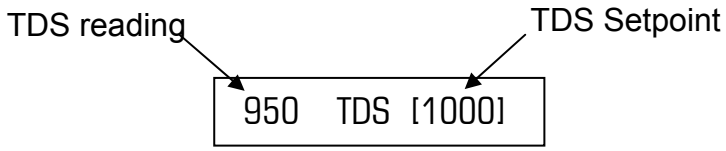
1. Make sure that the power is switched off and the controller is unplugged from mains power.
2. Remove cover of enclosure.
3. Locate the two screws as indicated in the diagram above and remove. Do not discard these screws.
4. Plug the interconnecting cable into the USB socket.
5. Screw the 2 metal spacers into space where the screws were removed.
6. Locate the two mounting holes on the interface card.
7. Use the screws removed in step 3 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 pH range: 0-14pH

3. COMMISSIONING

3.1 Start-Up - DIGICHEM

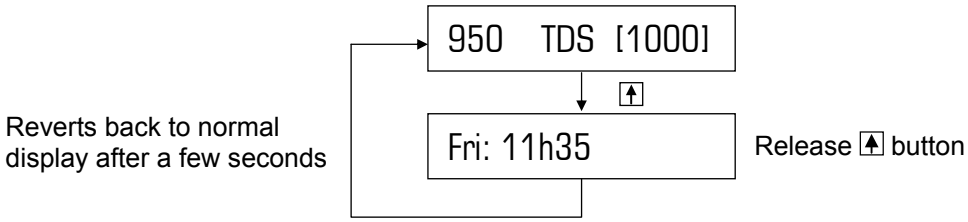
After power-up, the DIGICHEM controller is ready to perform conductivity (TDS or μS) indication and control. All the relevant information is displayed on the LCD display as explained below.



If the backup battery has gone flat, the internal clock will reset to Sunday midnight (ie. 00h00) and the display above will alternate with the display below:

It is recommended, for ease of setup and programming, that at this stage the correct time & day is set as outlined in section 4.9. Allow 24 hours for the internal backup battery to charge up fully.

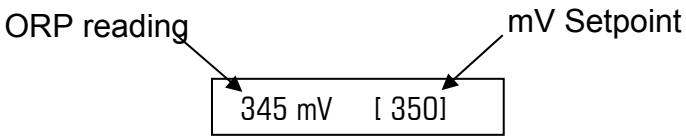
At any time during normal operation, the time and day can be viewed by holding down the scroll button. As soon as the time is displayed this button should be released. (see procedure below).



Status	Display
Normal operation:	**Measured TDS** & **TDS Setpoint**, as shown above
Programming mode:	Programming information (eg. "SET: Setpoint")
When dosing starts:	Which pump activates (eg. "**Pump A Activated**")
During Pre-bleed:	**Measured TDS**, **Reduced TDS setpoint** (ie. 87% of normal setpoint & "**P/B!**" (ie. "Pre-Bleed")
During biocide dosing and bleed-lockout:	**Measured TDS**, Increased TDS setpoint (ie. **L/O Setpoint**) & "**L/O!**" (ie. "Bleed Lock Out")
Alarm is activated:	Displays alarm activated, eg. "**Alarm !! [HIGH]**"

3.2 Start-Up – DCON-RX2A

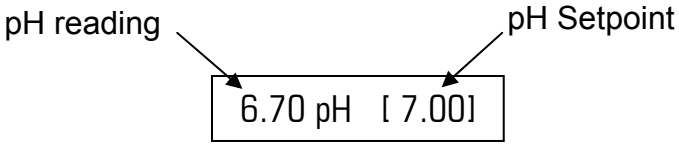
After power-up, the DCON-RX2A controller is ready to perform ORP indication and control. All the relevant information is displayed on the LCD display as explained below.



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.

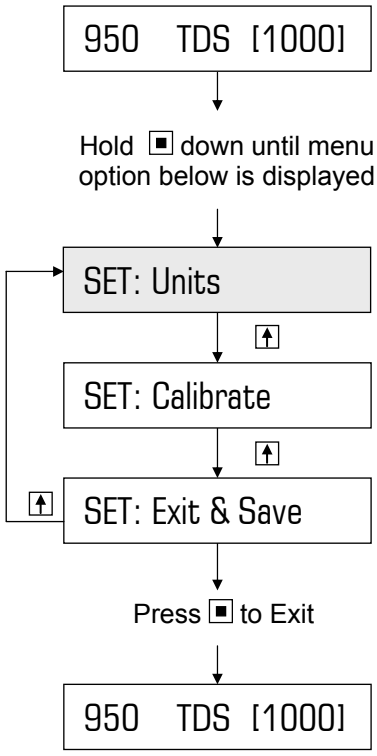
3.3 Start-Up – DCON-PH2A

After power-up, the DCON-PH2 controller is ready to perform pH indication and control. All the relevant information is displayed on the LCD display as explained below.



Display **during normal operation**:	pH of solution as reported by pH probe as well as SETPOINT(shown between square brackets)
Display **during programming**:	Programming information
Display **if alarm is reported**:	Displays which alarm is activated.

3.4 Select Displayed Units (ie. TDS or μS) - DIGICHEM



Conductivity can be displayed in either:

TDS (ie. Total Dissolved Solids), or
μS (ie. microsiemens)

The displayed units, ie. either TDS or μS should be selected before performing calibration and before programming conductivity setpoint.

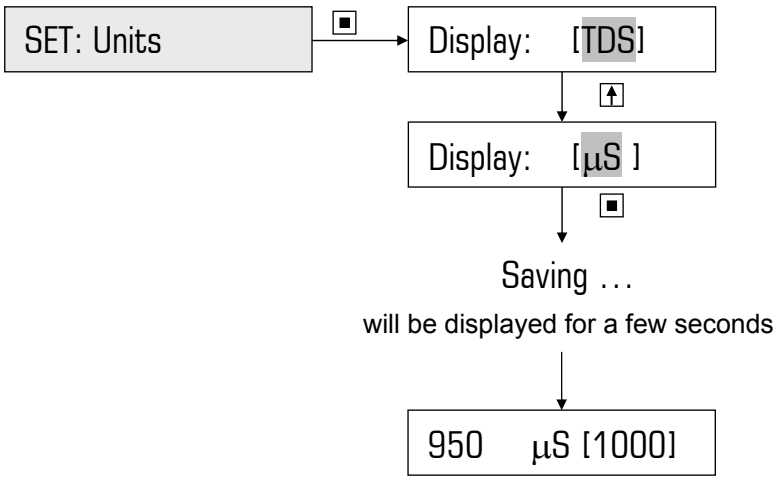
To leave the display in TDS, ie. factory default setting, proceed to section 3.4.

Item flashing on display:

▲ Press to Scroll/Toggle
▣ Press to Select/Enter

Note: Shading represents flashing

Example:
Changing the factory default of TDS to μS



3.5 Calibration - DIGICHEM

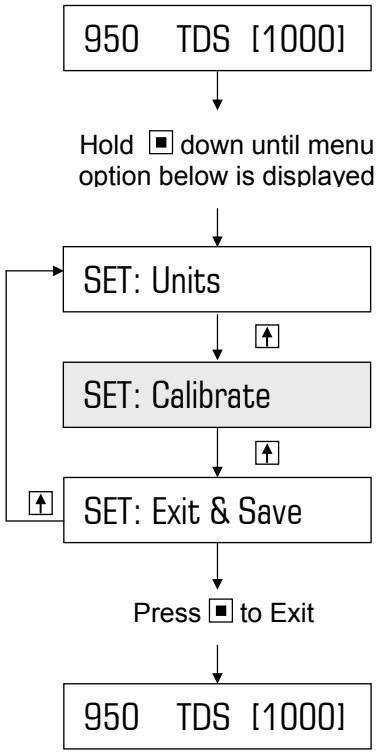
Take a sample of water from the sample valve on the manifold and measure the TDS with a hand-held conductivity meter. Should the TDS readout on the display differ from the sample taken, calibrate the controller as follows:

<u>Option 1</u>: The displayed TDS requires a large adjustment (> 50%).

(For optimum performance, this should be performed on first installation. Thereafter, option 2 should be sufficient).

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.



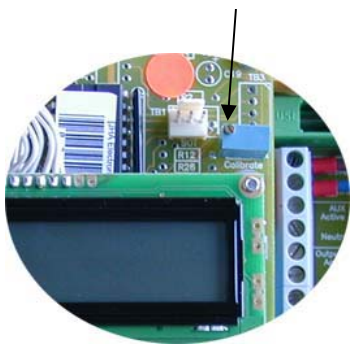
1. Remove the lid of the controller
2. Turn the calibration potentiometer (see picture below) with an insulated miniature screwdriver until the desired reading is obtained.
3. Replace the lid of the controller, ensuring that the seal is in place and no wires are trapped between the lid and the base.

<u>Option 2</u>: The displayed TDS requires a small adjustment (< 50%)
(Set to 0000 to reset software calibration)

Item flashing on display:

▲ Press to Scroll/Increment
▣ Press to Select/Enter

Note: Shading represents flashing



3.6 Calibration – DCON-RX2A

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.

3.7 Calibration – DCON-PH2A

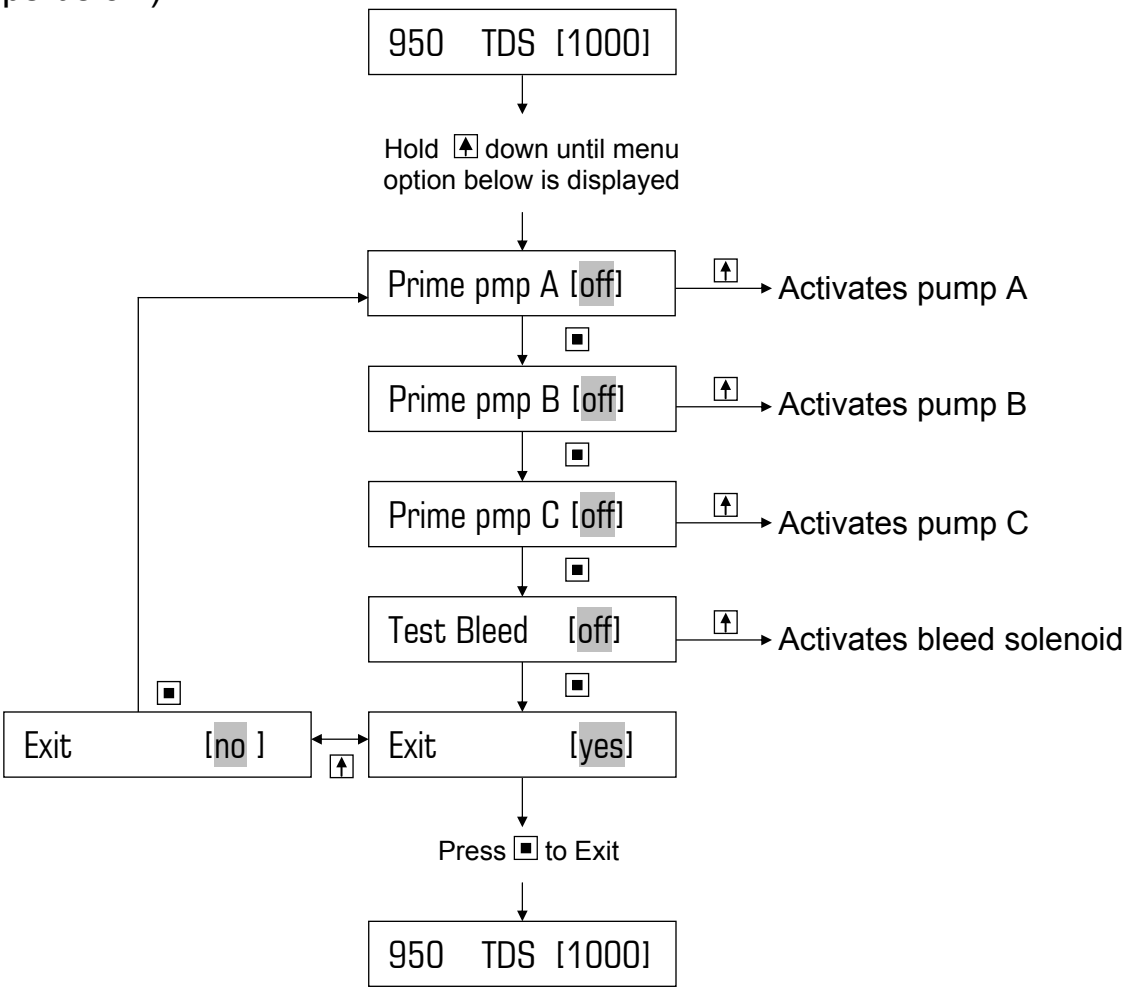
If the pH reading appears to be incorrect, try cleaning the electrode tip first. Should calibration still be necessary, the following can be performed, BUT ONLY by a qualified technician:

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. Remove the pH electrode from the system.
3. Insert the pH electrode in pH7 buffer solution and wait until the pH reading settles.
4. Locate the ZERO potentiometer (ie. pH7) on the left-hand side of the motherboard.
5. Slowly turn the pot with an insulated miniature screwdriver until the measured pH reads 7.00 pH.
6. Insert the probe into either pH4 or pH10 buffer solution and wait until the pH reading settles.
7. Locate the SLOPE potentiometer (ie. pH4/10) on the left-hand side of the motherboard.
8. Slowly turn the pot with an insulated miniature potentiometer until the measured pH reads 4.00pH or 10.00pH.
9. Return the probe to the system.
10. Replace the controller lid, ensuring the gasket is in place.

3.8 Priming Pumps / Testing Solenoid Valves

On the **DIGICHEM** controller, biocide pump A (DIGICHEM-APHRX2A only), Inhibitor pump C and bleed solenoid valve can be individually primed/tested (see menu steps below).



