MTD75

Cooling Tower Controller

Operation Guide

Preface

Product warranty

The MTD75 has a warranty against defects in materials and workmanship for three years from the date of shipment. During this period LTH will, at its own discretion, either repair or replace products that prove to be defective. The associated software is provided 'as is' without warranty. The warranty assumes the defective unit will be returned to our works for inspection/repair and does not include for site visits to rectify faults.

Limitation of warranty

The foregoing warranty does not cover damage caused by accidental misuse, abuse, neglect, misapplication or modification.

No warranty of fitness for a particular purpose is offered. The user assumes the entire risk of using the product. Any liability of LTH is limited exclusively to the replacement of defective materials or workmanship.

There are no user serviceable parts, including fuses etc., within the unit. Any attempt to dismantle the controller will invalidate the warranty.

Disclaimer

LTH Electronics Ltd reserves the right to make changes to this manual or the controller without notice, as part of our policy of continued developments and improvements.

All care has been taken to ensure accuracy of information contained in this manual. However, we cannot accept responsibility for any errors or damages resulting from errors or inaccuracies of information herein.

Copyright and trademarks

MTD75 is a trademark of LTH Electronics Ltd

Sixth edition: March 2021

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Manufacturing Standards

Electromagnetic compatibility

This instrument has been designed to comply with the standards and regulations set down by both the United Kingdom EMC Regulations S.I. 2016/1091 and the European EMC Directive 2014/30/EU using BS EN 61326-1: 2013.

Safety

This instrument has been designed to comply with the standards and regulations set down by both the United Kingdom Equipment Safety Regulations S.I. 2016/1101 and the European Low Voltage Directive 2014/35/EU using BS EN 61010-1: 2010.

Restriction of Hazardous Substances

This instrument has been produced to comply with the standards and regulations set down by both the United Kingdom Equipment Restriction of Hazardous Substances Regulations S.I. 2012/3032 and the European Restriction of Hazardous Substances Directive 2011/65/EU using BS EN IEC 63000 : 2018.

Quality

This instrument has been manufactured under the following quality standard:

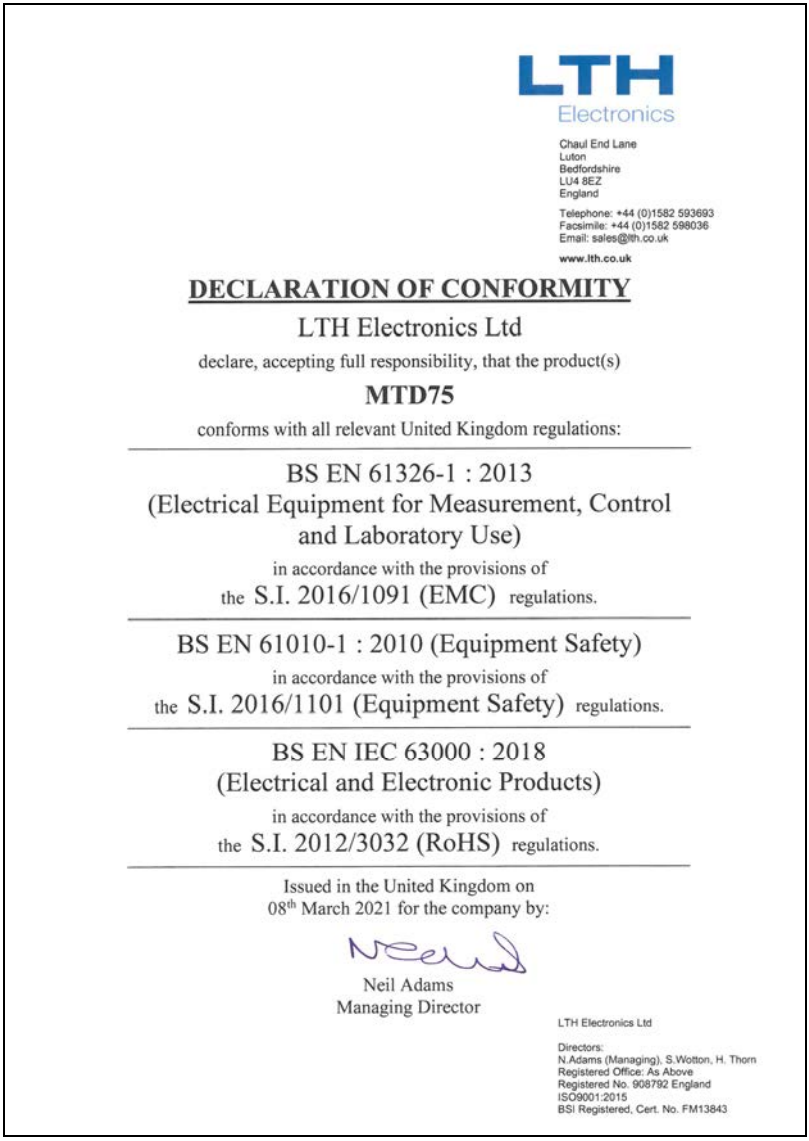
ISO 9001:2015. Certificate No: FM 13843

Note: The standards referred to in the design and construction of LTH products are those prevailing at the time of product launch. As the standards are altered from time to time, we reserve the right to include design modifications that are deemed necessary to comply with the new or revised regulations.

Disposal

As per regulation S.I. 2012/3032 and directive 2012/19/EU, please observe the applicable local or national regulations concerning the disposal of waste electrical and electronic equipment.

Declaration of Conformity



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DECLARATION OF CONFORMITY

LTH Electronics Ltd

declare, accepting full responsibility, that the product(s)

MTD75

conforms with all relevant United Kingdom regulations:

BS EN 61326-1 : 2013
(Electrical Equipment for Measurement, Control and Laboratory Use)

in accordance with the provisions of
the S.I. 2016/1091 (EMC) regulations.

BS EN 61010-1 : 2010 (Equipment Safety)

in accordance with the provisions of
the S.I. 2016/1101 (Equipment Safety) regulations.

BS EN IEC 63000 : 2018
(Electrical and Electronic Products)

in accordance with the provisions of
the S.I. 2012/3032 (RoHS) regulations.

Issued in the United Kingdom on
08th March 2021 for the company by:

Neil Adams
Managing Director

LTH Electronics Ltd

Directors:
N.Adams (Managing), S.Wotton, H. Thorn
Registered Office: As Above
Registered No. 908792 England
ISO9001:2015
BSI Registered, Cert. No. FM13843

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the 2014/35/EU (Low Voltage) directive.

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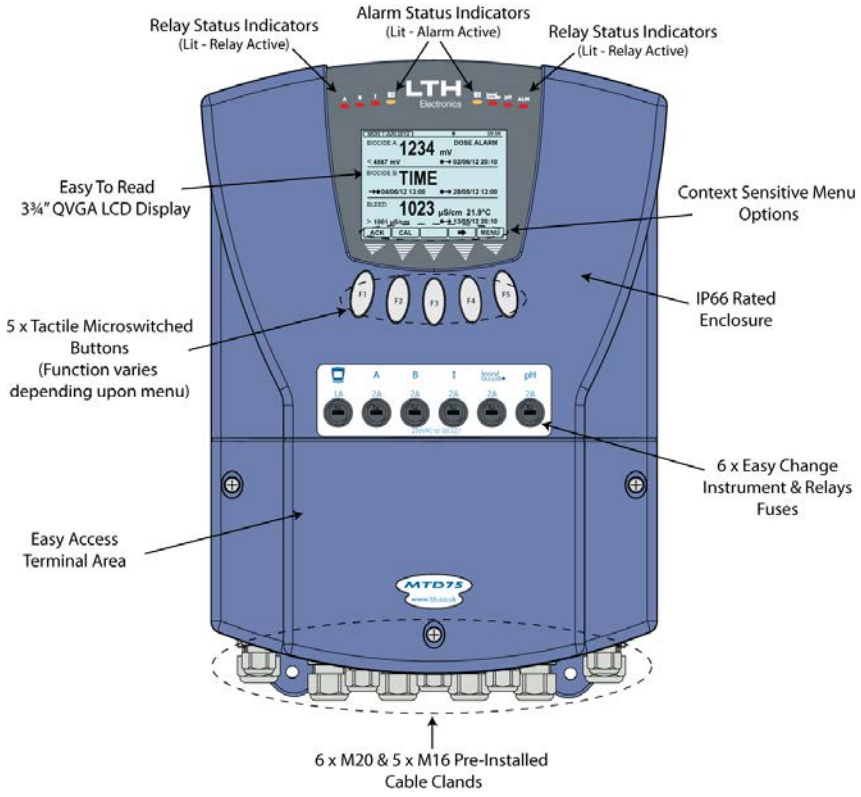
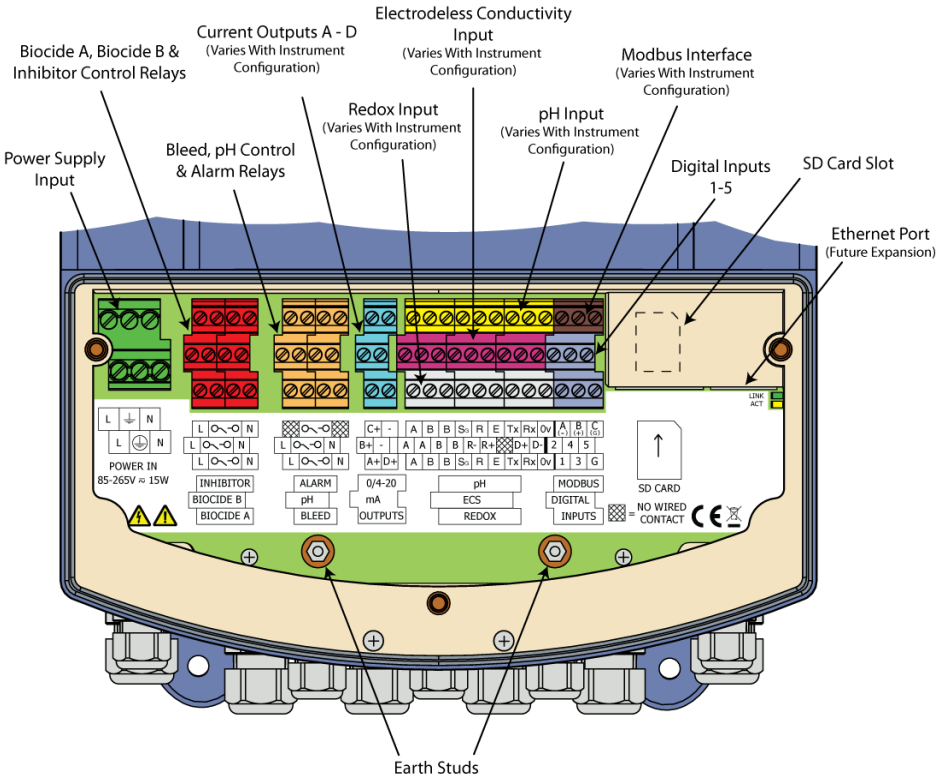
Contents

Introduction

The MTD75 is a microprocessor controlled cooling tower controller, designed to provide timed or measured control of pumps or solenoids for inhibitor, biocide, bleed and pH control operations in a cooling tower system.
The unit can be optionally equipped to measure Conductivity, pH, Redox and Temperature levels in the cooling tower, using these levels the controller can provide a more accurate dosing and bleeding scheme.
Utilising a multifunction easy to read QVGA LCD the controller displays readings and provides feedback to the operator on the status of the sensors and the controller's outputs.
The unit possess and optionally activated RS485 Modbus interface to allow for remote access, configuration and control of the controller.
Finally the controller also features an SD card interface which enables the user to backup and restore controller settings, copy settings between controllers, log the controller operation (optional extra) and to upgrade the controller's software.



MTD75 Overview



MXD75 Termination Overview

MTD75 Controller Specification

Biocide A Output

User defined Biocide A dose duration, triggered from one of the user selectable sources:

Water Volume (From Water Meter Input)

Timed (Per week/day/hour)

Redox (when < set level)

Division of the Water Meter Input (X input pulses give one output pulse)

Multiply by the Water Meter Input (One input pulse gives X output pulses)

External Input (Contact Closure)

User selectable On/Off, Pulsed or Time Proportional output.

Contact closure and 250VAC* supply terminals provided (fused to 2A, accessible on the front panel).

The Biocide A output can be initiated manually through the menu system to permit testing and priming of the system.

Biocide B Output

User defined Biocide B dose duration, triggered from one of the user selectable sources:

Water Volume (From Water Meter Input)

Timed (Per week/day/hour)

Division of the Water Meter Input (X input pulses give one output pulse)

Multiply by the Water Meter Input (One input pulse gives X output pulses)

Ratio (Biocide A : Biocide B)

External Input (Contact Closure)

User selectable On/Off, Pulsed or Time Proportional output.

Contact closure and 250VAC* supply terminals provided (fused to 2A, accessible on the front panel).

The Biocide B output can be initiated manually through the menu system to permit testing and priming of the system.

Bleed Output	User defined Bleed duration, triggered from one of the user selectable sources: Water Volume (From water Meter Input) Timed (Per week/day/hour) Conductivity (when > set level) External Input (Contact Closure) On/Off output at 250VAC* fused to 2A (accessible on the front panel). The Bleed output can be initiated manually through the menu system to permit testing of the Bleed system.
Inhibitor Output	User defined Inhibitor dose duration, triggered from one of the user selectable sources: Water Input (From water Meter Input) Timed (Per week/day/hour) Bleed (After accumulated Bleed Time) Division of the Water Meter Input (X input pulses give one output pulse) Multiply by the Water Meter Input (One input pulse gives X output pulses) External Input (Contact Closure) User selectable On/Off or Pulsed output. Contact closure and 250VAC* supply terminals provided (fused to 2A, accessible on the front panel). The Inhibitor output can be initiated manually through the menu system to permit testing and priming of the system.
pH Control	User defined pH Control dose duration, triggered from one of the user selectable sources: Water Volume (From Water Meter Input) Timed (Per week/day/hour) pH (user selectable < or > level) Division of the Water Meter Input (X input pulses give one output pulse)

pH Control Continued	Multiply by the Water Meter Input (One input pulse gives X output pulses) External Input (Contact Closure) User selectable On/Off, Pulsed or Time Proportional output. Contact closure and 250VAC* supply terminals provided (fused to 2A, accessible on the front panel). The pH Control output can be initiated manually through the menu system to permit testing and priming of the system. * Dependant on input supply levels
Alarm Relay	A volt free normally open contact, rated at 5A 30V DC / 5A 250VAC (non-inductive). User configurable to energise on: Power On — Input Error Dose Alarm Timeout — Water Meter Timeout Flow Switch — Tank Level Alarm Any Error
Redox Measurement Input	Single ended or differential with solution ground. Up to 100 meters cable.
(Optional)	Separate glass and reference electrode pair. Combination electrode. Other manufacturer's sensors can be accommodated.
Redox Range of Measurement	-1999mV to +1999mV
Redox Accuracy	± 3mV
Electrodeless Conductivity Input (Optional)	ECS20 or ECS40 Series electrodeless conductivity sensor. Up to 100 meters LTH 54E.
Electrodeless Conductivity Input Range of Measurement	0 to 9,999 µS/cm 0 to 9,999 ppm
Electrodeless Conductivity Input Accuracy	± 1% of range

pH Measurement Input	Single ended or differential with solution ground. Up to 100 meters cable.
(Optional)	Separate glass and reference electrode pair.
	Combination electrode.
	Other manufacturer's sensors can be accommodated.
pH Range of Measurement	0.00 to 14.00 pH
pH Accuracy	± 0.05 pH
Temperature Input	Electrodeless Conductivity Input — PT1000
	pH Input — PT100 or PT1000
Temperature Range of Measurement	-50 °C to +160 °C
Temperature Accuracy	± 0.2 °C (When using a 4 wire PT1000 - ECS)
	± 0.2 °C (When using a 3 wire PT1000 – pH/Redox)
Linearity	± 0.1% of range
Repeatability	± 0.1% of range

Operator Adjustment

	Slope	Offset
Redox	NA	± 400mV
Electrodeless Conductivity	± 10%	NA
pH	60-120%	3 to 11pH
Temperature	NA	± 50 °C

Current Outputs	4 Current Outputs each selectable 0-20mA or 4-20mA into 1000 ohms max.
(Optional)	Fully isolated to 2kV.
	Expandable up to 5% of any operating range and offset anywhere in that range.
Current Output Adjustment	±0.01mA, 3 point 0-4-20 mA for remote monitor calibration

Digital Inputs	5 contact closures for remote activation of user defined operations. Can be configured to operate in either normally open or normally closed modes

Digital Input	Functions
1	Water Meter Input
2	Flow Switch Input
3-5	Off-Line, Interlock, Tank Level, Remote Dose

Modbus RS485 Interface	Supports RTU and ASCII formats
	Node Address: 1 to 247
(Optional)	Baud Rates (Bits Per Second) : 300, 600, 1200, 2400, 4800, 9600, 19200, 31250, 38400
	Parity Options: Even, Odd, None
SD Card Interface	Enables backing up and restoring of controller configuration, on site upgrading of the controller's software and optional Data Logging. SD, SDHC and SDXC-FAT32 cards supported.
Data Logging	3 User configurable Live Trending Screens of 2 readings
(Optional)	Data Logging All Operating Values to SD Card
	User defined Trend and log Interval
	User defined Time & Date to View data from the SD Card onto the unit
Display	3 ¾" QVGA back lit LCD module.
Buttons	5 tactile feedback, micro-switched, silicone rubber.
Alarm LED's	2 Yellow LED's located above the main display area for the controller's alarm status, lit = active.
Dosing and Control Relay LED's	6 red LED's located above the main display area indicate the status of the dosing and control relays, lit = active.
Ambient Operating Temperature	-20°C to +50°C (-4°F to +122°F) for full specification
EMC	S.I. 2016/1091 & 2014/30/EU using BS EN 61326-1: 2013.
Low Voltage Directive	S.I. 2016/1101 & 2014/35/EU using BS EN 61010-1: 2010.
Power Supply	Universal 80-265V AC or DC, 15W max (fused to 1A, accessible on the front panel)

Controller Housing	UL 94-V0 PC/ABS.
Ingress Protection	IP66 to IEC 60529
Weight	Maximum 2.7 kilograms (controller only).
Dimensions	331 x 242 x 117 mm (H, W, D) excluding mounting brackets.

Installation – Safety & EMC

This chapter describes how to install the controller and how to connect the unit to a power source and auxiliary equipment.

Although today's electronic components are very reliable, it should be anticipated in any system design that a component could fail and it is therefore desirable to make sure a system will **fail safe**. This could include the provision of an additional monitoring device, depending upon the particular application and any consequences of an controller or sensor failure.

Wiring Installation

The specified performance of the controller is entirely dependent on correct installation. For this reason, the installer should thoroughly read the following instructions before attempting to make any electrical connections to the unit.

CAUTION ! : ALWAYS REMOVE THE MAIN POWER FROM THE SYSTEM BEFORE ATTEMPTING ANY ALTERATIONS TO THE WIRING. ENSURE THAT BOTH POWER INPUT LINES ARE ISOLATED. MAKE SURE THAT THE POWER CANNOT BE SWITCHED ON BY ACCIDENT WHILST THE UNIT IS BEING CONNECTED. FOR SAFETY REASONS AN EARTH CONNECTION MUST BE MADE TO THE EARTH TERMINAL OF THIS CONTROLLER.

LOCAL WIRING AND SAFETY REGULATIONS SHOULD BE STRICTLY ADHERED TO WHEN INSTALLING THIS UNIT. SHOULD THESE REGULATIONS CONFLICT WITH THE FOLLOWING INSTRUCTIONS, CONTACT LTH ELECTRONICS OR AN AUTHORISED LOCAL DISTRIBUTOR FOR ADVICE.

To maintain the specified levels of Electro Magnetic Compatibility (EMC, susceptibility to and emission of electrical noise, transients and radio frequency signals) it is essential that the types of cables recommended within these instructions be used. If the installation instructions are followed carefully and precisely, the controller will achieve and maintain the levels of EMC protection stated in the specification. Any equipment to which this unit is connected must also have the same or similar EMC control to prevent undue interference to the system.

❖ Terminations at the connectors should have any excess wire cut back so that a minimal amount of wire is left free to radiate electrical pick-up inside or close to the controller housing.

❖ The terminal cover must be correctly re-assembled and securely fastened to maintain a continuous electro-magnetic shield around the controller.

❖ **N.B.** The use of CE marked equipment to build a system does not necessarily mean that the completed system will comply with the European requirements for EMC.

Noise suppression

In common with other electronic circuitry, the controller may be affected by high level, short duration noise spikes arising from electromagnetic interference (EMI) or radio frequency interference (RFI). To minimise the possibility of such problems occurring, the following recommendations should be followed when installing the controller in an environment where such interference could potentially occur.

The following noise generating sources can affect the controller through capacitive or inductive coupling.

- Relay coils
- Solenoids
- AC power wires, particularly at or above 100V AC
- Current carrying cables
- Thyristor field exciters
- Radio frequency transmissions
- Contactors
- Motor starters
- Business and industrial machines
- Power tools
- High intensity discharge lights
- Silicon control rectifiers that are phase angle fired

The controller is designed with a high degree of noise rejection built in to minimise the potential for interference from these sources, but it is recommended that you apply the following wiring practices as an added precaution. Cables transmitting low level signals should not be routed near contactors, motors, generators, radio transmitters, or wires carrying large currents.

If noise sources are so severe that the controller's operation is impaired, or even halted, the following external modifications should be made, as appropriate:

- Fit arc suppressors across active relay or contactor contacts in the vicinity.

- Run signal cables inside steel tubing as much as is practical.

- Use the internal relays to switch external slave relays or contactors when switching heavy or reactive loads.

- Fit an in-line mains filter close to the power terminals of the controller.

- In cases of very high background RF and HF noise environments, LTH can supply a length of proprietary RF suppressing mains cable.

MTD75 Add-in Cards Installation

The efficiency of the MTD75 to control the cooling water can be greatly increased by using sensors to control the dosing and bleeding of the water instead of just relying on fixed time and water meter controls. The MTD75 is designed to be expandable by the use of add-in cards; these add-in cards can take the form of either sensor input add-in cards or output option add-in cards. The MTD75 can be fitted with up to 3 sensor input cards and 1 output option card. The sensor input cards are designated Input Card 1, Input Card 2 and Input Card 3. Unlike the rest of the MXD70 Series the input and output cards are fixed as following:

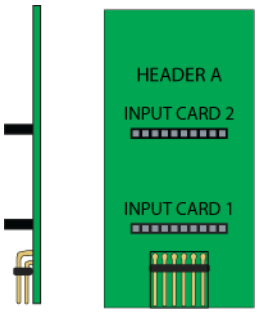
	Fixed Type	Card	LTH Order No.
Input Card 1	Redox	pH/Redox Input Card	2002
Input Card 2	Electrodeless Conductivity	Electrodeless Conductivity Input Card	1201
Input Card 3	pH	pH/Redox Input Card	2002
Output Card	Current Outputs	4 Current Output Card	7052

The input and output cards are installed via the use of headers which must also be ordered separately as follows:

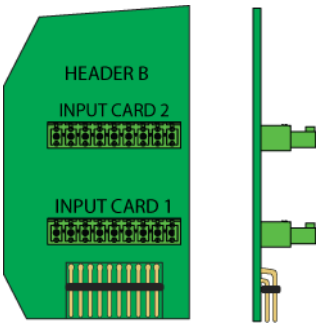
	Headers	Kit	LTH Order No.
Input Card 1 & Input Card 2	A and B	MTD75 Expansion Kit 1	7511
Input Card 3 & Output Card	C and E	MTD75 Expansion Kit 2	7512

! Electrostatic precautions must be taken when handling the Add-in cards.

Input cards 1 & 2 are installed via the use of headers A and B.

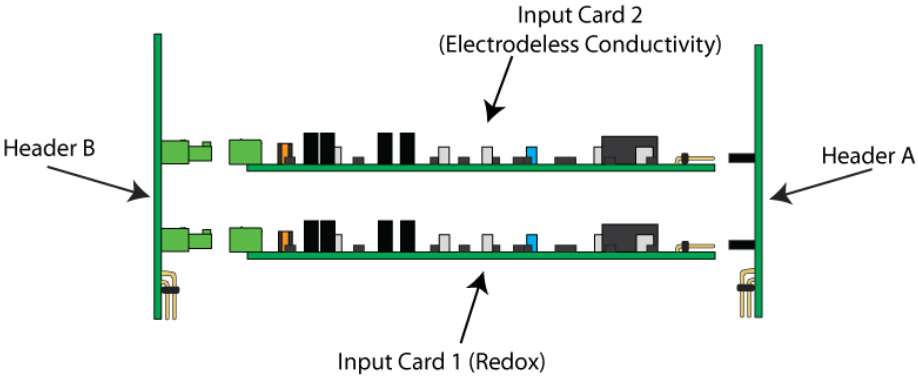


Header A

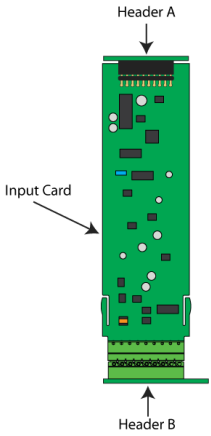


Header B

Insert the required input cards between the headers as shown in the following two diagrams, ensuring that the connectors are correctly aligned with the headers on the input cards.

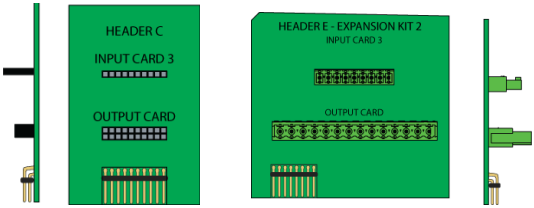


Input Card 1 & 2 Installation Side View



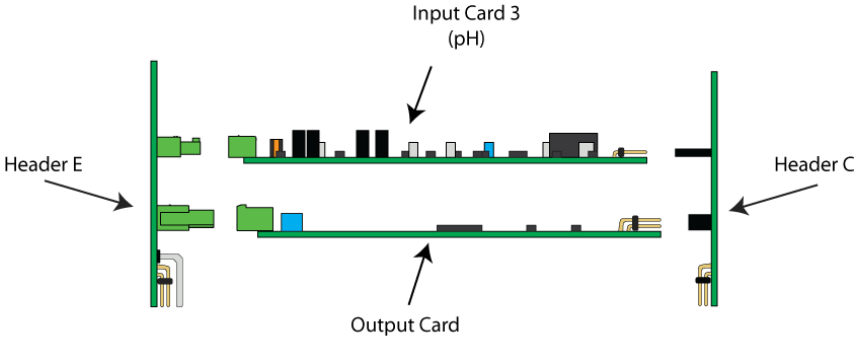
Input Card 1 & 2 Installation Top View

Input card 3 and the output card are installed via the use of headers C and header E.

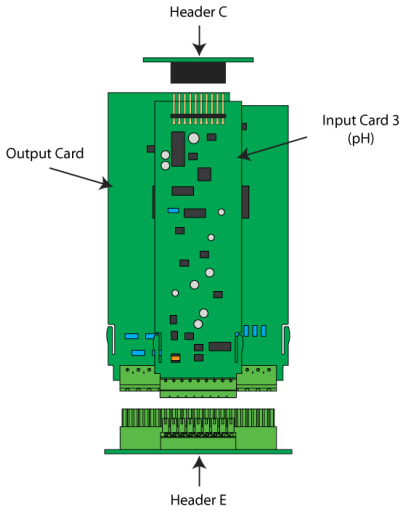


Header C Header E

Insert the required input card or output option card between the headers as shown in the following two diagrams, ensuring that the connectors are correctly aligned with the headers on the cards.



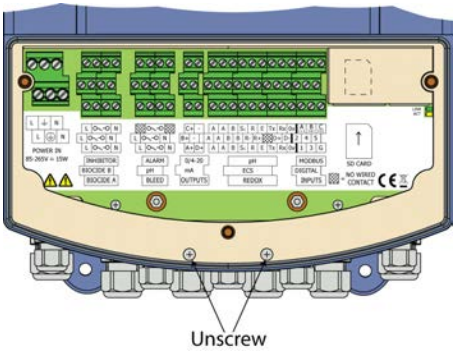
Input Card 3 & Output Card Installation Side View



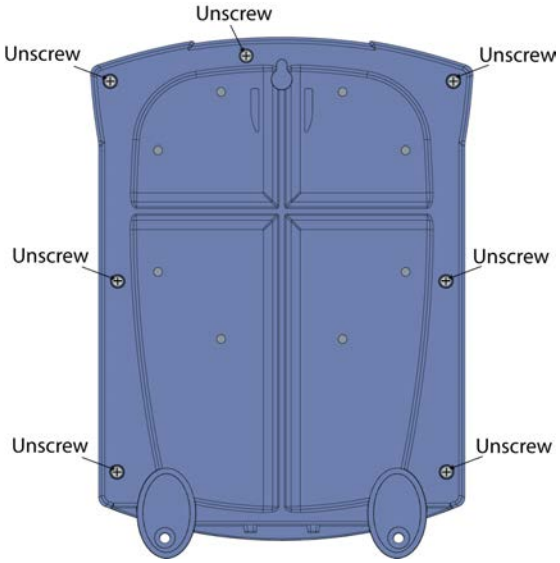
Input Card 3 & Output Option Card Installation Top View

To install the cards and headers into the controller, first remove the terminal cover.

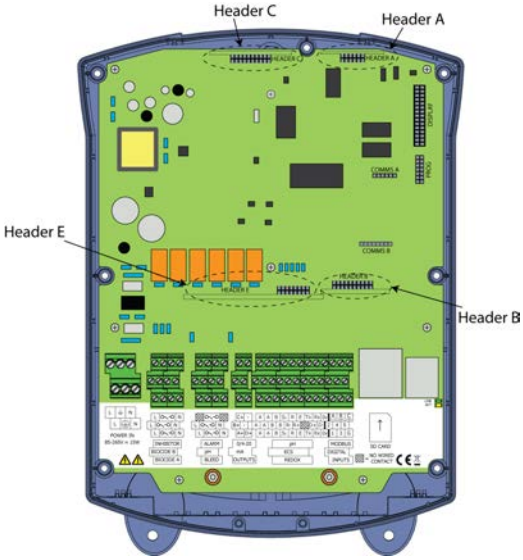
Then remove the two revealed screws at the bottom of the case.



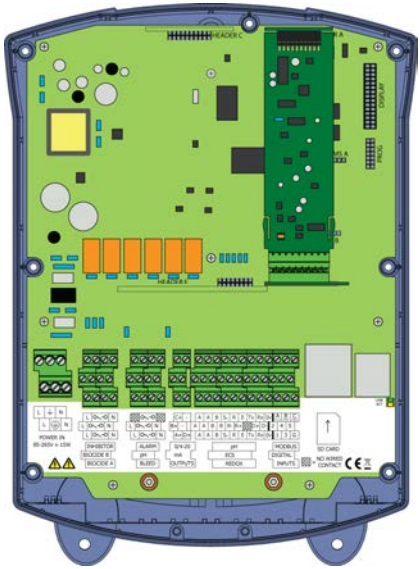
Then on the underside of the case remove the remaining seven screws. N.B. Do not lose the O-rings which may come off when removing the screws.



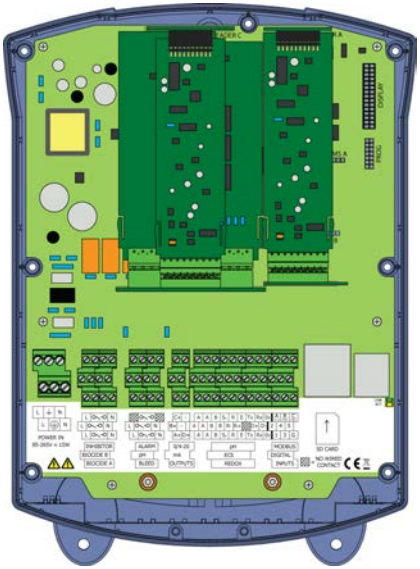
The headers with the cards attached must then be inserted into the controller's main board connectors. Match the header's name with corresponding text on the board, as shown in the following figure. Care must be taken to align the header board with the dotted outline on the main board.



Once inserted the controller should look as follows



With Input Card 1 and 2



With Input Card 1, 2, 3 and Output Option Card

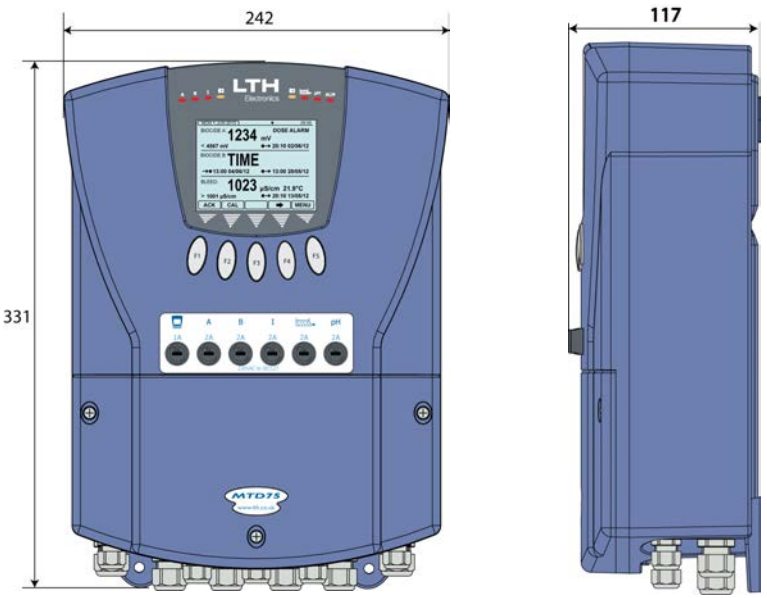
Next reassemble the controller case, ensuring all of the O-rings are in place on the back of the case and all of the screws are re-inserted. Connect the power (see Supply Voltage Connections section) and check that all of the new cards have been recognised by the controller.

Now consult the appropriate wiring section for details of how to connect the sensors and outputs.

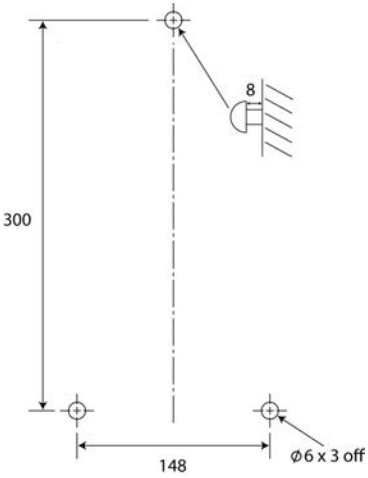
MTD75 Installation

Surface Mounting

The MTD75 controller is designed for fixing to a wall or other flat surface. Three 6.5mm diameter holes are provided for this purpose. Note that fasteners are not provided.



MTD75 Overall Dimensions



Drill Hole Dimensions

LTH Recommends using No. 10 x 1¼ inch round head screws or similar for mounting.

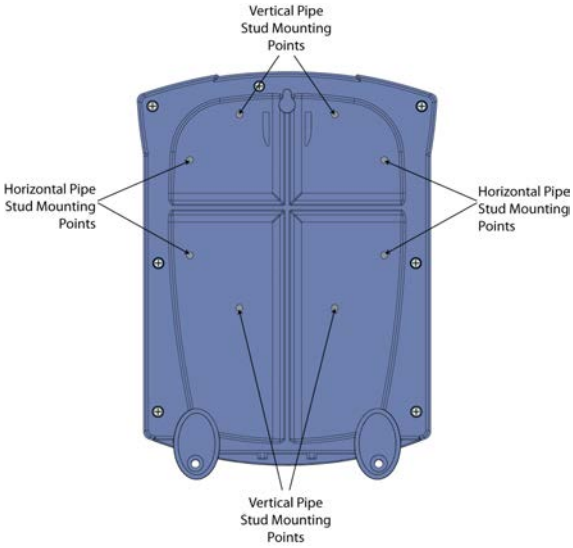
Ensure top screw head is 8mm proud.

Care must be taken when fitting the unit on uneven walls or surfaces. Do not over stress the mounting lugs.

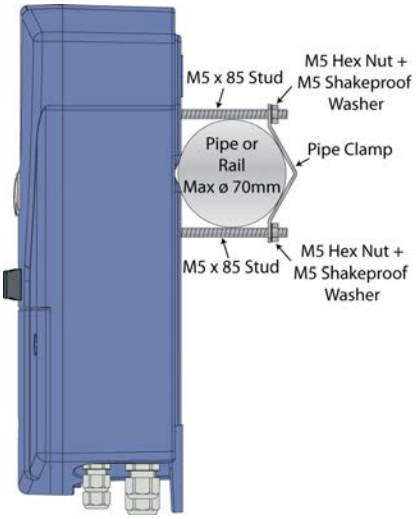
Over tightening the mounting screws could also break the lugs.

Pipe Mounting

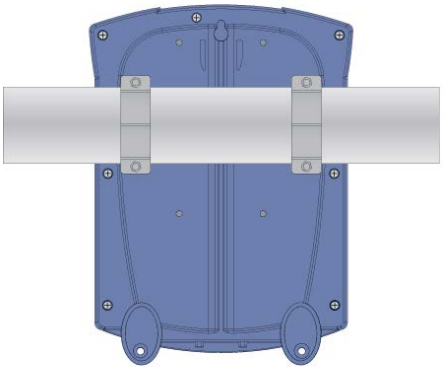
The handrail & pipe-mounting kit is designed for fixing to a vertical or horizontal handrail or pipe, of 25 – 70 mm outside diameter. (Optional – LTH Part No. 7599).



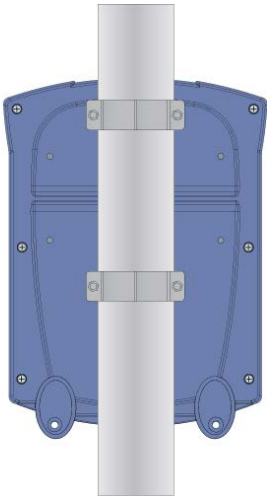
The controller is then clamped using the mounting kit as follows.



Note: Care should be taken not to over tighten mounting, as damage may result to enclosure.



Horizontal Mounting

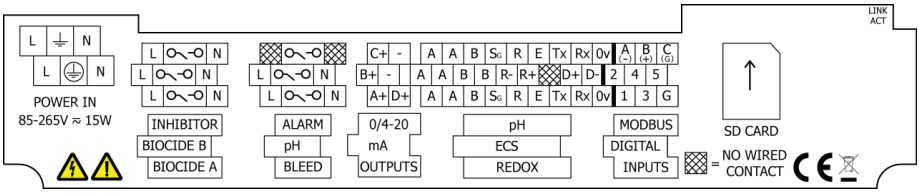


Vertical Mounting

Blank

MTD75 Connections

Having ensured that the main power is isolated from the controller, remove the terminal cover by releasing the three front screws. (The terminal cover is the small cover at the bottom of the front panel). Once the cover has been removed the following terminal arrangement should be visible.



MTD75 terminal label

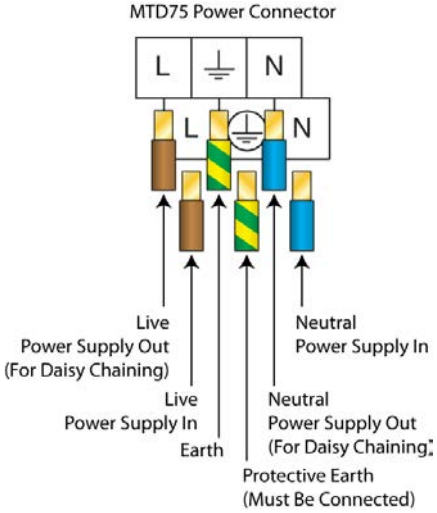
The cables should be fed through the cable glands. After each cable has been attached, pull most of the cable slack back through the cable gland to prevent any unwanted RF energy from being radiated inside the housing. Make sure not to strain the cable within the controller. Tighten the cable gland onto the cable so that it grips sufficiently to seal and to prevent the cable from being pulled back through the gland.

Any unused cable glands must be sealed with the included blanking plugs to retain the controller's ingress protection rating.

Supply Voltage Connections

The MTD75 can be powered from 85-265V 50/60 Hz AC. The unit provides two terminals for each of the input connections "Live" & "Neutral", plus an "Earth" terminal. This allows the supply to be "daisy chained" to other controllers. The controller uses a universal power supply that accepts a wide range of voltage and frequency inputs**.**

Refer to the label adjacent to the power supply terminals for the input voltage limits. Exceeding these limits may damage the controller.



85-265V AC
Power Connections

NB. The Live and Neutral terminals are internally linked to the L & N terminals of the relay terminal blocks. The user should therefore ensure that the pumps/solenoids attached to the relay terminals are compatible with the incoming power source.

The controller is fused to 1A at the front panel. The power supply should be taken from an isolated spur and fused to a maximum of 12 Amps.

The incoming Earth wire must be connected to the "Earth" terminal (centre terminal on the Power Input block)

Relay Connections

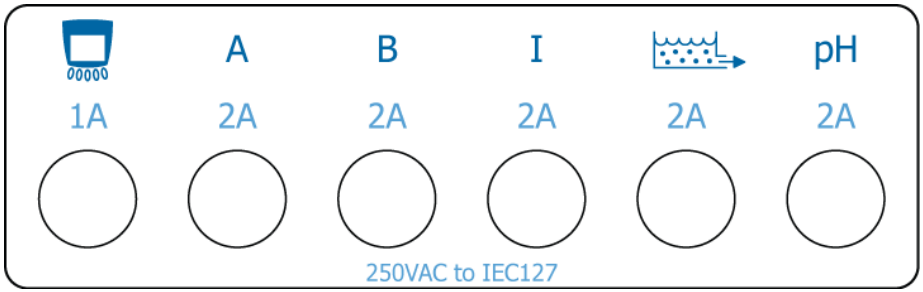
Six sets of relay contacts are provided for the pump/solenoid connections and an alarm output.

Biocide, Inhibitor and Bleed Connections

The pump relay contacts are normally open; volts free contacts, and are isolated from the rest of the controller. The contacts are rated at 250VAC/ 30VDC @ 5A.

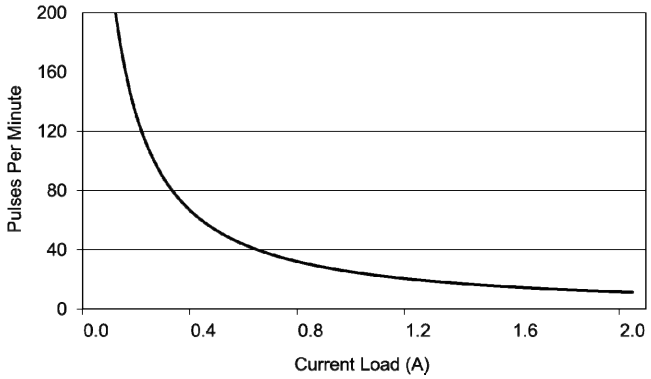
In addition to the two relay contacts, the terminals for each of the pumps or solenoids provide connections to the Live and Neutral lines.

The Live terminals are fused via the front panel fuses, at 2A (see diagram below).



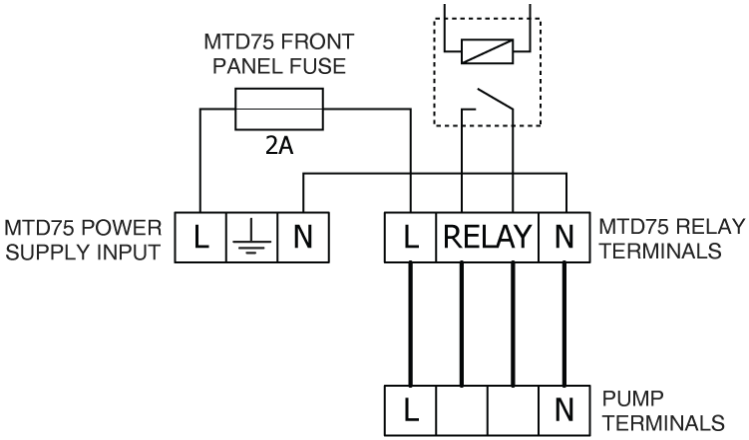
Controller	Biocide A	Biocide B	Inhibitor	Bleed	pH

Front Panel Fuse Layout

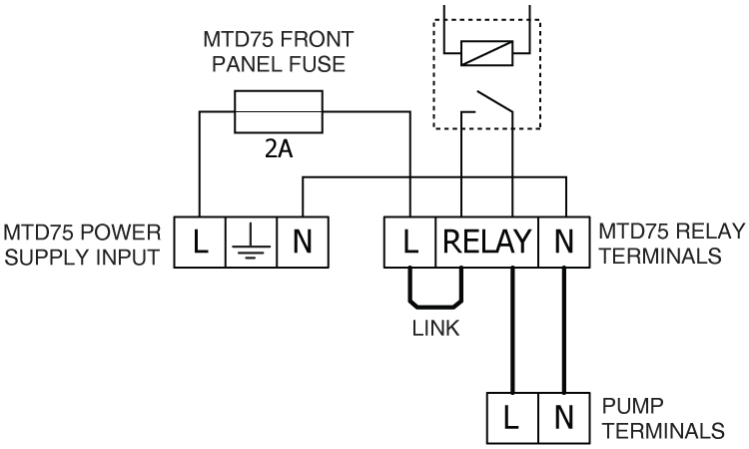


Relay Pulse Rate Limits

The following diagrams show the two methods of connecting the relay terminals to the pump terminals.



