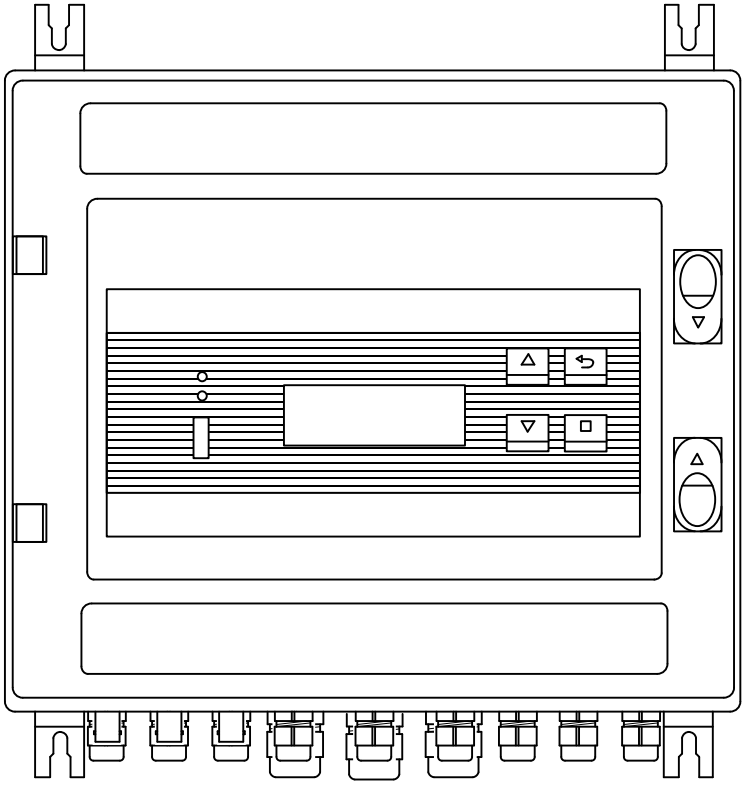
Instruction Manual for Water Treatment Controller Model: DIGICHEM® Plus+ Gen II



Fill in serial number here ⇨ _____

Refer to back page

Supplied by:

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 or 18 months from Invoice date (whichever occurs first). 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

Primarily designed for cooling tower water treatment, the DIGICHEM Plus+ electronic controller incorporates the following key features:

- Conductivity bleed control
- pH Control
- ORP Control
- Dispersant pump dosing control
- Inhibitor pump dosing control
- Dual Biocide pump control (via 10 independent 28-day timer programs)
- On Board Data logging
- Tower circulating/condenser pump override facility with delay-off timer
- High and Low Conductivity, pH & ORP alarms with programmable trip delay
- Internet Connectivity for remote access, remote settings change and viewing of data logs
- External USB-A socket for Settings Backup/Copy/Paste feature, log download and easy Firmware updates.

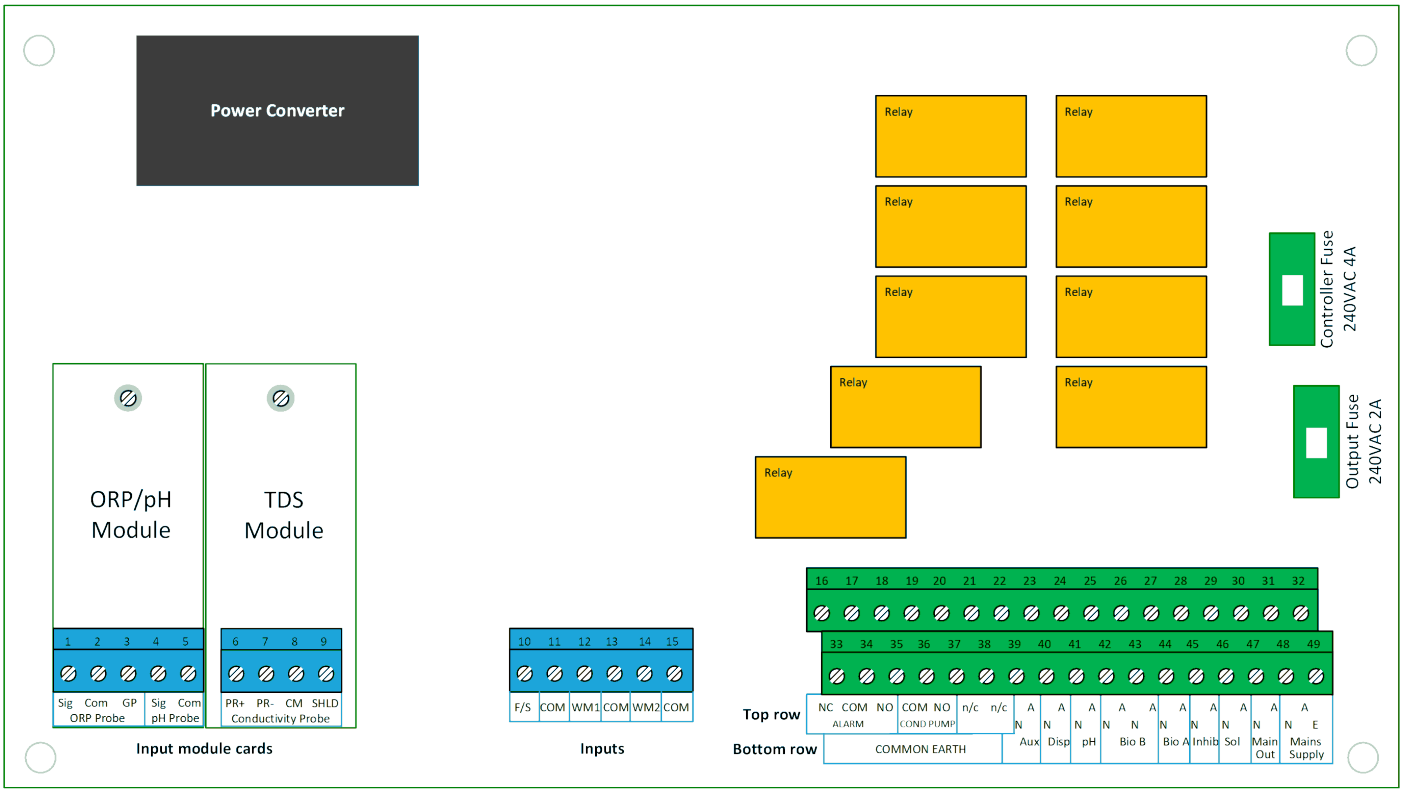
Mount the DIGICHEM Plus+ on a flat vertical surface away from extreme heat, humidity or areas where temperature variations are extreme, ideally at eye-level to allow good visibility of the LCD display. Also ensure that a 240VAC mains power point is located nearby.

2.1 Electrical Wiring

CAUTION: Only trained/qualified personnel may open and work inside of a DIGICHEM Plus+ controller. When opening the controller enclosure please take care of the following:

1. Electrical Hazard Warning – Physically disconnect mains power before opening.
2. Pull the lid away from the base slowly to ensure you do not impose any strain on the interconnecting cable, which easily unplugs from the motherboard.
3. Static Discharge Warning – discharge any static built up by earthing, use care and common sense.
4. Leaking and water ingress – when closing the enclosure, ensure the rubber seal is correctly seated to ensure it does not leak and the IP rating is maintained.

Refer wiring and connection diagrams below:



Terminal Designation:

Pin	Description	Wire Colour
1	ORP Probe Signal	White
2	ORP Probe Common	Green
3	Ground Probe	Grey
4	pH Probe Signal	White
5	pH Probe Common	Green
6	Conductivity Probe PR+	Red
7	Conductivity Probe PR-	Yellow
8	Conductivity Probe CM+	Blue
9	Conductivity Probe Screen	Grey
10	Flow Switch	White
11	Flow Switch Common	Green
12	Water Meter 1 - Make Up	
13	Water Meter 1 - Make Up Common	
14	Water Meter 2 - Bleed	
15	Water Meter 2 - Bleed Common	
16	Alarm Relay - NC	
17	Alarm Relay - Common	
18	Alarm Relay - NO	
19	Cond (Condenser) Pump Common	
20	Cond (Condenser) Pump NO	
21	No connection	
22	No connection	
33	Common Earth	Yellow/Green
34	Common Earth	Yellow/Green
35	Common Earth	Yellow/Green

Pin	Description	Wire Colour
36	Common Earth	Yellow/Green
37	Common Earth	Yellow/Green
38	Common Earth	Yellow/Green
23	Auxiliary Active (240VAC)	Brown
39	Auxiliary Neutral	Blue
24	Dispersant Active (240VAC)	Brown
40	Dispersant Neutral	Blue
25	pH Active (240VAC)	Brown
41	pH Neutral	Blue
26	Bio B /ORP Active (240VAC)	Brown
42	Bio B /ORP Neutral	Blue
27	Bio B /ORP Active (240VAC)	Brown
43	Bio B /ORP Neutral	Blue
28	Bio A /ORP Active (240VAC)	Brown
44	Bio A Neutral	Blue
29	Inhibitor Active (240VAC)	Brown
45	Inhibitor Neutral	Blue
30	Bleed Solenoid Active (240VAC)	Brown
46	Bleed Solenoid Neutral	Blue
31	Mains Out Active (fused 240VAC)	
47	Mains Out Neutral	
32	Mains Supply Active (240VAC)	Brown
48	Mains Supply Neutral	Blue
49	Mains Supply Earth	Yellow/Green

Fuses: Controller fuse: 2A/250VAC (M205, 20mm x 5mm diameter)
Output fuse: 4A/250VAC (M205, 20mm x 5mm diameter)

Notes on Alarm Relay Contacts:

1. Alarm relay is energised i.e. COM 17 connected to NO 18 during normal operation of the unit.
2. Alarm relay de-energises i.e. COM 17 connected to NC 16) when an alarm condition is confirmed or when the unit loses power.

Notes on Flow Switch:

A flow switch with NO or NC volt-free contacts is required to be connected to terminals 10 & 11 (not polarity sensitive). The flow switch logic is programmable via the menu.

Notes on Water Meter Inputs:

Water meters with Volt-free pulse outputs (e.g. Reed switches) are required for Make-Up & Bleed water meter inputs.
For Mag-flow water meters with opto-coupled outputs, use terminals 12 & 14 for the +, and terminals 13 & 15 for the – inputs from the water meters.

2.2 Conductivity Probe Installation & Maintenance

The probe is supplied screwed into a PVC Tee piece such that the electrode tips are submerged in the water flowing through the manifold in which the tee is usually fitted. The conductivity probe seals with an O-ring and hence no Thread tape is required to seal.

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.

The controller should always be calibrated after probe cleaning.

3. Controller Functionality

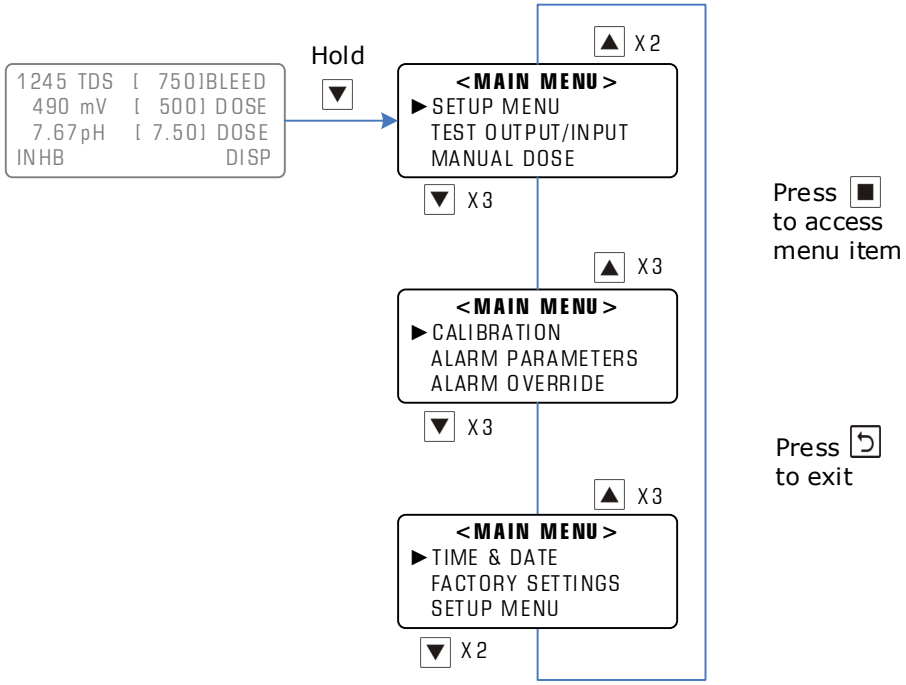
The following section outlines controller menu and functionality.

3.1 Menu Logic

The DIGICHEM Plus+ has a very user-friendly menu system:

- The menu structure is circular
- The relevant menu item, or programmed value flashes on the display, and is shown as bold letters or numbers when explained in this instruction manual.
- Up & Down arrow pushbuttons allow you to scroll through the menu items and to increase/decrease programmed settings
- The MAIN MENU expands to several levels of SUB MENUS when pressing ENTER on various menu items
- The BACK pushbutton can be pressed at any time to exit from a current menu to a previous menu screen, or to not save any edited settings
- The LCD is backlit

The MAIN MENU of the controller is illustrated as follows:



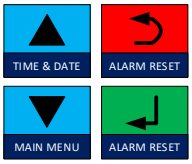
Main Menu

Note: If password protection is enabled, the controller will ask you to enter your password before allowing you to enter this menu.

3.2 Pushbuttons

The DIGICHEM Plus+ has 4 pushbuttons each of which have dual functions:

1. Scroll UP (Time & Date)
2. Scroll DOWN (Main Menu)
3. ENTER (Alarm Reset)
4. BACK (View Settings)



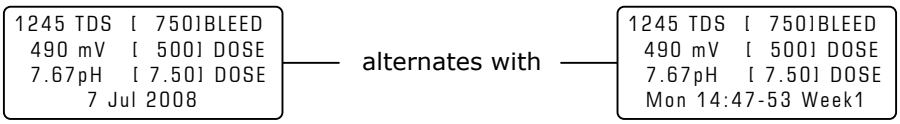
- The **Scroll UP** ▲ and **DOWN** ▼ pushbuttons allow you to scroll in both directions in the menus. Once a menu item has been selected and there is a value to program, the Scroll ▲▼ pushbuttons allow you to increase or decrease the number programmed.

- The **ENTER** ↵ pushbutton allows you to enter a part of the program that you have selected. It also accepts any numbers programmed with the Scroll pushbuttons.

- The **BACK** ↩ pushbutton allows you to exit from any menu, as well as to exit from any screen without saving values, should you have changed any values without pushing the ENTER pushbutton.

- If the **Scroll UP | Time & Date** ▲ pushbutton is pressed momentarily in NORMAL MODE, the time and date is displayed on a cycling basis with the site and controller name. To revert to NORMAL MODE, press the pushbutton momentarily again.

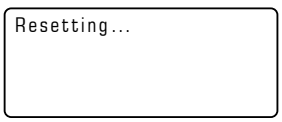
  The time and date are displayed as follows:



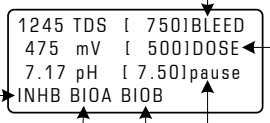
  NOTE:
  The Time & Date is programmable, but the Week No is automatically set. Hence, if you have multiple controllers in the field, the Week No will be the same on all (assuming the Time & Date are programmed correctly).

- To get into the menus of the DIGICHEM Plus+, hold down the **Scroll DOWN | Main Menu** ▼ pushbutton. The display will count down until you access the menus. If password protection is enabled, the controller will ask you to enter your password before allowing you to enter this menu.

- If you wish to cancel an alarm or any timers activated, press and hold the **ENTER | Alarm Reset** ↵ pushbutton until the display says:



3.3 Controller Display Information



BLEED is displayed when power is applied to the bleed solenoid output of the controller. If the solenoid output is suspended due to a pause in the bleed cycle, 'pause' will be displayed here.

INHB is displayed when power is applied to the Inhibitor output of the controller. If the Inhibitor output is suspended due to no flow, the display will say NO FLOW.

DOSE is displayed when power is applied continuously to the ORP output of the controller. If the ORP output is suspended due to a pause in the control cycle, 'pause' will be displayed here.

BIOA is displayed when power is applied to the Biocide A output of the controller.

'pause' is displayed when the pH output is suspended due to a pause in the control cycle. If the pH output is then energised due to the controller function, 'DOSE' will be displayed here.

If ORP control is disabled, BIOB is displayed here when power is applied to the Biocide B output of the controller.

If the pH or mV output is suspended due to the program being inactive in a 28 day time cycle, 'idle' will be displayed here.

If ORP control is enabled, then the Biocide B relay is used for the ORP output, and BIOB will not be displayed. DOSE will still be displayed next to the mV setpoint.

If pH or ORP control is disabled, 'off' will be displayed here.

Notes

- If a pulse from a make-up water meter is received, a '+' will be displayed momentarily
- If a pulse from a bleed water meter is received, a '-' will be displayed momentarily

3.4 USB Port

There is a USB port on the front panel of the controller next to the LCD. This is used to download data logs from the controller, down/upload settings and can also be used to load new firmware versions should they be required. See 5.13 USB Menu section for more information.

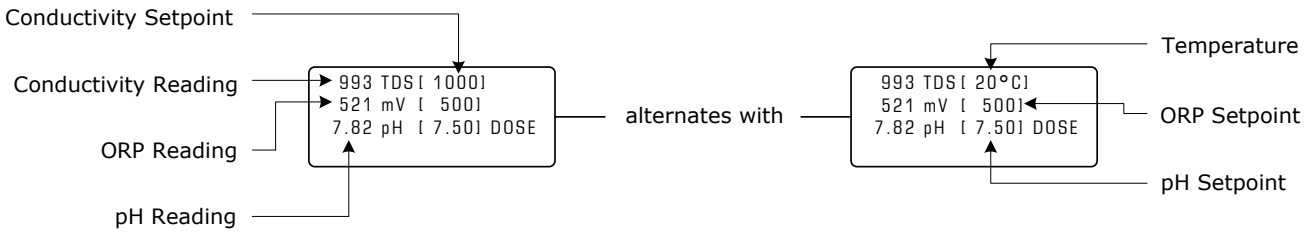
CAUTION: Refer to previous section before reading this section

4.1 Start-Up

After installing the controller, connect the power. Once the start-up sequence completes, the controller will automatically enter NORMAL MODE. The display will show the measured conductivity, along with the conductivity setpoint (displayed in square brackets), alternating with the temperature measured by the conductivity probe.

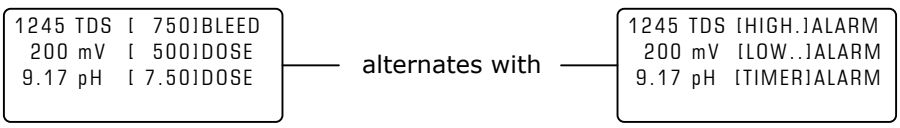
The display will also show the measured pH and ORP, along with the associated setpoints (displayed in the square brackets).

Depending on the measured values, the controller may also display control functions of those illustrated in Section 3.3 for Controller Output Indication. An example of a startup screen is shown below:



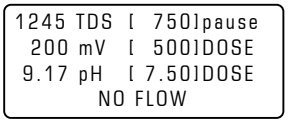
Other information that you may see on the display, which alternates with the display above:

- When an alarm is reported, the actual alarm message will be periodically displayed in the specific area on the main screen, for that alarm. Please see the example below:



Example: Various Alarms for TDS, ORP and pH being displayed

- When a flow switch is connected to the controller, each output is suspended when there is no flow past the flow switch. The outputs that would be suspended are only those that are selected via the Flow Switch Menu.



Example: No Flow Condition for Flow Switch Enabled on Bleed

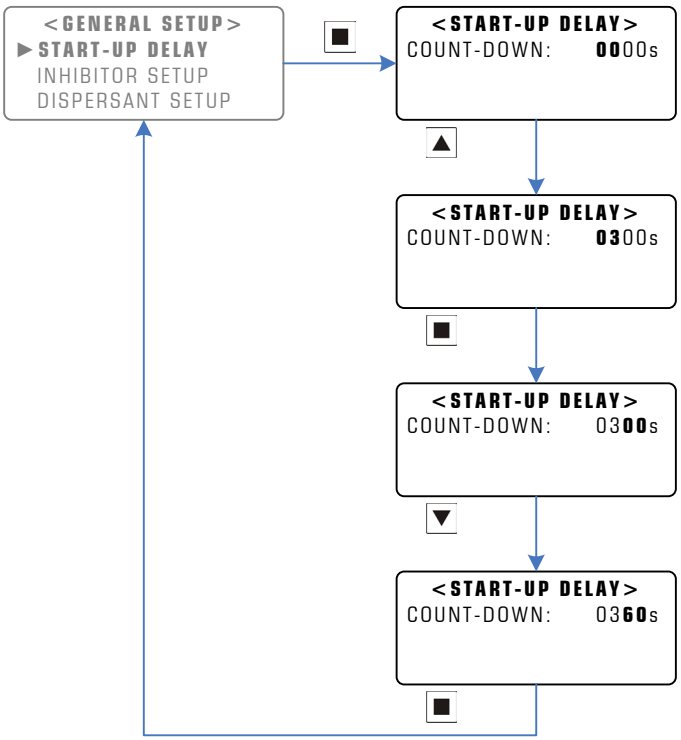
4.1.1 Start-Up Delay

Main Menu > *SETUP MENU > GENERAL SETUP > START-UP DELAY*

The Start-Up Delay feature is used to delay the activation of the control functions of the DIGICHEM Plus+ Controller when it is first powered on.

This feature is useful in situations where the system water needs time to circulate adequately, for example to ensure that chemicals are thoroughly mixed before pH, ORP, or conductivity control begins. This would also ensure the readings of these variables to first stabilise before commencing control.

The example below illustrates setting the Start-Up Delay to 6 minutes (or 360 seconds).

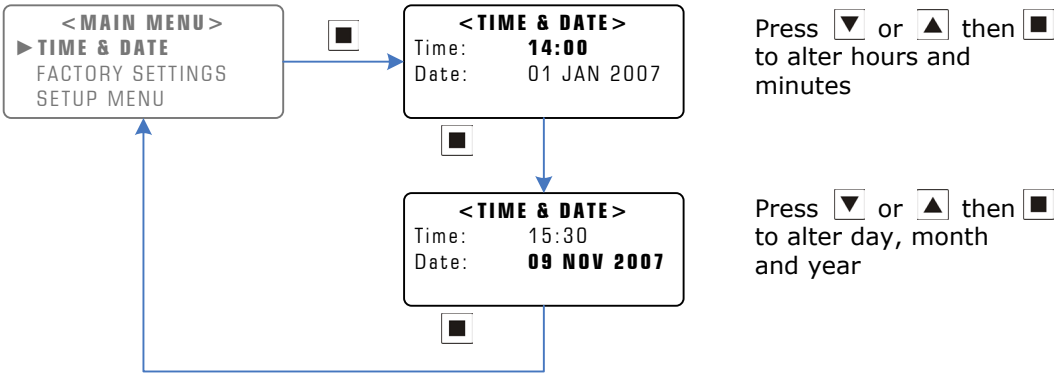


Example: Increasing the Start-Up Delay from 0 seconds to 360 seconds

NOTE: The Start-Up delay will also take effect upon resumption of flow.

4.2 Setting Time & Date

Main Menu > *TIME & DATE*



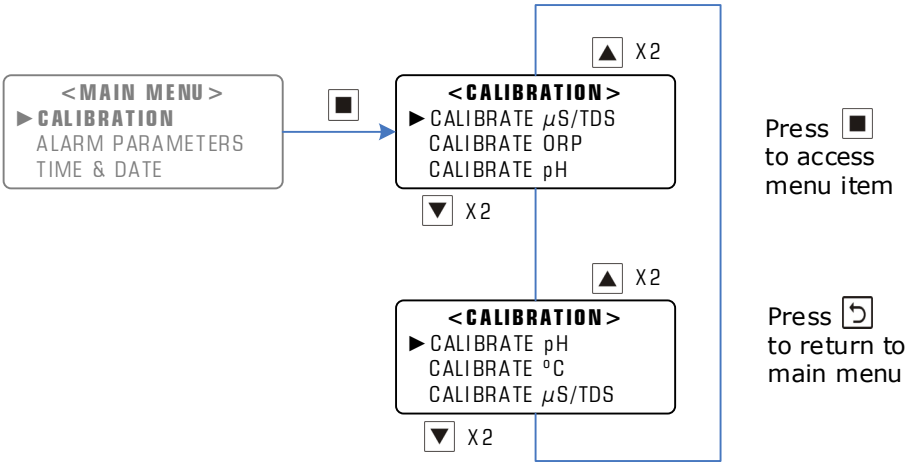
Example: Setting the Time and Date to 15:30 on the 9 Nov 2007

NOTE: The Week Number will be automatically set

4.3 Calibration

Main Menu > *CALIBRATION*

The Calibration menu has the following displays:



Calibration Menu

4.3.1 Temperature (°C) Calibration

Main Menu > *CALIBRATION > CALIBRATE °C*

Measure the temperature of the water in the tower basin with an independent temperature sensor / thermometer. Simply adjust the temperature reading in the calibration menu to the desired temperature and press ENTER.

If the temperature sensor is faulty or the probe is not connected, an error message will be displayed.

4.3.2 Conductivity (TDS / µS) Calibration

Main Menu > *CALIBRATION > CALIBRATE µs/TDS*

IMPORTANT: Select the display in either µS or TDS before proceeding. (Refer section 5.1.1)

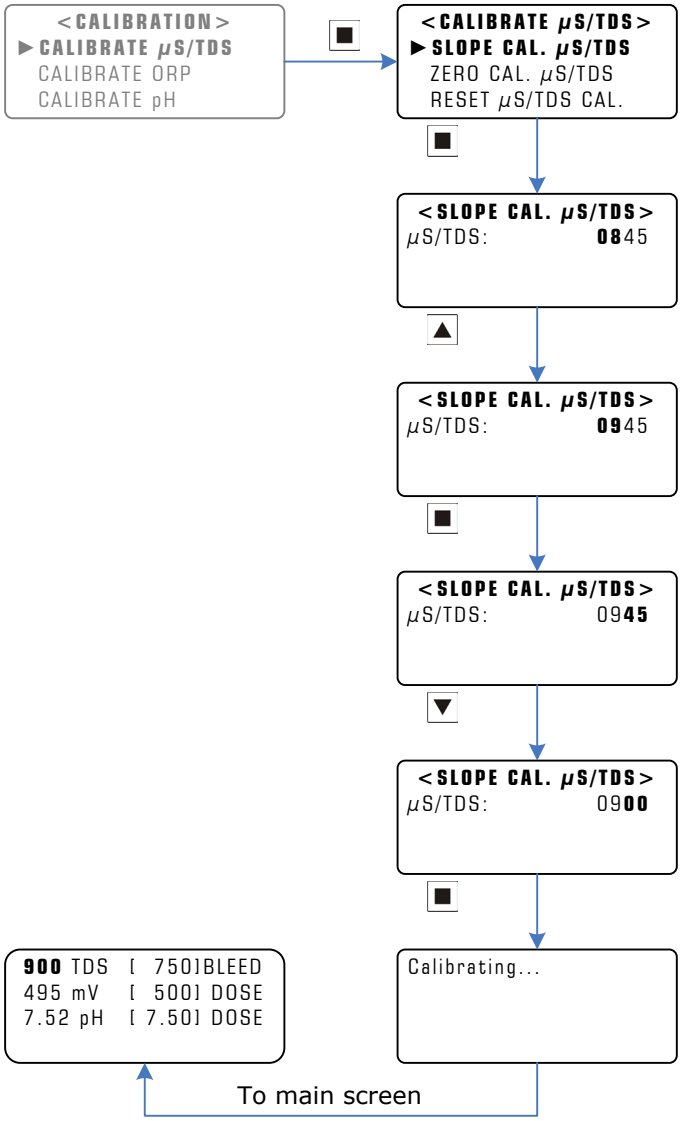
Calibrating the TDS SLOPE

Main Menu > *CALIBRATION > CALIBRATE µs/TDS > SLOPE CAL µS/TDS*

Take a sample of water from the sample valve on the manifold and measure the conductivity with a calibrated hand-held conductivity meter. Alternatively, insert the Conductivity probe in a buffer solution of known conductivity. Should the conductivity readout on the display differ from the sample taken, calibrate the controller as follows:

Adjust the current reading via the Calibration Menu to the desired reading.

Please see the example on the following page:



Example: Calibrating the Slope Value from 845 TDS to 900 TDS

Calibrating the µS/TDS ZERO

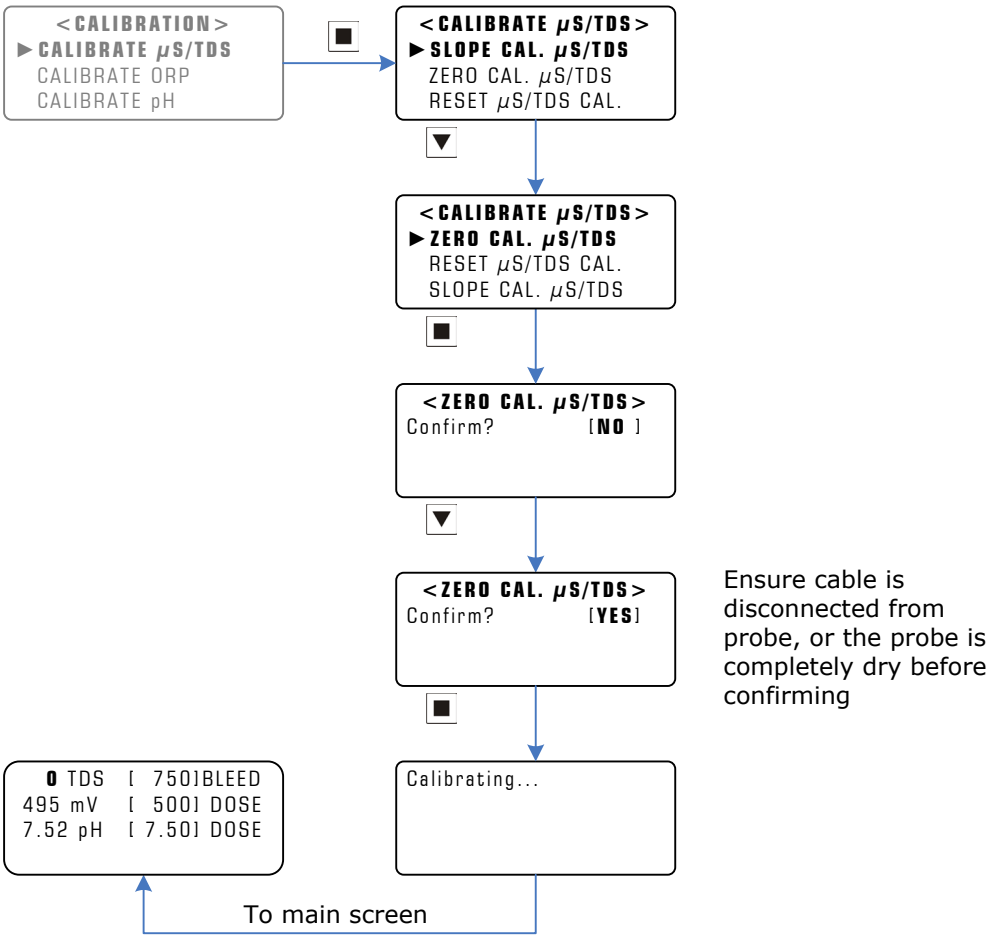
Main Menu > *CALIBRATION > ZERO CAL µS/TDS*

The zero is factory set so should not require calibration. However, if the display reads above zero with the conductivity probe disconnected, or with the probe dry, recalibrate the zero as follows:

1. Remove the probe from the manifold.
2. Dry the electrodes of the probe, so that there is zero (or minimal) conductivity between the electrodes.
3. Wait until the reading on the LCD is stable. If the reading does not settle to exactly 0, wait until it does not drop any further.
4. Go to the Calibrate Menu and set the Zero Calibration (see next page).
5. Screw the probe back into the manifold.
6. Perform the SLOPE calibration again.