Item flashing on display:

▲ Press to Toggle
■ Press to Select/Enter

Note: Shading represents flashing

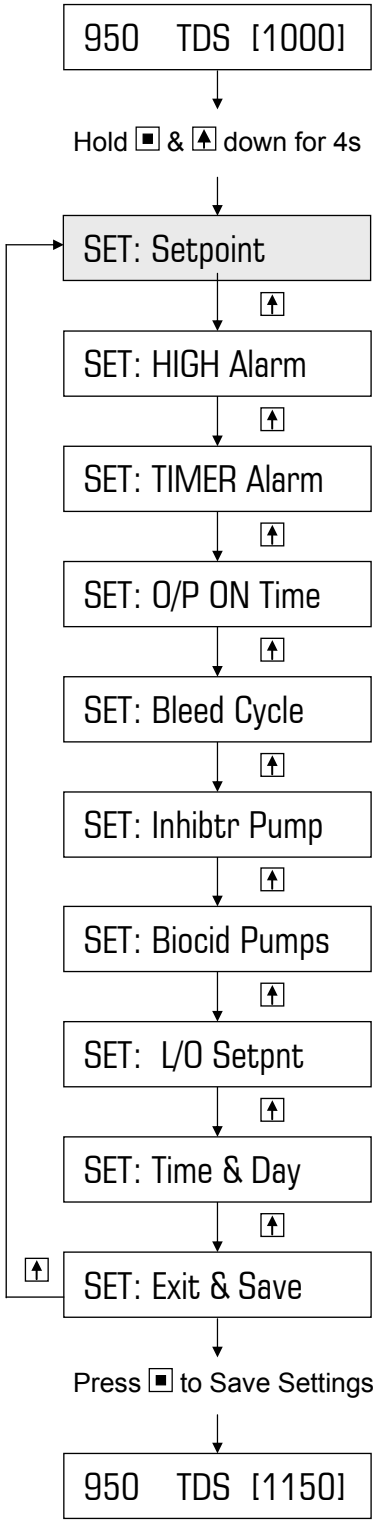
On the **DCON-RX2A (**and the **DCON-PH2A)** controller, press the SCROLL pushbutton ▲ for at least 2 seconds. The display will read:

Testing Output …

The ORP pump/dosing solenoid valve (**DCON-RX2A**) will activate for approximately 2 minutes before reverting to normal mode. The acid pump (**DCON-PH2**) 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 - DIGICHEM

4.1 Set Conductivity Setpoint



Item flashing on display:

▲ Press to Scroll/Increment
■ Press to Select/Enter

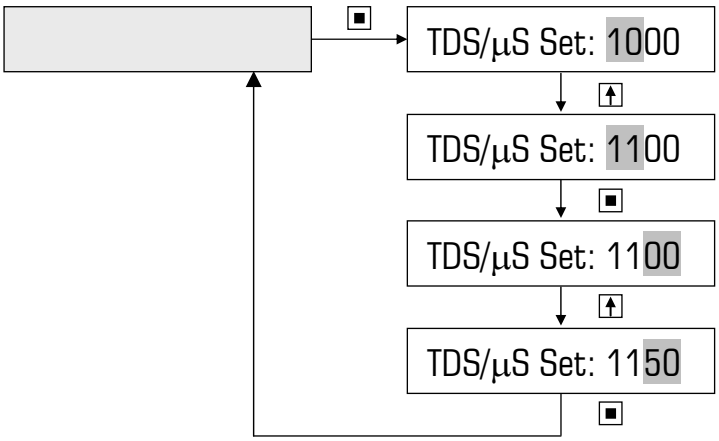
Note: Shading represents flashing

One of the main functions of the DIGICHEM is conductivity control, ie. the solenoid valve opens (ie. bleeds) when the TDS rises above the setpoint. When this occurs, the system water is flushed to drain and fresh make-up water dilutes the system, thus lowering the conductivity of the cooling tower water.

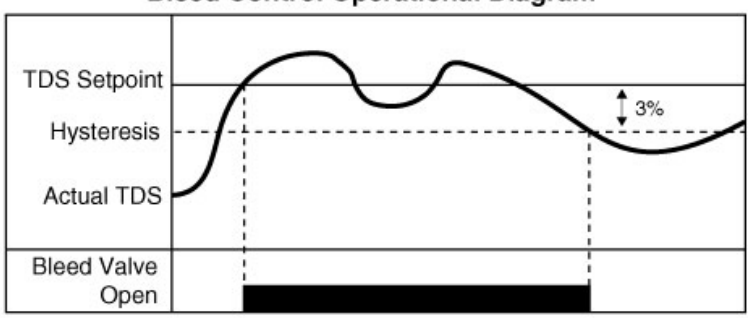
The setpoint is entered as an actual number (eg. 1000 TDS).

The controller can be programmed to bleed continuously (ie. factory default), or on a duty cycle (as outlined in section 4.5), when the system TDS > setpoint.

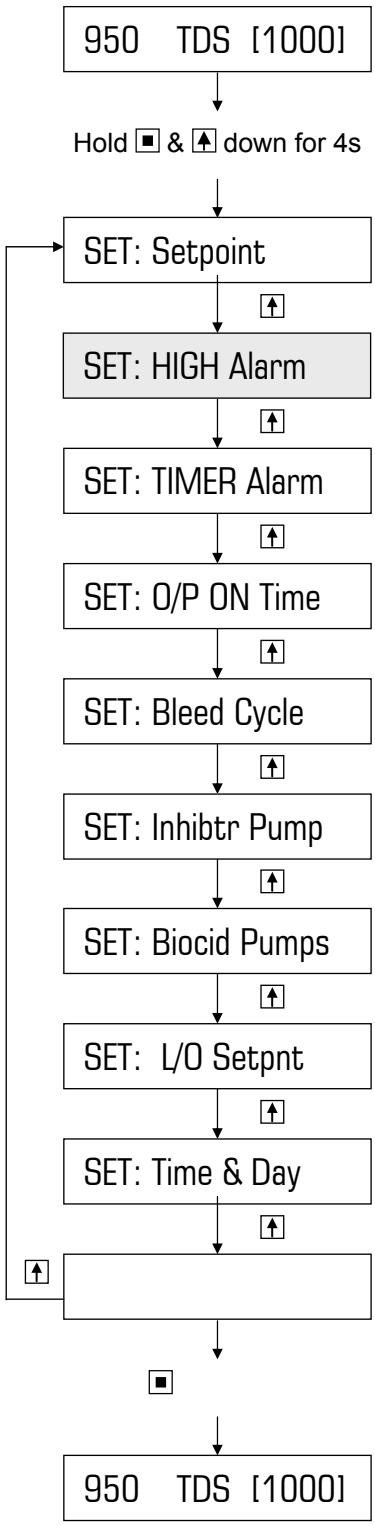
Example:
Increasing factory default setpoint of 1000 TDS to a new setting of 1150 TDS



Bleed Control Operational Diagram



4.2 Set HIGH Conductivity Alarm



Item flashing on display:

▲ Press to Scroll/Increment
■ Press to Select/Enter

To leave the alarm in its disabled state, ie. factory default setting of 0000, proceed to section 4.3.

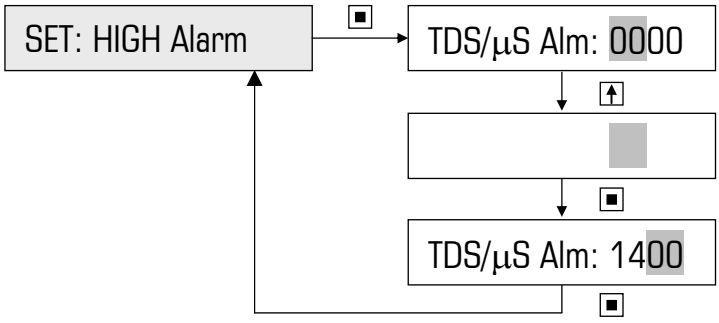
Enabling the alarm requires you to program a HIGH TDS value that is higher than the programmed setpoint.

If the TDS rises above the HIGH alarm level, the high alarm will be reported on the display and the alarm LED will illuminate.

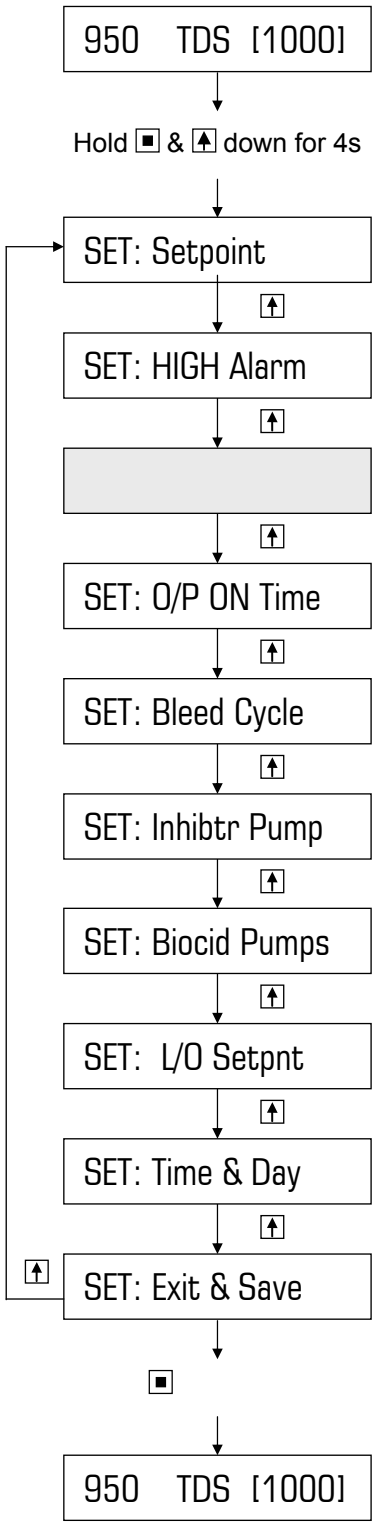
The HIGH alarm condition can be reset by pressing & holding the ENTER button (until the Alarm LED switches off) or will automatically cancel once the conductivity drops to a level below the HIGH alarm level.

When an alarm is reported, the display will alternate between the alarm and the normal display. For instance, if HIGH Alarm = 1400TDS, the display will alternate between "Alarm !! [HIGH]" and "1450 TDS [1000]", assuming 1450TDS is the measured conductivity.

Example:
Change factory default of 0000 to 1400
(ie. alarm reported when conductivity > 1400)



4.3 Set TIMER Alarm (ie. Max continuous bleed time)



Item flashing on display:

▲ Press to Scroll/Increment
■ Press to Select/Enter

Note: Shading represents flashing

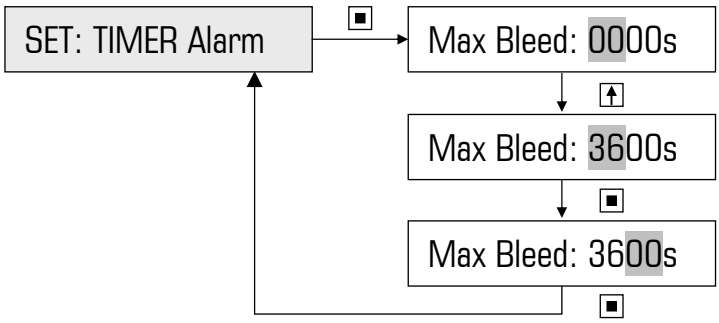
The TIMER alarm activates when the maximum permissible continuous bleed time is exceeded. This alarm is designed to protect the system from excessive bleeding and/or excessive Inhibitor dosing (if set to dose Inhibitor on bleed). Should there be a problem with make-up water not entering the tower, the solenoid valve will continue to bleed indefinitely as no dilution takes place. Alternatively, a faulty TDS probe may read a high TDS when in fact the TDS is low, and the solenoid valve will continue to bleed indefinitely. The TIMER alarm prevents these excessive conditions.

To leave the alarm in its disabled state, ie. factory default setting of 0000s, proceed to section 4.4

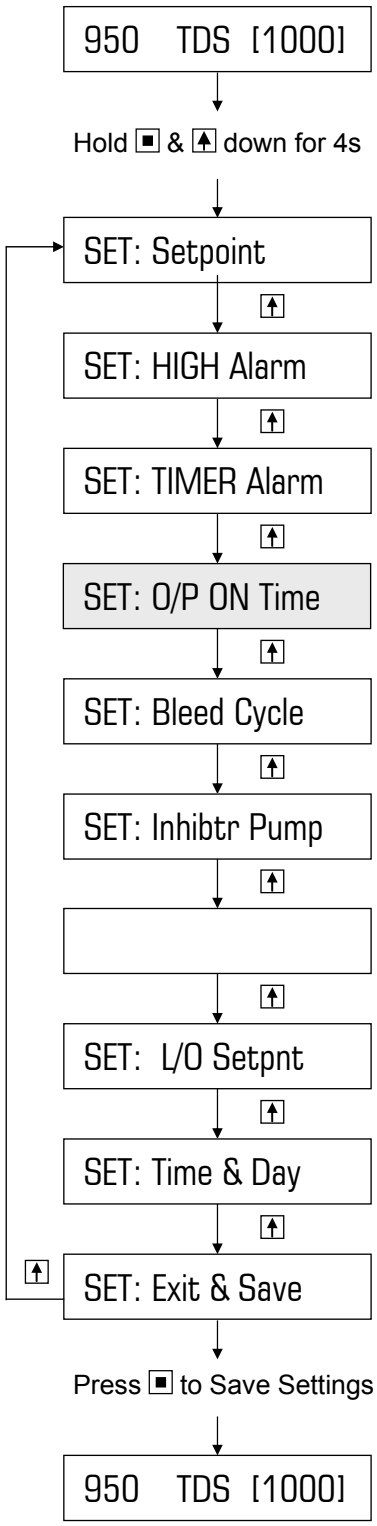
If the TDS drops below the setpoint within the programmed time, the timer resets. However, if the timer times out before the TDS reaches the setpoint, the bleed solenoid valve switches off and is disabled until the unit is manually reset by holding down the ENTER button, or until the TDS drops below the setpoint. Until then, the alarm will be reported on the display and the alarm LED will illuminate.

When an alarm is reported, the display will alternate between the alarm and the normal display. For instance, the display will alternate between "Alarm !! [Timer]" & "1100 TDS[1000]", assuming the TDS reading from the probe is 1100TDS.

