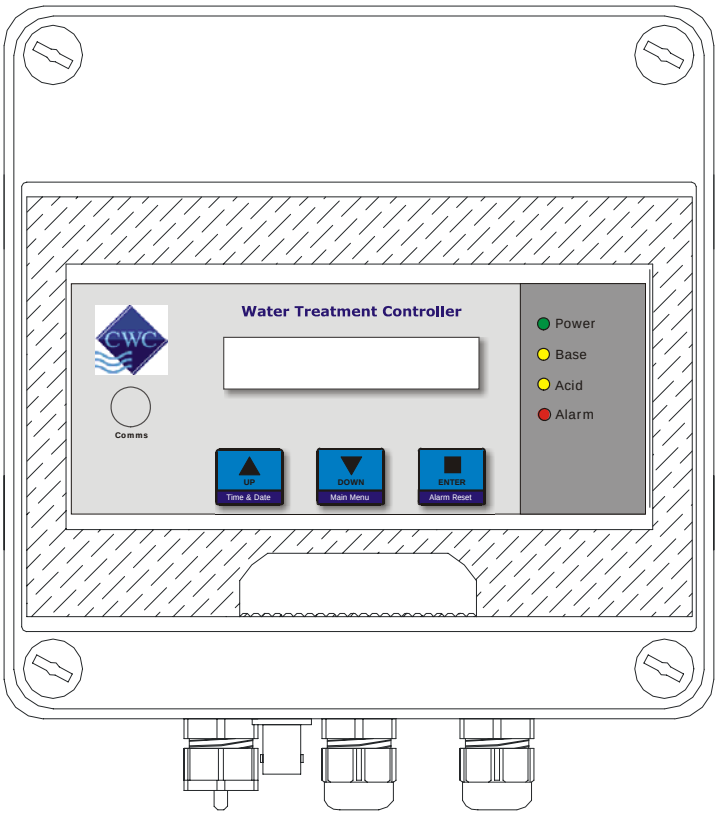
Instruction **Manual**

Dual pH Controller
Model: PHD-XP2



Supplied by:

Convergent Water Controls Pty Ltd
2/4 Huntley Street, PO Box 7058
Alexandria NSW 2015

t: (02) 9698 3131 **w:** cwc.com.au
f: (02) 9698 3210 **e:** support@cwc.com.au

Manufacturer: Convergent Water Controls Pty Ltd, Sydney Australia.

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

Warranty: This product is guaranteed for a period of 12 months from installation date 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

The PHD-XP2 measures and controls the pH as read by a pH sensor and can be programmed to dose both acid and base. If unstable readings are experienced, the unit can measure pH with respect to an optional solution ground probe (model DCON-CMR) using its differential input amplifier.

When acid is dosed, it causes a decrease in pH. Similarly, when base is dosed, it causes an increase in pH.

The PHD-XP2 features 2 methods of pH control: **ON/OFF or proportional**. With ON/OFF control, the controller either turns the pump on continuously when correcting the pH or modulates the pump by turning the pump ON and OFF during the dosing period. (These ON and OFF times are programmable). For more accurate control, the proportional dosing algorithm modulates the pump based on a percentage pH variation from the Setpoint. The further the pH is from the Setpoint, the shorter the OFF period is. The closer the pH is to the Setpoint, the longer the OFF period is.

Other useful features of the PHD-XP2 are the programmable alarms, 7-day timer programs and data-logging facility.

2. Installation

Mount the PHD-XP2 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.

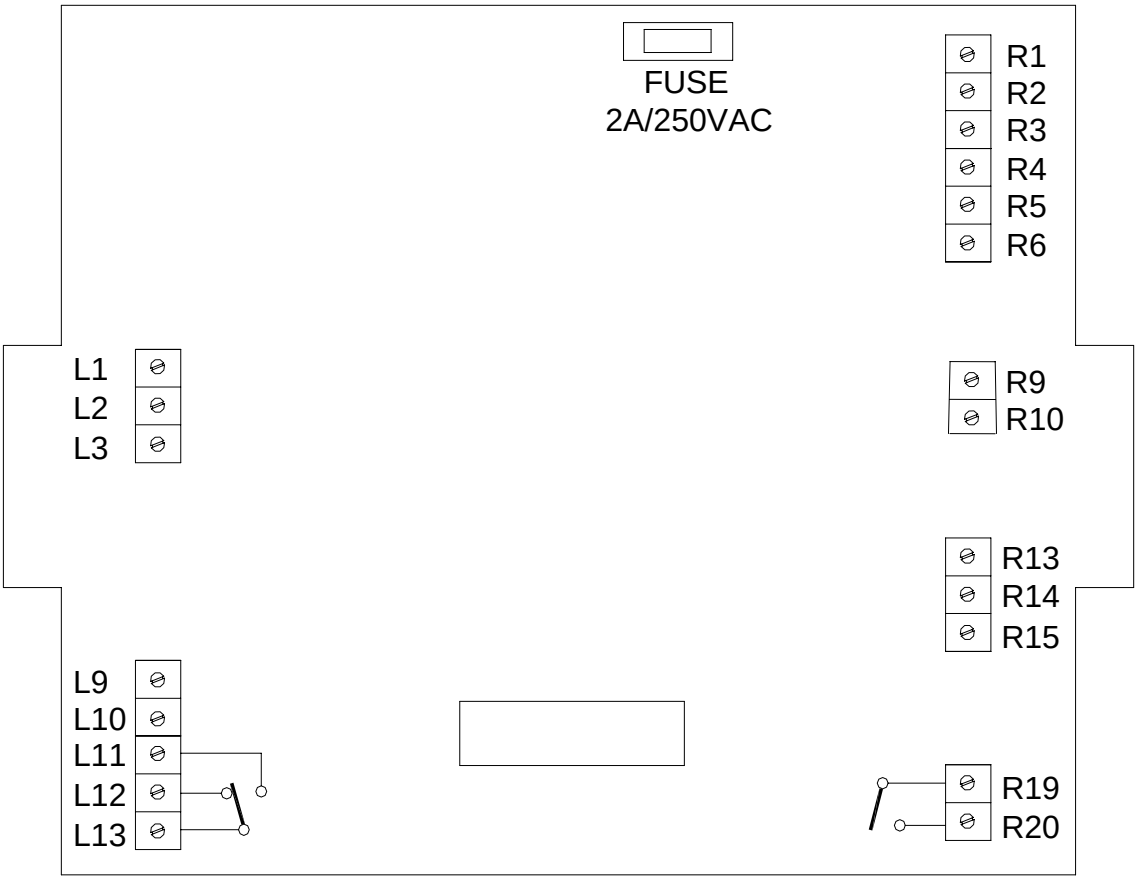
2.1 Electrical Wiring

CAUTION: If opening the controller, 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.

NOTES:

1. The BNC connector for the pH sensor is panel mounted in the bottom of the enclosure
2. The solution ground probe connection point is via a screw terminal on the circuit board (terminal L3)
3. The N/O output R19 & R20 is used as a flow-switch repeat contact to be able to daisy-chain multiple controllers together with one flow switch. When

connected to the flow switch input of another controller, one flow switch will disable both controllers on no-flow.
The diagrams below show the connections to the PHD-XP2 controller circuitry:



PHD-XP2 Mother Board Circuitry

L1:	BNC - pH Signal (White)
L2:	BNC - common (Green)
L3:	Solution Ground Probe
L9:	Flow Switch In
L10:	Flow Switch Common
L11 + L13:	Alarm Relay N/O volt-free (10A/250VAC res)
L12 + L13:	Alarm Relay N/C volt-free (10A/250VAC res)
R1:	Mains Active 240VAC (power supply)
R2:	Mains Neutral
R3:	Auxiliary Continuous Active 240VAC (2A fused)
R4:	Auxiliary Neutral
R5:	Base Control Output Active 240VAC (2A fused) for connecting dosing pump or solenoid valve
R6:	Base Control Output Neutral
R9:	Acid Control Output Active 240VAC (2A fused) for connecting dosing pump or solenoid valve

R10:	Acid Control Output Neutral
R13 - R15:	Common Earth
R19:	Flow Switch Repeat common
R20:	Flow Switch Repeat N/O volt-free (10A/250VAC res)

2.2 Sensor Installation

Consider carefully the type and location of the pH sensor. Your instrument supplier should be able to advise the correct sensor type for your application.

Any pH sensor has a high output impedance and is susceptible to interference if not installed correctly. Plan the installation such that the pH sensor is as close as possible to the controller. If the sensor needs to be located further away from the pH controller, an extension cable must be obtained. The further the sensor is away from the controller, the greater the effect of electrical interference will be. This may degrade the signal from the sensor and causes incorrect readings. Never attempt to extend the sensor cable by means of a terminal block or soldered connection. This will leave the connection open to interference or moisture, which will affect the accuracy of the system. Always have the connection (when using an extension cable) in a waterproof junction box. A maximum sensor cable length of 10 metres is recommended, however, in a good environment, up to 20 metres is likely to be acceptable.

The optional Solution Ground Probe, if used, must be inserted into the same solution as the pH sensor. The controller uses common mode rejection technology to eliminate any electrical interference on the pH sensor. This function must be enabled in the SETUP MENU of the controller. Solution ground probes are only recommended if there is an unacceptable level of fluctuation in the pH readout on the controller.