Alternative zero calibration procedure:

1. Disconnect the cable from the back of the probe.
2. Wait until the reading on the LCD is stable. If the reading does not settle to exactly 0, wait until it does not drop any further.
3. Go to the Calibrate Menu and set the Zero Calibration (see below).
4. Re-connect the cable to the probe securely.
5. Perform the SLOPE calibration again.



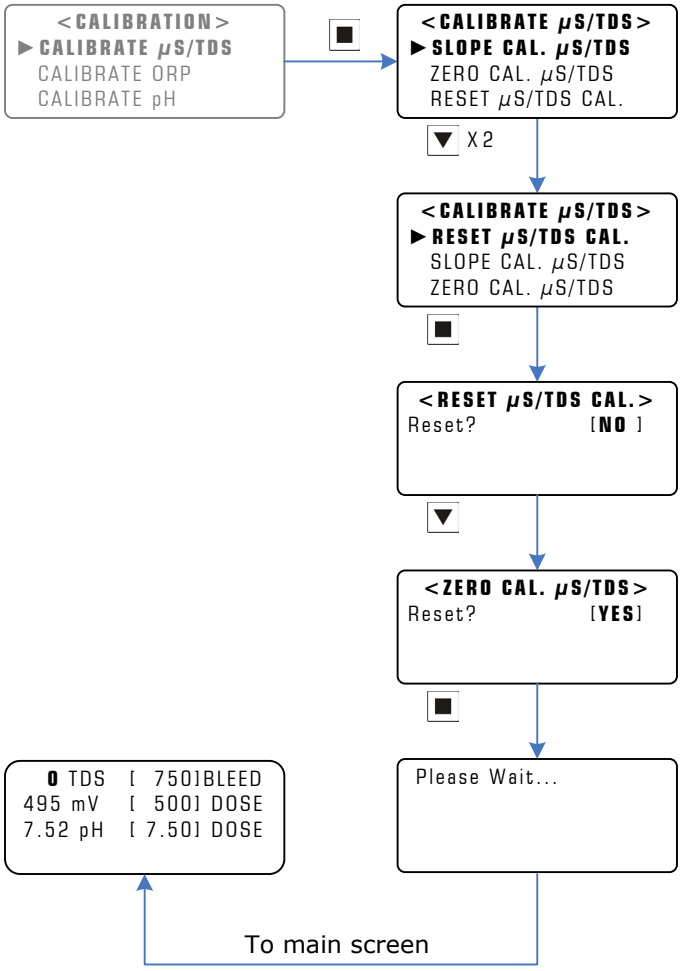
Calibrating the Zero for µS/TDS

Resetting the TDS CALIBRATION

Main Menu > *CALIBRATION > RESET µS/TDS CAL.*

If you inadvertently calibrate the zero and/or slope to the incorrect values, and you cannot recover by repeating the normal calibration procedure, then you can reset the calibration and start again.

See diagram on the following page to reset the calibration:



Resetting the µS/TDS Calibration

4.3 3 ORP mV Calibration

Main Menu > *CALIBRATION > CALIBRATE ORP*

NOTE: The DIGICHEM Plus+ ORP is factory calibrated, so under normal circumstances, calibration is not required. However, if you need to calibrate, or verify the reading in buffer solutions, proceed as follows:

Putting the controller into CALIBRATE mode automatically bypasses the solution ground probe. This enables a mV simulator to be connected to the controller for calibration or enables you to insert the ORP sensor in a buffer solution without the solution ground probe. This ensures you get an accurate reading on the controller.

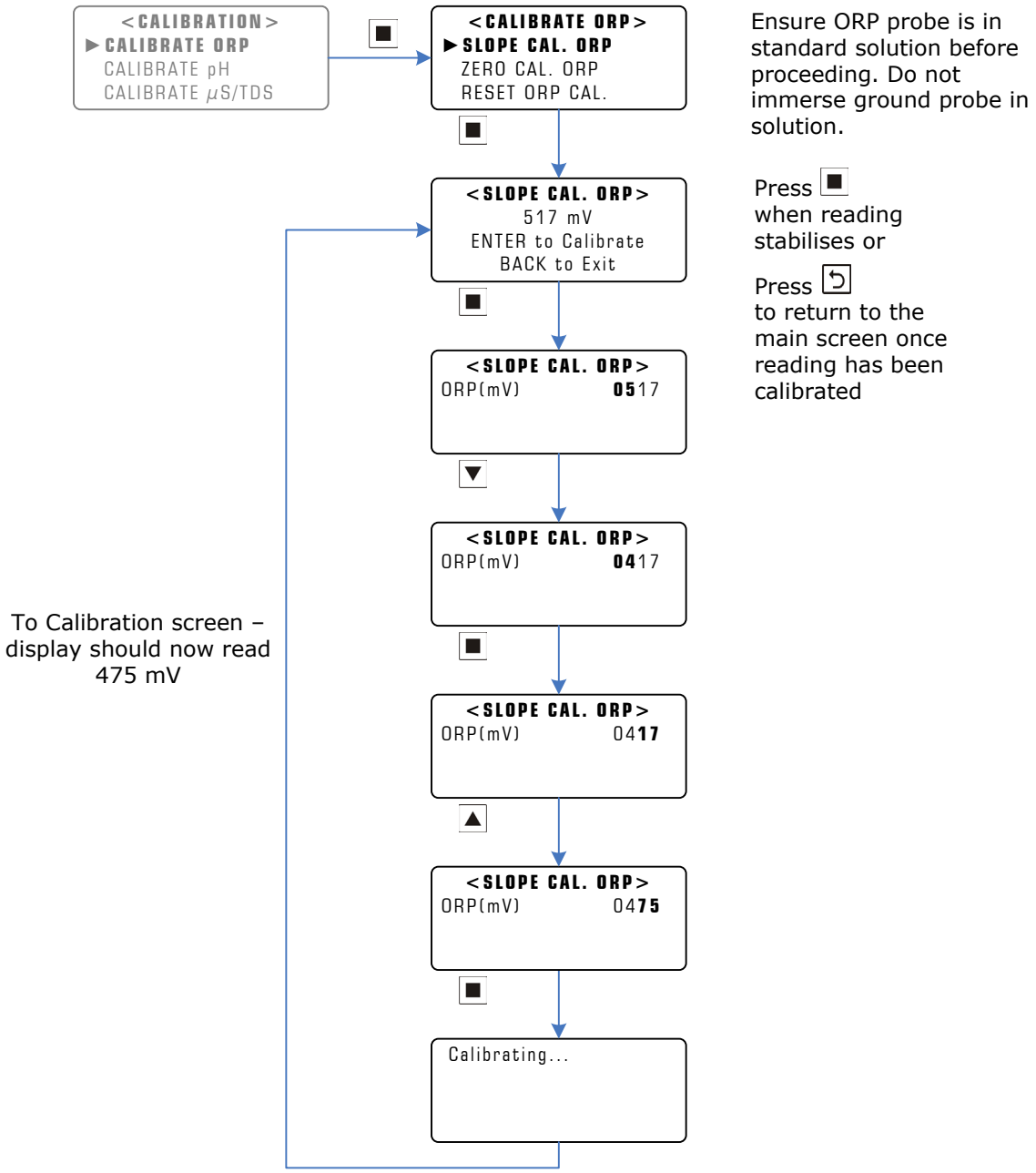
The ground probe is automatically enabled again when you exit ORP calibration.

Calibrating the ORP SLOPE

Main Menu > *CALIBRATION > CALIBRATE ORP > SLOPE CAL. ORP*

Before you proceed, set the mV simulator to the desired setting, or put the ORP sensor in the buffer solution.

IMPORTANT: Wait for the measured mV reading to stabilise before proceeding.



Example: Calibrating the ORP Slope Value from 517mV to 475mV

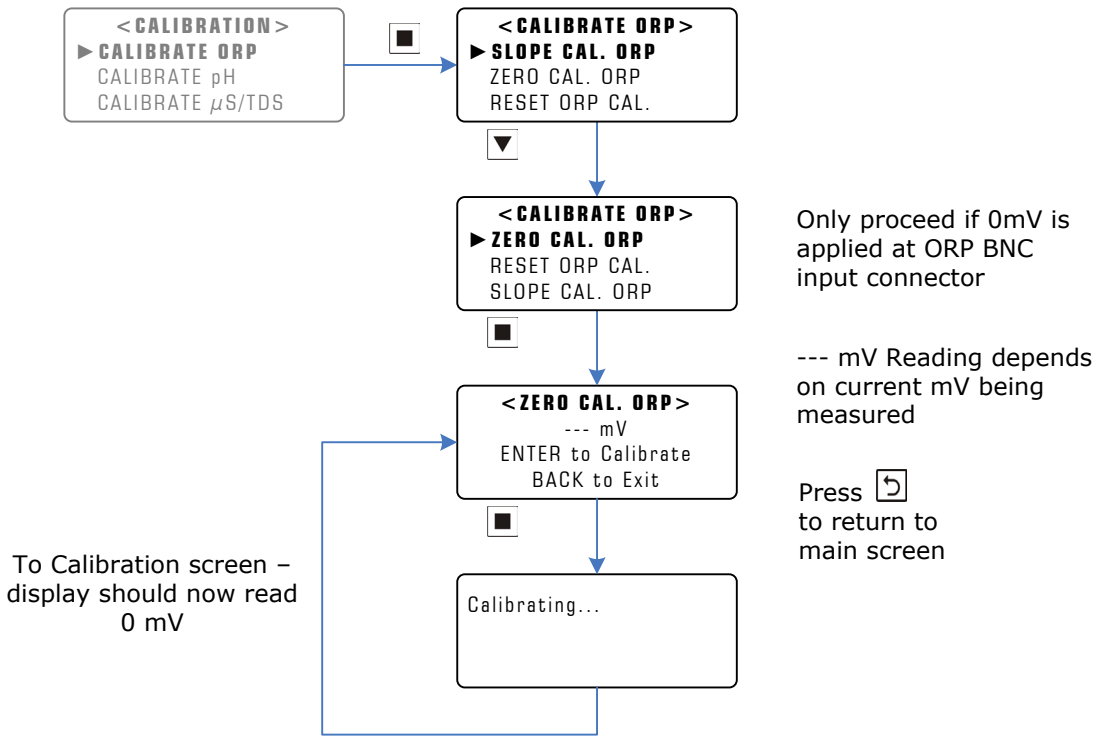
Calibrating the ORP ZERO

Main Menu > *CALIBRATION > CALIBRATE ORP > ZERO CAL. ORP*

The zero is factory set so should not require calibration. However, if you want to set the zero, you will require a mV simulator with a 0mV or pH7 setting. Alternatively, you can short circuit the BNC input for this procedure.

Before you proceed, set the mV simulator to the zero setting (pH7 setting = 0mV)

IMPORTANT: Wait for the measured mV reading to stabilise before proceeding. This reading should be very close to zero.

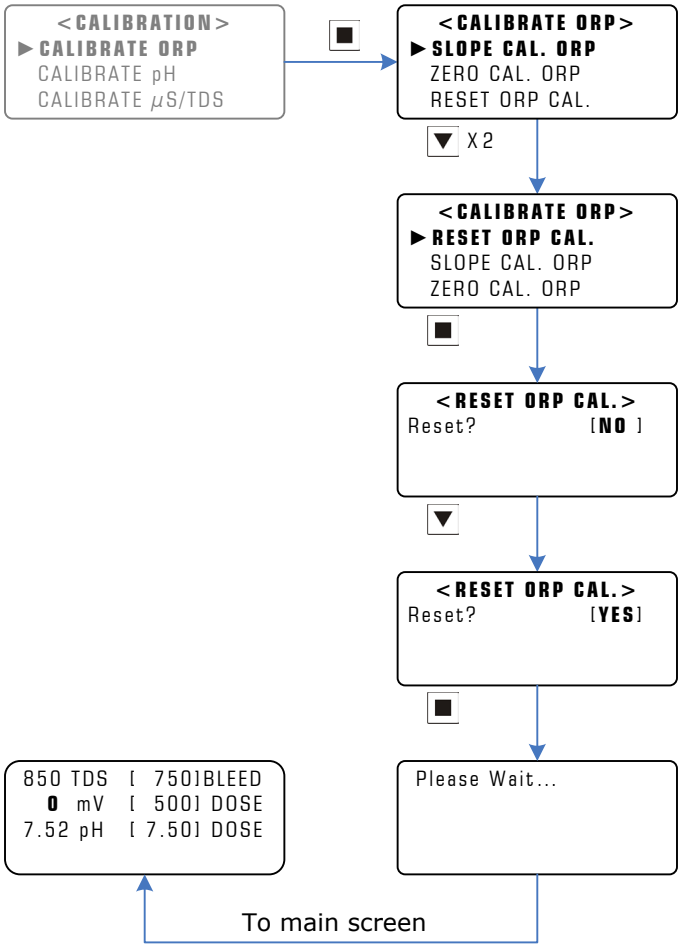


Calibrating the Zero for ORP

Resetting the ORP CALIBRATION

Main Menu > *CALIBRATION > CALIBRATE ORP > RESET ORP CAL.*

If you inadvertently calibrate the zero and/or slope to the incorrect values, and you cannot recover by repeating the normal calibration procedure, then you can reset the calibration and start again.



Resetting the ORP Calibration

4.3 4 pH Calibration

Main Menu > *CALIBRATION > CALIBRATE pH*

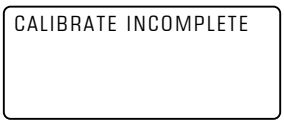
The controller should automatically detect what buffer you are using. If not, the pH sensor may be due for replacement or faulty, or the controller might require a calibration reset only or possibly a factory and calibration reset.

NOTE: When calibrating, if the measured pH still deviates from that of the buffer after pressing ENTER, then press the ENTER pushbutton again. This can be repeated until the reading becomes stable.

Please also note that if the ENTER button is not pressed after approximately 4 minutes, the controller will time-out and enter the main screen. Therefore, if a lengthy duration of calibration is required, please make sure the ENTER button is pressed at least once within a 4 minute time interval.

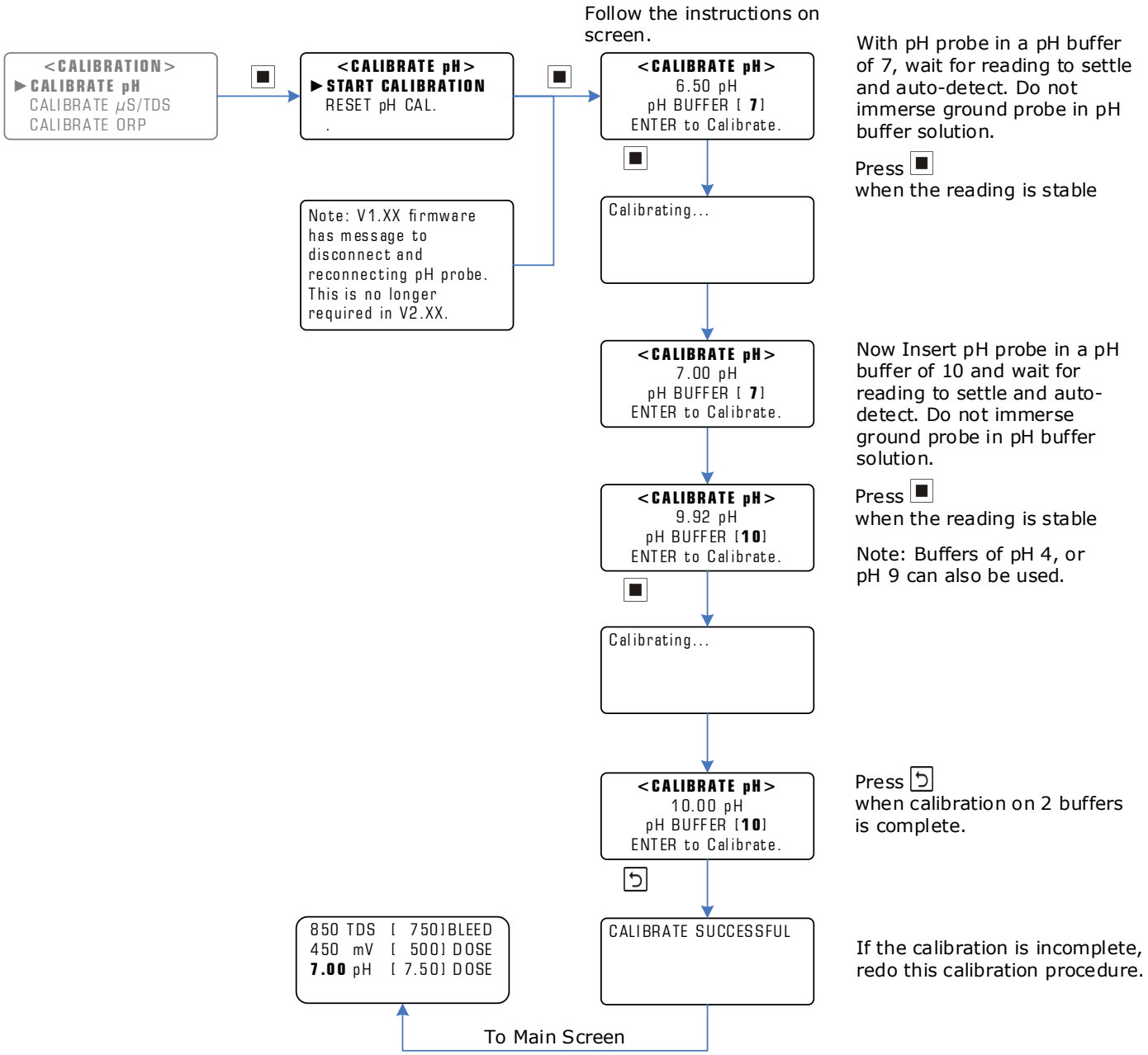
Please note that a buffer of 7 must always be used as one of the 2 buffers when calibrating pH. The second buffer can be either 4, 9 or 10.

If the calibration is not done successfully, the controller will momentarily display:



The controller will then exit to the main screen.
If this is the case, then repeat the calibration procedure.

See an example of pH calibration on the following page:

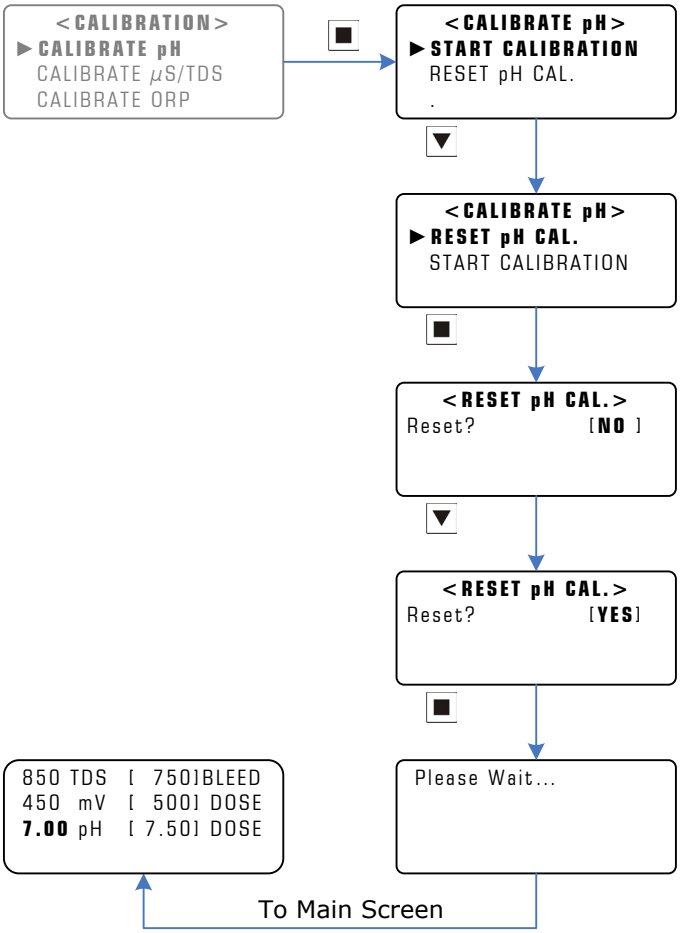


Example: Calibrating the pH for a reading of 6.5 pH in a 7 pH Buffer Solution, and a 9.92 pH reading in a pH Buffer Solution of 10 pH

Resetting the pH CALIBRATION

Main Menu > *CALIBRATION > CALIBRATE pH > RESET pH CAL.*

NOTE: Once a pH Reset has been done, a pH calibration will be required.

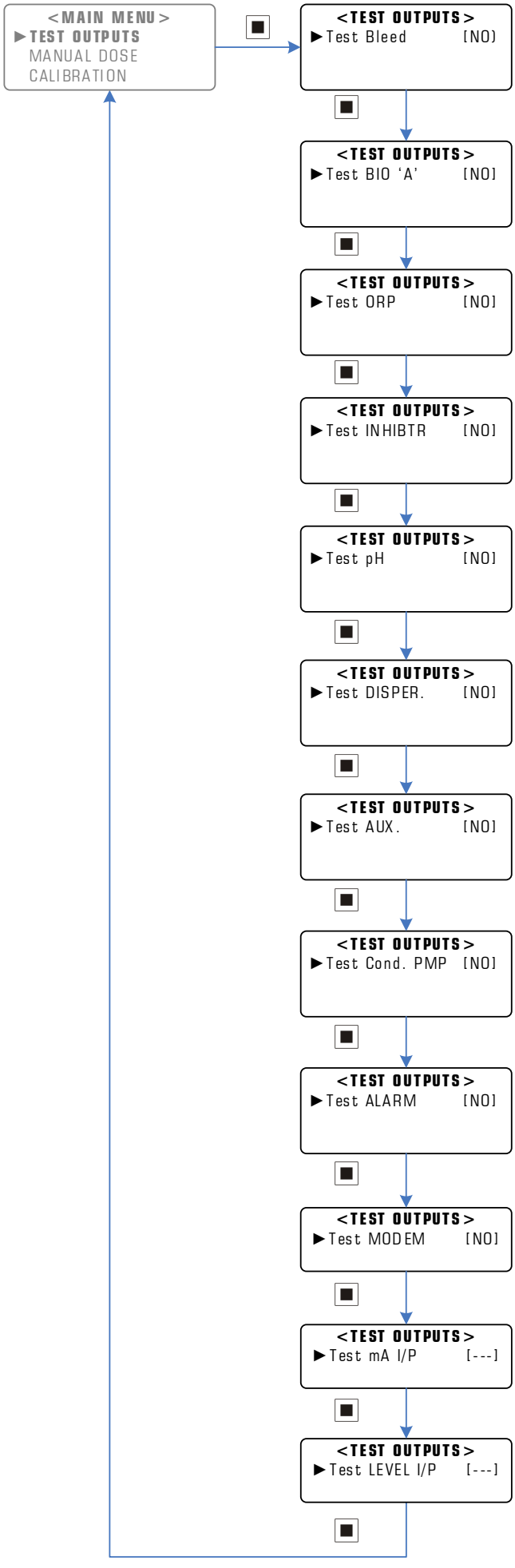


Resetting the pH Calibration

4.4 Testing Relay Outputs

Main Menu > *TEST OUTPUTS*

Please see the following page for testing outputs:



Press ▼ or ▲ to turn on

Press ■ to move on to test the next output

Press ⮌ to return to main menu at any time

If ORP is disabled, Test BIO 'B' will be displayed

(Ver. 0.83 and later)

(Ver. 2.13 and later) [---] is displayed if Remote Coms is not enabled or mA input or Level cards not detected.

Test Outputs

When any of the Outputs are activated, the Output relay switches, applying 240Vac power onto the output terminal, which activates the pump or solenoid valve wired to it.

When the Alarm Output is activated, the relay de-energises, switching the Common from the Normally Open Contact to the Normally Closed contact of the Alarm relay.

When REMOTE COMMS is enabled in the menu, the MODEM can be tested. The controller attempts to connect to the Internet if the MODEM is installed.

If mA or Level inputs cards are installed, the Test mA I/P and Test LEVEL I/P outputs can be tested respectively. When either are enabled, the main screen is displayed with the raw value of the current mA reading on the bottom line.

Refer to the instruction manual of DP-OPT-CARD-IP or DP-OPT-CARD-IP-mA-2 for more information on what is displayed.

NOTES:

1. If any output is activated manually without reverting to the de-activated state, the controller will automatically turn the output off 2 minutes after no pushbutton activity.
2. If you wish to drive an output for longer than 2 minutes, activate the MANUAL DOSE function within the MAIN MENU
3. The outputs should all switch on when tested, regardless of the flow condition.
4. Do not switch the Cond. PMP relay rapidly ON and OFF, if powering the condenser pump of the cooling tower.

4.5 Manual Dose

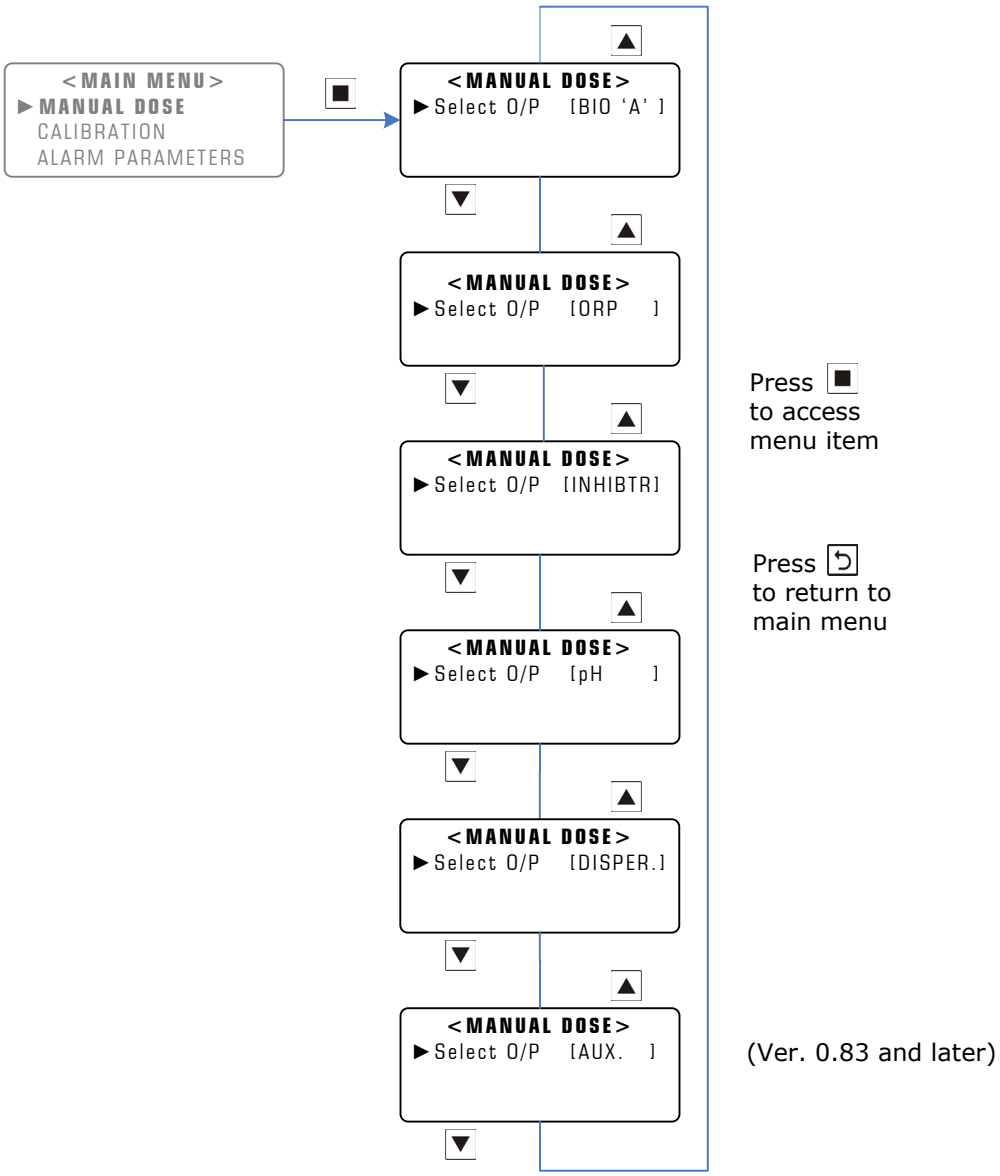
Main Menu > *MANUAL DOSE*

To perform an unattended slug dose of chemical, simply program the dose time (up to 99 minutes, in 1 minute increments) for any output.

NOTES:

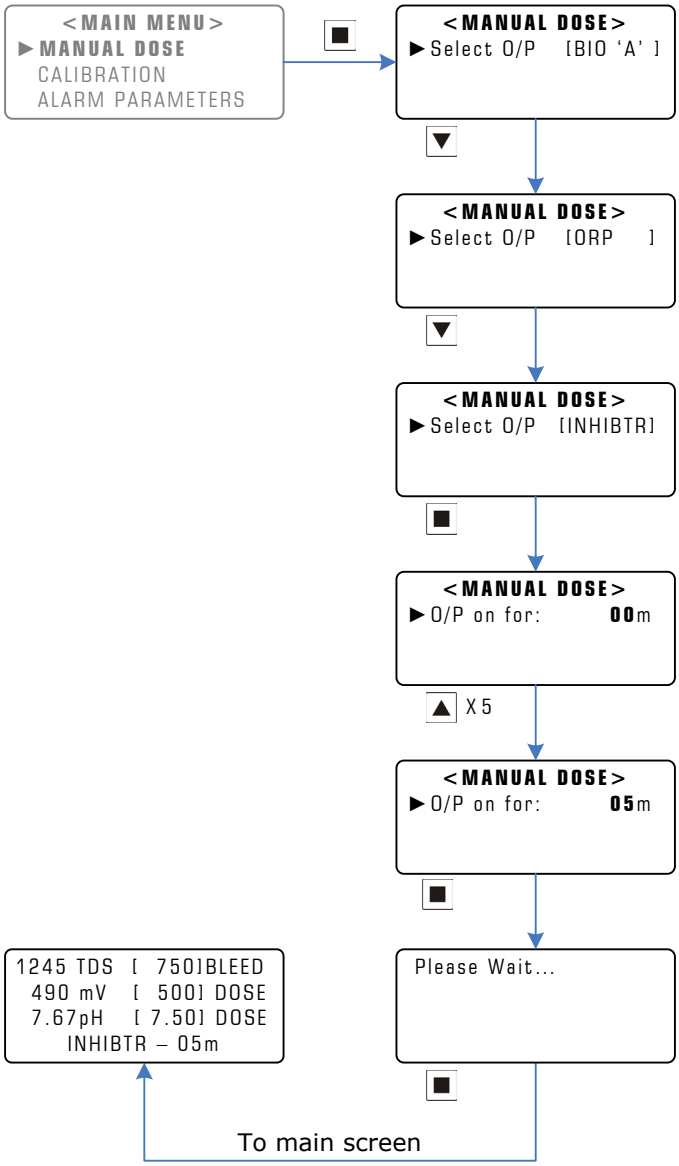
- For any manual dose, the pump will dose even if there is no flow.
- The condenser pump will turn on automatically during any manual dose.
- To cancel a manual dose, press and hold the ENTER (Reset) pushbutton.