For pumps with separate power and activation connections



For pumps with only power connections

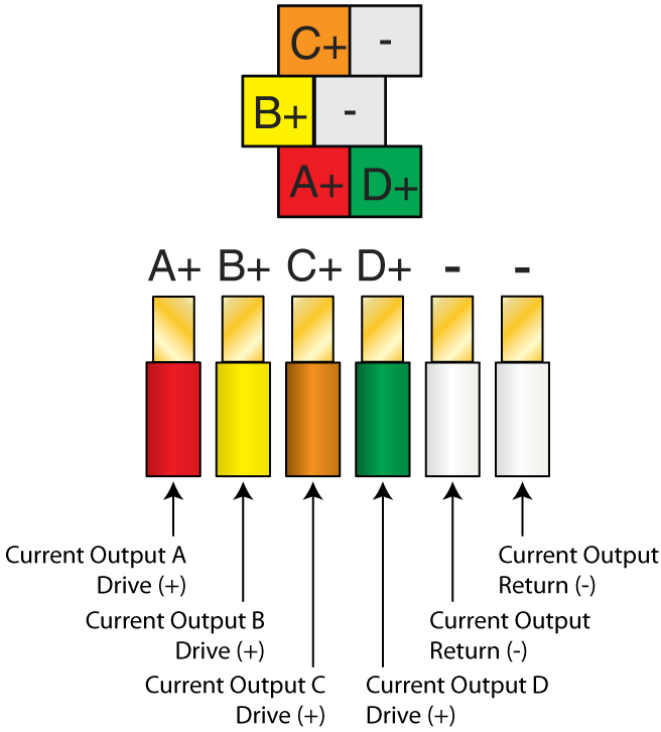
Alarm Relay

The alarm relay contacts are normally open; volt free contacts, and are isolated form the rest of the instrument. The contacts are rated at 250VAC/ 30VDC @ 5A. The Alarm relay can be triggered from a user selectable source (See page 97).

Current Output Connections

The MTD75 can be supplied with 4 current outputs designated A to D, which can terminate into a load resistance not exceeding 750Ω. For best noise immunity use a screened twisted pair cable, with the screen connected to Earth at one end. Use a sufficiently large cable to avoid a high resistance in the overall current loop.

MTD75 Current Output Connector



MTD75 Current Output Connection Detail

(N.B. Available Current Outputs Varies Depending Upon Instrument Configuration)

Sensor Input

The MTD75 can be fitted with up to three optional sensor input cards providing Redox, Electrodeless Conductivity and pH measurement inputs.

Redox Measurement Installation

The choice of the correct type of Redox electrode, how and where to mount it, so that it has a representative sample of solution are probably the two most important considerations when installing a Redox system.

The following criteria are of great importance during selection:

The chemical make-up, temperature and the viscosity of the sample.
The use of the correct materials for corrosion resistance.
Position of electrode for robustness and service access.
Ensuring a representative, uncontaminated solution sample.

To ensure correct electrode mounting the following conditions should be observed:

The electrode system can only measure what is in the immediate vicinity of the sensor area of the probe.
A moderate flow is maintained to provide an "up to date" sample. Excessive flow rates, however, can cause certain electrodes to rapidly deplete, which will result in inaccurate readings. In this case a sealed reference is recommended.
Ensure that both the glass electrode and reference are in contact with the sample.
Avoid points where air can be trapped.
Avoid points of high turbulence as air bubbles will affect the measurement.
If the sample has solids present then use a guard or filter to protect the glass electrode.
The glass electrode contains a liquid, ensure that the probe is mounted so that the internal filling solution is in contact with the glass bulb.

When a new redox electrode is first fitted or changed it may need to be calibrated (see page 111). Depending on the application it may also need periodic re-calibration, the MTD75 series provides an inbuilt count down timer which will trigger an alarm when calibration interval has expired (see page 111).

Care and Maintenance of Redox Electrodes

All Redox electrodes contain an electrolyte solution, gel or polymer that has a limited life in both operation and on the shelf. The electrode shelf life depends on its storage conditions, it is recommended that the electrode should be used within six to twelve months after purchase.

For gel filled, non-flow electrodes the storage boot may become dried out during storage. This can result in evaporation of the water inside the electrode causing high impedance in the reference cell. If allowed to fully dry out the operation of the electrode will be irreversibly damaged. For electrodes in storage it is recommended that every three to four months the following procedure is carried out:

Remove the black storage boot or transit cover at the end of the electrode. Re-wet the fibre pack inside the storage boot with 3.8 Molar Potassium Chloride (KCl) saturated solution or if this is not available use a quantity of 4pH buffer solution. Note do not use deionised water. Re-seal the storage boot or transit cover.

For electrodes with soaker bottles ensure that the electrode is stored upright in the soaker bottle, and replace the bottle solution with 3.8 Molar Potassium Chloride (KCl) saturated solution approximately every 6 months.

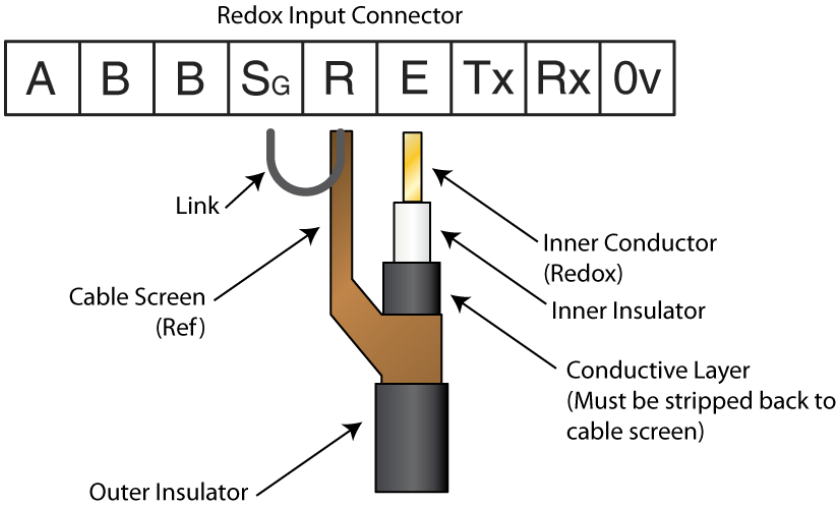
Depending on the issue the following glass body redox electrode maintenance procedures can be carried out:

Initial Cleaning – Wash the electrode with a solution of liquid detergent and warm water by gently scrubbing with a soft tooth brush or wet tissue. Follow this by thoroughly rinsing the electrode in deionised water or clean tap water.

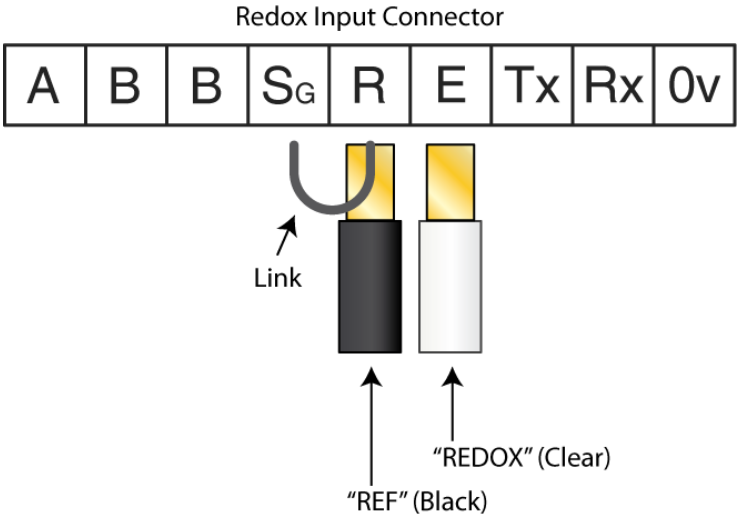
Inorganic Scale Deposits – Dissolve the deposit by immersing the electrode bulb only in a solution of dilute (10%) Hydrochloric Acid for a few minutes. **Follow the supplier's data sheet when handling acids and dispose of as instructed by your local authority regulations.**

Organic Oil or Grease Films – Wash the electrode with a solution of liquid detergent and warm water by gently scrubbing with a soft toothbrush or wet tissue. Follow this by soaking the pH electrode for between 10 and 30 minutes in a 3.8 Molar KCl solution.
Plugged or Dry Wick – Remove contaminate with one of the above cleaning procedures. Then soak the electrode in an 80°C, 3.8 Molar KCl solution for 30 minutes. Before allowing the electrode to cool in the same solution to promote flow of internal electrolyte through the liquid junction.

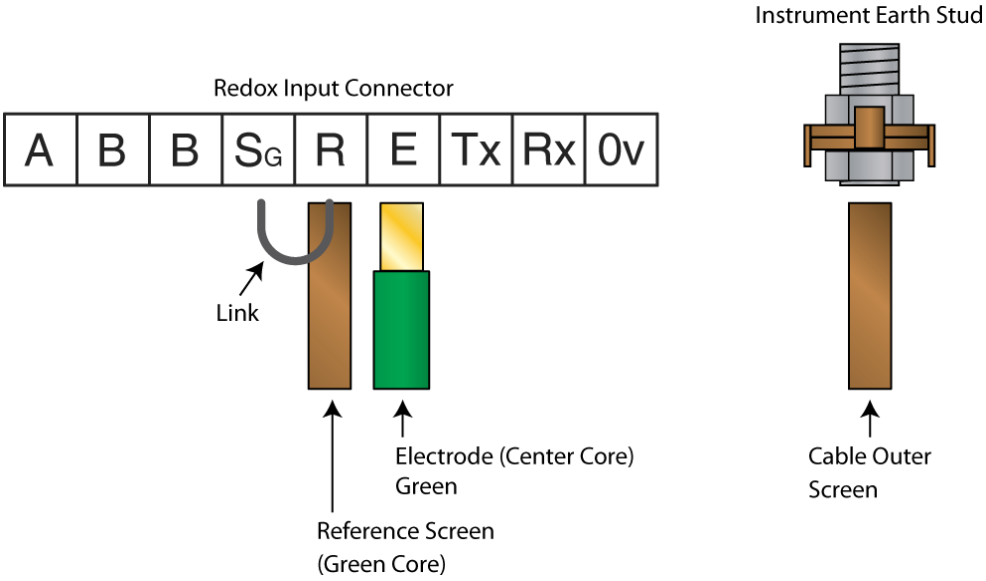
Redox Input Termination Information



Redox LN10 Coax Cable Connection Details

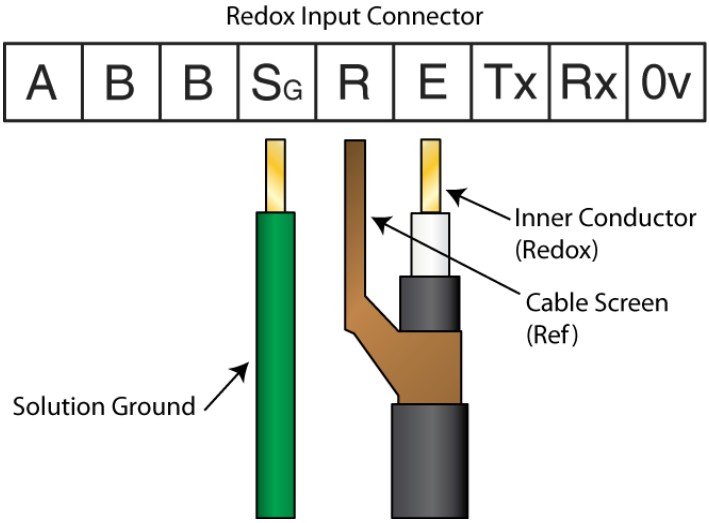


DynaProbe & ProcessProbe Cable Connection Details

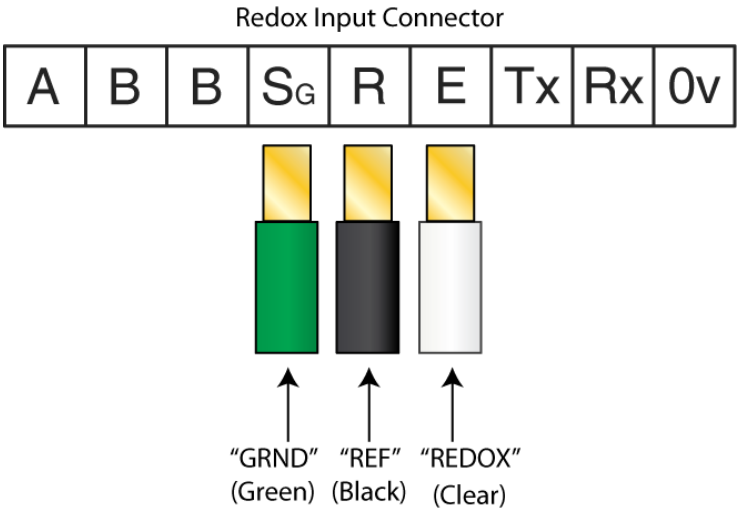


Redox 54E Extension Cable Connection Details

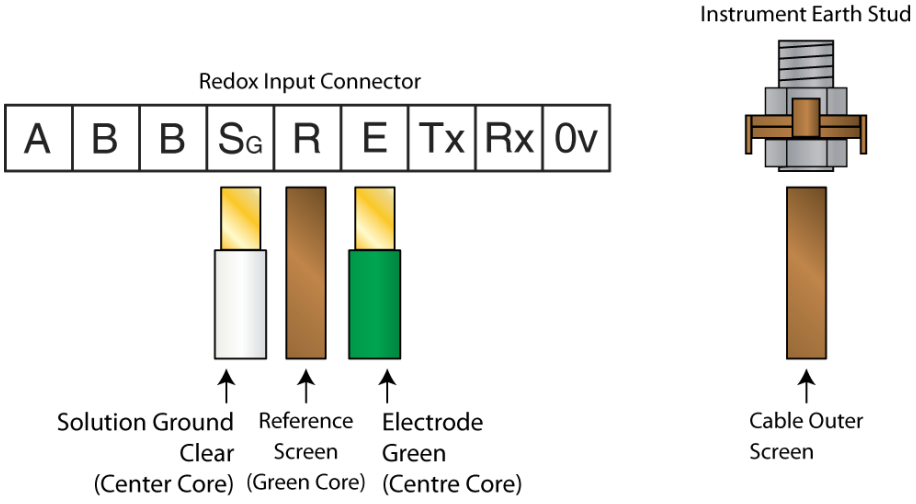
The Redox input card of the MTD75 also provides a differential input method of wiring the redox electrode. This provides better electrical noise immunity and allows the sensor to operate in solutions where flowing electrical currents may cause measurement problems.



pH / Redox LN10 Coax Cable Connection Details
with Separate "Solution Ground" Connection

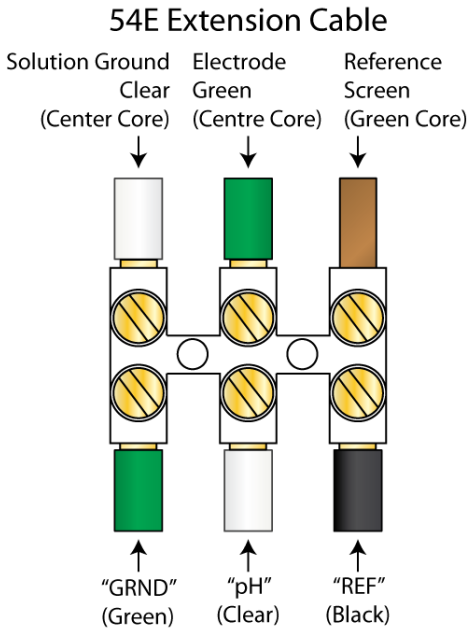


DynaProbe & ProcessProbe Cable Connection Details with "Solution Ground"



pH 54E Extension Cable Connection Details with "Solution Ground"

LTH 54E Extension Cable Connection Information



S400 ProcessProbe to 54E Extension Cable Connection Details

Electrodeless Conductivity Measurement Installation

The choice of the correct type of electrodeless conductivity sensor and how and where to mount the sensor, so that it has a representative sample of solution are probably the two most important considerations when installing a conductivity system.

The following criteria are of great importance during selection:

The choice of the best method of measurement.
Use of the correct materials for temperature and corrosion resistance.
Position of sensor for robustness and service access.
Ensuring a representative, uncontaminated solution sample.

The electrodeless method of measuring conductivity has many advantages over conventional methods in particular the sensors will operate with virtually zero maintenance and provide reliable measurements over extended periods of time.

LTH provides a selection of electrodeless sensors in a variety of materials including PEEK™ a food grade material with excellent chemical resistance and high temperature performance. Contact LTH Electronics or your local distributer for more information.

To ensure correct sensor mounting the following conditions should be observed:

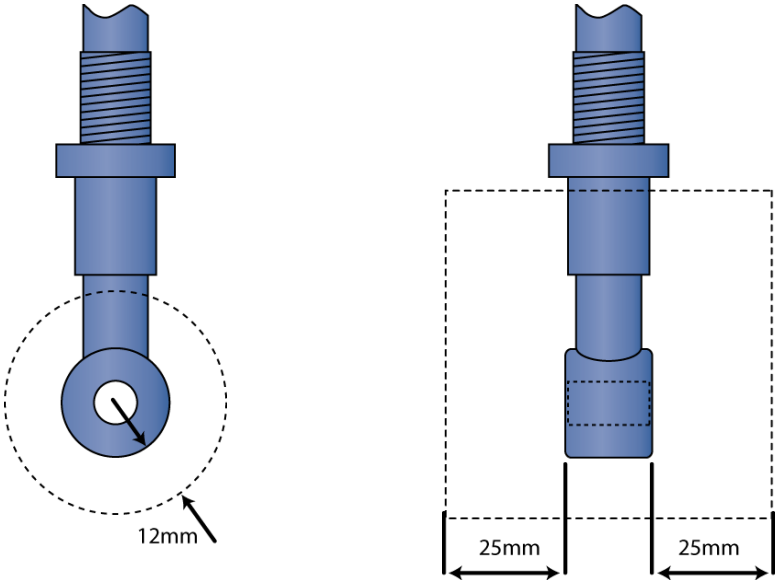
The solution around the sensor is representative of the solution as a whole.

For best performance line up the cross hole with direction of flow.

A moderate flow is maintained to provide an “up to date” sample. Excessive flow rates, however, can cause cavitations and turbulence within the sensor, which will result in inaccurate readings.

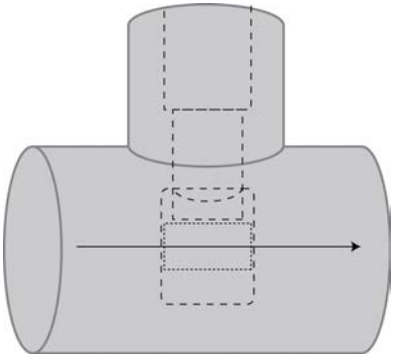
The sensor is mounted so that air bubbles do not lodge within it - displacing solutions and affecting the sample volume (air is not conductive).
Similarly it must be in a position so that sludge and particulate matter does not collect within the sensor.

The electrodeless sensor will need a minimum clearance around it when installed or making measurements in a sample. Do not rest it on the bottom of a tank or vessel. See the following figures for details.



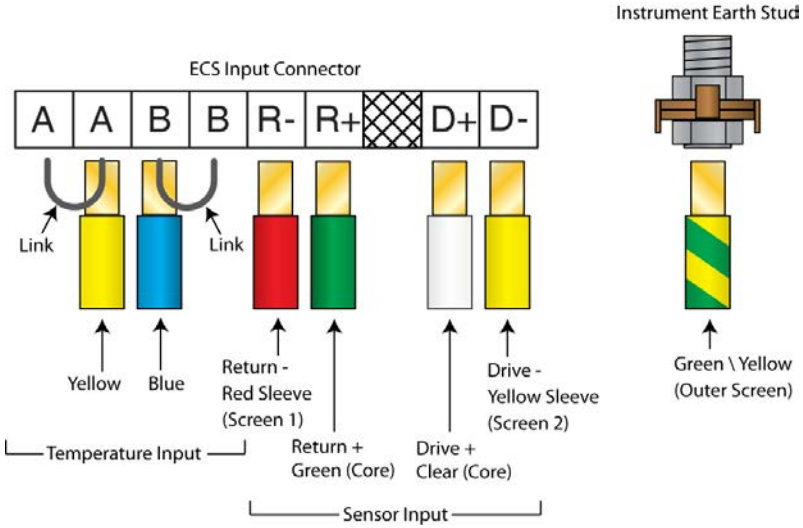
ECS20 Series Sensor Installation Clearance

Care should also be taken to ensure to position of the sensor within the flow is correct.

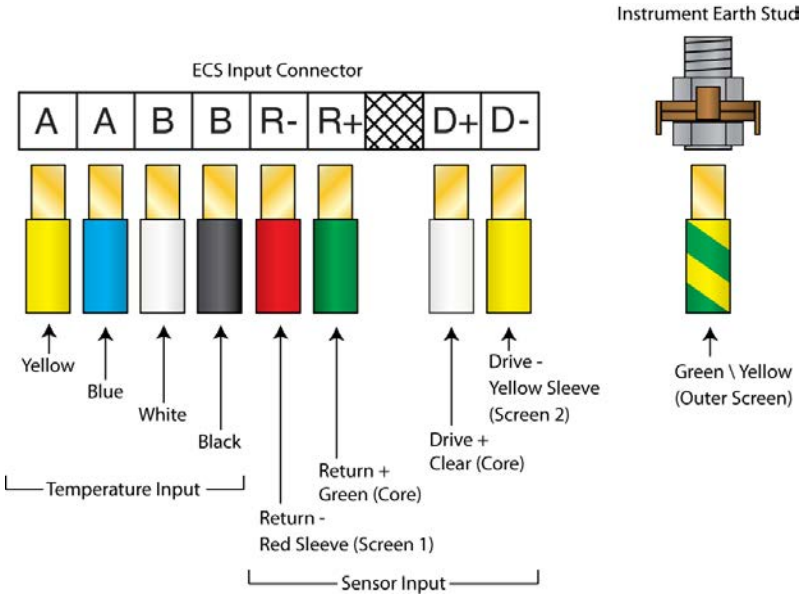


Ideally the probe head should be located in the centre of a T piece with the centre hole parallel with the flow.

Electrodeless Conductivity Input Termination Information



Electrodeless Conductivity 54H Cable Connection Details



Electrodeless Conductivity 54E Cable Connection Details

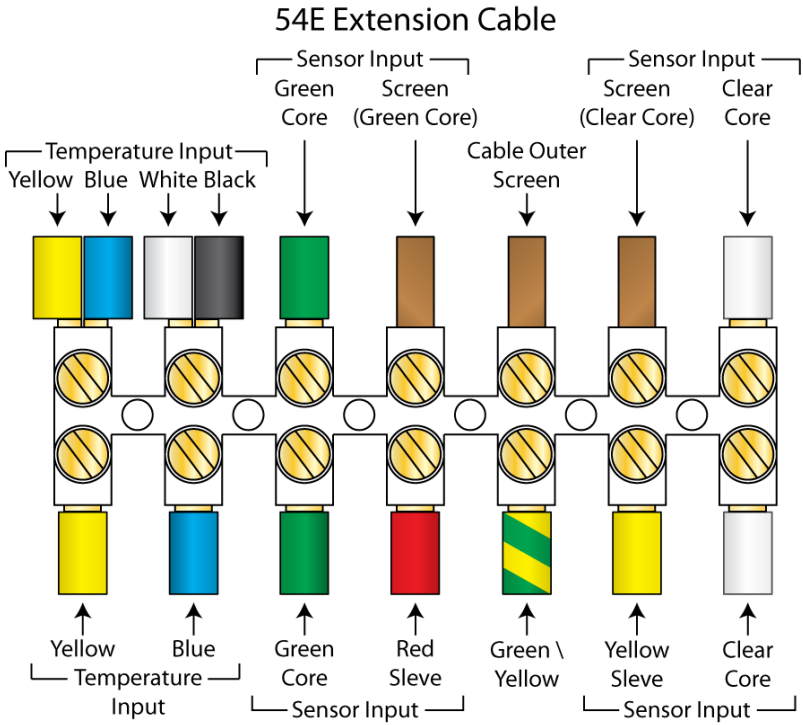
Extension Cable Arrangement

It is strongly recommended that only LTH 54E is used to extend the sensor / instrument distance. When extending the cable a terminal block can be used to connect two lengths of cable.
The user should be careful to avoid wiring the positive drive and return signals into adjacent locations on the terminal block. The preferred arrangement would be to have the positive signals as far apart from each other as the terminal block will allow with the negatives between them and the earth between the negative signals as shown in the following diagram.

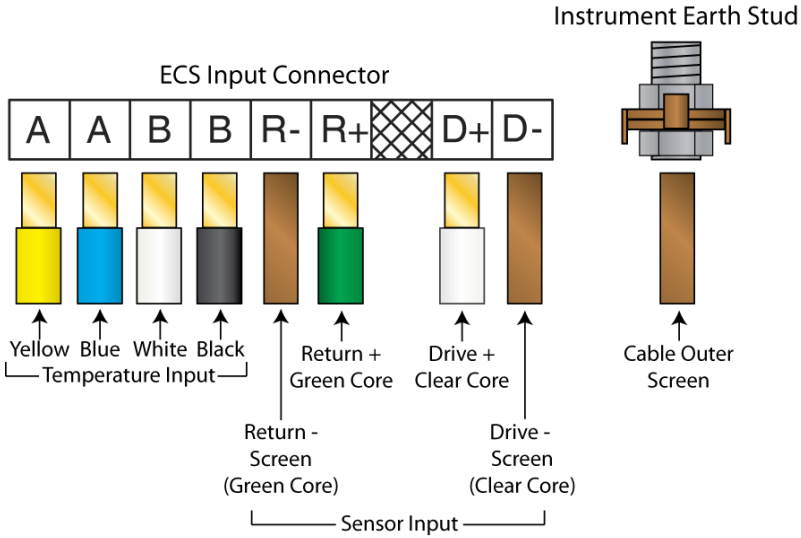
Drive +	Drive -	Earth	Return -	Return +

Recommended Extension Terminal Block Arrangement

The following diagram details the connections required to extend a 54H cable as found on the ECS20 sensors with 54E cable.



ECS20 54H Cable to 54E Extension Cable Connection Details



Electrodeless Conductivity 54E Extension Cable Connection Details

pH Measurement Installation

The choice of the correct type of pH electrode, how and where to mount it, so that it has a representative sample of solution are probably the two most important considerations when installing a pH system.

The following criteria are of great importance during selection:

The chemical make up, temperature and the viscosity of the sample.
The use of the correct materials for corrosion resistance.
Position of electrode for robustness and service access.
Ensuring a representative, uncontaminated solution sample.

The following tips might be useful. High temperature samples will restrict your choice to electrodes with high temperature references, note that low temperatures will also affect the response time of the electrode. When measuring high viscosity samples it is important that the junction is easy to clean. Samples with high pH or salt concentrations require electrodes with alkali-resistant membranes.

To ensure correct electrode mounting the following conditions should be observed:

The electrode system can only measure what is in the immediate vicinity of the sensor area of the probe.

A moderate flow is maintained to provide an “up to date” sample. Excessive flow rates, however, can cause certain electrodes to rapidly deplete, which will result in inaccurate readings. In this case a sealed reference is recommended.

Ensure that both the glass electrode and reference are in contact with the sample.
Avoid points where air can be trapped.

Avoid points of high turbulence as air bubbles will affect the measurement.

If the sample has solids present then use a guard or filter to protect the glass electrode. Alternatively use a flat pH bulb.

The glass electrode contains a liquid, ensure that the probe is mounted so that the internal filling solution is in contact with the glass bulb.

When a new pH electrode is first fitted or changed it must be calibrated (see page 125). Depending on the application it may also need periodic re-calibration, the MTD75 provides an inbuilt count down timer which will trigger an alarm when calibration interval has expired (see page 125).

Care and Maintenance of pH Electrodes

All pH electrodes contain an electrolyte solution, gel or polymer that has a limited life in both operation and on the shelf. The electrode shelf life depends on its storage conditions, it is recommended that the electrode should be used within six to twelve months after purchase.

For gel filled, non-flow electrodes the storage boot may become dried out during storage. This can result in evaporation of the water inside the electrode causing high impedance in the reference cell. If allowed to fully dry out the operation of the electrode will be irreversibly damaged. For electrodes in storage it is recommended that every three to four months the following procedure is carried out:

Remove the black storage boot or transit cover at the end of the electrode. Re-wet the fibre pack inside the storage boot with 3.8 Molar Potassium Chloride (KCl) saturated solution or if this is not available use a quantity of 4pH buffer solution. Note do not use deionised water. Re-seal the storage boot or transit cover.

For electrodes with soaker bottles ensure that the electrode is stored upright in the soaker bottle, and replace the bottle solution with 3.8 Molar Potassium Chloride (KCl) saturated solution approximately every 6 months.

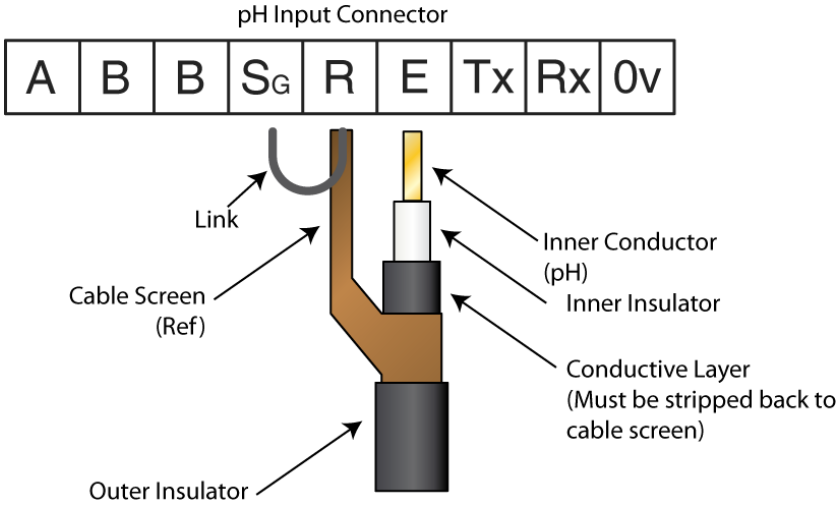
Depending on the issue the following glass body pH electrode maintenance procedures can be carried out:

Initial Cleaning – Wash the electrode with a solution of liquid detergent and warm water by gently scrubbing with a soft tooth brush or wet tissue. Follow this by thoroughly rinsing the electrode in deionised water or clean tap water.

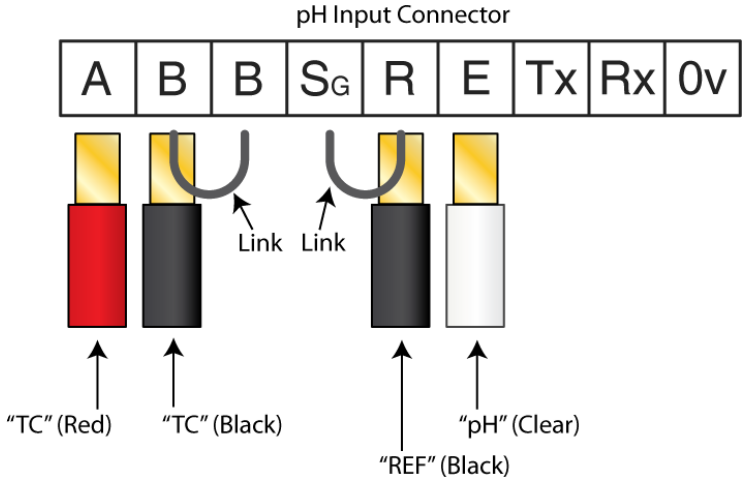
Inorganic Scale Deposits – Dissolve the deposit by immersing the electrode bulb only in a solution of dilute (10%) Hydrochloric Acid for a few minutes. **Follow the supplier's data sheet when handling acids and dispose of as instructed by your local authority regulations.**

Organic Oil or Grease Films – Wash the electrode with a solution of liquid detergent and warm water by gently scrubbing with a soft toothbrush or wet tissue. Follow this by soaking the pH electrode for between 10 and 30 minutes in a 3.8 Molar KCl solution.
Plugged or Dry Wick – Remove contaminate with one of the above cleaning procedures. Then soak the electrode in an 80°C, 3.8 Molar KCl solution for 30 minutes. Before allowing the electrode to cool in the same solution to promote flow of internal electrolyte through the liquid junction.

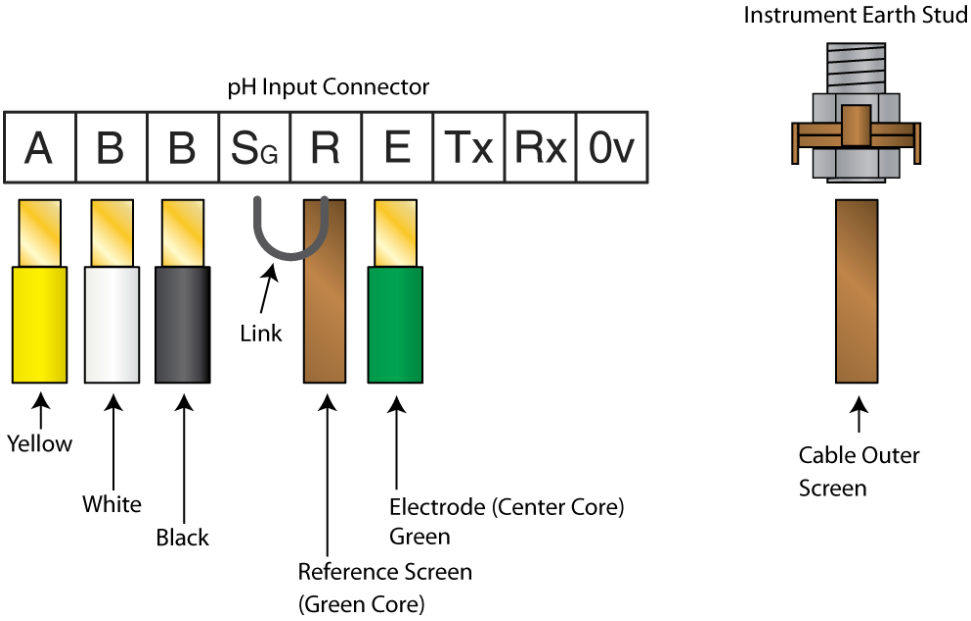
pH Input Termination Information



pH LN10 Coax Cable Connection Details

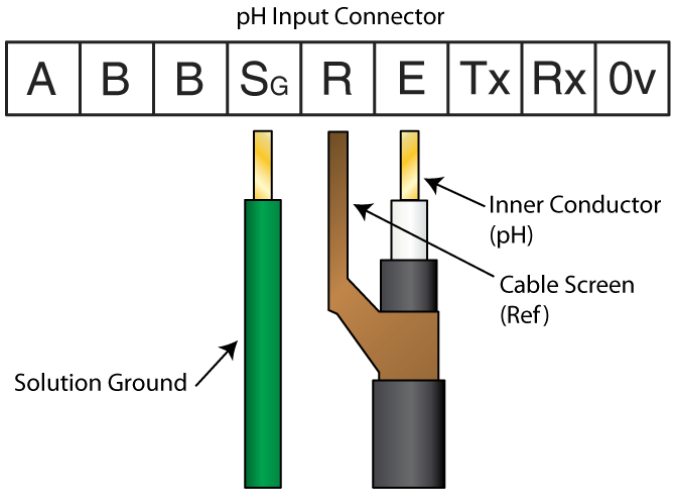


DynaProbe & ProcessProbe Cable Connection Details

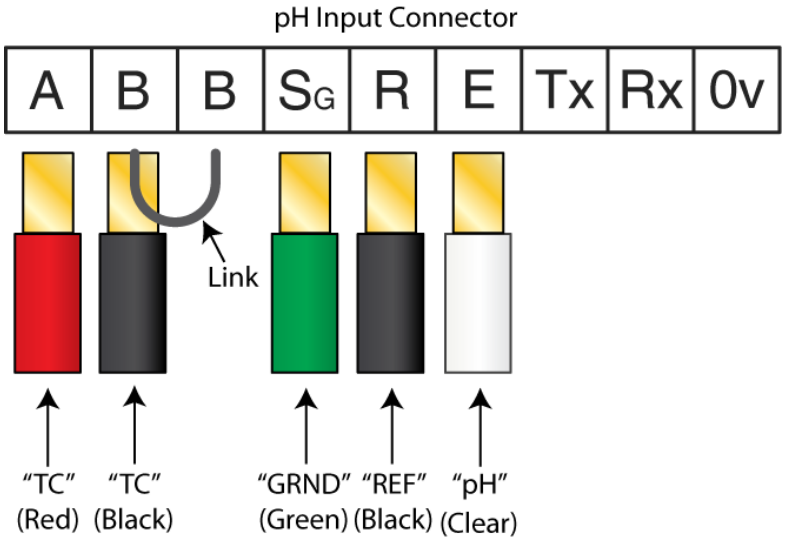


pH 54E Extension Cable Connection Details

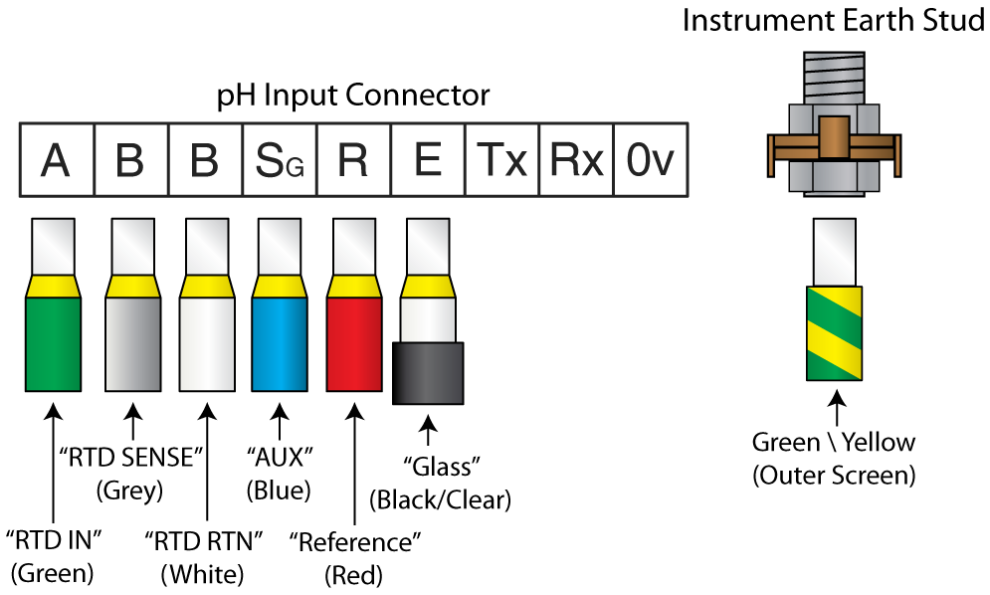
The pH input card of the MTD75 also provides a differential input method of wiring the pH electrode. This provides better electrical noise immunity and allows the sensor to operate in solutions where flowing electrical currents may cause measurement problems.



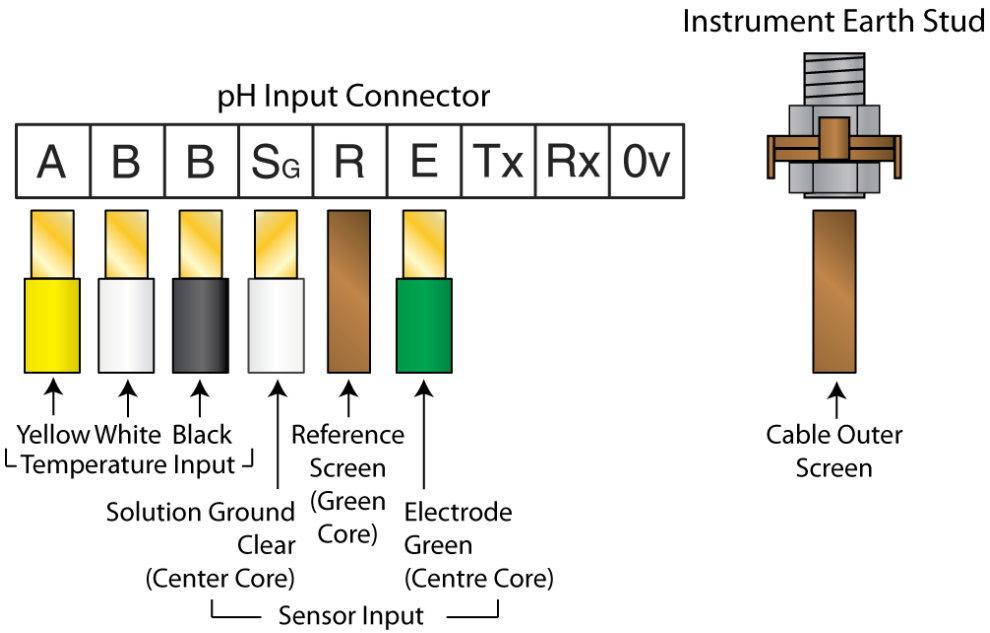
pH LN10 Coax Cable Connection Details
with Separate "Solution Ground" Connection



DynaProbe & ProcessProbe Cable Connection Details
with "Solution Ground"

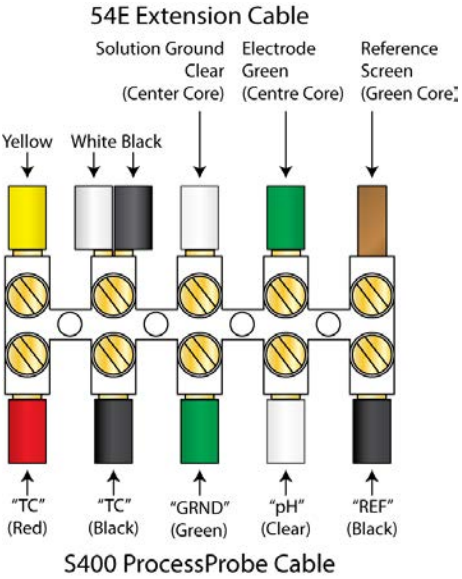


VP6 Detachable Cable Connection Details
with "Solution Ground"

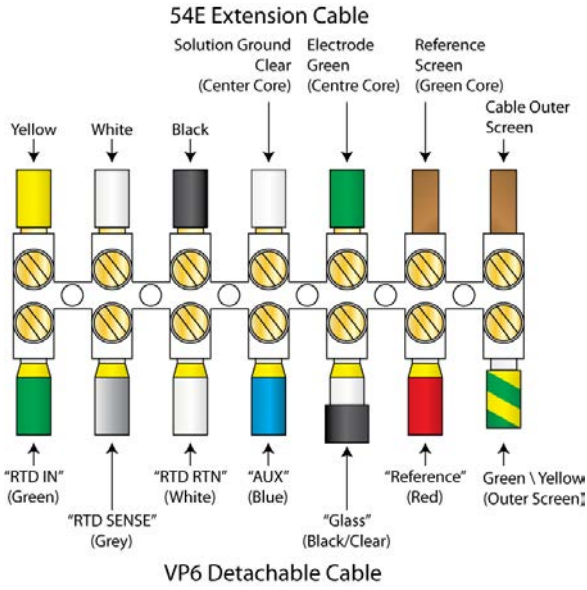


pH 54E Extension Cable Connection Details
with “Solution Ground”

LTH 54E Extension Cable Connection Information



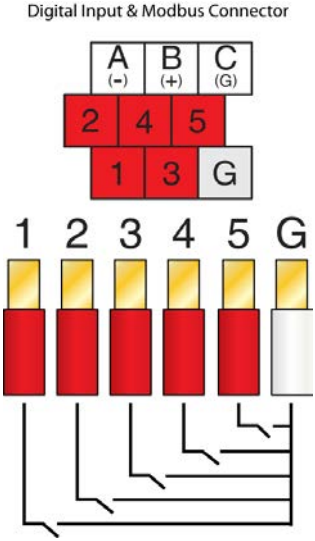
S400 ProcessProbe to 54E Extension Cable Connection Details



VP6 Detachable Cable to 54E Extension Cable Connection Details

Digital Inputs

The MTD75 features 5 digital inputs, the instrument can be configured to initiate the appropriate action when the contact either closes or opens between the input pin and the reference pin ("G").



MTD75 Digital Input Connection Details

Water Meter Input (Digital Input 1)

The terminal marked "1" is provided for contact to a standard water meter where contact activation indicates the flow of water. The 'K' factor for the water meter can be set in the "Configuration" menu (see page 151).

Flow Switch Input (Digital Input 2)

The terminal marked "2" is provided for connection to a flow switch in the process loop to indicate when there is no water flow past the sensors. When activated this will flag an error message on the main display and inhibit any dosing or bleed relays. The polarity of this input (NO/NC) can be set in the digital input 2 menu (see page 147).