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



4.4 Set O/P ON Time (ie. Tower circulating/condenser pump override facility)



Item flashing on display:

▲ Press to Scroll/Increment
■ Press to Select/Enter

Note: Shading represents flashing

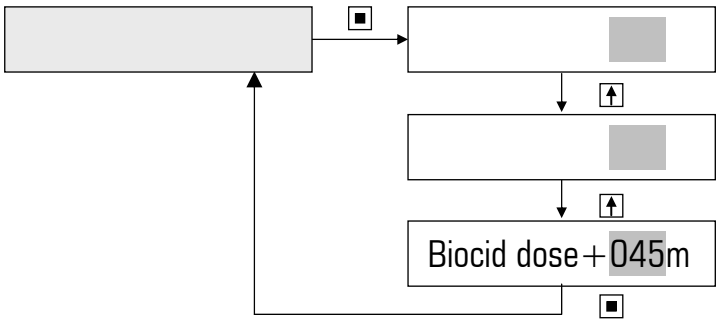
Often when biocides are dosed into the manifold of the DIGICHEM panels, the circulating/ condenser pump of the cooling tower is not running. This causes problems of corrosion in the manifold as well as biocide not being dosed into the cooling tower water.

The DIGICHEM has an on-board relay contact (N/O) which can be wired into the condenser pump contactor (see wiring diagram in section 2.2).

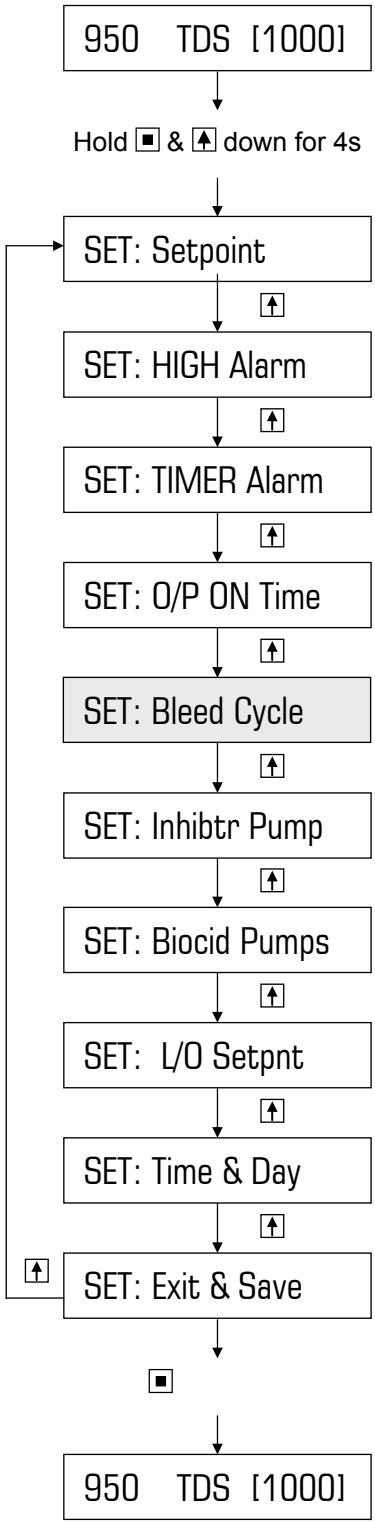
When the biocide Pump A starts dosing (controlled by the DIGICHEM, i.e. DIGICHEM-APHRX2A system only), the N/O contact closes, powering the contactor which in turn starts the condenser pump. The condenser pump will continue to run while the biocide is dosing, as well as for a period of time after biocide dosing. This ensures continuous water circulation and effective mixing of the biocide chemical.

This time that the pump runs after a Biocide A dose, is programmed here as the O/P ON Time.

Example:
Changing factory default of 15 minutes to 45 minutes after biocide dosing.



4.5 Set Bleed Cycle



To leave the Bleed Cycle in its disabled state proceed to section 4.6. This is the factory default setting of ON/OFF=00s/00s which means that the solenoid valve will bleed continuously when the measured TDS > the TDS Setpoint.

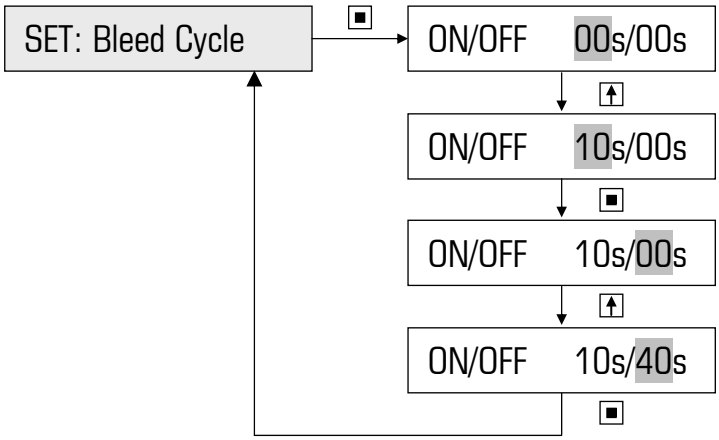
Alternatively, once the TDS is above the setpoint, the bleed solenoid valve can be programmed to cycle ON and OFF until the TDS is corrected.

This action prevents excessive tower drainage and allows the make-up to efficiently mix with the cooling tower water.

This ability to cycle is also useful because it prevents flooding by slowing down the flow rate into a blocked drain.

Example:

Factory default:	00s/00s (ie. bleed solenoid activated continuously when TDS > TDS setpoint).
Change to:	10s/40s (ie. 20% duty cycle), calculated as 10/(10+40).

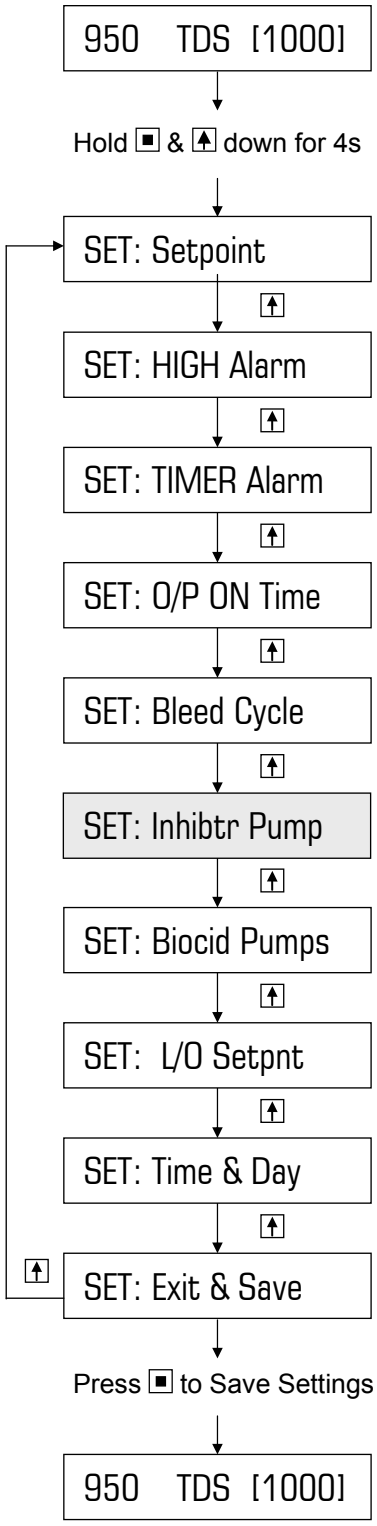


Item flashing on display:

▲ Press to Scroll/Increment
■ Press to Select/Enter

Note: Shading represents flashing

4.6 Set Inhibitor Pump



Item flashing on display:

▲ Press to Scroll/Increment
■ Press to Select/Enter

Note: Shading represents flashing

There are 4 **Possible Inhibitor Feed Pump Modes** to select from:

1. **Continuous on Bleed**
2. **% of Time on Bleed**
3. **% of Time on Flow (24 hours/day)**
4. **Water Meter Pulse**

1. Continuous on bleed

Pump doses continuously when measured TDS > Setpoint, regardless of any bleed cycle programmed.

2. % of Time on Bleed:

Pump doses on a duty cycle when measured TDS > Setpoint, independent from any bleed cycle programmed. Duty cycle is repeating ON and OFF times, eg ON=30sec, followed by OFF=30sec & repeating (ie. 50% duty cycle).

3. % of Time on Flow (24 hours/day)

Pump doses on a continuous duty cycle as long as the manifold is flooded. Duty cycle is repeating ON and OFF times, eg ON=20sec, followed by OFF=60sec & repeating (ie. 25% duty cycle). If the manifold is still flooded on no-flow, flow switch option AF04 should be fitted (standard feature of "-P" system).

4. Water Meter Pulse

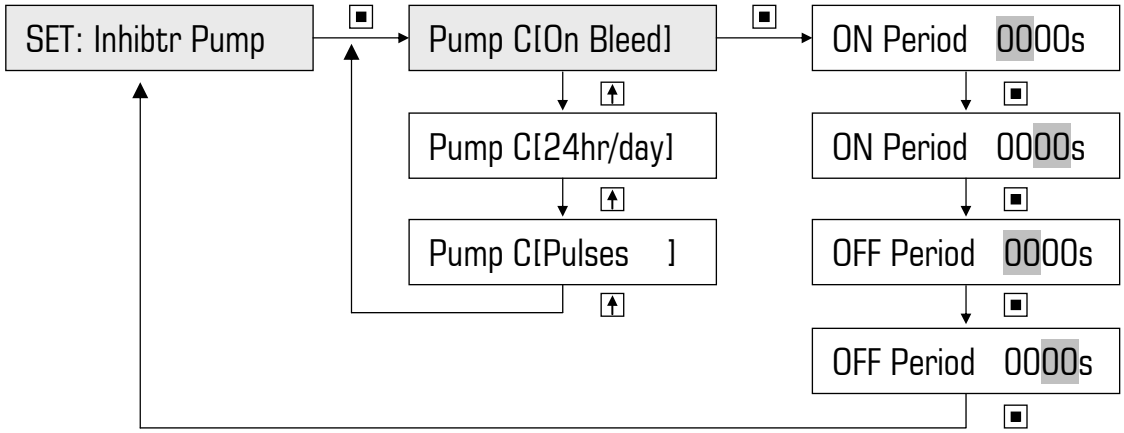
Pump doses proportional to pulses received from a water meter fitted in the make-up line. The DIGICHEM activates the pump for a set time once a pre-determined number of pulses is counted. For example, the pump may dose for 30 seconds (ie. programmed dose time) every 100 litres of make-up water (ie. programmed pulse count of 100).

4.6 Set Inhibitor Pump (continued)

4.6.1 Continuous on Bleed Mode

Pump doses continuously when the measured TDS > Setpoint, regardless of any bleed cycle programmed. The ON and OFF times are both pre-set to 0 seconds. This is the factory default setting.

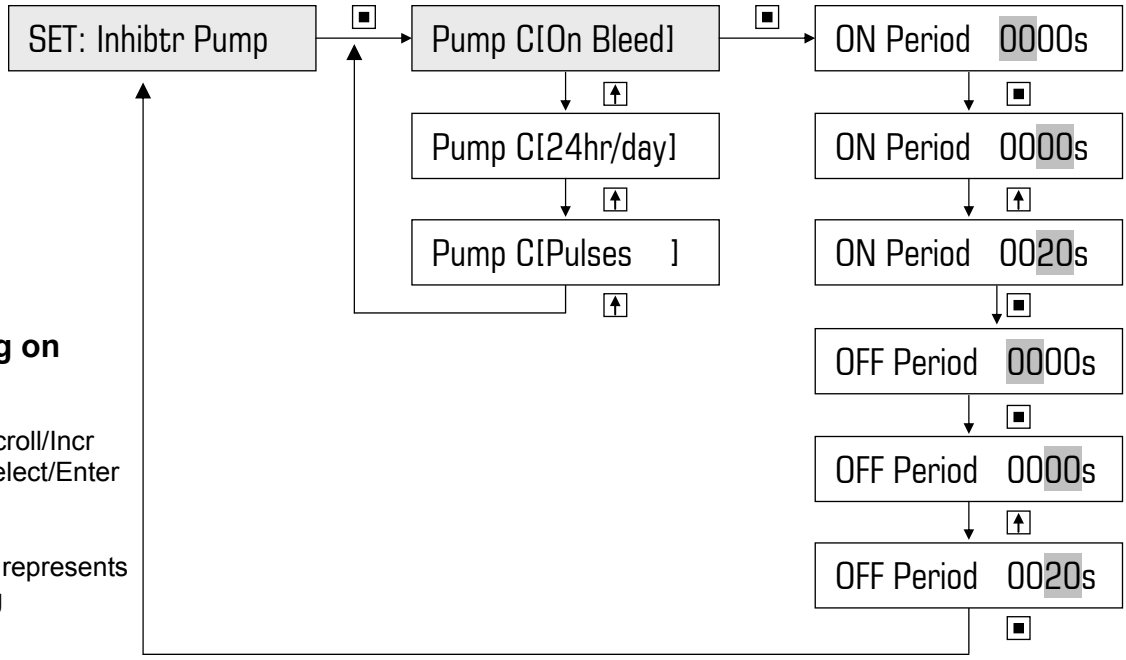
Example: Factory setting of dosing inhibitor continuously on bleed.



4.6.2 % of Time on Bleed Mode

Pump doses on a duty cycle (ie. Dose cycle) when the measured TDS > Setpoint. This duty cycle is totally independent from any bleed cycle programmed. By varying the duty cycle, you are effectively turning down the dose rate of the pump.

Example: Change Factory default of dosing inhibitor continuously on bleed to a 50% duty cycle on bleed (ie. 20 seconds ON & OFF times chosen).