The Manual Dose Menu is shown on the following page:



Manual Dose

An example of Manual Dosing the Inhibitor is shown on the following page:



Example: Manual Dosing the Inhibitor for 5 minutes

NOTES: For any manual dose, the pump will dose even if there is no flow. The condenser pump will turn on automatically during any manual dose.

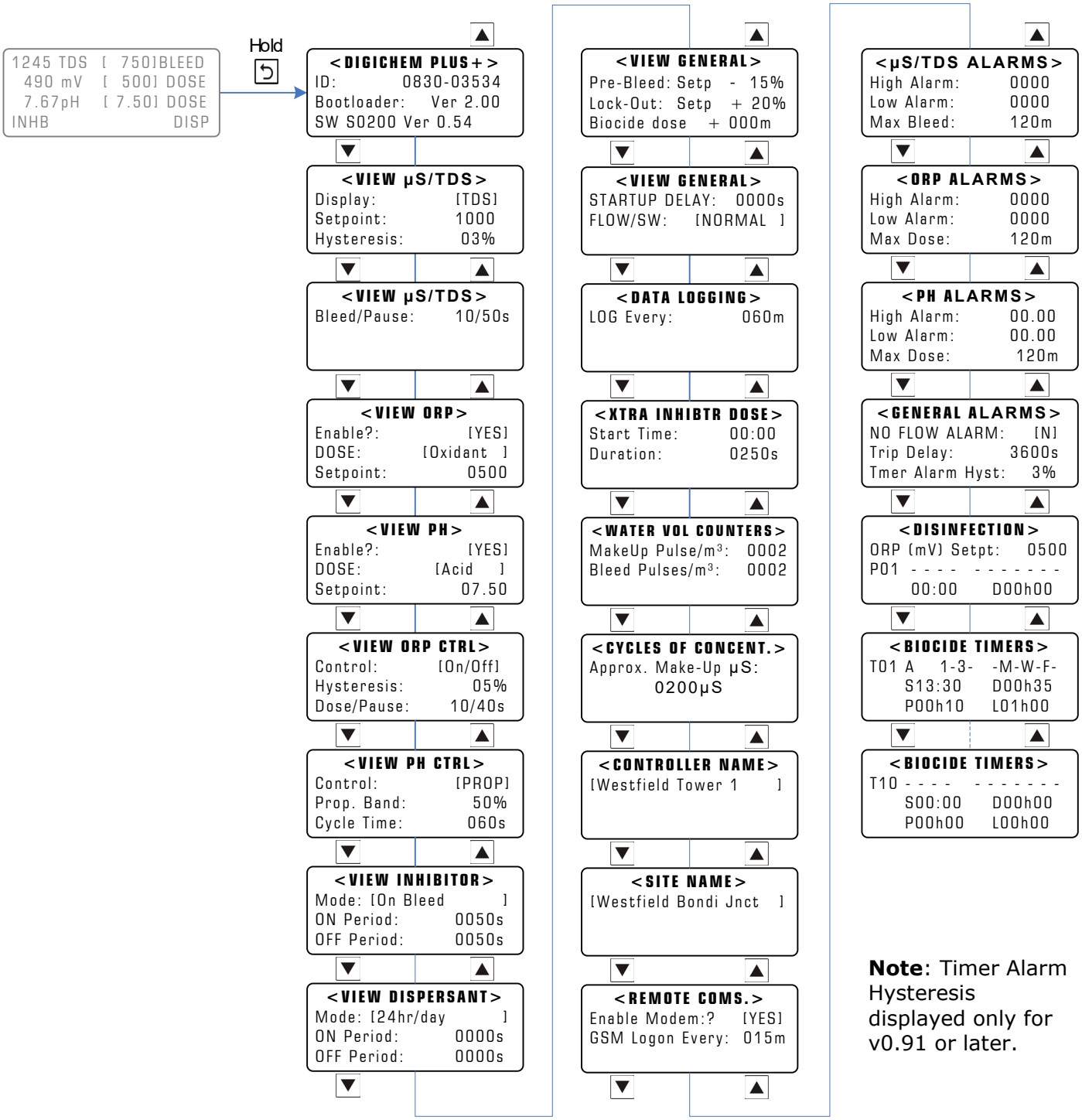
To cancel a manual dose, press and hold the ENTER (Reset) pushbutton.

When a manual dose is active the main screen will display the output and the time left for the relevant output at the bottom of the display, e.g. "INH – 01m" if the Inhibitor output will be active for 1 minute.

4.6 View Settings

Main Display > *VIEW SETTINGS*

To view all the settings, you have programmed into the controller without going into the menus themselves, you can simply scroll up and down to view them all, as illustrated below:



Note: Timer Alarm Hysteresis displayed only for v0.91 or later.

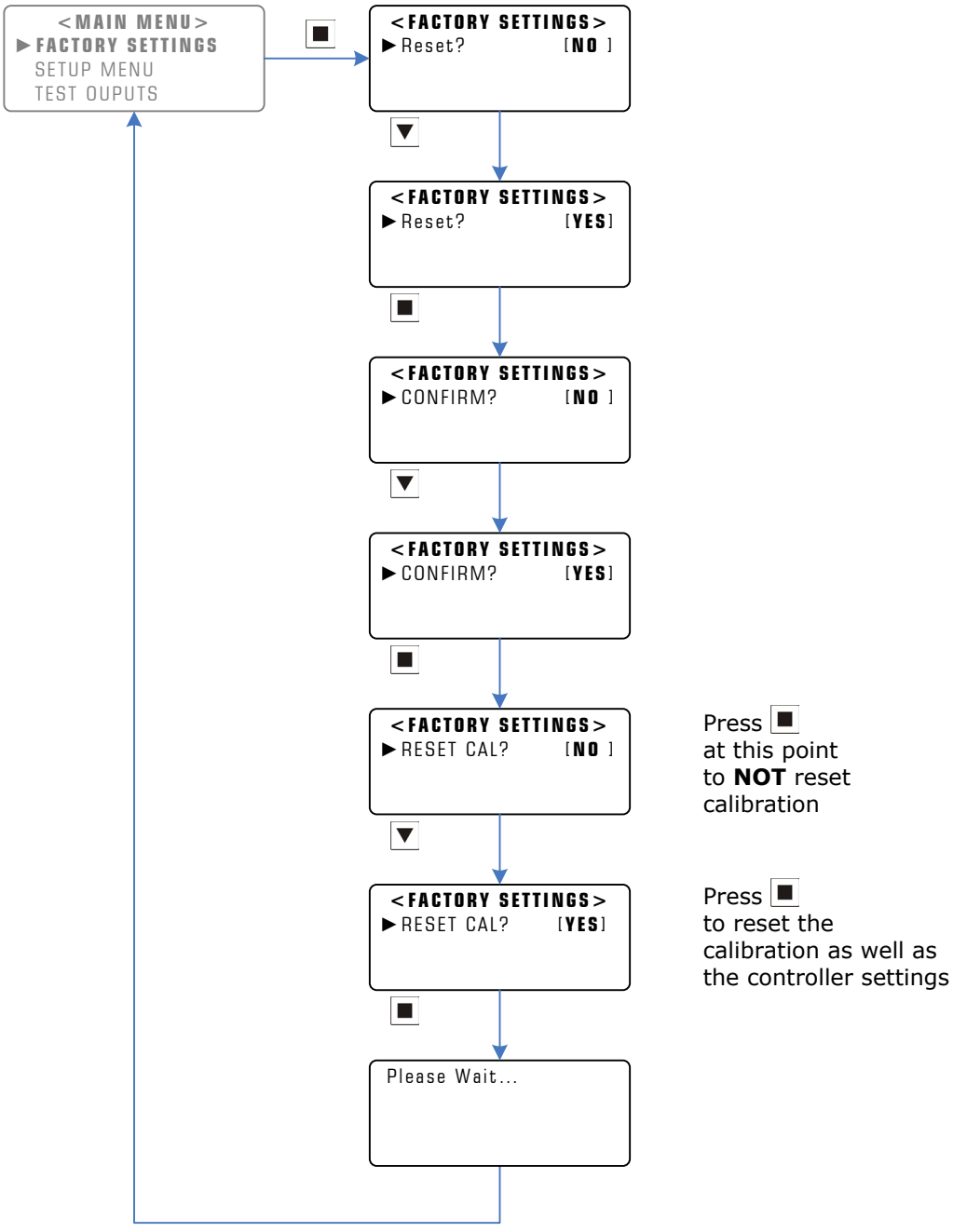
View Settings Menu

4.7 Factory Settings

Main Menu > *FACTORY SETTINGS*

CAUTION:

- Enter this part of the program ONLY if you wish to erase your program settings.
- The default settings (listed in Section 6 of this manual) most likely will not suit your application, so it will be necessary to reprogram the controller with your desired settings.
- This menu gives the option of resetting the calibration as well.



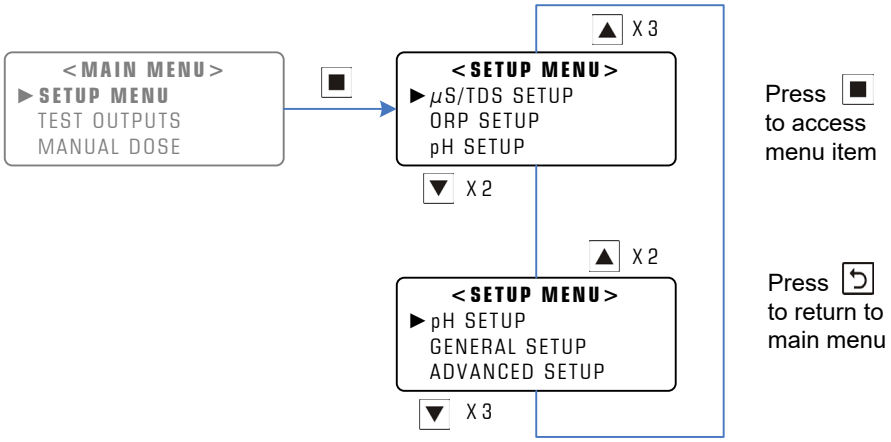
Factory and Calibration Reset

5. Programming Setup Menu

Main Menu > *SETUP MENU*

IMPORTANT:

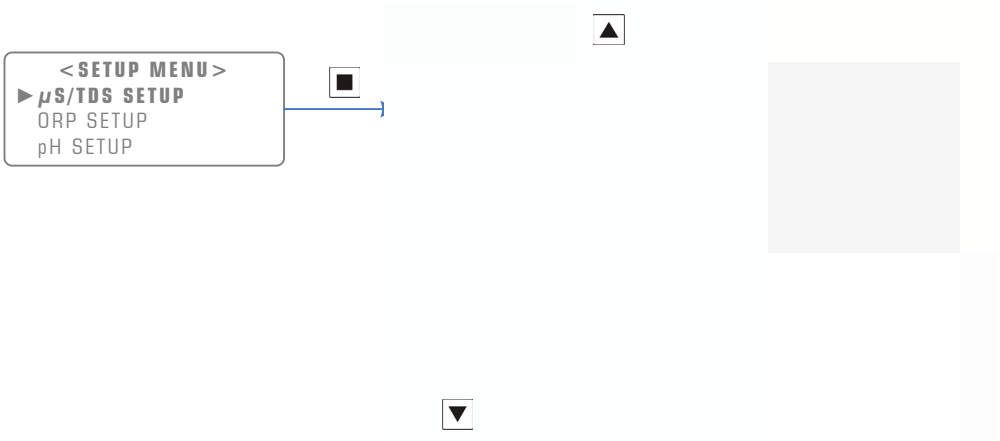
- Once settings are changed, it is necessary to exit the SETUP MENU to save your settings.
- Setup Menu Structure illustrated as follows:



Setup Menu

5.1 µS/TDS Setup

Main Menu > *SETUP MENU > µS/TDS SETUP*



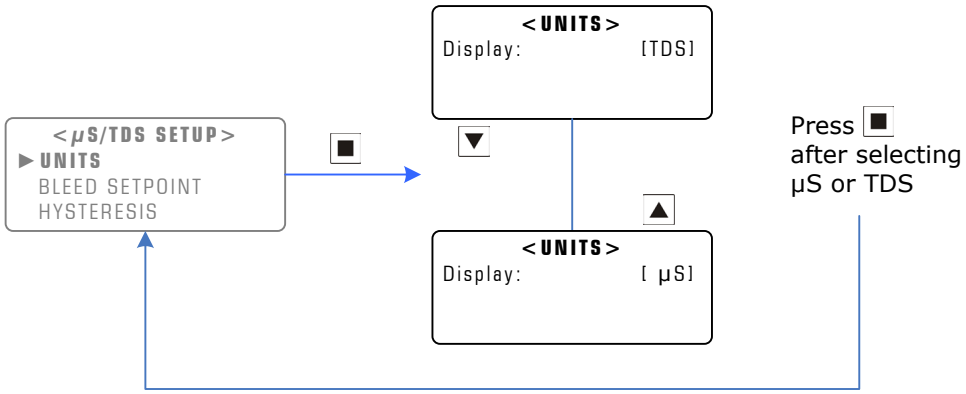
µS / TDS Setup Menu

5.1.1 Set Conductivity Units

Main Menu > *SETUP MENU > µS/TDS SETUP > UNITS*

Conductivity can be displayed in either:

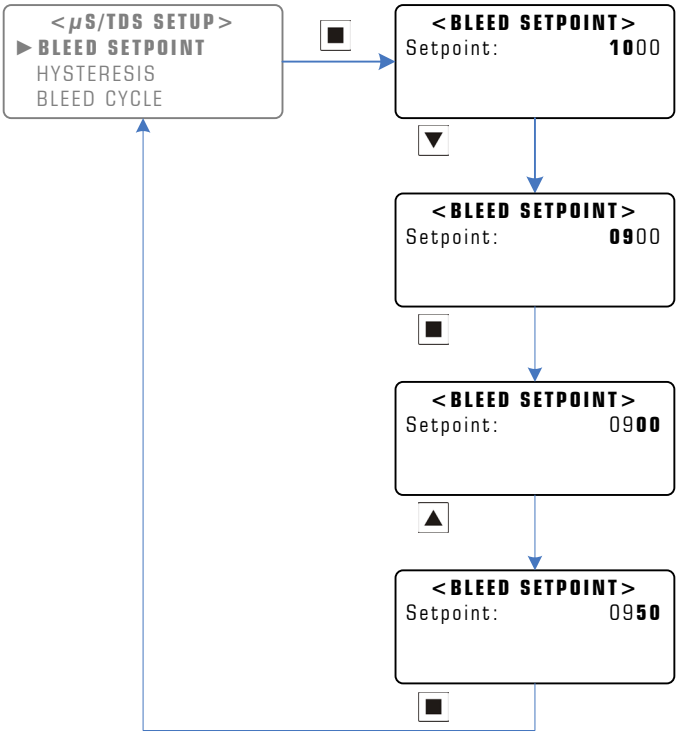
- TDS (Total Dissolved Solids), or
- µS (Micro-siemens)



NOTE: The displayed units should be selected before performing any calibration or programming of the unit.

5.1.2 Set Bleed Setpoint

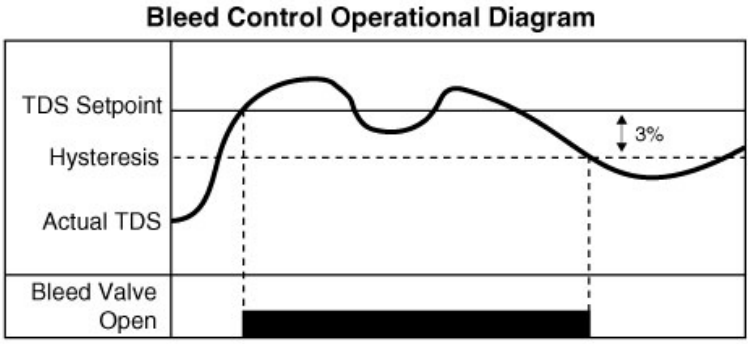
Main Menu > *SETUP MENU > µS/TDS SETUP > BLEED SETPOINT*



Example: Decreasing Setpoint from 1000 TDS to 950 TDS

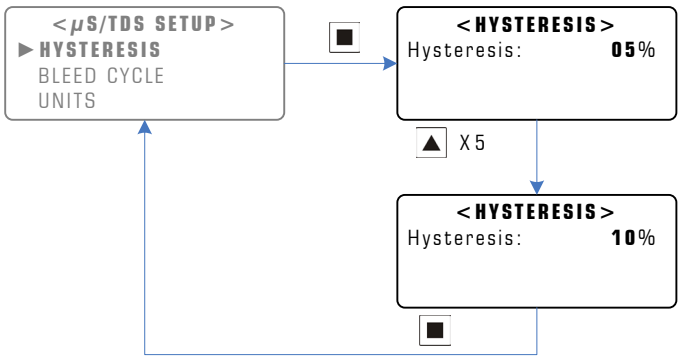
The Bleed Setpoint is the desired conductivity value of the process (displayed in TDS or µS). When a solenoid valve is connected to the bleed

output, the valve opens when the conductivity rises above the setpoint. When this occurs, the tower water is flushed to drain and fresh make-up water dilutes the system, thus lowering the conductivity of the tower water. The valve shuts when the conductivity drops to the Hysteresis value (explained in the next section). The cycle repeats.



5.1.3 Set Conductivity Hysteresis

Main Menu *> SETUP MENU > µS/TDS SETUP > HYSTERESIS*



Example: Increasing Hysteresis from 5% to 10%

Hysteresis is the deadband between the two conductivity points at which the solenoid valve opens and closes. The solenoid valve opens when the conductivity rises above the programmed setpoint and shuts when it drops to a level below the setpoint. This level is called Hysteresis and is a % of the setpoint.

NOTE: The maximum Hysteresis setting for the Conductivity, pH, and ORP is 20%.

5.1.4 Set Conductivity Bleed Cycle

Main Menu > *SETUP MENU > µS/TDS SETUP > BLEED CYCLE*

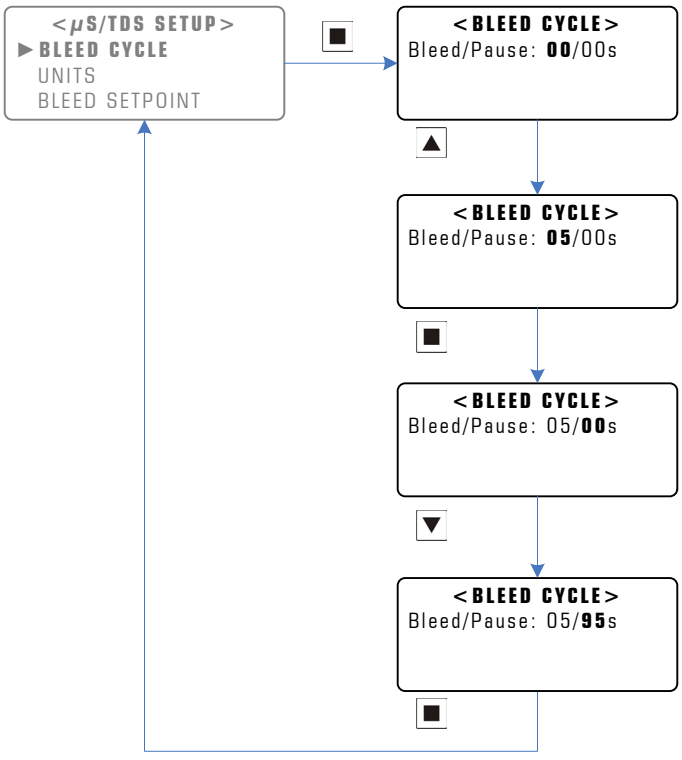
When the controller calls for bleed, the solenoid valve can be programmed to bleed continuously or on a cycle until it reaches the Conductivity Setpoint. To leave the Bleed Cycle in its disabled state, proceed to the next section. If you wish to program a bleed cycle, then proceed as follows:

The menu asks for a Bleed Time and a Pause Time to be programmed. The Pause Time follows the Bleed Time, and the cycle is repeated until the Setpoint minus Hysteresis is reached.

A bleed cycle can prevent excessive tower drainage in a very small system and allows the make-up to efficiently mix with the cooling tower water.

The ability to cycle is also useful because it prevents flooding by slowing down the bleed flow rate into a blocked drain.
Another benefit is to force more return water back to the tower basin when chemical is dosed into the tower manifold during a long bleed duration.

An example of a Bleed / Pause setup is shown below.
The solenoid bleeds 5 seconds during every 100 second cycle (ie 5 out of 100), which equates to a 5% bleed cycle.



Example: Programming a bleed cycle of 5 seconds bleed, followed by a pause of 95 seconds

If you wish to have the control output continuously active during bleed (rather than cycling ON and OFF), simply set the Bleed/Pause times to 00/00s

NOTES:

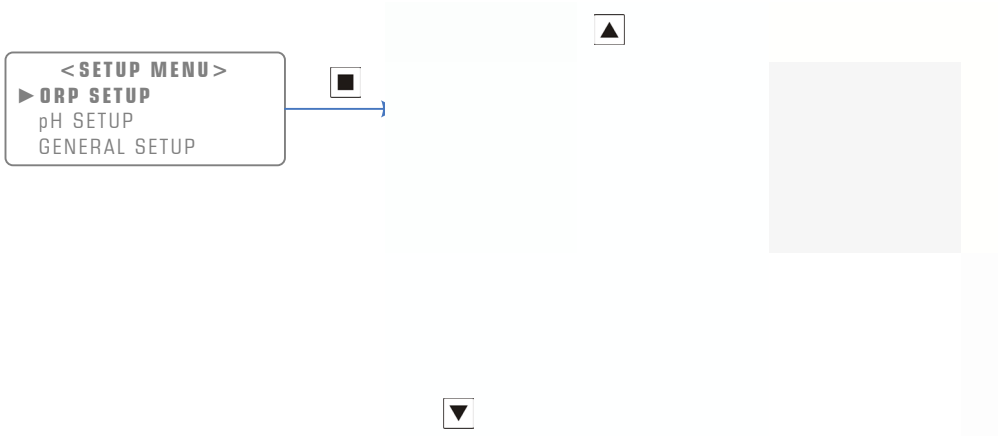
If the conductivity is greater than 25% above the programmed setpoint, then the controller automatically adjusts the ON/OFF bleed cycle to bring it to setpoint more quickly.

If Inhibitor is set to "Dose on Bleed" mode, and an ON/OFF cycle for Inhibitor is programmed, then the Inhibitor ON/OFF cycle only occurs during the ON part of the Bleed Cycle. This means Inhibitor will only dose when the bleed valve is actually opened and passing water. During the OFF part of the Bleed Cycle, Inhibitor dosing is suspended.

5.2 ORP Setup

Main Menu *> SETUP MENU > ORP SETUP*

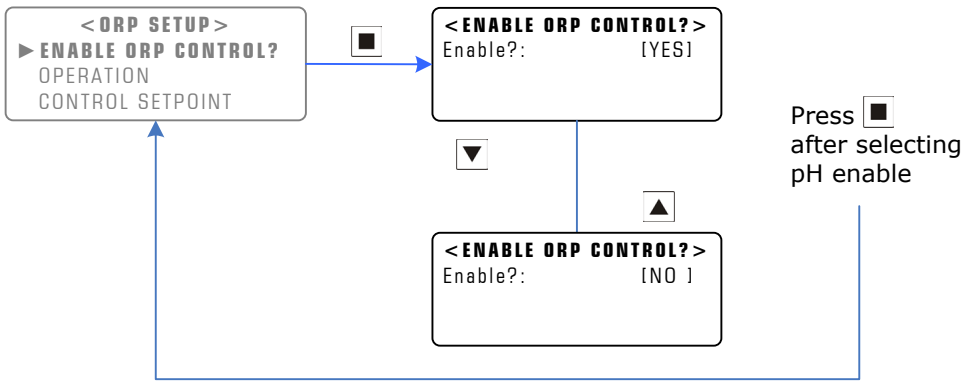
NOTE: For ORP Control Method Setup, please refer to section 5.4



In the example above, if ORP control method is set to Proportional Control, then instead of Hysteresis and Dose Cycle being displayed, Proportional Band and Control Cycle will be displayed as the last two menu options.

5.2.1 Enable / Disable ORP Control

The DIGICHEM Plus+ can be programmed to have the ORP control function enabled or disabled. See diagram below:

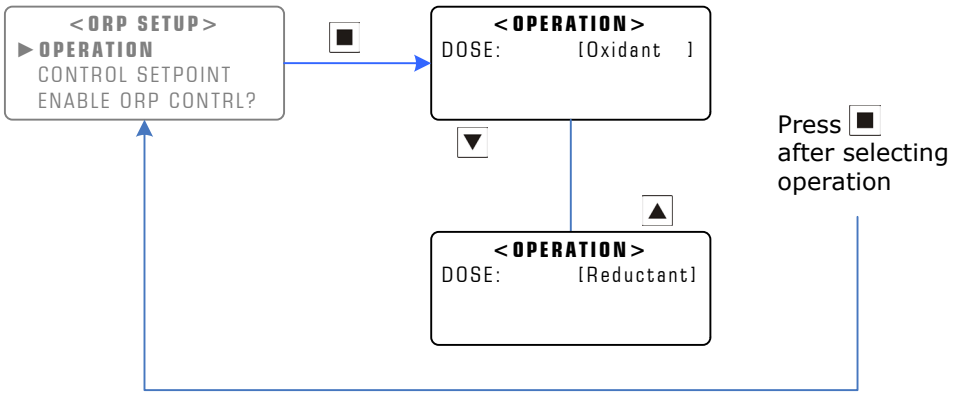


Important: High and Low ORP alarms are disabled when ORP control is Disabled

5.2.2 Select ORP Operation

Main Menu > *SETUP MENU > ORP SETUP > OPERATION*

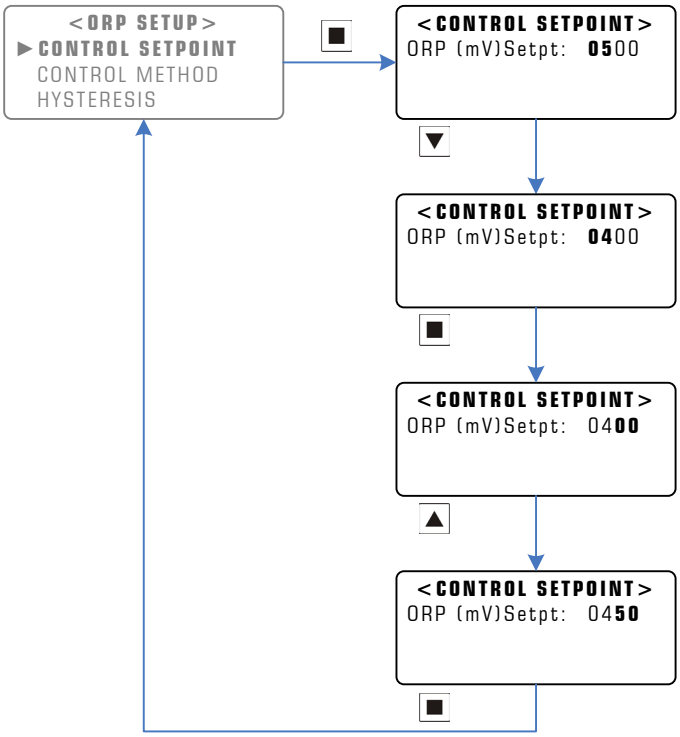
The DIGICHEM Plus+ controller can dose either an oxidant to increase the ORP, or a reductant to decrease the ORP. Only one or the other can be selected. For cooling tower dosing applications, ORP control is always achieved by dosing Oxidant.



5.2.3 Set ORP Setpoint

Main Menu > *SETUP MENU > ORP SETUP > CONTROL SETPOINT*

The ORP Setpoint is the desired ORP value of the process (displayed in mV).

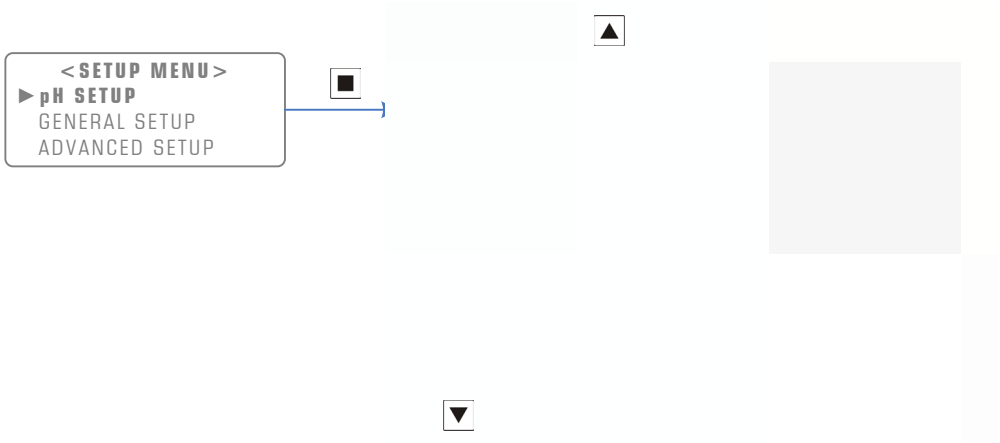


Example: Decreasing ORP Setpoint from 500mV to 450mV

5.3 pH Setup

Main Menu > *SETUP MENU > pH SETUP*

NOTE: For pH Control Method Setup, please refer to section 5.4



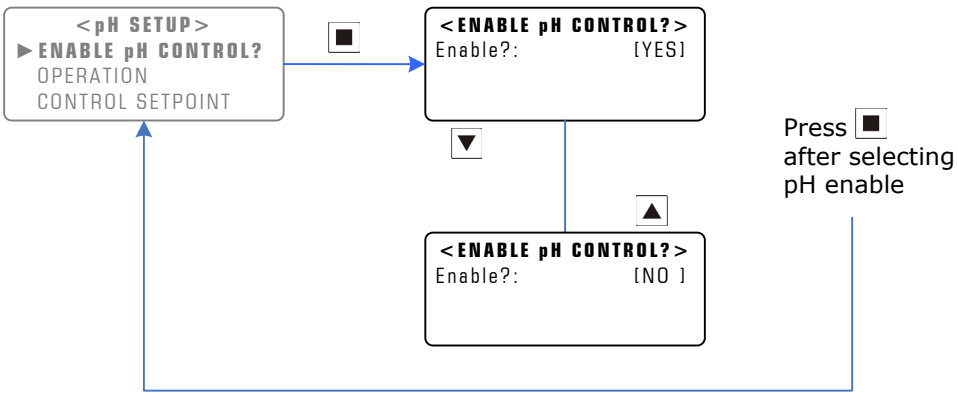
pH Setup Menu for Proportional Control

In the example above, if pH control method is set to On/Off Control, then instead of Proportional Band and Control Cycle being displayed, Hysteresis and Dose Cycle will be displayed as the last two menu options.