3. Controller Functionality

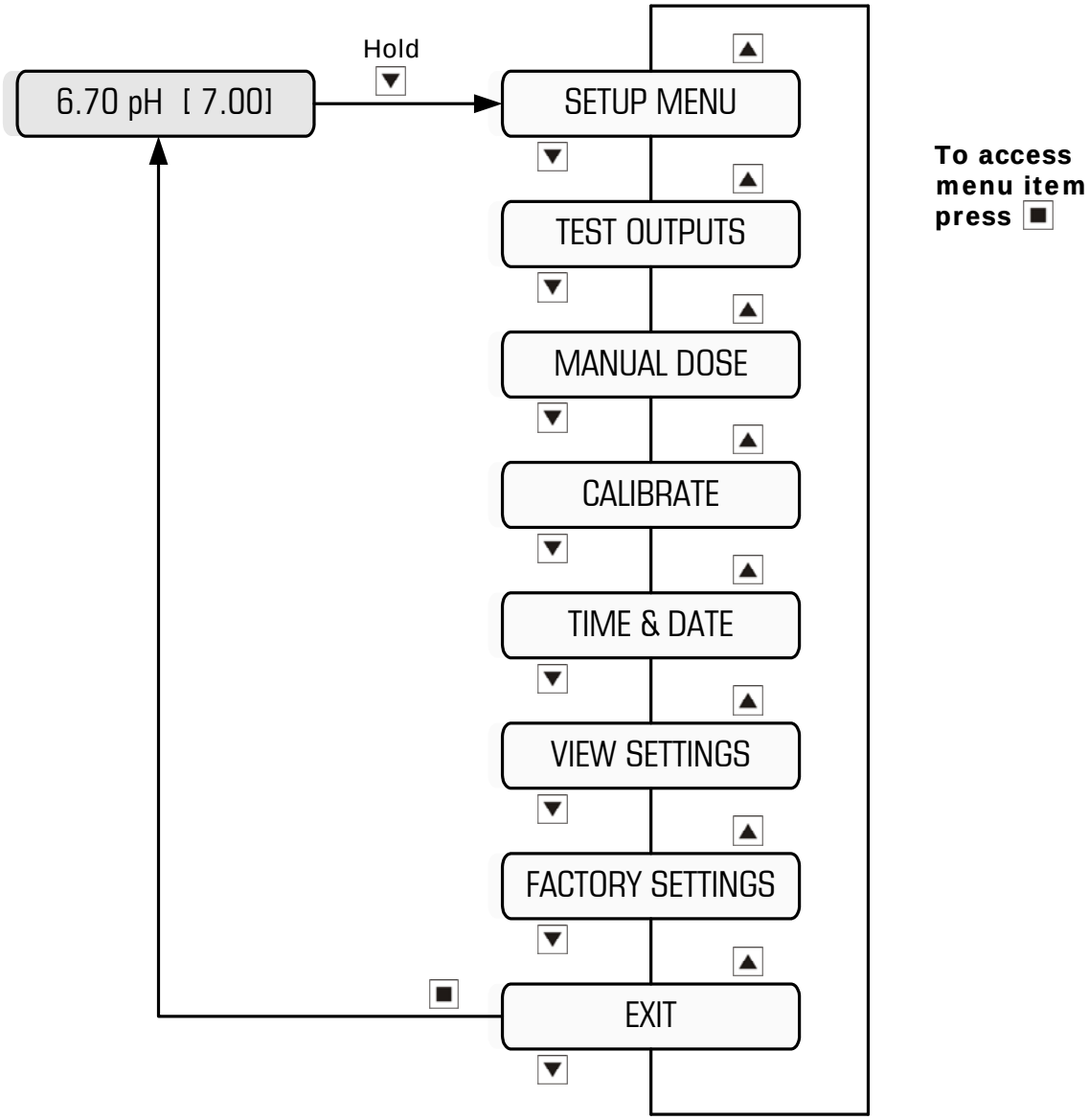
3.1 Menu Logic

The PHD-XP2 has an advanced but very user-friendly menu system:

- The menu structure is circular
- The relevant menu item, or programmed value flashes
- Up and 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 LCD is backlit

The MAIN MENU of the controller is illustrated as follows:



3.2 Pushbuttons

The PHD-XP2 has 3 pushbuttons which each have dual functions:

1. Scroll UP (Time & Date)
2. Scroll DOWN (Main Menu)
3. ENTER (Reset)

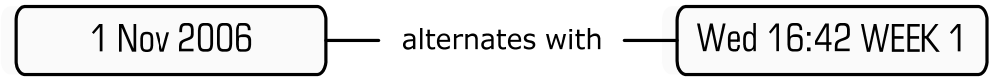
- The **Scroll UP** and **DOWN** pushbuttons allows you to scroll in both directions in the circular menus. Once a menu item has been selected and

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.

- If the Scroll UP (Time & Date) pushbutton is pressed momentarily in NORMAL MODE (explained in section 4.1), the time and date is displayed. To revert back to NORMAL MODE, press the pushbutton momentarily again.

  The time and date is 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 PHD-XP2, hold down the Scroll DOWN (Main Menu) pushbutton. The display will count down until you access the menus.

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

3.3 LED Indication

There are 4 LEDs on the front face of the PHD-XP2:

- Power (green): illuminates continuously when power is applied to the controller
- Base (amber): illuminates continuously when power is applied to the base control output of the controller. If the control output is suspended due to a pause in the control cycle, the LED will flash on and off.
- Acid: (amber): illuminates continuously when power is applied to the acid control output of the controller. If the control output is suspended due to a pause in the control cycle, the LED will flash on and off.

- Alarm (red): illuminates when the alarm relay switches. If the alarm delay is timing before the alarm condition is confirmed, the LED will flash on and off.

3.4 Comms Port

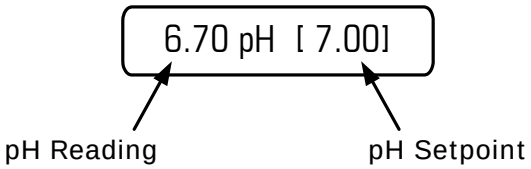
There is a Comms port on the front panel of the controller next to the LCD. This is used to download data from the controller, and can also used to upload new software versions should they be required. (An optional cable for downloading data is required, P/N SP-XP2-COMCABLE-1)

4. Commissioning

CAUTION: Refer to previous section before reading this section

4.1 Start-Up

Power up the controller after installation. After a start-up sequence, the controller automatically goes into NORMAL MODE. The display should read the measured pH as well as the pH Setpoint within square brackets, as follows:

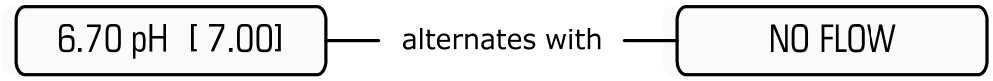


Other information that you may see on the display, which alternates with the display above:

- When an alarm is reported, the actual alarm message will be periodically displayed.

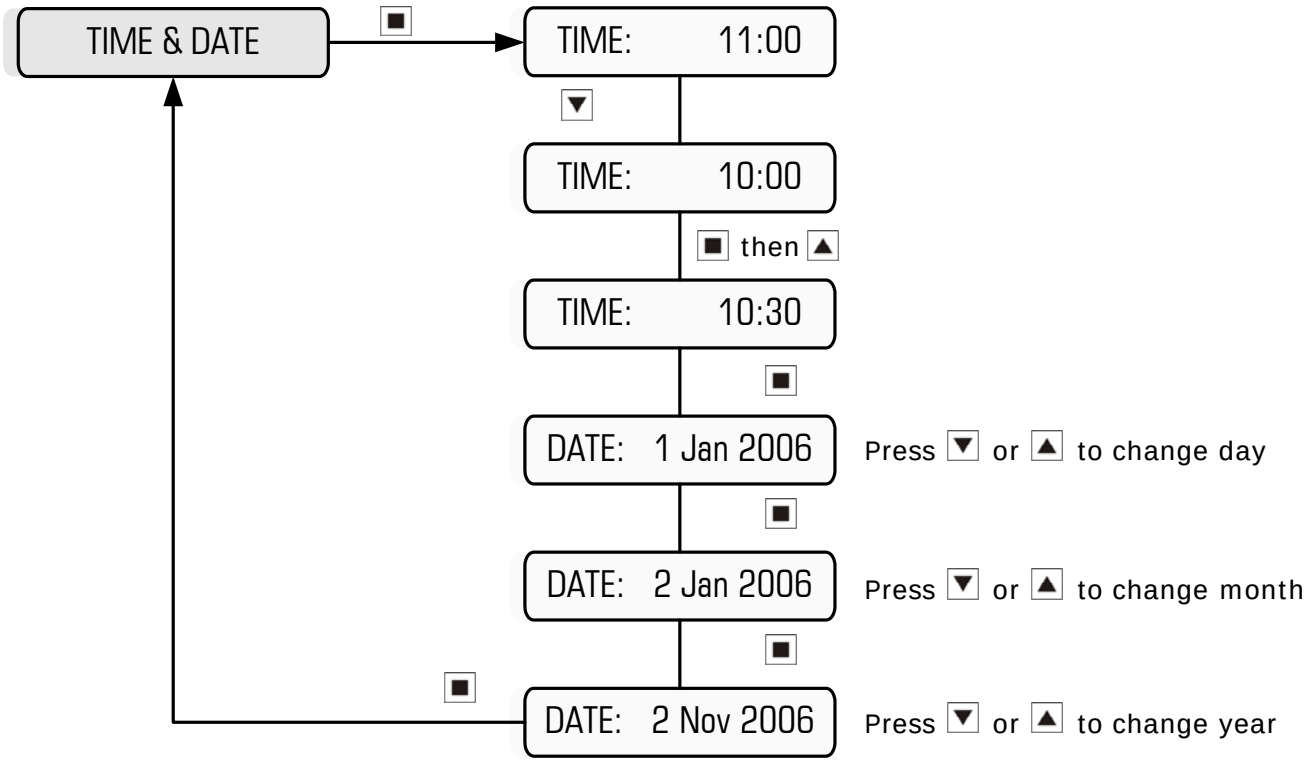
- The controller has a programmable timer which is activated on start-up or when flow is resumed (assuming the flow switch function is enabled in the SETUP menu). This timer times down to zero, during which time pH control is suspended. This gives the system time for the water to circulate and for the pH reading to settle down.

- When a flow switch is connected to the controller, pH control is suspended when there is no flow past the flow switch. This function is enabled in the SETUP menu.



4.2 Setting Time & Date

Main Menu > *TIME & DATE*



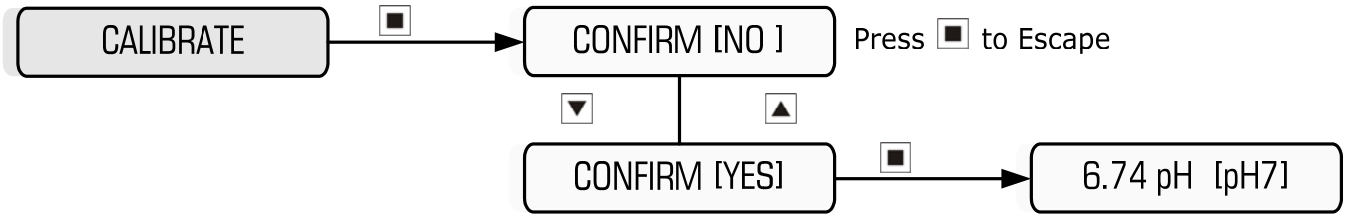
Example: Setting time & date to 10:30 on 2 Nov 2006

NOTE: The Week No will be automatically set

4.3 Calibration

Step 1
Insert the pH Sensor in pH7 buffer solution

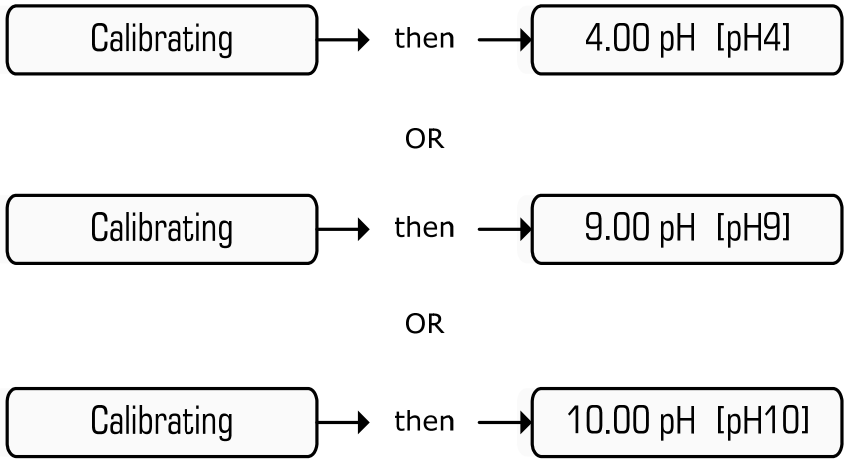
Main Menu > *CALIBRATE*



Step 2
Wait for the measured pH reading to stabilise and check if the flashing pH value within the square brackets corresponds to the buffer solution. Only press the ENTER pushbutton if the buffer reading in brackets is correct, and the measured pH reading is stable. (The controller should automatically detect what buffer you are using. If not, the pH sensor may be faulty, or the controller might require a factory and calibration reset). The display briefly shows:

Note: If the measured pH still deviates from that of the buffer, press the ENTER pushbutton again and repeat Step 2.