Item flashing on display:

▲ Press to Scroll/Incr
■ Press to Select/Enter

Note: Shading represents flashing

4.6.3 % of Time on Flow Mode (24 hours/day)

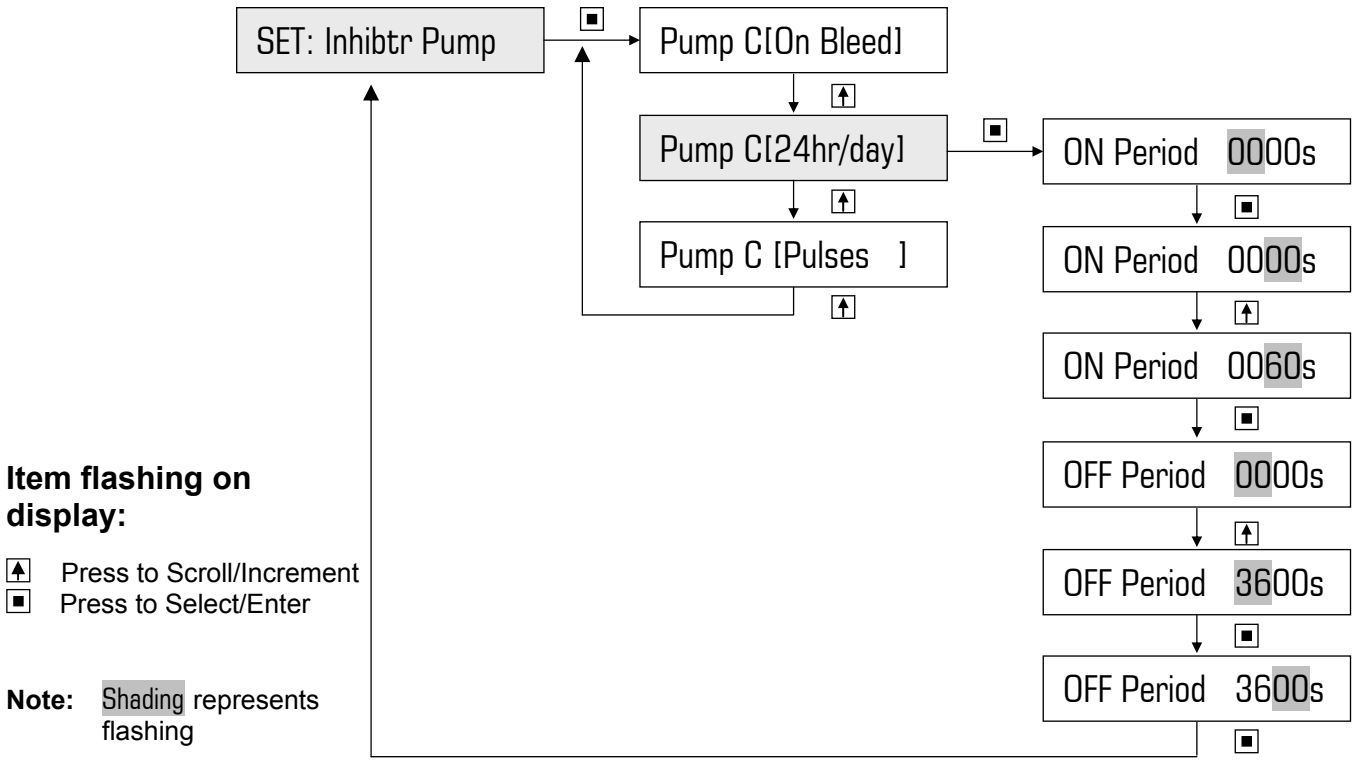
Pump doses on a continuous duty cycle as long as the manifold is flooded. Duty cycle is repeating ON and OFF times, eg ON=60sec, followed by OFF=3600sec & repeating (ie. 1.6% duty cycle). If the manifold is still flooded on no-flow, flow switch option AF04 should be fitted (standard feature of "-P" system).

Example: **Change Factory default of dosing inhibitor continuously to a 1.6% duty cycle.**

Dosage required = 0.5 litres/day
Pump dose rate = 1.3 litres/hr = 31.2 litres/day
Duty cycle = 0.5 / 31.2 = **1.6%**

Hence, to dose 0.5 litres/day, the pump needs to dose 1.6% of the time.
1.6% of 24 hours is approx 23 minutes (ie. 58 sec every hour)

Set ON time = 60 sec (ie. 58 sec rounded off)
Set OFF time = 3600 sec (ie. 1 hour)



4.6.4 Water Meter Pulse

Pump doses proportional to pulses received from a water meter in the make-up line. The DIGICHEM activates the pump for a set time once a pre-determined number of pulses is counted.

Example: **Dose for 30 seconds every 100 litres of make-up water**

Water meter pulse rate = 1 pulse / litre
Desired concentration = 100 p.p.m.

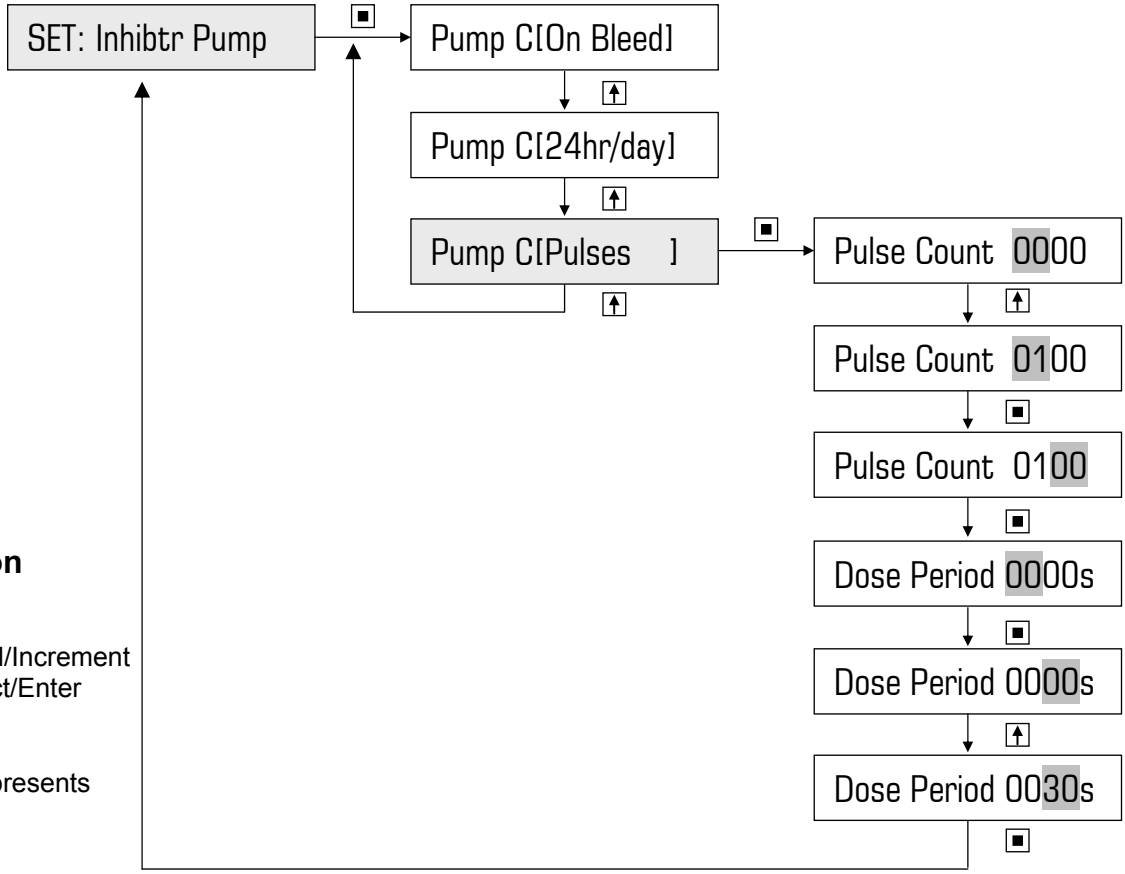
100 p.p.m. = 10 ml chemical / 100 litres flow
= 10 ml chemical / 100 pulses

Hence, we require the pump to dose 10ml every 100 pulses counted.

How long does the pump need to dose to deliver 10ml?

Pump dose rate = 1300 ml/hr = 0.36 ml/sec
Dose time = 10 ml / 0.36 ml/sec
= 27.8 seconds (ie. approx. 30 sec)

Set PULSE COUNT = 100
Set DOSE PERIOD = 30 seconds



Item flashing on display:

▲ Press to Scroll/Increment
■ Press to Select/Enter

Note: Shading represents flashing

4.7 Set Biocide Programs – DIGICHEM-APHRX2A only

Biocide A is dosed into the manifold according to **timer programs** set up by the user. There are 10 independent programs which can be programmed to operate daily, once per week, or on any number of days per week. A typical biocide program, which will operate at the same time on the specified days of the week, consists of 3 consecutive time durations:

Pre-bleed: This reduces the system conductivity to 87% of the normal setpoint prior to biocide dosing in order to allow for a longer Bleed Lock-out duration without the risk of entering scaling conditions. Pre-bleed duration is programmable from 0 to 250 minutes.

Biocide dosing: The biocide pump (Pump A) doses chemical into the manifold. Dose duration is programmable from 1 to 250 minutes and commences immediately after Pre-Bleed. Bleed-off is disabled (ie. locked out) during dosing provided the lock-out TDS setpoint is not exceeded.

Bleed Lock-out: After biocide dosing, bleed-off continues to be disabled for the lock-out duration, programmable from 0 to 999 minutes, provided the lock-out TDS setpoint is not exceeded.

During Pre-bleed, the displayed setpoint eg. [1000], alternates with [P/B !]

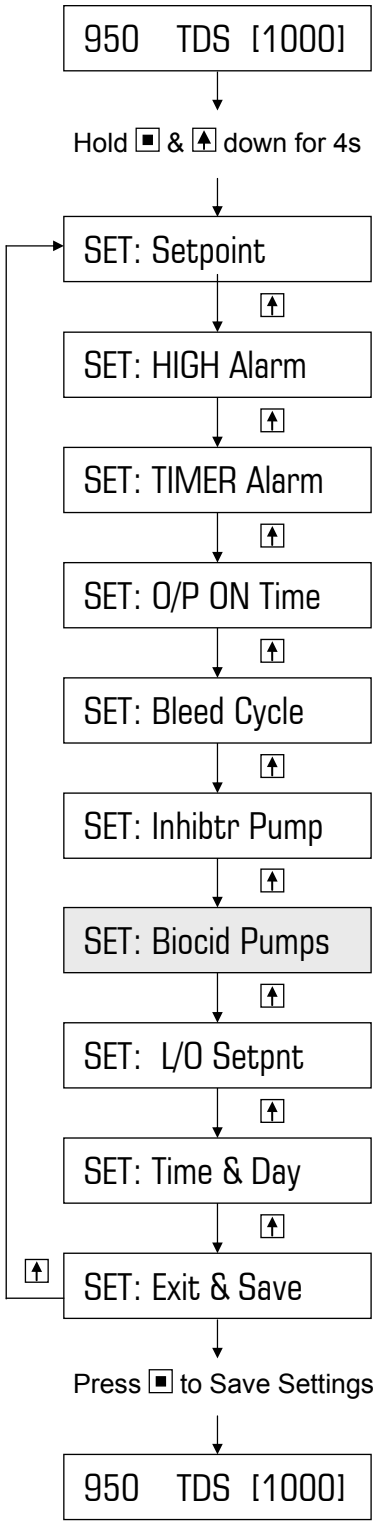
During Biocide dosing and Bleed lock-out, the displayed Lock-out setpoint eg. [1500] alternates with [L/O !]

By preventing bleed-off during and after biocide dosing, the system is ensured of receiving maximum benefit from the dosed biocide, as no biocide will be lost during this time via bleed-off. Furthermore, because the conductivity is reduced during Pre-Bleed, the system has a longer retention period. As a result, a highly effective “kill” is achieved without resulting in high scaling conditions.

Each of the 10 Biocide Dosing programs can be set up to operate Biocide pump A or Biocide pump B. However, A should always be set, as the pump is always connected to Biocide A output.

Pump A has its own START TIME, followed by its own consecutive PRE-BLEED, BIOCIDE DOSING and BLEED LOCK-OUT durations. **Note that biocide programs should not overlap.**

4.7 Set Biocide Programs – DIGICHEM-APHRX2A only (continued)



Item flashing on display:

▲
▣

Steps to setting up the biocide timer programs:

Step 1
Select the timer program (eg. 1, 2, etc, up to 10).

Step 2
Select the biocide pump, A or B, for that program.
(eg. A, for DIGICHEM-AB2RX2A)

Step 3
Select days of the week to dose.

Step 4
4.1 Set pre-bleed start time (ie. time of day)
4.2 Set pre-bleed duration (in minutes)
4.3 Set dosing duration (in minutes)
4.4 Set bleed-lockout duration (in minutes)

Step 5
Setup more programs (if required), reset any programs (if required) & exit biocide timer programs menu

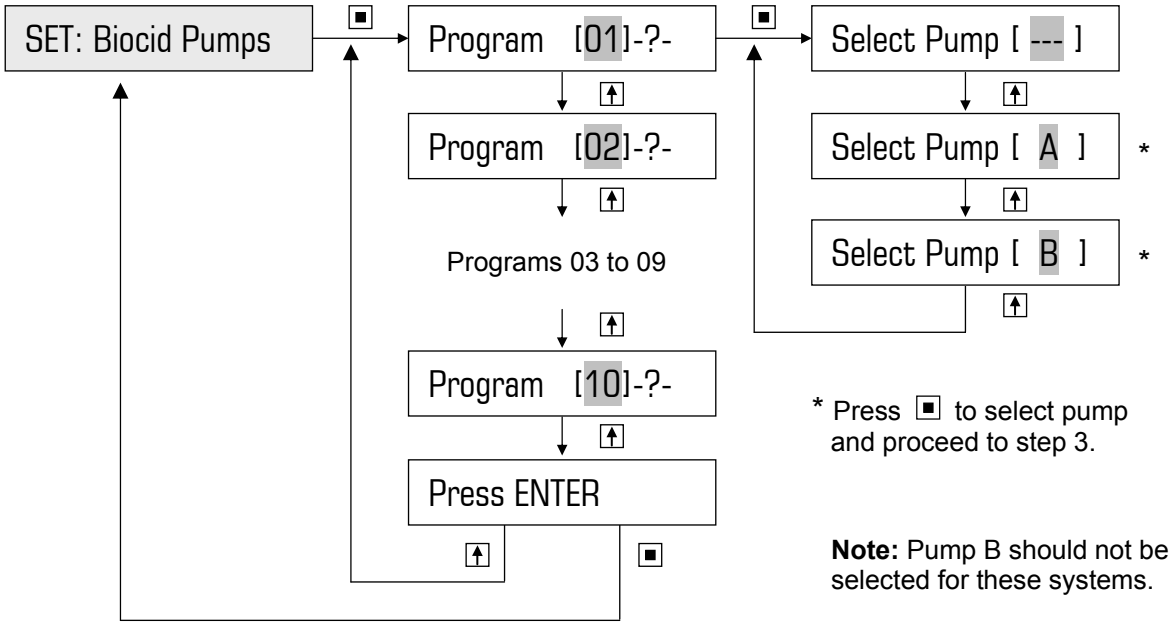
Important Note:

Do not overlap 2 different biocide programs.