5.3.1 Enable / Disable pH Control

Main Menu > *SETUP MENU > pH SETUP > ENABLE pH CONTROL?*

The DIGICHEM Plus+ can be programmed to have the pH control function enabled, or disabled. See diagram below:

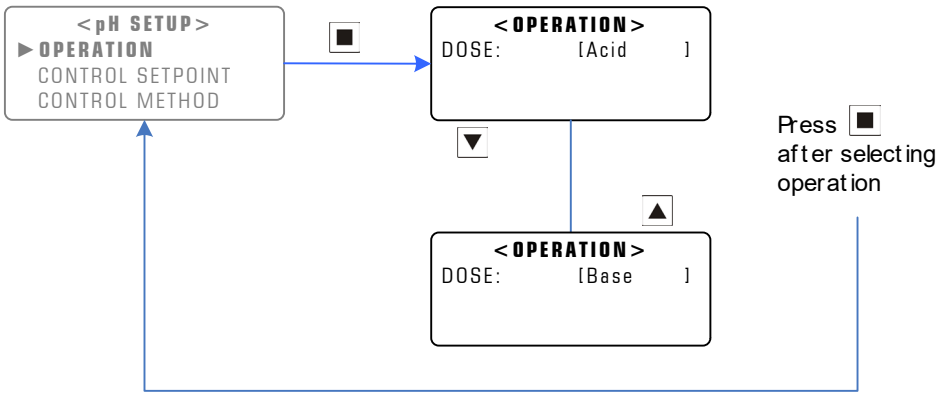


Important: High and Low pH alarms are disabled when ORP control is Disabled

5.3.2 Select pH Operation

Main Menu > *SETUP MENU > pH SETUP > OPERATION*

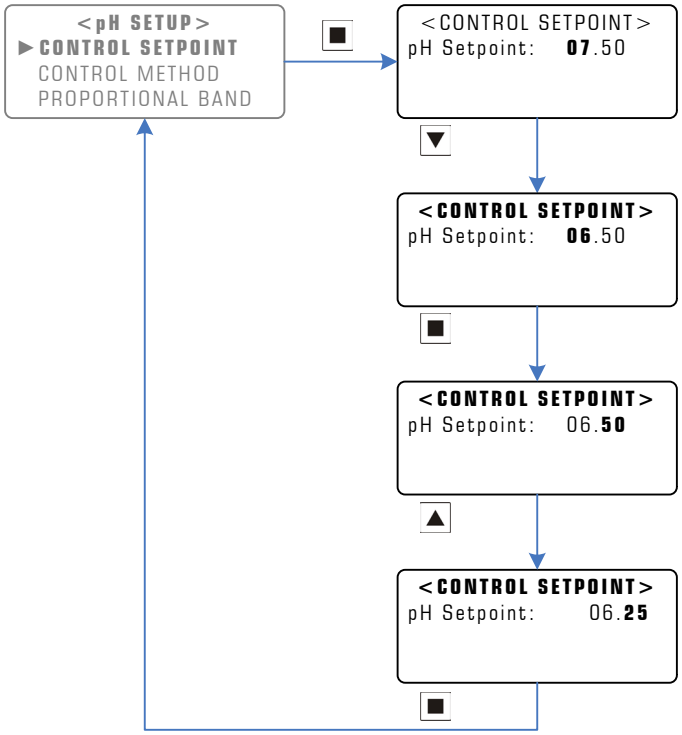
The DIGICHEM Plus+ controller can dose either an Acid (eg. Sulphuric Acid) to lower the pH, or a Base (eg. Sodium Hydroxide) to increase the pH. Only one or the other can be selected:



5.3.3 Set pH Setpoint

Main Menu > *SETUP MENU > pH SETUP > CONTROL SETPOINT*

The pH Setpoint is the desired pH value of the process:



Example: Decreasing setpoint from 7.50pH to 6.25pH

5.4 pH and ORP Control Method Setup

Main Menu > SETUP MENU > ORP SETUP > CONTROL METHOD
or:
Main Menu > SETUP MENU > PH SETUP > CONTROL METHOD

The DIGICHEM Plus+ controls the pH and the ORP independently with On/Off or Proportional control methods.

These 2 methods of control will be discussed below, namely:

- **ON/OFF control** with programmed Dose Cycle (i.e. modulation), or
- **PROPORTIONAL control** via automatically varying the duty cycle

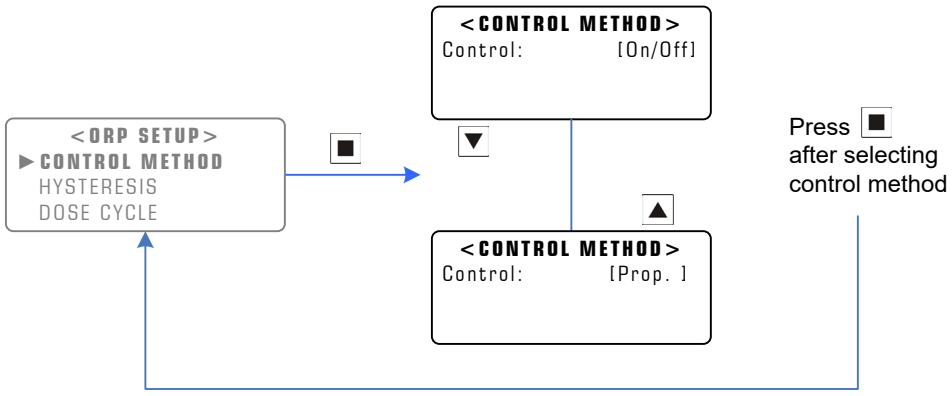
With **ON/OFF control**, the controller either turns the pump on continuously when correcting the pH/ORP or modulates the pump by turning the pump ON and OFF during the dosing period. The On period and Off periods are programmable.

With **proportional control**, the dosing algorithm modulates the pump based on a percentage pH variation from the Setpoint. The further the pH / ORP is from the Setpoint, the shorter the OFF period is with respect to the ON period. The closer the pH/ORP is to the Setpoint, the longer the OFF period is with respect to the ON period. The control cycle and the proportional band are programmable.

5.4.1 Setting the Control Method

Set the control method as follows:

Main Menu > SETUP MENU > ORP SETUP > CONTROL METHOD

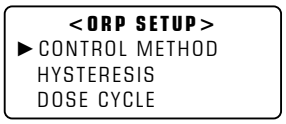


Example: Setting the ORP Control Method from On/Off to Proportional

5.4.2 On/Off Control

For On/Off Control, the menu structure will be different to that of Proportional Control. For the Control Method set to On/Off Control, the menu structure is shown below for the ORP setup:

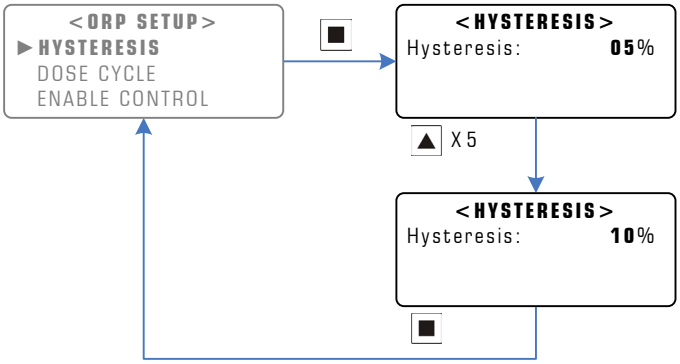
Note: The same can be applied to the pH Setup menu.



Now set the Hysteresis of the controller:

NOTE: The maximum Hysteresis setting for the Conductivity, pH, and ORP is 20%.

Main Menu > *SETUP MENU > ORP SETUP > HYSTERESIS*



Example: Increasing the ORP Hysteresis from 5% to 10%

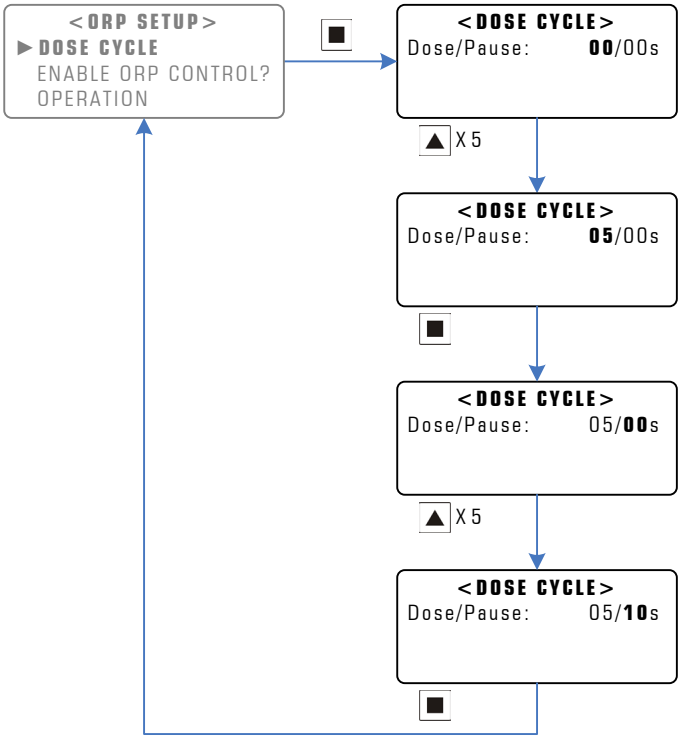
Tip: Set the Hysteresis to 1% if a dose cycle is required..

Now set the Dose Cycle of the controller:

Main Menu > *SETUP MENU > ORP SETUP > DOSE CYCLE*

When the controller calls for dosing, the pump(s) can be programmed to dose continuously or on a cycle until it reaches the pH and/or ORP Setpoints. A cycle is recommended to reduce overshoot, and to preserve the life of the pump(s).

The menu asks for a Dose Time and a Pause Time to be programmed. The Pause Time follows the Dose Time, and the cycle is repeated until the Setpoints plus/minus Hysteresis is reached. The diagram on the following page illustrates a dose cycle programmed for a 5 second dose followed by 10 second pause:



Example: Programming an ORP Dose cycle to Dose for 5 seconds, followed by a pause of 10 seconds

In the example above, the pump doses 5 seconds during every 15 second cycle (i.e. 5 out of 15 seconds), which equates to a 33% duty cycle.

The function of the dose cycle is to assist in reducing overshoot by achieving ORP (or pH) change more slowly. In a large system, there is often a lag after dosing until the ORP or pH sensor realises a change in actual value. The lag time estimated should be programmed as the Pause time.

Should the readout drift more than 25% away from the programmed Setpoint, the controller automatically doubles the Dose time and halves the Pause time to bring the ORP and/or pH within 25% of the Setpoint very quickly. As soon as the readout returns to within 25% of the Setpoint, normal pump duty cycle (i.e. programmed Dose/Pause times) will resume. In the example above, the Dose and Pause times will temporarily be 5 seconds each, where the pump(s) will dose for 5 seconds during every 15 second cycle, which equates to a 33% duty cycle.

If you wish to have the control output continuously active during dosing (rather than cycling ON and OFF), simply set the Dose/Pause times to 00/00s. However, it is recommended to then increase the Hysteresis to at least 5%.

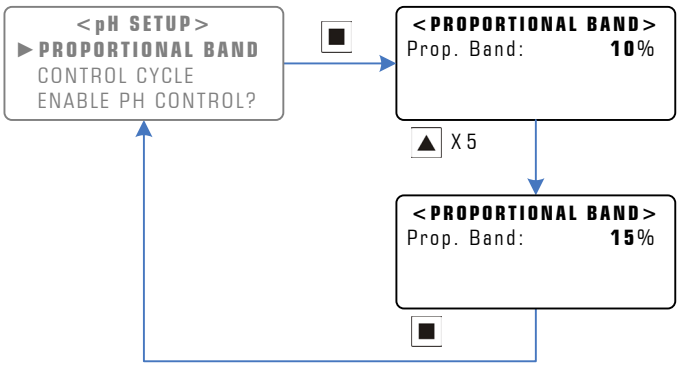
5.4.3 Proportional Control

For Proportional Control, the menu structure will be different to that of On/Off Control. For the Control Method set to Proportional Control, the menu structure is shown below for the pH setup:

Note: The same can be applied to the ORP Setup menu.

Now set the Proportional Band of the Controller:

Main Menu > *SETUP MENU > pH SETUP > PROPORTIONAL BAND*

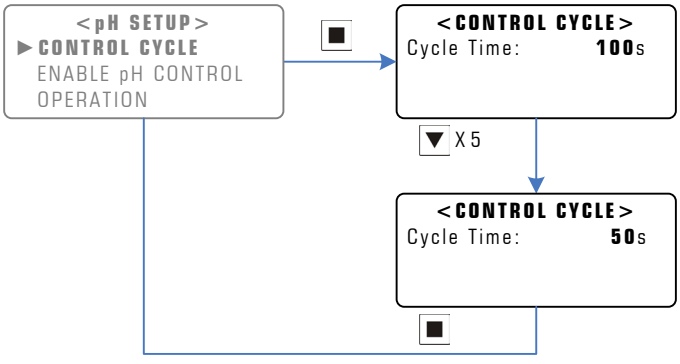


Example: Increasing pH Proportional Band from 10% to 15%

Now set the Control Cycle of the Controller:

Main Menu > *SETUP MENU > pH SETUP > CONTROL CYCLE*

Please see the diagram below for pH Control Cycle Setup:



Example: Decreasing the pH Proportional Control Cycle time from 100s to 50s

Whilst dosing, if the pH and/or ORP reading on the LCD changes very quickly, the Control Cycle will need to be as short as possible, eg 10 seconds. This will reduce overshoot, as the controller will be able to adjust its dose rate very quickly in responding to a rapidly changing pH and/or ORP.

Conversely, in a large system with a large volume of water, and a slow recirculation rate, the pH and/or ORP reading may take a long time to change after dosing occurs. In this case, it is better to have a longer Control Cycle, e.g. 100 seconds, to allow for the ORP reading to change, before further dosing takes place.

If unsure, set the control cycle to your best estimate of the time it takes for the water where the chemical is injected into, to get back to the pH and/or ORP sensors.

5.4.4 Explanation of pH Control Methods

The DIGICHEM Plus+ features 2 methods of pH control:

- **ON/OFF control** with programmed Dose Cycle (ie modulation), or
- **PROPORTIONAL control** via automatically varying duty cycle

On/Off pH Control Explanation:

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.

Hysteresis prevents rapid switching of the pump on and off when the system pH hovers around the Setpoint. Hysteresis is the difference between the two pH points at which the pump starts and the pump stops. Hysteresis is programmed as a percentage of the Setpoint, is only applicable to ON/OFF control, and is usually only required to be greater than 1% if no dose cycle is programmed.

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 (i.e.. 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 (i.e.. 7.00pH plus 0.35pH).

Proportional pH Control Explanation:

With proportional control, the controller will always attempt to keep the pH as close as possible to the Setpoint. For proportional control to work, the controller requires the Setpoint as well as 2 other parameters to be programmed:

- The Proportional Band, and
- The Control Cycle

The **Proportional Band**, set as a percentage of the Setpoint, is the band in which proportional control takes place. For example, if the Setpoint = 7.00 pH, and the Proportional band is 10%, then proportional control takes place between 7.00 pH and 7.70 pH (dosing acid) or between 7.00 pH and 6.30 pH (dosing base).

Once the Setpoint is reached, the control output is OFF continuously. Outside of the proportional band on the opposite end, the control output is ON continuously.

Proportional control, which takes place within the proportional band is explained as follows:

Assuming a pump is connected to the control output, the controller will modulate the power supply to the dosing pump proportionally. This modulation is an ON/OFF cycle (called the **Control Cycle**) where the ON/OFF ratio reduces the closer the pH is to the Setpoint (i.e. The ON time is much shorter than the OFF time). Conversely, if the pH starts drifting away from the Setpoint (but still within the proportional band), the ON time starts getting longer with respect to the OFF time.

NOTE: (v0.71 or later) If using the pH Dose Timer Alarm operating in Proportional control, the timer will cancel if the measured pH reaches 97% of the pH Setpoint, rather than cancelling at the actual Setpoint itself.

5.4.5 Explanation of ORP Control Methods

The DIGICHEM Plus+ features 2 methods of ORP control:

- **ON/OFF control** with programmed Dose Cycle (ie modulation), or
- **PROPORTIONAL control** via automatically varying duty cycle

On/Off ORP Control Explanation:

If **dosing oxidant**, the pump will dose when the ORP readout drops below the ORP SETPOINT . Dosing will stop once the readout rises above the ORP SETPOINT plus the Hysteresis percentage. (This percentage is the Hysteresis value and is a percentage of the SETPOINT). Cooling tower applications require dosing an Oxidant to increase the ORP.

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

Hysteresis prevents rapid switching of the pump on and off when the system ORP hovers around the Setpoint. Hysteresis is the difference between the two mV points at which the pump starts and the pump stops. Hysteresis is programmed as a percentage of the Setpoint, is only applicable to ON/OFF control, and is usually only required to be greater than 1% if no dose cycle is programmed.

For example, if the SETPOINT is 500 mV and the Hysteresis value is 5%, then the calculated Hysteresis value is 25 mV.

If dosing oxidant, the pump will be activated when the ORP drops below 500 mV and will stop when the ORP rises above 525 mV (i.e. 500 mV plus 25 mV).

If dosing reductant, the pump will be activated when the ORP rises above 500 mV and will stop when the ORP drops to 475 mV (i.e. 500 mV minus 25 mV).

Proportional ORP Control Explanation:

With proportional control, the controller will always attempt to keep the ORP as close as possible to the Setpoint. For proportional control to work, the controller requires the Setpoint as well as 2 other parameters to be programmed:

- The Proportional Band, and
- The Control Cycle

The **Proportional Band**, set as a percentage of the Setpoint, is the band in which proportional control takes place. For example if the Setpoint = 500 mV, and the Proportional band is 10%, then proportional control takes place between 500 mV and 550 mV (dosing reductant) or between 500 mV and 450 mV (dosing oxidant).
Once the Setpoint is reached, the control output is OFF continuously.

Outside of the proportional band on the opposite end, the control output is ON continuously.

Proportional control, which takes place within the proportional band is explained as follows:

Assuming a pump is connected to the control output, the controller will modulate the power supply to the dosing pump proportionally. This modulation is an ON/OFF cycle (called the Control Cycle) where the ON/OFF ratio reduces the closer the ORP is to the Setpoint (i.e. The ON time is much shorter than the OFF time). Conversely, if the ORP starts drifting away from the Setpoint (but still within the proportional band), the ON time starts getting longer with respect to the OFF time.

NOTE: If using the ORP Dose Timer Alarm operating in Proportional control, the timer will cancel if the measured ORP reaches 97% of the ORP Setpoint, rather than cancelled at the actual Setpoint itself.

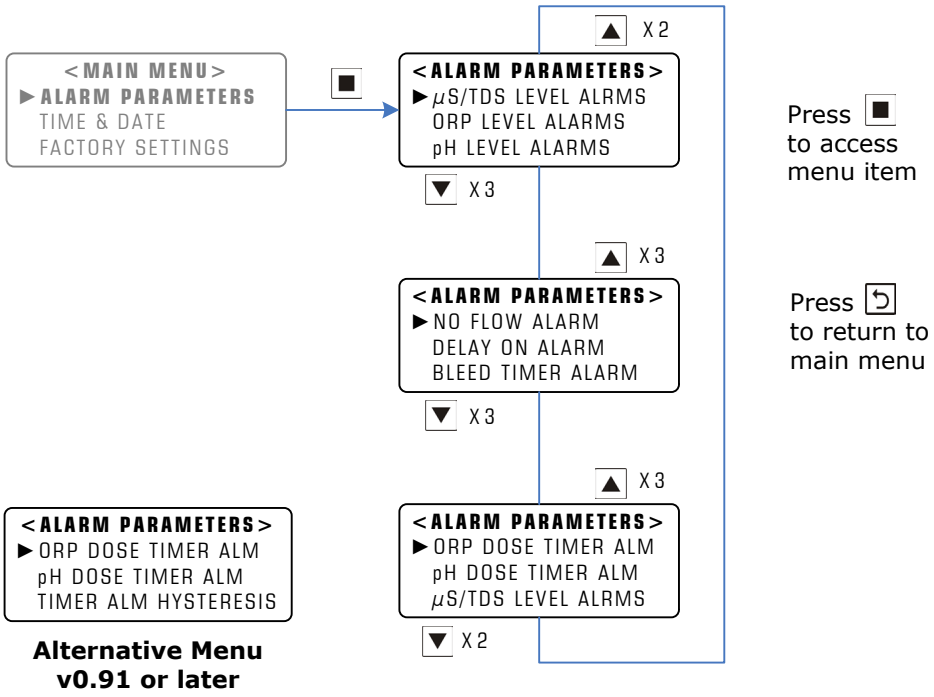
The **Control Cycle** is the other parameter to be programmed. Whilst dosing, if the ORP reading on the LCD changes very quickly, the Control Cycle will need to be as short as possible, e.g. 10 seconds. This will reduce overshoot, as the controller will be able to adjust its dose rate very quickly in responding to a rapidly changing ORP.

Conversely, in a large system with a large volume of water, and a slow recirculation rate, the ORP reading may take a long time to change after dosing occurs. In this case, it is better to have a longer Control Cycle, eg 100 seconds, to allow for the ORP reading to change, before further dosing takes place.

If unsure, set the control cycle to your best estimate of the time it takes for the water where the chemical is injected into, to get back to the ORP sensor.

5.5 Alarm Parameters

Main Menu > *ALARM PARAMETERS*



The controller has 8 programmable alarm functions as outlined above. If any of the alarms are activated and confirmed, the common alarm contact switches, and the Alarm message is displayed on the relevant position on the Main Menu of the LCD.

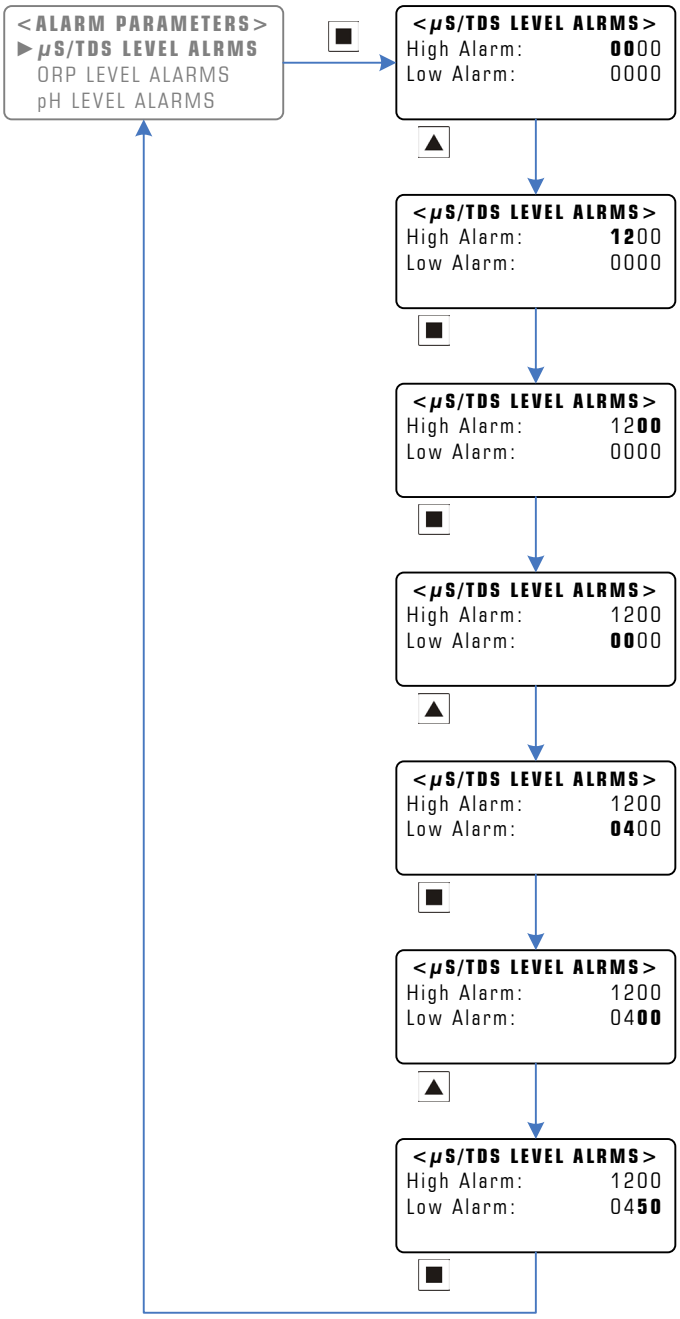
5.5.1 Conductivity Level Alarms

The High Conductivity Alarm is activated if the Conductivity rises above the programmed setting and automatically resets if the Conductivity drops below the programmed setting again.

The Low Conductivity Alarm is activated if the Conductivity drops below the programmed setting and automatically resets if the Conductivity rises above the programmed setting again.

Please see the following page for an example of how to set the High and Low alarms for conductivity:

Main Menu > *ALARM PARAMETERS >µS/TDS LEVEL ALRMS*



Example: Setting a High Alarm of 1200 TDS and a Low Alarm of 450 TDS

NOTE: Setting the High or Low Alarms to 0000 disables the Alarm.

5.5.2 ORP Level Alarms

The High ORP Alarm is activated if the ORP rises above the programmed setting and automatically resets if the ORP drops below the programmed setting again. The Low ORP Alarm is activated if the ORP drops below the programmed setting and automatically resets if the ORP rises above the programmed setting again.

NOTES:

1. During Disinfection, the HIGH ORP alarm is ignored, until the mV drops below the HIGH ORP alarm value (if programmed). This enables you to have the Disinfection Setpoint higher than the HIGH ORP Alarm, without generating an alarm during Disinfection.

2. During No-Flow, the High and Low ORP alarms are disabled. However, an alarm reported before a No-Flow condition is not affected and will remain in alarm during No-Flow, When flow returns, alarm is reset

Example: Setting a High Alarm of 650mV and a Low Alarm of 350mV

NOTE: Setting the High or Low Alarms to 0000 disables the Alarm.

5.5.3 pH Level Alarms

The High pH Alarm is activated if the pH rises above the programmed setting and automatically resets if the pH drops below the programmed setting again.

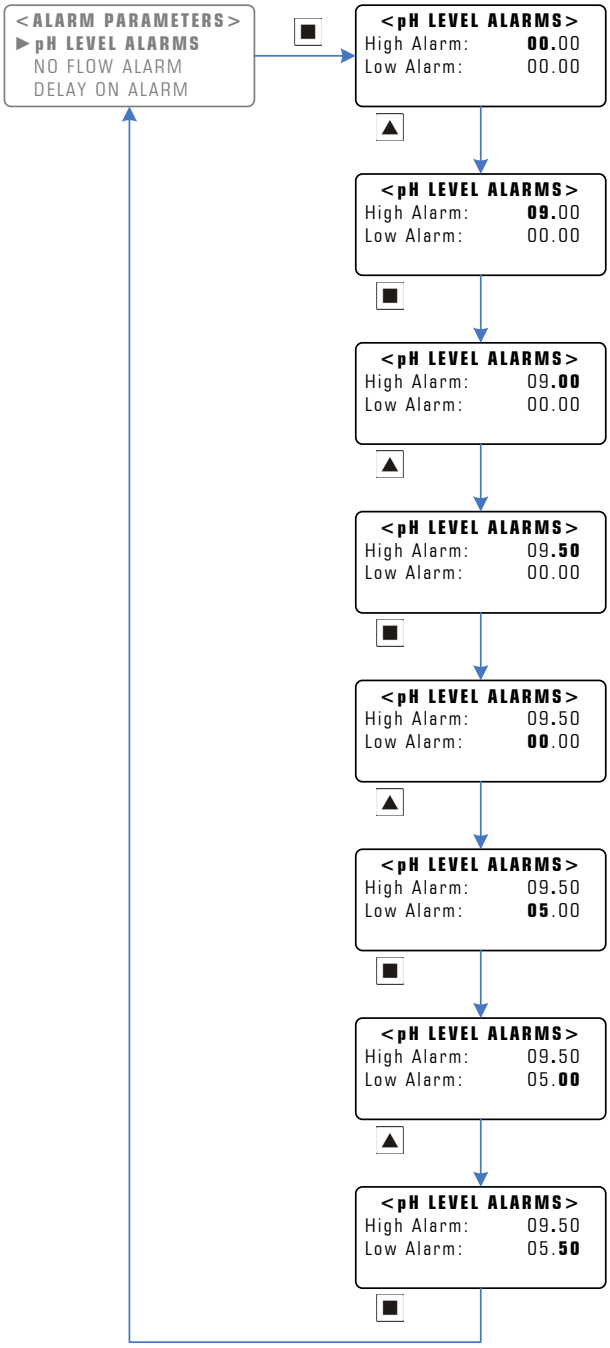
The Low pH Alarm is activated if the pH drops below the programmed setting and automatically resets if the pH rises above the programmed setting again.

Main Menu > *ALARM PARAMETERS >pH LEVEL ALARMS*

NOTES:

1. Setting the High or Low Alarms to 00.00 disables the Alarm.

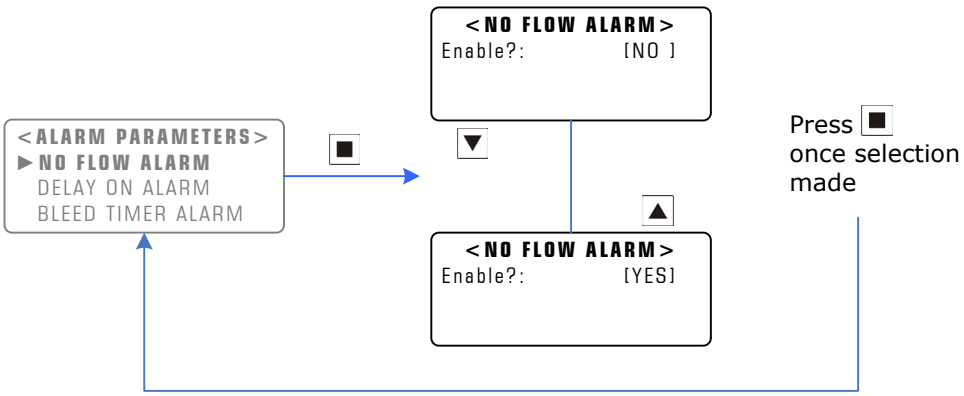
2. During No-Flow, the High and Low ORP alarms are disabled. However, an alarm reported before a No-Flow condition is not affected and will remain in alarm during No-Flow. When flow returns, the alarm is reset.



Example: Setting a High Alarm of 9.5 pH and a Low Alarm of 5.5 pH

5.5.4 No Flow Alarm

Main Menu > *ALARM PARAMETERS > NO FLOW ALARM*

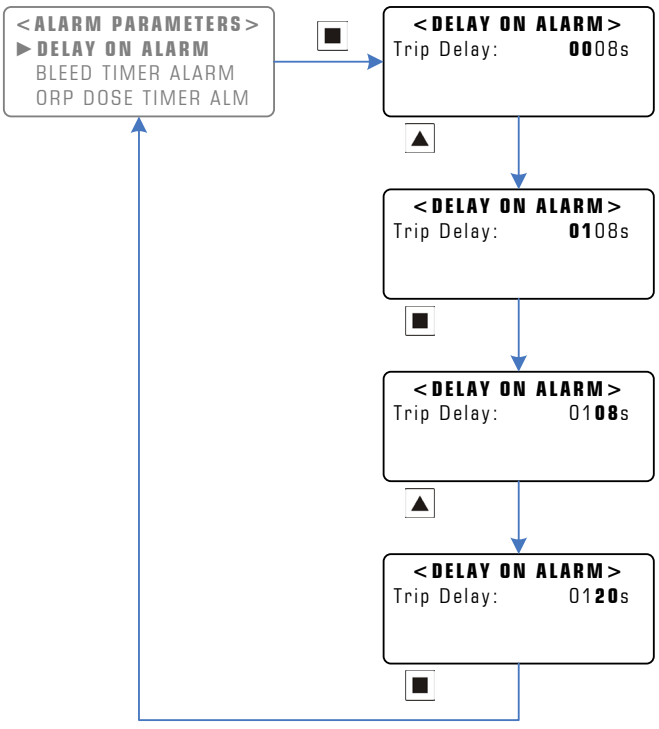


If the No Flow Alarm is enabled, the Alarm will activate when there is no flow detected by the optional flow switch.