Digital Inputs 3-5

Digital inputs 3-5 provide a user configured system to set the associated relay to either Offline or Interlock, indicate that there is a chemical Tank Level issue, or to activate a Remote Dose or Bleed of the relay.

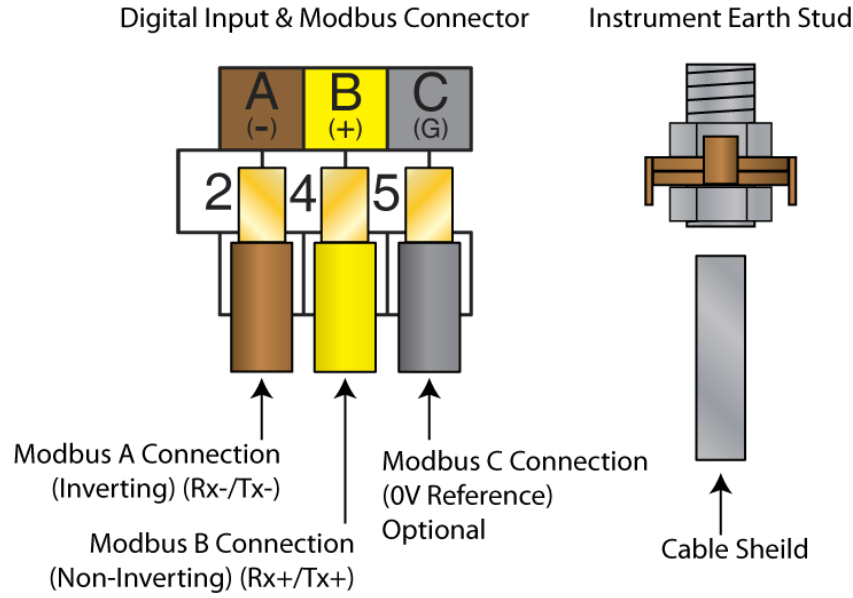
Modbus RS485

In the EIA/TIA-485 standard, two versions (cable type A and B) are specified for the bus line and can be used for all transmission rates. However, we recommend you use cable type A. The cable specification for cable type A is provided in the following table:

Cable Type A	
Characteristic Impedance	135 to 165Ω at a measuring frequency of 3 to 20Mhz
Cable Capacitance	<30pF/m
Core Cross-section	>AWG22
Cable Type	Twisted Pairs
Loop Resistance	≤100Ω/km
Signal damping	Max 9 dB over the entire cable cross-section
Shielding	Copper braided shielding or braided shielding and foil shielding

Note the following when designing the bus structure:

- Using cable type A and with a transmission rate of 9600 Baud, the maximum line length (segment length) of the MODBUS RS485 system is 10000 meters. The total length of the spurs may not exceed a maximum of 6.6 meters.
- A maximum of 32 devices are permitted per segment.
- Each segment is terminated at either end with a 120 Ω terminating resistor (not supplied).
- The bus length or the number of devices can be increased by introducing a repeater.

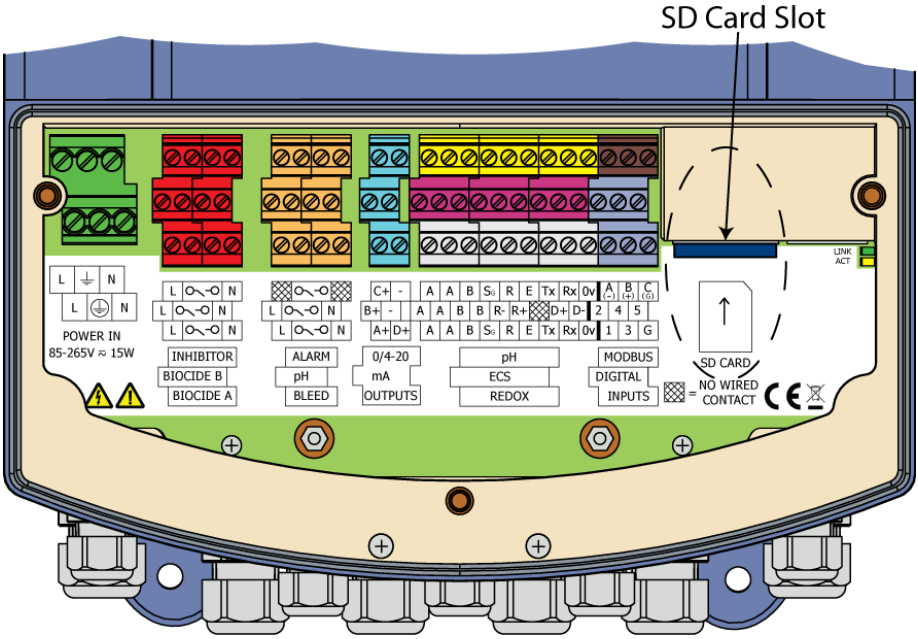


MTD75 MODBUS RS485 CONNECTION DETAILS

SD Card Interface

The MTD75 features a SD card interface which is compatible with SD, SDHC and SDXC formatted cards (N.B. SDXC cards may need formatting by the MTD75 before use – see Configuration Menu section). The card can be removed whilst the instrument is on but only when the disk icon is not shown at the top of the display.

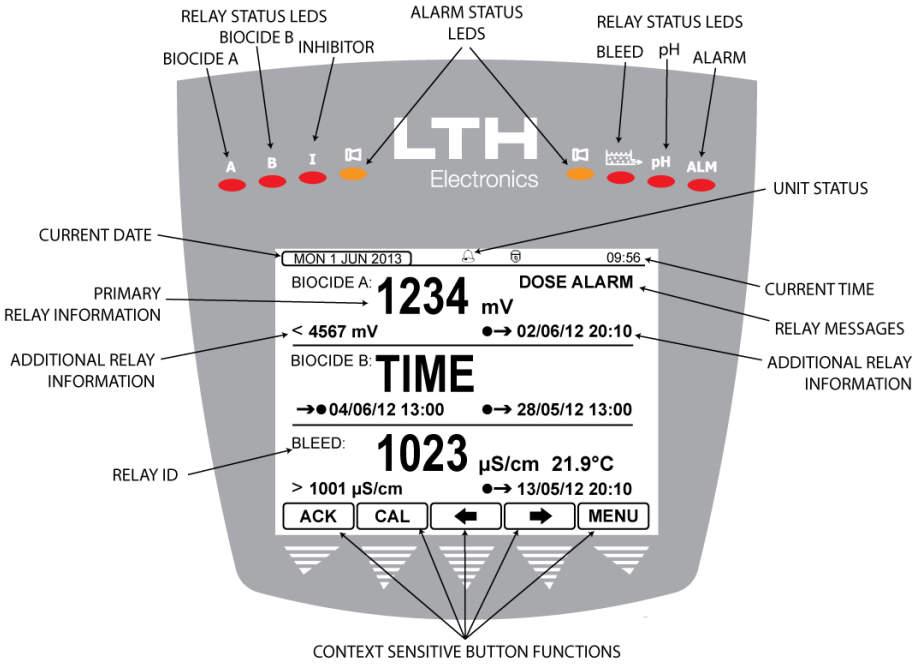
To insert the card ensure that the corner notch is at the top right of the card, and then just push it all the way in to the socket. To remove the card push it up then release and the card should then come out of the socket. N.B. When removing, it may be required to pull the card out of the last bit of the socket.



User Interface

CAUTION! BEFORE PROCEEDING, ENSURE THAT THE INSTALLATION INSTRUCTIONS HAVE BEEN FOLLOWED CORRECTLY. FAILURE TO DO SO MAY RESULT IN AN ELECTRICALLY HAZARDOUS INSTALLATION OR IRREPARABLE DAMAGE TO THE INSTRUMENT.

The MTD75 Series uses a high quality backlit 3¾" QVGA LCD to display the controller status and settings. This is accompanied by 5 control buttons whose function varies depending upon which screen the user is viewing. The button function is indicated by the control section at the bottom of the display. Also present are six Relay Status LEDs that when illuminated indicate which relay is active. Located between the relay LEDs there are two Alarm Status LEDs which provide clear indication of a fault within the instrument.



The Front Screens

The MTD75 has two front screens each with the capability of showing up to three control or dosing relays. Switching between the two front screens is achieved by using the ➡ and ⬅ arrows. Each relay section displays the relay's configured function and two pieces of additional information regarding the operation of the relay.

The information that can be displayed on the front screen is in the following format:

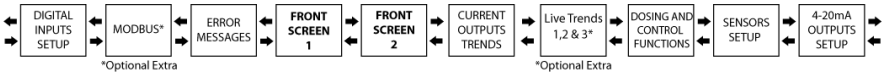
Relay Source	Primary Display	Secondary Display Left	Secondary Display Right
Off	**INACTIVE**		
Volume	**VOLUME**	**→● XX.XXm³** Input water volume to next activation.	**●→ XX.XXm³** Input water volume since last activation.
Time	**TIME**	**→● dd/mm/yy hh:mm** Time of next activation.	**●→ dd/mm/yy hh:mm** Time of last activation.
Redox	**XXXXmV** Redox reading	**<XXXXmV** Relay activation value.	**●→ dd/mm/yy hh:mm** Time of last activation.
Elec Cond	**XXXXµS/cm XX.X°C** Conductivity reading and temperature	**>XXXXµS/cm** Relay activation value.	**●→ dd/mm/yy hh:mm** Time of last activation.
pH	**XX.XXpH XX.X°C** pH reading and temperature	**>XX.XXpH** or **<XX.XXpH** Relay activation value.	**●→ dd/mm/yy hh:mm** Time of last activation.
÷ Meter	**÷ METER**	**●→ dd/mm/yy hh:mm** Time of last activation.	
X Meter	**X METER**	**●→ dd/mm/yy hh:mm** Time of last activation.	
A:B (Volume)	**RATIO**	**→● XX.XXm³** Input water volume to next activation.	**●→ XX.XXm³** Input water volume since last activation.
A:B (Time)	**RATIO**	**→● dd/mm/yy hh:mm** Time of next activation.	**●→ dd/mm/yy hh:mm** Time of last activation.

Water Meter Pulse

Also shown on the front screens is a total water counter which displays the water meter input. When a water meter pulse is sensed a  symbol is displayed next to the water meter total.

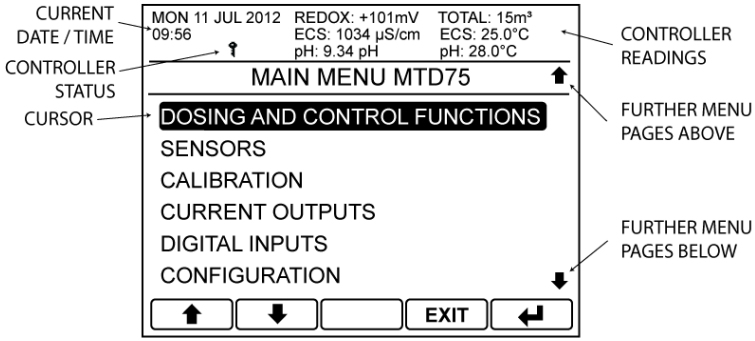
The Menu System

When the controller is switched on it will complete a configuration check that will take approximately 20 seconds after this it will default to the front screen 1. The user interface is arranged in two ways, the first is a quick configuration overview which is accessible by scrolling left or right from the front screen as shown below.



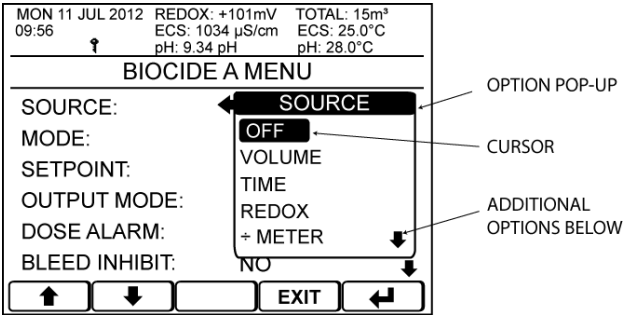
Scrolling Menu Layout

The second menu is accessible by pressing the menu button on either of the front screens. This then brings up the main menu from which the user can access the instruments settings.



The main menu is split into two main sections. The top shows the current time & date, the controller's status and the current readings. The bottom section shows the current options for that menu which may be selected by moving the cursor with the arrow buttons and pressing the enter button. The exit button is used to return to the previous menu or alternatively if held down for 3 seconds will take the instrument straight back to front screen 1. If no buttons are pressed after 2 minutes the instrument will default back to front screen 1. To the right of the menu screen arrows will indicate if there are further menu pages above or below the current one.

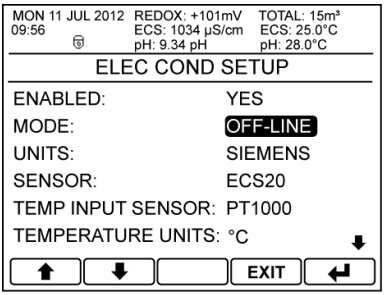
When changing a setting an option pop-up will appear from which the user can select an option or alternatively enter in a value. Note when looking at a list of options an arrow in the top right or bottom right corner of the pop-up indicates further options above or below the ones currently shown.



Security Code Access

To protect the controller's setup from unauthorised or accidental tampering, a security access code system is present. This is implemented via the controller's menu system which operates in two modes, "locked" as indicated by a padlock symbol and "unlocked" as indicated by a key symbol. The locked mode allows the user to observe the controller's configuration but without the ability to change it. If the user wishes to change a setting then the "Security Code" pop-up will appear that will prompt them to enter the security code which will then change the instruments mode to "unlocked". Once unlocked, the user can change any setting without having to re-enter the security access code, however the instrument will automatically lock itself if no further buttons are pressed after 2 minutes 30 seconds.

The default security access code is <u>1000</u>

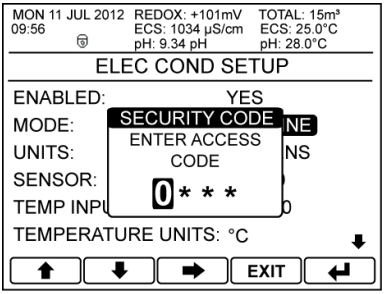


Select the option you wish to change and press enter to bring up the Security Code pop-up.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Chose Option



Enter the required Access Code.

If the code is incorrect the user will be prompted to try again.

If the code is correct the padlock at the top of the screen will turn to a key and the unit will be unlocked

⬆/⬇ – Increase / Decrease Digit

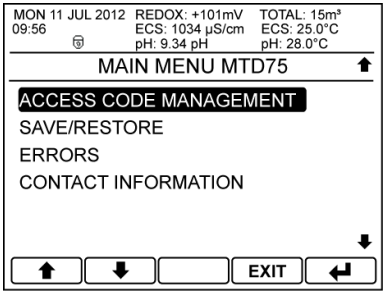
➡ – Select Next Digit

EXIT – Cancel

↵ – Enter Code

Access Code Management

The user can select their own access code in the access code management menu, or alternatively they can disable the security system permanently by changing the access code to 0000.



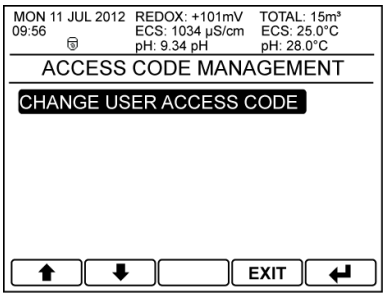
Main Menu

From either of the front screens press the menu button to show the main menu options and select Access Code Management.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



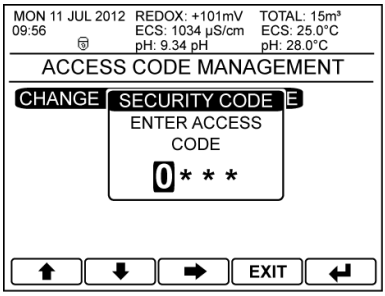
Access Code Management

Select change user access code.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Enter Current Code

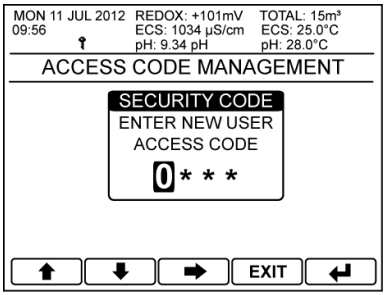
The user is required to enter the existing security code before the new code can be entered.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Enter Code



Enter New Code

Enter the new security access code

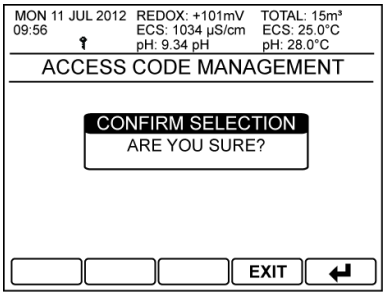
NB. Set the new code to 0000 to disable the security access system and permanently unlock the controller.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Code

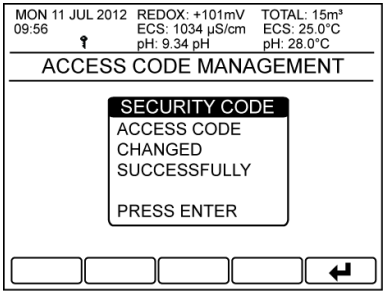


New Code Confirmation

Confirm the change of the security access code.

EXIT – Cancel

↵ – Confirm Change



Change Confirmation

The controller will then confirm that the security code has been successfully changed.

↵ – Exit

Dosing and Control Functions

The MTD75 controller is fitted with 6 dosing and control relays. Each individual relay can be configured to operate from various different sources. The Dosing and Control Function menu contains all of the necessary setup functions to configure the relays. The controller indicates the status of the enabled relays by means of 6 LED indicators located above the main display. A lit LED indicates that the relay is active. If the LED is blinking it indicates a dose alarm has occurred on that relay.

Biocide A Control Functions

The Biocide A menu contains the basic configurations for the Biocide A output. The user can select to initiate the Biocide A dose in a number of ways by selecting the appropriate trigger condition at the "Source" menu item. Selecting "Off" from the "Source" menu item can permanently deactivate the Biocide A relay output.

Dosing by Volume
When the "Source" menu item is set to "Volume" the MTD75 will count the volume of water given from the 'K' factor (see page 151) and the water meter input (see page 52). After the amount equals or exceeds the level set the Biocide A relay will activate for the dose duration. The volume of water passed since the last dose and the amount of water remaining to the next dose are displayed on the front screen (See page 55).

Timed Dosing
When the "Source" menu item is set to "Time" the MTD75 will activate the Biocide A dose after the selected period. The user must first select the overall period of the dosing cycle (i.e. per week/day/hour). From there the user can then select the interval of dosing.

When the Dose cycle ("Dose Per") is set to "Hour" the user can then select the interval between doses to the minutes and seconds. When the dose cycle is set to "Day" the interval can be set to the hours and minutes.

When the Dose cycle is set to "Week" the user can select which days of the week the dose occurs on, the time of day that dose occurs and its duration. Both the time of day and the duration can be set different for each day of the week.

If the trigger source is "Volume" then the controller also offers a background "Timed Dose". When enabled the timed dosing menus will also appear, working the same way except when the cycle is set to "Week". When this occurs the user will be able to select an interval from 1 to 6 days.

Dosing By Redox Level
If an optional redox card has been fitted and enabled (see pages 19 & 99) the MTD75 will allow the user to select "Redox" as the biocide A trigger. When selected the Biocide A relay will be activated when the input Redox level goes below the set level.

Dosing From The Water Meter
The MTD75 provides the facility to generate a pulsed output directly in proportion to the water meter input. When the trigger is set to "xMeter" the controller will output a set number of pulses for every input pulse received. When set to "÷Meter" the controller will require a set number of input pulses for one output pulse.

Output Configuration
Depending on the trigger selected the relay output can be configured to operate as an "On/Off" output, a "Pulse" output or a "Time Proportional" output.

When the output is set to "Pulse" the user can select the "Stroke Rate" which is the frequency of the output pulses. The output pulse width is fixed at 0.2 seconds.

When the output is set to "Time Proportional" the user can select the "Cycle Time" which is the sum of the on and the off times. The user can also select the "Proportional Band" over which the proportional timing is active. For example for a redox setpoint of 1000mV and a band of 100mV was entered. When the reading falls below 900mV the relay would be energised, as the input rises and approaches the set point the biocide relay starts to cycle on and off with the on time reducing and the off time increasing, respectively.

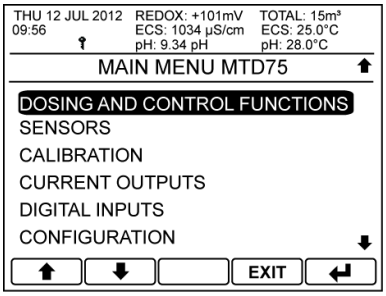
Bleed Inhibiting
The facility has been provided to allow the user to inhibit any Bleed operations during and for a period after, the Biocide A dose. The period of the Bleed Inhibit can be set from 00:00 to 24:00 hours. When the Bleed Inhibit is set to 00:00, the Bleed operation will be inhibited only for the duration of the Biocide A dose. Only available if the Bleed relay has been enabled.

Pre-Dose Bleeding
The MTD75 provides the user with the option to define a short Bleed operation before initiating the Biocide A Dose, this can be defined from 1 second to 99 minutes. NB. If a bleed inhibit occurs during a pre-bleed operation the pre-bleed will be terminated and the Biocide dose initiated immediately. Only available if the Bleed relay has been enabled.

Dose Alarm Timer
To prevent the occurrence of overdosing when using the "Redox" trigger, the user can define an "Alarm Time". If the dose relay remains active for longer than this set period the system will deactivate the relay, flash the Biocide A LED on the front panel and display the "Dose Alarm" message in the Biocide A section of the main display. To cancel the alarm and re-enable the dose relay the user needs to press the "ACK" button on the front screen and select Biocide A from the list.

Manual Dosing
To provide some flexibility in setting up and adjusting the dosing, the MTD75 is provided with a "Manual Dosing" option. Selecting the "Manual Dose: Start" option will activate the relay for the time set in the manual dose duration menu. If the user requires the manual dose to terminate before the timer runs out select the "Manual Dose: Stop" menu.

Biocide A Menu



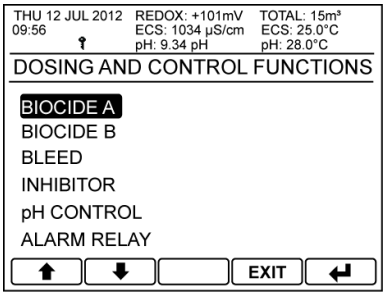
Main Menu

From either of the front screen press the menu button to show the main menu options and select Dosing and Control Functions.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



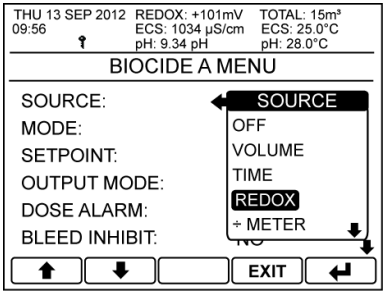
Dosing and Control Functions

Select Biocide A.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Biocide A Trigger Source

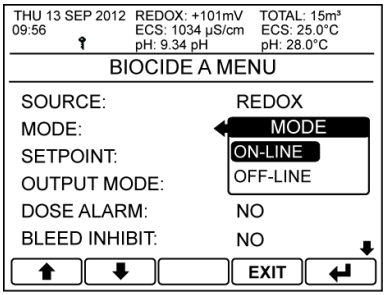
The user can select to initiate the Biocide A dose in a number of ways by selecting the appropriate trigger condition. Selecting "Off" from the "Source" menu item can permanently deactivate the Biocide A relay output.

Redox will only be shown if an optional redox card has been fitted and enabled (see pages 19 & 99)

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Mode

Selecting off-line causes the Biocide A relay to de-energise. Useful for when commissioning or calibrating the instrument.

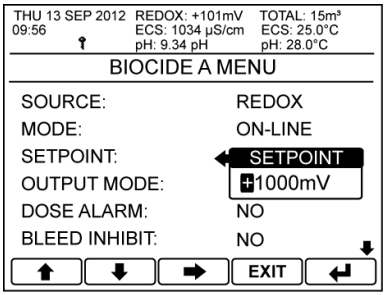
When the unit is placed in an off-line state "off-line" will appear in the relay's message section on the front screen.

If a "Cannot Edit Digital Input Has Control" message appears, then an associated digital input is currently controlling the on-line / off-line state of the relay.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Setpoint

The redox setpoint value below which the Biocide A relay will energise.

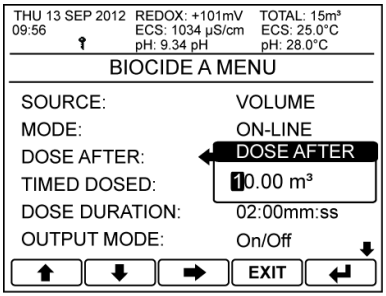
Only available when source is set to Redox

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Dose After

The volume of water required to pass before the Biocide A relay will energise.

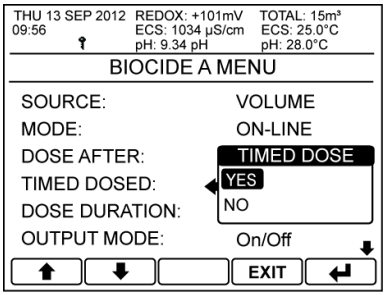
Only available when source is set to Volume

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Timed Dose

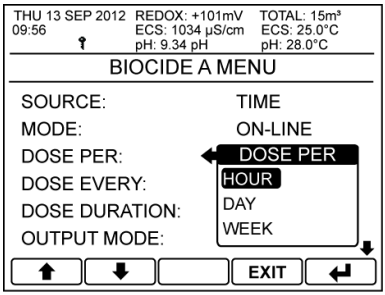
Select to enable a background timed dose.

Only available when source is set to volume

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



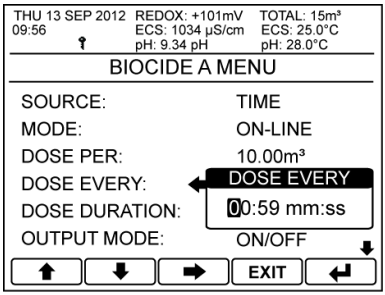
Dose Per

Select the Dose cycle when the trigger source is Time or when a background Timed Dose has been selected.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Dose Every

Select the dose period.

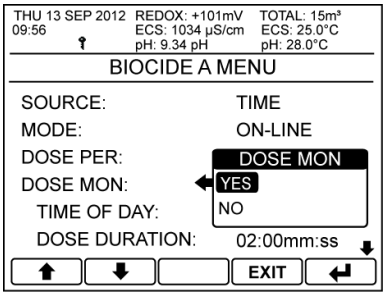
When "Hour" is selected this can be set to minutes and seconds, when "Day" is selected this can be set to hours and minutes.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



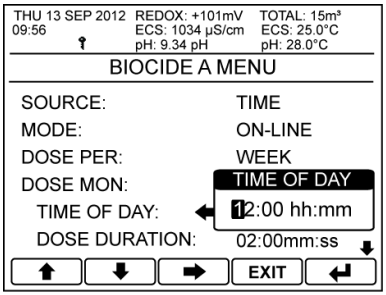
Dose Week

When the trigger source is "Time" and dose per is "Week" the user is given the choice of which days of the week to dose on,

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



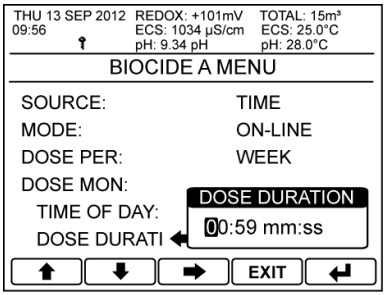
What time of day on the selected day to dose,

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



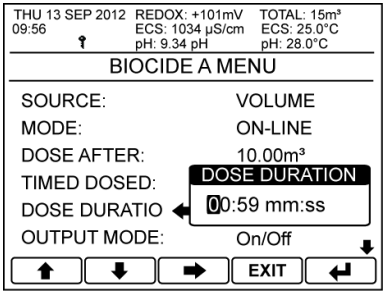
And the duration of the dose.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



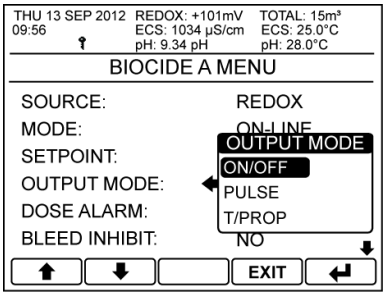
Dose Duration

Set the dose duration when using volume or timed dosing

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Output Mode

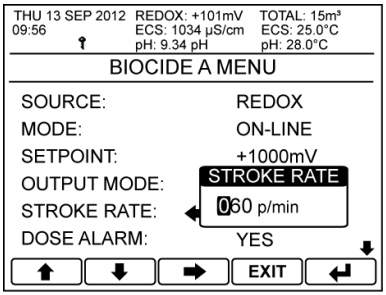
Set the output pump/solenoid type.

Note: Time proportional is only available when the trigger source is set to Redox.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Stroke Rate

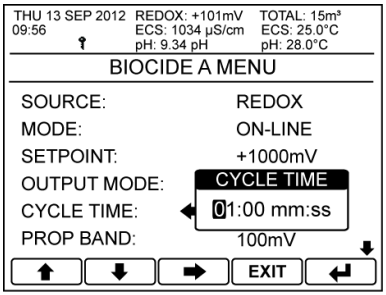
Set the pump stroke rate when either output mode is set to "Pulse" or the trigger source is set to either "÷ Meter" or "X Meter".

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Cycle Time

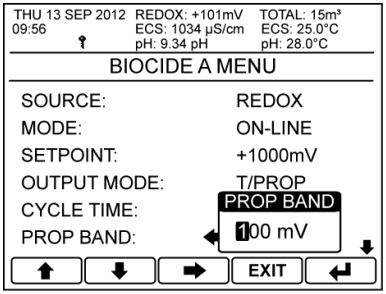
Set the sum of the On and Off times when the output mode is set to "Time Proportional".

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Time Proportional Band

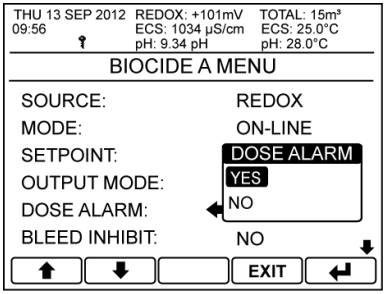
Set the proportional band when the output mode is set to "Time Proportional".

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Dose Alarm

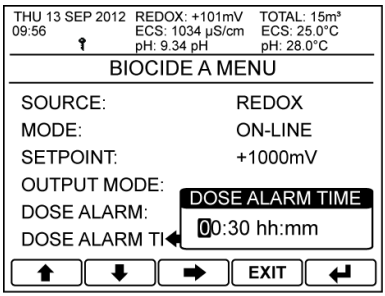
Enable the Dose Alarm.

Available to indicate and prevent overdosing when using Redox.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Dose Alarm Time

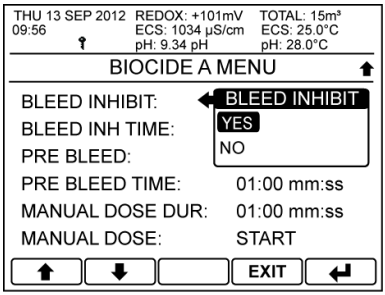
Sets the time which if the Biocide is active for longer than causes the dose alarm to activate.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Bleed Inhibit

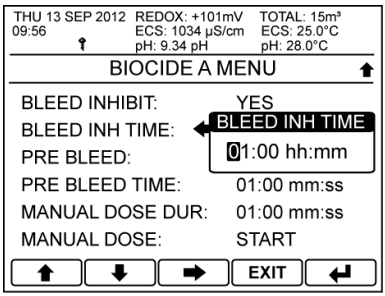
Inhibit any "Bleed" operations until after the set bleed inhibit time.

Only available if the bleed relay is enabled.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Bleed Inhibit Time

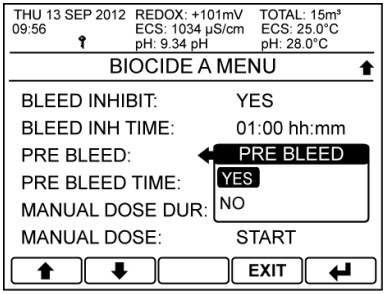
Duration of the bleed inhibit after completion of dosing (00:00 indicates bleed inhibit only during dosing).

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Pre Bleed

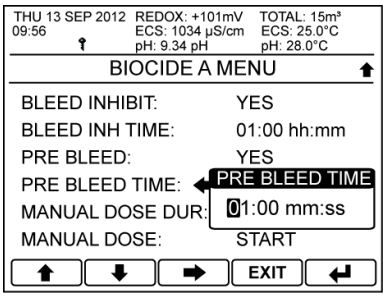
Perform a defined bleed operation before dosing.

Only available if the bleed relay is enabled.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Pre Bleed Time

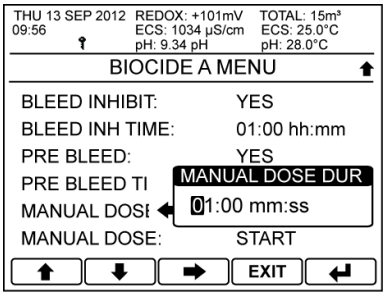
Set the duration of the pre-dose bleed operation.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Manual Dose Duration

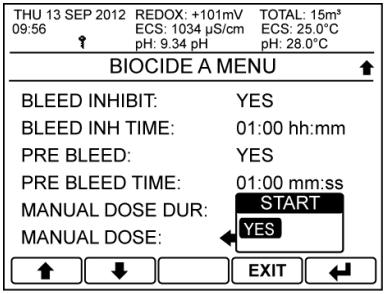
Set the dose duration of the manual dose.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Manual Dose

Start the manual dose.

Note, once started the user can cancel the manual dose by selecting stop.

EXIT – Cancel

↵ – Select Option

BLANK

Biocide B Control Functions

The Biocide B menu contains the basic configurations for the Biocide B output. The user can select to initiate the Biocide B dose in a number of ways by selecting the appropriate trigger condition at the "Source" menu item. Selecting "Off" from the "Source" menu item can permanently deactivate the Biocide B relay output.

The Biocide B relay behaves identically to the Biocide A relay apart from the addition of dosing by ratio A : B and the inability to select Redox as the trigger source.

Dosing By Ratio A : B
The Biocide B relay can be activated by linking it by ratio to Biocide A. i.e. if the Ratio is set to say 3: 1, Biocide B will replace Biocide A on every fourth dose of Biocide A. This feature is only available when the Biocide A trigger source is set to "Volume" or "Time".

BLANK

Bleed Control Functions

The Bleed menu contains the basic configurations for the Bleed output. The user can select to initiate the Bleed operation in a number of ways by selecting the appropriate trigger condition at the "Source" menu item. Selecting "Off" from the "Source" menu item can permanently deactivate the Bleed relay output.

Bleed By Volume
When the "Source" menu item is set to "Volume" the MTD75 will count the volume of water given from the 'K' factor (see page 151) and the water meter input (see page 52). After the amount equals or exceeds the level set the Bleed relay will activate for the dose duration. The volume of water passed since the last bleed and the amount of water remaining to the next bleed are displayed on the front screen (see page 55).

Timed Bleeding
When the "Source" menu item is set to "Time" the MTD75 will initiate the Bleed operation after the selected period. The user must first select the overall period of the Bleed cycle (i.e. per week/day/hour). From there the user can then select the time interval for the bleed.

When the Bleed cycle ("Bleed Per") is set to "Hour" the user can then select the interval between bleeds to the minute and seconds. When the Bleed cycle is set to "Day" the interval can be set to the hour and minutes.

When the Bleed cycle is set to "Week" the user can select which days of the week the bleed occurs on, the time of day that bleed occurs and its duration. Both the time of day and the duration can be set different for each day of the week.

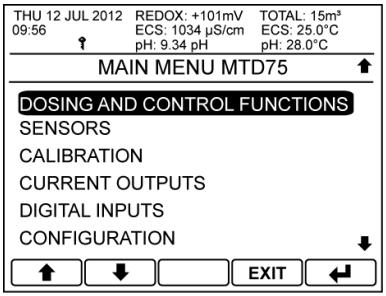
If the trigger source is "Volume" then the controller also offers a background "Timed Bleed". When enabled the timed bleeding menus will also appear, working the same way except when the cycle is set to "Week". When this occurs the user will be able to select an interval from 1 to 6 days.

Bleeding By Conductivity Level
If and optional electrodeless conductivity card has been fitted and enabled (see pages 19 & 101) the MTD75 will provide the facility to take measurements from an Electrodeless conductivity sensor (see page 42). This will allow the user to select the "Elec Cond" trigger setting from the "Source" menu item. When selected the Bleed relay will be activated when the input conductivity level goes above the set level.

Bleed Alarm Timer
To prevent the occurrence of excessive bleeding when using the "Elec Cond" trigger, the user can define an "Alarm Time". If the bleed relay remains active for longer than this set period the system will deactivate the relay, flash the Bleed LED on the front panel and display the "Bleed Alarm" message in the Bleed section of the main display. To cancel the alarm and re-enable the bleed relay the user needs to press the "ACK" button on the front screen and select Bleed from the list.

Manual Bleeding
To provide some flexibility in setting up and adjusting the bleeding, the MTD75 is provided with a "Manual Bleeding" option. Selecting the "Manual Bleed: Start" option will activate the relay for the time set in the manual bleed duration menu. If the user requires the manual bleed to terminate before the timer runs out select the "Manual Bleed: Stop" menu.

Bleed Menu



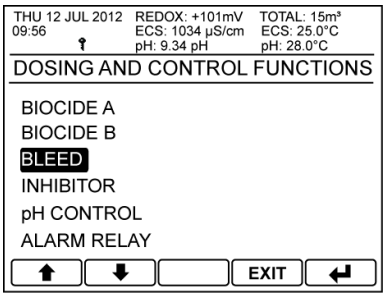
Main Menu

From either of the front screen press the menu button to show the main menu options and select Dosing and Control Functions.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



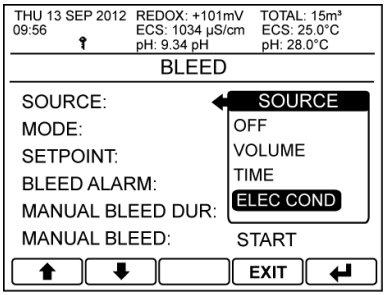
Dosing and Control Functions

Select Bleed.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Bleed Trigger Source

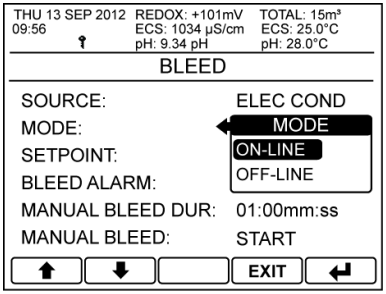
The user can select to initiate the Bleed operation in a number of ways by selecting the appropriate trigger condition. Selecting "Off" from the "Source" menu item can permanently deactivate the Bleed relay output.

Elec Cond will only be shown if an optional Electrodeless Conductivity card has been fitted and enabled (see pages 19 & 101).

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Mode

Selecting off-line causes the Bleed relay to de-energise. Useful for when commissioning or calibrating the instrument.

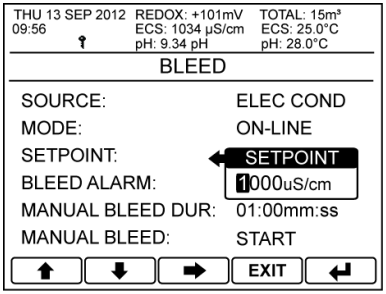
When the unit is placed in an off-line state "off-line" will appear in the relay's message section on the front screen.

If a "Cannot Edit Digital Input Has Control" message appears, then an associated digital input is currently controlling the on-line / off-line state of the relay.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Setpoint

The conductivity setpoint value below which the Bleed relay will energise.

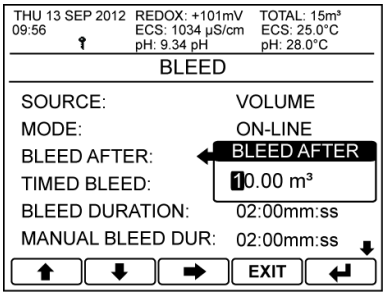
Only available when source is set to Elec Cond.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Bleed After

The volume of water required to pass before the Bleed relay will energise.

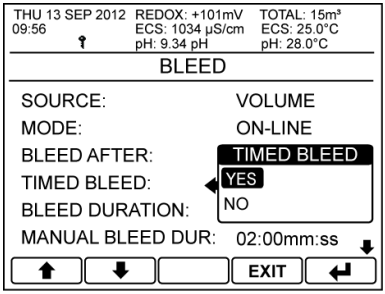
Only available when source is set to Volume

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Timed Bleed

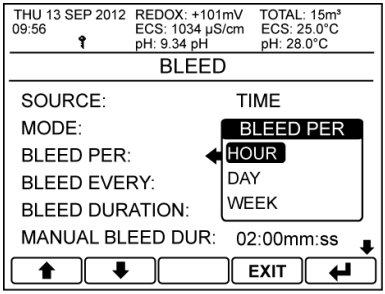
Select to enable a background timed bleed.

Only available when source is set to volume

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



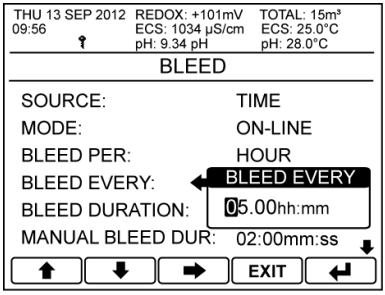
Bleed Per

Select the Bleed cycle when the trigger source is Time or when a background Timed Bleed has been selected.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Bleed Every

Select the bleed period.

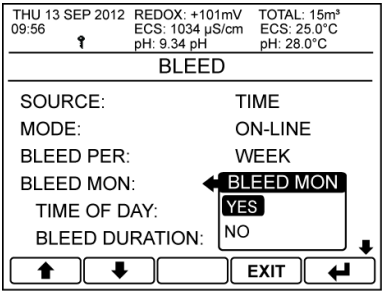
When "Hour" is selected this can be set to minutes and seconds, when "Day" is selected this can be set to hours and minutes.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



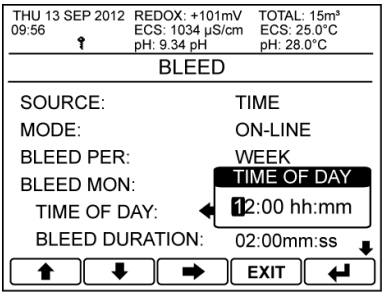
Bleed Week

When the trigger source is "Time" and bleed per is "Week" the user is given the choice of which days of the week to bleed on,

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



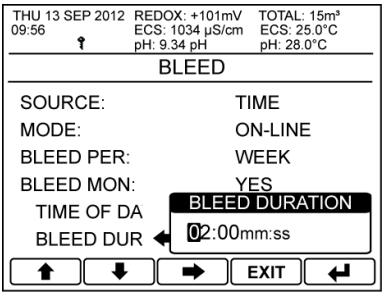
What time of day on the selected day to bleed,

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



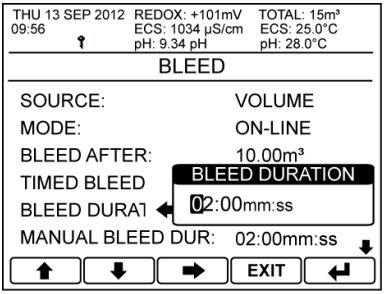
And the duration of the bleed.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



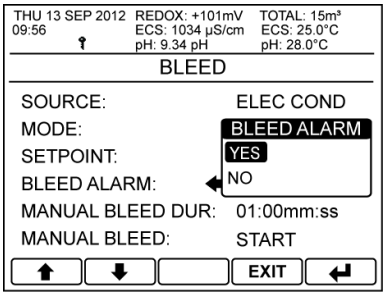
Bleed Duration

Set the bleed duration when using volume or timed bleeding.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Bleed Alarm

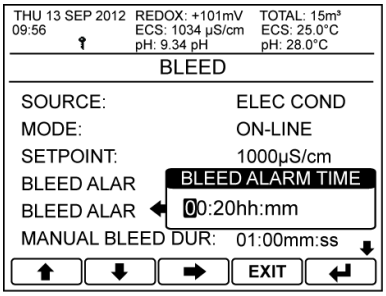
Enable the Bleed Alarm.

Available to indicate and prevent excess bleeding when using electrodeless conductivity.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Bleed Alarm Time

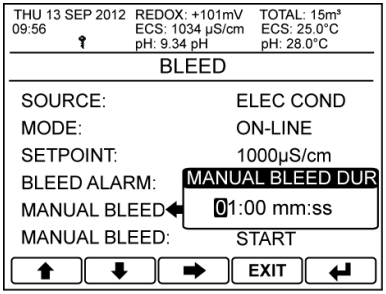
Sets the time which if the Bleed relay is active for longer than causes the bleed alarm to activate.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Manual Bleed Duration

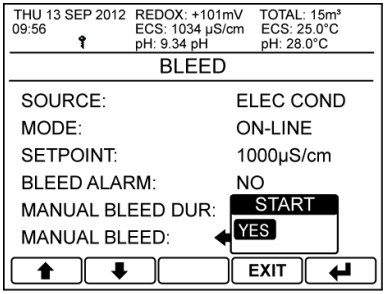
Set the bleed duration of the manual bleed.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Manual Bleed

Start the manual bleed.