However, if the secondary biocide output B is used to power another controller for an extended period, a program controlling Biocide pump A at the same time is acceptable. Important: The program on pump A must start and finish within any program activating output B.

4.7 Set Biocide Programs – DIGICHEM-APHRX2A only (continued)

Step 1 & 2: **Select the program and allocate biocide pump**



Item flashing on display:

▲ Press to Scroll/Toggle
▣ Press to Select/Enter

Note: Shading represents flashing

TO ERASE A BIOCIDE PROGRAM

To reset/erase an existing biocide program, see step 5

TO VERYIFY THE SETTINGS OF ANY BIOCIDE PROGRAM

When the program number & pump (eg. Program [02]-A-) is displayed, continually press the ENTER button and all the program settings will be successively displayed.

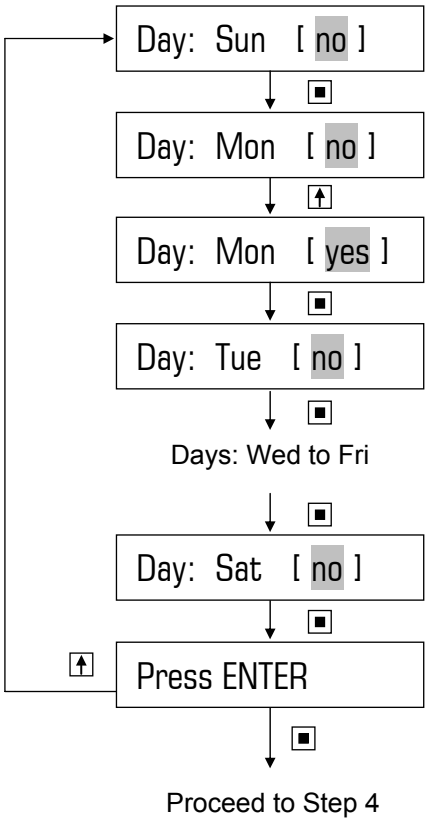
Continue pressing the ENTER button until the program number is displayed again (eg. Program [02]-A-).

Press SCROLL to go the next program (eg. Program [03]). Continuously press SCROLL to exit the biocide program part of the menu.

Step 3: Selecting days of week on which to dose.

Example: Settings already programmed
Program: 01
Pump: A

Example: Days to Dose
Monday only



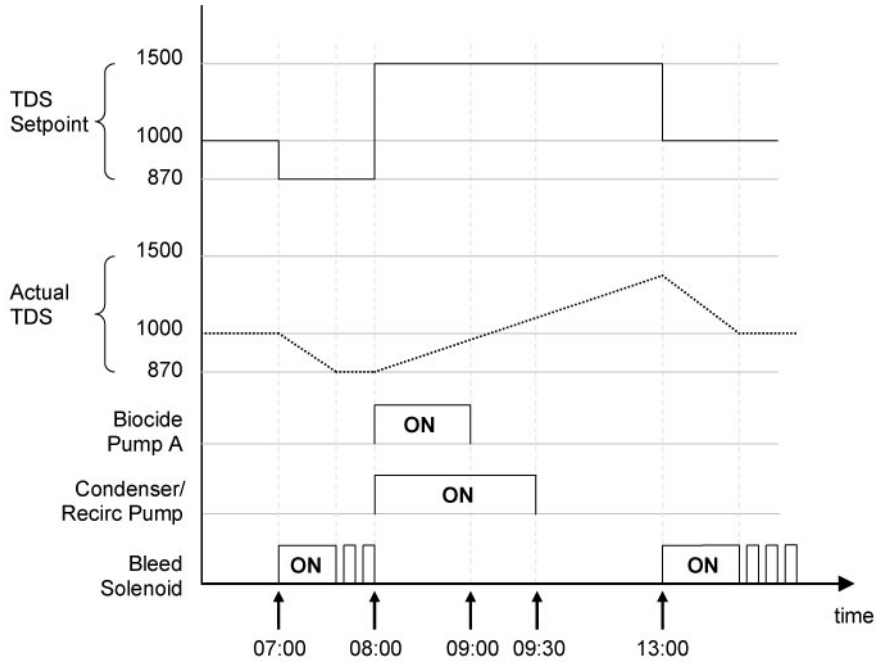
Item flashing on display:

▲ Press to Scroll/Toggle
■ Press to Select/Enter

Note: Shading represents flashing

4.7 Set Biocide Programs – DIGICHEM-APHRX2A only (continued)

Diagram of Example



Start time: 00h00

Start time: 07h00

Start time: 07h00

Pre-Bleed: 0000m

Pre-Bleed: 0000m

Pre-Bleed: 0060m

Dose for: 0000m

Dose for: 0000m

Dose for: 0060m

Bleed L/O: 0000m

Bleed L/O: 0200m

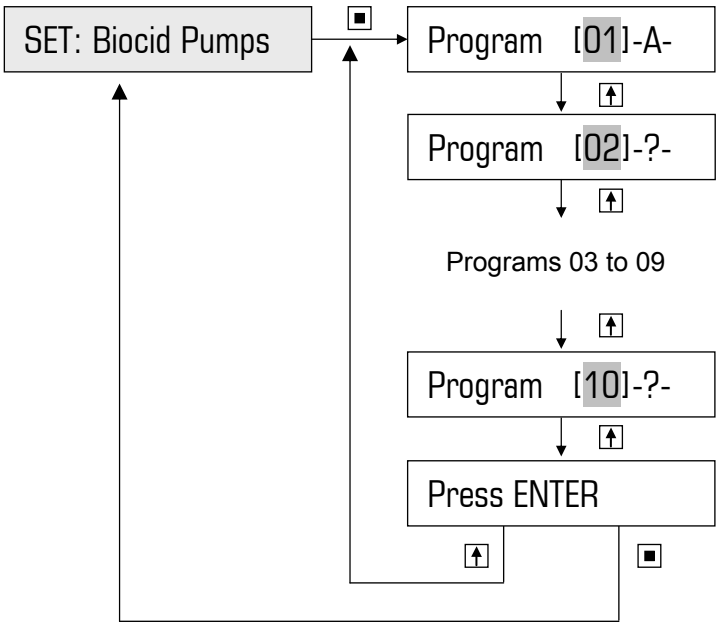
Bleed L/O: 0200m

Bleed L/O: 0240m

Program [01] -A-

Proceed to Step 5

Step 5: **Set the other timer programs (if required) and exit the biocide timer program menu.**



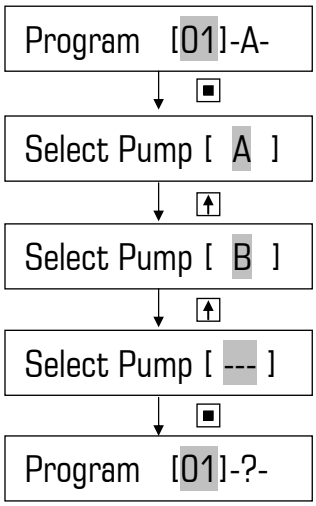
Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

Resetting/disabling a timer program

To disable any timer program or to reset a program's settings, select pump to "---" (see example below)

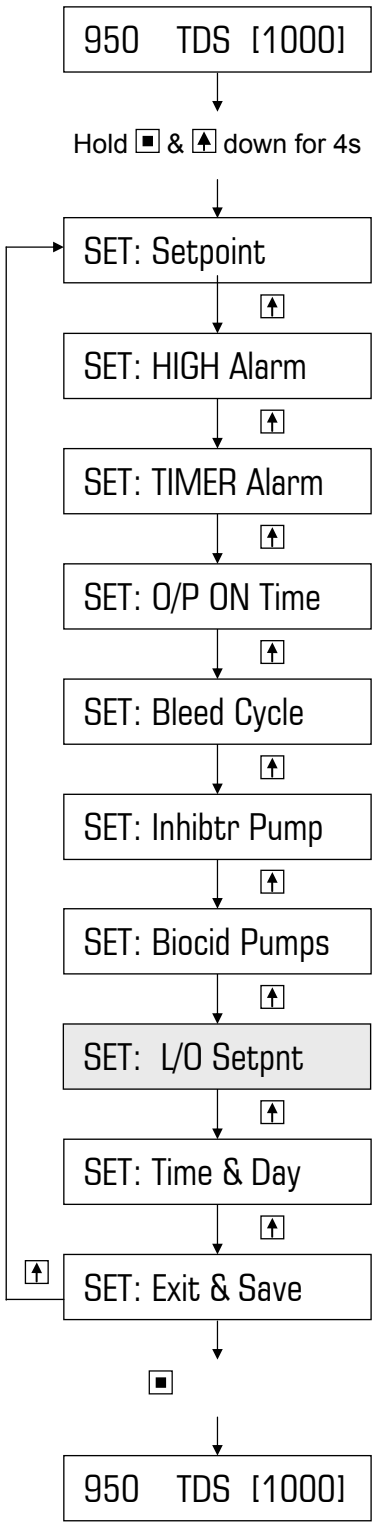


Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

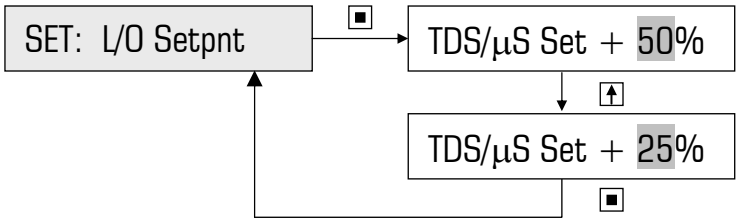
Note: Shading represents flashing

4.8 Set Bleed Lockout Setpoint – DIGICHEM-APHRX2A only



The DIGICHEM has a facility to prevent the system conductivity from increasing too much during biocide dosing and bleed lockout. If the measured conductivity rises above the Bleed Lockout Setpoint, the bleed solenoid valve will be activated. For example if the conductivity setpoint is 1000 TDS and the lock-out setpoint is set at 25%, the system will bleed during biocide dosing & bleed lock-out only if the conductivity rises above 1250 TDS.

Example
Changing factory default of 50% to 25%

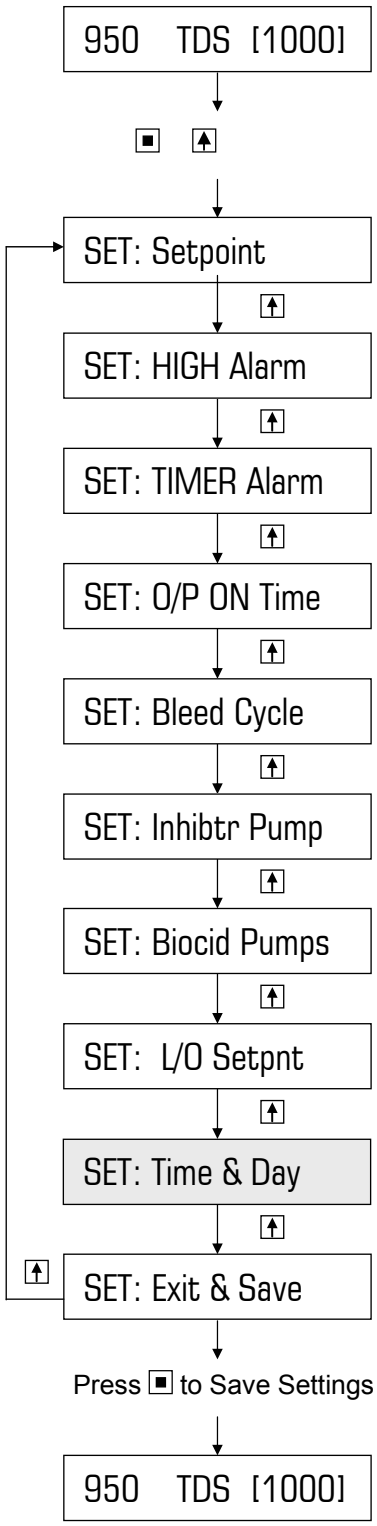


Item flashing on display:

▲ Press to Scroll/Increment
■ Press to Select/Enter

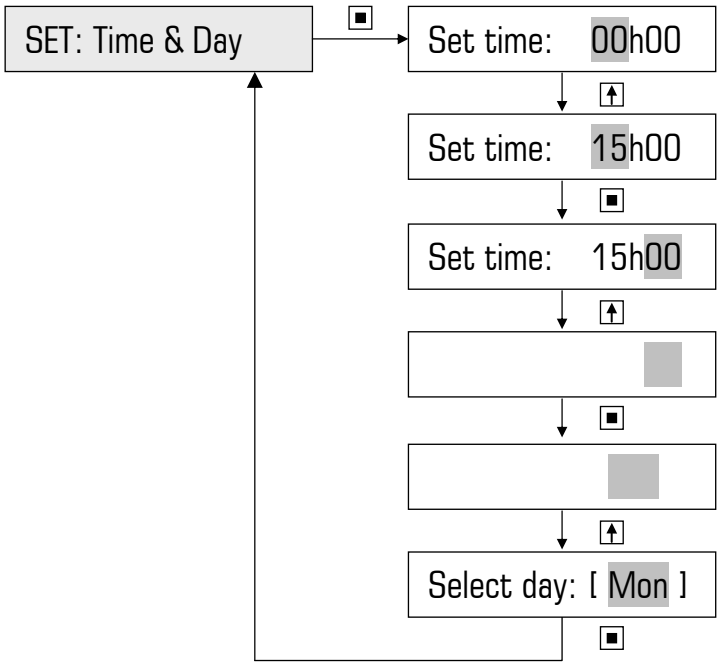
Note: Shading represents flashing

4.9 Set Time & Day – DIGICHEM-APHRX2A only



In order for the biocide control to function properly, the current time and day needs to be set.