NOTE: A flow switch is included with all dosing systems incorporating a DIGICHEM Plus+ Controller.
If the No Flow Alarm is left disabled, then the Alarm is unaffected by a no-flow condition.

5.5.5 Delay On Alarm

Main Menu > *ALARM PARAMETERS > DELAY ON ALARM*



Example: Setting the Delay on Level Alarms to 2 minutes

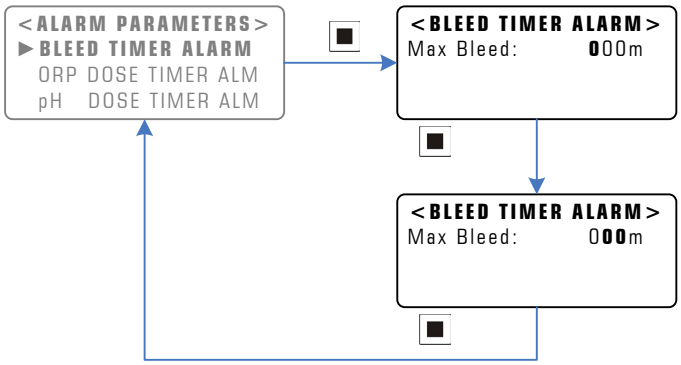
When an alarm condition is detected, e.g. High Conductivity Alarm, the relay only trips immediately if the Trip Delay is set to 2 seconds. However, if alarms do not become immediately critical, it is better to program a delay on the alarm to prevent "nuisance trips".

If a Trip Delay, e.g. 120s, is programmed, the alarm relay will only trip if the High Conductivity condition exists continuously for 120 seconds. However, if the Conductivity drops to below the High Conductivity Alarm level before the 120 seconds times out, the Alarm condition will reset.

NOTE: The minimum alarm trip delay able to be set is 2 seconds.

5.5.6 Bleed Timer Alarm

Main Menu > *ALARM PARAMETERS > BLEED TIMER ALARM*



Example: Leaving the Bleed Timer Alarm Disabled

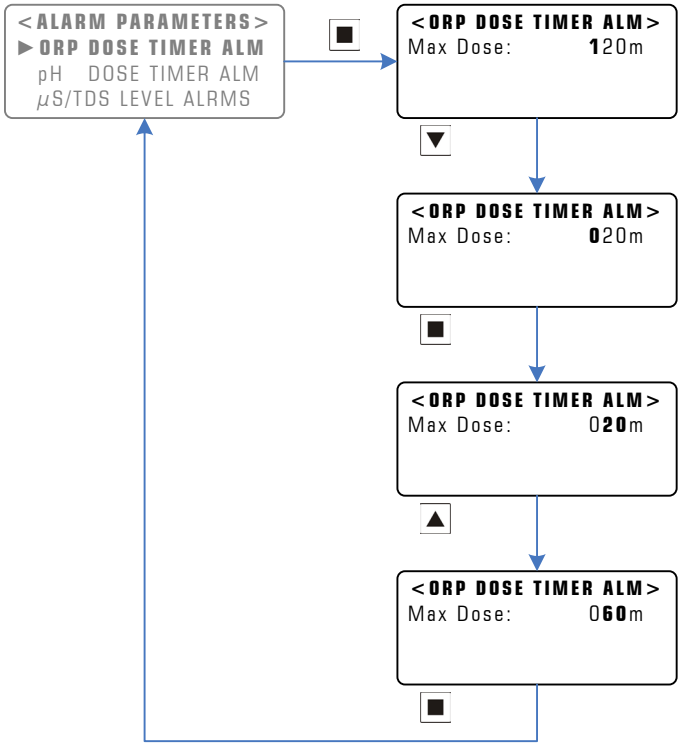
The Bleed Timer Alarm is the maximum acceptable bleed time for the system to reach the Setpoint. This alarm is designed to protect the system from excessive bleeding in the event of a false reading from a faulty Conductivity probe, or if the controller itself is faulty.

To leave the alarm in its disabled state, the programmed setting is 000m.

If the system Conductivity reaches the Setpoint within the programmed time, the timer resets. However, if the timer times out before the Conductivity reaches the Setpoint, the bleed solenoid switches off and remains disabled until the unit is manually reset by holding down the Reset pushbutton.

5.5.7 ORP Dose Timer Alarm

Main Menu > *ALARM PARAMETERS > ORP DOSE TIMER ALM*



Example: Setting a Maximum Continuous ORP Dose Time of 60 minutes

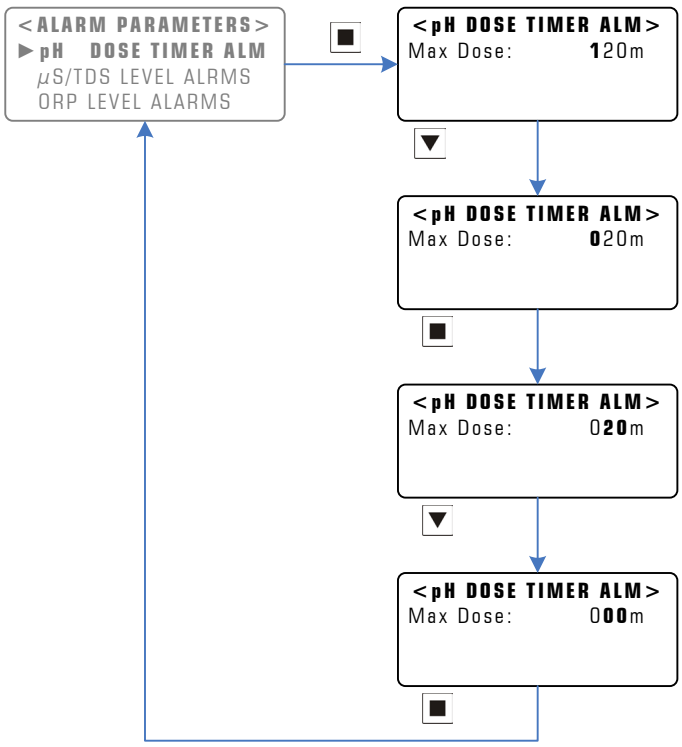
The ORP Dose Timer Alarm is the maximum acceptable Dose time for the system to reach the ORP Setpoint (less the timer alarm hysteresis). This alarm is designed to protect the system from excessive dosing in the event of a false reading from a faulty ORP probe, or if the controller itself is faulty.

To disable the ORP Dose Timer Alarm, program the timer setting to 000m.

If the system ORP reaches the Setpoint (less the timer alarm hysteresis) within the programmed time, the timer resets. However, if the timer times out before the ORP reaches this level, the ORP Dose Timer Alarm is raised, and the pump switches off and remains disabled until the unit is manually reset by holding down the Reset pushbutton.

5.5.8 pH Dose Timer Alarm

Main Menu > *ALARM PARAMETERS > pH DOSE TIMER ALM*



Example: Disabling pH Dose Timer Alarm

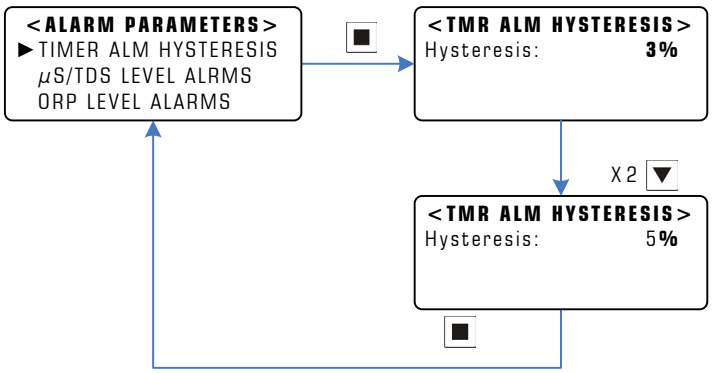
The pH Dose Timer Alarm is the maximum acceptable Dose time for the system to reach the pH Setpoint (less the timer alarm hysteresis. This alarm is designed to protect the system from excessive dosing in the event of a false reading from a faulty pH probe, or if the controller itself is faulty.

To disable the pH Dose Timer Alarm, program the timer setting to 000m.

If the system pH reaches the Setpoint (less the timer alarm hysteresis) within the programmed, the timer resets. However, if the timer times out before the pH reaches this level, the pH Dose Timer Alarm is raised, and the pH Pump switches off and remains disabled until the unit is manually reset by holding down the Reset pushbutton.

5.5.9 Timer Alarm Hysteresis

Main Menu > *ALARM PARAMETERS > TMR ALM HYSTERESIS*

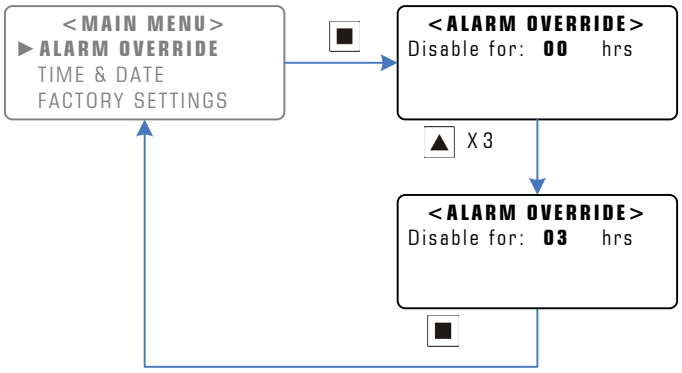


Example: Setting the Timer Alarm Hysteresis to 5%

Sections 5.5.7 & 5.5.8 explain how the Timer Alarms reset themselves if the pH or ORP reaches the setpoint (less the timer alarm hysteresis). This percentage is programmable from 1 to 20%. For instance, if you are happy if the ORP reaches 90% of setpoint (e.g. 450mV, if setpoint is 500mV), then set Timer Alarm Hysteresis to (100–90= 10%), so that the ORP Timer Alarm cancels if the ORP is above 450mV.

5.5.10 Alarm Override

Main Menu > *ALARM OVERRIDE*



Example: Setting the Alarm Override to disable all alarms for 3 hours

The DIGICHEM Plus+ has the feature to disable all alarms temporarily. This is useful, for example, if you are performing a tower clean, where the ORP, pH or Conductivity levels may rise or fall above or below pre-programmed alarm parameters.
In this case you would not want the alarms to trigger, so therefore the alarm override feature locks out, or disables all alarms for a programmable time period (0 to 99 hours).

The Alarm Override is also logged as a percentage of the data logging interval in the controller's data log. For example, if the data logging interval is 120 minutes and the alarm override was active for 60 minutes during this time, the log would display 50%.

5.6 Inhibitor & Dispersant Setup

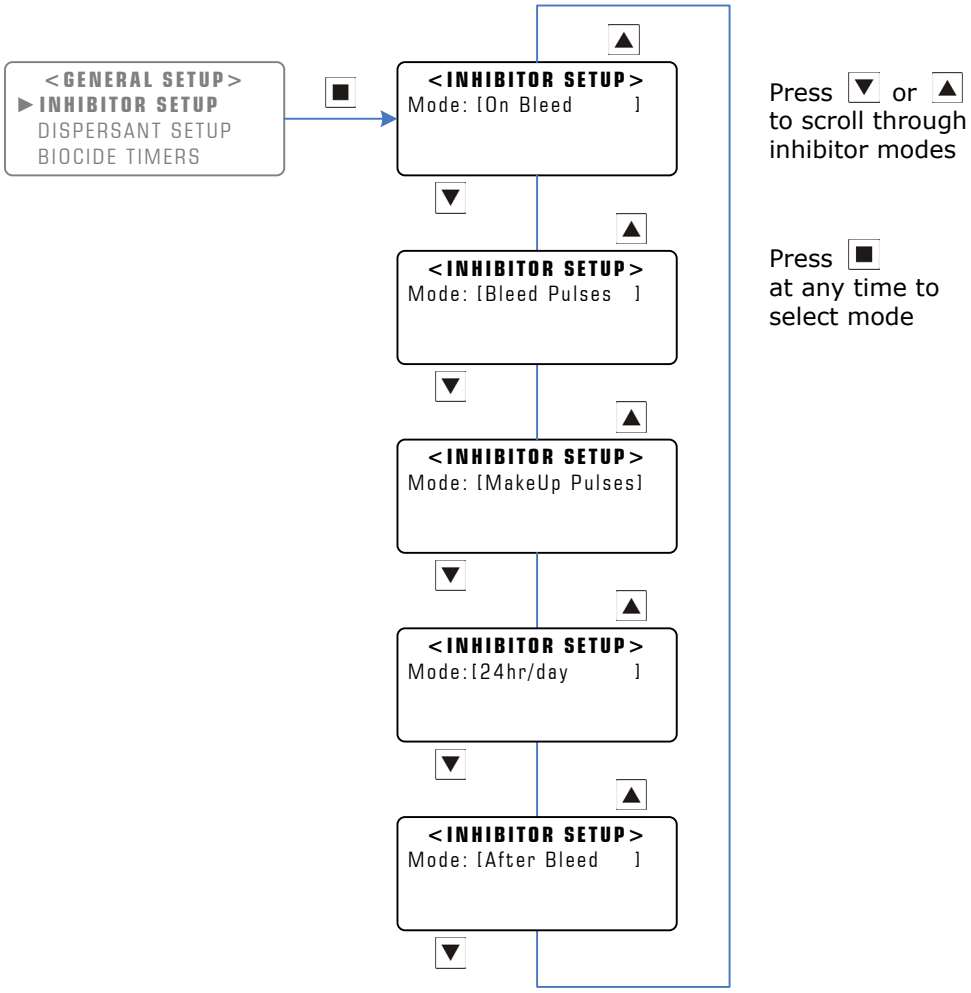
Main Menu > *SETUP MENU > GENERAL SETUP > INHIBITOR SETUP*

Main Menu > *SETUP MENU > GENERAL SETUP > DISPERSANT SETUP*

The above two features are identical but work independently.
There are 5 Possible Inhibitor/Dispersant Feed Pump Modes to select from:

- Dose on a Cycle when the controller is bleeding (Mode: On Bleed)
- Dose on a Cycle for the same bleed time, but delayed until bleed is completed (Mode: After Bleed)
- Dose on a continuous Cycle (Mode: 24hr/day)
- Dose upon pulses received from a Make-up flow meter (Mode: Make-Up Pulses)
- Dose upon pulses received from a Bleed flow meter (Mode: Bleed Pulses)

In the examples to follow, it may be necessary to change the current Inhibitor mode. The screens will vary according to if you are in the mode that requires a change, or you are changing to a new mode.



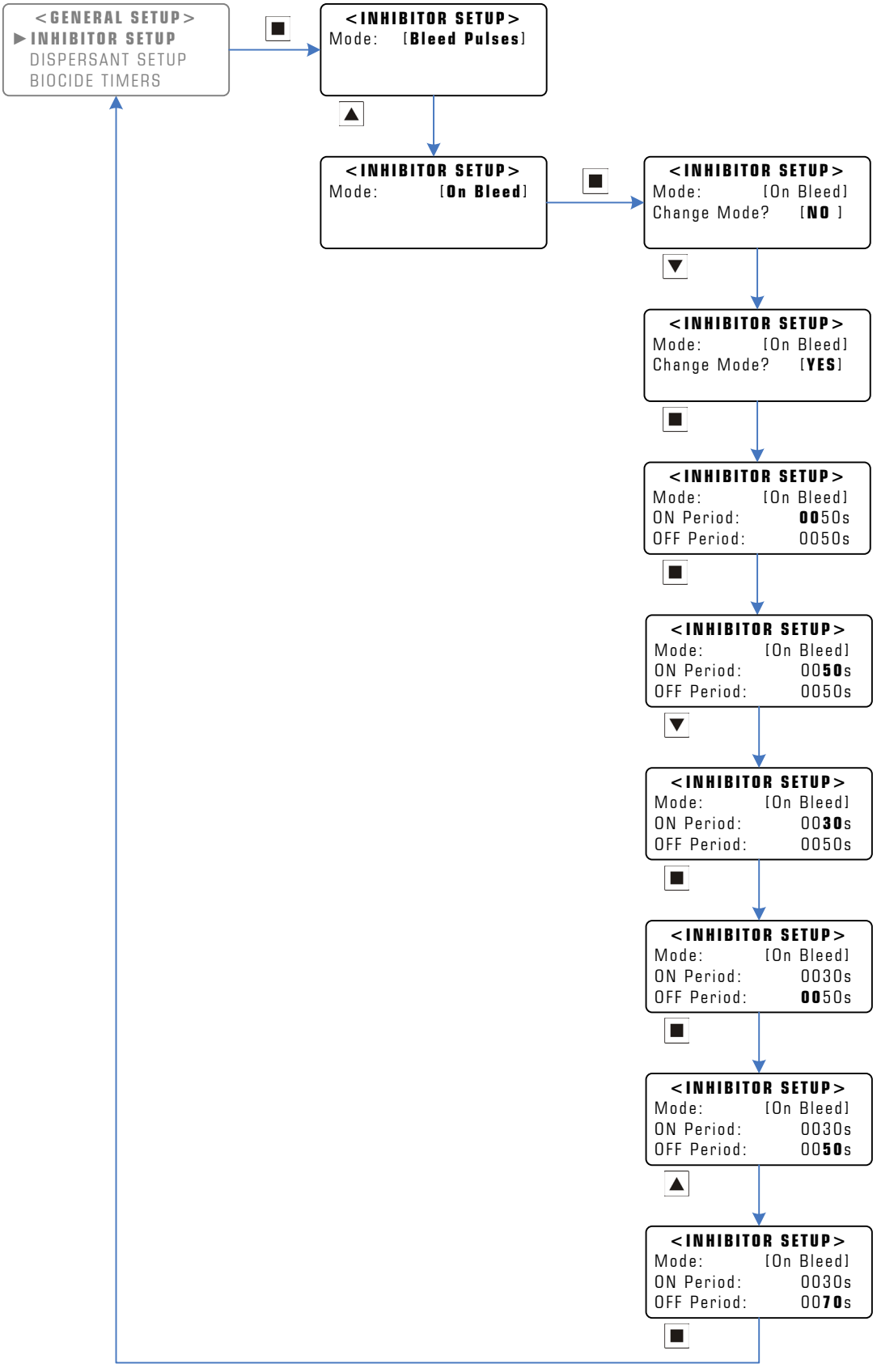
Inhibitor Setup Menu

5.6.1 Dose on Bleed Mode

In this mode, the Inhibitor Pump doses during bleed, on a programmable ON/OFF time cycle when the measured Conductivity is greater than the Conductivity Setpoint, if the Bleed Cycle is set to ON/OFF = 00/00s, i.e. Bleed continuously.

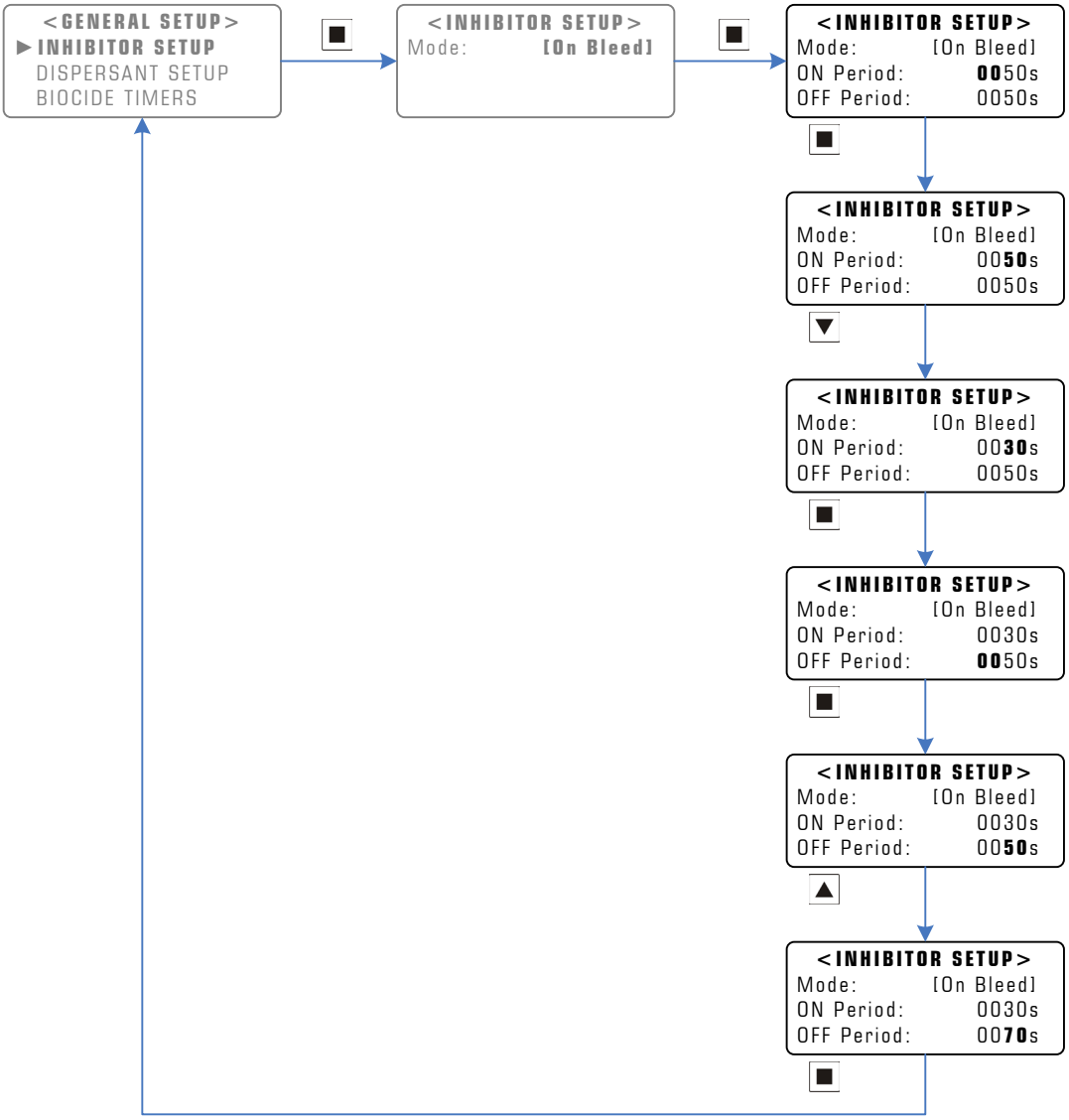
If Inhibitor is set to "Dose on Bleed" mode, and an ON/OFF cycle for Inhibitor is programmed, then the Inhibitor ON/OFF cycle only occurs during the ON part of the Bleed Cycle. This means Inhibitor will only dose when the bleed valve is opened and passing water. During the OFF part of the Bleed Cycle, Inhibitor dosing is suspended.

RECOMMENDATION: If dosing Inhibitor on bleed when a bleed cycle is programmed, it is recommended to program a longer Bleed Cycle ON time than the complete Inhibitor Cycle. For example, program the bleed cycle to 50s ON/ 80s OFF, and the Inhibitor cycle to 2s ON/ 10s OFF (Hence, the 2/10s cycle only operates during the Bleed 50s ON time period). The logic is that if you change the bleed cycle, the Inhibitor dosage as a proportion of the time the bleed solenoid is bleeding, does not change.



Example: Changing Inhibitor from "Bleed Pulses" mode to "On Bleed" mode - Decreasing Inhibitor pump duty cycle from 50% to 30%

In the previous example, some of the screens may not appear, if you are already in 'On Bleed' mode, and you enter to this menu again. See the example below:



Example: With Inhibitor on Bleed mode currently set - Decreasing Inhibitor pump duty cycle from 50% to 30%

NOTE: For most applications, it is recommended to work on a 100 second cycle. For any of the % of Time modes, you can use the table on the following page as a guide to set your Inhibitor or Dispersant pump duty cycle:

Dosing Pump Turn-down required	ON Period	OFF Period
10% of maximum dose rate	0010s	0090s
20% of maximum dose rate	0020s	0080s
30% of maximum dose rate	0030s	0070s
40% of maximum dose rate	0040s	0060s
50% of maximum dose rate	0050s	0050s
60% of maximum dose rate	0060s	0040s
70% of maximum dose rate	0070s	0030s
80% of maximum dose rate	0080s	0020s
90% of maximum dose rate	0090s	0010s
100% of maximum dose rate	0000s	0000s

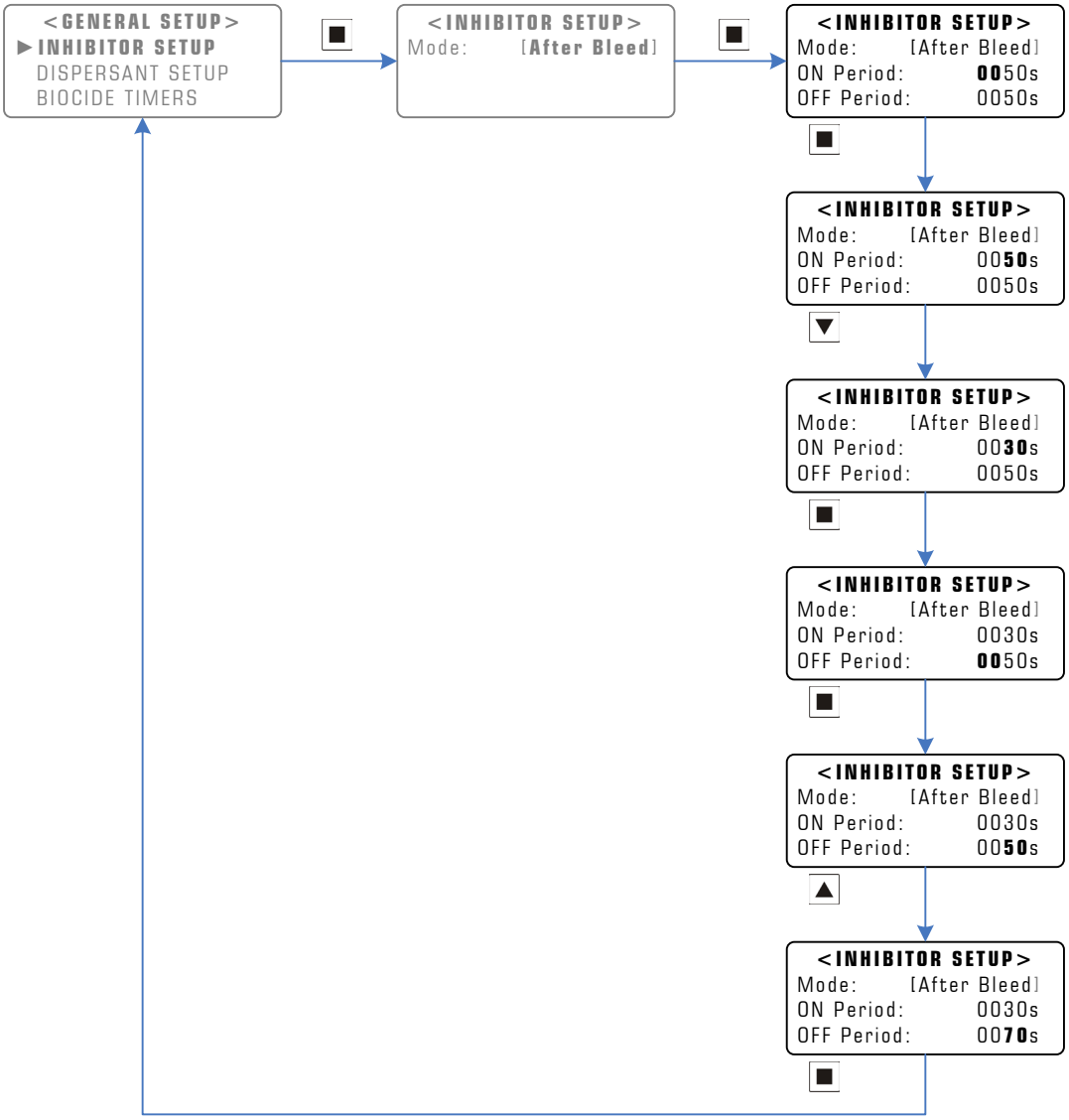
5.6.2 After Bleed Mode

In After Bleed Mode, the Inhibitor Pump will dose for a proportional time based on the amount of time the bleed was on for.

For example, after a Bleed Cycle, if the total time bleed time (including pauses) was 15 minutes, then the Inhibitor will also dose on a programmable ON/OFF cycle for 15 minutes, commencing immediately after the 15 minute bleed cycle is complete.

The example on the following page explains programming an After Bleed ON/OFF cycle time:

NOTE: The Dispersant Setup screens are identical to that of the Inhibitor, but for purposes of illustration, the Inhibitor Setup is shown in the following diagrams:

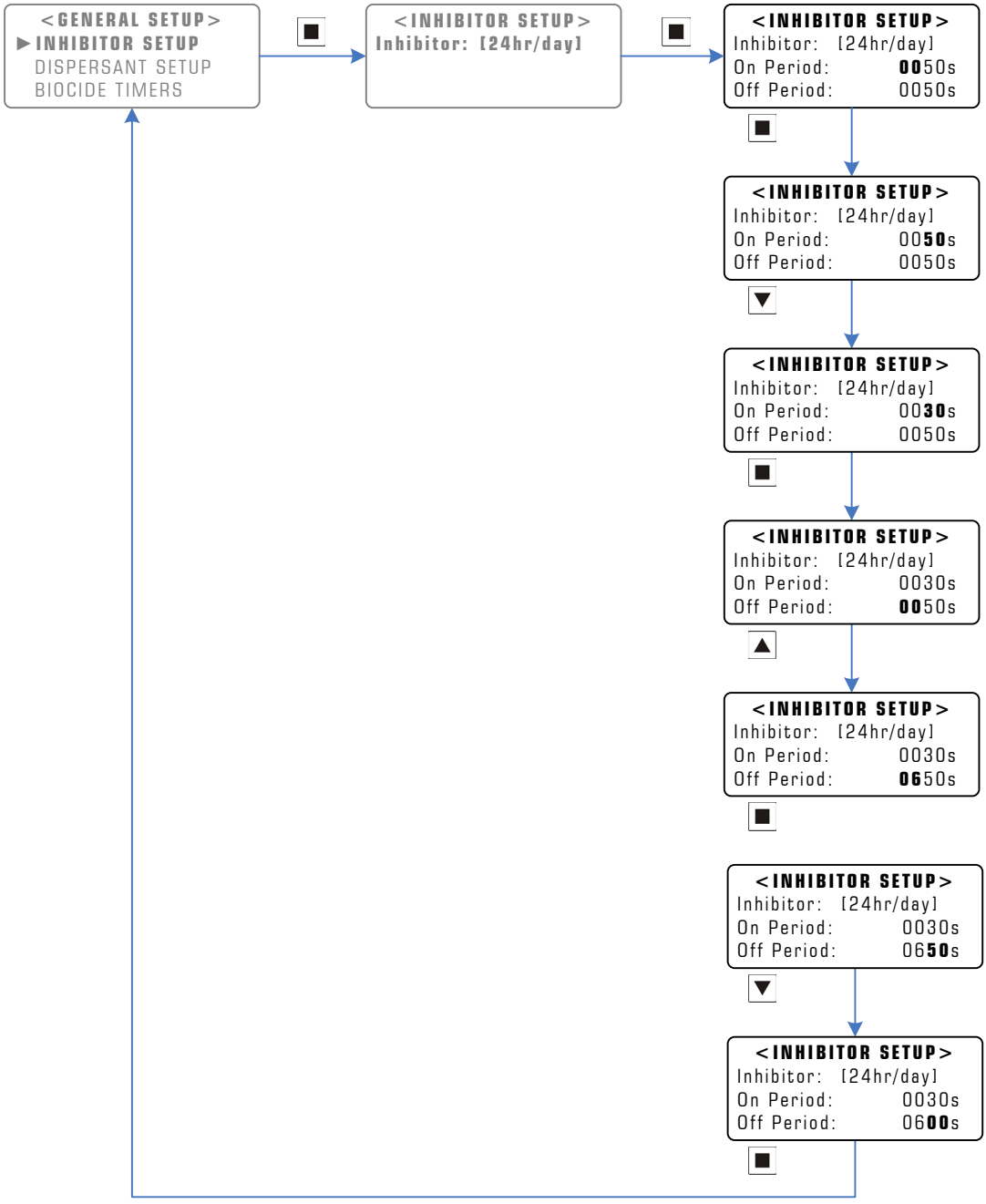


Example: With Inhibitor on 'After Bleed' mode currently set –
Decreasing Inhibitor pump duty cycle from 50% to 30%

5.6.3 Twenty Four Hour Per Day (24hr/day) Cycle

In this mode, the Inhibitor Pump will dose on a continuous duty cycle all day, every day. The Duty cycle is repeating ON / OFF times, e.g. ON=30sec, followed by OFF=570sec & repeating (i.e. 5% duty cycle).