Note, once started the user can cancel the manual bleed by selecting stop.

EXIT – Cancel

↵ – Select Option

Inhibitor Control Functions

The Inhibitor menu contains the basic configurations for the Inhibitor output. The user can select to initiate the Inhibitor dose in a number of ways by selecting the appropriate trigger condition at the "Source" menu item. Selecting "Off" from the "Source" menu item can permanently deactivate the Inhibitor relay output.

Dosing By Volume
When the "Source" menu item is set to "Volume" the MTD75 will count the volume of water given from the 'K' factor (see page 151) and the water meter input (see page 52). After the amount equals or exceeds the level set the Inhibitor relay will activate for the dose duration. The volume of water passed since the last dose and the amount of water remaining to the next dose are displayed on the front screen (see page 55).

Timed Dosing
When the "Source" menu item is set to "Time" the MTD75 will initiate the Inhibitor dose after the selected period. The user must first select the overall period of the dosing cycle (i.e. per week/day/hour). From there the user can then select the interval of dosing.

When the Dose cycle ("Dose Per") is set to "Hour" the user can then select the interval between doses to the minutes and seconds. When the dose cycle is set to "Day" the interval can be set to the hours and minutes.

When the Dose cycle is set to "Week" the user can select which days of the week the dose occurs on, the time of day that dose occurs and its duration. Both the time of day and the duration can be set different for each day of the week.

If the trigger source is "Volume" then the controller also offers a background "Timed Dose". When enabled the timed dosing menus will also appear, working the same way except when the cycle is set to "Week". When this occurs the user will be able to select an interval from 1 to 6 days.

Dosing By Bleed Duration
The MTD75 includes the facility to dose the Inhibitor in proportion to the amount of bleed time that has accumulated. Selecting the "Bleed" trigger in the "Source" menu and setting the time accordingly at the "Bleed Time" menu item can simply do this.

Dosing From The Water Meter
The MTD75 provides the facility to generate a pulsed output directly in proportion to the water meter input. When the trigger is set to "xMeter" the controller will output a set number of pulses for every input pulse received. When set to "÷Meter" the controller will require a set number of input pulses for one output pulse.

Output Configuration
Depending on the trigger selected the relay output can be configured to operate as an "On/Off" output or a "Pulse" output. In either case the duration of the dose is set in the "Dose Duration" menu item.

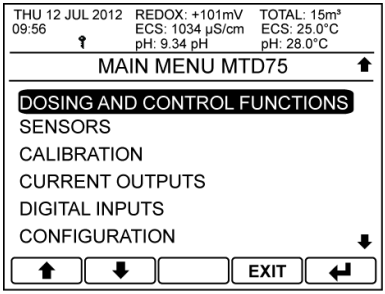
When the output is set to "Pulse" the user can select the "Stroke Rate" which is the frequency of the output pulses. The output pulse width is fixed at 0.2 seconds.

Bleed Inhibiting
The facility has been provided to allow the user to inhibit any Bleed operations during and for a period after, the Inhibitor dose. The period of the Bleed Inhibit can be set from 00:00 to 24:00 hours. When the Bleed Inhibit is set to 00:00, the Bleed operation will be inhibited only for the duration of the Inhibitor dose. Only available if the Bleed relay has been enabled.

Pre-Dose Bleeding
The MTD75 provides the user with the option to define a short Bleed operation before initiating the Inhibitor Dose, this can be defined from 1 second to 99 minutes. NB. If a bleed inhibit occurs during a pre-bleed operation the pre-bleed will be terminated and the Inhibitor dose initiated immediately. Only available if the Bleed relay has been enabled.

Manual Dosing
To provide some flexibility in setting up and adjusting the dosing, the MTD75 is provided with a "Manual Dosing" option. Selecting the "Manual Dose: Start" option will activate the relay for the time set in the manual dose duration menu. If the user requires the manual dose to terminate before the timer runs out select the "Manual Dose: Stop" menu.

Inhibitor Menu



Main Menu

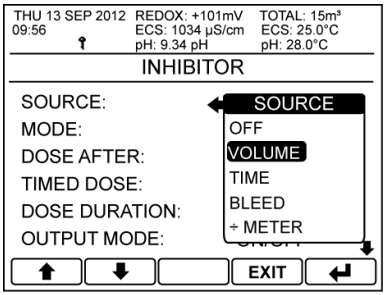
From either of the front screen press the menu button to show the main menu options and select Dosing and Control Functions.

⬆/⬇ – Select Option
EXIT – Return to Front Screen
↵ – Enter Option

Dosing and Control Functions

Select Inhibitor.

⬆/⬇ – Select Option
EXIT – Return to Main Menu
↵ – Enter Option



Inhibitor Trigger Source

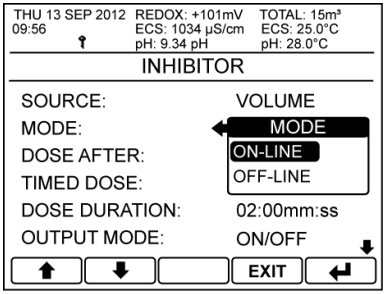
The user can select to initiate the Inhibitor dose in a number of ways by selecting the appropriate trigger condition. Selecting "Off" from the "Source" menu item can permanently deactivate the Inhibitor relay output.

Bleed will only be shown if the bleed relay has been configured (see page 74).

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Mode

Selecting off-line causes the Inhibitor relay to de-energise. Useful for when commissioning or calibrating the instrument.

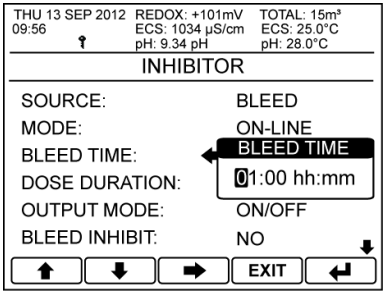
When the unit is placed in an off-line state "off-line" will appear in the relay's message section on the front screen.

If a "Cannot Edit Digital Input Has Control" message appears, then an associated digital input is currently controlling the on-line / off-line state of the relay.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Bleed Time

Trigger the Inhibitor relay after the entered accumulated bleed time.

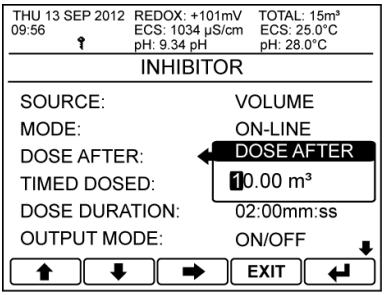
Only available when the source is set to "Bleed".

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Dose After

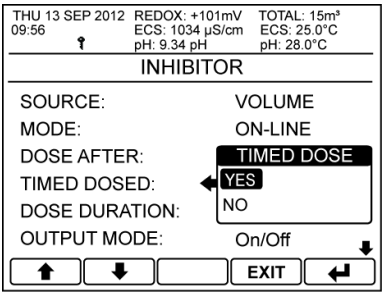
The volume of water required to pass before the Inhibitor relay will energise. Only available when source is set to Volume.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Timed Dose

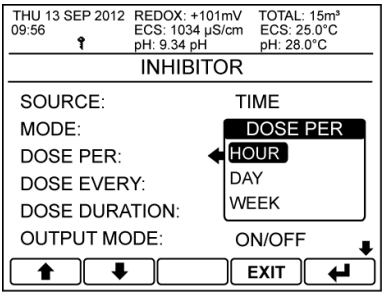
Select to enable a background timed dose.

Only available when source is set to volume

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



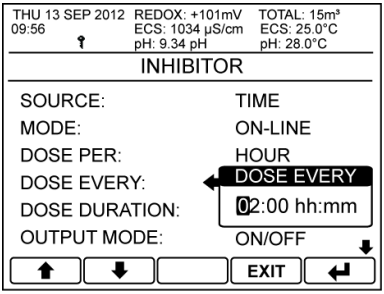
Dose Per

Select the Dose cycle when the trigger source is Time or when a background Timed Dose has been selected.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Dose Every

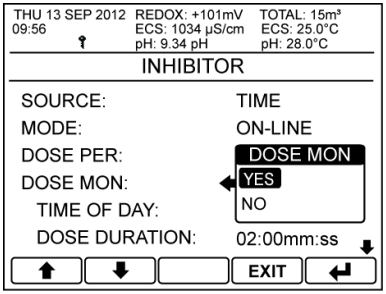
Select the dose period. When "Hour" is selected this can be set to minutes and seconds, when "Day" is selected this can be set to hours and minutes.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



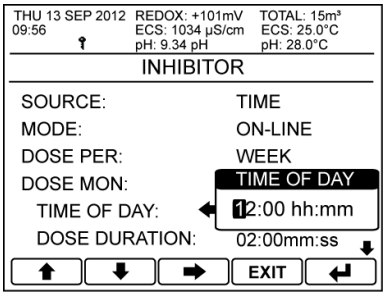
Dose Week

When the trigger source is "Time" and dose per is "Week" the user is given the choice of which days of the week to dose on,

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



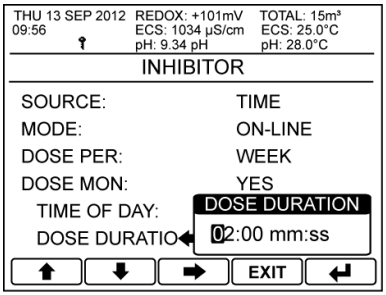
What time of day on the selected day to dose,

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



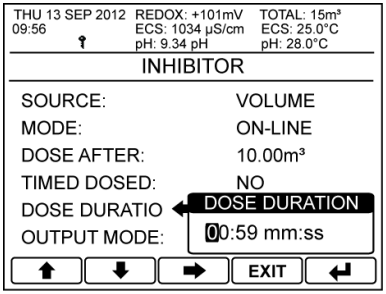
And the duration of the dose.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Dose Duration

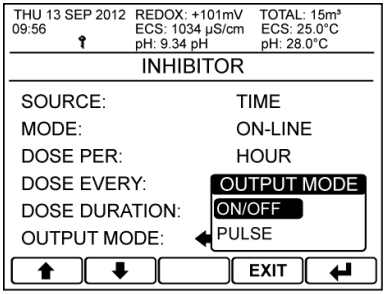
Set the dose duration when using volume or timed dosing

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



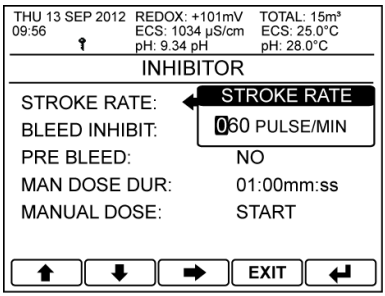
Output

Set the output pump/solenoid type.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Stroke Rate

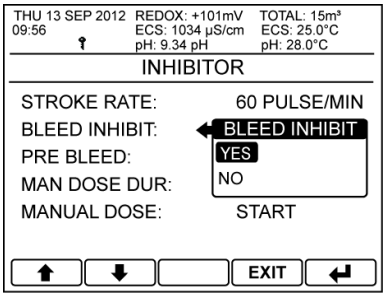
Set the pump stroke rate when either output mode is set to "Pulse" or the trigger source is set to either "÷ Meter" or "X Meter".

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Bleed Inhibit

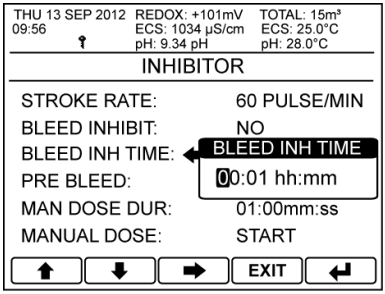
Inhibit any "Bleed" operations until after the set bleed inhibit time.

Only available if the bleed relay is enabled.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Bleed Inhibit Time

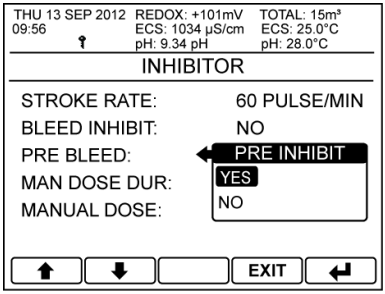
Duration of the bleed inhibit after completion of dosing (00:00 indicates bleed inhibit only during dosing).

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Pre Bleed

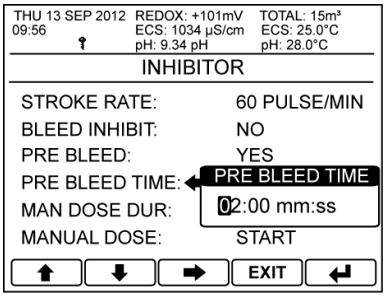
Perform a defined bleed operation before dosing.

Only available if the bleed relay is enabled.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Pre Bleed Time

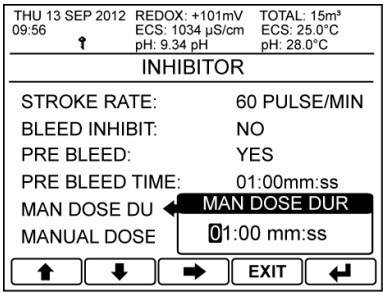
Set the duration of the pre-dose bleed operation.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Manual Dose Duration

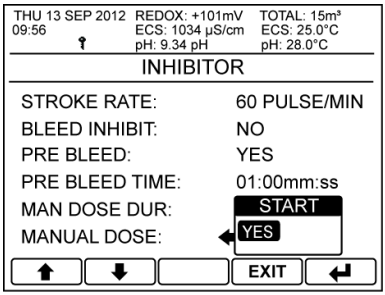
Set the dose duration of the manual dose.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Manual Dose

Start the manual dose.

Note, once started the user can cancel the manual dose by selecting stop.

EXIT – Cancel

↵ – Select Option

BLANK

pH Control Functions

The pH Control menu contains the basic configurations for the pH Control output. The user can select to initiate the pH Control dose in a number of ways by selecting the appropriate trigger condition at the "Source" menu item. Selecting "Off" from the "Source" menu item can permanently deactivate the pH Control relay output.

Dosing By Volume
When the "Source" menu item is set to "Volume" the MTD75 will count the volume of water given from the 'K' factor (see page 151) and the water meter input (see page 52). After the amount equals or exceeds the level set the pH Control relay will activate for the dose duration. The volume of water passed since the last dose and the amount of water remaining to the next dose are displayed on the front screen (See page 55).

Timed Dosing
When the "Source" menu item is set to "Time" the MTD75 will activate the pH Control dose after the selected period. The user must first select the overall period of the dosing cycle (i.e. per week/day/hour). From there the user can then select the interval of dosing.

When the Dose cycle ("Dose Per") is set to "Hour" the user can then select the interval between doses to the minutes and seconds. When the dose cycle is set to "Day" the interval can be set to the hours and minutes.

When the Dose cycle is set to "Week" the user can select which days of the week the dose occurs on, the time of day that dose occurs and its duration. Both the time of day and the duration can be set different for each day of the week.

If the trigger source is "Volume" then the controller also offers a background "Timed Dose". When enabled the timed dosing menus will also appear, working the same way except when the cycle is set to "Week". When this occurs the user will be able to select an interval from 1 to 6 days.

Dosing By pH Level
If an optional pH card has been fitted and enabled (see pages 19 & 107) the MTD75 will allow the user to select "pH" as the pH Control trigger. When selected the pH Control relay will be activated when the input pH level goes depending on the pH Trigger either above or below the set level.

Dosing From The Water Meter
The MTD75 provides the facility to generate a pulsed output directly in proportion to the water meter input. When the trigger is set to "xMeter" the controller will output a set number of pulses for every input pulse received. When set to "÷Meter" the controller will require a set number of input pulses for one output pulse.

Output Configuration
Depending on the trigger selected the relay output can be configured to operate as an "On/Off" output, a "Pulse" output or a "Time Proportional" output.

When the output is set to "Pulse" the user can select the "Stroke Rate" which is the frequency of the output pulses. The output pulse width is fixed at 0.2 seconds.

When the output is set to "Time Proportional" the user can select the "Cycle Time" which is the sum of the on and the off times. The user can also select the "Proportional Band" over which the proportional timing is active. For example for a pH setpoint of 10.00pH, a band of 1.00pH and the trigger low was entered. When the reading falls below 9.00pH the relay would be energised, as the input rises and approaches the set point the control relay starts to cycle on and off with the on time reducing and the off time increasing, respectively.

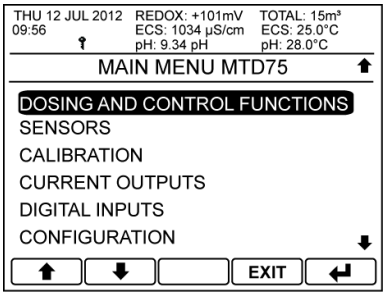
Bleed Inhibiting
The facility has been provided to allow the user to inhibit any Bleed operations during and for a period after, the pH Control dose. The period of the Bleed Inhibit can be set from 00:00 to 24:00 hours. When the Bleed Inhibit is set to 00:00, the Bleed operation will be inhibited only for the duration of the pH Control dose. Only available if the Bleed relay has been enabled.

Pre-Dose Bleeding
The MTD75 provides the user with the option to define a short Bleed operation before initiating the pH Control Dose, this can be defined from 1 second to 99 minutes. NB. If a bleed inhibit occurs during a pre-bleed operation the pre-bleed will be terminated and the Biocide dose initiated immediately. Only available if the Bleed relay has been enabled.

Dose Alarm Timer
To prevent the occurrence of overdosing when using the "pH" trigger, the user can define an "Alarm Time". If the dose relay remains active for longer than this set period the system will deactivate the relay, flash the pH Control LED on the front panel and display the "Dose Alarm" message in the pH Control section of the main display. To cancel the alarm and re-enable the dose relay the user needs to press the "ACK" button on the front screen and select pH Control from the list.

Manual Dosing
To provide some flexibility in setting up and adjusting the dosing, the MTD75 is provided with a "Manual Dosing" option. Selecting the "Manual Dose: Start" option will activate the relay for the time set in the manual dose duration menu. If the user requires the manual dose to terminate before the timer runs out select the "Manual Dose: Stop" menu.

pH Control Menu



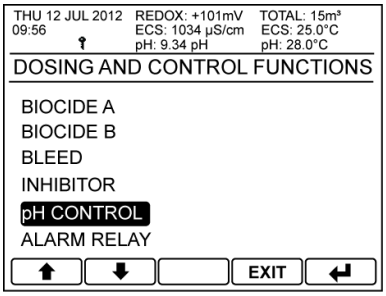
Main Menu

From either of the front screen press the menu button to show the main menu options and select Dosing and Control Functions.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



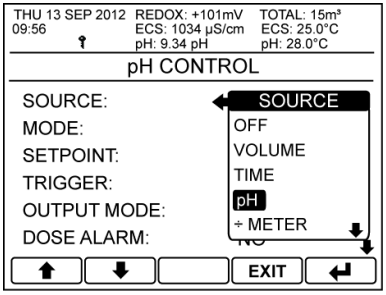
Dosing and Control Functions

Select pH Control.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



pH Control Trigger Source

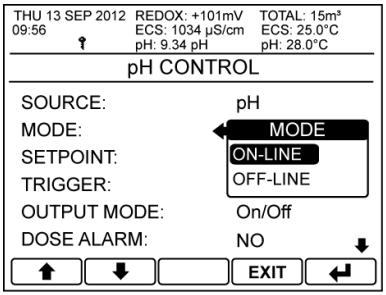
The user can select to initiate the pH dose in a number of ways by selecting the appropriate trigger condition. Selecting "Off" from the "Source" menu item can permanently deactivate the pH Control relay output.

pH Control will only be shown if an optional pH card has been fitted and enabled (see pages 19 & 107)

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Mode

Selecting off-line causes the pH Control relay to de-energise. Useful for when commissioning or calibrating the instrument.

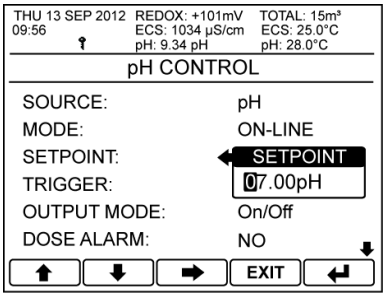
When the unit is placed in an off-line state "off-line" will appear in the relay's message section on the front screen.

If a "Cannot Edit Digital Input Has Control" message appears, then an associated digital input is currently controlling the on-line / off-line state of the relay.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Setpoint

The pH setpoint value

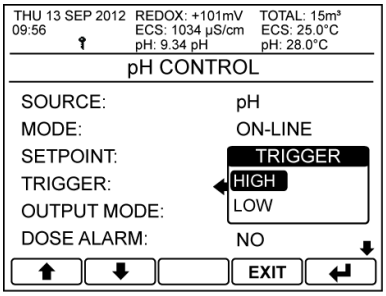
Only available when source is set to pH

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Trigger

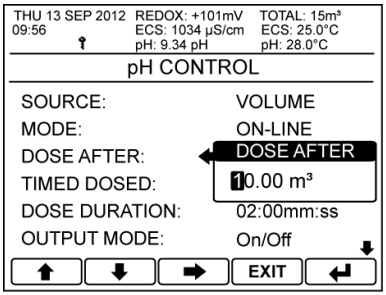
Set whether the relay activates above or below the setpoint.

Only available when source is set to pH

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Dose After

The volume of water required to pass before the pH Control relay will energise.

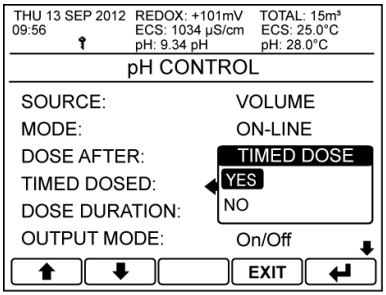
Only available when source is set to Volume.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Timed Dose

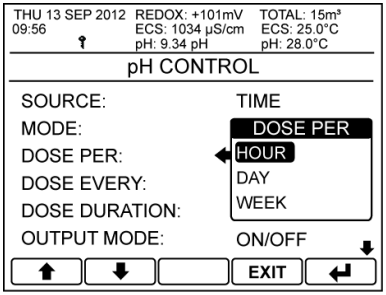
Select to enable a background timed dose.

Only available when source is set to volume

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



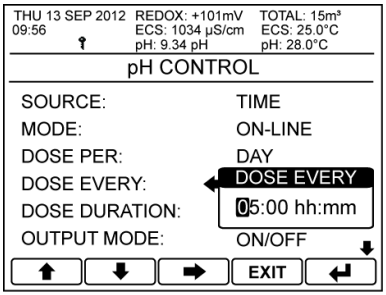
Dose Per

Select the Dose cycle when the trigger source is Time or when a background Timed Dose has been selected.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Dose Every

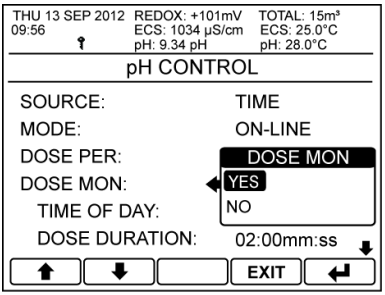
Select the dose period. When "Hour" is selected this can be set to minutes and seconds, when "Day" is selected this can be set to hours and minutes.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

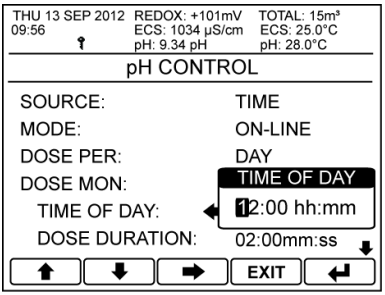
↵ – Save Value



Dose Week

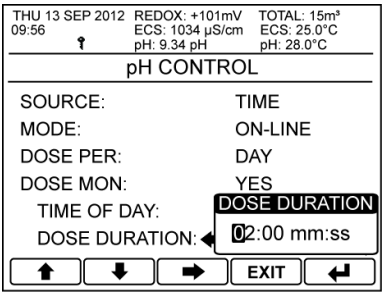
When the trigger source is "Time" and dose per is "Week" the user is given the choice of which days of the week to dose on,

⬆/⬇ – Select Option
EXIT – Cancel
↵ – Save Selection



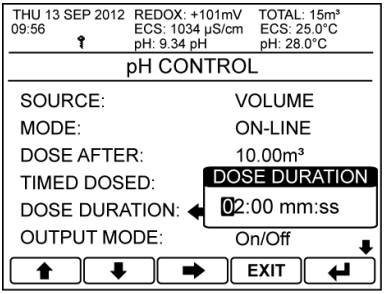
What time of day on the selected day to dose,

⬆/⬇ – Increase / Decrease Digit
➡ – Select Next Digit
EXIT – Cancel
↵ – Save Value



And the duration of the dose.

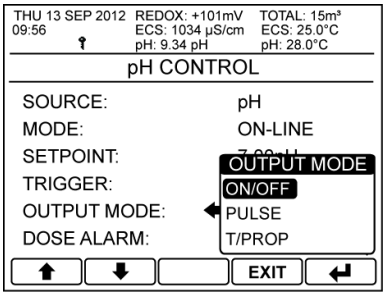
⬆/⬇ – Increase / Decrease Digit
➡ – Select Next Digit
EXIT – Cancel
↵ – Save Value



Dose Duration

Set the dose duration when using volume or timed dosing

⬆/⬇ – Increase / Decrease Digit
➡ – Select Next Digit
EXIT – Cancel
↵ – Save Value



Output

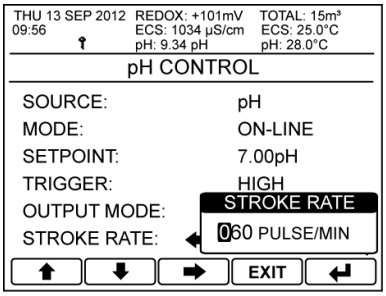
Set the output pump/solenoid type.

Note: Time proportional is only available when the trigger source is set to pH.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Stroke Rate

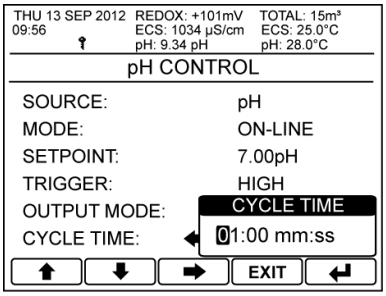
Set the pump stroke rate when either output mode is set to "Pulse" or the trigger source is set to either "÷ Meter" or "X Meter".

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Cycle Time

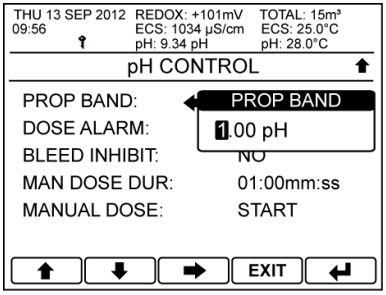
Set the sum of the On and Off times when the output mode is set to "Time Proportional".

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Time Proportional Band

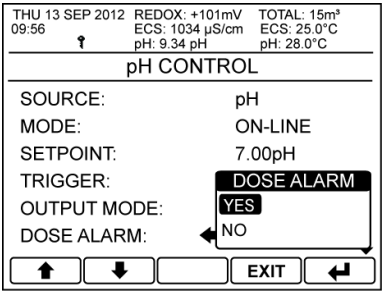
Set the proportional band when the output mode is set to "Time Proportional".

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Dose Alarm

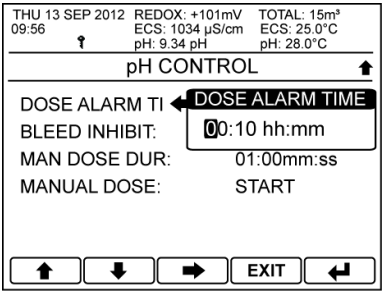
Enable the Dose Alarm.

Available to indicate and prevent overdosing when using pH.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Dose Alarm Time

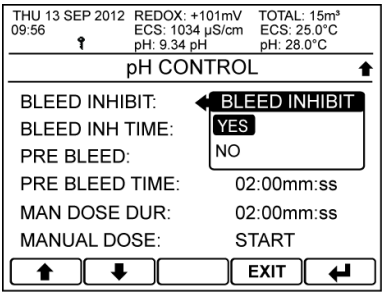
Sets the time which if the Biocide is active for longer than causes the dose alarm to activate.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Bleed Inhibit

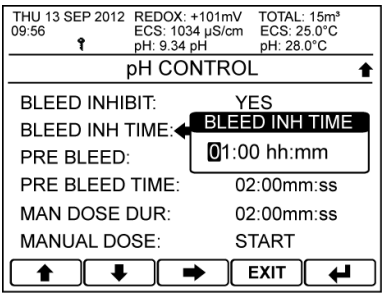
Inhibit any "Bleed" operations until after the set bleed inhibit time.

Only available if the bleed relay is enabled.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Bleed Inhibit Time

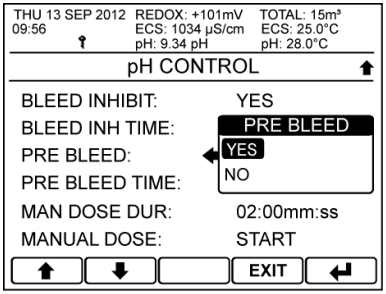
Duration of the bleed inhibit after completion of dosing (00:00 indicates bleed inhibit only during dosing).

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Pre Bleed

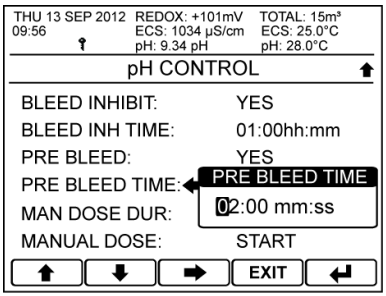
Perform a defined bleed operation before dosing.

Only available if the bleed relay is enabled.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Pre Bleed Time

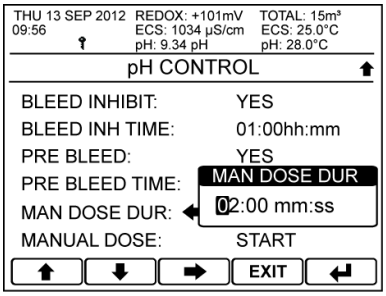
Set the duration of the pre-dose bleed operation.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Manual Dose Duration

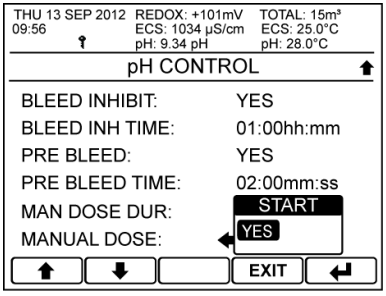
Set the dose duration of the manual dose.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Manual Dose

Start the manual dose.

Note, once started the user can cancel the manual dose by selecting stop.

EXIT – Cancel

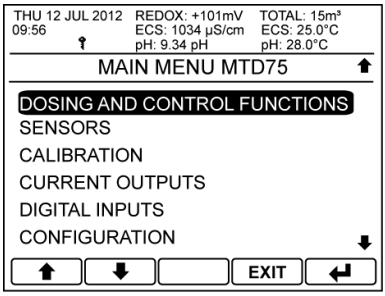
↵ – Select Option

BLANK

Alarm Relay Configuration

The Alarm relay is a volt free normally open contact provided to give external indication of error conditions within the controller. The Alarm relay can be configured to trigger from a number of error sources. These are:

a)	Power On:	When power is applied to the unit the relay will be energised
b)	Input Error:	When an error is detected on the sensor input (when fitted)
c)	Dose Alarm:	When one of the Dose alarms is triggered
d)	Water Meter:	When the water meter timeout alarm occurs
e)	Flow Switch:	When the flow switch input is detected (See page 52)
f)	Tank Alarm:	When the tank alarm input is detected (See page 52)
g)	Any Error:	When any error condition is detected



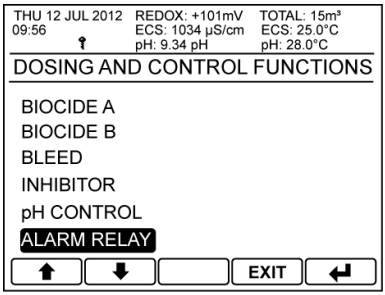
Main Menu

From either of the front screen press the menu button to show the main menu options and select Dosing and Control Functions.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



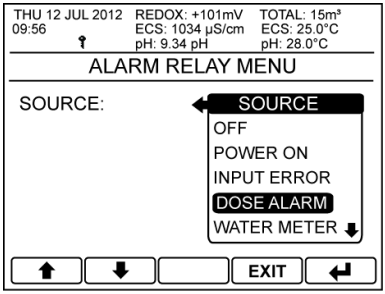
Dosing and Control Functions

Select Alarm Relay.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Alarm Relay Trigger Source

The user can select to trigger the alarm relay in a number of different ways by selecting the appropriate trigger condition. Selecting "Off" from the "Source" menu item can permanently deactivate the Alarm relay output.

⬆/⬇ – Select Option

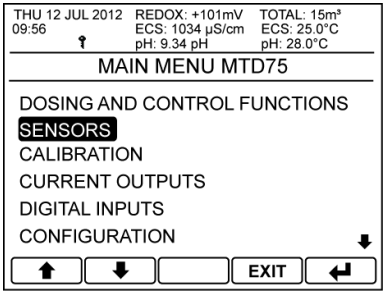
EXIT – Cancel

↵ – Save Selection

BLANK

Redox Input Channel Setup

If the Redox input card has been installed in the controller, see page 19, the basic configurations for the sensor's input will appear in the following menu.



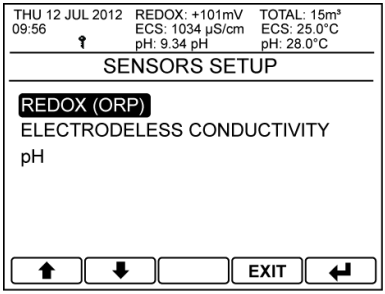
Main Menu

From either of the front screen press the menu button to show the main menu options and select Sensors.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



Sensors Setup

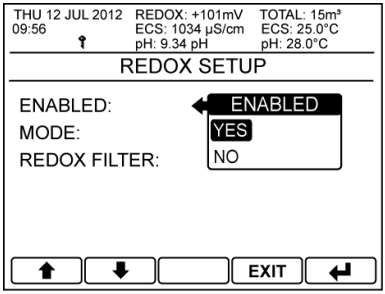
Select Redox (ORP).

Redox (ORP) will only appear if the Redox card is installed (See page 19).

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Sensor Enabled

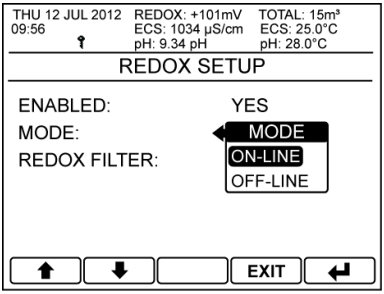
Enables the redox sensor interface.

If the user has a redox card installed but is not using it, setting this to No will clear any redox sensor error messages that may be present.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Mode

Selecting off-line causes any control relays associated with this input to de-energise. Also causes any current outputs associated to hold their current value, useful for when commissioning or calibrating the instrument.

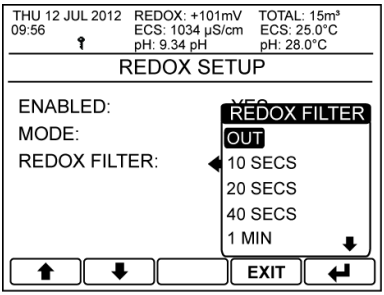
When the unit is placed in an off-line state "off-line" will appear in the messages section on the front screen.

If a "Cannot Edit Digital Input Has Control" message appears, then an associated digital input is currently controlling the on-line / off-line state of the channel.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Input Filtering (Averaging)

When very noisy environments are encountered, this function will allow the user to filter the sensor readings by taking a running average over the time period selected (from 10 seconds to 5 minutes).

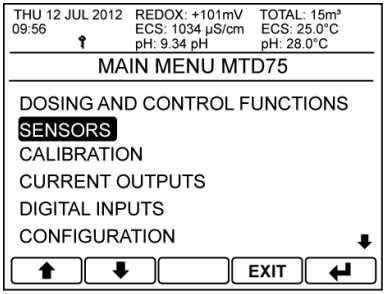
⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

Electrodeless Conductivity Input Channel Setup

If the Electrodeless Conductivity input card has been installed in the controller, see page 19, the basic configurations for the sensor's input will appear in the following menu.



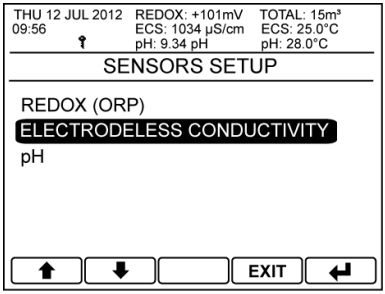
Main Menu

From either of the front screen press the menu button to show the main menu options and select Sensors.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



Sensors Setup

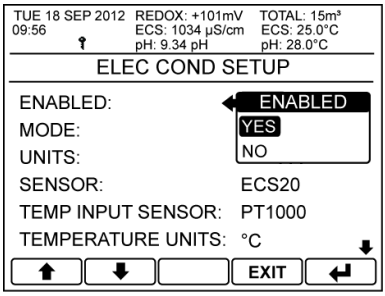
Select Electrodeless Conductivity.

Electrodeless Conductivity will only appear if the Electrodeless Conductivity card is installed (See page 19).

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Sensor Enabled

Enables the electrodeless conductivity sensor interface.

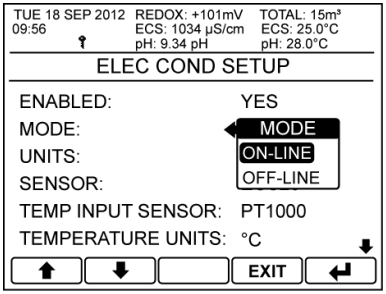
If the user has an electrodeless conductivity card installed but is not using it, setting this to No will clear any electrodeless conductivity sensor error messages that may be present.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

ECS Setup



Mode

Selecting off-line causes any control relays associated with this input to de-energise. Also causes any current outputs associated to hold their current value, useful for when commissioning or calibrating the instrument.

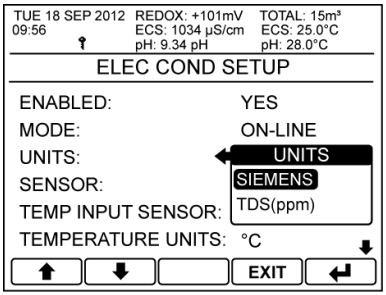
When the unit is placed in an off-line state "off-line" will appear in the messages section on the front screen.

If a "Cannot Edit Digital Input Has Control" message appears, then an associated digital input is currently controlling the on-line / off-line state of the channel.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



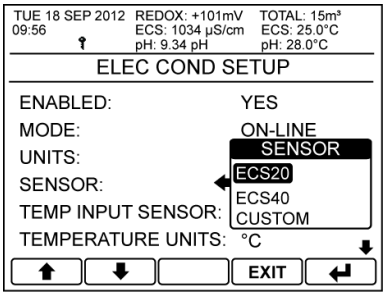
Units

The reading can be set to be displayed in either in Siemens/cm or TDS (Total Dissolved Solids) in ppm.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Sensor Type

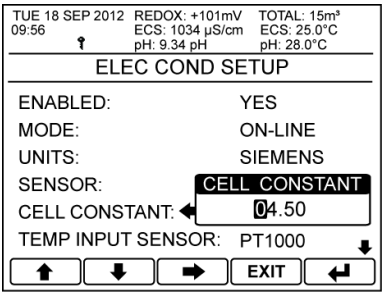
The electrodeless conductivity input can use either the ECS20, or all of the ECS40 series sensors. Selecting the appropriate sensor will configure the instrument with the correct nominal cell constant. If the sensor type is not shown selecting custom will allow a manual cell constant to be entered.

! A Sensor loop calibration must be performed when a new sensor is attached to the controller or the sensor cable is changed; see page 117 for details.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Cell Constant

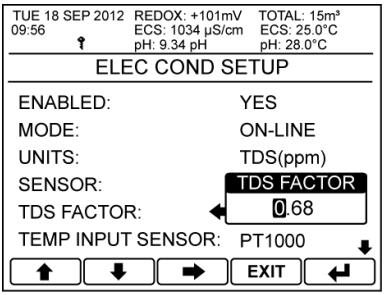
Allows manual entry of the sensor cell constant if custom is selected in the sensor type menu.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



TDS Factor

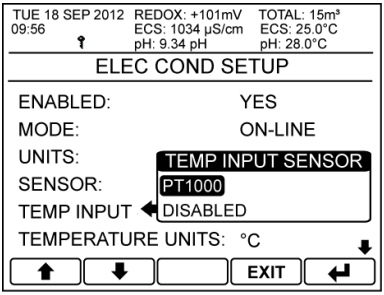
When TDS is selected as the operating units the instrument will display the conductivity as "ppm" using a factor which can be adjusted between 0.50 and 0.90.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Temperature Input Sensor

Select the electrodeless conductivity input temperature sensor type for use with the sensor measurement's automatic temperature compensation.

If a temperature sensor is not connected to the input then this menu item should be set to disabled, else temperature input error messages will be shown.

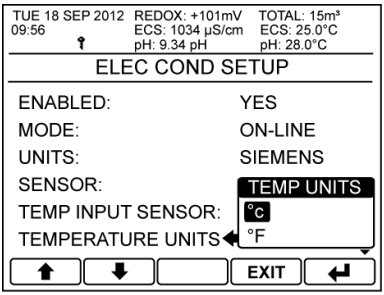
Note. Even when disabled is set a manual temperature compensation can be used.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

ECS Setup



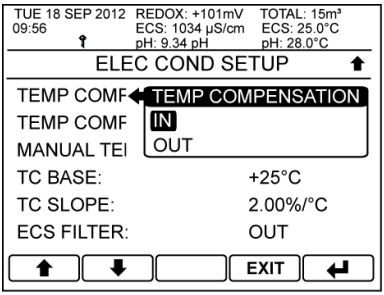
Temperature Units

Sets the temperature units used.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



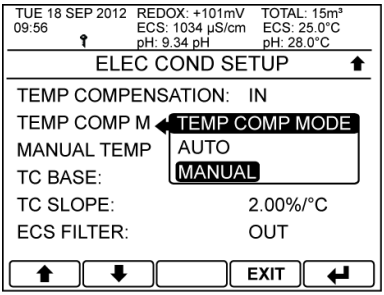
Temperature Compensation

Temperature compensation is enabled by setting this to "In".

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



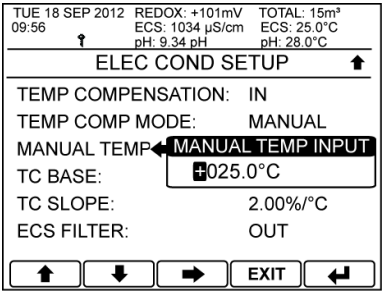
Temperature Compensation Mode

To use temperature compensation from a measured input select "Auto", else select "Manual" to enable a fixed value entry. Only Available if Temperature Compensation is set to in.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Manual Temperature Input

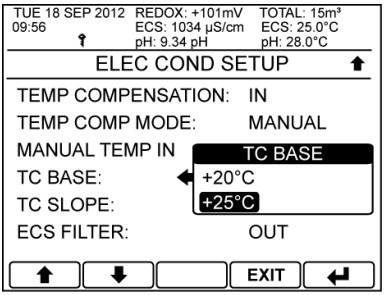
The fixed temperature value used for manual temperature compensation. Only available when temperature compensation mode is set to "manual".

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



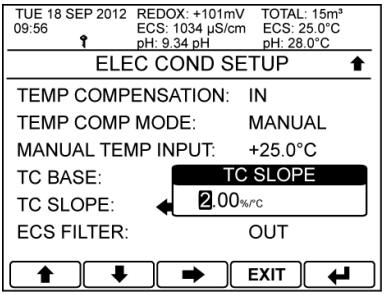
Temperature Compensation Base

Sets the temperature compensation base. See Appendix C – Temperature Coefficient for more information. Only Available if Temperature Compensation is set to in.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Temperature Compensation Slope

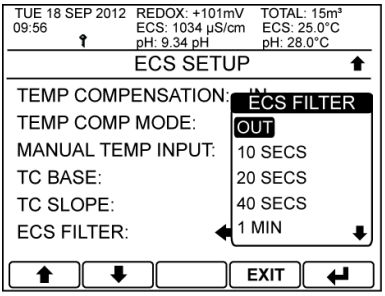
Sets the temperature compensation slope. See Appendix C – Temperature Coefficient for more information. Only Available if Temperature Compensation is set to in.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Input Filtering (Averaging)

When very noisy environments are encountered, this function will allow the user to filter the sensor readings by taking a running average over the time period selected (from 10 seconds to 5 minutes).