Example
Current time setting: 00h00 on Sunday
Correct time setting: 15h30 on Monday



Item flashing on display:

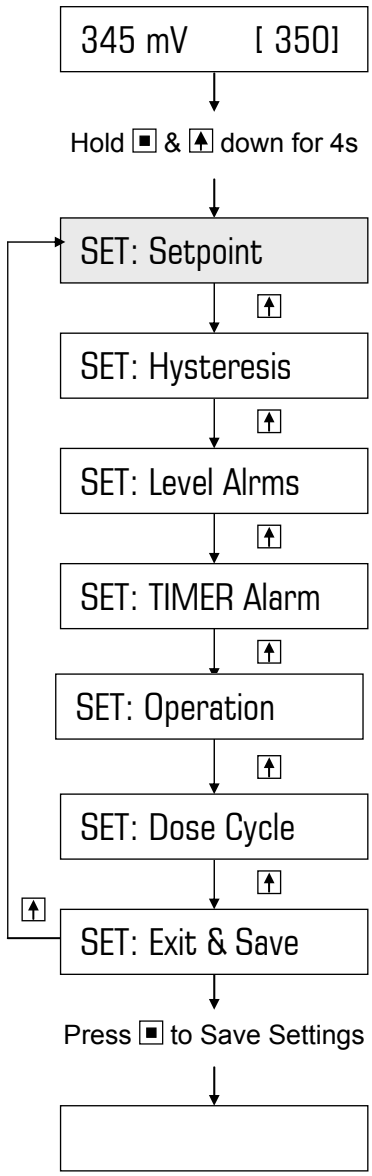
▲ Press to Scroll/Increment
▣ Press to Select/Enter

Note: Shading represents flashing

5. PROGRAMMING STEPS IN DETAIL – DCON-RX2A

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

5.1 Set mV Setpoint



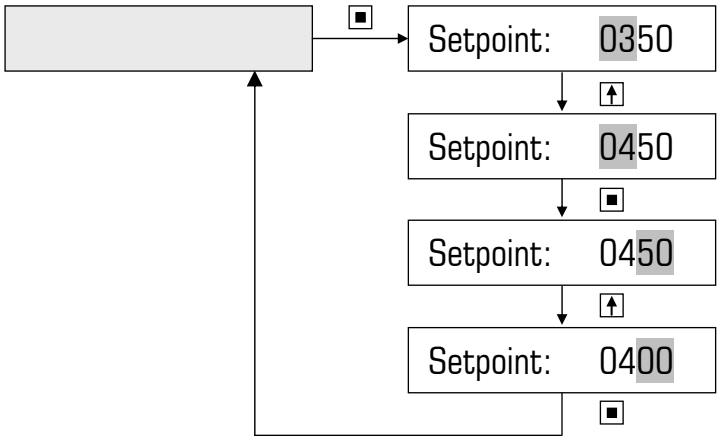
This is the desired ORP value of the process. To determine the setpoint, proceed as follows:

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

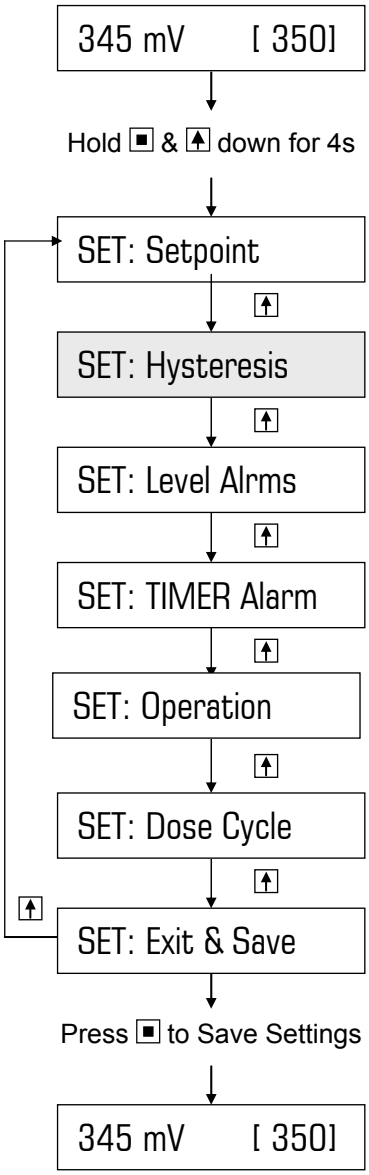


Item flashing on display:

↑ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

5.2 Set Hysteresis

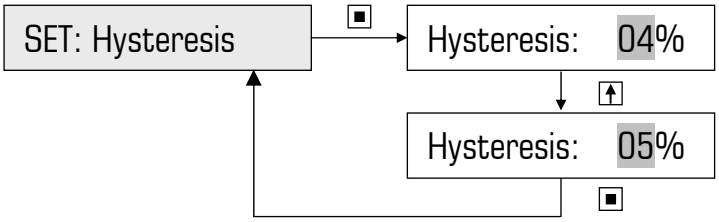


Hysteresis prevents rapid switching of the pump/dosing valve on and off when the system ORP hovers around the setpoint. 'Hysteresis' is the difference in mV level at which the pump/dosing valve starts and the pump/dosing valve stops.

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.

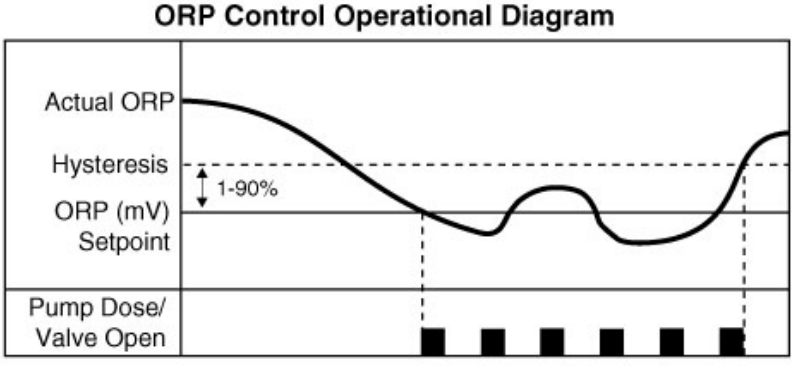
Example:
Increasing factory default hysteresis of 4% to a new setting of 5%



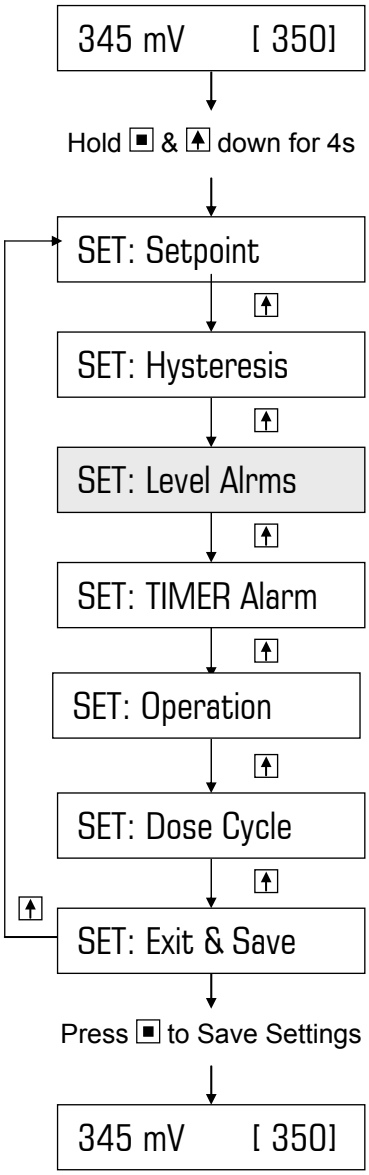
Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing



5.3 Set High & Low mV Alarms



Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

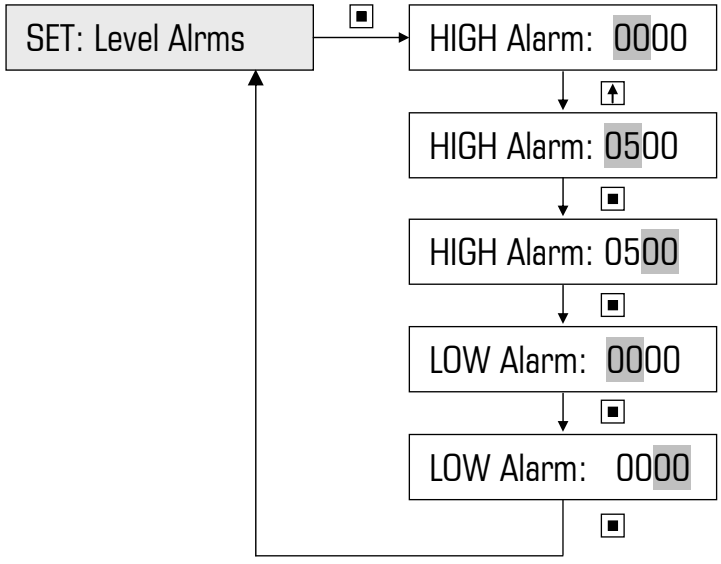
To leave the alarms in their disabled state, ie. factory default settings of 0000, proceed to section 5.4.

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).

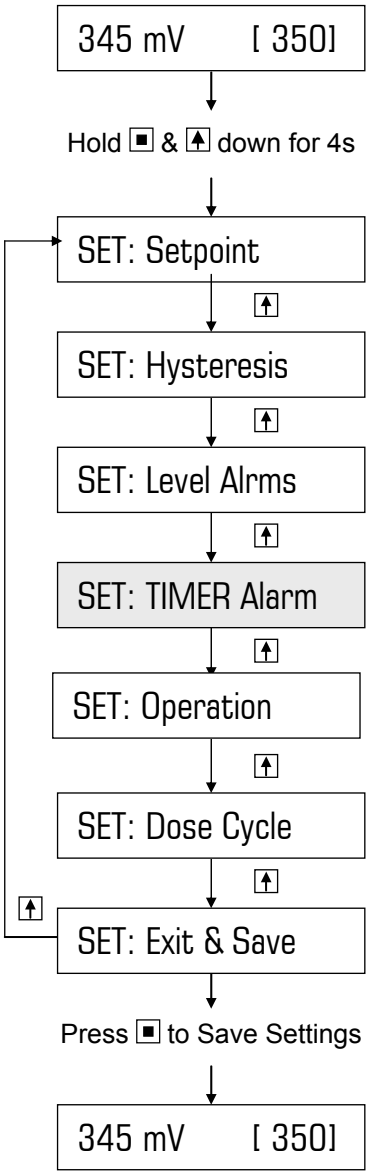
If the system ORP rises above the HIGH alarm level, the HIGH alarm activates. Similarly, if the system ORP drops below the LOW alarm level, the LOW alarm activates. The alarm LED will illuminate and the display will alternate between the alarm and the normal display. For instance, if HIGH Alarm = 500mV, 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)



5.4 Set Timer Alarm



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 ("-P" systems only).

To leave the alarm in its disabled state, ie. factory default setting of 0000s, proceed to section 5.5

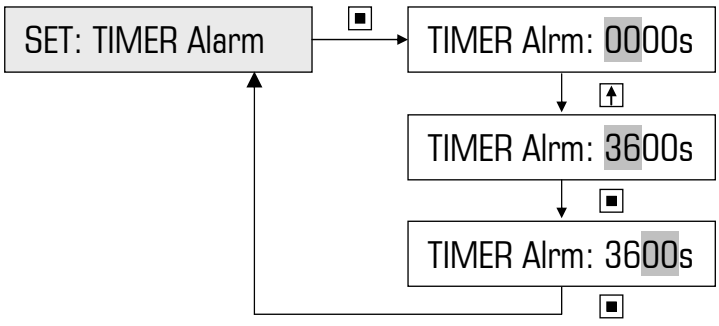
If the system ORP reaches the setpoint within the programmed time, the timer resets. However, if the timer times out before the ORP reaches the setpoint, the pump switches off and remains disabled until the unit is manually reset by holding down the ENTER button. Until then, the alarm LED will illuminate 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.

Item flashing on display:

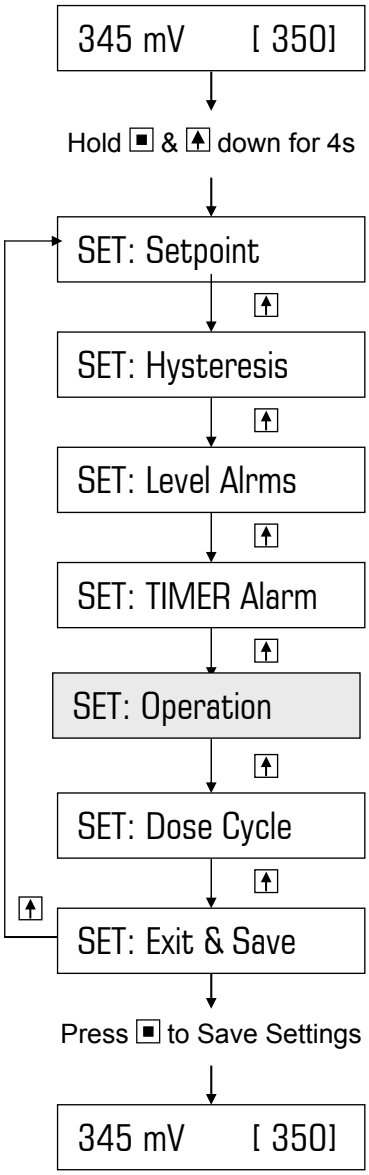
▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

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



5.5 Set Operation



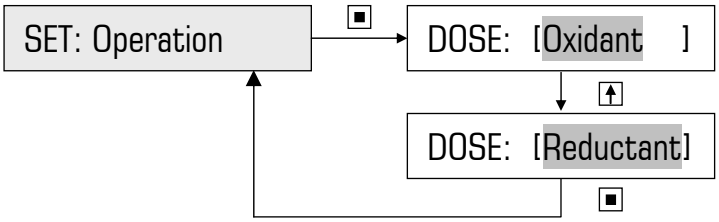
The controller can be programmed to respond to a rise or drop in ORP. The controller is factory programmed to operate as a dosing controller, dosing an oxidising agent via a dosing pump or N/C solenoid controlling water flow through a brominator.