An example of the 24hr/day cycle is shown on the following page:



Example: With Inhibitor on "24hr/day" mode currently set – Setting the Inhibitor pump to repeat dose for 30 seconds followed by a 600 second off period

5.6.4 Make-Up Water Pulses

In this mode, the Inhibitor Pump doses proportional to pulses received from a water meter fitted in the Make-Up line. The DIGICHEM Plus+ activates the pump for a set time once a pre-determined number of pulses is counted, explained further in the following example:

Water meter pulse rate = 1 pulse / litre
Desired concentration = 100 ppm
[100 ppm = 10ml chemical / 100 litres flow = 10ml chemical / 100 pulses]

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

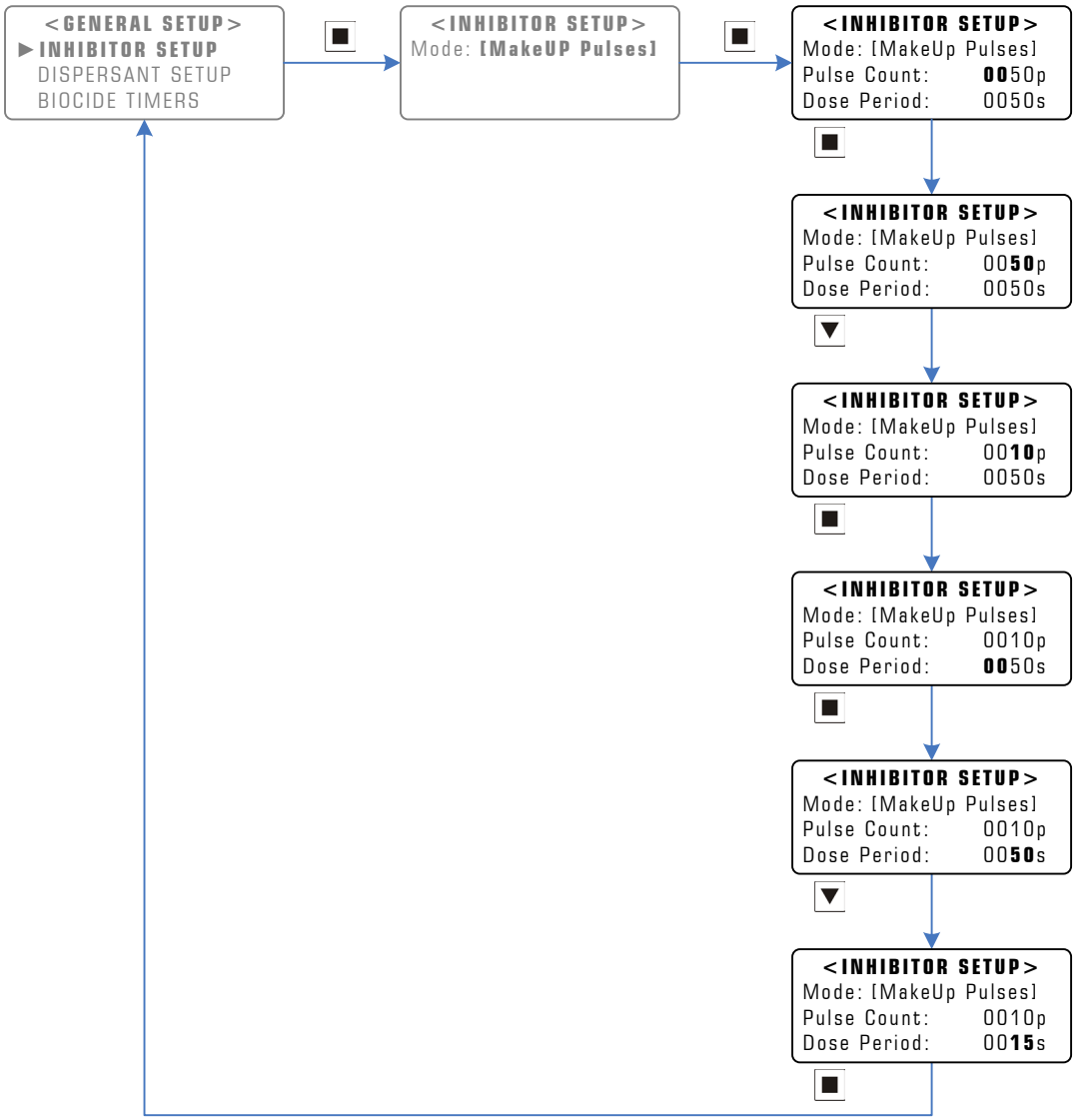
How long does the pump need to dose to deliver 10ml?

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

Set PULSE COUNT = 100
Set DOSE PERIOD = 30 seconds

In the example above, the pump doses for 30 seconds (i.e. programmed dose time) every 100 litres of make-up water (i.e. programmed pulse count of 100).

The example below explains setting up the pulse count and dose time:



Example: With Inhibitor on "Make-Up Pulses" mode currently set – Setting the Inhibitor pump to dose for 15 seconds after 10 pulses from a water meter

5.6.5 Bleed Water Pulses

In this mode, the Inhibitor Pump doses proportional to pulses received from a water meter fitted in the Bleed line. The DIGICHEM Plus+ activates the pump for a set time once a pre-determined number of pulses is counted.

Select the mode of "Bleed Pulses" in the Inhibitor Setup menu (Explained in Section 5.6) and see the example above from section 5.6.4 Make-Up Water Pulses.

Notes: (v0.91 or later) A '+' will be displayed on the LCD screen momentarily for a make-up pulse and a '-' will be displayed for a Bleed pulse.

5.7 Biocide Setup

Main Menu > *SETUP MENU > GENERAL SETUP > BIOCIDE TIMERS*

Biocide is dosed according to **28 day 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, fortnightly or once a month. A typical biocide program, which will operate at the same time on the specified days of the week, consists of 3 consecutive time durations:

1. Pre-bleed
2. Biocide Dosing
3. Bleed Lock-out

1. Pre-bleed

This reduces the system conductivity to a lower temporary setpoint (e.g. 85% of setpoint) prior to biocide dosing to allow for a longer Bleed Lock-out duration without the risk of entering scaling conditions. Pre-bleed duration is programmable from 1 minute up to 23 hours. (Note: The Pre-Bleed Setpoint of 85%, i.e. Setpoint -15% is fully programmable and is explained further in section 5.8).

2. Biocide dosing

The biocide pump (Pump A or Pump B/ORP) doses chemical, typically into a manifold. Dose duration is programmable from 1 minute up to 23 hours and commences immediately after Pre-Bleed. Bleed-off is disabled (i.e. locked out) during dosing provided the Bleed Lock-out setpoint is not exceeded. If ORP control is enabled, Pre-Bleed and Bleed-Lockout are only applicable to Biocide A.

3. Bleed Lock-out

After biocide dosing, bleed-off continues to be disabled for the lock-out duration, programmable from 1 minute up to 23 hours, provided the Bleed Lock-out setpoint is not exceeded. (Note: The default Bleed Lock-out Setpoint of Setpoint +20% is fully programmable and is explained further in section 5.9).

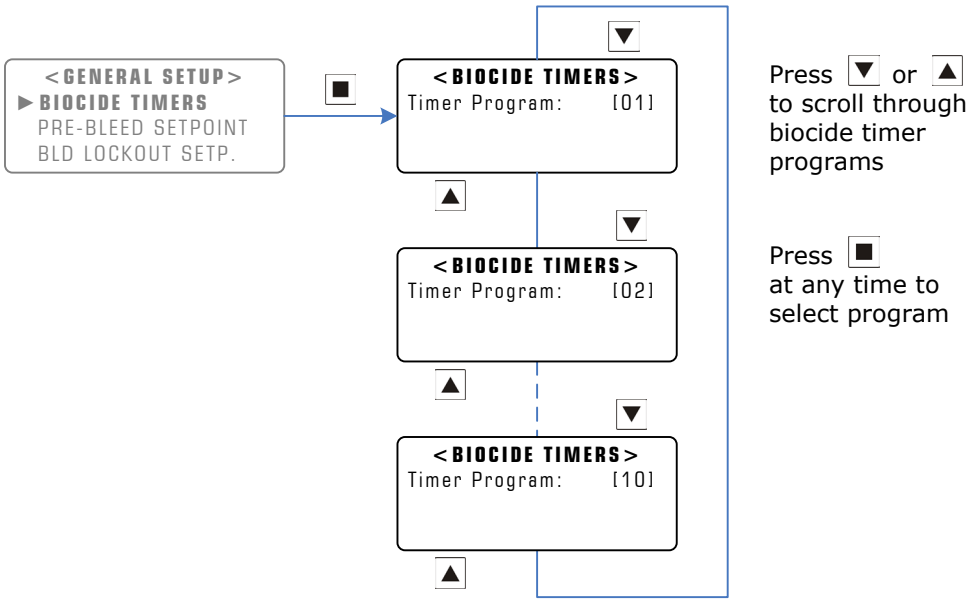
By preventing bleed-off during and after biocide dosing, the system is ensured of receiving maximum benefit from the dosed biocide, as no biocide will be lost during this time via bleed-off. Furthermore, because the conductivity is reduced during Pre-Bleed, the system has a longer retention period. As 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/ORP. In other words, the programs can be allocated in any combination to either of the two biocide outputs, A and B/ORP.

For instance, if pump A is set up in 6 programs, pump B/ORP can only have up to 4 programs controlling it. Not all the programs need to be allocated. If only two of the programs are required, then the other 8 will remain disabled. Pump A and Pump B/ORP work totally independently, and each program has its own START TIME, followed by its own consecutive PRE-BLEED, BIOCIDE DOSING and BLEED LOCK-OUT durations. **However, biocide programs should not overlap.**

NOTE: When a timer program is initially entered, the controller will control as per normal, until the end of the timer program. At the end of the timer program, the outputs will then go into an "Idle" state. The outputs will be in an "Idle" state until the Timer program is activated again.

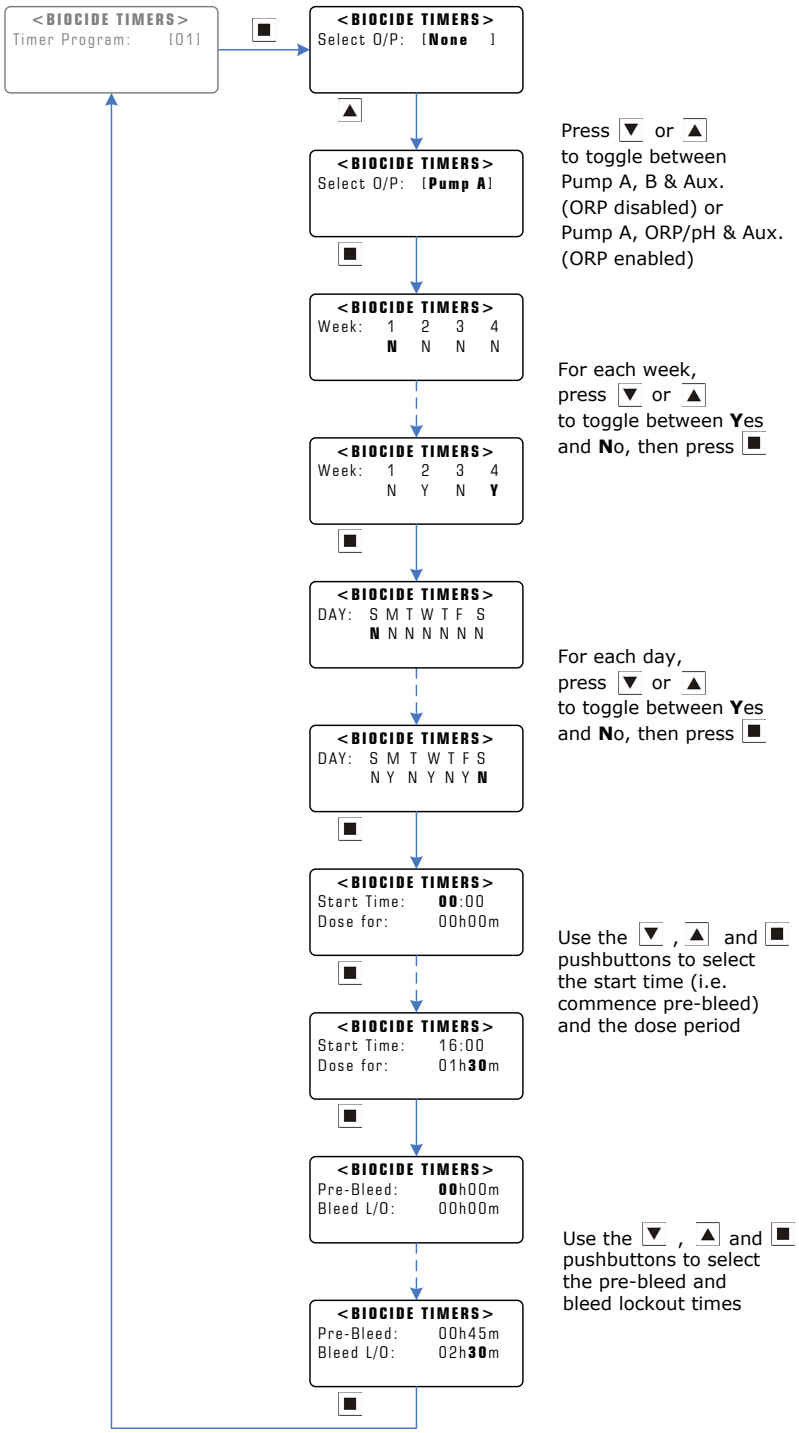
Main Menu > *SETUP MENU > GENERAL SETUP > BIOCIDE TIMERS*



The example on the following page illustrates setting up Timer Program [01] for Pump A:

Note: If ORP is disabled, then Pump B will be displayed as an option. If ORP is enabled, then ORP/pH will be displayed as an option.

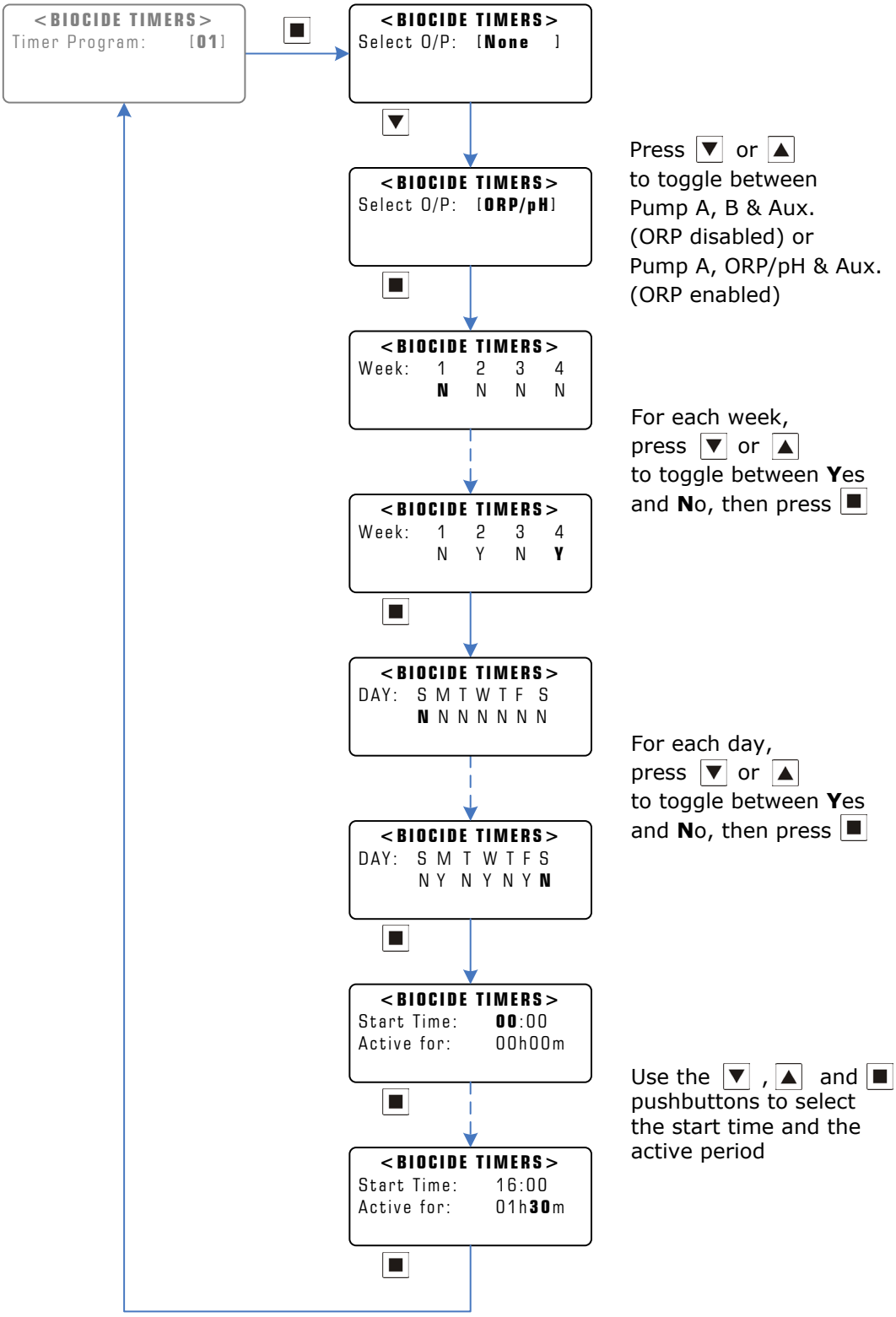
Main Menu > *SETUP MENU > GENERAL SETUP > BIOCIDE TIMERS > TIMER > PROGRAM [01]*



Example: Selecting Biocide Program 1, for pump A to dose on Mon, Wed, Friday in Weeks 2 & 4, with a 45m pre-bleed starting at 16h00, thereafter dosing for 1h30m, with an additional bleed lockout of 2h30m

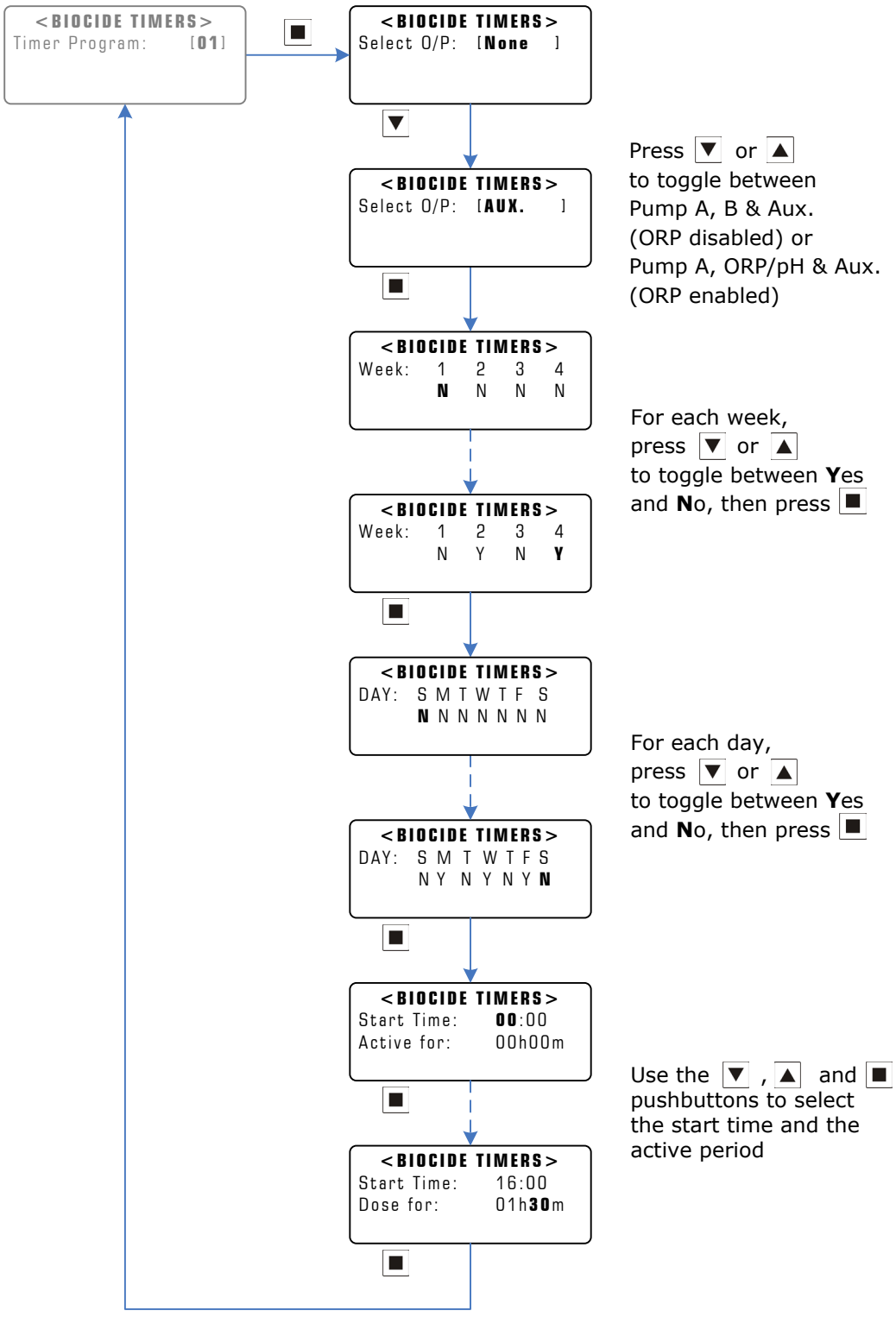
However, this menu will change, if ORP is enabled.
The example below shows the menu structure using the previous example, where instead of Pump A, the ORP/pH Output will be activated:

NOTE: For this selection, Pre-Bleed and Bleed Lockout will not appear in the menu, or the Main screen when the controller is inside or outside of an active period.



Example: Selecting Biocide Program 1, for the ORP & pH control functions to be active on Mon, Wed, Friday in Weeks 2 & 4, active for 1h30m, commencing at 16h00. Therefore the ORP & pH control only occur betweeen 16h00 and 17h30 on the days selected.

The Auxiliary (Aux.) output can also be switched from a timer, as per the example below:

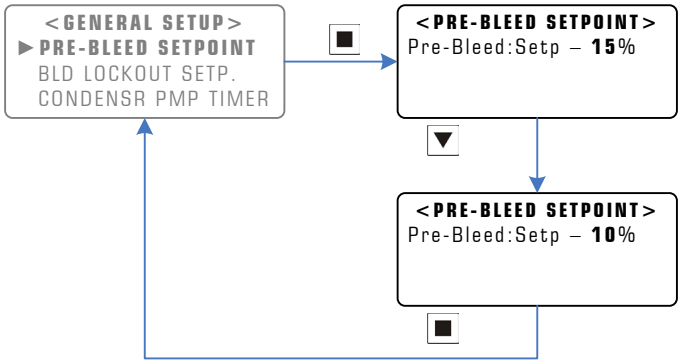


Example: Selecting Biocide Program 1, for the Aux. control function to be active on Mon, Wed, Friday in Weeks 2 & 4, active for 1h30m, commencing at 16h00.

NOTE: When the Aux. output is activated, the main screen will display "AUX." at the bottom.

5.8 Pre-Bleed Setpoint

Main Menu > *SETUP MENU > GENERAL SETUP > PRE-BLEED SETPOINT*

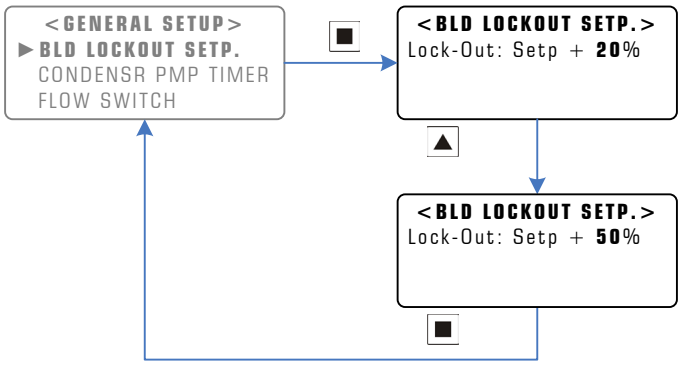


Example: Decreasing the Pre-Bleed Setpoint from Setpoint -15% to Setpoint -10%

In the example above, the Pre-Bleed setpoint is set as the Normal Conductivity Setpoint less 15%. Hence, during the Pre-bleed time (ie. Immediately before biocide dosing), the normal conductivity setpoint is reduced by 15%, and the controller will try to maintain this reduced setpoint until biocide dosing commences. The objective of pre-bleed is to allow for a longer Bleed Lock-out duration without the risk of entering scaling conditions.

5.9 Bleed Lock-out Setpoint

Main Menu > *SETUP MENU > GENERAL SETUP > BLD LOCKOUT SETP.*



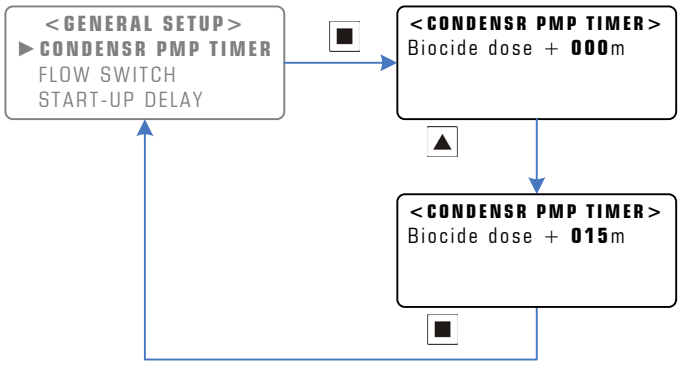
Example: Increasing Lockout Setpoint from Setpoint +20% to Setpoint +50%

In the example above, the Lockout setpoint is set as the Normal Conductivity Setpoint plus 50%. Hence, during Biocide Dosing and during the Lockout time (ie. Immediately after biocide dosing), the normal conductivity setpoint is increased by 50%, and the controller will try to maintain this increased setpoint until the Lockout Period expires. 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.

5.10 Condenser Pump Timer

Main Menu > *SETUP MENU > GENERAL SETUP > CONDENSR PMP TIMER*



Example: Setting the Condenser Pump Timer for 15 minutes

Often when biocides are dosed into the manifold of the DIGICHEM Plus+ systems, the circulating/ condenser pump of the cooling tower is not running. This can cause problems of clogging and corrosion in the manifold, as well as biocide not being dosed into the cooling tower water.

The DIGICHEM Plus+ controller has an on-board relay contact (N/O) which can be wired into the condenser pump contactor (see wiring diagram in section 2.1). The contact provided is a dry contact (i.e. volt free) so it can be connected in series with the condenser pump contactor circuit, or any other circuit as required. Alternatively, the relay contact can power the contactor by looping 240VAC active to the common of the relay contact and connecting the NO contact to the coil of the contactor. Note: In this instance, the contactor must have a 240VAC coil and must be normally powered from the same 240VAC mains circuit as the DIGICHEM Plus+.
Do NOT connect a Condenser pump or Re-circulation pump directly to this output.

When either biocide pump starts dosing (except Biocide B if set to dose on ORP), 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.

The time that the pump runs AFTER a biocide dose, is programmed here as the Condenser Pump Timer.