⬆/⬇ – Select Option

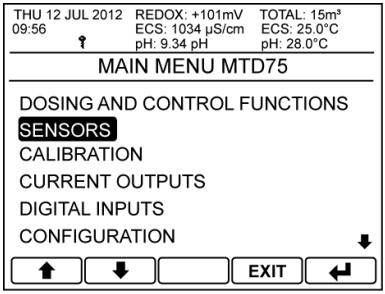
EXIT – Cancel

↵ – Save Selection

BLANK

pH Input Channel Setup

If the pH input card has been installed in the controller, see page 19, the basic configurations for the sensor's input will appear in the following menu.



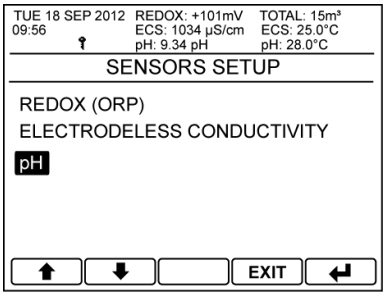
Main Menu

From either of the front screen press the menu button to show the main menu options and select Sensors.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



Sensors Setup

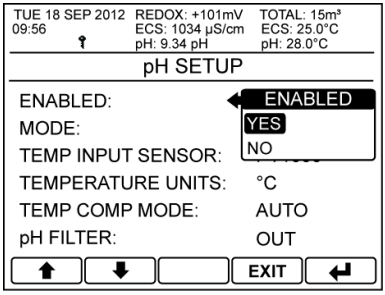
Select pH.

pH will only appear if the pH card is installed (See page 19).

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Sensor Enabled

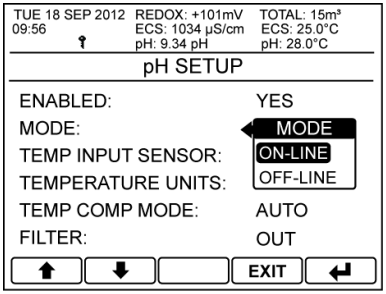
Enables the pH sensor interface.

If the user has a pH installed but is not using it, setting this to No will clear any pH sensor error messages that may be present.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Mode

Selecting off-line causes any control relays associated with this input to de-energise. Also causes any current outputs associated to hold their current value, useful for when commissioning or calibrating the instrument.

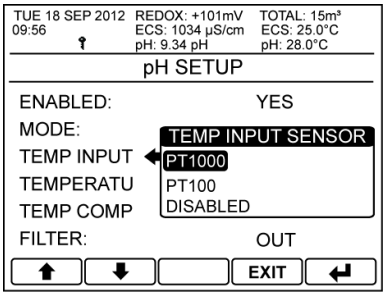
When the unit is placed in an off-line state "off-line" will appear in the messages section on the front screen.

If a "Cannot Edit Digital Input Has Control" message appears, then an associated digital input is currently controlling the on-line / off-line state of the channel.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Temperature Input Sensor

Select the pH input temperature sensor type for use with the sensor measurement's automatic temperature compensation.

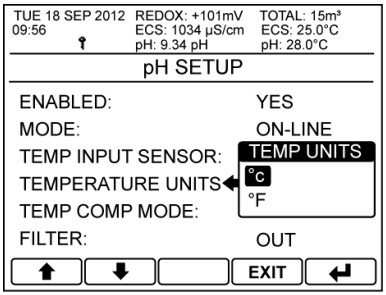
If a temperature sensor is not connected to the input then this menu item should be set to disabled, else temperature input error messages will be shown.

Note. When disabled a manual temperature compensation value must be set.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



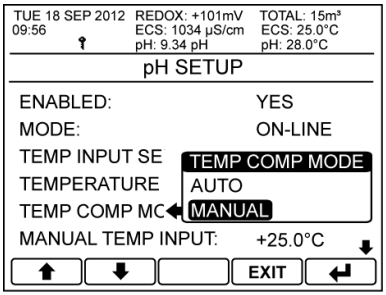
Temperature Units

Sets the temperature units used.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



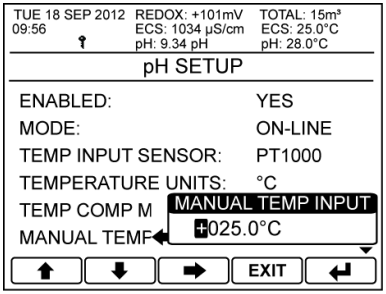
Temperature Compensation Mode

To use temperature compensation from a measured input select "Auto", else select "Manual" to enable a fixed value entry.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Manual Temperature Input

The fixed temperature value used for manual temperature compensation.

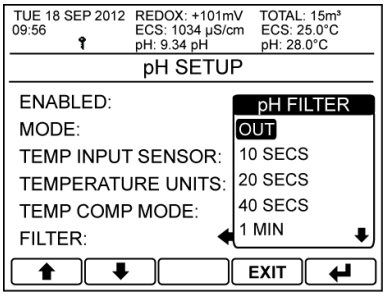
Only available when temperature compensation mode is set to "manual".

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Input Filtering (Averaging)

When very noisy environments are encountered, this function will allow the user to filter the sensor readings by taking a running average over the time period selected (from 10 seconds to 5 minutes).

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

BLANK

Redox Input Channel Calibration

Calibration Procedures
Normal good practices should be observed when calibrating electrode systems against standard solutions.

Always clean the electrode system before inserting in the standard solution to avoid contamination and to obtain the best response from the electrode system.
Rinse the electrode system in clean (preferably demineralised) water between standard solutions.
Allow time for the electrode system temperature to stabilise in each standard solution.
Use standard solutions of known quality. If in doubt make up fresh solutions.
Use clean beakers and bottles for standard solutions.
The input channel can be taken offline, which de-energises the relays and holds the current outputs at their last values. This facility is useful when calibrating the system, however the operator must ensure the relays are in a safe state when using this feature.

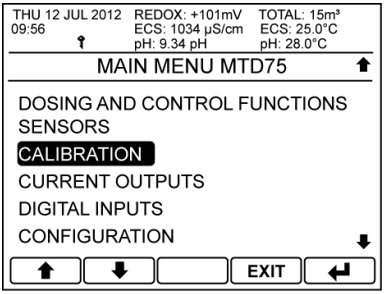
Redox Standards
Unlike pH electrodes, the redox electrode's slope does not change. Nevertheless, incorrect redox potentials may be occasionally measured and the cause of these errors is usually a contaminated platinum (Pt) surface, or a contaminated or plugged reference junction. Calibration of an Redox Electrode is a single point adjustment calibration only.

For calibration and test purposes, standard solutions at various potentials can be purchased from LTH Electronics:

Part No. 138/175	124mV Redox Solution (500ml)
Part No. 138/176	358mV Redox Solution (500ml)

Redox Calibration Menu

If the Redox input card has been installed in the controller (see page 19), and enabled in the sensor setup menu (see page 99), the calibration menu provides the facility to adjust the sensor inputs to the system in which it is operating.



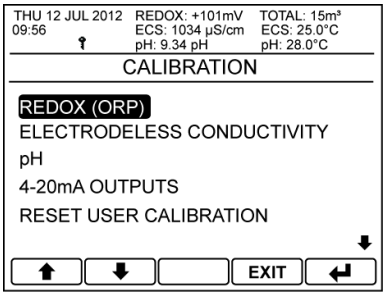
Main Menu

From either of the front screen press the menu button to show the main menu options and select Calibration.

↑/↓ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



Calibration

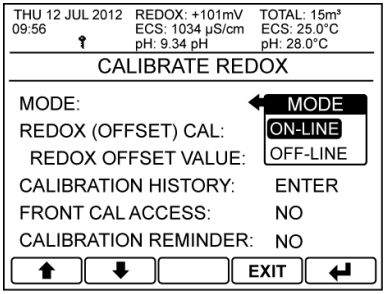
Select Redox (ORP).

Redox (ORP) will only appear if the Redox card is installed (See page 19).

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Mode

Selecting off-line causes any setpoints associated with this channel to de-energise. Also causes any current outputs associated to hold their current value, useful for when commissioning or calibrating the instrument.

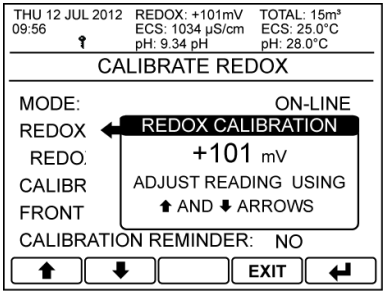
When the unit is placed in an off-line state "off-line" will appear in the channel messages section on the front screen.

If a "Cannot Edit Digital Input Has Control" message appears, then an associated digital input is currently controlling the on-line / off-line state of the channel.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Redox Offset Calibration

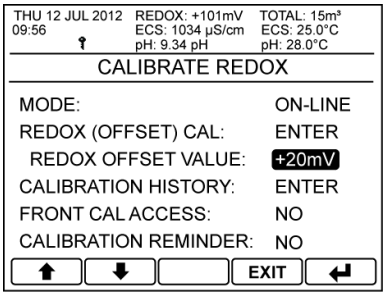
The Redox Offset calibration enables the user to adjust the sensor reading to match a known input.

The current Redox sensor reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows. When the reading is correct press the enter button to store the calibration.

⬆/⬇ – Adjust the Reading Up or Down

EXIT – Cancel

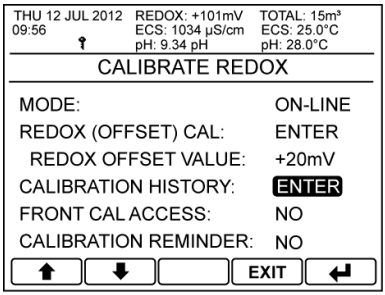
↵ – Save Calibration



Redox Offset Value

The Redox offset value currently being applied. The value will change depending on the result of the Redox offset calibration.

Cannot be edited

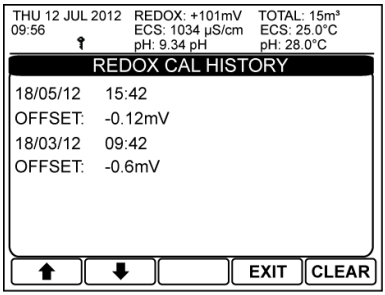


Enter Calibration History

The MTD75 series has a calibration history feature which allows the user to review the record of sensor solution calibrations.

To enter the calibration history menu press enter.

↵ – Enter Option



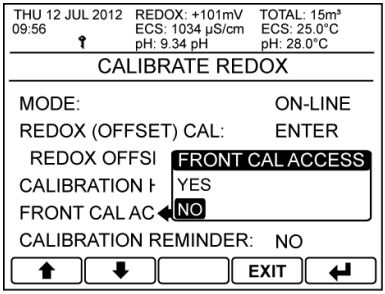
Calibration History

The calibration history page provides a record of all Offset calibrations carried out. The data includes the date and time of the calibration and the calculated Offset.

↑/↓ – Move To Next Page Up or Down

EXIT – Return To Calibration Menu

CLEAR – Clear All of the Calibration History



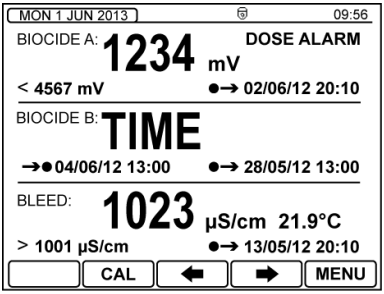
Front Screen Calibration Access Enable

When enabled front calibration access allows direct entry into the calibration menu from the front screen. It also disables the security access system within the calibration menu enabling the calibration functions without having to enter the security access code.

↑/↓ – Select Option

EXIT – Cancel

↵ – Save Selection



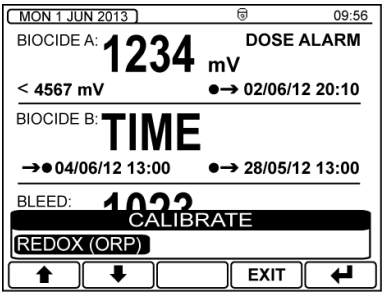
Front Screen Calibration Access

When the calibration access is enabled press the "CAL" button to bring up pop-up to select which sensor to calibrate.

CAL – Enter Calibrate Channel Select Menu

⬅/➡ – Scroll Around Menus

Menu – Access Main Menu



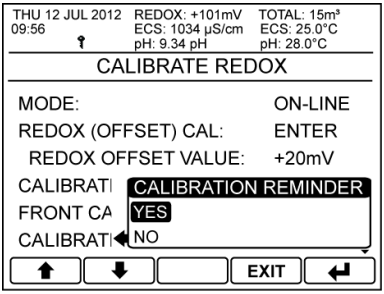
Select Sensor to Calibrate

From the pop-up select the sensor the user wishes to calibrate. Only sensors whose front calibration access has been enabled will appear.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Enter Menu



Calibration Reminder

By enabling the calibration reminder the user can configure a calibration interval, which when expired will activate an alarm and channel message on the front screen.

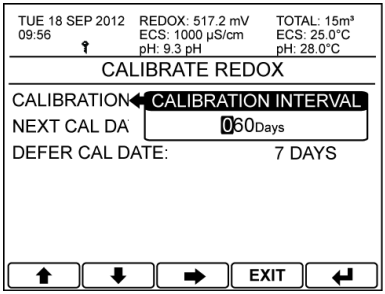
If the interval has expired and the alarm has activated, then on the completion of a successful sensor calibration the next cal date will be automatically incremented by calibration interval.

If the user completes a successful sensor calibration before the calibration interval has expired, then the instrument will ask the user whether they wish to update the next cal due date by the calibration interval.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Calibration Interval

Sets the interval time for the calibration alarm.

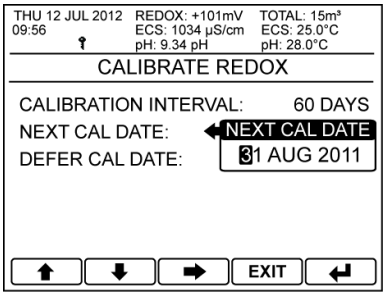
The Next Cal Date will update to show the date of the next calibration alarm.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Next Calibration Date

Sets the exact date of the next calibration alarm.

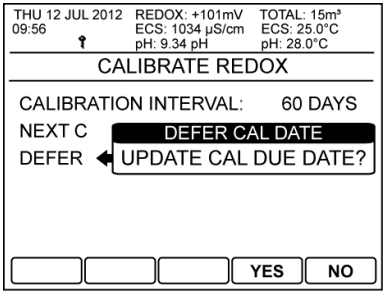
The Calibration Interval will update to show the number of days to the next calibration date.

⬆/⬇ – Increase / Decrease Digit or Text

➡ – Select Next Item

EXIT – Cancel

↵ – Save Entry



Defer Calibration Date

Turns off the alarm and increases the calibration interval by an extra 7 days.

Only appears once the calibration interval has expired.

YES – Increase Interval

NO – Cancel

BLANK

Electrodeless Conductivity Input Channel Calibration

Normal good practices should be observed when calibrating an electrodeless conductivity system.

Three Calibration procedures are provided with the electrodeless conductivity input:

- An initial installation loop calibration that matches the sensor, cable and instrument using loop resistors. This only needs to be performed when the system is commissioned and when a sensor or cable is changed.
- A solution calibration, that will allow the user to fine tune the calibration. Note: The amount of adjustment is quite small because the factory calibration is accurate and with modern electronics, drift is very low. If it is found that during a calibration there is insufficient adjustment then it is probable that there is a problem with either the calibration procedure, or a fault with the instrument, sensor or cabling.
- Temperature measurement adjustment, will allow to fine tune the temperature input in relation to a known input.

For best results always clean the sensor before making any adjustments.

Calibration of Conductivity Readings
Conductivity measurements are very temperature dependent so it is essential that an understanding of the complex relationship between conductivity and temperature is understood when calibrations are made. It is possible to make several different types of calibration.

Calibration with Standard Solutions
This calibration must be carried out under strictly controlled conditions due to the temperature effect on conductivity measurements and the possibility of contamination of the standard solution. The advantage of this calibration method is that the sensor and cable are an integral part of the calibration. LTH strongly recommends a lower limit of 500µS/cm for this type of calibration. Conductivity is a very sensitive measurement and even trace contamination of the standard solution will be detected, for example exposing the solution to air will add 1µS/cm to the standard solution due to absorption of CO_2.

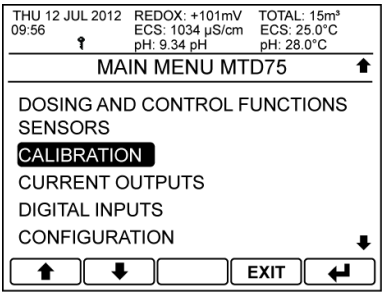
Most standards are made up from a solution of KCl dissolved in high purity water. BS EN 60746-3 provides details of the concentrations of KCl necessary to produce industry standard conductivity solutions. Readymade solutions are available from LTH with traceable certification if required.

Standard solutions will be supplied with a conductivity value quoted at a reference temperature. This temperature is the base temperature and the calibration should be performed at that temperature, with the temperature compensation switched out. Alternatively, the temperature compensation should be switched on and a temperature slope and base temperature equal to that of the calibration solution can be used to configure the instrument. For example this would be 1.76%/°C for a KCl solution between 1000 to 10,000µS/cm. For more details on calculating the slope of a different solution, refer to Appendix C – Temperature Coefficient (page 196).

Calibration by Comparison with Another Instrument
This can provide the easiest method for in-situ calibrations but has the disadvantage of only being able to check a single measurement point. As measurements are made by comparison of the readings taken in the same solution, temperature effects are less critical. However, it is essential that settings for temperature compensation are the same on both instruments.

Electrodeless Conductivity Calibration Menu

If the Electrodeless Conductivity input card has been installed in the controller (see page 19), and enabled in the sensor setup menu (see page 101), the calibration menu provides the facility to adjust the sensor inputs to the system in which it is operating.



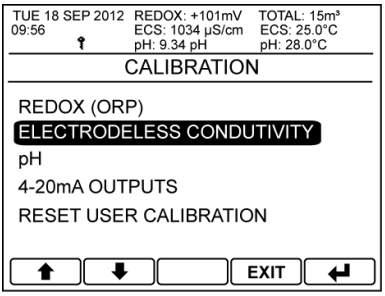
Main Menu

From either of the front screen press the menu button to show the main menu options and select Calibration.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



Calibration

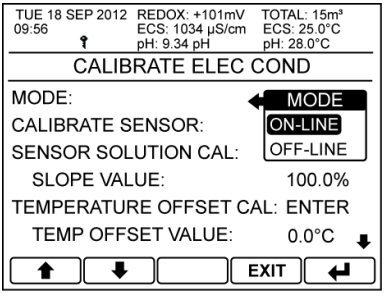
Select Electrodeless Conductivity

Electrodeless Conductivity will only appear if the Electrodeless Conductivity card is installed (See page 19).

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Mode

Selecting off-line causes any setpoints associated with this channel to de-energise. Also causes any current outputs associated to hold their current value, useful for when commissioning or calibrating the instrument.

When the unit is placed in an off-line state "off-line" will appear in the channel messages section on the front screen.

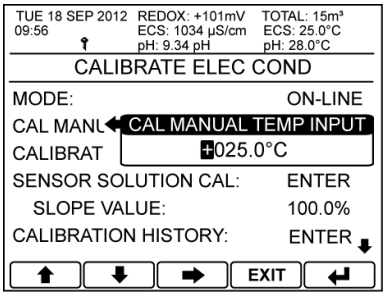
If a "Cannot Edit Digital Input Has Control" message appears, then an associated digital input is currently controlling the on-line / off-line state of the channel.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

ECS Calibration



Calibration Manual Temperature Input

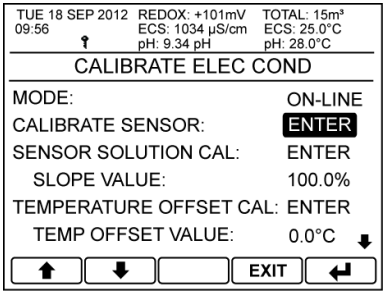
This setting allows a different fixed temperature value to be used when calibrating. Makes it easier to calibrate a standard solution at a different temperature to the process. Only available when the temperature compensation mode has been set to manual in the sensor setup menu.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

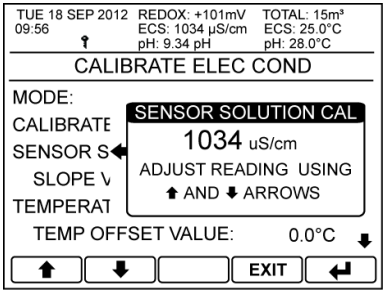
↵ – Save Value



Calibrate Sensor

Sensor loop calibration. Must be carried out when a sensor or sensor cable is changed. See page 123 for more details.

↵ – Enter Sensor Calibration



Sensor Solution Calibration

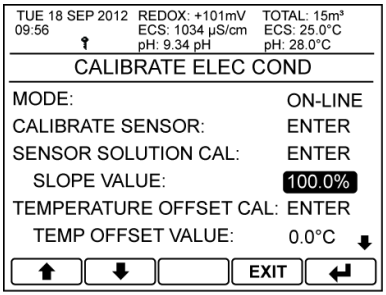
The sensor solution calibration enables the user to adjust the sensor reading to match a known input.

The current sensor reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows. When the reading is correct press the enter button to store the calibration. The calculated slope is shown in the next menu entry.

⬆/⬇ – Adjust the Reading Up or Down

EXIT – Cancel

↵ – Save Calibration



Sensor Slope

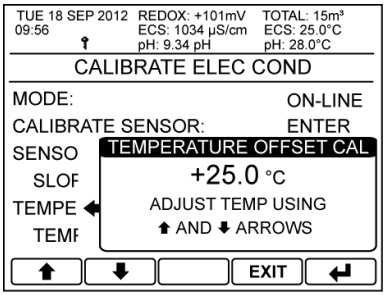
The sensor slope value currently being used. The value will change depending on the result of the sensor solution calibration.

Cannot be edited

A slope value of 100% indicates that no adjustment has been made to the sensor calibration.

A slope value of greater than 100% indicates that the sensor reading has had to be increased to match the known input.

A slope value of less than 100% indicates that the sensor reading has had to be decreased to match the known input.



Temperature Offset Calibration

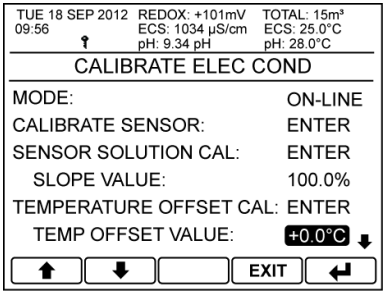
The temperature offset calibration enables the user to adjust the temperature reading to match a known input.

The current temperature reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows. When the reading is correct press the enter button to store the calibration. The calculated offset is shown in the next menu entry.

↑/↓ – Adjust the Reading Up or Down

EXIT – Cancel

↵ – Save Calibration

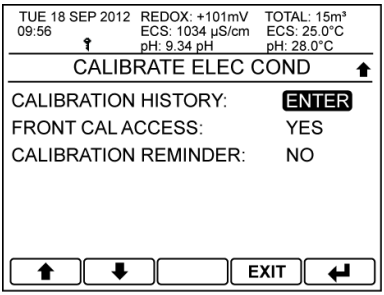


Temperature Offset Value

The temperature offset value currently being used.

The value will change depending on the result of the temperature offset calibration.

Cannot be edited

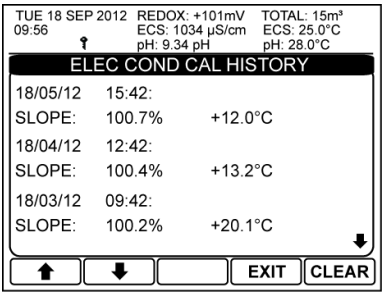


Enter Calibration History

The MTD75 series has a calibration history feature which allows the user to review the record of sensor solution calibrations.

To enter the calibration history menu press enter.

↵ – Enter Calibration History



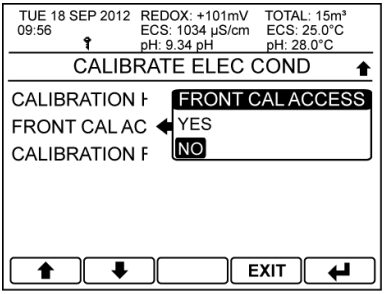
Calibration History

The calibration history page provides a record of all sensor solution calibrations carried out. The data includes the date and time of the calibration, the calculated sensor slope and the temperature compensation reading at the time.

↑/↓ – Move To Next Page Up or Down

EXIT – Return To Calibration Menu

CLEAR – Clear All of the Calibration History



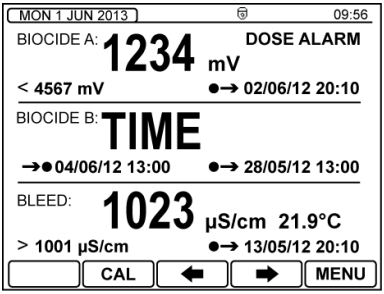
Front Screen Calibration Access Enable

When enabled front calibration access allows direct entry into the calibration menu from the front screen. It also disables the security access system within the calibration menu enabling the calibration functions without having to enter the security access code.

↑/↓ – Select Option

EXIT – Cancel

↵ – Save Selection



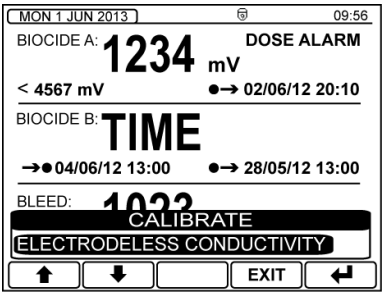
Front Screen Calibration Access

When the calibration access is enabled press the "CAL" button to bring up pop-up to select which sensor to calibrate.

CAL – Enter Calibrate Channel Select Menu

←/→ – Scroll Around Menus

Menu – Access Main Menu



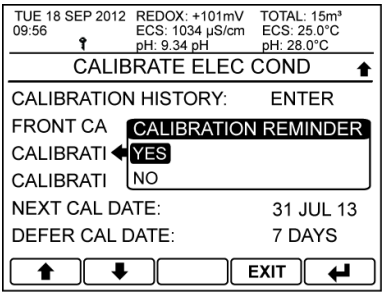
Select Sensor to Calibrate

From the pop-up select the sensor the user wishes to calibrate. Only sensors whose front calibration access has been enabled will appear.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Enter Menu



Calibration Reminder

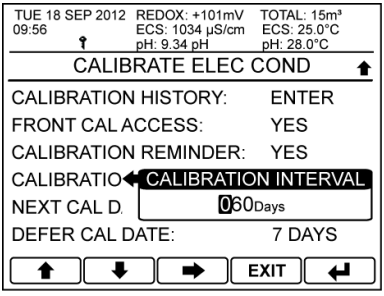
By enabling the calibration reminder the user can configure a calibration interval, which when expired will activate an alarm and channel message on the front screen.

At the end a sensor solution calibration, if the calibration reminder is enabled, the user will be prompted to update the cal due date by the calibration interval and so clearing an alarm if active.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Calibration Interval

Sets the interval time for the calibration alarm.

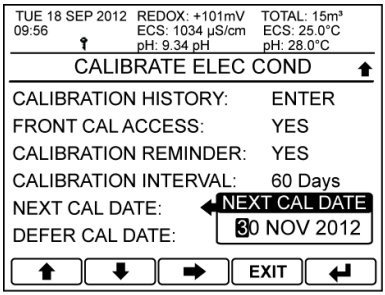
The Next Cal Date will update to show the date of the next calibration alarm.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Next Calibration Date

Sets the exact date of the next calibration alarm.

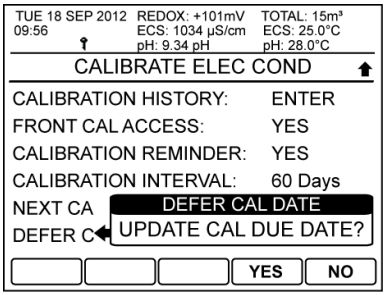
The Calibration Interval will update to show the number of days to the next calibration date.

⬆/⬇ – Increase / Decrease Digit or Text

➡ – Select Next Item

EXIT – Cancel

↵ – Save Entry



Defer Calibration Date

Turns off the alarm and increases the calibration interval by an extra 7 days.

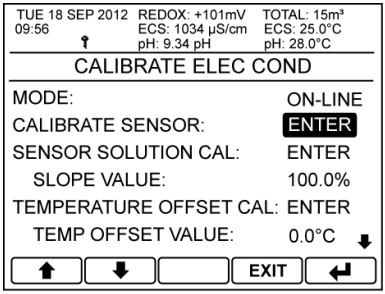
Only appears once the calibration interval has expired.

YES – Increase Interval

NO – Cancel

Sensor Loop Calibration

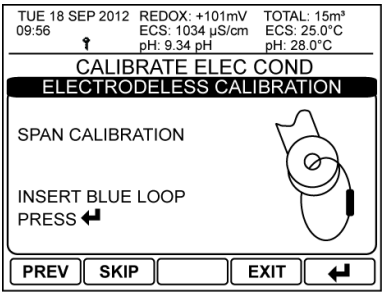
The sensor calibration is a one off configuration calibration, to allow for losses due to cable length and sensor output variations. It must be completed when either a sensor or sensor cable is changed. To complete the calibration the Blue loop resistor supplied with the input card must be used, once completed do not discard the resistor as it will be required for future calibration and checks. The resistor must be removed prior to installing the sensor into a pipe or tank.



Calibrate Sensor

To start the sensor loop calibration select the "Calibrate Sensor" item from the electrodeless conductivity calibration menu.

↵ – Enter Sensor Calibration



Insert Blue Loop

Attach the Blue (500Ω) loop resistor to the sensor as shown, then press the enter button. The screen will then indicate that the unit is sampling the sensor.

If the calibration has been completed successfully then the instrument will automatically prompt for the next loop resistor.

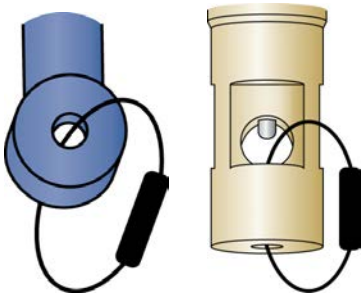
If the fail message appears then there has been a calibration problem check the loop resistor, the sensor and the cable. If all appears correct press the "prev" button then the enter button to restart the calibration.

PREV – Exit Calibration Without Saving

SKIP – Skip to Next Calibration Point

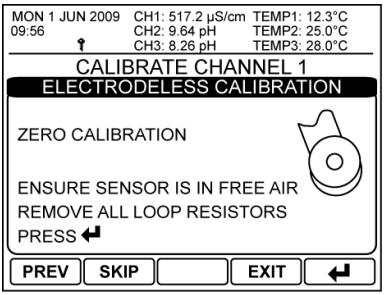
EXIT – Exit Calibration Without Saving

↵ – Initiate Calibration



ECS20 Series Sensor **ECS40 Series Sensor**

Loop Resistor Path



Zero Calibration

Remove the loop resistor, and ensure that the sensor head is located in free air, then press the enter button. Note this calibration can take a few minutes.

When the calibration has completed successfully press the enter button to save the calibration and return to the channel's main calibration menu.

PREV – Go to Previous Calibration Point

SKIP – Exit Calibration Without Saving

EXIT – Exit Calibration Without Saving

↵ – Initiate Calibration

pH Input Channel Calibration

Calibration Procedures
Normal good practices should be observed when calibrating electrode systems against standard solutions.

Always clean the electrode system before inserting in the standard solution to avoid contamination and to obtain the best response from the electrode system.
Rinse the electrode system in clean (preferably demineralised) water between standard solutions.
Allow time for the electrode system temperature to stabilise in each standard solution.
Use standard solutions of known quality. If in doubt make up fresh solutions.
Use clean beakers and bottles for standard solutions.
The sensor can be taken offline, which de-energises the relays and holds the current outputs at their last values. This facility is useful when calibrating the system, however the operator must ensure the relays are in a safe state when using this feature.

pH Buffers
Please see page 137 for information regarding the range of buffer solutions LTH can supply.

Calibration Principle
The MXD70 Series offers two different but simple methods of calibration for pH electrode systems.

Auto
In Auto calibration the instrument requires that the electrode is first placed in a 4pH buffer and then secondly in a 9pH buffer. These are nominal values for which the instrument carries the exact LTH buffer values due to temperature variations (other pH buffer solution values at temperature can also be entered). From these two points the instrument then calculates the Offset and Slope for the electrode.

In order for the auto calibration to work correctly, the buffer temperature must either be measured by the instrument during calibration, or if manual temperature compensation is being used the buffer temperature must be entered in the Calibration Manual Temperature Input in the calibration menu.

Manual
In Manual calibration mode it is possible to do single or two point calibration, using the *Buffer* and *Slope* menu items. It is important to do the calibration in the correct order.

1. Adjustment of the Buffer (Offset) value at 7.00pH
2. Adjustment of the Slope (Gain) value at any other pH (usually 4 or 9 pH).

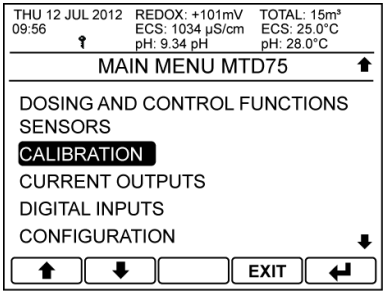
The output from an ideal glass/reference electrode pair will normally be 0mV at 7pH, therefore the slope will have little or no effect at 7pH but increasing influence the further from 7pH the calibration point is.

If a single point calibration is required the buffer should be adjusted and no adjustment made to the slope that will remain at the previously entered value. As actual pH buffer values are used no compensation is made for the buffer solution with temperature in the instrument. It is important therefore to note the actual buffer value at the temperature of the solution, see page 137 for a table showing pH variations versus temperature for LTH's standard solutions.

Temperature has an effect on the output from the pH electrode as well, so it is important that the buffer temperature is entered into the Calibration Manual Temperature Input if manual temperature compensation is being employed. Alternatively any automatic temperature compensation element should be placed in the buffer solution with the pH sensor if Auto TC is being used.

pH Calibration Menu

If the pH input card has been installed in the controller (see page 19), and enabled in the sensor setup menu (see page 107), the calibration menu provides the facility to adjust the sensor inputs to the system in which it is operating.



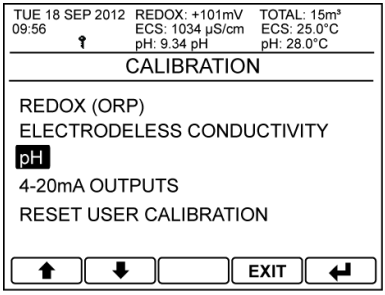
Main Menu

From either of the front screen press the menu button to show the main menu options and select Calibration.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



Calibration

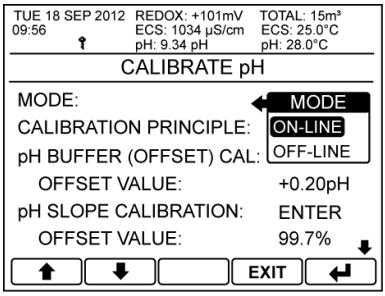
Select pH

pH will only appear if the pH card is installed (See page 19).

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Mode

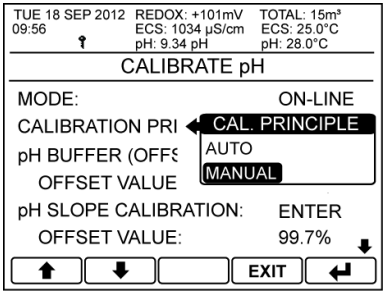
Selecting off-line causes any setpoints associated with this channel to de-energise. Also causes any current outputs associated to hold their current value, useful for when commissioning or calibrating the instrument. When the unit is placed in an off-line state "off-line" will appear in the channel messages section on the front screen.

If a "Cannot Edit Digital Input Has Control" message appears, then an associated digital input is currently controlling the on-line / off-line state of the channel.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Calibration Principle

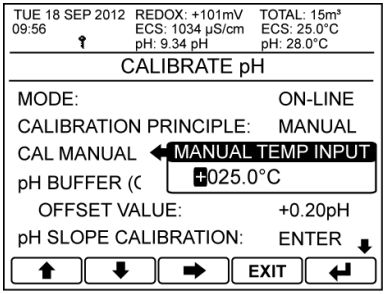
This setting defines the operating mode of the pH Electrode calibration. In Auto mode the instrument automatically adjusts the offset and slope. In Manual mode the user manually adjusts the reading to match known values.

See page 125 for more details.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Calibration Manual Temperature Input

This setting allows a different fixed temperature value to be used when calibrating. Makes it easier to calibrate a standard solution at a different temperature to the process.

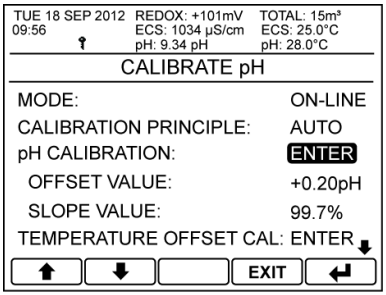
Only available when the compensation mode has been set to manual in the sensor setup menu.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



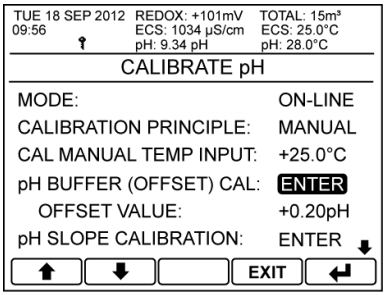
pH Calibration

Enter the pH Auto Calibration routine.

Only available when the calibration principle is set to auto in this menu.

See page 133 for more details.

↵ – Enter pH Auto Calibration



pH Buffer (Offset) Calibration

Enter the pH Manual Offset Calibration Routine

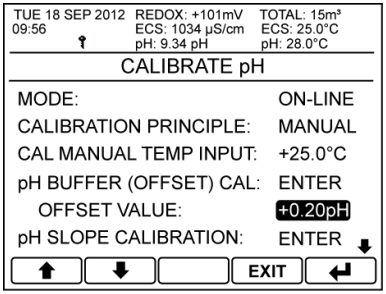
Only available when the calibration principle is set to Manual in this menu.

See page 135 for more details.

⬆/⬇ – Select Option

EXIT – Return to Select Calibration Channel

↵ – Enter pH Manual Offset Calibration

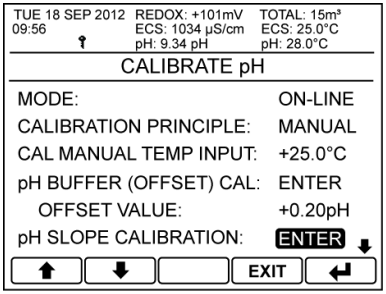


Offset Value

Displays the electrode Offset currently being used by the instrument.

Cannot be edited.

Changed by either using the pH manual offset calibration, or by the pH auto calibration.



pH Slope Calibration

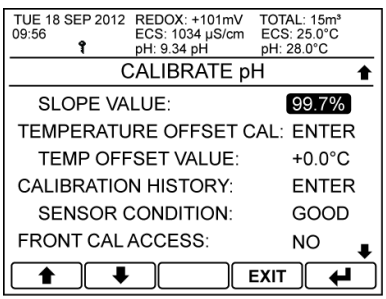
Enter the pH Manual Slope Calibration Routine
Only available when the calibration principle is set to Manual in this menu.

See page 135 for more details.

⬆/⬇ – Select Option

EXIT – Return to Select Calibration Channel

↵ – Enter pH Manual Slope Calibration

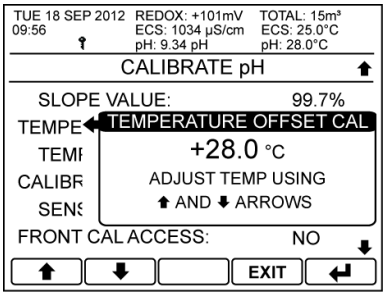


Slope Value

Displays the electrode Slope currently being used by the instrument.

Cannot be edited.

Changed by either using the pH manual slope calibration, or by the pH auto calibration.



Temperature Offset Calibration

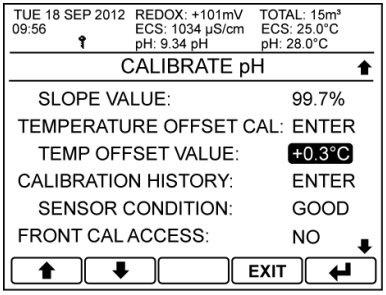
The temperature offset calibration enables the user to adjust the temperature reading to match a known input. Only available when the sensor's temperature input is not set to disabled.

The current temperature reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows. When the reading is correct press the enter button to store the calibration.

↑/↓ – Adjust the Reading Up or Down

EXIT – Cancel

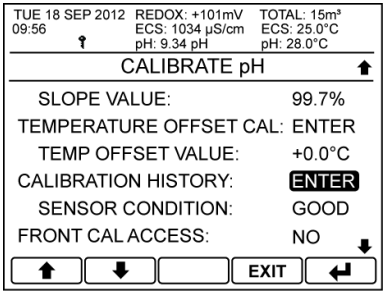
↵ – Save Calibration



Temperature Offset Value

The temperature offset value currently being used. The value will change depending on the result of the temperature offset calibration.

Cannot be edited

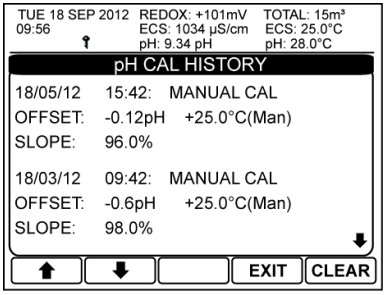


Enter Calibration History

The MTD75 series has a calibration history feature which allows the user to review the record of sensor solution calibrations.

To enter the calibration history menu press enter.

↵ – Enter Calibration History



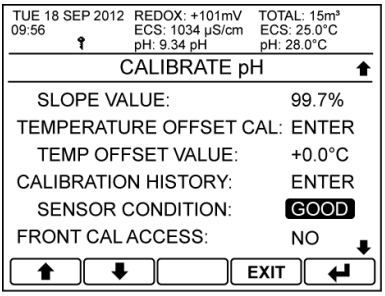
Calibration History

The calibration history page provides a record of all Offset and Slope calibrations carried out.
The data includes the date and time of the calibration, the calculated Offset and Slope, the calibration principle used and the temperature compensation reading at the time.

↑/↓ – Move To Next Page Up or Down

EXIT – Return To Calibration Menu

CLEAR – Clear All of the Calibration History

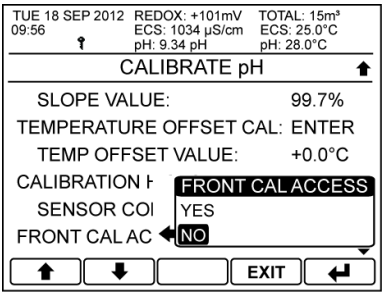


Sensor Condition

The MTD75 Series is capable of analysing the result of the pH electrode offset and slope calibration and indicates to the user the condition the electrode is in.

Good – The electrode is operating within set parameters.
Replace Soon – The electrode is getting towards the end of is operating life.
Replace – The electrode is exhausted and should be replaced.

Cannot be edited



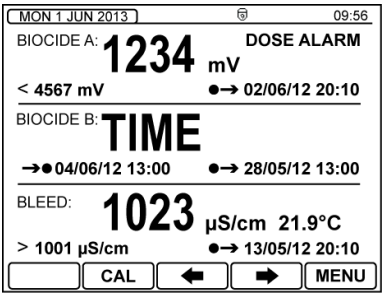
Front Screen Calibration Access Enable

When enabled front calibration access allows direct entry into the calibration menu from the front screen. It also disables the security access system within the calibration menu enabling the calibration functions without having to enter the security access code.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



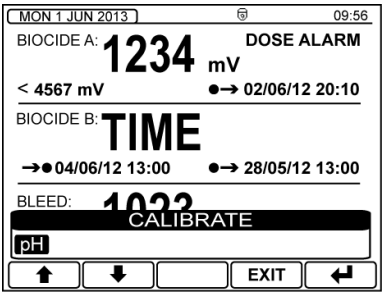
Front Screen Calibration Access

When the calibration access is enabled press the "CAL" button to bring up pop-up to select which channel to calibrate.

CAL – Enter Calibrate Channel Select Menu

⬅/➡ – Scroll Around Menus

Menu – Access Main Menu



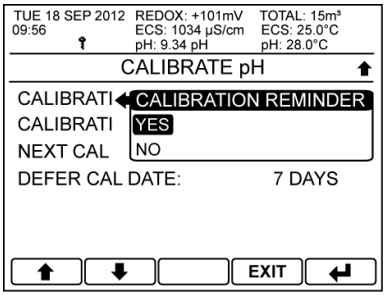
Select Channel to Calibrate

From the pop-up select the channel the user wishes to calibrate. Only channels whose front calibration access has been enabled will appear.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Enter Menu



Calibration Reminder

By enabling the calibration reminder the user can configure a calibration interval, which when expired will activate an alarm and channel message on the front screen.