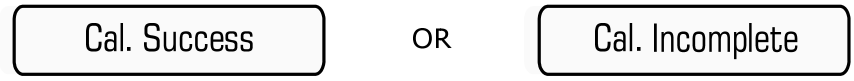
Step 3
Insert the pH Sensor in pH4, pH9 or pH10 buffer solution. Repeat Step 2. The display briefly shows:



Note: If the measured pH still deviates from that of the buffer, press the ENTER pushbutton. This can be repeated until the reading is stable.

Step 4

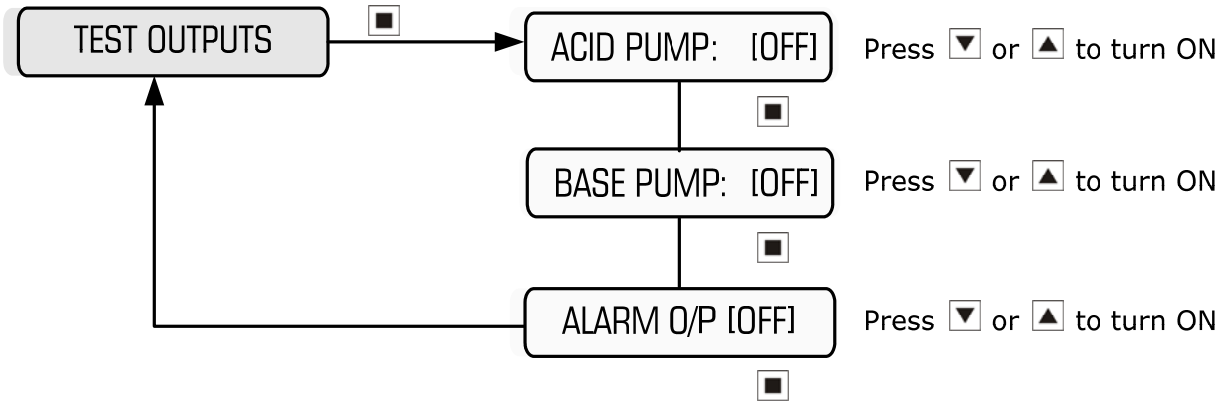
Once calibration has been completed, press either the SCROLL UP or DOWN pushbutton. The display briefly shows the following before reverting to the NORMAL DISPLAY:



Note: If Cal. Incomplete is shown, the calibration process needs to be repeated.

4.4 Testing Control Output Relays and Alarm Relay

Main Menu > *TEST OUTPUTS*



When the Acid or Base Control Outputs are activated, the amber Control LED's illuminate and the Control relay switches, applying 240VAC power onto the output terminals. This activates the pump or solenoid valve wired to it.

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

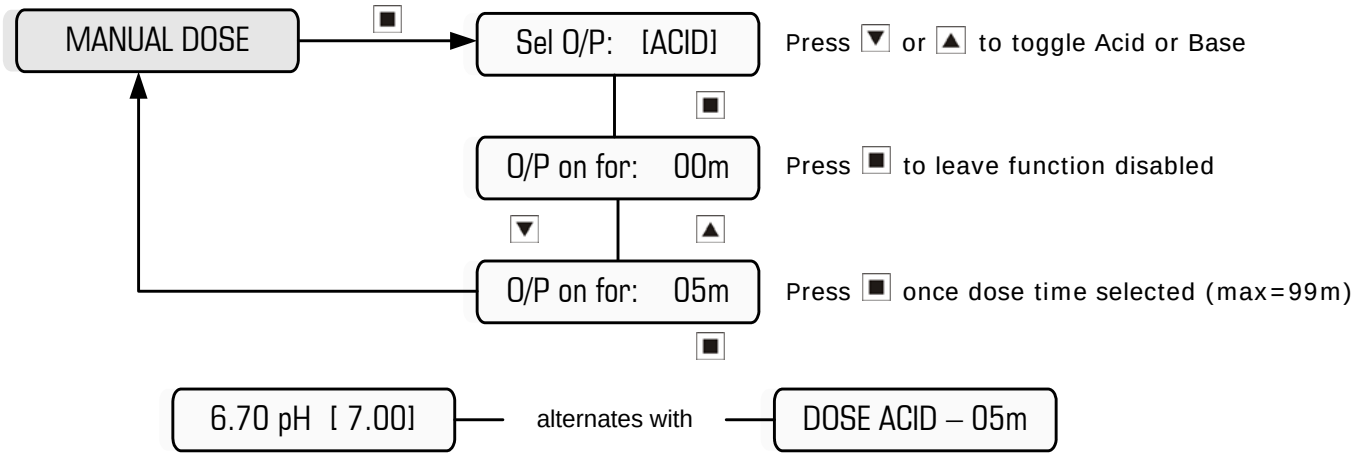
NOTES:

1. If no push button is pressed in the TEST outputs mode, after 2 minutes the controller will automatically revert back to the main screen, and the control outputs will be activated as usual in normal operation.
2. If you wish to drive the control output for longer than 2 minutes, activate the MANUAL DOSE function within the MAIN MENU
3. The outputs will all switch on when tested, regardless of the flow condition.

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) as follows:



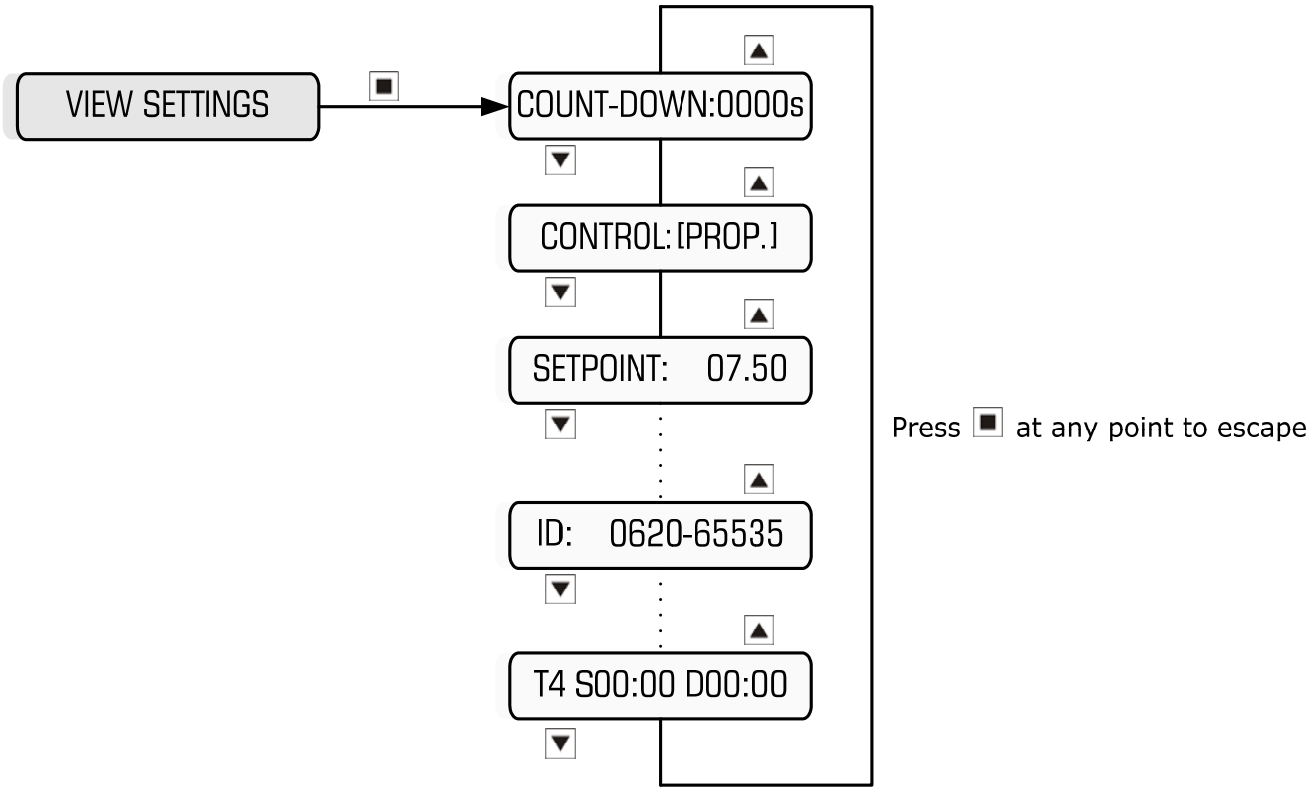
Example: Setting ACID Output to dose for 5 minutes

Note: The pump will not dose if there is no flow

4.6 View Settings

Main Menu > *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. Please see this on the following page:

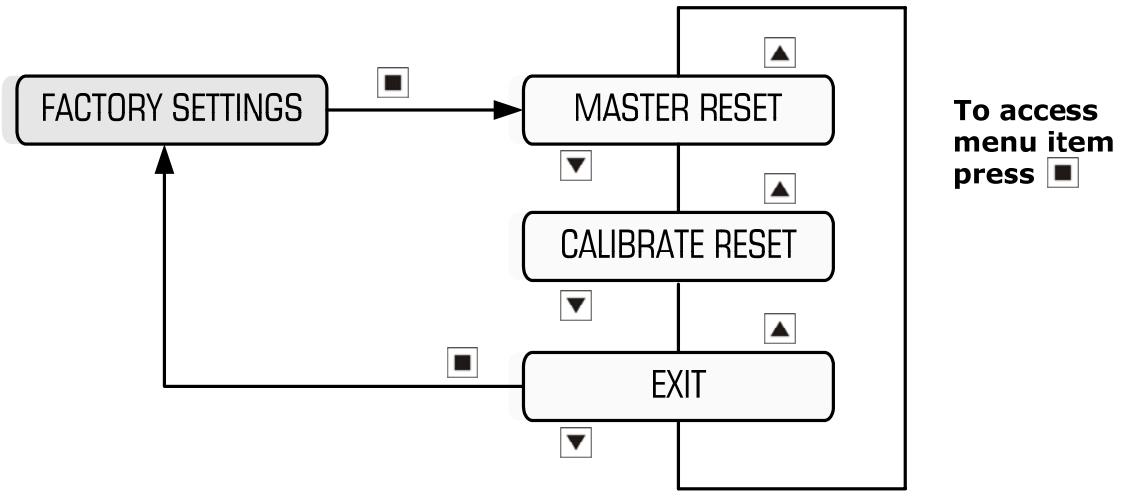


4.7 Factory Settings

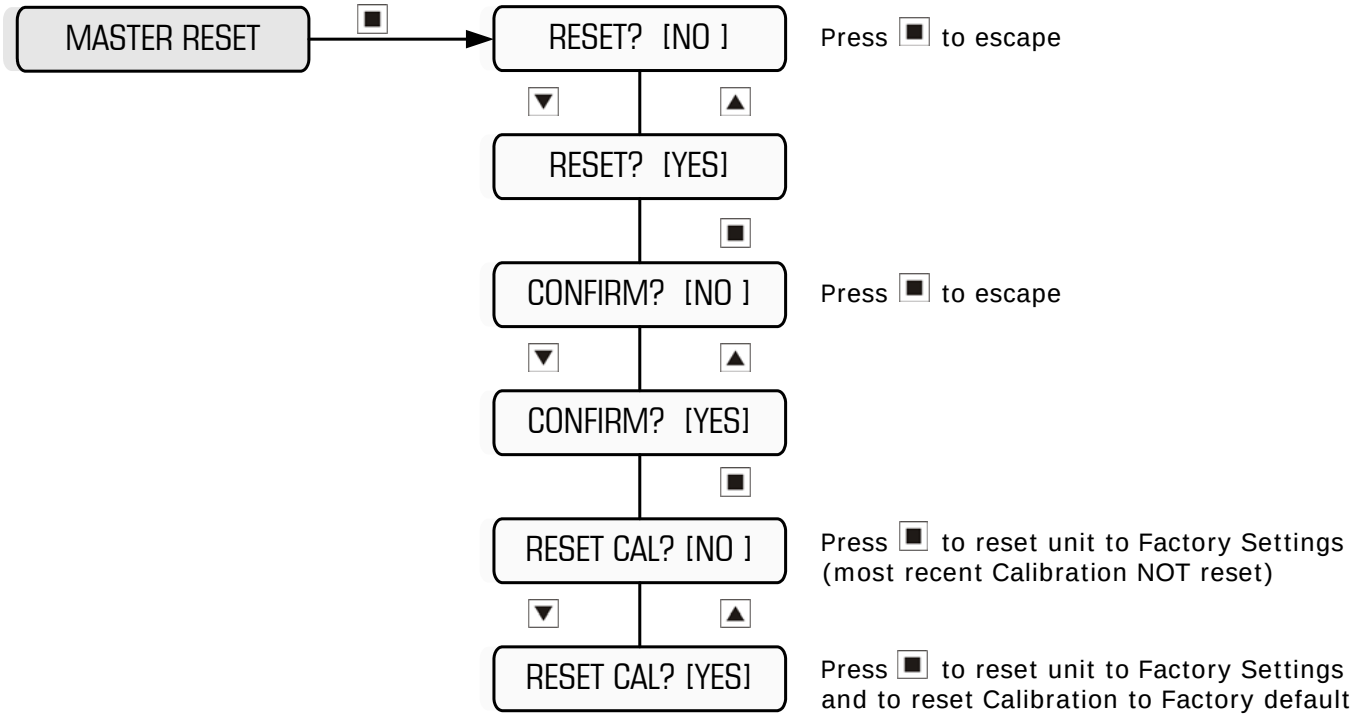
Main Menu > *FACTORY SETTINGS*

CAUTION:

- Enter this part of the program ONLY if you wish to erase your program settings.
- The default settings 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.



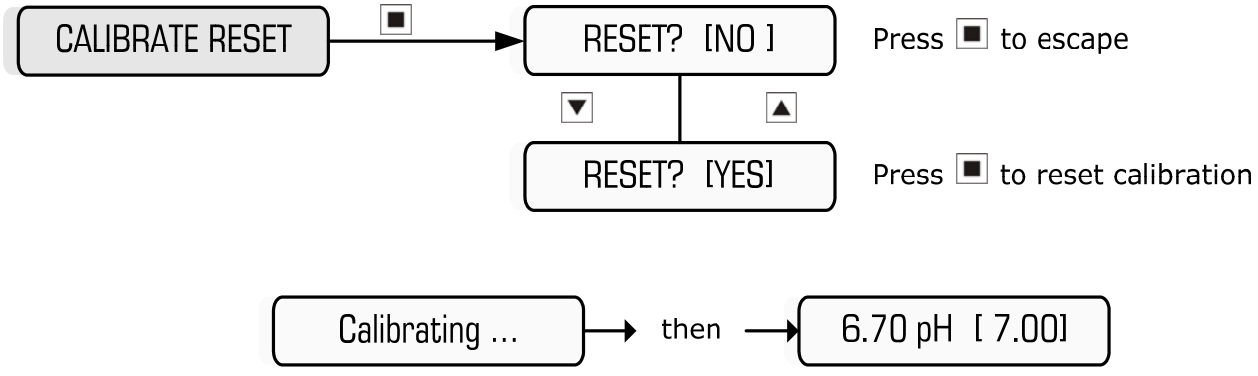
Main Menu > *FACTORY SETTINGS > MASTER RESET*



Main Menu > *FACTORY SETTINGS > CALIBRATE RESET*

To reset the pH calibration of the unit without resetting other settings, access the Factory Settings Menu option, select Calibrate Reset and follow the prompts.

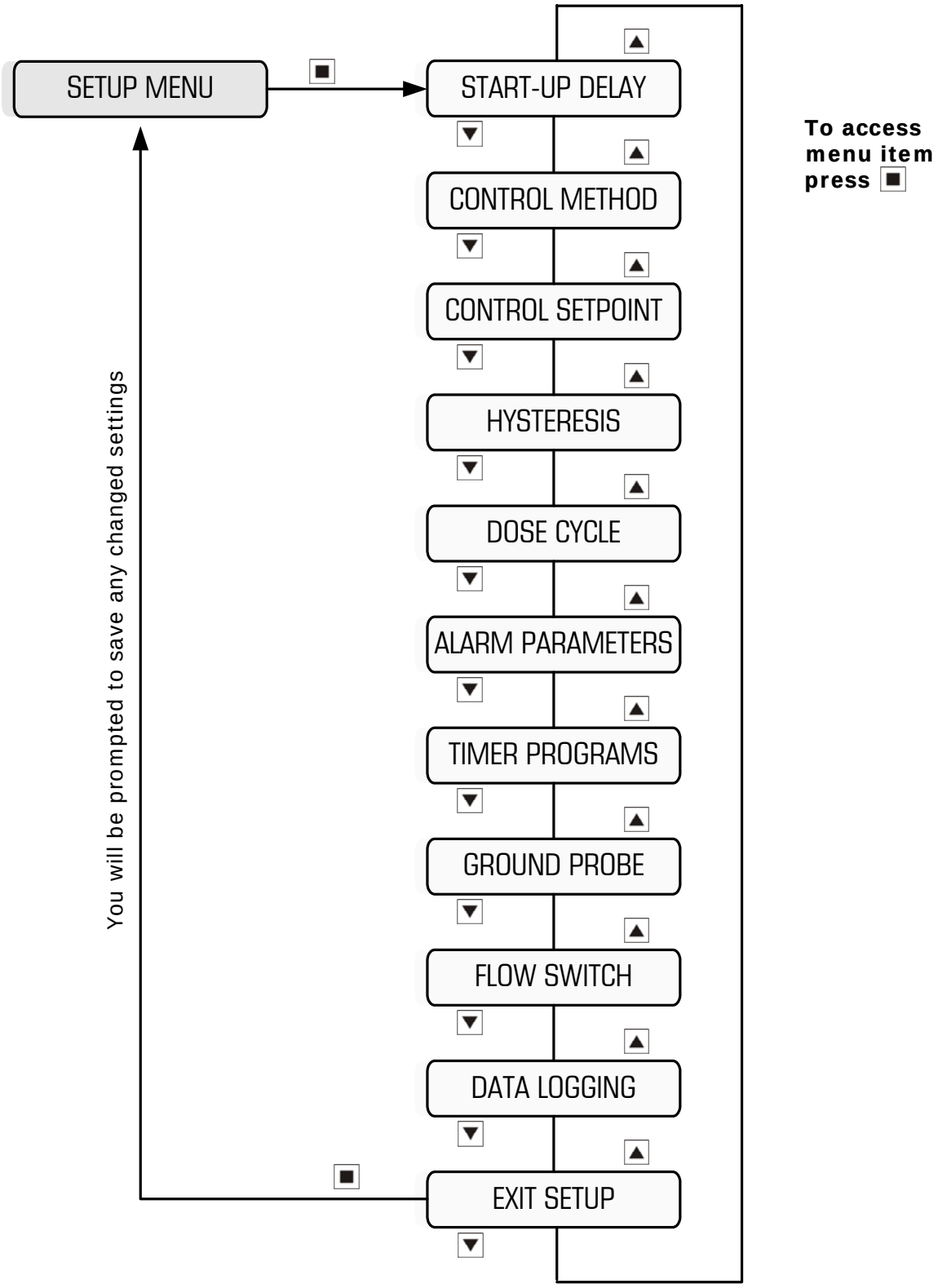
NOTE: Once the calibration has been reset, you will need to re-calibrate the pH sensor (see section 4.3).