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

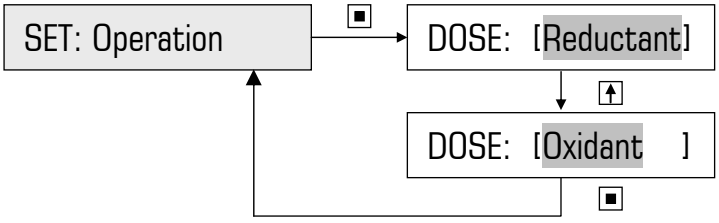


Item flashing on display:

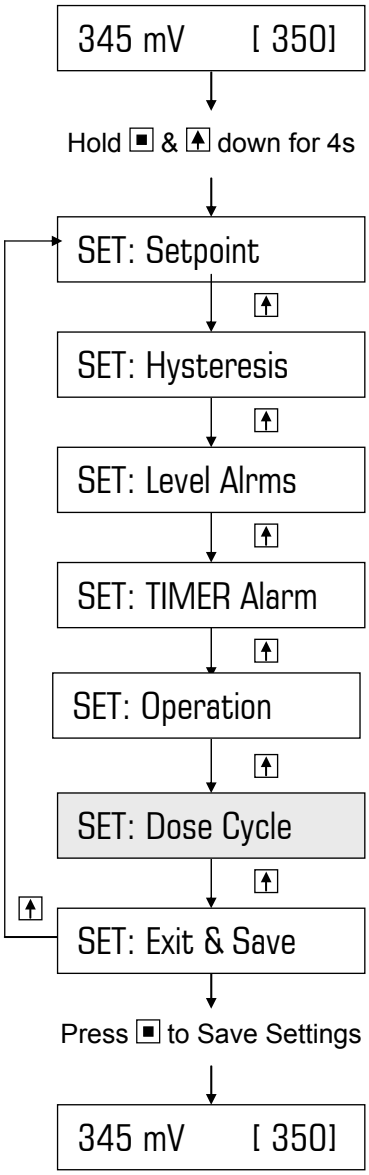
↑ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

Example 2 – dosing Oxidising Agent:
Changing Setting of Reductant to Oxidant.



5.6 Set Dose Cycle



Item flashing on display:

↑ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

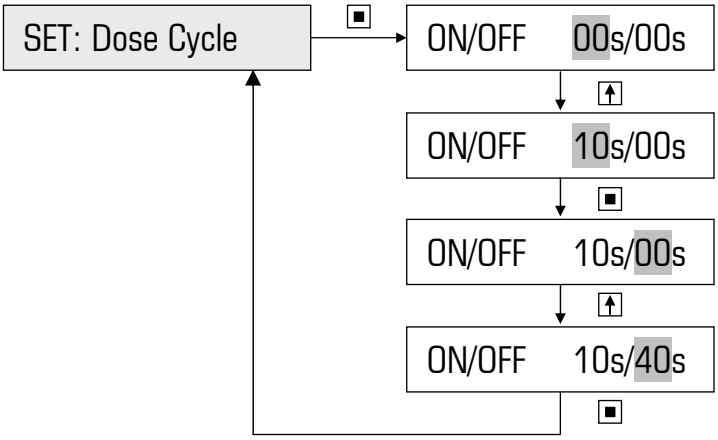
To leave the Dose Cycle in its disabled state, Exit & Save. This is the factory default setting of ON/OFF=00s/00s which means that the pump will dose continuously when the system ORP < mV Setpoint.

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.

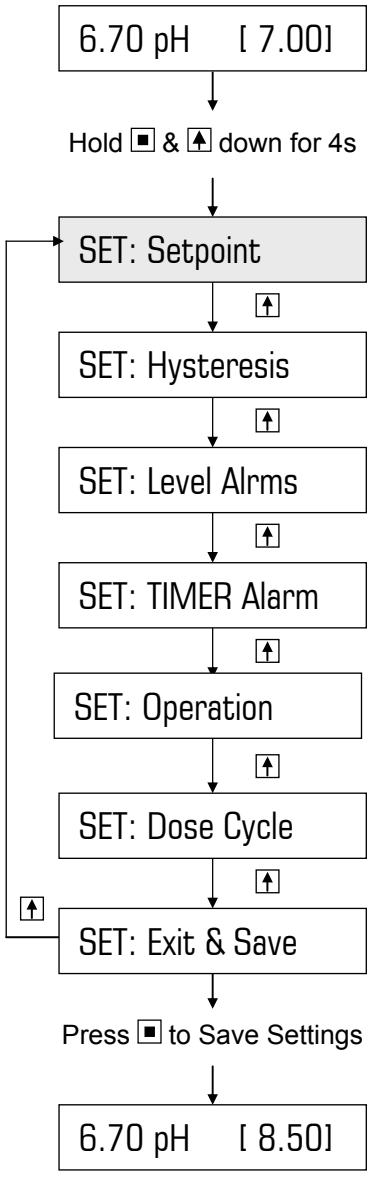
Example:
Factory default: 00s/00s (ie. pump doses continuously when ORP < mV setpoint).
Change to: 10s/40s (ie. 20% duty cycle)



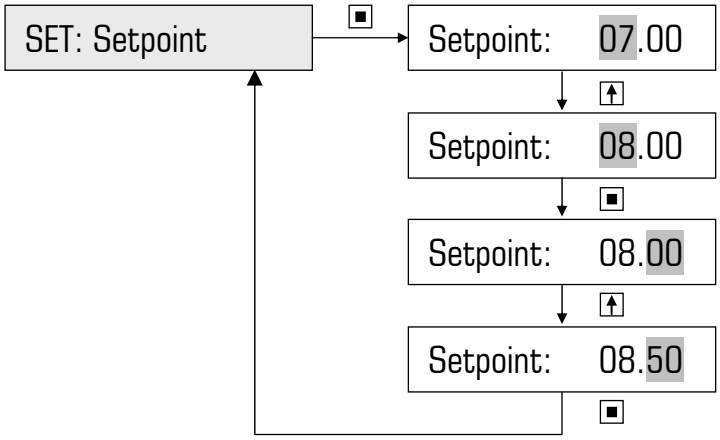
6. PROGRAMMING STEPS IN DETAIL – DCON-PH2A

6.1 Set pH Setpoint

This is the desired pH value of the process.



Example:
Increasing factory default setpoint of 7.00 pH to a new setting of 8.50 pH

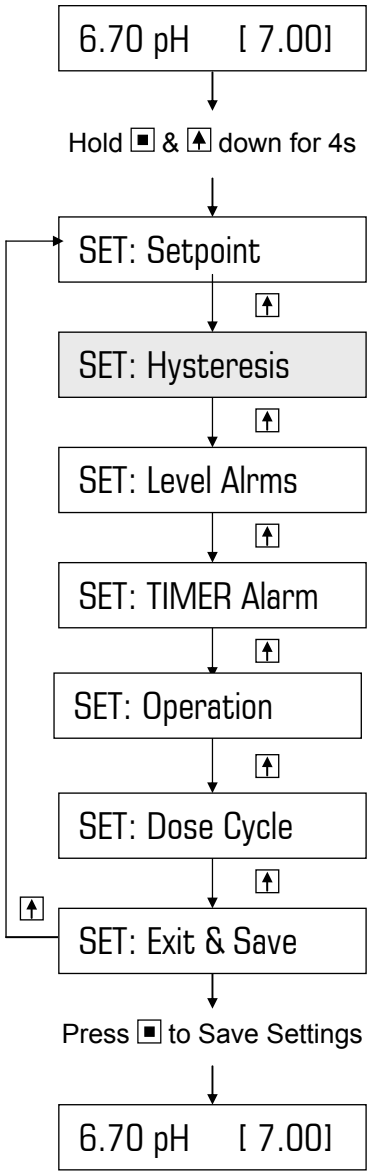


Item flashing on display:

▲ Press to Scroll
▣ Press to Select/Enter

Note: Shading represents flashing

6.2 Set Hysteresis



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

If **dosing acid**, the pump will dose when the pH readout rises above the pH SETPOINT . Dosing will stop once the readout drops below the pH SETPOINT minus a percentage. (This percentage is the hysteresis value and is a percentage of the SETPOINT).

If **dosing base**, the pump will dose when the pH readout drops below the pH SETPOINT . Dosing will stop once the readout rises above the pH SETPOINT plus the hysteresis percentage

For example, if the SETPOINT is 7.00pH and the hysteresis value is 5%, then the calculated hysteresis value is 0.35 pH.

If **dosing acid**, the pump will be activated when the pH rises above 7.00pH and will stop when the pH drops to 6.65 pH (ie. 7.00pH minus 0.35pH).

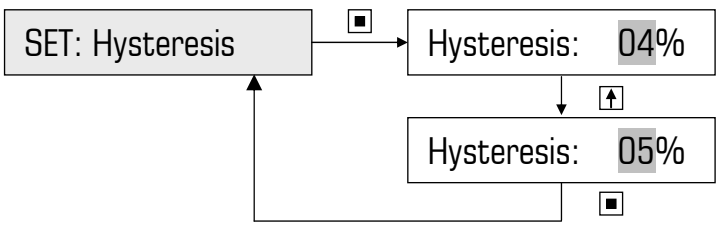
If **dosing base**, the pump will be activated when the pH drops below 7.00pH and will stop when the pH rises above 7.35 pH (ie. 7.00pH plus 0.35pH).

Item flashing on display:

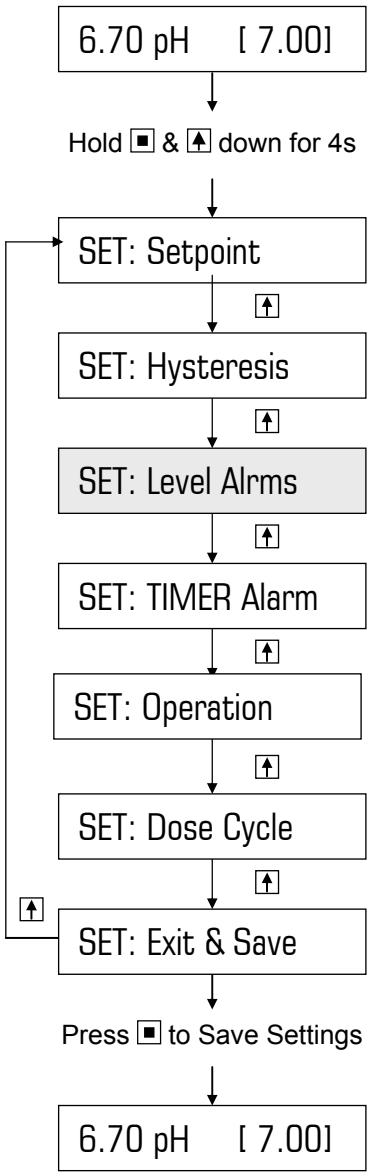
▲ Press to Scroll
▣ Press to Select/Enter

Note: Shading represents flashing

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



6.3 Set High & Low pH Alarms



Item flashing on display:

▲ Press to Scroll
▣ Press to Select/Enter

Note: Shading represents flashing

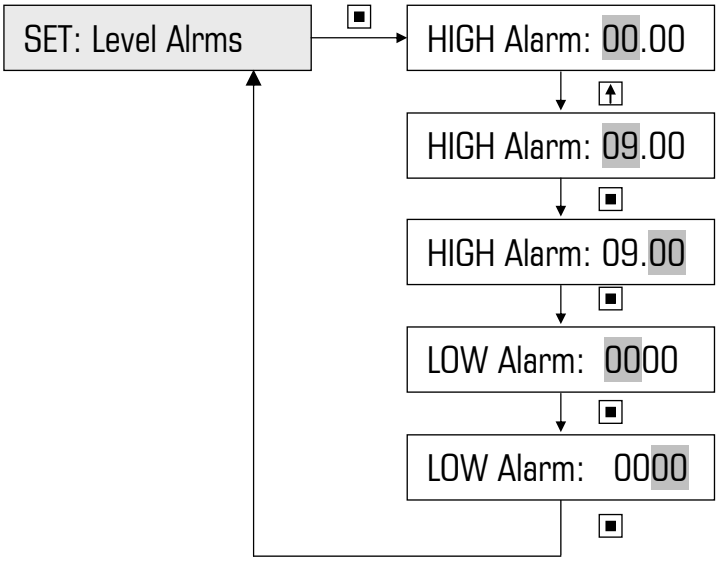
To leave the alarms in their disabled state, ie. factory default settings of 0000, proceed to section 4.4.

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

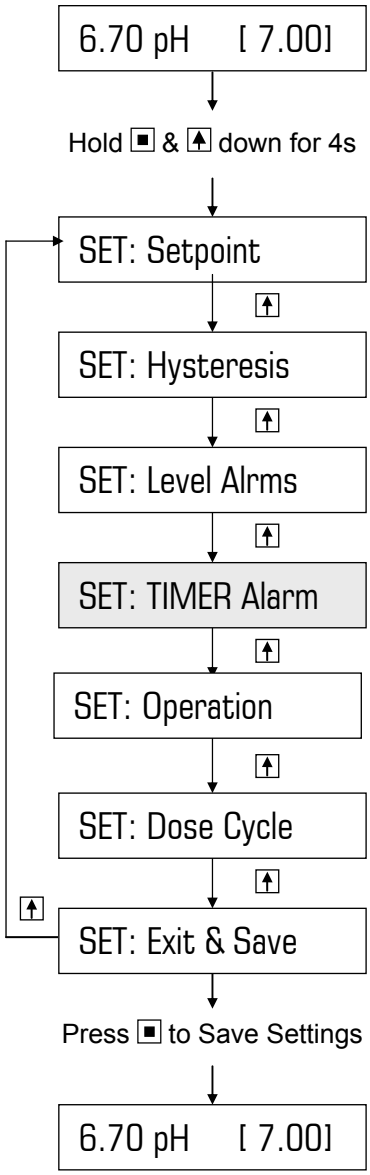
If the system pH rises above the HIGH alarm level, the HIGH alarm activates. Similarly, if the system pH drops below the LOW alarm level, the LOW alarm activates. The alarm LED will illuminate and the display will alternate between the alarm and the normal display. For instance, if HIGH Alarm = 9.00 pH, the display will alternate between "Alarm !! [HIGH]" and "9.10 pH [7.00]", assuming 9.10 pH is the measured pH. Furthermore, if enabled, the audible alarm buzzer will sound.

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 pH is again between the HIGH and LOW alarms levels.