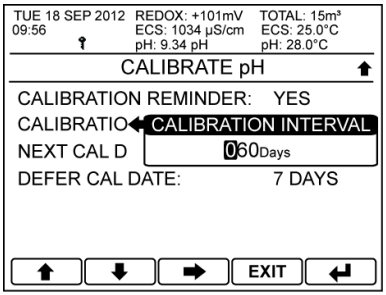
If the interval has expired and the alarm has activated, then on the completion of a successful sensor calibration the next cal date will be automatically incremented by calibration interval.

If the user completes a successful sensor calibration before the calibration interval has expired, then the instrument will ask the user whether they wish to update the next cal due date by the calibration interval.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Calibration Interval

Sets the interval time for the calibration alarm.

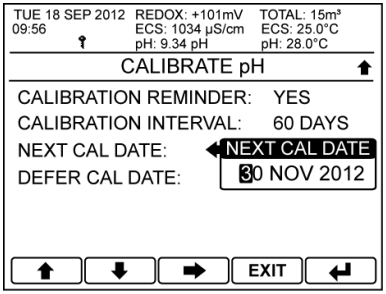
The Next Cal Date will update to show the date of the next calibration alarm.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Next Calibration Date

Sets the exact date of the next calibration alarm.

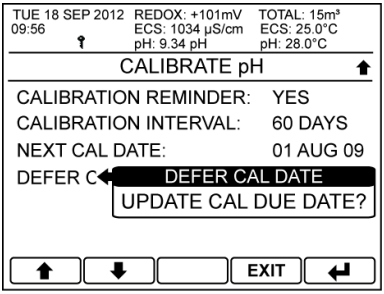
The Calibration Interval will update to show the number of days to the next calibration date.

⬆/⬇ – Increase / Decrease Digit or Text

➡ – Select Next Item

EXIT – Cancel

↵ – Save Entry



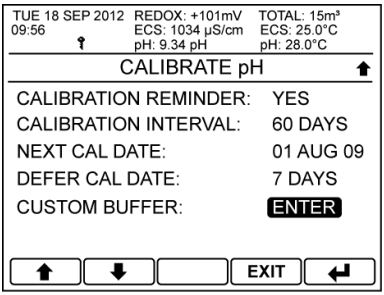
Defer Calibration Date

Turns off the alarm and increases the calibration interval by an extra 7 days.

Only appears once the calibration interval has expired.

YES – Increase Interval

NO – Cancel



Custom Buffer Entry

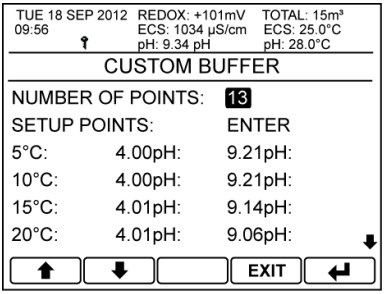
Enters the custom buffer setup menu.

Only available when the pH calibration principle is set to auto.

↑/↓ – Select Option

EXIT – Return to Select Calibration Channel

↵ – Enter pH Manual Slope Calibration



Custom Buffer Menu

The custom buffer menu allows the user to enter in alternative custom buffer solution values at fixed temperatures for use with the pH automatic calibration function.

Number of Points – Define the required number of data points to be entered (Maximum 13)

Setup Points – Automatically define the data points one after another. It is recommended that the points are added in ascending order of temperature.

Data Points – Alternatively the user can edit a single temperature point by selecting it in the menu.

Reset Custom Buffer – Reset the points back to the LTH standard buffer defaults.

↑/↓ – Select option or Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel or Return to Calibration Menu

↵ – Save Entry

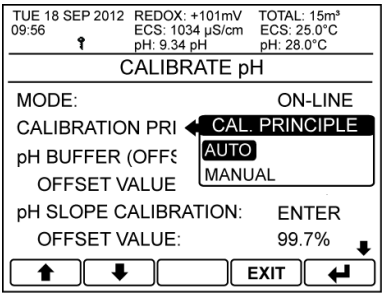
Auto pH Sensor Calibration

The Auto pH sensor calibration is a two point offset and slope calibration, which requires the use of a 4 and 9 pH buffer solutions. These are nominal values from which the instrument converts to exact buffer values due to temperature variations. To accomplish this, the instrument uses a buffer table which comes pre-configured with the following two LTH buffers:

4pH – LTH Order Number 138/199
9pH – LTH Order Number 138/201

If the user wishes to use alternative buffers then they must enter in their own buffer values at different temperatures by following the custom buffer instructions on page 132.

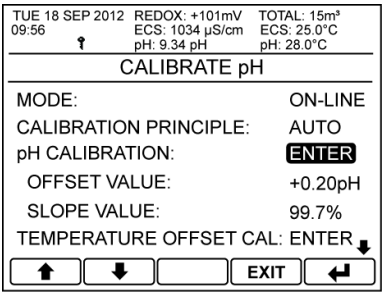
In order for the auto calibration to work correctly, the buffer temperature must either be measured by the instrument during calibration, or if manual temperature compensation is being used the buffer temperature must be entered in the "Calibration Manual Temperature Input" in the calibration menu.



Calibration Principle

To use Auto calibration first set the calibration principle to Auto.

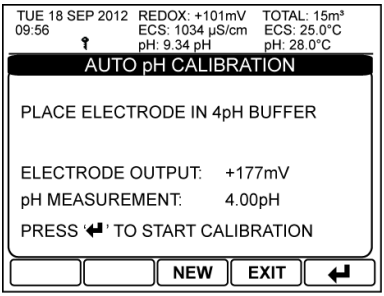
⬆/⬇ – Select Option
EXIT – Cancel
↵ – Save Selection



pH Auto Calibration

To start the pH calibration, select the "pH Calibration" item from the desired channel's calibration menu.

↵ – Enter pH Auto Calibration



Place Electrode In 4pH Buffer

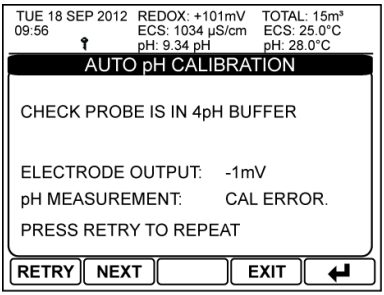
Place the electrode in the 4pH buffer and press enter to begin sampling.

Note. If the electrode is new, pressing the "new" button will reset the existing offset and slope and add a "new electrode" entry in the calibration history.

NEW – Register New Electrode

EXIT – Exit Calibration Without Saving

↵ – Initiate 4pH Calibration



Calibration Error

If no problem has been detected the instrument will automatically progress to the next calibration point. If it has encountered a problem this screen will appear.

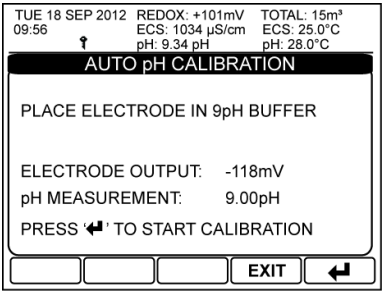
Check that the electrode is connected correctly and that the correct buffer has been used. Then press "Retry" to repeat the calibration.

PREV – Go to Previous Calibration Point

SKIP – Skip to Next Calibration Point

EXIT – Exit Calibration Without Saving

↵ – Initiate Calibration



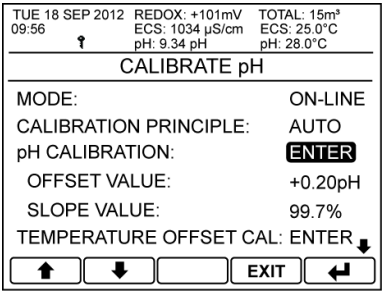
Place Electrode In 9pH Buffer

Place the electrode in the 9pH buffer and press enter to begin sampling.

If the calibration has been completed successfully the instrument will return back to the main calibration menu.

EXIT – Exit Calibration Without Saving

↵ – Initiate 9pH Calibration



Offset and Slope

Once back in the main menu the calculated offset and slope values being used by the instrument will be displayed.

Lower down in the calibration menu the instrument will also display the sensor condition calculated from the span and offset values. See page 130 for more information.

Manual pH Sensor Calibration

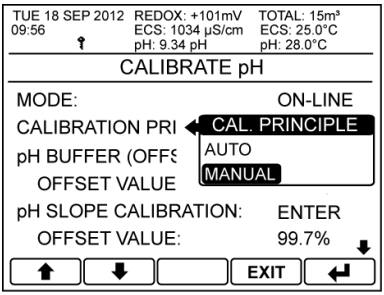
When using Manual calibration mode it is possible to do either a single or two point calibration. This is accomplished by using the *Buffer* and *Slope* menu items. However it is important to do the calibration in the correct order:

1. Adjustment of the Buffer (Offset) value at 7.00 pH.
2. Adjustment of the Slope (Gain) value at any other pH (usually 4 or 9 pH).

If a single point calibration is required then only the buffer should be adjusted and no adjustment made to the slope.

As actual pH buffer values are used no compensation is made for the buffer solution with temperature in the instrument. It is important therefore to know the actual buffer value at the temperature of the solution. The standard LTH 4, 7 and 9 pH values at temperature can be seen on page 137.

It is also important that the buffer temperature is entered into the Calibration Manual Temperature Input if manual temperature compensation is being employed. Alternatively any automatic temperature compensation element should be placed in the buffer solution with the pH sensor if Auto TC is being used.



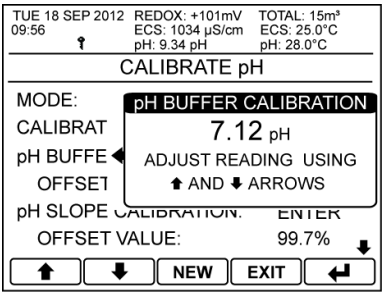
Calibration Principle

The default method of calibration is "Manual" mode, however if the probe is pH and the type is glass then "Auto" mode may have been selected. If this is the case then calibration principle will need to be set to manual.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



pH Buffer (Offset) Calibration

The pH buffer calibration enables the user to adjust the sensor buffer until the displayed reading matches the known input. To activate the function select "pH Buffer (Offset) Cal" and press enter.

The current sensor reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows. When the reading is correct press the enter button to store the calibration.

It is recommended that the buffer should be adjusted at 7pH (± 2pH) for a glass probe, and 0pH (+2pH) for an antimony probe.

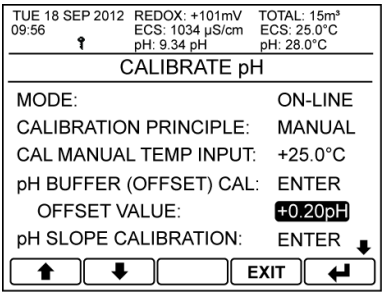
Note. If the electrode is new, pressing the "new" button will reset the existing offset and slope and add a "new electrode" entry in the calibration history.

⬆/⬇ – Adjust the Reading Up or Down

NEW – Register New Electrode

EXIT – Cancel

↵ – Save Calibration

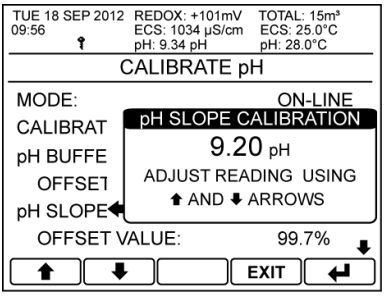


Offset Value

The adjusted offset value from the buffer calibration routine is displayed here.

The "Sensor Condition" function located further down the calibration menu will also update. See page 130 for more information.

If only a single point calibration is required then the following does not need to be carried out.



pH Slope Calibration

The pH slope calibration enables the user to adjust the sensor slope until the displayed reading matches the known input. To activate the function select "pH Slope Calibration" and press enter.

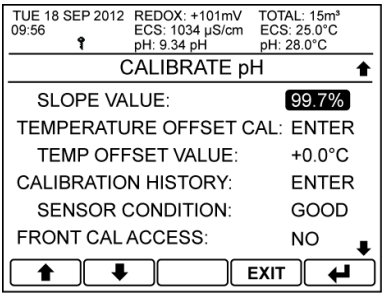
The current sensor reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows. When the reading is correct press the enter button to store the calibration.

The slope limits are 80% to 110%.

↑/↓ – Adjust the Reading Up or Down

EXIT – Cancel

↵ – Save Calibration



Slope Value

The adjusted slope value from the slope calibration routine is displayed here.

The "Sensor Condition" function located further down the calibration menu will also update. See page 130 for more information.

Buffer Solutions

The following table gives the LTH buffer solution values. **NB.** Buffer solutions should be prepared and used in accordance with the instructions supplied with them.

pH variation against temperature			
Temperature (°C)	**LTH 4pH Buffer**	**LTH 7pH Buffer**	**LTH 9pH Buffer**
10	4.00	7.07	9.21
15	4.00	7.04	9.14
20	4.00	7.02	9.06
25	4.00	7.00	9.00
30	4.01	6.99	8.96
35	4.02	6.98	8.92
40	4.03	6.97	8.88
50	4.05	6.96	8.83
60	4.08	6.96	8.81

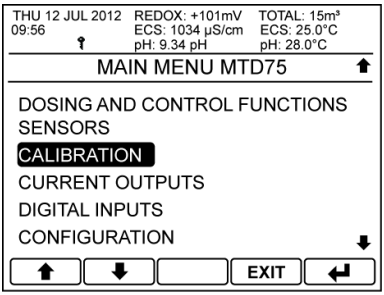
LTH Buffer Solutions Ordering Information

Type No	Part No	Description
SB-052-1610	138/199	4pH Buffer standard colour coded Red, 500ml.
SB-168-1610	138/200	7pH Buffer standard colour coded Clear, 500ml.
SB-054-1610	138/201	9pH Buffer standard colour coded Blue, 500ml.

BLANK

Resetting the User Calibration

If required the user can reset the user calibrations to their default states.



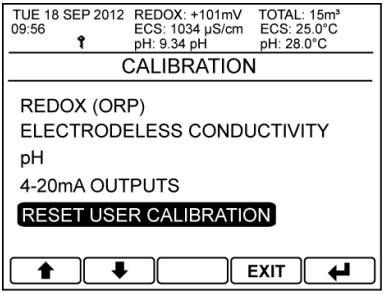
Main Menu

From the front screen press the menu button to show the main menu options and select Calibration.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



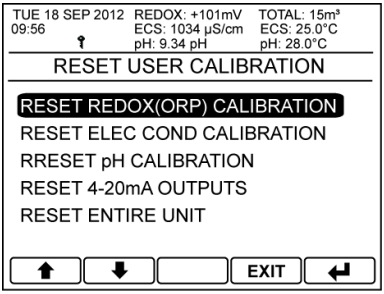
Calibration

Select Reset User Calibration.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



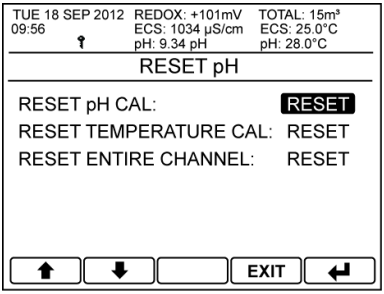
Reset User Calibration

Select sensor input.

⬆/⬇ – Select Option

EXIT – Return to Calibration

↵ – Enter Option



Reset User Calibration

Select whether to reset the sensor calibration, the temperature calibration or reset all of the sensor's user calibrations.

⬆/⬇ – Select Option

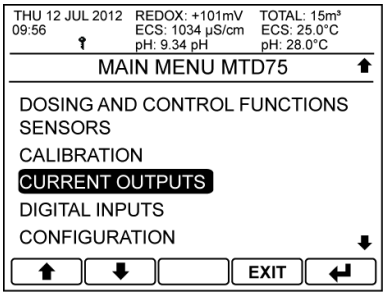
EXIT – Return to Reset User Calibration

↵ – Enter Option

BLANK

Current Outputs

The MTD75 Series can optionally be fitted with four current outputs designated A – D. Each individual current output can be assigned to any one of the Sensor Inputs. The current output menu contains all of the necessary setup functions to configure the current output sources. The instrument can display all of the enabled current outputs on one trend screen.



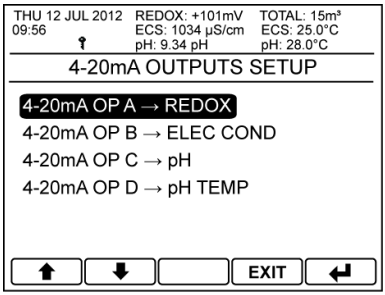
Main Menu

From the front screen press the menu button to show the main menu options and select 4-20mA Outputs.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



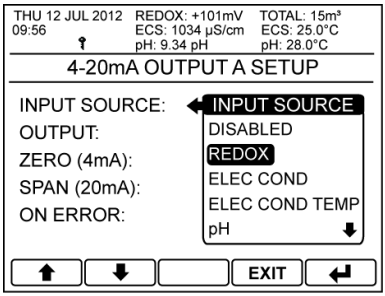
Outputs Setup

Select the Current Output you wish to edit.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Input Source

The sensor the current output is to be associated with.

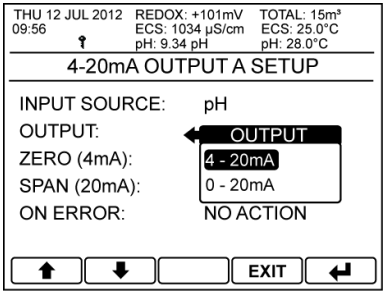
The sensors shown depend on the configuration of the controller and whether the sensor has been enabled in the channel setup menu.

To disable the current output select the disabled option. This will turn off the output, remove it's reading from the current output trend screen and the menu header. It will also clear any error messages associated with it.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



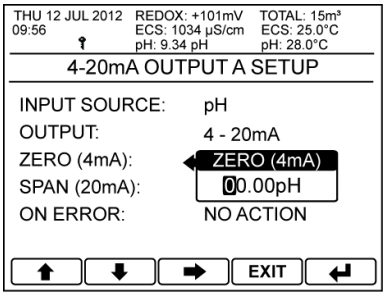
Output

The current output can be scaled across either 4 – 20mA or 0 – 20mA

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Zero (0/4mA)

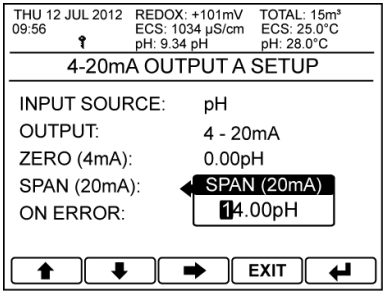
Enter the desired sensor value to be represented by 0mA or 4mA (depends on current output scaling). An inverse relationship can be achieved by setting the Zero greater than the Span.
If the sensor reading falls outside this and the span value an error / alarm will be activated.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Span (20mA)

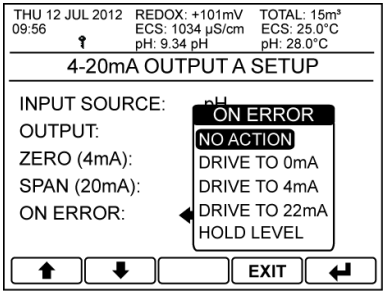
Enter the desired sensor value to be represented by 20mA. An inverse relationship can be achieved by setting the Span less than the Zero.
If the sensor reading falls outside this and the zero value an error / alarm will be activated.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



On Error

The current outputs can be programmed to output 0mA, 22mA or Hold their value when an error is detected on the input source (i.e. Sensor Fault, Temperature Fault), to provide remote warning of error conditions or to ensure fail safe operation.

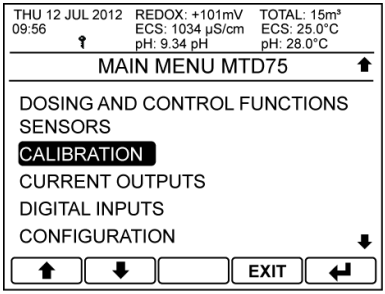
⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

Current Output Calibration

The user is provided with an opportunity to adjust the current output to calibrate any equipment that may be being used to monitor the current output signal.



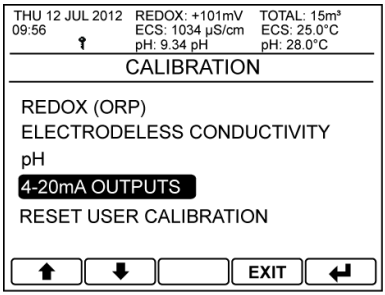
Main Menu

From the front screen press the menu button to show the main menu options and select Calibration.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



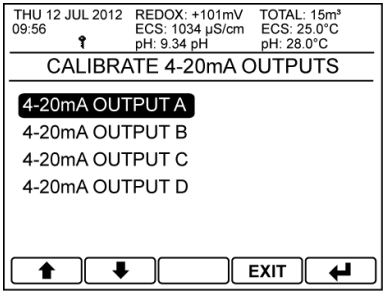
Calibration

Select 4-20mA Outputs.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



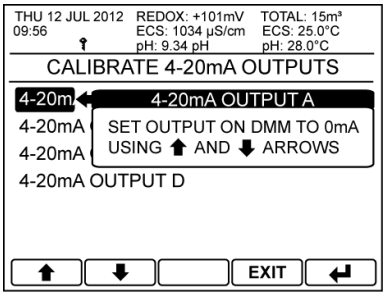
Calibrate 4-20mA Outputs

Select the current output you wish to calibrate.

⬆/⬇ – Select Option

EXIT – Return to Calibration

↵ – Enter Option



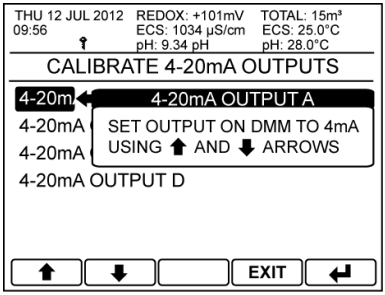
Adjust 0mA Output

Using the ⬇ and ⬆ buttons adjust the current output until it reads the desired value on your current meter. Please keep in mind that the current output cannot go below 0mA.

⬆/⬇ – Adjust Output

EXIT – Cancel

↵ – Save Adjustment



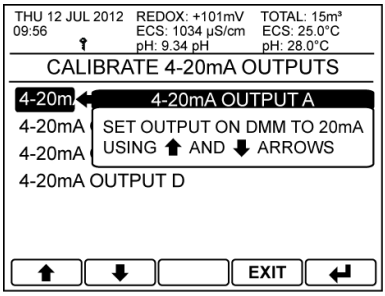
Adjust 4mA Output

Using the ⬇ and ⬆ buttons adjust the current output until it reads the desired value on your current meter.

⬆/⬇ – Adjust Output

EXIT – Cancel

↵ – Save Adjustment



Adjust 20mA Output

Using the ⬇ and ⬆ buttons adjust the current output until it reads the desired value on your current meter.

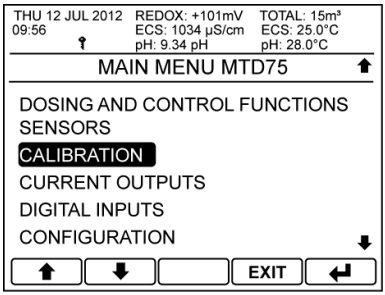
⬆/⬇ – Adjust Output

EXIT – Cancel

↵ – Save Adjustment

Resetting the current Output user Calibration

If required the user can reset the current output user calibration back to factory settings.



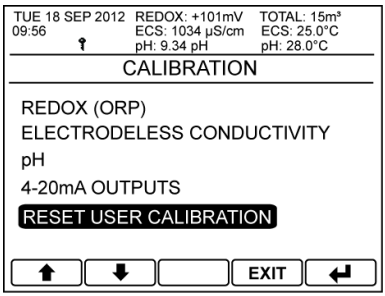
Main Menu

From the front screen press the menu button to show the main menu options and select Calibration.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



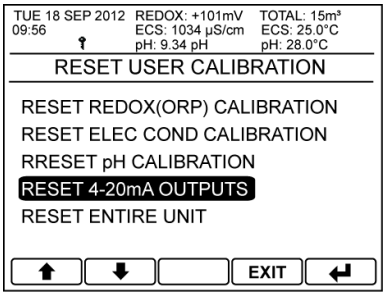
Calibration

Select Reset User Calibration.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



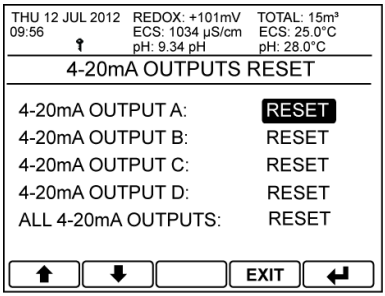
Reset User Calibration

Select Reset 4-20mA Outputs.

⬆/⬇ – Select Option

EXIT – Return to Calibration

↵ – Enter Option



4-20mA Outputs Reset

Select the required 4-20mA Output to Reset its user calibration back to factory settings.

⬆/⬇ – Select Option

EXIT – Return to Reset User Calibration

↵ – Enter Option

BLANK

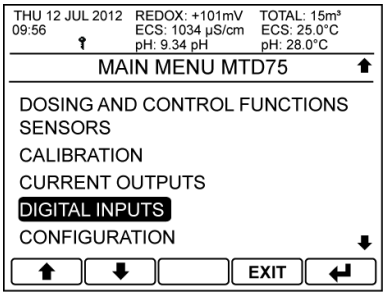
Digital Inputs

The MTD75 features 5 digital inputs, the instrument can be configured to initiate the appropriate action when a contact either closes or opens between the input pin and the reference pin.

Water Meter Input (Digital Input 1)
The terminal marked "1" is provided for contact to a standard water meter where contact activation indicates the flow of water. The 'K' factor for the water meter can be set in the "Configuration" menu (see page 151). The polarity of this input (NO/NC) can be set in the digital input 1 menu.

Flow Switch Input (Digital Input 2)
The terminal marked "2" is provided for connection to a flow switch in the process loop to indicate when there is no water flow past the sensors. When activated this will flag an error message on the main display and inhibit any dosing which is using a sensor input as its trigger source. The polarity of this input (NO/NC) can be set in the digital input 2 menu.

Digital Inputs 3-5
Digital inputs 3-5 provide a user configured system to set the associated relay to either Offline or Interlock, indicate that there is a chemical Tank Level issue, or to activate a Remote Dose or Bleed of the relay.



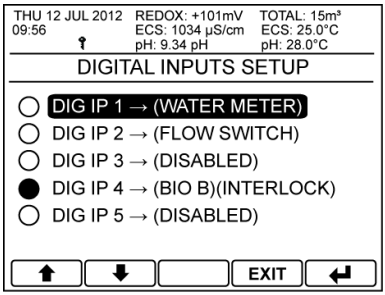
Main Menu

From the front screen press the menu button to show the main menu options and select Digital Inputs.

⬆/⬇ – Select Option

EXIT – Return to Calibration

↵ – Enter Option



Digital Inputs Setup

Select the Digital Input you wish to edit.

The status of the Digital Input is also shown to the left of each item.

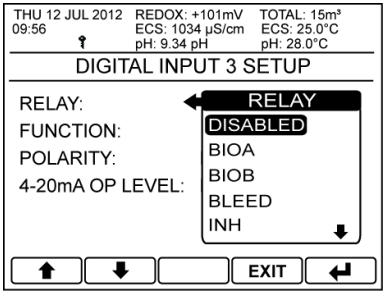
○ – Digital Input Inactive

● – Digital Input Active

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Relay

The "Relay" the digital input is to be associated with. Only enabled relays will be shown.

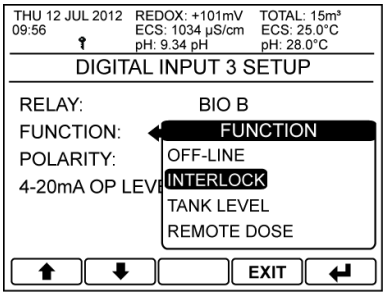
To disable the digital input select the disabled option.

Not available on Digital Inputs 1 & 2

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



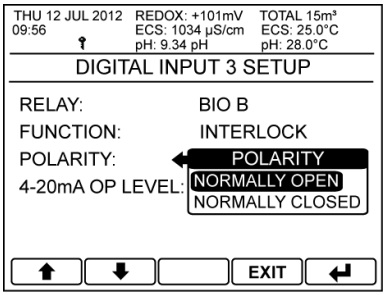
Function

The digital input can be configured to operate in the following ways:
(Digital Input 1 Only)
Water Meter
(Digital Input 2 Only)
Flow Switch
(Digital Inputs 3, 4 & 5 Only)
Off-Line
Interlock
Tank Level
Remote Dose

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



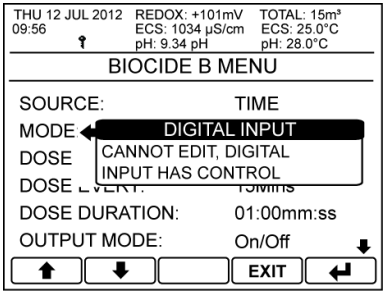
Polarity

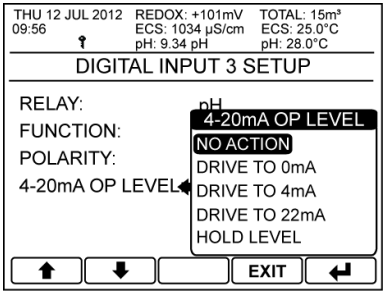
Configure whether the digital input activates on the closing of the circuit (normally open) or the opening of the circuit (normally closed).

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection





Offline, Interlock, Tank Level Switch

These three functions when active will cause the associated relay to de-energise. They are also accompanied by a message on the front screen informing the user which action is currently active.

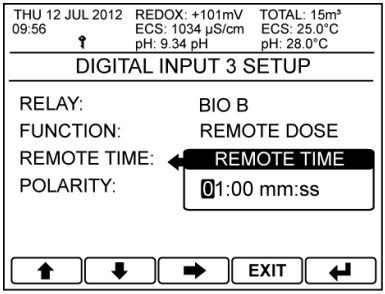
Note – When a digital input is assigned to one of these functions the user can no longer take the associated relay offline using the menu item in the setup menu. As indicated by the "Cannot Edit, Digital Input Has Control" message.

In addition to de-energising the relay the user can also define the operation of any current outputs associated with the sensor the relay is currently using.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Remote Dose

If selected enables the user to remotely dose the associated relay for the duration set in the Remote Time menu.

⬆/⬇ – Select Option

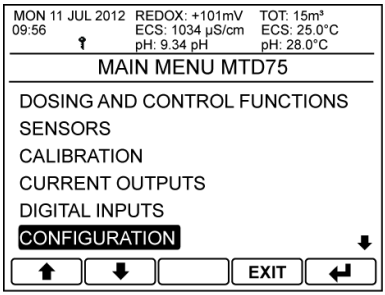
EXIT – Cancel

↵ – Save Selection

BLANK

Configuration

The configuration menu enables the user to configure the basic operating parameters of the controller.



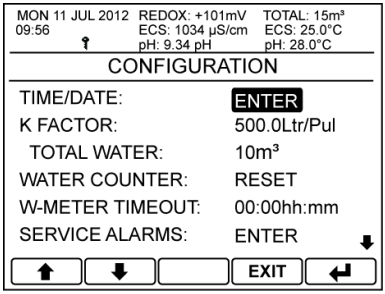
Main Menu

From the front screen press the menu button to show the main menu options and select Configuration.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



Time / Date

Configure the internal battery backed clock.

WARNING: Changing the time or day can lead to missed doses or immediate dosing where "Time" is defined as the trigger source.

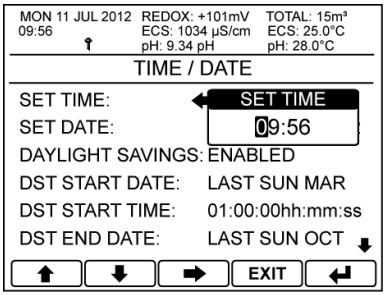
If this may lead to problems, make sure to alter the time/day when no relay outputs will be affected.

If a date/day of week change is made, use the "Manual Dosing" option on those relays that are triggered by time to ensure correct time/date correlation.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Set Time

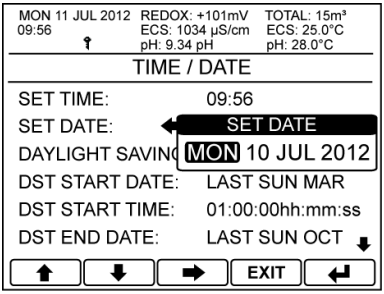
Sets the controller's time.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Time



Set Date

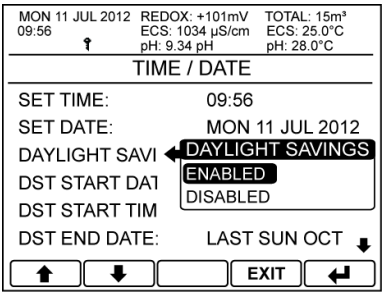
Sets the controller's date.

⬆/⬇ – Increase / Decrease item

➡ – Select Next item

EXIT – Cancel

↵ – Save Date



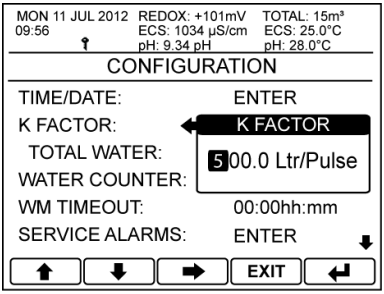
Daylight Savings

This allows the controller to automatically adjust it's time for when daylight savings starts and ends. The start and end times may be adjusted to allow for local differences.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



K Factor

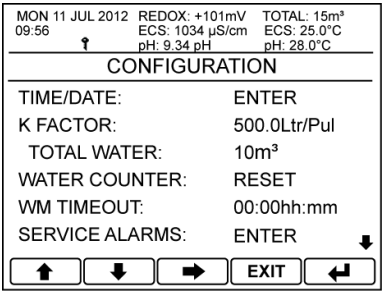
Set the 'K' factor for the water meter input.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

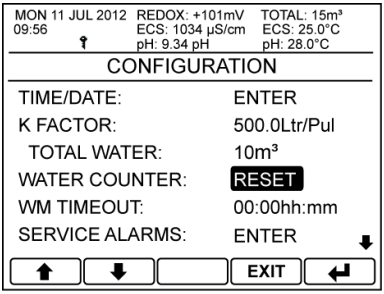
EXIT – Cancel

↵ – Save Value



Total Water

The total amount of water the controller has measured.



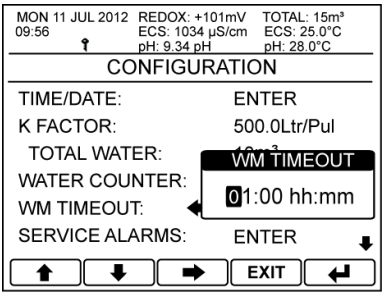
Water Counter Reset

Reset the total water counter to zero.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Water Meter Timeout

Provision has been made to generate an alarm condition if the water meter input pulses stop or become very slow, which may indicate problems with the water flow into the cooling tower.

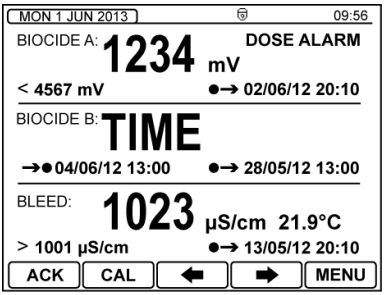
Setting the timer to 00:00 will disable the alarm.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

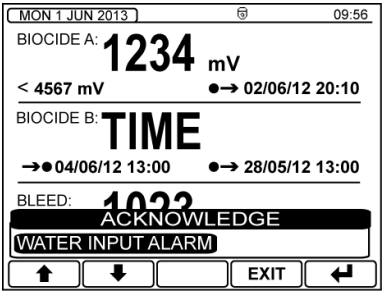
↵ – Save Value



If the time between incoming pulses is greater than the set time, the unit will activate the alarm. The controller will display a warning message on the main display when the timer expires.

The water meter alarm can be cancelled by pressing the "ACK" button on the front screen and selecting "Water Meter Alarm"

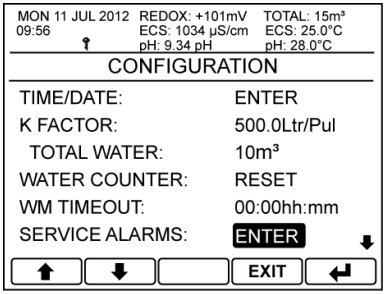
This timeout can also be used to trigger the alarm relay to indicate to external processes that the water flow has stopped.



⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Service Alarms

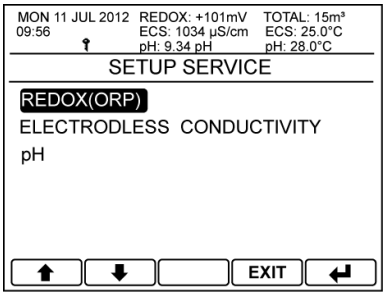
The MTD75 has an inbuilt Service Alarm for each sensor input which will activate when the maintenance engineer's service interval has expired.

Note. By default the alarms are disabled and can only be setup using the service access code which can be obtained from LTH Electronics.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



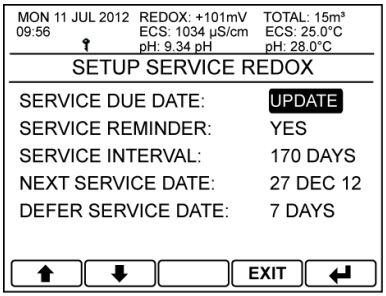
Select Service Alarm Channel

Select which service alarm the user wishes to edit.

⬆/⬇ – Select Option

EXIT – Return to Configuration Menu

↵ – Enter Option



Setup Service Alarm

Service alarm configuration:

Service Due Date: Update – Automatically increment the next service date by the service interval. Requires service security code prior to use.

Service Reminder – Turn the service alarm on or off. Requires service security code prior to use.

Service Interval – Set the Service Interval. Requires service security code prior to use.

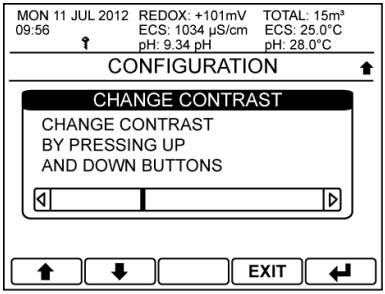
Next Service Date – Sets the exact service date. Requires service security code prior to use.

Defer Service Date – Only appears once the service interval has expired. Increases the service interval by an extra 7 days. Requires standard security code prior to use.

⬆/⬇ – Select Option

EXIT – Return to Select Service Alarm Menu

↵ – Edit Option



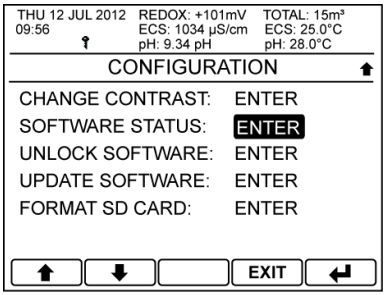
Change Display Contrast

This allows the user to adjust the contrast of the display to compensate for environmental conditions that may affect the readability of the display.

↑/↓ – Adjust Contrast

EXIT – Cancel

↵ – Save Contrast



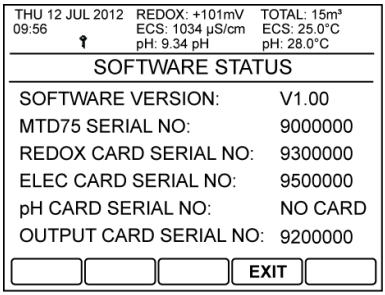
Software Status

Provides information about the software version and serial numbers of the controller.

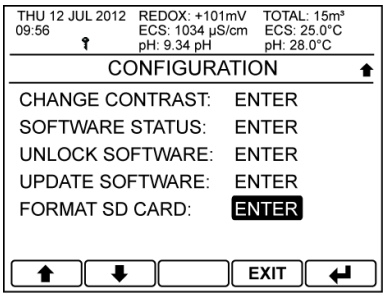
↑/↓ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



EXIT – Return to Configuration Menu



Format SD Card

Allows the users to reformat SD cards which are incompatible with the controller. For cards which are greater than 4GB this may take several minutes.

↑/↓ – Select Option

EXIT – Return to Main Menu

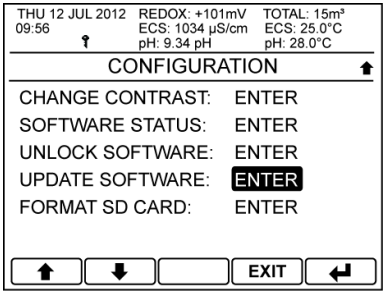
↵ – Enter Option

BLANK

Update Software

The MTD75 operating software can be upgraded by saving the latest version from LTH onto a SD card, inserting it into the instrument and following the instructions below. All three files must be present on the SD card for the update to work. If the card is not formatted correctly the controller will inform the user, the card must then be reformatted using the Format SD Card function.

Caution! The MTD75 update may take up to 5 minutes, during which time the unit will not operate.



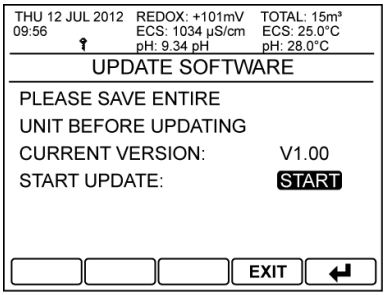
Update Software

Select the update software option from within the configuration menu.

↑/↓ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Update Software

Verify that the new software is of a higher version than the current one shown. It is recommended that the entire unit is saved before the update is started. See the "Save Setup" section for instructions.

Select start to continue.

↑/↓ – Select Option

EXIT – Return to Configuration Menu

↵ – Enter Option

Update Software

If the controller has verified that all of the required software is present on the SD card press enter to begin the update.

During the update the display and LEDs will indicate the progress of the update.

Once finished the controller will restart automatically.

EXIT – Return to Update Software Menu

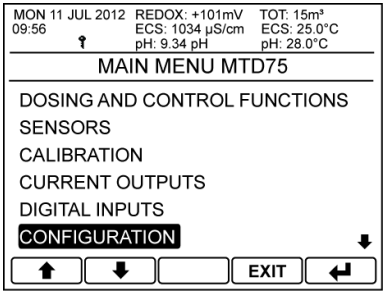
↵ – Begin Update

BLANK

Optional Software Functions

The MTD75 series features optional software functions which when purchased will expand the controller's capabilities. These functions by default are locked. They can be unlocked by LTH or your local distributor at the time of order. Alternatively the functions may be ordered after purchase by supplying LTH or your local distributor the serial number of your controller along with the purchase order. In return they will supply you with an 8 digit unlock code that is unique to the controller and the required function to be unlocked.

Unlocking Optional Software Functions



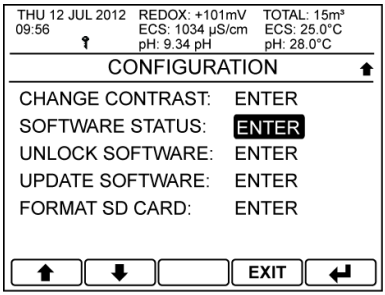
Main Menu

From the front screen press the menu button to show the main menu options and select Configuration.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



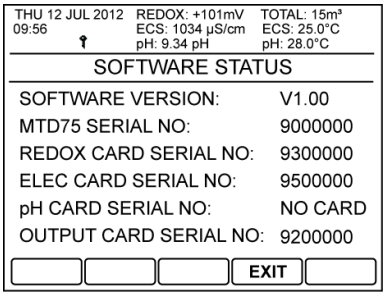
Software Status

Select Software Status.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

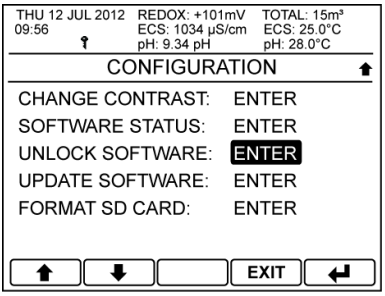
↵ – Enter Option



Software Status

Record the MTD75 serial number and supply it to LTH or your local distributor along with your purchase order.

EXIT – Return to Configuration Menu



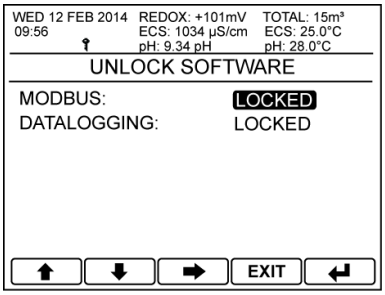
Unlock Software

Upon receipt of the 8 digit unlock code return to the Configuration menu and select Unlock Software.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



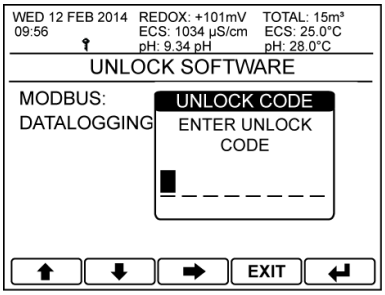
Unlock Software

Select the optional software function you wish to unlock.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Enter the required Unlock Code.

If the code is incorrect the user will be prompted to try again.