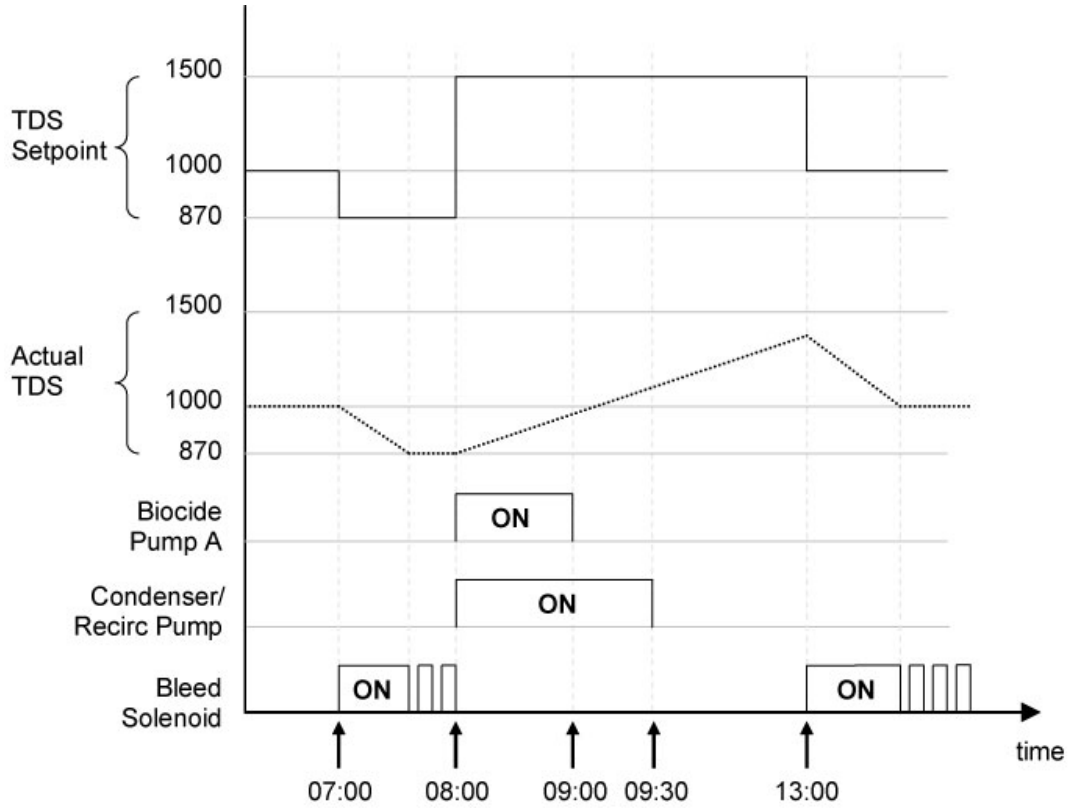
IMPORTANT: If this feature is used, it is not recommended to switch the condenser pump on and off rapidly using the output test feature, explained in section 4.4

The following is another example of a biocide program set to dose on a weekly cycle:

Start time: 07:00
Pre-Bleed: 00h60m (ie. 07h00 to 08h00)
Dose for: 00h60m (ie. 08h00 to 09h00)
Bleed L/O: 04h00m (ie. 09h00 to 13h00)

Other Program Settings

Setpoint	=	1000 TDS
Pre Bleed Setpoint	=	Setpoint – 13% (ie. 870 TDS)
Bleed Lock-out Setpoint	=	Setpoint + 50% (ie. 1500 TDS)
Program	=	01
Pump	=	A
Condenser Pump Timer	=	30m (i.e. delay off time after A dose)



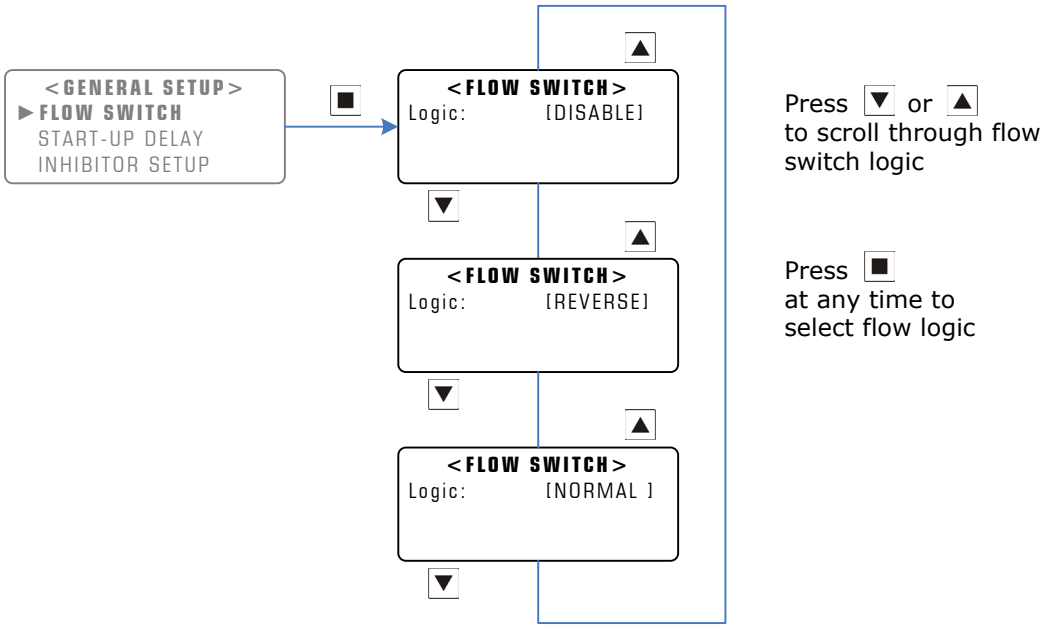
5.11 Flow Switch

Main Menu > *SETUP MENU > GENERAL SETUP > FLOW SWITCH*

With a flow switch connected to the controller, any or all the outputs can be disabled when there is no flow. An output, when selected via this menu for flow detection, will stop immediately if no flow is detected. For example, when bleeding, the solenoid valve will close immediately if no flow is detected.

There are 3 possible settings in the menu for the flow switch logic:

- DISABLE: All outputs active when required, regardless of flow or no flow
- NORMAL: Enabled outputs activate when required, only if the flow switch input is shorted
- REVERSE: Enabled outputs activate when required, only if the flow switch input is open circuit

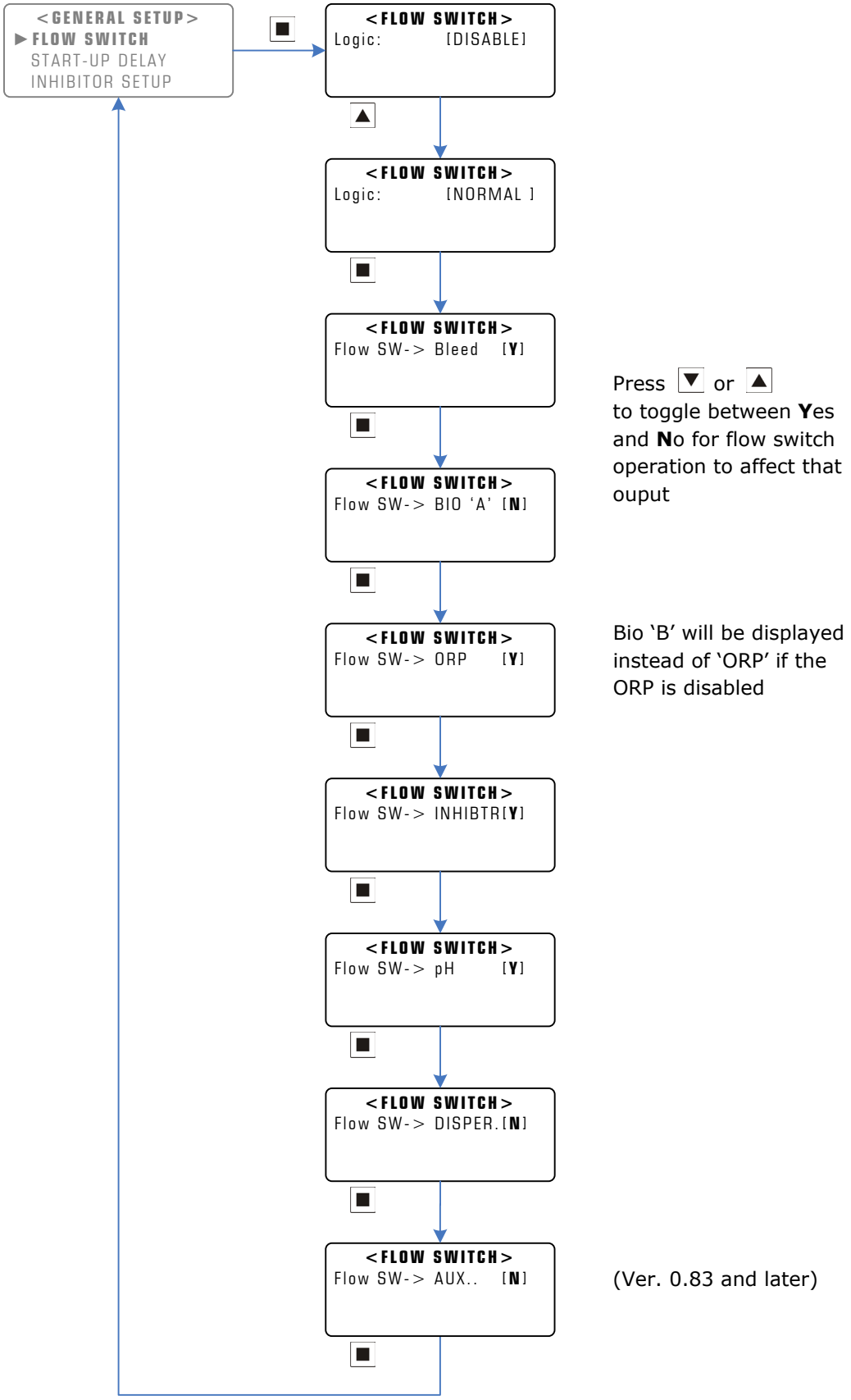


Flow Switch Setup Menu

The Flow Switch can disable either one or any combination of the 6 outputs if there is no flow. Typically, the Bleed, Inhibitor, pH & ORP outputs are disabled if there is no flow and the Non-Oxidising Biocides dose during their programs regardless of the flow status. However, either or both Biocide outputs can be set to be disabled if there is no flow.

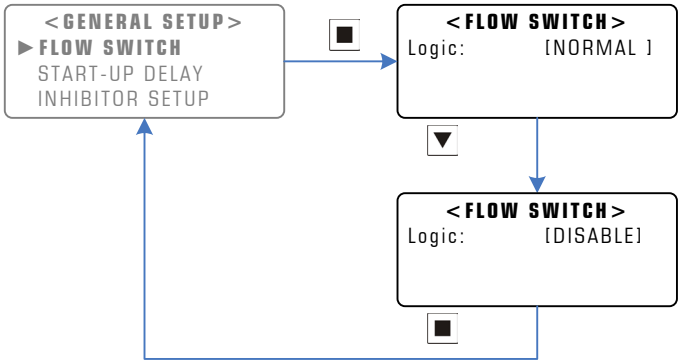
NOTE: Upon resumption of flow, if a Start-Up delay time has been programmed, the controller will only start controlling after this time. See Section 4.1.1 for Start-Up delay programming.

Please see the example on the following page demonstrating the enabling of the flow switch for various outputs:



Example: Setting the Flow Switch to operate for Bleed, ORP, Inhibitor, and pH Functions

Should the flow switch be disabled altogether, please see example on the following page:



Example: Disabling Flow Switch Operation from Normal Logic

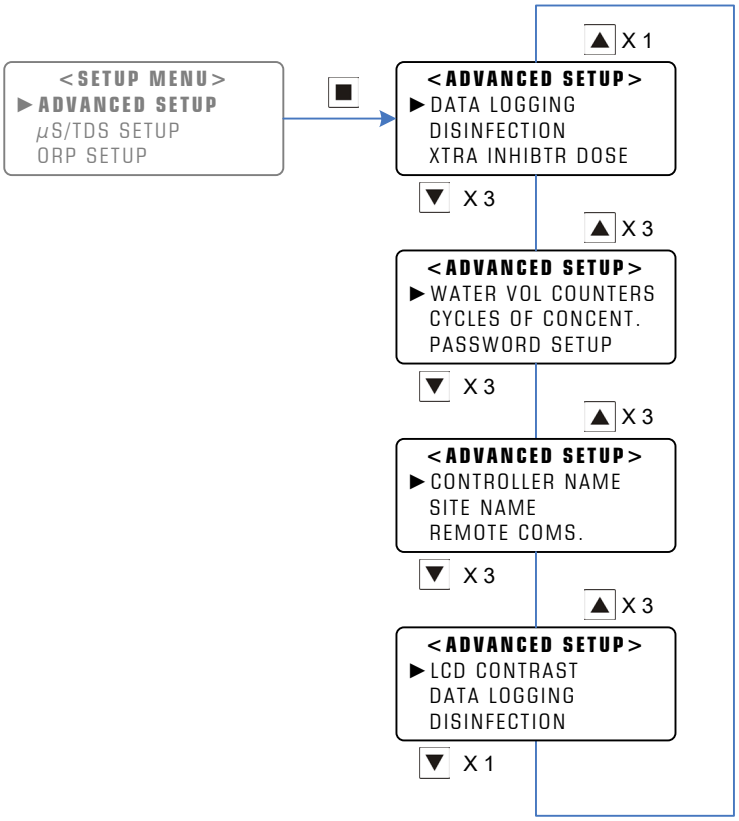
5.12 Advanced Setup Menu

Main Menu > *SETUP MENU > ADVANCED SETUP*

The Advanced Setup Menu has the following features:

- Data Logging – Log Process Variables on a time basis
- Disinfection – Program a weekly slug dose
- Extra Inhibitor Dose – Additional Inhibitor Dose to decrease scaling
- Water Volume Counters – Log Make-Up and Bleed Water Volumes
- Cycles of Concentration – Measured Conductivity / Make-Up Conductivity
- Password Setup – Setup Access Rights to Controller
- Controller Name – Assign a unique name to the controller
- Site Name – Assign a unique name to the site where the controller is installed
- Remote Coms – Enable GSM/GPRS Modem if fitted
- LCD Contrast – Adjust the intensity of the LCD screen display

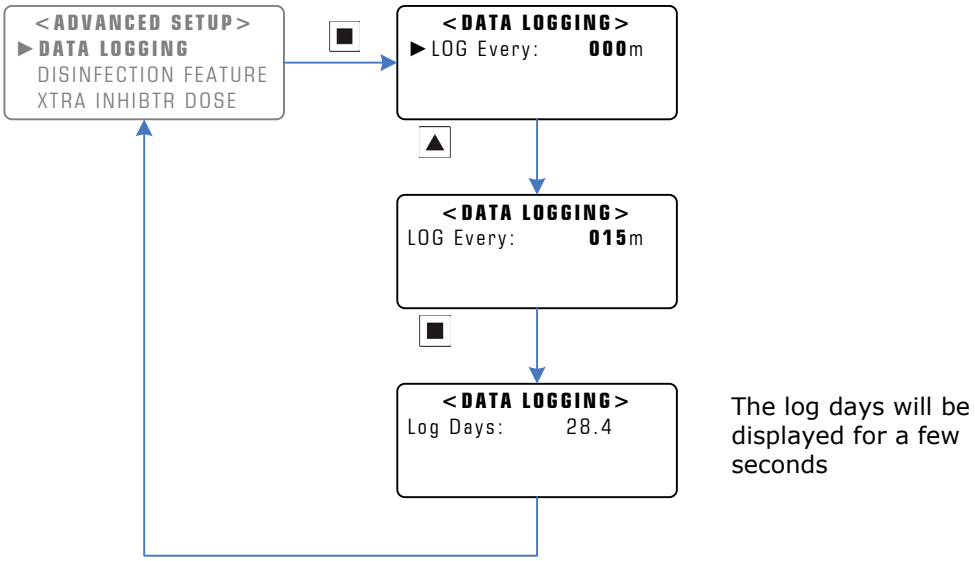
The diagram on the following page illustrates how to navigate through the Advanced Setup Menu:



Advanced Setup Menu

5.12.1 Data Logging

Main Menu > *SETUP MENU > ADVANCED SETUP > DATA LOGGING*



Example: Increasing Data Logging times from 0min to Log every 15min

IMPORTANT: If the Logging Interval is changed, all previous Logs will be erased.

The controller has the facility to log the following items at pre-programmed intervals:

Name	Description	Range	Example
Date	Date stamp of log	N/A	08/07/2008
Time	Time stamp of log	N/A	12:45
Conductivity	Conductivity/TDS of water	0 – 10000	1024
Temperature	Temperature of water in °C	0 – 100	20
pH	pH of water	0.01 – 13.99	7.40
ORP	mV of water	0 – 999	606
Auxiliary Input1	Spare Analogue input (4-20mA)	0.0 – 10000	125
Auxiliary Input2	Spare Analogue input (4-20mA)	0.0 – 10000	125
Cycles of Concentration	The cooling water conductivity divided by the makeup water conductivity	0 – 1000	5.1
MakeUp water	Volume of water makeup in litres	0 – 20000	5400
Bleed water	Volume of bleed water in litres	0 – 20000	200
Evaporation & Losses	Volume of water lost due to evaporation and other losses	0 – 9999	1234
Bleed%	Percentage of the log period the Bleed output being active for	0 – 100	0
Inhibitor%	Percentage of the log period the Inhibitor output being active for	0 – 100	20
BioA%	Percentage of the log period the Biocide 'A' output being active for	0 – 100	0
BioB%/ORP	Percentage of the log period the Bio 'B' or ORP output active for	0 – 100	45
pH%	Percentage of the log period the pH output being active for	0 – 100	20
Dispersant%	Percentage of the log period the dispersant output being active for	0 – 100	10
Aux%	Percentage of the log period the Aux. output being active for	0 – 100	0
Alarm%	Percentage of the log period the Alarm output being active for	0 – 100	0
Flow%	Percentage of the log period the flow switch was being active for	0 – 100	0
Alarm Override	Boolean 1 for true or 0 for false.	0 or 1	0
Tank 1: Inhib. Level LOW	Boolean 1 for true or 0 for false.	0 or 1	0
Tank 2: Bio A Level LOW	Boolean 1 for true or 0 for false.	0 or 1	0
Tank 3: Bio B/ CL2 Level LOW	Boolean 1 for true or 0 for false.	0 or 1	0
Tank 4: Bromine Level LOW	Boolean 1 for true or 0 for false.	0 or 1	0
Tank 5: pH Level LOW	Boolean 1 for true or 0 for false.	0 or 1	0

Tank 6: Dispersant Level LOW	Boolean 1 for true or 0 for false.	0 or 1	0

The pre-programmed intervals are 5, 10, 15, 30, 60, 120 or 240 minutes. If the controller is set to log every 0 minutes, then logging is disabled.

Each logged entry takes up memory, so the longer the interval, the longer the time can be between downloads. For example, the controller will have enough memory to store data for 9.4 days for a log taken every 5 minutes, 56.8 days for a log taken every 30 minutes, or for 455 days for a log taken every 240 minutes.

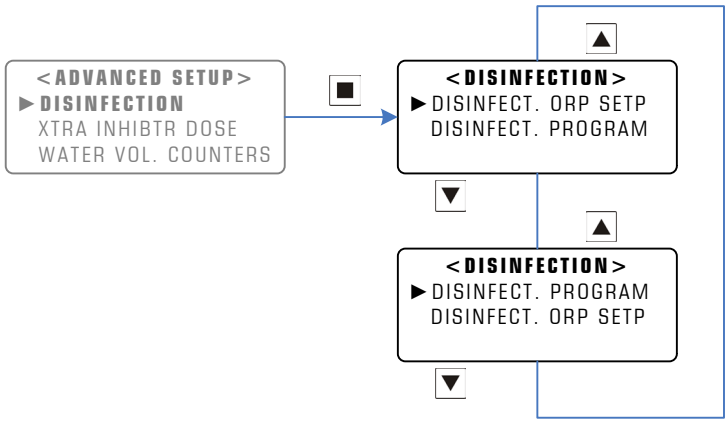
Once the memory is full, the data logger overwrites on a cyclic basis and the oldest data is overwritten first and continues to overwrite the next memory location of the earliest information originally stored.

The data can be downloaded to memory card via the USB port on the front panel of the controller.

If the optional GSM/GPRS Modem is installed and enabled, the logged information can be viewed remotely via the DIGICHEM Plus+ portal at https://www.app.digichemplus.com/.

5.12.2 Disinfection

Main Menu > *SETUP MENU > ADVANCED SETUP > DISINFECTION*

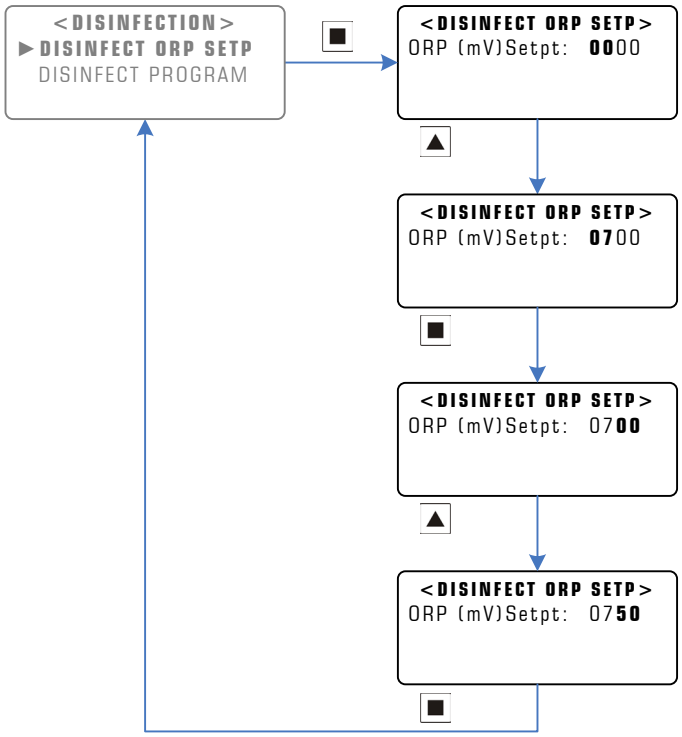


Disinfection Feature Setup Menu

The Disinfection Feature initiates a higher dose of Oxidising Biocide, to achieve an efficient disinfection of the system.
This is achieved by temporarily running the ORP control at a higher ORP Setpoint for a programmable amount of time.

The Disinfection ORP Setpoint Menu is shown on the following page:

Main Menu > *SETUP MENU > ADVANCED SETUP > DISINFECTION >* DISINFECT ORP SETP



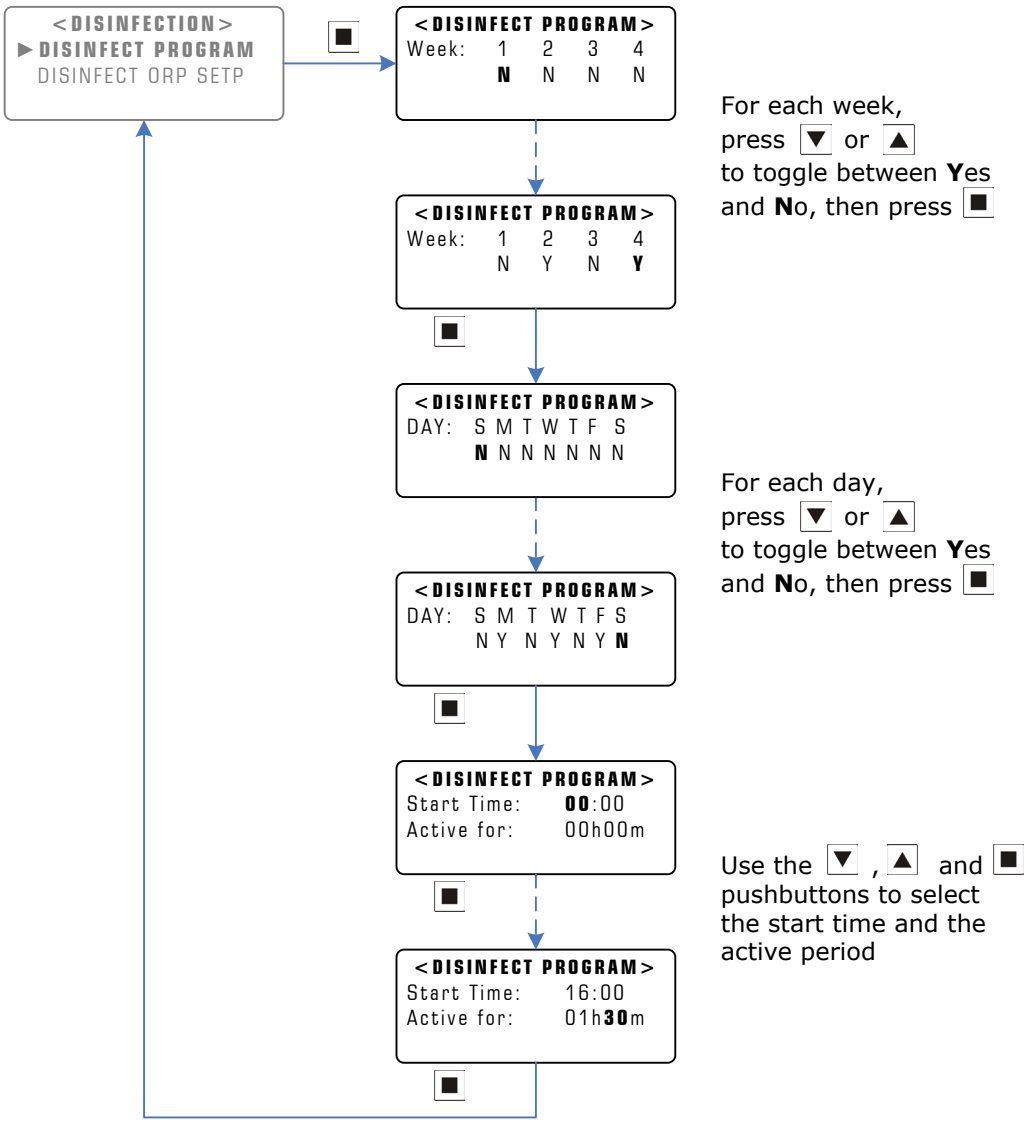
Example: Increasing the Disinfection ORP Setpoint from 500mV to 750mV

NOTES: The disinfection ORP Setpoint must be set at a higher ORP mV than the regular programmed ORP Setpoint.
If the Disinfection ORP Setpoint = 0000, then the function is disabled.

During Disinfection, the HIGH ORP alarm is ignored, until the mV drops below the HIGH ORP alarm value (if programmed). This enables you to have the Disinfection setpoint higher than the HIGH ORP alarm, without generating an alarm during Disinfection.

To Select the Weeks, Days and Time, that the Disinfection Program is active for, please see the diagram on the following page:

Please note that only one start time & duration for all the programmed days can be selected for the Disinfection program, and this will be the only time, and duration that is programmable.



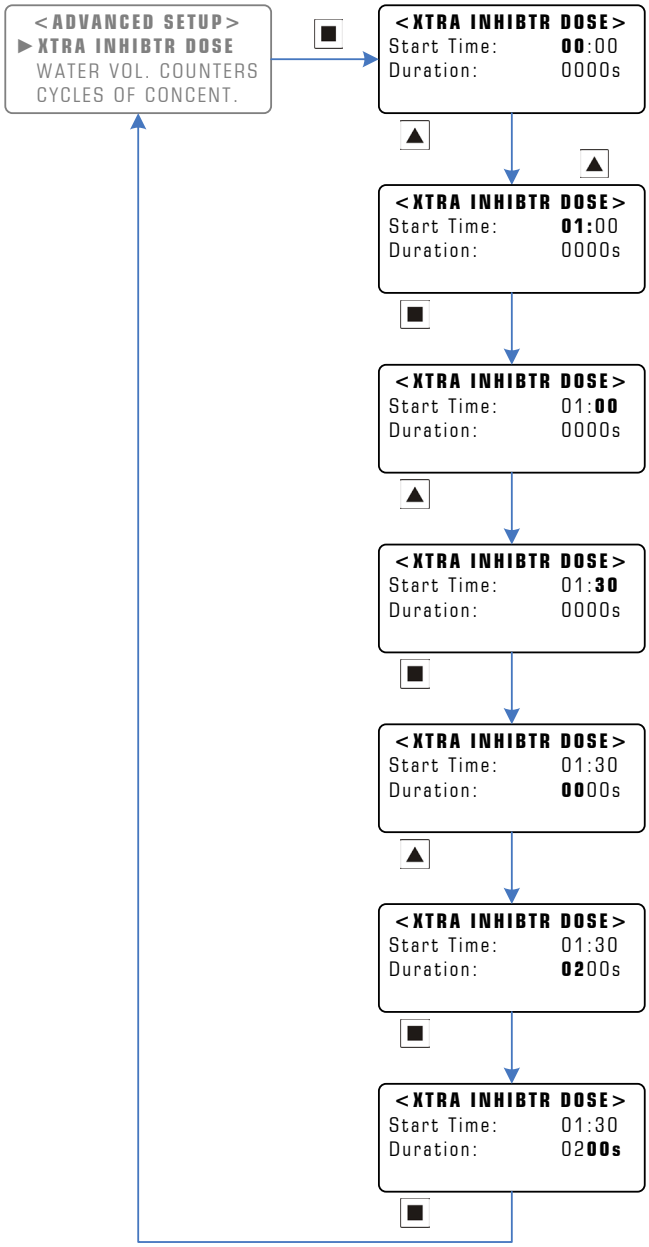
Example: Activating the Disinfection Program to start at 16h00 on Mon, Wed, & Friday in Weeks 2 & 4, for 1h30m (i.e. program cancels at 15h30 on those days)

5.12.3 Extra Inhibitor Dose

Main Menu > *SETUP MENU > ADVANCED SETUP > XTRA INHIBTR DOSE*

An Extra Inhibitor Dose is available with the DIGICHEM Plus+ which occurs once a day. This dose is useful to cater for any uncontrolled losses that the cooling water system may have. A start time and duration are programmable as per the diagram below.

NOTES: If the Start Time and Duration are both set to 00:00, and 0000s respectively, the Extra Inhibitor Dose is disabled.



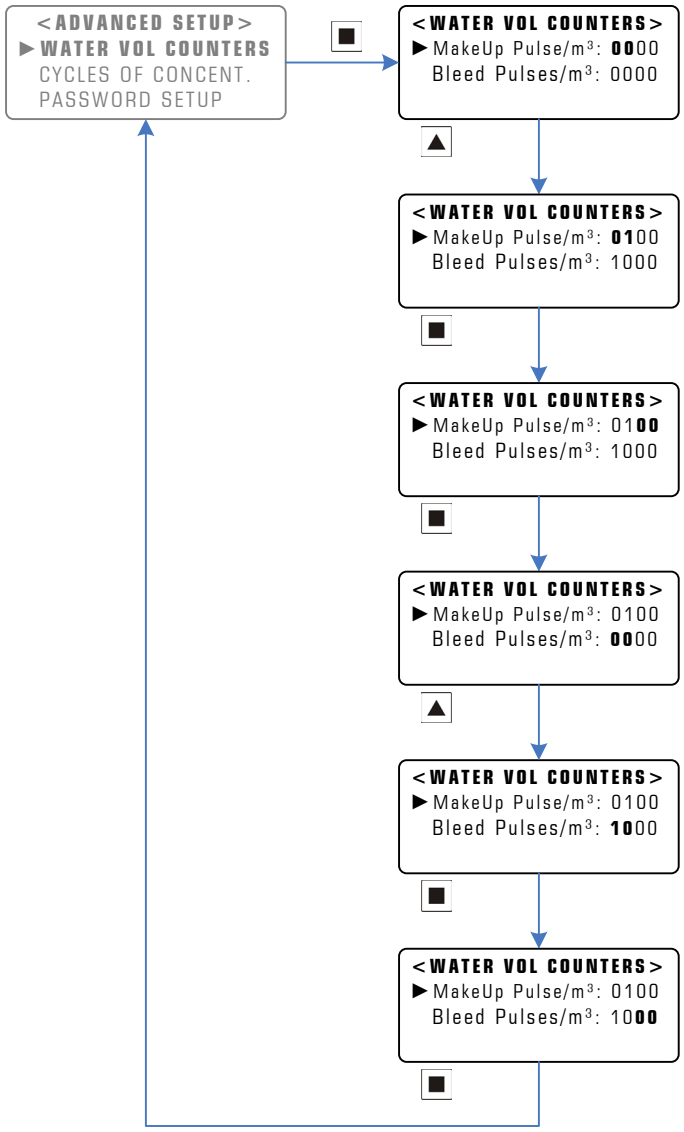
Example: Setting up an Extra Inhibitor dose, starting at 1:30, dosing for 200 seconds

5.12.4 Water Volume Counters

Main Menu > *SETUP MENU > ADVANCED SETUP > WATER VOL COUNTERS*

The Water Volume Counters enable the DIGICHEM Plus+ to count pulses from water meters on the Make-Up and Bleed lines. This enables logging of the Make-Up volume and Bleed Water volume, in order to inform the user of how much water is being depleted from the system down the drain, as well as how much water is being used by the system for Make-Up. Subtracting the Bleed Water volume from the Make-Up water volume, allows a calculation of how much water is evaporating and being lost from the system. The number of pulses per m^3 must be entered for the counter totalise correctly.