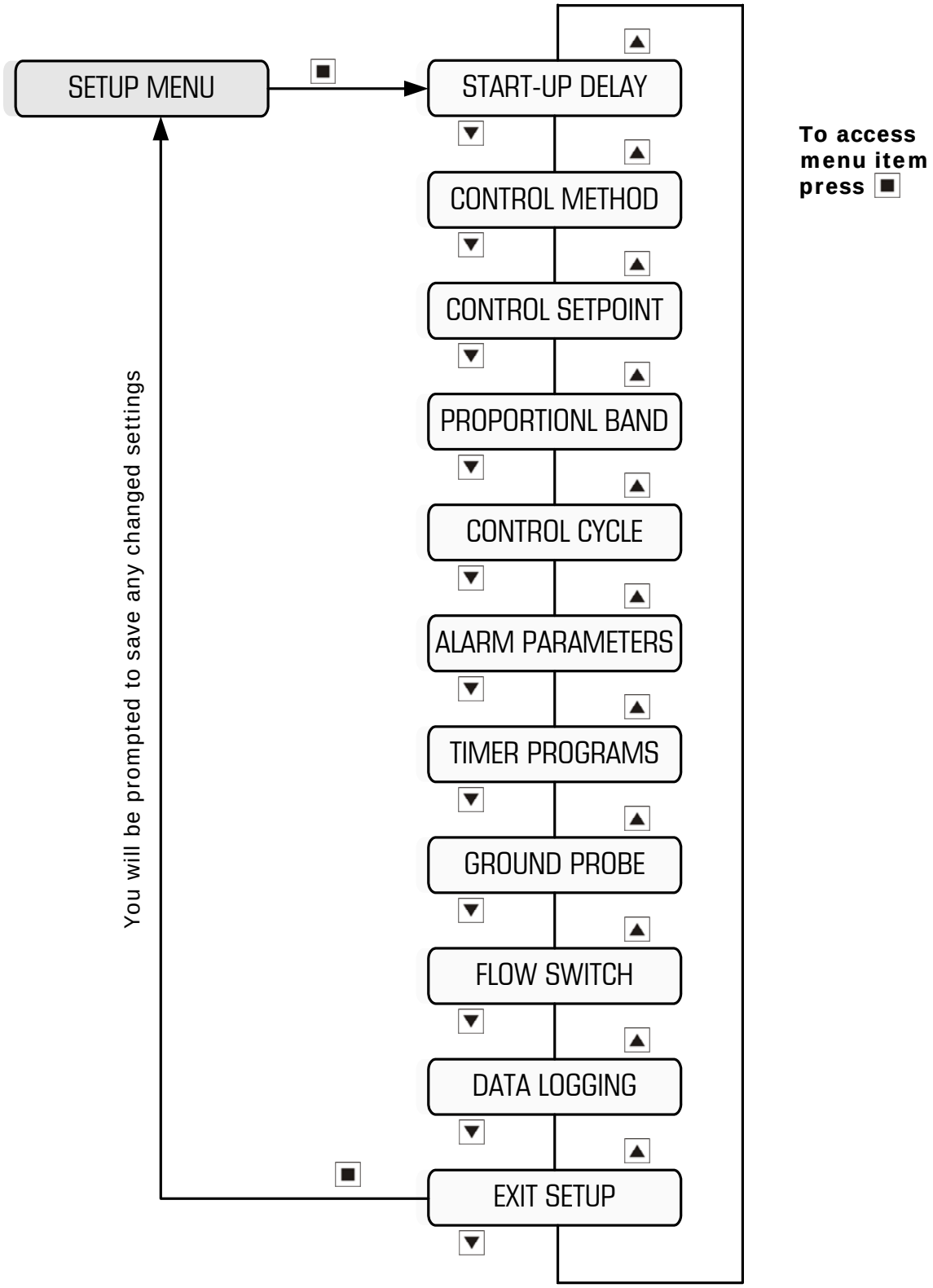
5. Programming Setup Menu

IMPORTANT:

- Once settings are changed, it is necessary to exit the SETUP MENU in order to save your settings.
- Depending on the Control Method selected (i.e. ON/OFF or PROPORTIONAL – as outlined in section 5.4), the Setup Menu will change – both Menu Structures illustrated as follows:



Setup Menu when ON / OFF Control Method Selected

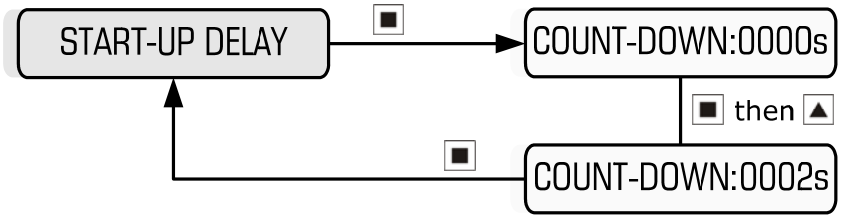


Setup Menu when Proportional Control Method Selected

5.1 Program Start-up Delay

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

The start-up delay is a timer that starts timing when the unit is powered up, or flow resumes after a “no-flow” condition. During this time, the control output is disabled. Only once the time counts down to zero, does the control output become active if the unit calls for dosing. The purpose of this timer is to allow the system water to mix and circulate effectively before dosing commences. If this feature is not required, then simply program the start-up delay to zero. When timing, the start-up delay can be cancelled by holding down the ENTER (Reset) pushbutton.

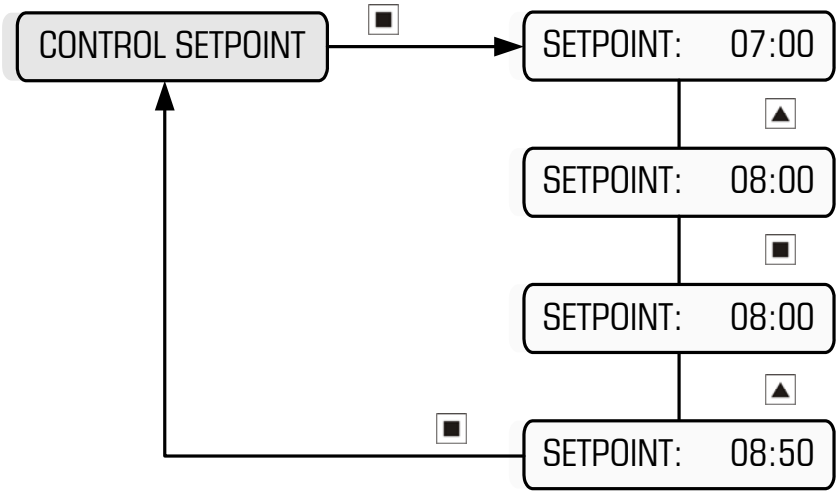


Example: Setting Start-Up Delay of 2 seconds

5.2 Set pH Setpoint

Main Menu > *SETUP MENU > CONTROL SETPOINT*

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



Example: Increasing setpoint from 7.00pH to 8.50pH

5.3 Set Control Method

Main Menu > *SETUP MENU > CONTROL METHOD*

The PHD-XP2 features 2 methods of pH control:

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

With **ON/OFF control**, the controller either turns the pump on continuously when correcting the pH 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 is from the Setpoint, the shorter the OFF period is with respect to the ON period. The closer the pH 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.

5.3.1 ON/OFF Control

The Acid 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).

The Base 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, and is only applicable to ON/OFF control

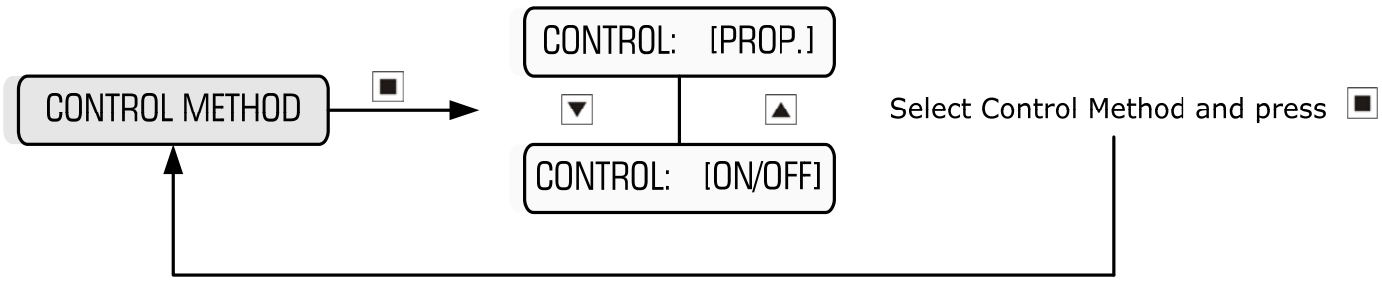
For example, if the SETPOINT is 7.00pH and the hysteresis value is 5%, then the calculated hysteresis value is 0.35 pH.

The Acid pump will be activated when the pH rises above 7.00 + 0.35.
The Base, the pump will be activated when the pH drops below 7.00 – 0.35.
If the On/Off Dose Cycle time is set as DOSE/WAIT = 00/00s, then the controller will dose continuously either Acid or Base when required.

Once the Setpoint is programmed for ON/OFF control, the 2 parameters; Hysteresis and Dose Cycle, are required to be programmed.

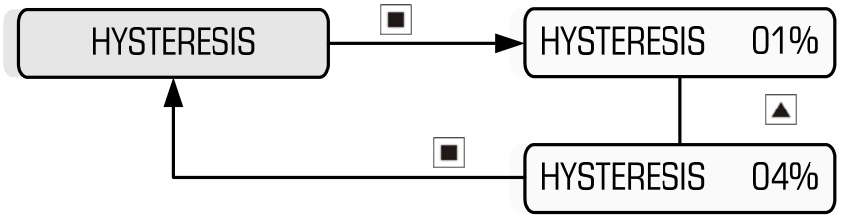
Step 1:
Select the ON/OFF Control Method

Main Menu *> SETUP MENU > CONTROL METHOD*



Step 2:
Program the Hysteresis
(**Note:** This menu item will only appear if ON/OFF control is selected first)

Main Menu *> SETUP MENU > HYSTERESIS*



Example: Increasing Hysteresis from 1% to 4%

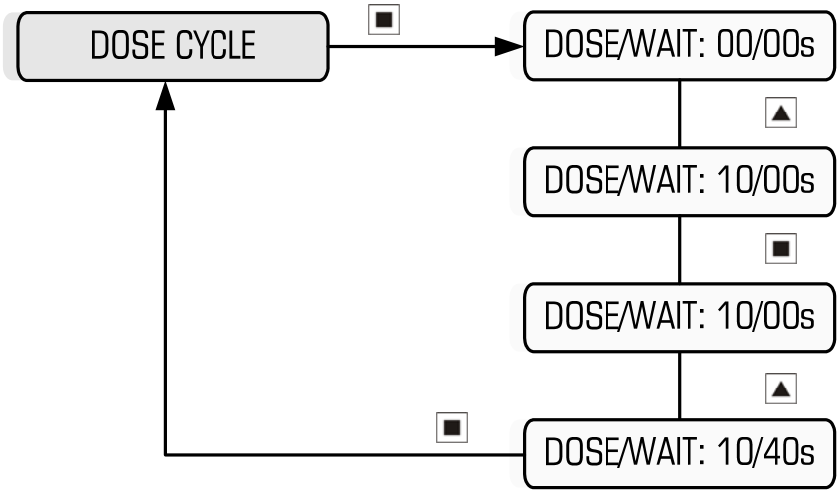
Step 3*:*
Program the Dose Cycle

Main Menu *> SETUP MENU > DOSE CYCLE*

When the controller calls for dosing, the pumps can be programmed to dose continuously or on a cycle until they reach the pH Setpoint. A cycle is recommended to reduce overshoot, and to preserve the life of the pumps.

The menu asks for a Dose Time and a Wait Time to be programmed. The Wait Time follows the Dose Time, and the cycle is repeated until the Setpoint plus/minus hysteresis is reached. The same dose cycle is applied to both the Acid and Base pumps.

The following diagram illustrates a dose cycle programmed for a 10 second dose followed by 40 second wait:



Example: Programming a dose cycle for 10s, followed by a wait period of 40s

In the example above, the pumps dose 10 seconds during every 50 second cycle (ie 10+40), which equates to a 20% duty cycle.