If the code is correct the function will now be unlocked

⬆/⬇ – Change Character

➡ – Select Next Character

EXIT – Cancel

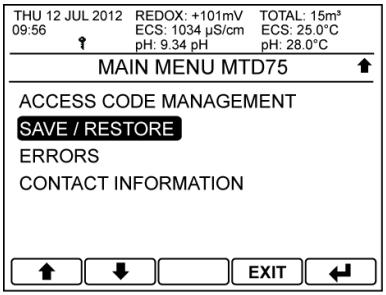
↵ – Enter Code

Save, Restore & Reset

The MTD75 features the ability to save and restore the current configuration of the relays, sensors, current outputs and digital inputs into either one of two save slots inside the controller.

Alternatively the configuration can be saved and restored via an SD card inserted into the unit, which allows the controller's configuration to be backed up. It also provides the ability to copy the configuration from one controller to another, providing that the second controller's hardware configuration is identical.

The save and restore menu also features the ability to reset the whole controller's configuration back to the factory configuration.



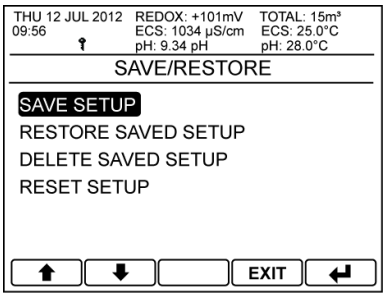
Main Menu

From the front screen press the menu button to show the main menu options and select Save/Restore.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



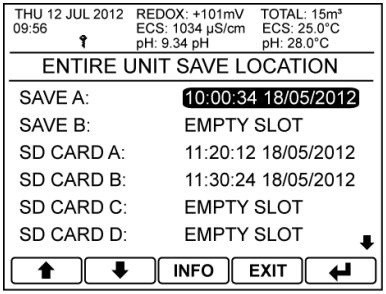
Save / Restore Menu

Select the operation you wish to carry out.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Select Location

Select either Save A or Save B to access the controller's internal stores. Alternatively if inserted select SD Card A-H to use one of the 8 SD card saves.

If a save location is already being used, as indicated by a time - date stamp, then information about that save can be accessed by selecting it and pressing the INFO button.

⬆/⬇ – Chose Location

INFO – Location Information

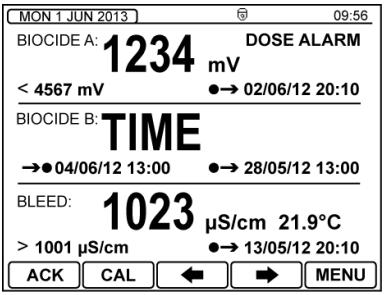
EXIT – Return to Save / Restore Menu

↵ – Select Location

BLANK

Error Messages

If the internal diagnostics have detected an error condition then the error LEDs will illuminate. This is accompanied by an alarm bell in the unit status area. The list of currently active errors can be viewed either to the left of Front Screen 1 or by selecting the errors option in the main menu. By selecting an error and pressing the help button a more detailed description of the error is shown along with suggested solutions to the possible causes of the error.



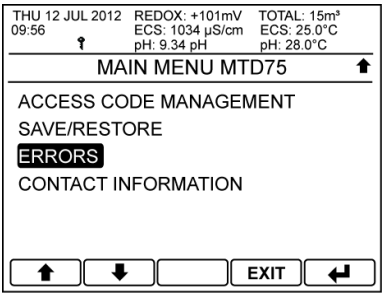
Error Menu Access

The error menu can be accessed by either pressing the scroll left button whilst on Front Screen 1.

– Scroll Left (To Error Menu)

– Scroll Right

Menu – Access Main Menu

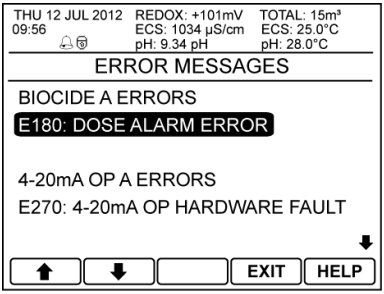


Or by selecting the Errors option from the main menu.

/ – Select Option

EXIT – Return to Front Screen

– Enter Option



Error Messages

For more information regarding each error message select the required message and press the help button.

/ – Select Error

EXIT – Return to Main Menu

HELP – Extended Information

BLANK

Modbus RS485

MODBUS is an open application layer messaging protocol, which is deployed in areas of manufacturing automation, process automation and building automation. It provides client/server communication between devices connected over a RS485 connection.

Modbus RS485 networks consist of two different devices, a Master and a Slave.

Master Device - Master devices determine the data traffic on the network. They can send data without an external request.

Slave Device - Slave devices are peripheral devices. They do not have their own access rights to the data traffic on the network and only send their data due to an external request from a master. The MTD75 operates as a slave device on the network.

Modbus Telegram Structure - The data is transferred between the master and slave by means of a telegram. A request telegram from the master contains the following four telegram fields:

- Slave address - The slave address can be in an address range from 1 to 247. The master talks to all the slaves simultaneously by means of the slave address 0 (broadcast message).
- Function code - The function code determines which read, write and test operations should be executed by means of the MODBUS protocol.
- Data - Depending on the function code, the following values are transmitted in this data field: Register start address (from which the data is transmitted), Number of registers, Write/read data, Data length, etc.
- Checksum - The telegram check sum forms the end of the telegram.

The master can send another telegram to the slave as soon as it has received an answer to the previous telegram or once the time-out period set at the master has expired. This time-out period can be specified or modified by the user and depends on the slave response time.
If an error occurs during data transfer or if the slave cannot execute the command from the master, the slave returns an error telegram (exception response) to the master.
The slave response telegram consists of telegram fields which contain the requested data or which confirm that the action requested by the master has been executed. It also contains a check sum.

MTD75 Modbus communication is indicated in the top of the screen by the following symbol: ⇌

Supported Modbus Function Codes

Function Code	Type	Function
2	Read Discrete Inputs	Reads one or more discrete inputs of the MTD75 1 to a maximum of 2000 consecutive registers can be read with a telegram. The discrete inputs in the response message are packed as one discrete input per bit of the data field. Status is indicated as 1= ON and 0= OFF. ! Note. If the returned output quantity is not a multiple of eight, the remaining bits in the final data byte will be padded with zeros. Application: For reading the status of the controller and its error messages.

Function Code	Type	Function
3	Read Holding Register	Reads one or more registers of the MTD75. 1 to a maximum of 125 consecutive registers (1 register = 2 bytes) can be read with a telegram. Application: For reading measurements and the configuration of the controller's parameters.
5	Write Single Coil	Writes a single output to either ON or OFF in the MTD75. The requested ON/OFF state is specified by the following data field: FF 00 hex = ON. 00 00 hex = OFF. All other values are illegal and will not affect the output. Application: Activates a single function in the MTD75 by writing the On state to the coil address once. Note, on completion the function will automatically move to the Off state.
6	Write Single Register	Write a single MTD75 register with a new value. Application: For configuring a single parameter in the controller. ! Note. Registers whose address space consume more than one register i.e. Floats, cannot be set using this function code.
16	Write Multiple Registers	Writes several MTD75 registers with a new value. A maximum of 120 consecutive registers can be written with a single telegram. Application: For configuring parameters in the controller.
23	Read & Write Multiple Registers	Simultaneous reading and writing of registers in the MTD75. 1 to a maximum of 118 registers in a single telegram. Write access is executed before read access. Application: For configuring and then checking the status of the parameters in the controller.

! Maximum number of writes - If a non-volatile parameter is modified via the MODBUS this change is saved in the EEPROM of the controller. The number of writes to the EEPROM is technically restricted to a maximum of 1 million. Attention must be paid to this limit since, if exceeded, it results in data loss and controller failure. For this reason, avoid constantly writing non-volatile controller parameters via the MODBUS.

Response Times - The time it takes the controller to respond to a request telegram from the MODBUS master is typically 25 to 50 milliseconds. It may take longer for a command to be executed in the controller. Thus the data is not updated until the command has been executed. Write commands especially are affected by this.

Data types - the following data types are supported by the controller:

• **FLOAT** – Floating point numbers IEE 754, Data length 4 bytes (2 registers)

Byte 3	Byte 2	Byte 1	Byte 0
SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM

S = Sign, E = Exponent, M = Mantissa

• **INT** – Integer (16 bits), Data length 2 bytes (1 register)

Byte 1	Byte 0
Most Significant Bit (MSB)	Least Significant Bit (LSB)

• **LONG** – Long Integer (32 bits), Data length 4 bytes (2 registers)

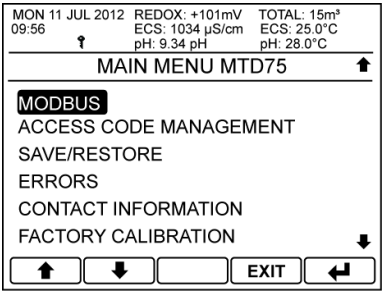
Byte 3	Byte 2	Byte 1	Byte 0
Most Significant Bit (MSB)	…	…	Least Significant Bit (LSB)

Byte Transmission Sequence – The bytes are transmitted in the following data order:

Type	Sequence			
	1st	2nd	3rd	4th
FLOAT	Byte 3 (SEEEEEEE)	Byte 2 (EMMMMMMM)	Byte 1 (MMMMMMMM)	Byte 0 (MMMMMMMM)
INT	Byte 1 (MSB)	Byte 0 (LSB)		
LONG	Byte 3 (MSB)	Byte 2	Byte 1	Byte 0 (LSB)

Modbus Setup

If the Modbus interface has been unlocked (see page 159), the configuration for the interface will appear in the following menu.



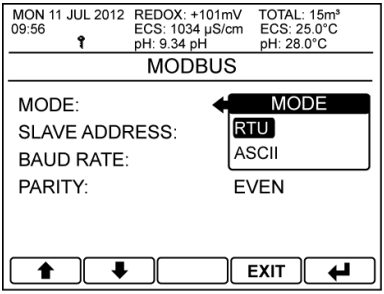
Main Menu

From the front screen press the menu button to show the main menu options and select Configuration.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



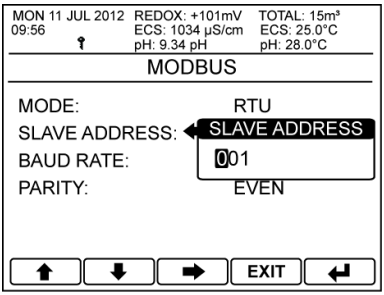
Mode

Set the Modbus communication mode format to either RTU or ASCII.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Slave Address

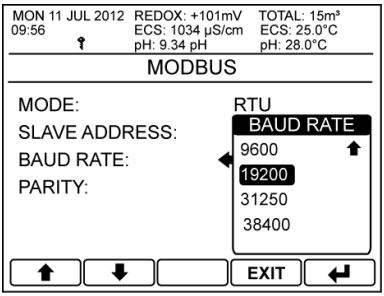
Set the save address used to address the controller. Can be set from 1 to 247.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



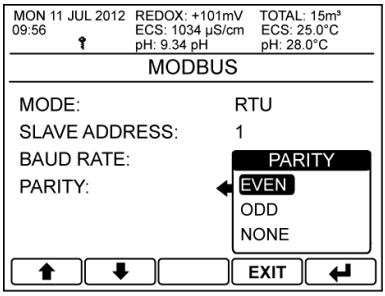
Baud Rate

Set the communication Baud rate.
Available options: 300, 600, 1200, 2400, 4800, 9600, 19200, 31250 and 38400 bits per second.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Parity

Set the error parity bit.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

BLANK

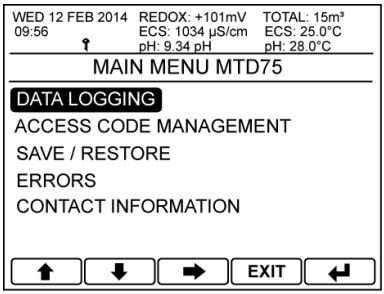
Data Logging

The Data logging optional software function expands the capabilities of the MTD75 controller by allowing the user to record over time the status of the controller. It consists of two separate sections, Live Trending and SD Card Data Logging, which together will help the user to analyse and improve the performance of their application. Please note by default this function is locked. It can be unlocked by LTH or your local distributor at the time of order or through purchasing an unlock code, see page 161 for further information.

Live Trending

Live Trending provides the user with 3 separate live trend screens adjacent to the front screen with each showing 2 readings; these enable the user to instantly view the last 50 samples of each reading. The live trend screen also features a review mode where by the user can further analyse the last 200 samples of each reading, If the user finds something of note the software provides a facility to save those 200 readings to an excel compatible file on the SD card. Further analysis is provided by optionally displaying the minimum, maximum and average value of the 200 samples. The number of readings, the source of the readings, the displayed scale and the sample interval rate are all configurable by the user.

Setup Live Trending



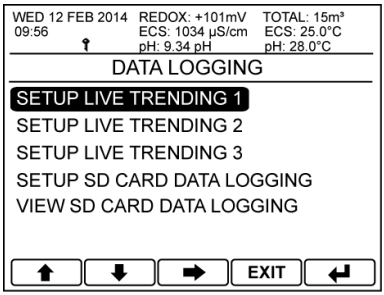
Main Menu

From the front screen press the menu button to show the main menu options and select Data Logging.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



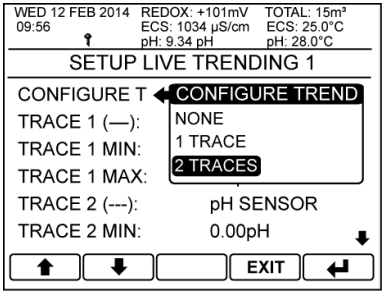
Data Logging

Select the live trend you wish to setup.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



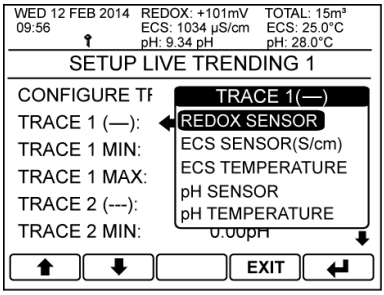
Configure Trend

Select the number of traces to display. By selecting none the live trend is disabled and no longer visible from the front screen.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



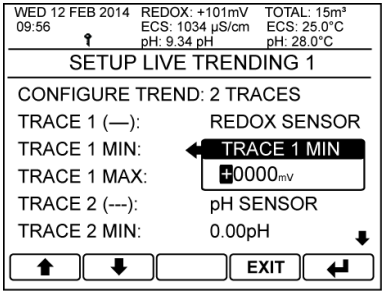
Trace 1 (——)

Select which measurement Trace 1 (left hand side axis) is to be associated with. The options shown depend on the configuration of the instrument.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Trace Min

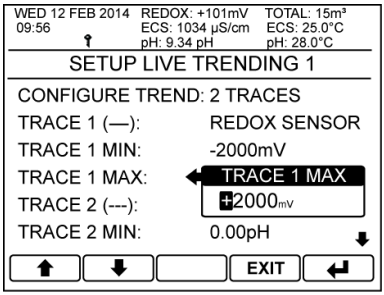
Enter the Trace's minimum displayed value. Adjust in conjunction with the maximum displayed value to increase the measurements displayed resolution.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Trace Max

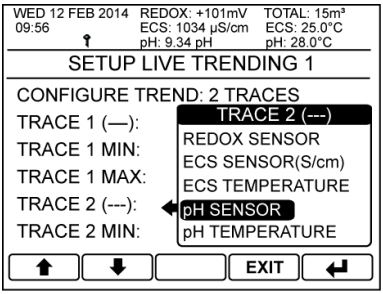
Enter Trace's maximum displayed value. Adjust in conjunction with the minimum displayed value to increase the measurements displayed resolution.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



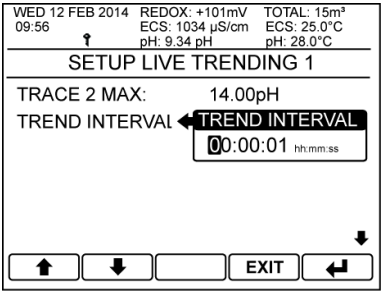
Trace 2 (----)

Select which measurement Trace 2 (right hand side axis) is to be associated with. The options shown depend on the configuration of the instrument. Then configure trace 2's min and max as before with trace 1.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Trend Interval

Enter the time interval between samples for both trace 1 and trace 2.

⬆/⬇ – Increase / Decrease Digit

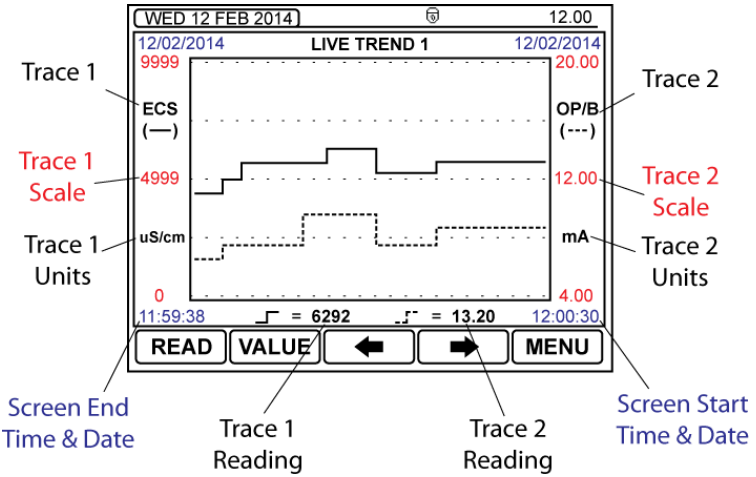
➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value

Live Trend Screen

Once Configured the Live Trend screens can be found by moving right from the front screen. In addition the live trend screens will not "time out" back to the front screen. The screen operates in two modes "Live Mode" and "Review Mode", in Live Mode Screen shows the last 50 sampled readings whilst in Review Mode the user can scroll back through the last 200 readings.
Note. When in review mode the screen will no longer update with live readings, however the live readings are still being recorded and will be restored when review mode is exited.

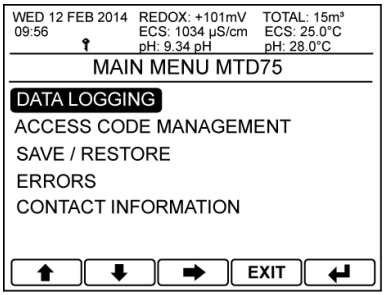


READ/ MIN/ MAX/ AVG	– Indicates the status of the Trace Readings at the bottom of the screen when in Live Mode. Press to cycle between the available options: READ = Current Reading MIN = The minimum value of the last 200 readings MAX = The maximum value of the last 200 readings AVG = The average value of the last 200 readings
LINE/ PAGE	– When in Review Mode toggles between the cursor moving a line at a time or at a page at a time.
VALUE	– Press to enter the live trend Review Mode. Review mode allows the user to scroll back through the last 200 readings.
EXIT	– When in Review Mode, press to exit and return to the Live Mode.
⬅ or ➡	– When in Live Mode – return to the front screen or move on to the next live trend. – When in Review Mode - moves the cursor across the screen. The pointed to value will be displayed at the bottom of the screen and the time at the top.
MENU	– Enter the instruments main menu screen.
SAVE	– When in Review Mode and a SD card is present, saves a copy of the current 200 readings as a time stamped excel compatible file to the Live Trend folder on the SD card (only available when an SD card has been inserted).

SD Card Data Logging

The SD Card Data Logging part of the data logging software enables the user to log over long periods the status of the controller direct to the SD card. Variables logged include: the primary sensor readings, any secondary readings, the status of the dosing and control functions, the current output readings, the status of the digital inputs and any error messages. This data can then be viewed either inside the controller or removed and viewed in Microsoft Excel on a PC.

Setup SD Card Data Logging



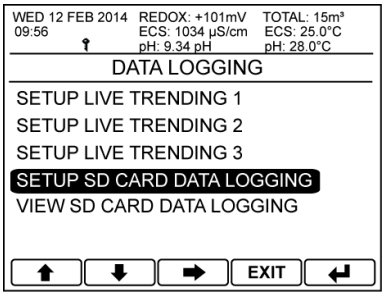
Main Menu

From the front screen press the menu button to show the main menu options and select Data Logging.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



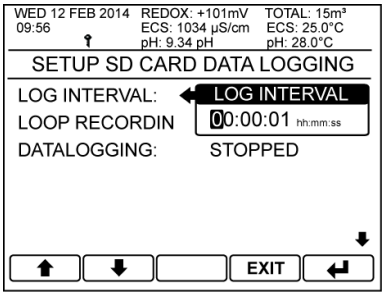
Data Logging

Select Setup SD Card Data Logging.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Log Interval

Enter the time interval of the SD card data logging.

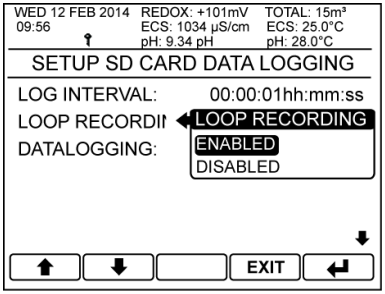
Note. If logging at 1 sample per second, 1GB of space on the SD card will provide at least 40 Days of logging.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



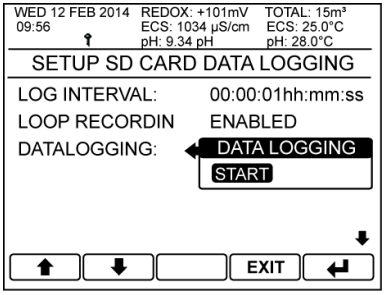
Loop Recording

If enabled, when the SD card becomes full the instrument will automatically delete the oldest data log file and then continue to log.
If loop recording is disabled the instrument will automatically stop recording if the SD card becomes full and set an error message.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Data Logging Start/Stop

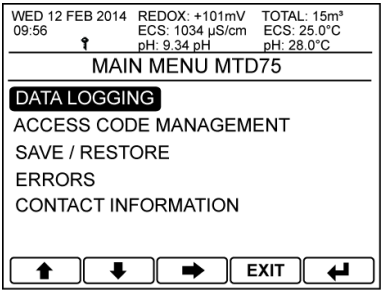
Shows the current status of the data logging (Stopped / Recording) and allows the logging to be started and stopped. When the data logging is active the SD card active symbol will be shown at the top of the screen.
Note: If a large number of files are present on the SD card there may be a delay whilst the software is searching the card for a clear space. Whilst the card is being searched the SD card active symbol will flash.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

View SD Card Data Logging



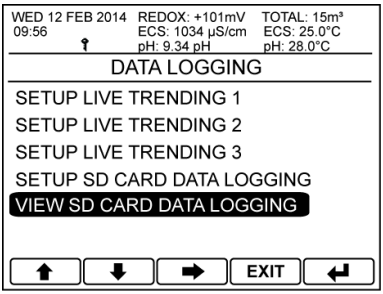
Main Menu

From the front screen press the menu button to show the main menu options and select Data Logging.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



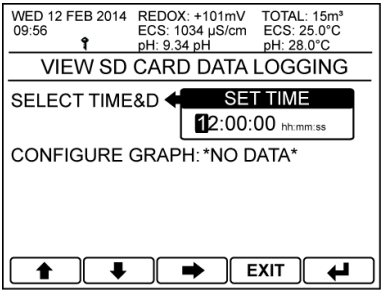
Data Logging

Select View SD Card Data Logging.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

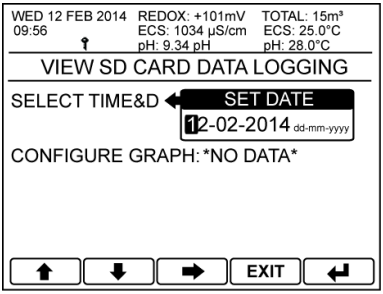
↵ – Enter Option



Select Time & Date

Enter the time and date of the data to be viewed. If the SD card contains no data at the selected time and date then the configure graph shows *No Data*.

Note. If the SD card contains many files then there may be a delay whilst the card is searched.

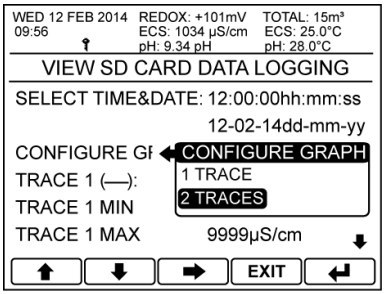


⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



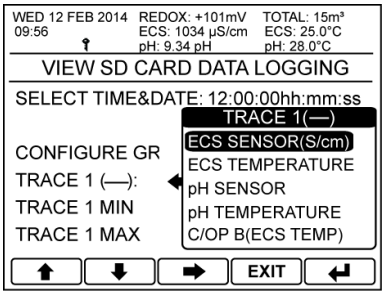
Configure Graph

Select how many traces to show on the graph.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



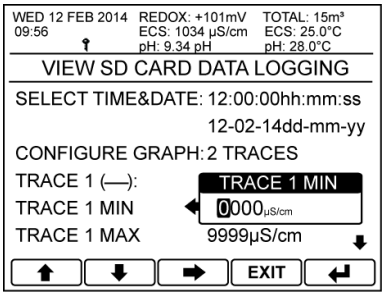
Trace 1 (——)

Select which measurement Trace 1 (left hand side axis) is to be associated with. The options shown depend on the configuration of the instrument.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Trace Min

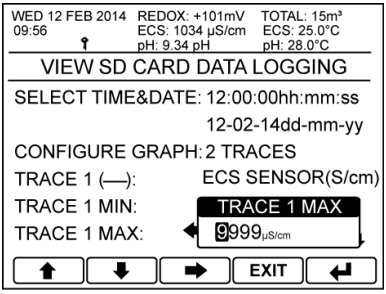
Enter the Trace's minimum displayed value. Adjust in conjunction with the maximum displayed value to increase the measurements displayed resolution.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Trace Max

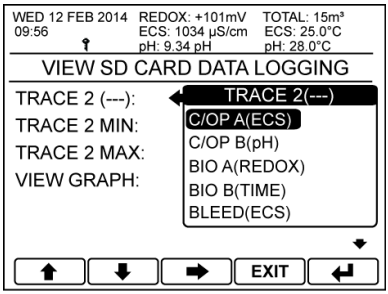
Enter the Trace's maximum displayed value. Adjust in conjunction with the minimum displayed value to increase the measurements displayed resolution.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



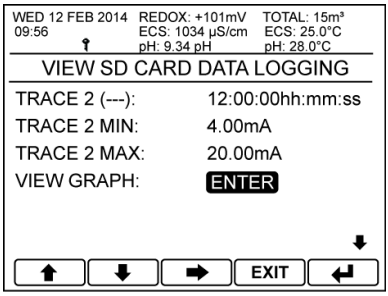
Trace 2 (---)

Select which measurement Trace 2 (right hand side axis) is to be associated with. The options shown depend on the configuration of the instrument. Then configure trace 2's min and max as before with trace 1.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



View Graph

View the configured graph.

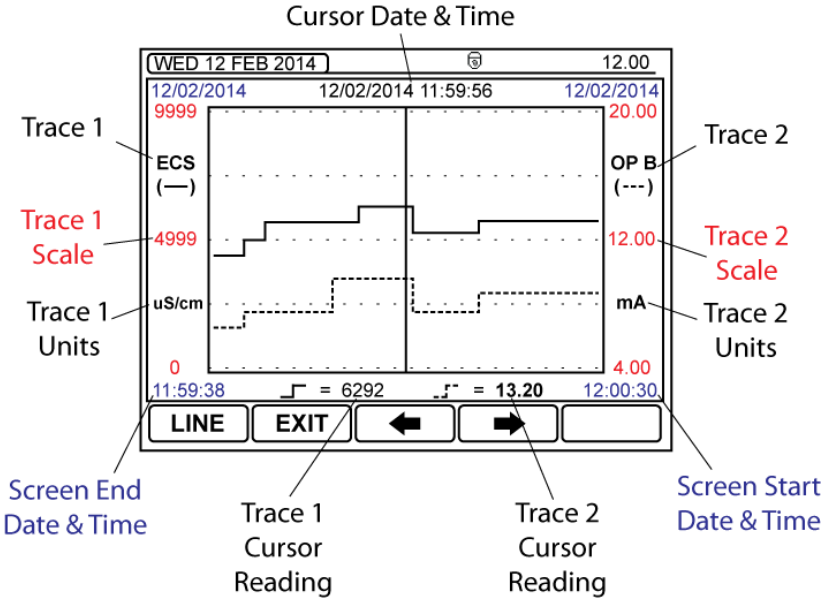
⬆/⬇ – Select Option

EXIT – Cancel

↵ – Enter Option

SD Card Data Logging Graph

Once Configured the SD card Data Logging Graph starts by showing the closest reading to the one selected by the time and date. The user can then use the cursor to scroll backwards and forwards in time through the log on the SD card. Each screen shows 50 readings. For faster scrolling the user can turn on page mode where by the screen jumps a page at a time through the readings. Where a break occurs in the trace you have reached the end of one file and the beginning of the next. Note: there may be a delay in scrolling when new data is loaded from the SD card.



LINE/ PAGE	– Toggles between the cursor moving a line at a time or at a page at a time.
EXIT	– Press to exit and return to View SD Card Data Logging menu.
⬅ or ➡	– Moves the cursor across the screen. The pointed to value will be displayed at the bottom of the screen and the time at the top.

Viewing the SD Card Data Log on a PC

Before the user removes the card from the controller they must first stop the SD Card data logging (see page 175) and the SD card active symbol  must not be present at the top of the screen.
Once removed place the SD card in the card reader connected to the pc. Open the SD card in the file explorer and browse to either the Data Logging folder to view the SD card data logging or the Live Trend folder to view the live trend log saves.

Each file is limited to 65535 logs; when this limit is reached the instrument will automatically create a new file. The instrument will also automatically create a new file if the configuration of the instrument is changed whilst the data logging is active.

Each file name contains the date and time of when it was created. The data is stored as a comma separated variable (CSV), which can be read by Microsoft Excel.

The first column of data contains the date and time of each sample. Note: by default Excel hides the seconds value, to display this you need to apply a custom format to the column as follows: dd/mm/yyyy hh:mm:ss.

The proceeding columns contain:

- Enabled Dosing and control functions relays, where 0 = off, 100 = fully on. When using a proportional control mode this number represents the biocide output as a percentage of the proportional band.
- Enabled Sensor reading and units.
- Any secondary readings and units i.e. temperature.
- The output level of any enabled current output.
- The status of any enabled digital inputs, where 0 = inactive and 1 = active.
- Any active error messages.

! Beware the file is not protected; changes can be made and may be irreversible. If any changes are made it may affect the ability for the instrument to read the file if it is placed back into the instrument.

BLANK

Appendix A – Customer Setup

MTD75	
Instrument Serial Number	
Redox Card Fitted	
Redox Card Serial Number	
Electrodeless Conductivity Card Fitted	
Electrodeless Conductivity Card Serial Number	
Dose After	
pH Card Fitted	
pH Card Serial Number	
Output Option Card Fitted	
Output Option Serial Number	

Biocide A	
Source	
Mode	
Setpoint	
Dose After	
Timed Dose	
Dose Per	
Dose Every	
Dose Monday	
Dose Monday Time of Day	
Dose Monday Duration	
Dose Tuesday	
Dose Tuesday Time of Day	
Dose Tuesday Duration	
Dose Wednesday	
Dose Wednesday Time of Day	
Dose Wednesday Duration	
Dose Thursday	
Dose Thursday Time of Day	
Dose Thursday Duration	
Dose Friday	
Dose Friday Time of Day	

Biocide A Continued	
Dose Friday Duration	
Dose Saturday	
Dose Saturday Time of Day	
Dose Saturday Duration	
Dose Sunday	
Dose Sunday Time of Day	
Dose Sunday Duration	
Dose Duration	
Output Mode	
Stroke Rate	
Cycle Time	
Time Proportional Band	
Dose Alarm	
Dose Alarm Time	
Bleed Inhibit	
Bleed Inhibit Time	
Pre Bleed	
Pre Bleed Time	
Manual Dose Duration	

Biocide B	
Source	
Mode	
Ratio A:B	
Dose After	
Timed Dose	
Dose Per	
Dose Every	
Dose Monday	
Dose Monday Time of Day	
Dose Monday Duration	
Dose Tuesday	
Dose Tuesday Time of Day	
Dose Tuesday Duration	
Dose Wednesday	

Biocide B Continued	
Dose Wednesday Time of Day	
Dose Wednesday Duration	
Dose Thursday	
Dose Thursday Time of Day	
Dose Thursday Duration	
Dose Friday	
Dose Friday Time of Day	
Dose Friday Duration	
Dose Saturday	
Dose Saturday Time of Day	
Dose Saturday Duration	
Dose Sunday	
Dose Sunday Time of Day	
Dose Sunday Duration	
Dose Duration	
Output Mode	
Stroke Rate	
Bleed Inhibit	
Bleed Inhibit Time	
Pre Bleed	
Pre Bleed Time	
Manual Dose Duration	

Bleed	
Source	
Mode	
Setpoint	
Bleed After	
Timed Bleed	
Bleed Per	
Bleed Every	
Bleed Monday	
Bleed Monday Time of Day	
Bleed Monday Duration	

Bleed Continued	
Bleed Tuesday	
Bleed Tuesday Time of Day	
Bleed Tuesday Duration	
Bleed Wednesday	
Bleed Wednesday Time of Day	
Bleed Wednesday Duration	
Bleed Thursday	
Bleed Thursday Time of Day	
Bleed Thursday Duration	
Bleed Friday	
Bleed Friday Time of Day	
Bleed Friday Duration	
Bleed Saturday	
Bleed Saturday Time of Day	
Bleed Saturday Duration	
Bleed Sunday	
Bleed Sunday Time of Day	
Bleed Sunday Duration	
Bleed Duration	
Dose Alarm	
Dose Alarm Time	
Manual Dose Duration	

Inhibitor	
Source	
Mode	
Bleed Time	
Dose After	
Timed Dose	
Dose Per	
Dose Every	
Dose Monday	
Dose Monday Time of Day	
Dose Monday Duration	

Inhibitor Continued	
Dose Tuesday	
Dose Tuesday Time of Day	
Dose Tuesday Duration	
Dose Wednesday	
Dose Wednesday Time of Day	
Dose Wednesday Duration	
Dose Thursday	
Dose Thursday Time of Day	
Dose Thursday Duration	
Dose Friday	
Dose Friday Time of Day	
Dose Friday Duration	
Dose Saturday	
Dose Saturday Time of Day	
Dose Saturday Duration	
Dose Sunday	
Dose Sunday Time of Day	
Dose Sunday Duration	
Dose Duration	
Output Mode	
Stroke Rate	
Bleed Inhibit	
Bleed Inhibit Time	
Pre Bleed	
Pre Bleed Time	
Manual Dose Duration	

pH Control	
Source	
Mode	
Setpoint	
Trigger	
Dose After	
Timed Dose	

pH Control Continued	
Dose Per	
Dose Every	
Dose Monday	
Dose Monday Time of Day	
Dose Monday Duration	
Dose Tuesday	
Dose Tuesday Time of Day	
Dose Tuesday Duration	
Dose Wednesday	
Dose Wednesday Time of Day	
Dose Wednesday Duration	
Dose Thursday	
Dose Thursday Time of Day	
Dose Thursday Duration	
Dose Friday	
Dose Friday Time of Day	
Dose Friday Duration	
Dose Saturday	
Dose Saturday Time of Day	
Dose Saturday Duration	
Dose Sunday	
Dose Sunday Time of Day	
Dose Sunday Duration	
Dose Duration	
Output Mode	
Stroke Rate	
Cycle Time	
Time Proportional Band	
Dose Alarm	
Dose Alarm Time	
Bleed Inhibit	
Bleed Inhibit Time	
Pre Bleed	
Pre Bleed Time	
Manual Dose Duration	

Alarm Relay	
Source	

Redox Input	
Enabled	
Mode	
Redox Filter	

Electrodeless Conductivity Input	
Enabled	
Mode	
Units	
Sensor Type	
Cell Constant	
TDS Factor	
Temperature Input Sensor	
Temperature Units	
Temperature Compensation	
Temperature Compensation Mode	
Manual Temperature Input	
Temperature Compensation Base	
Temperature Compensation Slope	
ECS Filter	

pH Input	
Enabled	
Mode	
Temperature Input Sensor	
Temperature Units	
Temperature Compensation Mode	
Manual Temperature Input	
pH Filter	

Redox Calibration	
Mode	
Offset Value	
Front Cal Access	
Calibration Reminder	
Calibration Interval	
Next Calibration Date	

Electrodeless Conductivity Calibration	
Mode	
Calibration Manual Temp	
Slope Value	
Temperature Offset	
Front Cal Access	
Calibration Reminder	
Calibration Interval	
Next Calibration Date	

pH Calibration	
Mode	
Calibration Principle	
Calibration Manual Temp	
Offset Value	
Slope Value	
Temperature Offset	
Sensor Condition	
Front Cal Access	
Calibration Reminder	
Calibration Interval	
Next Calibration Date	

pH Calibration Custom Buffer			
No. of Points			
Nominal Value			
Point	Temperature	Buffer Value	Buffer Value
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			

Current Output A	
Input Source	
Output	
Zero	
Span	
On Error	

Current Output B	
Input Source	
Output	
Zero	
Span	
On Error	

Current Output C	
Input Source	
Output	
Zero	
Span	
On Error	

Current Output D	
Input Source	
Output	
Zero	
Span	
On Error	

Digital Input 1	
Function (Fixed)	Water Meter
Polarity	

Digital Input 2	
Function (Fixed)	Flow Switch
Polarity	

Digital Input 3	
Relay	
Function	
Remote Dose Time	
Polarity	
4-20mA OP Level	

Digital Input 4	
Relay	
Function	
Remote Dose Time	
Polarity	
4-20mA OP Level	

Digital Input 5	
Relay	
Function	
Remote Dose Time	
Polarity	
4-20mA OP Level	

Configuration	
Daylight Savings	
DST Start Date	
DST Start Time	
DST End Date	
DST End Time	
K Factor	
Water Meter Timeout	
Redox Service Alarm	
Redox Service Alarm Interval	
Electrodeless Conductivity Service Alarm	
Electrodeless Conductivity Service Alarm Interval	
pH Service Alarm	
pH Service Alarm Interval	

Optional Software Functions	
Modbus RS485	
Data Logging	

Modbus RS485	
Mode	
Slave Address	
Baud Rate	
Parity	

Live Trending 1	
Configure Trend	
Trace 1(—)	
Trace 1 Min	
Trace 1 Max	
Trace 2(---)	
Trace 2 Min	
Trace 2 Max	
Trend Interval	

Live Trending 2	
Configure Trend	
Trace 1(—)	
Trace 1 Min	
Trace 1 Max	
Trace 2(---)	
Trace 2 Min	
Trace 2 Max	
Trend Interval	

Live Trending 3	
Configure Trend	
Trace 1(—)	
Trace 1 Min	
Trace 1 Max	
Trace 2(---)	
Trace 2 Min	
Trace 2 Max	
Trend Interval	

SD Card Data Logging	
Log Interval	
Loop Recording	

Appendix B - Temperature Data

The table below lists approximate resistance values of temperature sensors that may be used with the MTD75. Not all options are available on all sensor types.

Temperature (°C)	PT1000 RTD	PT100 RTD
0	1000.0Ω	100.00Ω
10	1039.0Ω	103.90Ω
20	1077.9Ω	107.79Ω
25	1097.3Ω	109.73Ω
30	1116.7Ω	111.67Ω
40	1155.4Ω	115.54Ω
50	1194.0Ω	119.40Ω
60	1232.4Ω	123.24Ω
70	1270.7Ω	127.07Ω
80	1308.9Ω	130.89Ω
90	1347.0Ω	134.70Ω
100	1385.0Ω	138.50Ω

Appendix C – Temperature Coefficient

Calculating the temperature coefficient of a solution

If the temperature coefficient of the solution being monitored is not known, the controller can be used to determine that coefficient. You should set the sensor's temperature coefficient to 0.0% or temperature compensation to "Out".
The following measurements should be made as near to the normal operating point as practical, between 5°C and 70°C for the highest accuracy. Immerse the measuring cell in at least 500 ml of the solution to be evaluated, allow sufficient time to stabilise, approximately one or two minutes, and then record both the temperature and conductivity readings. Raise the solution temperature by at least 10°C and again record the temperature and conductivity readings. Using the following equation, the temperature compensation slope can be calculated in percentage terms:

$$\alpha = \frac{(Gx-Gy) \times 100\%}{Gy(Tx-25) - Gx(Ty-25)} \quad \text{(base temperature 25°C)}$$

Note: If the base temperature is set to 20°C, then replace 25 with 20 in the above equation.

Term	Description
Gx	Conductivity in µS/cm at temperature Tx
Gy	Conductivity in µS/cm at temperature Ty

Note: One of these measurements can be made at ambient temperature.

Set the temperature compensation slope to the calculated value. The temperature compensation is now set up for normal operation.
If it is difficult or impossible to evaluate the temperature compensation slope using this method, a 2.0 % / °C setting will generally give a good first approximation until the true value can be determined by independent means.

Appendix D – Modbus RS485 Registers

Note. The availability of some of the registers depends upon the configuration of the controller.