Please see the diagram below to set the Water Volume Counters:



Example: Setting Make Up Pulses to 100 pulses / m^3 (1P/10L), and Bleed Pulses to 1000 pulses m^3 (1P/L)

If no water meters are wired into the controller, then leave the setting at 0000.

The following table explains the various settings for the pulses:

Water Meter Pulse Output	**Pulses / m^3**
1p/L (1 pulse per litre)	1000
1p/10L (1 pulse per 10 litres)	100
1p/100L (1 pulse per 100 litres)	10
1p/1000L (1 pulse per 1000 litres)	1
No Pulse	0000

Notes: A '+' will be displayed on the LCD screen momentarily for a make-up pulse, a '-' will be displayed for a Bleed pulse.

5.12.5 Cycles of Concentration

Main Menu > *SETUP MENU > ADVANCED SETUP > CYCLES OF CONCENT.*

A Cycle of Concentration is the ratio between the conductivity of the cooling water system, and the conductivity of the Make-Up Water. For example, if the conductivity of the cooling tower water is running at 500µS, and the Make-Up Water has a Conductivity of 250µS, the cycle of concentration is 500/250 = 2.

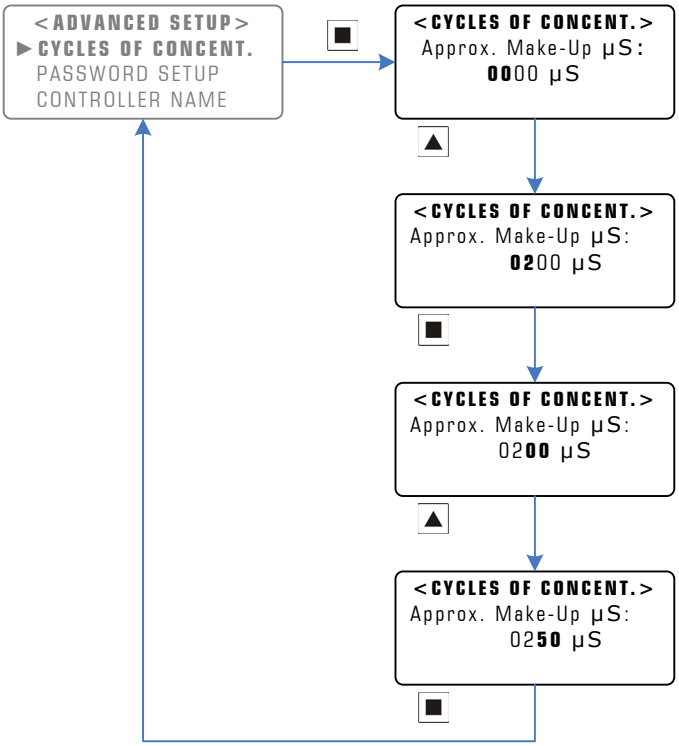
The higher the Cycles of Concentration, the more chance there is of scaling conditions, however water will be saved, as less will be drained from the system to maintain that Cycle of Concentration.

To Log the Cycles of Concentration, the Make-Up Water conductivity is required to be entered into the system, as per the diagram below:

Please note that if the Make-Up Conductivity is set to 0000 µS, then the Cycles of Concentration will not be logged.

If the unit of conductivity is set to TDS, then 'TDS' will be displayed as the Make-Up Conductivity variable, instead of 'µS'.

NOTE: The logged cycles of concentration will only be accurate if the Make-Up water conductivity remains constant.



Example: Entering a Make Up Water Conductivity of 250 µS

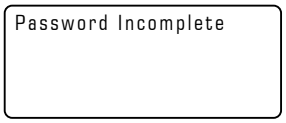
5.12.6 Password Setup

Main Menu > *SETUP MENU > ADVANCED SETUP > PASSWORD SETUP*

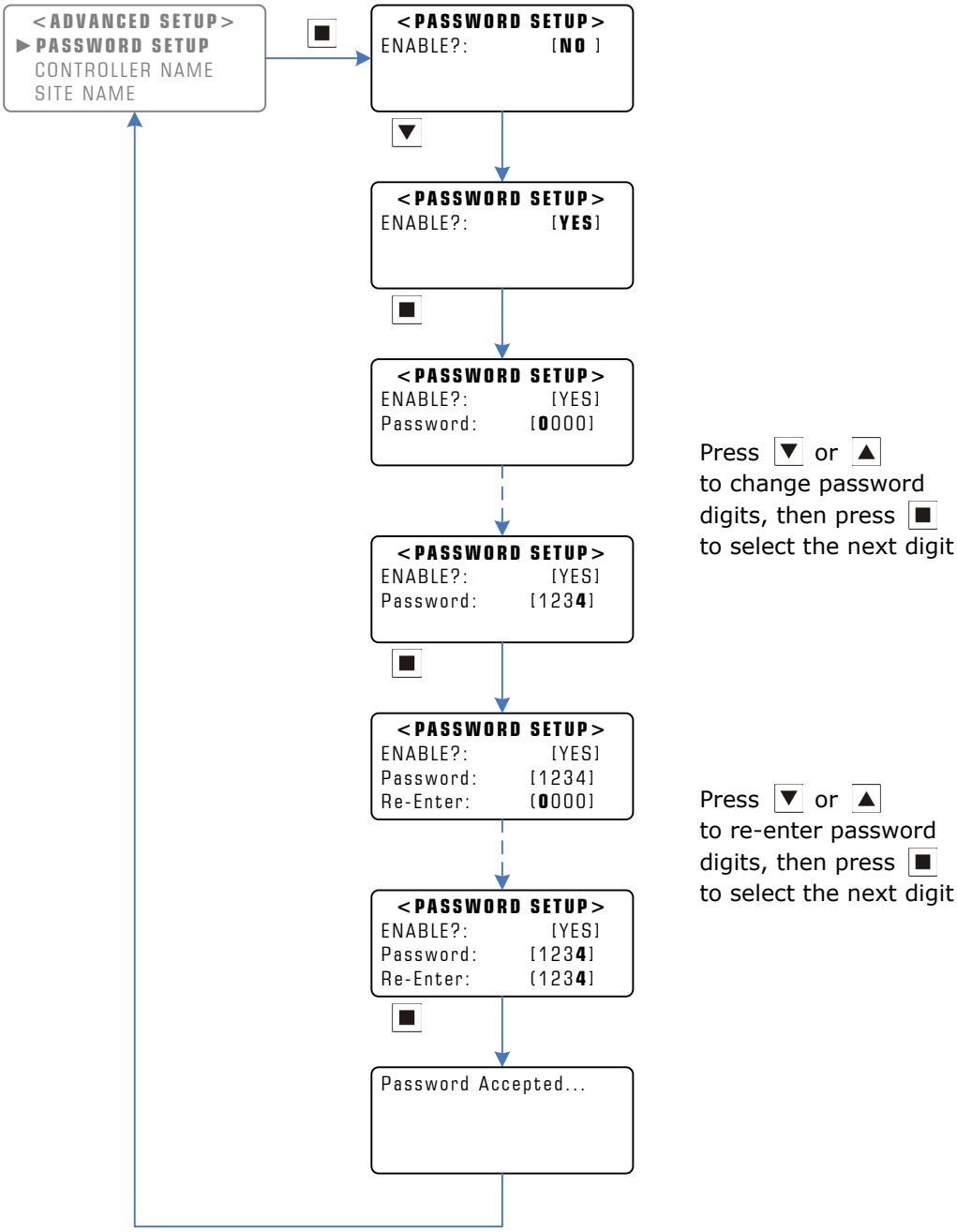
The Password Setup allows a protection feature for the DIGICHEM Plus+ Controller. The password is required to be entered twice for verification purposes.

The Password feature will protect the process from any settings being changed by an un-authorised person.

If the password is entered incorrectly, the display will show the following for a brief period:



It is now necessary to enter the Password Setup menu again, re-enter the Password. An example of this is shown on the following page:



Example: Entering an Access Password of 1234

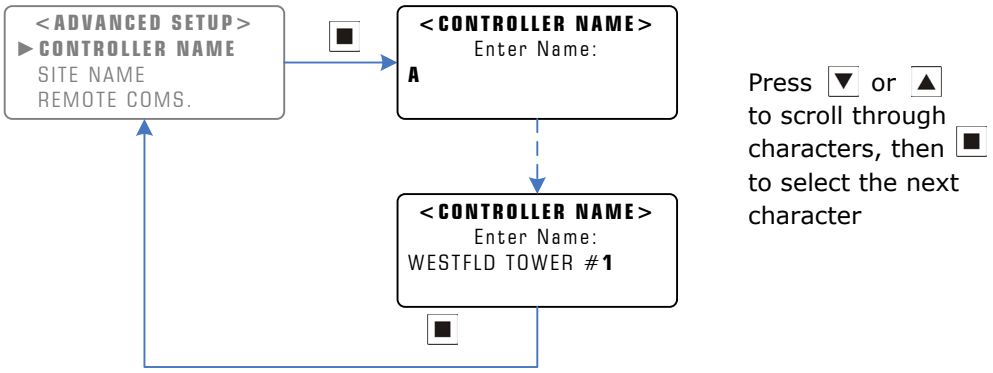
NOTE: If the password feature is enabled, the password will be required to enter the main menu. However, the user will be able to view the controller settings without the password.

5.12.7 Controller Name

Main Menu > *SETUP MENU > ADVANCED SETUP > CONTROLLER NAME*

A unique name can be assigned to individual DIGICHEM Plus+ units to distinguish them from other similar units in the field.

Please note that the controller's name is limited to 16 characters and if Remote Comms is enabled, it cannot be edited. An example of naming a unit is shown below:



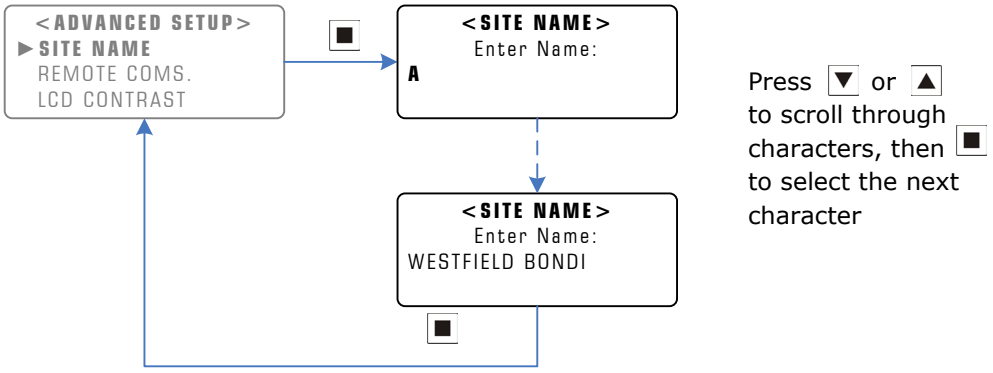
Example: Changing the Controller's name to WESTFLD TOWER #1

5.12.8 Site Name

Main Menu > *SETUP MENU > ADVANCED SETUP > SITE NAME*

A Site name can be assigned to a group of DIGICHEM Plus+ units to distinguish them from other geographical sites in different areas.

Please note that the Site name is limited to 16 characters and if Remote Comms is enabled, it cannot be edited. An example of naming a site is shown below:



Example: Changing the Site Name to WESTFIELD BONDI

5.12.9 Remote Communications

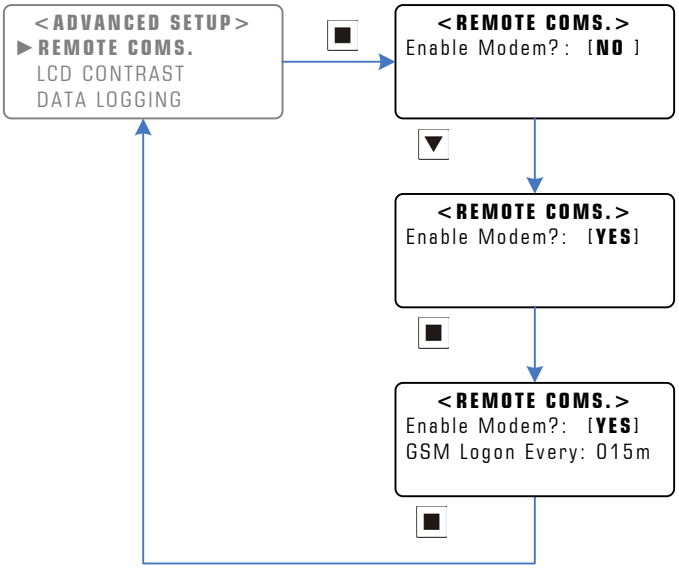
Main Menu > *SETUP MENU > ADVANCED SETUP > REMOTE COMS.*

The DIGICHEM Plus+ can communicate with the remote server (DIGICHEM Plus⁺ portal) via a GSM/GPRS modem, which can be supplied fitted or retrofitted as an option.

Web based software is available as a user interface to access the DIGICHEM Plus⁺ from any computer/mobile device which has an Internet connection.

The default GSM Logon cycle time to the remote server is once every 15 minutes. This time can be altered on the DIGICHEM Plus⁺ controller.

Below is an example of how to implement this feature on the DIGICHEM Plus⁺:



Example: Enabling the Remote Communications

Notes:

- This feature is only available with DIGICHEM Plus+ systems which have been ordered with the GSM/GPRS Modem as an option.
- If Remote Comms is enabled, then the Controller Name and Site Name will not be editable from the DP+ menu, only from the Web-server interface.

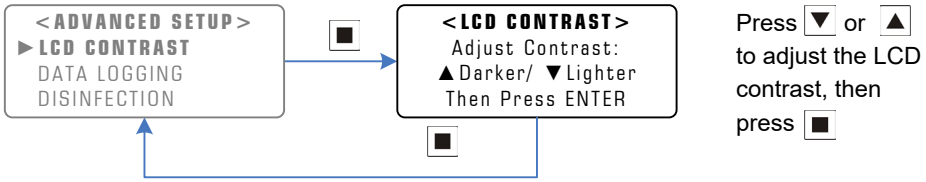
Once logged on, the server looks at the variables in the DIGICHEM Plus+ and updates the information on the server. If alarm conditions exist, the various contact people set up in the web-based software would be contacted via SMS, and/or e-mail depending on the software's setup parameters.

Please contact your supplier for this service should you require.

5.12.10 LCD Contrast

Main Menu > *SETUP MENU > ADVANCED SETUP > LCD CONTRAST*

The LCD screen display intensity can be adjusted which will affect all text displayed on the LCD screen. The diagram below illustrates this feature:



Changing the Display Contrast

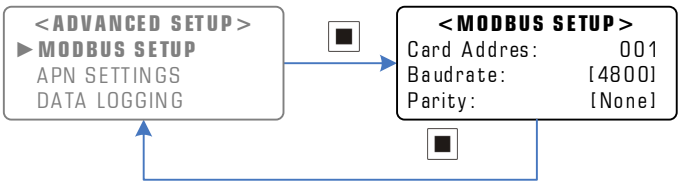
By holding the Up arrow key, the display will gradually become darker, and by holding the Down arrow key, the display will gradually become lighter.

5.12.11 MODBUS Setup

Main Menu > *SETUP MENU > ADVANCED SETUP > MODBUS SETUP*

The DIGICHEM Plus+ can communicate via MODBUS RTU as the "slave device". To utilize MODBUS, an optional DP-OPT-CARD-MODBUS module can be supplied fitted with new units or retrofitted later.

Additional information can be found under the instruction manual for the DP-OPT-CARD-MODBUS module. The diagram below illustrates the menu for this feature:



Press ▼ or ▲ to scroll the menu options. Press ⮌ to enter and change the selected item.

Press ▼ or ▲ to adjust the menu options and ⮌ to confirm setting.

Changing the MODBUS Settings

Configurations:

	Options	**Default**
Card Address	001 – 128 (0x1 - 0x80)	001
Baud rate	4800, 9600, 19200, 28800, 38400, 57600 & 115200	4800
Parity	None, Even, Odd	None

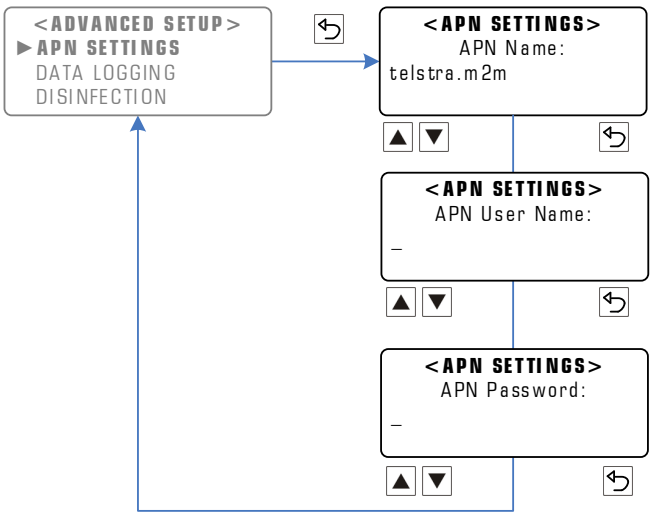
The DP-OPT-CARD-MODBUS module supports the following commands:

Function	**Description**
01	Read Coil
03	Read Holding Registers

5.12.12 APN Settings

Main Menu > *SETUP MENU > ADVANCED SETUP > APN SETTINGS*

To expand the functionality of remote communications, it is possible to change the modem APN (mobile data access point name), username and password to match the SIM card. Below shows the default settings.



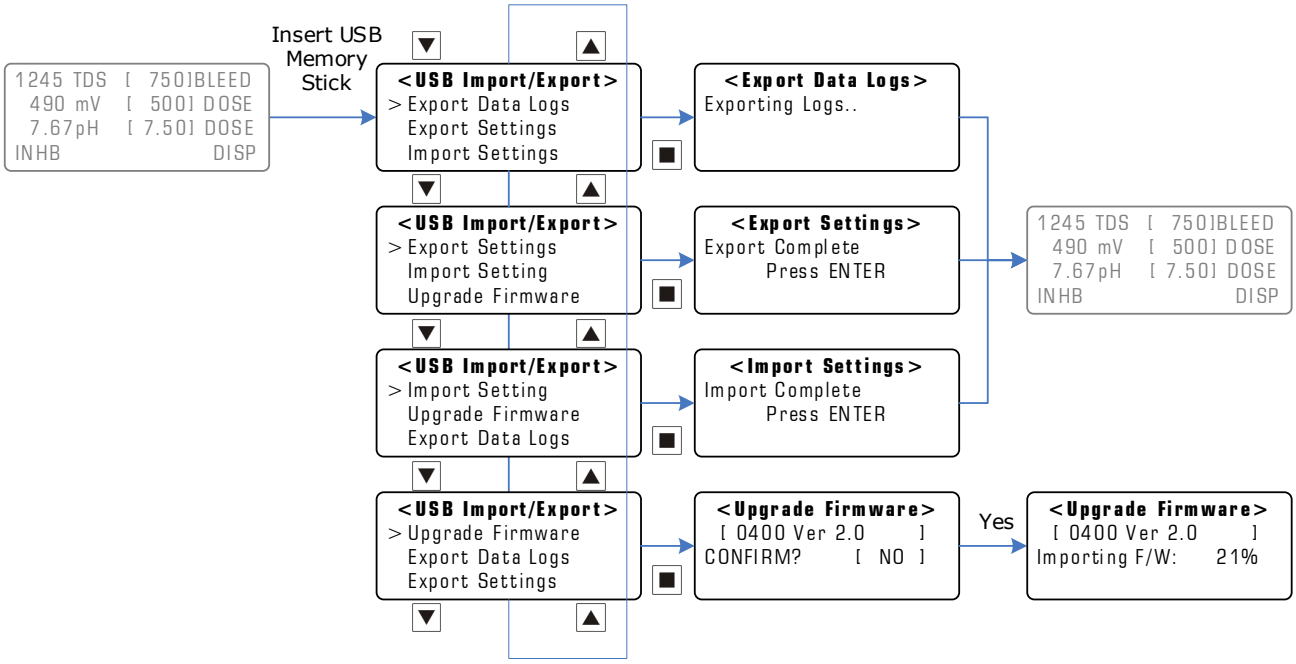
Press ▼ or ▲ to scroll through characters. Press ⮌ to move to the next character. Once entry is complete, key in empty spaces till the end of line.

Changing the APN Settings

5.13 USB Menu

Main Display > *Insert USB Memory Stick*

The USB menu becomes available when a USB memory stick is inserted into the USB port on the front face. The following features become available: Export Data Logs, Import Data Logs, Export Settings, Import Settings and Upgrade Firmware. The diagram below illustrates this feature:



USB Menu

- This feature is disabled during a Remote Coms communication event however the menu will display once it is complete.

5.13.1 Export Data Logs

When the Export Data Logs function is selected, the logged data is saved into the folder named DIGICHEM PLUS\LOGS\. The file created is a CSV (comma separated values) file type that can be opened on the computer in in programmes like MS Excel.

5.13.2 Settings (Export/Import)

The Export Settings function saves the controller settings to a file on the USB memory card. The settings can be applied to another controller or a controller that is replacing the current one.

5.13.3 Upgrade Firmware

For the firmware upgrade, the memory card will need the correct folder structure. By simply inserting the USB memory card in the Digichem Plus, the folder structure is automatically created, and the new firmware file can be copied into the folder named DIGICHEM PLUS\FIRMWARE\ from a computer. Please contact support for the latest released version.

Notes: (Upgrading from v1.11)

- If you are updating from firmware version 1.11, the update progress may not reach 100% and appear to stall, however the update is still happening in the background. After 5 minutes, a manual power cycle is required to allow the firmware update to complete. Once complete the USB memory card can be removed.

6. Factory Settings

The default factory settings are outlined below. These are the settings programmed when a manual Factory Reset is initiated via the menu.

Menu Setting/Item	Default
Start-Up Delay	Count-Down: 0000s (0060s for v0.91 or later)
Conductivity Units	TDS (i.e. ppm Total Dissolved Solids)
Bleed Setpoint	1000 ppm TDS
Hysteresis	3% (max 20% allowable)
Bleed/Pause Cycle	Bleed/Pause = 00s/00s (i.e.. Disabled)
pH Operation	Enabled - Dose Acid
pH Control Setpoint	7.50pH
pH Dose Timer Alarm	Max Dose: 120m
ORP Operation	Enabled - Dose Oxidant
ORP Control Setpoint	500mV
ORP Dose Timer Alarm	Max Dose: 120m
pH & ORP Control Method	Proportional
pH & ORP Proportional Band	50%
pH & ORP Control Cycle	60s
Ground Probe	Enable? [Yes]
High Alarms	0000 for all (i.e.. Disabled)
Low Alarms	0000 for all (i.e.. Disabled)
No Flow Alarm	Enable? [No]
Alarm Trip Delay	3600s
Bleed Timer Alarm	Max Bleed: 000m (i.e.. Disabled)
Timer Alarm Hysteresis	3% (Feature only available for v0.91 or later)
Inhibitor Mode	On bleed
Inhibitor Duty Cycle	ON/OFF = 0050s/0050s (i.e.. On Bleed Only)
Dispersant	24hr/day, ON/OFF = 0000s/0000s (i.e. Disabled)
Biocide Programs	All programs disabled
Pre-Bleed Setpoint	Setpoint -15%
Bleed Lockout Setpoint	Setpoint +20%
Condenser Pump Timer	Biocide Dose + 000m
Flow Switch	Logic [Normal]
Outputs disabled with no flow	Bleed, Inhibitor, pH & ORP
Data Logging	LOG Every: 060m
Disinfection ORP Setpoint	0000mV i.e. disabled
Extra Inhibitor Dose Start Time	00:00
Extra Inhibitor Dose Duration	0000s i.e. disabled
Water Volume Counters	All Set to 0000p/m^3 i.e. disabled
Cycles of Concentration	Set to 0001
Password Setup	Enable?: [No]
Controller Name	--------
Site Name	--------
Remote Coms.	Enable Modem?: [No]

7. Specifications

Item	Specification
Power Supply	220-240VAC, 50/60Hz
Power Consumption	10W max (with no loads on outputs)
Inputs	Conductivity Probe ORP Probe Solution Ground Probe (SS) pH Probe Flow Switch (Volt-free contact) Water meter Make-Up volt-free contact Water meter Bleed volt free contact
Mains Output	240VAC continuous (4A fused)
Control Outputs – Switched 240Vac	6A/240VAC resistive (4A fused)
Auxiliary Output – Switched 240Vac	6A/240VAC resistive (4A fused)
Alarm Relay Output	NO & NC Volt-free (6A/250VAC resistive) (4A fused)
Condenser Pump Relay Output	NO Volt-free (6A/250VAC resistive) (4A fused)
Measured Conductivity Resolution	1µS / 1 ppm TDS
Conductivity Accuracy	0.5% of measured range
Conducitivity Repeatability & drift	1.0% of measured range
Measured ORP Resolution	1 mV
ORP Accuracy	0.4% of measured range
ORP Repeatability & drift	0.8% of measured range
Measured pH Resolution	0.01 pH
pH Accuracy	0.4% of measured range
pH Repeatability & drift	0.8% of measured range
Data retention	100 years
Battery backup	1 year (approx)
Battery type	CR2032 (3Vdc)
Enclosure rating	IP65
Operating Temperature	0 - 50°C

8. Maintenance

8.1 Maintenance Warning

Only trained/qualified personnel may open and work inside of a Digichem Plus. When opening the controller enclosure please take care of the following:

1. Electrical Hazard Warning – Physically disconnect the 240V AC power before opening.
2. Static Discharge Warning – discharge any static built up by earthing, use care and common sense.
3. Leaking and water ingress – when closing the enclosure, ensure the rubber seal is correctly seated to ensure it does not leak and the IP rating is maintained.

8.2 Maintenance Schedule

The suggested maintenance schedule provides for a guideline as to the maintenance and replacement of parts on a DIGICHEM Plus+ control system.
This schedule is based on relatively clean water in a cooling tower, with no adverse conditions or phenomenon occurring.

The DIGICHEM Plus+ Maintenance schedule is suggested as follows:

Item:	Description:	Suggested Maintenance:
SP-SK-01A-BK	Squeeze Tube for SEKO PE-1.3 & PE-0.4 Pumps	Check quarterly, replace after 12 Months
SP-DCON-P10AT-P	Conductivity Probe (old style)	Clean monthly, replace after 2 Years +
SP-DCON-PB10AT-P	Conductivity Probe (new style)	Clean monthly, replace after 2 Years +
IONODE IH40-01M	pH Probe (smooth body)	Clean monthly, replace after 1 Year +
WA OPF10-NNN-1.5m	pH Probe (threaded body)	Clean monthly, replace after 1 Year +
IONODE IH30-01M	ORP Probe (smooth body)	Clean monthly, replace after 1 Year +
WA M-10-ORP-A-SC-1.5M	ORP Probe with Silcoat (threaded body)	Clean monthly, replace after 1 Year +
SP-SOL-1/2-B	Solenoid Valve	Manually test monthly, replace as required
SP-SK-03A	Injection Valve	Replace as required
SP-TB0604B-020	Black Discharge Tubing	Replace as required
SP-TB0604N-PVC	Clear Suction Tubing	Replace as required

9. Optional Extras

The following options can be fitted to the DIGICHEM Plus+ Systems:

DOSING PUMP OPTIONS

DP-OPT-PUMP-PH	Add pH Pump (Acid or Base) to DP-CAPH-RXB or DP-CAPH-RXPP, incl. extra manifold fittings
DP-OPT-PUMP-PH-CAB	Add pH Pump (Acid or Base) to DP-CAPH-RXB-CAB or DP-CAPH-RXPP-CAB, incl. extra manifold fittings
DP-OPT-PUMP-DIS	Add Dispersant pump to any PVC mounted DIGICHEM Plus+ System, incl. extra manifold fittings
DP-OPT-PUMP-DIS-CAB	Add Dispersant pump to any Cabinet mounted DIGICHEM Plus+ System, incl. extra manifold fittings

PVDF (KYNAR) MIXING CHAMBER OPTIONS FOR CHLORINE/BROMINE DOSING

DP-OPT-MIX-PVDF	Add PVDF (Kynar) Mixing chamber for neat mixing of Chlorine & Bromine to return neat via tube to tower basin
DP-OPT-MIXS-PVDF	Add PVDF (Kynar) Mixing chamber to go in-line with manifold outlet

INPUT & OUTPUT PLUG-IN CARDS

DP-OPT-CARD-IP	Input card to monitor 6 tank levels with optional low level tank switches
DP-OPT-CARD-IP-mA-2	Input card to monitor 6 tank levels with optional low level tank switches, plus to monitor two 4-20mA signals from 3rd party devices, such as corrosion transmitters. (NOTE: DP-OPT-CARD-3G or DP-OPT-CARD-GPRS modem required with connection plan).
DP-OPT-CARD-OP	Output card for BMS/DDC incl. 4 x 4-20mA outputs, 9 x logic outputs for each pump & solenoid valve status, and for flow, alarm & power status

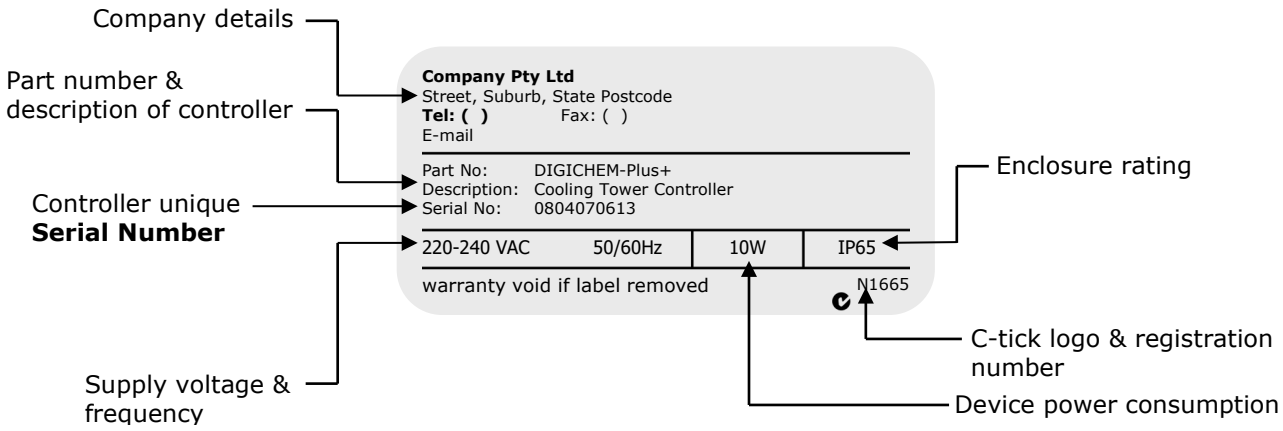
REMOTE COMMUNICATION OPTIONS

DP-OPT-CARD-4G	4G Modem card to enable full remote connectivity via the Internet (Excludes Access Fees - see options below)
DP-OPT-WEB-PRO-RATA	New activation of DIGICHEM Plus+ Internet connection. Includes server connection setup, e-mail & SMS charges billed pro-rata to JUNE. (Fair use policy of data & SMS notifications applies - see www.cwc.com.au/home/fairuse.html) Excludes SIM Card.

Please see the detailed assembly diagrams (included with purchase) for how the above parts are mounted with the various systems.

10. Service & Technical Support

Important: Please note the serial number and product/system part number before calling for assistance.



Example of Controller Info Label
(Adhered to Controller Enclosure)

Note:

1. Controllers incorporated in a system, have the same serial numbers as the system itself.
2. The First 6 digits of serial is the date of manufacture (yymmdd)