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

Should the pH readout drift more than 25% away from the programmed Setpoint the controller automatically doubles the Dose time and halves the Wait time to bring the pH within 25% of the Setpoint very quickly. As soon as the pH readout comes back to within 25% of the Setpoint, normal pump duty cycle (ie. programmed Dose/Wait times) will resume. In the example above, the Dose and Wait times will temporarily be 20 seconds each, i.e. the pump will dose for 20 seconds during every 40 second cycle, which equates to a 50% duty cycle.

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

5.3.2 PROPORTIONAL Control

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 3 other parameters to be programmed:

- The Proportional Band with
- Dead Band
- 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).

In actual operation of the PHD-XP2 controller, the Proportional Band operates outside of the Dead Band, as described below.

Once the Setpoint is reached, the control output is OFF continuously. Outside of the proportional band on either end of the scale (for dosing Acid or Base), 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.

After programming the Proportional Band, the controller will then prompt you to enter a **Dead Band** %.
The Dead Band is a % of the Setpoint that the controller will not activate any pump. This is because as the PHD-XP2 controller is controlling in both directions (i.e. dosing Acid and Base). Without a Dead Band setting, if the Setpoint is 7.00pH, it will constantly dose Acid if above the Setpoint, and as the reading drops below 7:00pH, it will start to constantly dosing Base. So in order to alleviate the both pumps coming on and off continuously, a Dead Band area is required, in which the pumps will not operate. This can be programmed to anything less than the Proportional Band setting.

Example of Operation:

- Setpoint = 7.5 pH
- Proportional Band = 10%
- Dead Band = 2% (i.e. 7.35 to 7.65 pH)
- Control Cycle = 20 seconds

First, for the Dead Band of 2% of 7.5 = 0.15. Therefore the controller will not activate any pump if the process value is 0.15pH above or below the Setpoint. So control of Base will occur from 7.35pH and lower, and control

of Acid will occur from 7.65 and higher. No control will occur if the process value is between 7.35pH and 7.65pH.
The Controller will dose Base continuously if the process pH drops below 6.6pH and continuously dose Acid if the pH rises above 8.4pH. This is the lower and upper limits that the Proportional Band will take effect between.
The lower 6.6pH is calculated as: Lower Dead Band (7.35) – Proportional Band % (0.75) = 6.6pH.
The upper 8.4pH is calculated as: Upper Dean Band (7.65) + Proportional Band % (0.75) = 8.4pH.

The **Control Cycle** is the final parameter to be programmed.
This is the On-Off time cycle within which the output will vary proportionally between. (can be set from 10 to 100 seconds).
Whilst dosing, if the pH 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.

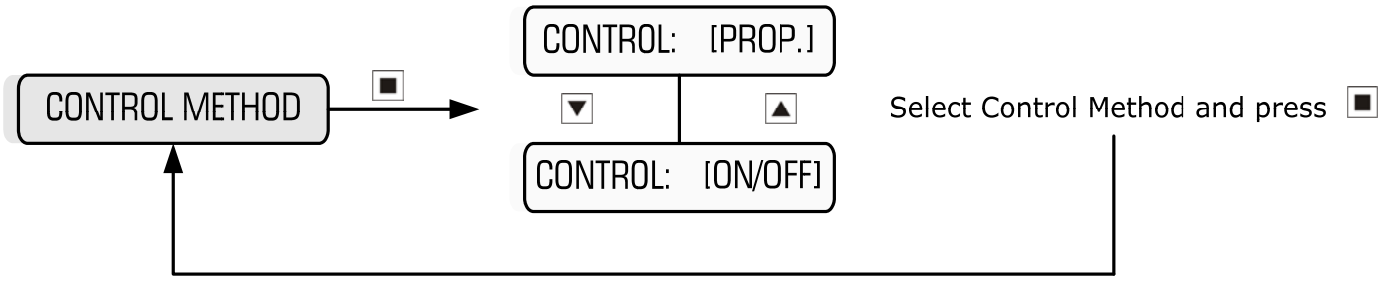
Conversely, in a large system with a large volume of water, and a slow recirculation rate, the pH reading may take a long time to change after dosing occurs. In this case, it is better to have a longer Control Cycle, eg 100 seconds, to allow for the pH reading to change, before further dosing takes place.

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 sensor.

Programming the controller:

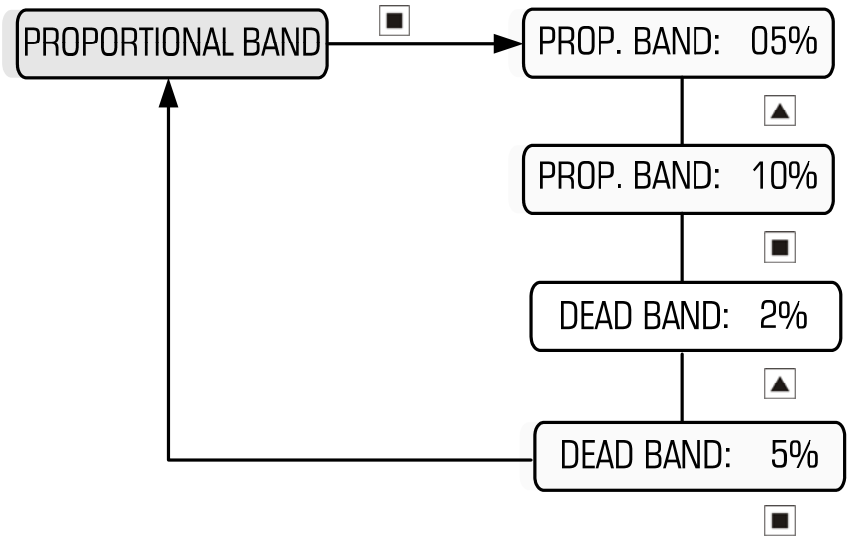
Step 1:
Select the Proportional Control Method

Main Menu *> SETUP MENU > CONTROL METHOD*



Step 2:
Program the Proportional Band
(**Note:** This menu will only appear if PROP. control is selected first)

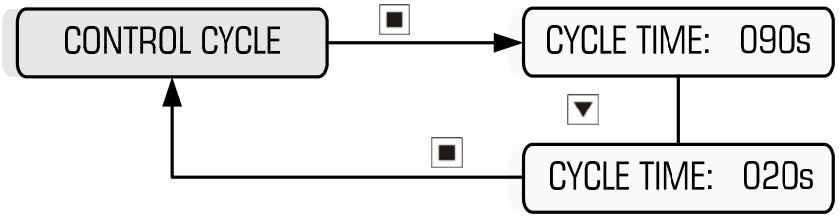
Main Menu *> SETUP MENU > PROPORTIONAL BAND*



Example: Increasing proportional band from 5% to 10%, and Dead Band from 2% to 5%

Step 3*:*
Program the Control Cycle

Main Menu *> SETUP MENU > CONTROL CYCLE*

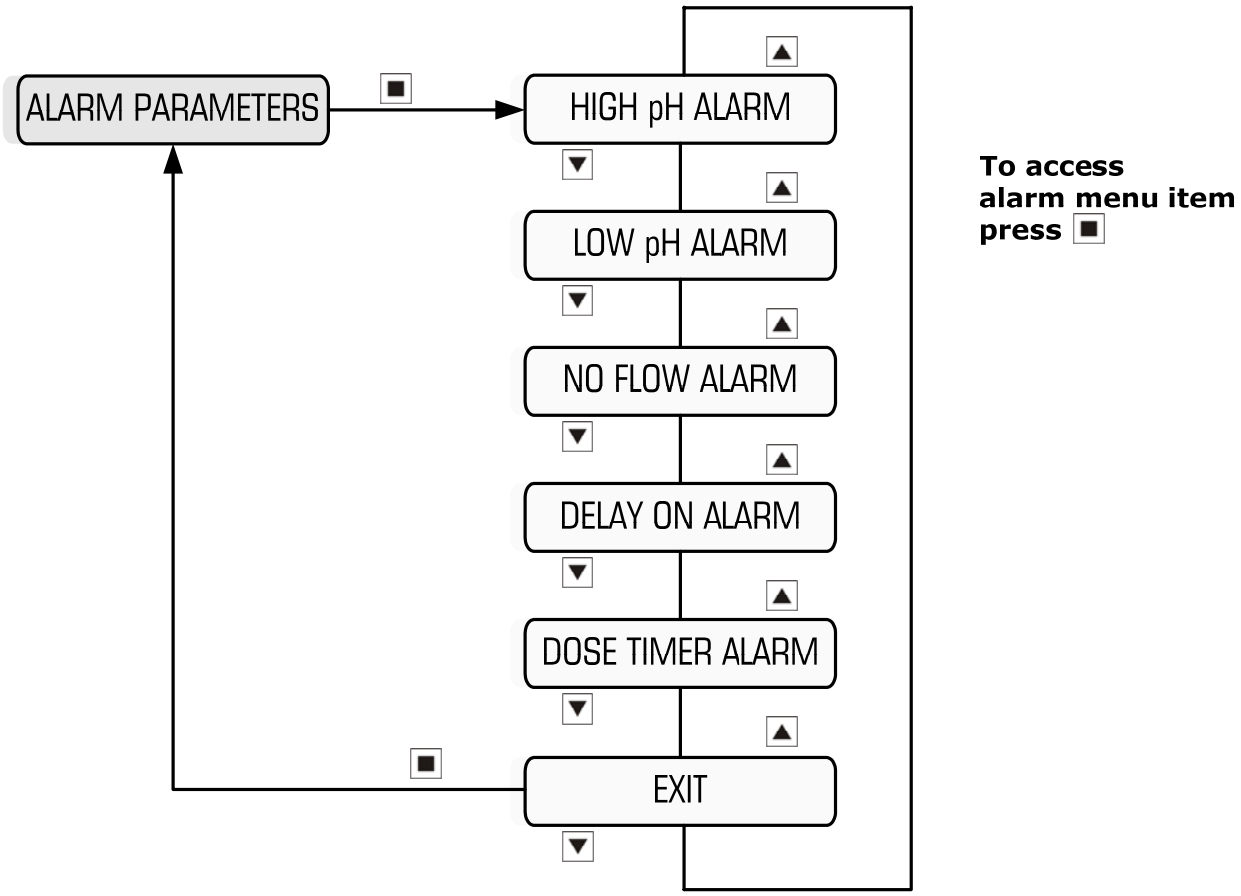


Example: Decreasing cycle time from 90 sec to 20 sec

5.4 Alarm Parameters

The controller has 5 programmable alarm functions as outlined below. If any of the alarms are activated and confirmed, the common alarm contact switches, the red Alarm LED illuminates, and the Alarm message is displayed on the LCD.