Example:
HIGH Alarm: Change factory default of 0 pH to 9pH (ie. alarm reported when pH > 09.00pH)
LOW Alarm: Leave factory default of 0 pH (ie. alarm disabled)



6.4 Set Timer Alarm



Item flashing on display:

▲ Press to Scroll
▣ Press to Select/Enter

Note: Shading represents flashing

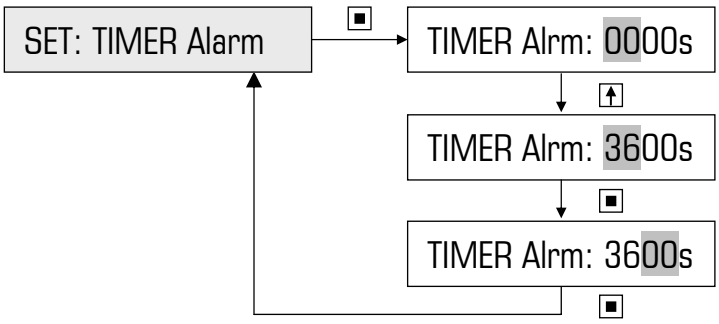
The TIMER alarm is the maximum permissible dose time to reach the SETPOINT. This alarm is designed to protect the system from overdosing in the event of a faulty probe reading a low/high pH when in fact the pH reading may be much higher/lower than the setpoint, when the system is set to dose acid/base. The alarm can also be used to disable the pump should the chemical tank run dry.

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

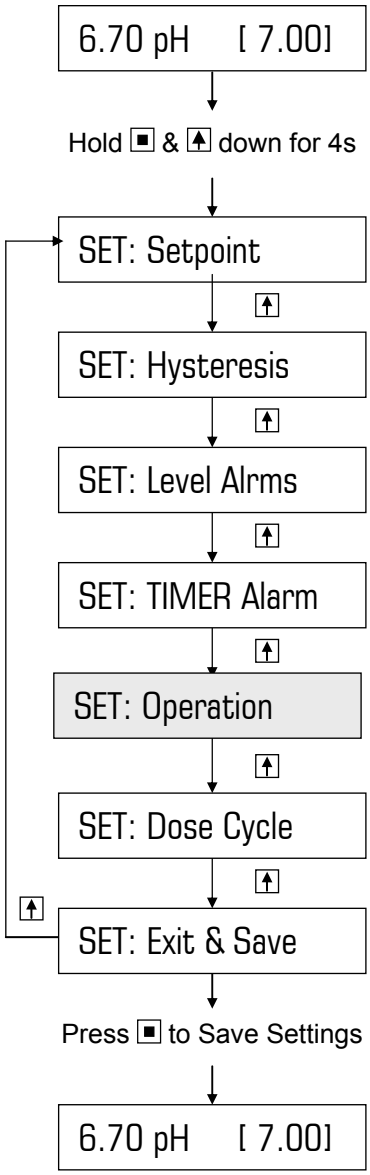
If the system pH reaches the setpoint within the programmed time, the timer resets. However, if the timer times out before the pH reaches the setpoint, the pump switches off and remains disabled until the unit is manually reset by holding down the ENTER button. Until then, the alarm LED will illuminate and the display will alternate between the alarm and the normal display. For instance, when dosing acid, the display will alternate between "Alarm !! [Timer]" and "10.40 pH [7.00]", assuming the reading from the probe is 10.40 pH. Note: Even though the reading from the probe is 10.40 pH in this instance, the actual system pH may be much less. Alternatively, the tank could be empty with no dosing and hence no drop in pH.

Furthermore, if enabled, the audible alarm buzzer will sound

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



6.5 Set Operation



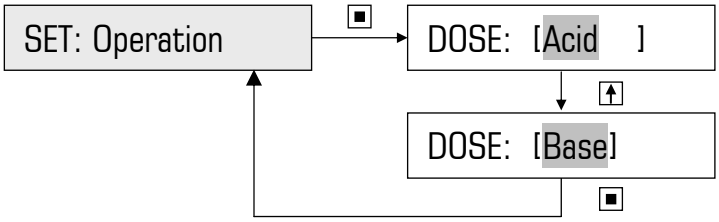
The controller can be programmed to respond to a rise or drop in pH. The controller is factory programmed to operate as a dosing controller, dosing acid via a dosing pump.

The two programmable options are:

DOSE: Acid (factory default)
DOSE: Base

Dosing acid is the most common setting. Hence, this programming step can be bypassed.

Example 1 – dosing Base:
Changing factory default of Acid to Base

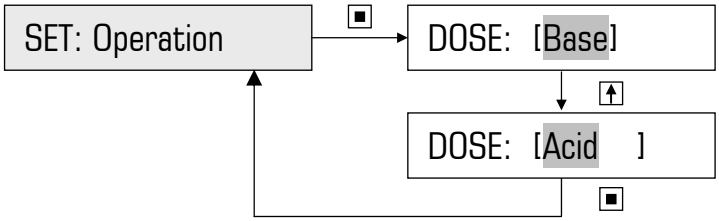


Item flashing on display:

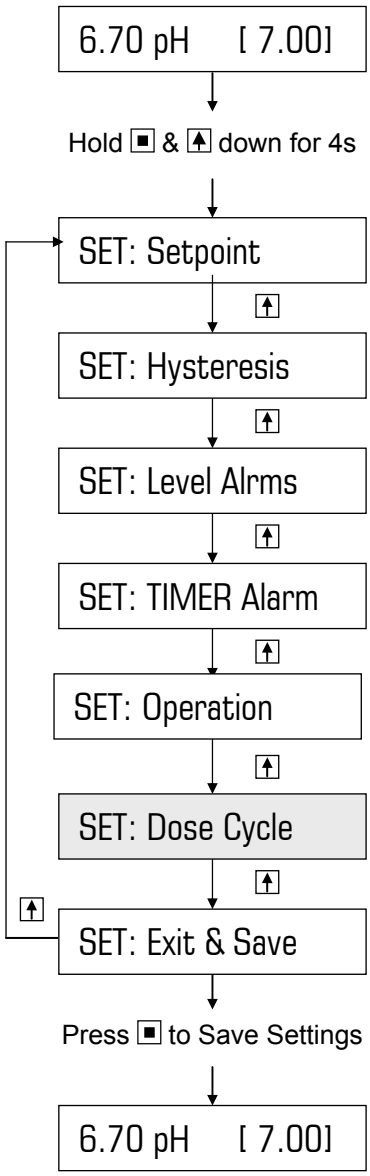
▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

Example 2 – dosing Acid:
Changing Setting of Base to Acid.



6.6 Set Dose Cycle



Item flashing on display:

▲ Press to Scroll
■ Press to Select/Enter

Note: Shading represents flashing

To leave the Dose Cycle in its disabled state, proceed to section 4.8. This is the factory default setting of ON/OFF=00s/00s which means that the pump will:

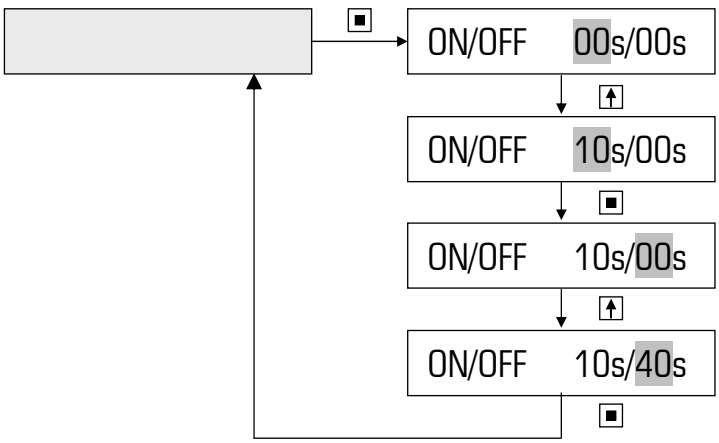
- dose acid continuously when pH > Setpoint (Operation set to dose acid), or
- dose base continuously when pH < Setpoint (Operation set to dose base).

However, when an acid or base is dosed for pH correction, some time is required for acid or base to mix. Depending upon the location of the dosing point and the volume of water in the system, it may take some time before the acid or base reaches the pH 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 pH readout drift more than 25% away from the programmed SETPOINT the controller doubles the ON time and halves the OFF time to bring the pH within 25% of the setpoint very quickly. As soon as the pH readout comes back 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 activated).
Change to: 10s/40s (ie. 20% duty cycle)



7. FACTORY SETTINGS / PROGRAMMABLE OPTIONS

DIGICHEM Controller:

Item	Factory Setting	Option	Note
Setpoint	1000 TDS	1 – 10,000 μS	Determine the desired system TDS/μS
High Alarm	0000 TDS	0 – 10,000 μS	0000 = alarm disabled Otherwise HIGH alarm setting must be greater than Setpoint
Timer Alarm	0000 sec	0 – 9999 sec	0000 = alarm disabled
O/P ON Time	Biocide dose time set + 015 m	15, 30, 45, 60, 75, 90, 105 or 120 minutes	Time after biocide dosing for which O/P ON relay contact remains closed. Activates during & after Biocide A or B.
Bleed Cycle	00s/00s	ON = 0-99 sec OFF = 0-99 sec	00s/00s = continuous bleed when system TDS > Setpoint
Inhibitor Pump Mode	Continuous On Bleed	1. Continuous on bleed 2. % of time on bleed 3. % of time on flow 4. Water Meter Pulse	Slow down dose rate by entering ON and OFF times of duty cycle.
Inhibitor Duty Cycle (Modes 2 & 3 only)	0000s/0000s	ON = 0-9999 sec OFF = 0-9999 sec	Duty cycle programmed used for “On bleed” modes or “On flow 24hr/day” modes
Inhibitor Water Meter Settings (Mode 4 only)	Pulse count = 0000 Dose period = 0000s	Pulse Count = 1-9999 pulses Dose Period = 1-9999 sec	When programmed pulse count is counted, pump doses for dose period set.
Biocide Pump Timer Programs	All programs disabled	10 Timer programs (program which pump to dose and on which days of the week).	Example: Program: 01 Pump: A Dose days: Mon, Wed, Fri
Pre Bleed Duration	0000m	0-250 min	Controller controls TDS to 87% of setpoint programmed During the Pre-Bleed Duration.
Pre-Bleed Setpoint	Setpoint minus 13%	87% of setpoint programmed (87% is fixed setting)	
Biocide Dosing Duration	0000m	1-250 min	During the Biocide dosing and Bleed Lock-out durations, the controller controls TDS to setpoint + programmed %.
Bleed Lock-Out Duration	0000m	0-999 min	
Bleed Lock-Out Setpoint	Setpoint plus 50%	100 to 199% of setpoint programmed	Factory default of 50% would mean TDS setpoint during biocide dosing and lock-out is 150% of normal TDS setpoint
Time & Day	00h00 Sun	00h00–23h59, Sun-Sat	Clock has battery backup. However, DIGICHEM should be powered continuously, regardless of when towers are shut down.

DCON-RX2A Controller:

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 (eg. 20 sec)
Dose Cycle OFF time	0 sec	0 – 99 sec	Reaction time (eg. 40 sec)

DCON-PH2A Controller:

Item	Factory Setting	Option	Note
Setpoint	7.00 pH	0.00 to 13.99 pH	Desired system pH
Hysteresis	4 %	1 – 90 %	Lower value ensures tighter control
High Alarm	0 pH	0.00 to 13.99 pH	0 = disabled, or ensure value > Setpoint
Low Alarm	0 pH	0.00 to 13.99 pH	0 = disabled, or ensure value < Setpoint
Timer Alarm	0 sec	0 – 9999 sec	0 = disabled
Operation	Dose Acid	Dose Acid or Base	Most applications dose acid
Dose Cycle ON time	0 sec	0 – 99 sec	Dose time (eg. 20 sec)
Dose Cycle OFF time	0 sec	0 – 99 sec	Reaction time (eg. 40 sec)

8. SPECIFICATIONS

DIGICHEM Controller:

Power Supply:	220 – 240 VAC (50 / 60Hz)
Internal fuse:	2A/250VAC (M205, 20mm x 5mm diameter)
Inputs:	Conductivity Probe, model DCON-P10AT or DCON-P10ATS Water meter potential-free contact Flow switch transmit signal from DCON-PH2A to input C&Sol (disables only C&Solenoid on no flow)
Standard Outputs:	1. Biocide A (switched 240VAC, 10A max resistive) – APHRX2A units only 2. Biocide B (switched 240VAC, 10A max resistive) - unused 3. Inhibitor C (switched 240VAC, 10A max resistive) 4. Solenoid (switched 240VAC, 5A max, with snubber) 5. O/P ON relay N/O potential free (240VAC, 10A max) 6. Alarm relay N/O & N/C potential free (240VAC, 2A resistive)
Optional Outputs	AF09 or AF09-3: Isolated 4-20mA card to remotely monitor TDS level Maximum output impedance: 750 Ω AF10: 4-20mA for TDS, & 6 NPN event O/Ps: Pumps A, B & C, Bleed Valve, Alarm & Power Failure
Displayed TDS Resolution:	1 TDS
Hysteresis (ie. Dead band):	3% fixed
LED Indication:	Power ON, Solenoid Operate, Alarm
Controller Enclosure rating:	IP55 (ie. Completely weatherproof)
Biocide Battery Backup	50 hours (designed for power failure only)
EMC compatibility	C-tick approved
Operating Temperature:	0 - 50°C
Memory backup:	EEPROM. Data retention of 10 years min.

DCON-RX2A Controller:

Power Supply:	220 – 240 VAC (50/60 Hz)
Inputs:	ORP Probe/Electrode Earth Probe, Flow switch
Standard Outputs:	240VAC applied to Pump Output – 10 Amp rated. Alarm relay N/O & N/C potential free (240VAC, 2A resistive)
Optional Outputs:	AF09A or AF09-3: Isolated 4-20mA card to remotely monitor ORP level AF10A: 4-20mA for ORP, & 3 NPN event O/Ps: ORP Pump (or Brom 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.

DCON-PH2A Controller:

Power Supply:	220 – 240 VAC
Inputs:	pH Probe/Electrode
Standard Outputs:	240VAC applied to Pump Output – 10 Amp rated Alarm relay N/O & N/C potential free (240VAC, 2A resistive)
Optional Outputs:	AF09B or AF09-3: Isolated 4-20mA card to remotely monitor pH level AF10B: BMS card with 4-20mA (or 1-5V) + 3 event outputs: output ON, alarm activate and power failure
Measured pH Resolution:	0.01 pH
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.