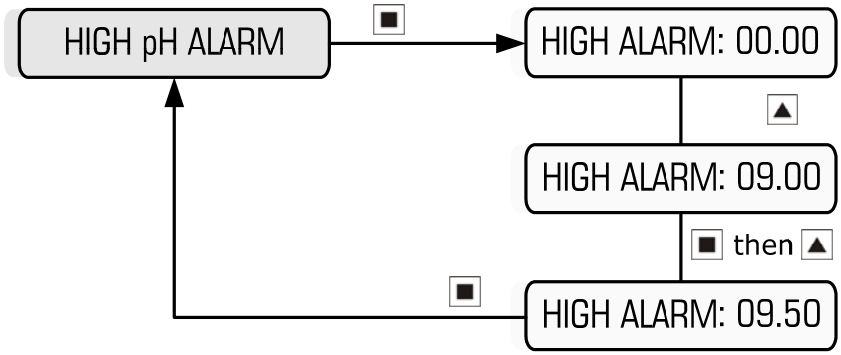
Main Menu > *SETUP MENU > ALARM PARAMETERS*



5.4.1 High pH Alarm

The High pH Alarm is activated if the pH rises above the programmed setting.

Main Menu > *SETUP MENU > ALARM PARAMETERS > HIGH pH ALARM*

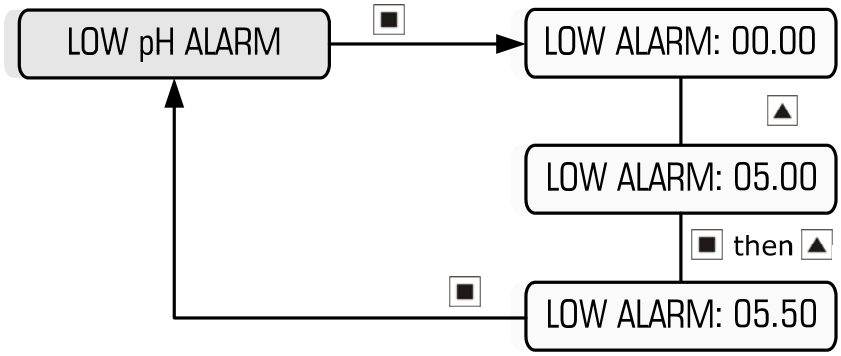


Example: Setting a High Alarm of 9.5pH

5.4.2 Low pH Alarm

The Low pH Alarm is activated if the pH drops below the programmed setting.

Main Menu > *SETUP MENU > ALARM PARAMETERS > LOW pH ALARM*

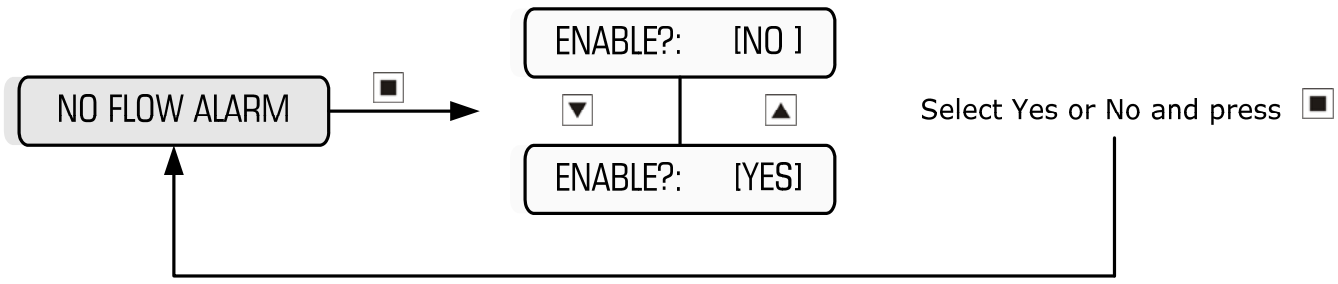


Example: Setting a Low Alarm of 5.5pH

5.4.3 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. If the No Flow Alarm is left disabled, then the Alarm is unaffected by a no-flow condition.

Main Menu > *SETUP MENU > ALARM PARAMETERS > NO FLOW ALARM*



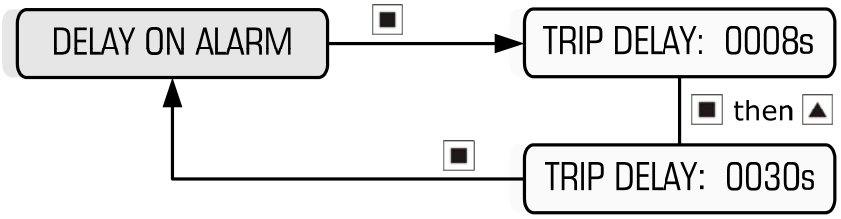
5.4.4 Delay On Alarm

When an alarm condition is detected, eg High pH Alarm, the relay only trips immediately if the Trip Delay is set to 0 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, eg. 120s, is programmed, the alarm relay will only trip if the High pH condition exists continuously for 120 seconds. However, if the pH drops to below the High pH Alarm level before the 120 seconds times out, the Alarm condition will reset.

Whilst the Trip Delay is timing, the red Alarm LED will flash. If the alarm condition still exists after the time delay, the LED will illuminate continuously until the alarm cancels, at which point, the LED goes off.

Main Menu > *SETUP MENU > ALARM PARAMETERS > DELAY ON ALARM*



Example: Setting alarm delay of 30 seconds

5.4.5 Dose Timer Alarm

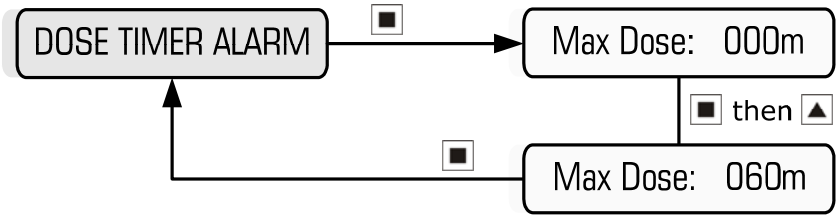
The Dose Timer Alarm is the maximum acceptable dose time to reach the Setpoint. This alarm is designed to protect the system from overdosing in the event of a false reading from a faulty pH sensor, a dry sensor, a disconnected sensor, or if the controller itself is faulty.

For example, the pH reading on the controller could be high when in fact the actual pH of the system is much lower, resulting in Acid dosing when there should be no dosing. The Timer Alarm stops this false dosing condition as soon as the Timer Alarm times out. The same goes for if the controller is dosing Base.

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

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

Main Menu > *SETUP MENU > ALARM PARAMETERS > DOSE TIMER ALARM*

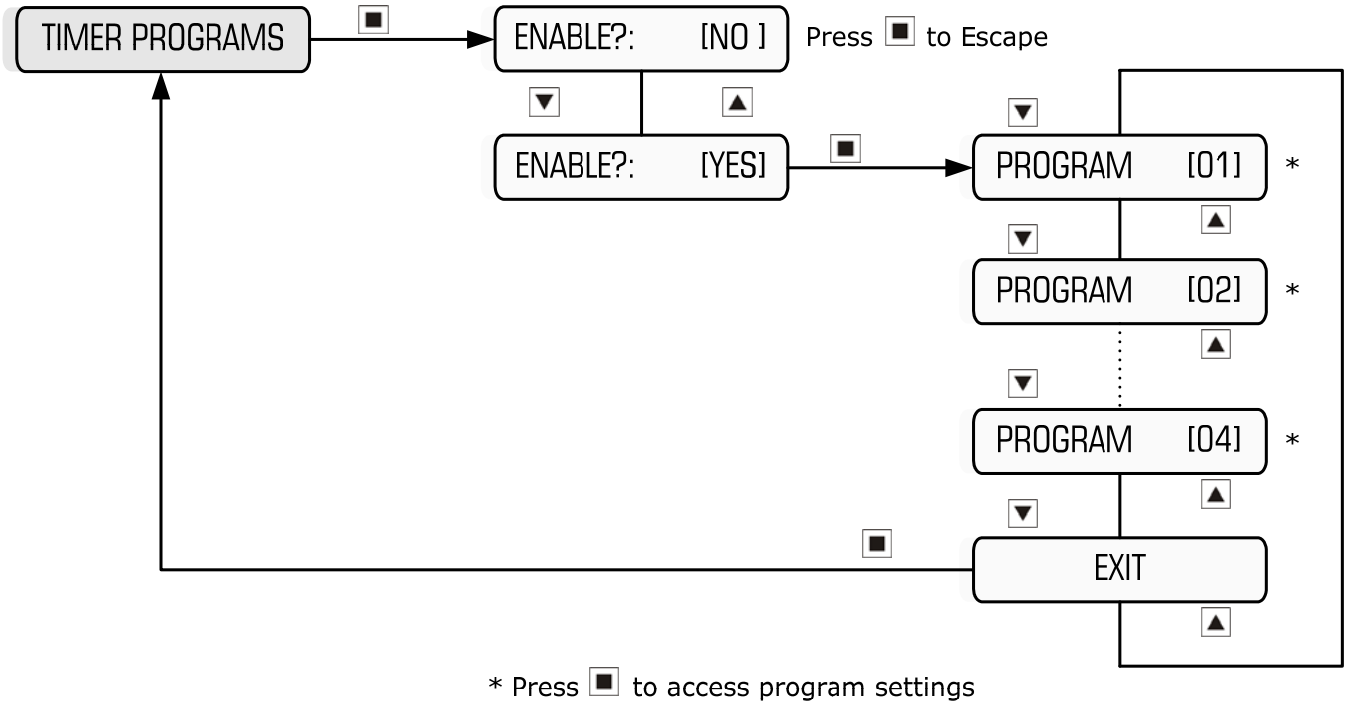


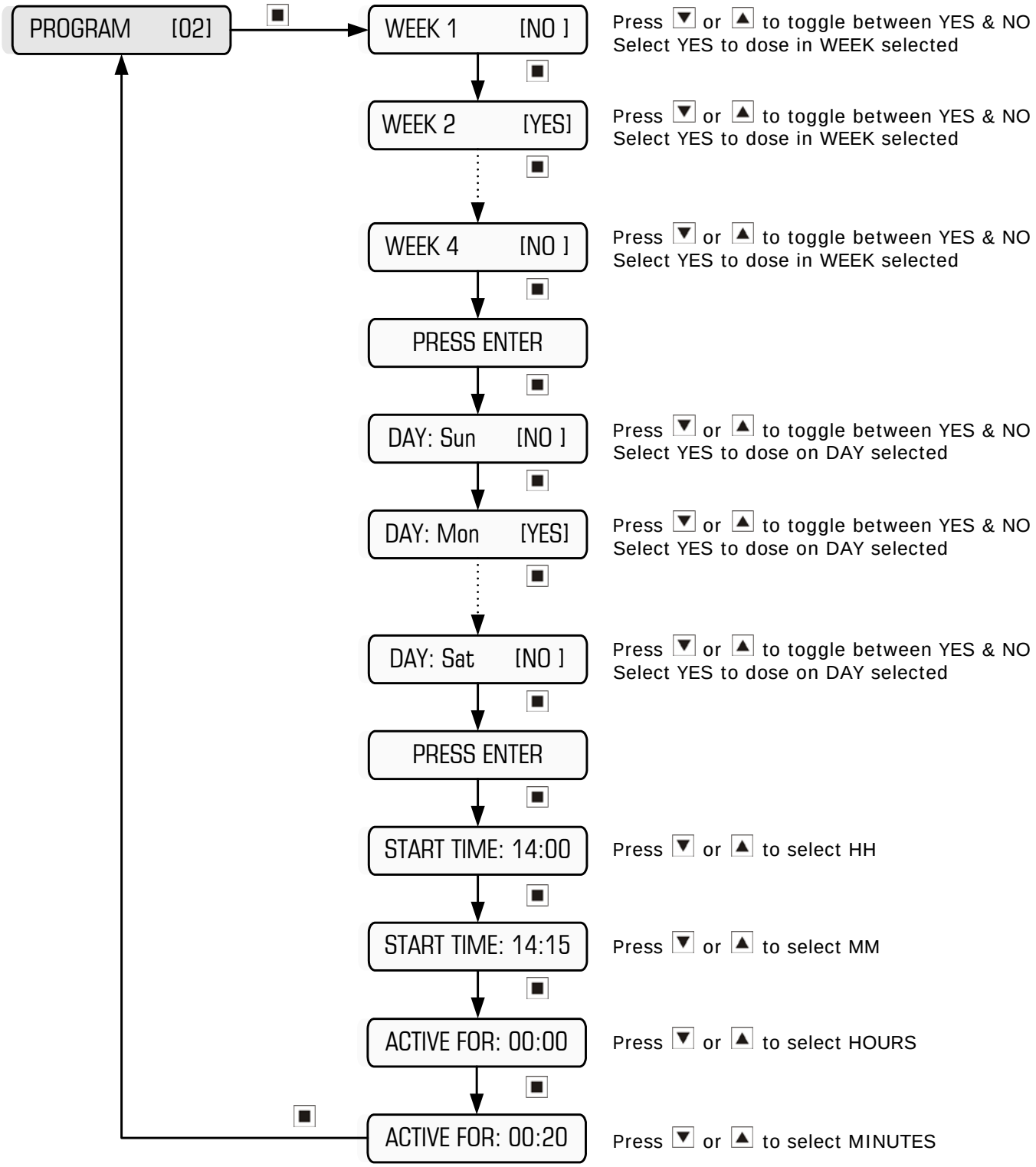
Example: Setting maximum dose time of 60 min

5.5 Timer Programs

If the timer programs are left in the disabled state, the controller will activate the control output when the control algorithm calls for dosing. However, if the timer programs are set up, the control function will only be active when the timer programs are active. During a Timer Program, if dosing is required, the pump will dose. However, if the controller calls for dosing outside of a Timer Program, the pump will remain idle. An example of where the Timer Programs are useful, is if you only want pH control to occur during certain time periods, eg. Process operating times.

Main Menu > *SETUP MENU > TIMER PROGRAMS*



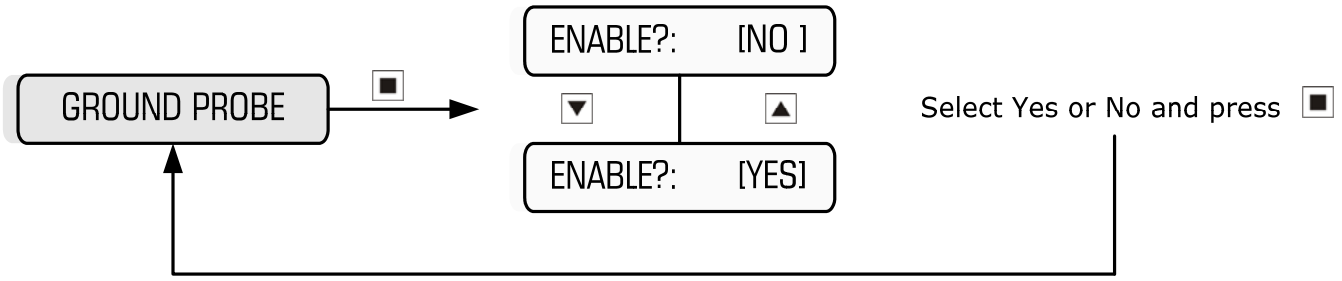


Example: Setting pH Control to be active for 20 minutes, beginning at 14:15 on Monday in Week 2 using Program 2.
pH Control will become inactive outside of this time period even if the pH needs to be corrected.

5.6 Ground Probe

The optional Solution Ground Probe (code DCON-CMR) is only required in processes (eg. Electroplating) where currents in the process solution cause interference of the pH measurement. If required, the ground probe cable must be connected inside the instrument to terminal L5, and the Stainless Steel tip must be inserted into the same water as the pH sensor. Furthermore, the function must be enabled via the menu as follows.

Main Menu > *SETUP MENU > GROUND PROBE*



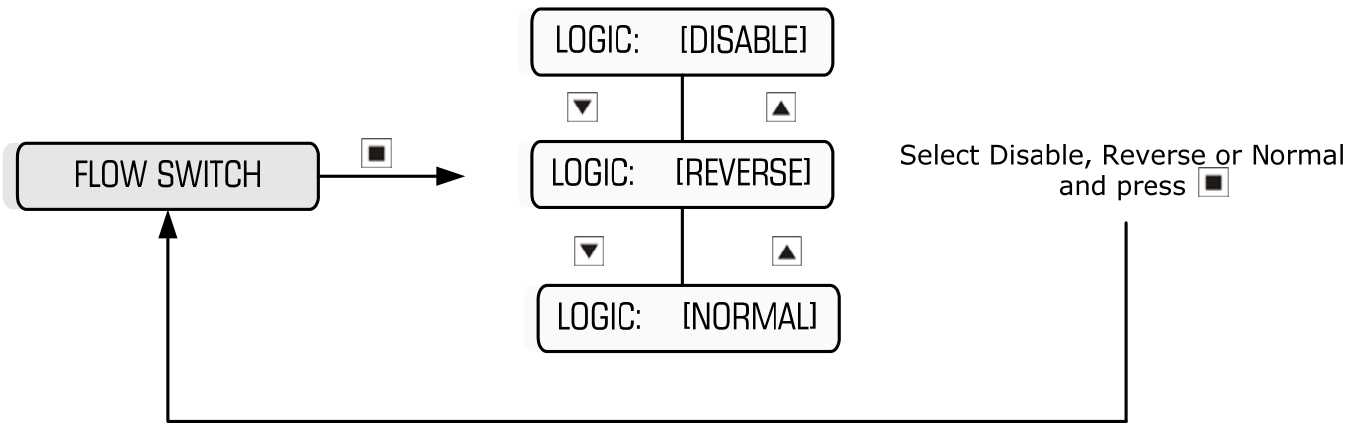
If a ground probe is not used, it is important to leave the function in its disabled state.

5.7 Flow Switch

If an optional flow switch is connected to the controller, pH control will only occur if there is flow. When dosing, the pump will stop immediately if no flow is detected. There are 3 possible settings in the menu for the flow switch:

- DISABLE: pH Control occurs regardless of flow or no flow
- NORMAL: pH Control only occurs when the flow switch input is shorted
- REVERSE: pH Control only occurs when the flow switch input is open circuit.

Main Menu > *SETUP MENU > FLOW SWITCH*



5.8 Data Logging

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

- Date
- Time
- pH reading
- % of time the pH Base control output is active
- % of time the pH Acid control output is active
- Status of the flow input
- % of time the common alarm is activated

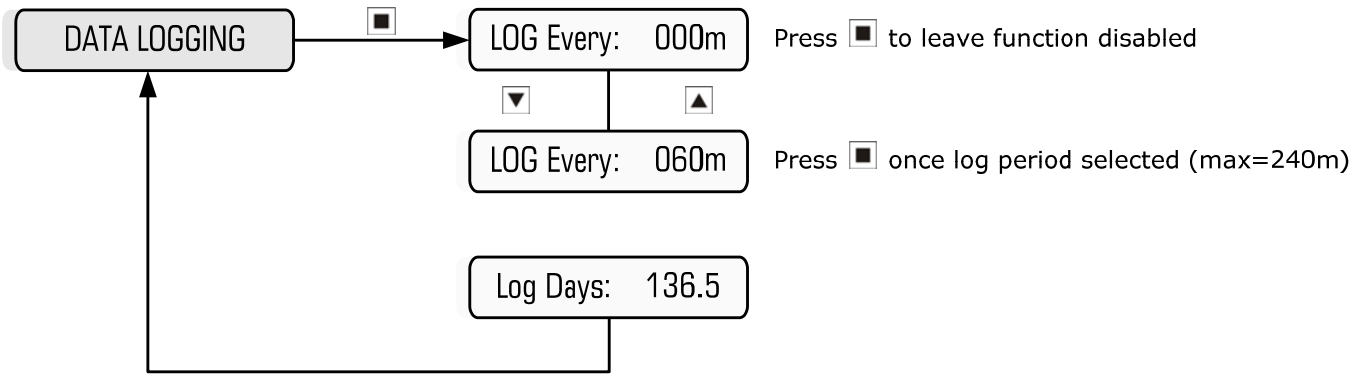
The pre-programmed intervals are 5, 10, 15, 30, 60, 120 or 240 minutes.
If the controller is set to log every 0 minutes, then logging is disabled.

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 14 days for a log taken every 5 minutes, or for 682 days for a log taken every 240 minutes.

Once the memory is full, the data logger loses the oldest information first.

The data is downloaded via the Comms port on the front panel of the controller. (An optional cable is required, P/N SP-XP2-COMCABLE-1)

Main Menu > *SETUP MENU > DATA LOGGING*



Example: Setting the controller to log every 60 min

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
Control Method	On/Off
Control Setpoint	7.5pH
Hysteresis	5%
Dose / Wait:	00/00s
High pH Alarm	00.00 pH
Low pH Alarm	00.00 pH
No Flow Alarm	Enable? [No]
Delay on Alarm	Trip Delay: 0008s
Dose Timer Alarm	Max Dose: 120m
Ground Probe	Enable? [No]
Flow Switch	Logic: [Normal]
Data Logging	LOG Every: 000m
Timer Programs	Enable? [No]

7. Specifications

Item	Specification
Power Supply	220-240VAC, 50/60Hz
Power Consumption	10W max (with no load on control output)
Inputs	pH Sensor (optional) Ground probe (optional) Flow switch (optional)
Auxiliary Mains Output	240VAC continuous (2A fused)
Control Outputs	2 x 2A/250VAC (fused)
Alarm Relay Output	N/O & N/C (10A/250VAC resistive)
Flow Switch Repeat Output	N/O (10A/250VAC resistive)
Optional Outputs	4-20mA (P/N AF09B) 4-20mA plus events (P/N AF10B)
Measured pH Resolution	0.01 pH
Accuracy	0.4% of measured range
Repeatability & drift	0.8% of measured range
Logged Items	Date, Time, pH, Acid%, Base%, Flow, Alarm%
Data retention	100 years
Battery backup	1 year (approx)
Enclosure rating	IP55
Operating Temperature	0 - 50°C