Register #	Access Rule	Name	Data Format	Description of Attribute	Semantics of Values
Relay States					
2000	Get	Bio A Relay	INT	The state of the Biocide A relay	0 = Relay Off 1 = Relay On 2 = Relay Over Dosed
2001	Get	Bio B Relay	INT	The state of the Biocide B relay	0 = Relay Off 1 = Relay On
2002	Get	Bleed Relay	INT	The state of the Bleed relay	0 = Relay Off 1 = Relay On 2 = Relay Over Dosed 4 = Relay Delay
2003	Get	Inhibitor Relay	INT	The state of the Inhibitor relay	0 = Relay Off 1 = Relay On
2004	Get	pH Relay	INT	The state of the pH relay	0 = Relay Off 1 = Relay On 2 = Relay Over Dosed
2005	Get	Alarm Relay	INT	The state of the Alarm Relay	0 = Relay Off 1 = Relay On
Total Water Counter					
2010	Get	Total Water	FLOAT	The total amount of water the controller has measured.	0 to 9999 Cubic Meters

Biocide A Relay Last and Next Dose Information					
2020	Get	Bio A Next Dose Hrs	INT	The time of the Next Biocide A Dose – Hour element	0 to 23 Hour
2021	Get	Bio A Next Dose Mins	INT	The time of the next Biocide A Dose – Minute element	0 to 59 Minute
2022	Get	Bio A Next Dose Date	INT	The time of the next Biocide A Dose – Day of month element	0 to 31 Day of month
2023	Get	Bio A Next Dose Month	INT	The time of the next Biocide A Dose – Month of Year element	0 to 12 Month of Year
2024	Get	Bio A Next Dose Year	INT	The time of the next Biocide A Dose – Year element	0 to 3000 Year
2025	Get	Bio A Last Dose Hrs	INT	The time of the last Biocide A Dose – Hour element	0 to 23 Hour
2026	Get	Bio A Last Dose Mins	INT	The time of the last Biocide A Dose – Minute element	0 to 59 Minute
2027	Get	Bio A Last Dose Date	INT	The time of the last Biocide A Dose – Day of month element	0 to 31 Day of month
2028	Get	Bio A Last Dose Month	INT	The time of the last Biocide A Dose – Month of Year element	0 to 12 Month of Year
2029	Get	Bio A Last Dose Year	INT	The time of the last Biocide A Dose – Year element	0 to 3000 Year
2030	Get	Bio A Next Volume	Float	The volume of water remaining till the next Biocide A Dose	0 to 99.99 Cubic Meters
2032	Get	Bio A Last Volume	Float	The volume of water measured since the last Biocide A Dose	0 to 99.99 Cubic Meters

Biocide B Relay Last and Next Dose Information					
2060	Get	Bio B Next Dose Hrs	INT	The time of the Next Biocide B Dose – Hour element	0 to 23 Hour
2061	Get	Bio B Next Dose Mins	INT	The time of the next Biocide B Dose – Minute element	0 to 59 Minute
2062	Get	Bio B Next Dose Date	INT	The time of the next Biocide B Dose – Day of month element	0 to 31 Day of month
2063	Get	Bio B Next Dose Month	INT	The time of the next Biocide B Dose – Month of Year element	0 to 12 Month of Year
2064	Get	Bio B Next Dose Year	INT	The time of the next Biocide B Dose – Year element	0 to 3000 Year
2065	Get	Bio B Last Dose Hrs	INT	The time of the last Biocide B Dose – Hour element	0 to 23 Hour
2066	Get	Bio B Last Dose Mins	INT	The time of the last Biocide B Dose – Minute element	0 to 59 Minute
2067	Get	Bio B Last Dose Date	INT	The time of the last Biocide B Dose – Day of month element	0 to 31 Day of month
2068	Get	Bio B Last Dose Month	INT	The time of the last Biocide B Dose – Month of Year element	0 to 12 Month of Year
2069	Get	Bio B Last Dose Year	INT	The time of the last Biocide B Dose – Year element	0 to 3000 Year
2070	Get	Bio B Next Volume	Float	The volume of water remaining till the next Biocide B Dose	0 to 99.99 Cubic Meters
2072	Get	Bio B Last Volume	Float	The volume of water measured since the last Biocide B Dose	0 to 99.99 Cubic Meters

Bleed Relay Last and Next Bleed Information					
2100	Get	Next Bleed Hrs	INT	The time of the Next Bleed – Hour element	0 to 23 Hour
2101	Get	Next Bleed Mins	INT	The time of the next Bleed – Minute element	0 to 59 Minute
2102	Get	Next Bleed Date	INT	The time of the next Bleed – Day of month element	0 to 31 Day of month
2103	Get	Next Bleed Month	INT	The time of the next Bleed – Month of Year element	0 to 12 Month of Year
2104	Get	Next Bleed Year	INT	The time of the next Bleed – Year element	0 to 3000 Year
2105	Get	Last Bleed Hrs	INT	The time of the last Bleed – Hour element	0 to 23 Hour
2106	Get	Last Bleed Mins	INT	The time of the last Bleed – Minute element	0 to 59 Minute
2107	Get	Last Bleed Date	INT	The time of the last Bleed – Day of month element	0 to 31 Day of month
2108	Get	Last Bleed Month	INT	The time of the last Bleed – Month of Year element	0 to 12 Month of Year
2109	Get	Last Bleed Year	INT	The time of the last Bleed – Year element	0 to 3000 Year
2110	Get	Next Bleed Volume	Float	The volume of water remaining till the next Bleed	0 to 99.99 Cubic Meters
2112	Get	Last Bleed Volume	Float	The volume of water measured since the last Bleed	0 to 99.99 Cubic Meters

Inhibitor Relay Last and Next Dose Information					
2140	Get	Inh Next Dose Hrs	INT	The time of the Next Inhibitor Dose – Hour element	0 to 23 Hour
2141	Get	Inh Next Dose Mins	INT	The time of the next Inhibitor Dose – Minute element	0 to 59 Minute
2142	Get	Inh Next Dose Date	INT	The time of the next Inhibitor Dose – Day of month element	0 to 31 Day of month
2143	Get	Inh Next Dose Month	INT	The time of the next Inhibitor Dose – Month of Year element	0 to 12 Month of Year
2144	Get	Inh Next Dose Year	INT	The time of the next Inhibitor Dose – Year element	0 to 3000 Year
2145	Get	Inh Last Dose Hrs	INT	The time of the last Inhibitor Dose – Hour element	0 to 23 Hour
2146	Get	Inh Last Dose Mins	INT	The time of the last Inhibitor Dose – Minute element	0 to 59 Minute
2147	Get	Inh Last Dose Date	INT	The time of the last Inhibitor Dose – Day of month element	0 to 31 Day of month
2148	Get	Inh Last Dose Month	INT	The time of the last Inhibitor Dose – Month of Year element	0 to 12 Month of Year
2149	Get	Inh Last Dose Year	INT	The time of the last Inhibitor Dose – Year element	0 to 3000 Year
2150	Get	Inh Next Volume	Float	The volume of water remaining till the next Inhibitor Dose	0 to 99.99 Cubic Meters
2152	Get	Inh Last Volume	Float	The volume of water measured since the last Inhibitor Dose	0 to 99.99 Cubic Meters

pH Control Relay Last and Next Dose Information					
2180	Get	PH Next Dose Hrs	INT	The time of the Next pH Control Dose – Hour element	0 to 23 Hour
2181	Get	PH Next Dose Mins	INT	The time of the next pH Control Dose – Minute element	0 to 59 Minute
2182	Get	PH Next Dose Date	INT	The time of the next pH Control Dose – Day of month element	0 to 31 Day of month
2183	Get	PH Next Dose Month	INT	The time of the next pH Control Dose – Month of Year element	0 to 12 Month of Year
2184	Get	PH Next Dose Year	INT	The time of the next pH Control Dose – Year element	0 to 3000 Year
2185	Get	PH Last Dose Hrs	INT	The time of the last pH Control Dose – Hour element	0 to 23 Hour
2186	Get	PH Last Dose Mins	INT	The time of the last pH Control Dose – Minute element	0 to 59 Minute
2187	Get	PH Last Dose Date	INT	The time of the last pH Control Dose – Day of month element	0 to 31 Day of month
2188	Get	PH Last Dose Month	INT	The time of the last pH Control Dose – Month of Year element	0 to 12 Month of Year
2189	Get	PH Last Dose Year	INT	The time of the last pH Control Dose – Year element	0 to 3000 Year
2190	Get	PH Next Volume	Float	The volume of water remaining till the next pH Control Dose	0 to 99.99 Cubic Meters
2192	Get	PH Last Volume	Float	The volume of water measured since the last pH Control Dose	0 to 99.99 Cubic Meters

Redox Sensor Readings					
2220	Get	Redox Reading	FLOAT	The current Redox sensor mV reading	-2000 to +2000 Millivolts

Electrodeless Conductivity Sensor Readings					
2230	Get	ECS Cond Reading	FLOAT	The current Electrodeless Conductivity sensor Conductivity reading	0 to 9999 µS/cm
2232	Get	ECS TDS Reading	FLOAT	The current Electrodeless Conductivity sensor Total Dissolved Solids reading	0 to 9999 ppm
2234	Get	ECS Temp Reading	FLOAT	The current Electrodeless Conductivity sensor Temperature reading	-50.0 to 300.0 °C or -58.0 to 572.0 °F

pH Sensor Readings					
2240	Get	pH Reading	FLOAT	The current pH sensor pH reading	0.00 to 14.00 pH
2242	Get	pH Temp Reading	FLOAT	The current pH sensor Temperature reading	-50.0 to 300.0 °C or -58.0 to 572.0 °F

Current Output Values					
2260	Get	Current A Output	FLOAT	The current output A mA output	0.00 to 22.00mA
2262	Get	Current B Output	FLOAT	The current output B mA output	0.00 to 22.00mA
2264	Get	Current C Output	FLOAT	The current output C mA output	0.00 to 22.00mA
2266	Get	Current D Output	FLOAT	The current output D mA output	0.00 to 22.00mA

Biocide A Configuration Integer Variables					
2300	Get/Set	Bio A Source	INT	The relay Trigger Source	1480 = Off 1481 = Volume 1482 = Time 1484 = Redox 1488 = ÷ Meter 1489 = X Meter
2301	Get/Set	Bio A Mode	INT	The current operating mode of the relay	1080 = Online 1081 = Offline
2302	Get/Set	Bio A Redox Setpoint	INT	The redox setpoint value below which the Biocide A relay will energise.	-2000 to 2000 Millivolts
2303	Get/Set	Bio A ÷ Meter	INT	Generate pulse after the set counts of the water meter input.	0 to 99 Pulses
2304	Get/Set	Bio A X Meter	INT	Generate set number of pulses at each water meter input.	0 to 99 Pulses
2305	Get/Set	Bio A Timed Dose	INT	The status of the background timed dose enabled	1077 = No 1076 = Yes
2306	Get/Set	Bio A Dose Per	INT	Select the Dose cycle.	1500 = Hour 1501 = Day 1502 = Week
2307	Get/Set	Bio A Dose Min	INT	Enter the dose cycle time – Minutes element when dose per minute	0 to 59 Minutes
2308	Get/Set	Bio A Dose Sec	INT	Enter the dose cycle time – Seconds element when dose per minute	0 to 59 Seconds
2309	Get/Set	Bio A Dose Hour	INT	Enter the dose cycle time – Hours element when dose per hour	0 to 23 Hours
2310	Get/Set	Bio A Dose Min	INT	Enter the dose cycle time – Minutes element when dose per hour	0 to 59 Minutes
2311	Get	Bio A Dose Day	INT	Select how often to dose when using a background dose and the dose per is set to week.	1505 = Day 1506 = 2 Days 1507 = 3 Days 1508 = 4 Days 1509 = 5 Days 1510 = 6 Days 1511 = Week

Biocide A Configuration Integer Variables Continued					
2312	Get/Set	Bio A Dose Mon	INT	If timed dosing per week, does a Monday dose need to be carried out	1076 = Yes 1077 = No
2313	Get/Set	Bio A Mon Time Hour	INT	If dosing on a Monday, the time of day the dose occurs – Hour element	0 to 23 Hour
2314	Get/Set	Bio A Mon Time Min	INT	If dosing on a Sunday, the time of day the dose occurs – Minute element	0 to 59 Minute
2315	Get/Set	Bio A Mon Dur Min	INT	If dosing on a Monday, the set dose duration – Minutes element	0 to 99 Minutes
2316	Get/Set	Bio A Mon Dur Sec	INT	If dosing on a Monday, the set dose duration – Seconds element	0 to 59 Seconds
2317	Get/Set	Bio A Dose Tue	INT	If timed dosing per week, does a Tuesday dose need to be carried out	1076 = Yes 1077 = No
2318	Get/Set	Bio A Tue Time Hour	INT	If dosing on a Tuesday, the time of day the dose occurs – Hour element	0 to 23 Hour
2319	Get/Set	Bio A Tue Time Min	INT	If dosing on a Tuesday, the time of day the dose occurs – Minute element	0 to 59 Minute
2320	Get/Set	Bio A Tue Dur Min	INT	If dosing on a Tuesday, the set dose duration – Minutes element	0 to 99 Minutes
2321	Get/Set	Bio A Tue Dur Sec	INT	If dosing on a Tuesday, the set dose duration – Seconds element	0 to 59 Seconds
2322	Get/Set	Bio A Dose Wed	INT	If timed dosing per week, does a Wednesday dose need to be carried out	1076 = Yes 1077 = No
2323	Get/Set	Bio A Wed Time Hour	INT	If dosing on a Wednesday, the time of day the dose occurs – Hour element	0 to 23 Hour
2324	Get/Set	Bio A Wed Time Min	INT	If dosing on a Wednesday, the time of day the dose occurs – Minute element	0 to 59 Minute
2325	Get/Set	Bio A Wed Dur Min	INT	If dosing on a Wednesday, the set dose duration – Minutes element	0 to 99 Minutes
2326	Get/Set	Bio A Wed Dur Sec	INT	If dosing on a Wednesday, the set dose duration – Seconds element	0 to 59 Seconds
2327	Get/Set	Bio A Dose Thu	INT	If timed dosing per week, does a Thursday dose need to be carried out	1076 = Yes 1077 = No
2328	Get/Set	Bio A Thu Time Hour	INT	If dosing on a Thursday, the time of day the dose occurs – Hour element	0 to 23 Hour

Biocide A Configuration Integer Variables Continued					
2329	Get/Set	Bio A Thu Time Min	INT	If dosing on a Thursday, the time of day the dose occurs – Minute element	0 to 59 Minute
2330	Get/Set	Bio A Thu Dur Min	INT	If dosing on a Thursday, the set dose duration – Minutes element	0 to 99 Minutes
2331	Get/Set	Bio A Thu Dur Sec	INT	If dosing on a Thursday, the set dose duration – Seconds element	0 to 59 Seconds
2332	Get/Set	Bio A Dose Fri	INT	If timed dosing per week, does a Friday dose need to be carried out	1076 = Yes 1077 = No
2333	Get/Set	Bio A Fri Time Hour	INT	If dosing on a Friday, the time of day the dose occurs – Hour element	0 to 23 Hour
2334	Get/Set	Bio A Fri Time Min	INT	If dosing on a Friday, the time of day the dose occurs – Minute element	0 to 59 Minute
2335	Get/Set	Bio A Fri Dur Min	INT	If dosing on a Friday, the set dose duration – Minutes element	0 to 99 Minutes
2336	Get/Set	Bio A Fri Dur Sec	INT	If dosing on a Friday, the set dose duration – Seconds element	0 to 59 Seconds
2337	Get/Set	Bio A Dose Sat	INT	If timed dosing per week, does a Saturday dose need to be carried out	1076 = Yes 1077 = No
2338	Get/Set	Bio A Sat Time Hour	INT	If dosing on a Saturday, the time of day the dose occurs – Hour element	0 to 23 Hour
2339	Get/Set	Bio A Sat Time Min	INT	If dosing on a Saturday, the time of day the dose occurs – Minute element	0 to 59 Minute
2340	Get/Set	Bio A Sat Dur Min	INT	If dosing on a Saturday, the set dose duration – Minutes element	0 to 99 Minutes
2341	Get/Set	Bio A Sat Dur Sec	INT	If dosing on a Saturday, the set dose duration – Seconds element	0 to 59 Seconds
2342	Get/Set	Bio A Dose Sun	INT	If timed dosing per week, does a Sunday dose need to be carried out	1076 = Yes 1077 = No
2343	Get/Set	Bio A Sun Time Hour	INT	If dosing on a Sunday, the time of day the dose occurs – Hour element	0 to 23 Hour
2344	Get/Set	Bio A Sun Time Min	INT	If dosing on a Sunday, the time of day the dose occurs – Minute element	0 to 59 Minute
2345	Get/Set	Bio A Sun Dur Min	INT	If dosing on a Sunday, the set dose duration – Minutes element	0 to 99 Minutes

Biocide A Configuration Integer Variables Continued					
2346	Get/Set	Bio A Sun Dur Sec	INT	If dosing on a Sunday, the set dose duration – Seconds element	0 to 59 Seconds
2347	Get/Set	Bio A Day Time Hour	INT	Set the time of day – Hour element, when using a background dose and the dose per is set to week.	0 to 23 Hour
2348	Get/Set	Bio A Day Time Min	INT	Set the time of day – Minute element, when using a background dose and the dose per is set to week.	0 to 59 Minute
2349	Get/Set	Bio A Dose Dur Min	INT	The set dose duration – Minutes element	0 to 99 Minutes
2350	Get/Set	Bio A Dose Dur Sec	INT	The set dose duration – Seconds element	0 to 59 Seconds
2351	Get/Set	Bio A Output Mode	INT	The relay output mode	1495 = On-Off 1496 = Pulse 1497 = Time Proportional
2352	Get/Set	Bio A Stroke Rate	INT	The set pump stroke rate	1 to 180 Pulses / Minute
2353	Get/Set	Bio A Cycle Min	INT	The time proportional cycle time – Minutes element	0 to 59 Minutes
2354	Get/Set	Bio A Cycle Sec	INT	The time proportional cycle time – Seconds element	0 to 59 Seconds
2355	Get/Set	Bio A Prop Band	INT	The setpoint proportional band.	0 to 999 Millivolts
2356	Get/Set	Bio A Dose Alarm	INT	The status of the dose alarm enable	1077 = No 1076 = Yes
2357	Get/Set	Bio A Dose Alm Hour	INT	Set the dose alarm time – Hour element	0 to 23 Hour
2358	Get/Set	Bio A Dose Alm Min	INT	Set the dose alarm time – Minute element	0 to 59 Minute
2359	Get/Set	Bio A Bleed Inh	INT	The current Bleed inhibit enabled status	1077 = No 1076 = Yes
2360	Get/Set	Bio A Bleed Inh Hour	INT	Set the bleed inhibit time – Hour element	0 to 23 Hour
2361	Get/Set	Bio A Bleed Inh Min	INT	Set the bleed inhibit time – Minute element	0 to 59 Minute
2362	Get/Set	Bio A Pre Bleed	INT	The current pre Bleed enabled status	1077 = No 1076 = Yes
2363	Get/Set	Bio A Pre Bleed Min	INT	Set the pre bleed time – Minutes element	0 to 99 Minutes
2364	Get/Set	Bio A Pre Bleed Sec	INT	Set the pre bleed time – Seconds element	0 to 59 Seconds
2365	Get/Set	Bio A Man Dose Min	INT	Set the manual dose time – Minutes element	0 to 99 Minutes
2366	Get/Set	Bio A Man Dose Sec	INT	Set the manual dose time – Seconds element	0 to 59 Seconds

Biocide A Configuration Floating Point Variables					
2380	Get/Set	Bio A Vol	FLOAT	Set the volume of water required to pass before the relay will energise	0.01 to 99.99 Cubic Meters

Biocide B Configuration Integer Variables					
2400	Get/Set	Bio B Source	INT	The relay Trigger Source	1480 = Off 1481 = Volume 1482 = Time 1488 = ÷ Meter 1489 = X Meter 1490 = Ratio
2401	Get/Set	Bio B Mode	INT	The current operating mode of the relay	1080 = Online 1081 = Offline
2402	Get/Set	Bio B Ratio	INT	The set Biocide A to Biocide B ratio	1 to 6 : 1
2403	Get/Set	Bio B ÷ Meter	INT	Generate pulse after the set counts of the water meter input.	0 to 99 Pulses
2404	Get/Set	Bio B X Meter	INT	Generate set number of pulses at each water meter input.	0 to 99 Pulses
2405	Get/Set	Bio B Timed Dose	INT	The status of the background timed dose enabled	1077 = No 1078 = Yes
2406	Get/Set	Bio B Dose Per	INT	Select the Dose cycle.	1500 = Hour 1501 = Day 1502 = Week
2407	Get/Set	Bio B Dose Min	INT	Enter the dose cycle time – Minutes element when dose per Minutes	0 to 59 Minutes
2408	Get/Set	Bio B Dose Sec	INT	Enter the dose cycle time – Seconds element when dose per Minutes	0 to 59 Seconds
2409	Get/Set	Bio B Dose Hour	INT	Enter the dose cycle time – Hours element when dose per hour	0 to 23 Hours
2410	Get/Set	Bio B Dose Min	INT	Enter the dose cycle time – Minutes element when dose per hour	0 to 59 Minutes
2411	Get	Bio B Dose Day	INT	Select how often to dose when using a background dose and the dose per is set to week.	1505 = Day 1506 = 2 Days 1507 = 3 Days 1508 = 4 Days 1509 = 5 Days 1510 = 6 Days 1511 = Week
2412	Get/Set	Bio B Dose Mon	INT	If timed dosing per week, does a Monday dose need to be carried out	1076 = Yes 1077 = No
2413	Get/Set	Bio B Mon Time Hour	INT	If dosing on a Monday, the time of day the dose occurs – Hour element	0 to 23 Hour

Biocide B Configuration Integer Variables Continued					
2414	Get/Set	Bio B Mon Time Min	INT	If dosing on a Monday, the time of day the dose occurs – Minute element	0 to 59 Minute
2415	Get/Set	Bio B Mon Dur Min	INT	If dosing on a Monday, the set dose duration – Minutes element	0 to 99 Minutes
2416	Get/Set	Bio B Mon Dur Sec	INT	If dosing on a Monday, the set dose duration – Seconds element	0 to 59 Seconds
2417	Get/Set	Bio B Dose Tue	INT	If timed dosing per week, does a Tuesday dose need to be carried out	1076 = Yes 1077 = No
2418	Get/Set	Bio B Tue Time Hour	INT	If dosing on a Tuesday, the time of day the dose occurs – Hour element	0 to 23 Hour
2419	Get/Set	Bio B Tue Time Min	INT	If dosing on a Tuesday, the time of day the dose occurs – Minute element	0 to 59 Minute
2420	Get/Set	Bio B Tue Dur Min	INT	If dosing on a Tuesday, the set dose duration – Minutes element	0 to 99 Minutes
2421	Get/Set	Bio B Tue Dur Sec	INT	If dosing on a Tuesday, the set dose duration – Seconds element	0 to 59 Seconds
2422	Get/Set	Bio B Dose Wed	INT	If timed dosing per week, does a Wednesday dose need to be carried out	1076 = Yes 1077 = No
2423	Get/Set	Bio B Wed Time Hour	INT	If dosing on a Wednesday, the time of day the dose occurs – Hour element	0 to 23 Hour
2424	Get/Set	Bio B Wed Time Min	INT	If dosing on a Wednesday, the time of day the dose occurs – Minute element	0 to 59 Minute
2425	Get/Set	Bio B Wed Dur Min	INT	If dosing on a Wednesday, the set dose duration – Minutes element	0 to 99 Minutes
2426	Get/Set	Bio B Wed Dur Sec	INT	If dosing on a Wednesday, the set dose duration – Seconds element	0 to 59 Seconds
2427	Get/Set	Bio B Dose Thu	INT	If timed dosing per week, does a Thursday dose need to be carried out	1076 = Yes 1077 = No
2428	Get/Set	Bio B Thu Time Hour	INT	If dosing on a Thursday, the time of day the dose occurs – Hour element	0 to 23 Hour
2429	Get/Set	Bio B Thu Time Min	INT	If dosing on a Thursday, the time of day the dose occurs – Minute element	0 to 59 Minute
2430	Get/Set	Bio B Thu Dur Min	INT	If dosing on a Thursday, the set dose duration – Minutes element	0 to 99 Minutes

Biocide B Configuration Integer Variables Continued					
2431	Get/Set	Bio B Thu Dur Sec	INT	If dosing on a Thursday, the set dose duration – Seconds element	0 to 59 Seconds
2432	Get/Set	Bio B Dose Fri	INT	If timed dosing per week, does a Friday dose need to be carried out	1076 = Yes 1077 = No
2433	Get/Set	Bio B Fri Time Hour	INT	If dosing on a Friday, the time of day the dose occurs – Hour element	0 to 23 Hour
2434	Get/Set	Bio B Fri Time Min	INT	If dosing on a Friday, the time of day the dose occurs – Minute element	0 to 59 Minute
2435	Get/Set	Bio B Fri Dur Min	INT	If dosing on a Friday, the set dose duration – Minutes element	0 to 99 Minutes
2436	Get/Set	Bio B Fri Dur Sec	INT	If dosing on a Friday, the set dose duration – Seconds element	0 to 59 Seconds
2437	Get/Set	Bio B Dose Sat	INT	If timed dosing per week, does a Saturday dose need to be carried out	1076 = Yes 1077 = No
2438	Get/Set	Bio B Sat Time Hour	INT	If dosing on a Saturday, the time of day the dose occurs – Hour element	0 to 23 Hour
2439	Get/Set	Bio B Sat Time Min	INT	If dosing on a Saturday, the time of day the dose occurs – Minute element	0 to 59 Minute
2440	Get/Set	Bio B Sat Dur Min	INT	If dosing on a Saturday, the set dose duration – Minutes element	0 to 99 Minutes
2441	Get/Set	Bio B Sat Dur Sec	INT	If dosing on a Saturday, the set dose duration – Seconds element	0 to 59 Seconds
2442	Get/Set	Bio B Dose Sun	INT	If timed dosing per week, does a Sunday dose need to be carried out	1076 = Yes 1077 = No
2443	Get/Set	Bio B Sun Time Hour	INT	If dosing on a Sunday, the time of day the dose occurs – Hour element	0 to 23 Hour
2444	Get/Set	Bio B Sun Time Min	INT	If dosing on a Sunday, the time of day the dose occurs – Minute element	0 to 59 Minute
2445	Get/Set	Bio B Sun Dur Min	INT	If dosing on a Sunday, the set dose duration – Minutes element	0 to 99 Minutes
2446	Get/Set	Bio B Sun Dur Sec	INT	If dosing on a Sunday, the set dose duration – Seconds element	0 to 59 Seconds
2447	Get/Set	Bio B Day Time Hour	INT	Set the time of day – Hour element, when using a background dose and the dose per is set to week.	0 to 23 Hour

Biocide B Configuration Integer Variables Continued					
2448	Get/Set	Bio B Day Time Min	INT	Set the time of day – Minute element, when using a background dose and the dose per is set to week.	0 to 59 Minute
2449	Get/Set	Bio B Dose Dur Min	INT	The set dose duration – Minutes element	0 to 99 Minutes
2450	Get/Set	Bio B Dose Dur Sec	INT	The set dose duration – Seconds element	0 to 59 Seconds
2451	Get/Set	Bio B Output Mode	INT	The relay output mode	1495 = On-Off 1496 = Pulse
2452	Get/Set	Bio B Stroke Rate	INT	The set pump stroke rate	1 to 180 Pulses / Minute
2453	Get/Set	Bio B Bleed Inh	INT	The current Bleed inhibit enabled status	1077 = No 1078 = Yes
2454	Get/Set	Bio B Bleed Inh Hour	INT	Set the bleed inhibit time – Hour element	0 to 23 Hour
2455	Get/Set	Bio B Bleed Inh Min	INT	Set the bleed inhibit time – Minute element	0 to 59 Minute
2456	Get/Set	Bio B Pre Bleed	INT	The current pre Bleed enabled status	1077 = No 1078 = Yes
2457	Get/Set	Bio B Pre Bleed Min	INT	Set the pre bleed time – Minutes element	0 to 99 Minutes
2458	Get/Set	Bio B Pre Bleed Sec	INT	Set the pre bleed time – Seconds element	0 to 59 Seconds
2459	Get/Set	Bio B Man Dose Min	INT	Set the manual dose time – Minutes element	0 to 99 Minutes
2460	Get/Set	Bio B Man Dose Sec	INT	Set the manual dose time – Seconds element	0 to 59 Seconds

Biocide B Configuration Floating Point Variables					
2480	Get/Set	Bio B Vol	FLOAT	Set the volume of water required to pass before the relay will energise	0.01 to 99.99 Cubic Meters

Bleed Configuration Integer Variables					
2500	Get/Set	Bleed Source	INT	The relay Trigger Source	1480 = Off 1481 = Volume 1482 = Time 1487 = ECS
2501	Get/Set	Bleed Mode	INT	The current operating mode of the relay	1080 = Online 1081 = Offline
2502	Get/Set	Bleed ECS Setpoint	INT	The electrodeless conductivity setpoint value below which the bleed relay will energise.	0 to 9999 µS/cm or 0 to 9999 ppm
2503	Get/Set	Timed Bleed	INT	The status of the background timed bleed enabled	1077 = No 1078 = Yes
2504	Get/Set	Bleed Per	INT	Select the bleed cycle.	1500 = Hour 1501 = Day 1502 = Week

Bleed Configuration Integer Variables Continued					
2505	Get/Set	Bleed Min	INT	Enter the bleed cycle time – Minutes element when bleed per Minute	0 to 59 Minutes
2506	Get/Set	Bleed Sec	INT	Enter the bleed cycle time – Seconds element when bleed per Minute	0 to 59 Seconds
2507	Get/Set	Bleed Hour	INT	Enter the bleed cycle time – Hours element when bleed per hour	0 to 23 Hours
2508	Get/Set	Bleed Min	INT	Enter the bleed cycle time – Minutes element when bleed per hour	0 to 59 Minutes
2509	Get	Bleed Day	INT	Select how often to bleed when using a background bleed and the bleed per is set to week.	1505 = Day 1506 = 2 Days 1507 = 3 Days 1508 = 4 Days 1509 = 5 Days 1510 = 6 Days 1511 = Week
2510	Get/Set	Bleed Mon	INT	If timed bleeding per week, does a Monday bleed need to be carried out	1076 = Yes 1077 = No
2511	Get/Set	Bleed Mon Time Hour	INT	If bleeding on a Monday, the time of day the bleed occurs – Hour element	0 to 23 Hour
2512	Get/Set	Bleed Mon Time Min	INT	If bleeding on a Sunday, the time of day the bleed occurs – Minute element	0 to 59 Minute
2513	Get/Set	Bleed Mon Dur Min	INT	If bleeding on a Monday, the set bleed duration – Minutes element	0 to 99 Minutes
2514	Get/Set	Bleed Mon Dur Sec	INT	If bleeding on a Monday, the set bleed duration – Seconds element	0 to 59 Seconds
2515	Get/Set	Bleed Tue	INT	If timed bleeding per week, does a Tuesday bleed need to be carried out	1076 = Yes 1077 = No
2516	Get/Set	Bleed Tue Time Hour	INT	If bleeding on a Tuesday, the time of day the bleed occurs – Hour element	0 to 23 Hour
2517	Get/Set	Bleed Tue Time Min	INT	If bleeding on a Tuesday, the time of day the bleed occurs – Minute element	0 to 59 Minute
2518	Get/Set	Bleed Tue Dur Min	INT	If bleeding on a Tuesday, the set bleed duration – Minutes element	0 to 99 Minutes
2519	Get/Set	Bleed Tue Dur Sec	INT	If bleeding on a Tuesday, the set bleed duration – Seconds element	0 to 59 Seconds
2520	Get/Set	Bleed Wed	INT	If timed bleeding per week, does a Wednesday bleed need to be carried out	1076 = Yes 1077 = No

Bleed Configuration Integer Variables Continued					
2521	Get/Set	Bleed Wed Time Hour	INT	If bleeding on a Wednesday, the time of day the bleed occurs – Hour element	0 to 23 Hour
2522	Get/Set	Bleed Wed Time Min	INT	If bleeding on a Wednesday, the time of day the bleed occurs – Minute element	0 to 59 Minute
2523	Get/Set	Bleed Wed Dur Min	INT	If bleeding on a Wednesday, the set bleed duration – Minutes element	0 to 99 Minutes
2524	Get/Set	Bleed Wed Dur Sec	INT	If bleeding on a Wednesday, the set bleed duration – Seconds element	0 to 59 Seconds
2525	Get/Set	Bleed Thu	INT	If timed bleeding per week, does a Thursday bleed need to be carried out	1076 = Yes 1077 = No
2526	Get/Set	Bleed Thu Time Hour	INT	If bleeding on a Thursday, the time of day the bleed occurs – Hour element	0 to 23 Hour
2527	Get/Set	Bleed Thu Time Min	INT	If bleeding on a Thursday, the time of day the bleed occurs – Minute element	0 to 59 Minute
2528	Get/Set	Bleed Thu Dur Min	INT	If bleeding on a Thursday, the set bleed duration – Minutes element	0 to 99 Minutes
2529	Get/Set	Bleed Thu Dur Sec	INT	If bleeding on a Thursday, the set bleed duration – Seconds element	0 to 59 Seconds
2530	Get/Set	Bleed Fri	INT	If timed bleeding per week, does a Friday bleed need to be carried out	1076 = Yes 1077 = No
2531	Get/Set	Bleed Fri Time Hour	INT	If bleeding on a Friday, the time of day the bleed occurs – Hour element	0 to 23 Hour
2532	Get/Set	Bleed Fri Time Min	INT	If bleeding on a Friday, the time of day the bleed occurs – Minute element	0 to 59 Minute
2533	Get/Set	Bleed Fri Dur Min	INT	If bleeding on a Friday, the set bleed duration – Minutes element	0 to 99 Minutes
2534	Get/Set	Bleed Fri Dur Sec	INT	If bleeding on a Friday, the set bleed duration – Seconds element	0 to 59 Seconds
2535	Get/Set	Bleed Sat	INT	If timed bleeding per week, does a Saturday bleed need to be carried out	1076 = Yes 1077 = No
2536	Get/Set	Bleed Sat Time Hour	INT	If bleeding on a Saturday, the time of day the bleed occurs – Hour element	0 to 23 Hour
2537	Get/Set	Bleed Sat Time Min	INT	If bleeding on a Saturday, the time of day the bleed occurs – Minute element	0 to 59 Minute

Bleed Configuration Integer Variables Continued					
2538	Get/Set	Bleed Sat Dur Min	INT	If bleeding on a Saturday, the set bleed duration – Minutes element	0 to 99 Minutes
2539	Get/Set	Bleed Sat Dur Sec	INT	If bleeding on a Saturday, the set bleed duration – Seconds element	0 to 59 Seconds
2540	Get/Set	Bleed Sun	INT	If timed bleeding per week, does a Sunday bleed need to be carried out	1076 = Yes 1077 = No
2541	Get/Set	Bleed Sun Time Hour	INT	If bleeding on a Sunday, the time of day the bleed occurs – Hour element	0 to 23 Hour
2542	Get/Set	Bleed Sun Time Min	INT	If bleeding on a Sunday, the time of day the bleed occurs – Minute element	0 to 59 Minute
2543	Get/Set	Bleed Sun Dur Min	INT	If bleeding on a Sunday, the set bleed duration – Minutes element	0 to 99 Minutes
2544	Get/Set	Bleed Sun Dur Sec	INT	If bleeding on a Sunday, the set bleed duration – Seconds element	0 to 59 Seconds
2545	Get/Set	Bleed Day Time Hour	INT	Set the time of day – Hour element, when using a background bleed and the bleed per is set to week.	0 to 23 Hour
2546	Get/Set	Bleed Day Time Min	INT	Set the time of day – Minute element, when using a background bleed and the bleed per is set to week.	0 to 59 Minute
2547	Get/Set	Bleed Dur Min	INT	The set bleed duration – Minutes element	0 to 99 Minutes
2548	Get/Set	Bleed Dur Sec	INT	The set bleed duration – Seconds element	0 to 59 Seconds
2549	Get/Set	Bleed Alarm	INT	The status of the bleed alarm enable	1077 = No 1078 = Yes
2550	Get/Set	Bleed Alm Hour	INT	Set the bleed alarm time – Hour element	0 to 23 Hour
2551	Get/Set	Bleed Alm Min	INT	Set the bleed alarm time – Minute element	0 to 59 Minute
2552	Get/Set	Man Bleed Min	INT	Set the manual bleed time – Minutes element	0 to 99 Minutes
2553	Get/Set	Man Bleed Sec	INT	Set the manual bleed time – Seconds element	0 to 59 Seconds

Bleed Configuration Floating Point Variables					
2580	Get/Set	Bleed Vol	FLOAT	Set the volume of water required to pass before the relay will energise	0.01 to 99.99 Cubic Meters

Inhibitor Configuration Integer Variables					
2600	Get/Set	Inhibitor Source	INT	The relay Trigger Source	1480 = Off 1481 = Volume 1482 = Time 1485 = Bleed 1488 = ÷ Meter 1489 = X Meter
2601	Get/Set	Inhibitor Mode	INT	The current operating mode of the relay	1080 = Online 1081 = Offline
2602	Get/Set	Inhibitor Bleed Time Hour	INT	Set the Bleed time – Hour Element, when Trigger set to Bleed	0 to 23 Hours
2603	Get/Set	Inhibitor ÷ Meter	INT	Generate pulse after the set counts of the water meter input.	0 to 99 Pulses
2604	Get/Set	Inhibitor X Meter	INT	Generate set number of pulses at each water meter input.	0 to 99 Pulses
2605	Get/Set	Inhibitor Bleed Time Min	INT	Set the Bleed time – Minute Element, when Trigger set to Bleed	0 to 59 Minutes
2606	Get/Set	Inhibitor Timed Dose	INT	The status of the background timed dose enabled	1077 = No 1078 = Yes
2607	Get/Set	Inhibitor Dose Per	INT	Select the Dose cycle.	1500 = Hour 1501 = Day 1502 = Week
2608	Get/Set	Inhibitor Dose Min	INT	Enter the dose cycle time – Minutes element when dose per Minute	0 to 59 Minutes
2609	Get/Set	Inhibitor Dose Sec	INT	Enter the dose cycle time – Seconds element when dose per Minute	0 to 59 Seconds
2610	Get/Set	Inhibitor Dose Hour	INT	Enter the dose cycle time – Hours element when dose per hour	0 to 23 Hours
2611	Get/Set	Inhibitor Dose Min	INT	Enter the dose cycle time – Minutes element when dose per hour	0 to 59 Minutes
2612	Get	Inhibitor Dose Day	INT	Select how often to dose when using a background dose and the dose per is set to week.	1505 = Day 1506 = 2 Days 1507 = 3 Days 1508 = 4 Days 1509 = 5 Days 1510 = 6 Days 1511 = Week
2613	Get/Set	Inhibitor Dose Mon	INT	If timed dosing per week, does a Monday dose need to be carried out	1076 = Yes 1077 = No
2614	Get/Set	Inhibitor Mon Time Hour	INT	If dosing on a Monday, the time of day the dose occurs – Hour element	0 to 23 Hour

Inhibitor Configuration Integer Variables Continued					
2615	Get/Set	Inhibitor Mon Time Min	INT	If dosing on a Sunday, the time of day the dose occurs – Minute element	0 to 59 Minute
2616	Get/Set	Inhibitor Mon Dur Min	INT	If dosing on a Monday, the set dose duration – Minutes element	0 to 99 Minutes
2617	Get/Set	Inhibitor Mon Dur Sec	INT	If dosing on a Monday, the set dose duration – Seconds element	0 to 59 Seconds
2618	Get/Set	Inhibitor Dose Tue	INT	If timed dosing per week, does a Tuesday dose need to be carried out	1076 = Yes 1077 = No
2619	Get/Set	Inhibitor Tue Time Hour	INT	If dosing on a Tuesday, the time of day the dose occurs – Hour element	0 to 23 Hour
2620	Get/Set	Inhibitor Tue Time Min	INT	If dosing on a Tuesday, the time of day the dose occurs – Minute element	0 to 59 Minute
2621	Get/Set	Inhibitor Tue Dur Min	INT	If dosing on a Tuesday, the set dose duration – Minutes element	0 to 99 Minutes
2622	Get/Set	Inhibitor Tue Dur Sec	INT	If dosing on a Tuesday, the set dose duration – Seconds element	0 to 59 Seconds
2623	Get/Set	Inhibitor Dose Wed	INT	If timed dosing per week, does a Wednesday dose need to be carried out	1076 = Yes 1077 = No
2624	Get/Set	Inhibitor Wed Time Hour	INT	If dosing on a Wednesday, the time of day the dose occurs – Hour element	0 to 23 Hour
2625	Get/Set	Inhibitor Wed Time Min	INT	If dosing on a Wednesday, the time of day the dose occurs – Minute element	0 to 59 Minute
2626	Get/Set	Inhibitor Wed Dur Min	INT	If dosing on a Wednesday, the set dose duration – Minutes element	0 to 99 Minutes
2627	Get/Set	Inhibitor Wed Dur Sec	INT	If dosing on a Wednesday, the set dose duration – Seconds element	0 to 59 Seconds
2628	Get/Set	Inhibitor Dose Thu	INT	If timed dosing per week, does a Thursday dose need to be carried out	1076 = Yes 1077 = No
2629	Get/Set	Inhibitor Thu Time Hour	INT	If dosing on a Thursday, the time of day the dose occurs – Hour element	0 to 23 Hour
2630	Get/Set	Inhibitor Thu Time Min	INT	If dosing on a Thursday, the time of day the dose occurs – Minute element	0 to 59 Minute
2631	Get/Set	Inhibitor Thu Dur Min	INT	If dosing on a Thursday, the set dose duration – Minutes element	0 to 99 Minutes

Inhibitor Configuration Integer Variables Continued					
2632	Get/Set	Inhibitor Thu Dur Sec	INT	If dosing on a Thursday, the set dose duration – Seconds element	0 to 59 Seconds
2633	Get/Set	Inhibitor Dose Fri	INT	If timed dosing per week, does a Friday dose need to be carried out	1076 = Yes 1077 = No
2634	Get/Set	Inhibitor Fri Time Hour	INT	If dosing on a Friday, the time of day the dose occurs – Hour element	0 to 23 Hour
2635	Get/Set	Inhibitor Fri Time Min	INT	If dosing on a Friday, the time of day the dose occurs – Minute element	0 to 59 Minute
2636	Get/Set	Inhibitor Fri Dur Min	INT	If dosing on a Friday, the set dose duration – Minutes element	0 to 99 Minutes
2637	Get/Set	Inhibitor Fri Dur Sec	INT	If dosing on a Friday, the set dose duration – Seconds element	0 to 59 Seconds
2638	Get/Set	Inhibitor Dose Sat	INT	If timed dosing per week, does a Saturday dose need to be carried out	1076 = Yes 1077 = No
2639	Get/Set	Inhibitor Sat Time Hour	INT	If dosing on a Saturday, the time of day the dose occurs – Hour element	0 to 23 Hour
2640	Get/Set	Inhibitor Sat Time Min	INT	If dosing on a Saturday, the time of day the dose occurs – Minute element	0 to 59 Minute
2641	Get/Set	Inhibitor Sat Dur Min	INT	If dosing on a Saturday, the set dose duration – Minutes element	0 to 99 Minutes
2642	Get/Set	Inhibitor Sat Dur Sec	INT	If dosing on a Saturday, the set dose duration – Seconds element	0 to 59 Seconds
2643	Get/Set	Inhibitor Dose Sun	INT	If timed dosing per week, does a Sunday dose need to be carried out	1076 = Yes 1077 = No
2644	Get/Set	Inhibitor Sun Time Hour	INT	If dosing on a Sunday, the time of day the dose occurs – Hour element	0 to 23 Hour
2645	Get/Set	Inhibitor Sun Time Min	INT	If dosing on a Sunday, the time of day the dose occurs – Minute element	0 to 59 Minute
2646	Get/Set	Inhibitor Sun Dur Min	INT	If dosing on a Sunday, the set dose duration – Minutes element	0 to 99 Minutes
2647	Get/Set	Inhibitor Sun Dur Sec	INT	If dosing on a Sunday, the set dose duration – Seconds element	0 to 59 Seconds
2648	Get/Set	Inhibitor Day Time Hour	INT	Set the time of day – Hour element, when using a background dose and the dose per is set to week.	0 to 23 Hour

Inhibitor Configuration Integer Variables Continued					
2649	Get/Set	Inhibitor Day Time Min	INT	Set the time of day – Minute element, when using a background dose and the dose per is set to week.	0 to 59 Minute
2650	Get/Set	Inhibitor Dose Dur Min	INT	The set dose duration – Minutes element	0 to 99 Minutes
2651	Get/Set	Inhibitor Dose Dur Sec	INT	The set dose duration – Seconds element	0 to 59 Seconds
2652	Get/Set	Inhibitor Output Mode	INT	The relay output mode	1495 = On-Off 1496 = Pulse
2653	Get/Set	Inhibitor Stroke Rate	INT	The set pump stroke rate	1 to 180 Pulses / Minute
2654	Get/Set	Inhibitor Bleed Inh	INT	The current Bleed inhibit enabled status	1077 = No 1078 = Yes
2655	Get/Set	Inhibitor Bleed Inh Hour	INT	Set the bleed inhibit time – Hour element	0 to 23 Hours
2656	Get/Set	Inhibitor Bleed Inh Min	INT	Set the bleed inhibit time – Minute element	0 to 59 Minutes
2657	Get/Set	Inhibitor Pre Bleed	INT	The current pre Bleed enabled status	1077 = No 1078 = Yes
2658	Get/Set	Inhibitor Pre Bleed Min	INT	Set the pre bleed time – Minutes element	0 to 99 Minutes
2659	Get/Set	Inhibitor Pre Bleed Sec	INT	Set the pre bleed time – Seconds element	0 to 59 Seconds
2660	Get/Set	Inhibitor Man Dose Min	INT	Set the manual dose time – Minutes element	0 to 99 Minutes
2661	Get/Set	Inhibitor Man Dose Sec	INT	Set the manual dose time – Seconds element	0 to 59 Seconds

Inhibitor Configuration Floating Point Variables					
2680	Get/Set	Inhibitor Vol	FLOAT	Set the volume of water required to pass before the relay will energise	0.01 to 99.99 Cubic Meters

pH Control Configuration Integer Variables					
2700	Get/Set	pH Source	INT	The relay Trigger Source	1480 = Off 1481 = Volume 1482 = Time 1486 = pH 1488 = ÷ Meter 1489 = X Meter
2701	Get/Set	pH Mode	INT	The current operating mode of the relay	1080 = Online 1081 = Offline
2702	Get/Set	pH Trig Mode	INT	The current trigger mode of the relay	1173 = Trigger High 1174 = Trigger Low
2703	Get/Set	pH ÷ Meter	INT	Generate pulse after the set counts of the water meter input.	0 to 99 Pulses
2704	Get/Set	pH X Meter	INT	Generate set number of pulses at each water meter input.	0 to 99 Pulses

pH Control Configuration Integer Variables Continued					
2705	Get/Set	pH Timed Dose	INT	The status of the background timed dose enabled	1077 = No 1078 = Yes
2706	Get/Set	pH Dose Per	INT	Select the Dose cycle.	1500 = Hour 1501 = Day 1502 = Week
2707	Get/Set	pH Dose Min	INT	Enter the dose cycle time – Minutes element when dose per Minute	0 to 59 Minutes
2708	Get/Set	pH Dose Sec	INT	Enter the dose cycle time – Seconds element when dose per Minute	0 to 59 Seconds
2709	Get/Set	pH Dose Hour	INT	Enter the dose cycle time – Hour element when dose per hour	0 to 23 Hours
2710	Get/Set	pH Dose Min	INT	Enter the dose cycle time – Minutes element when dose per hour	0 to 59 Minutes
2711	Get	pH Dose Day	INT	Select how often to dose when using a background dose and the dose per is set to week.	1505 = Day 1506 = 2 Days 1507 = 3 Days 1508 = 4 Days 1509 = 5 Days 1510 = 6 Days 1511 = Week
2712	Get/Set	pH Dose Mon	INT	If timed dosing per week, does a Monday dose need to be carried out	1076 = Yes 1077 = No
2713	Get/Set	pH Mon Time Hour	INT	If dosing on a Monday, the time of day the dose occurs – Hour element	0 to 23 Hour
2714	Get/Set	pH Mon Time Min	INT	If dosing on a Sunday, the time of day the dose occurs – Minute element	0 to 59 Minute
2715	Get/Set	pH Mon Dur Min	INT	If dosing on a Monday, the set dose duration – Minutes element	0 to 99 Minutes
2716	Get/Set	pH Mon Dur Sec	INT	If dosing on a Monday, the set dose duration – Seconds element	0 to 59 Seconds
2717	Get/Set	pH Dose Tue	INT	If timed dosing per week, does a Tuesday dose need to be carried out	1076 = Yes 1077 = No
2718	Get/Set	pH Tue Time Hour	INT	If dosing on a Tuesday, the time of day the dose occurs – Hour element	0 to 23 Hour
2719	Get/Set	pH Tue Time Min	INT	If dosing on a Tuesday, the time of day the dose occurs – Minute element	0 to 59 Minute
2720	Get/Set	pH Tue Dur Min	INT	If dosing on a Tuesday, the set dose duration – Minutes element	0 to 99 Minutes

pH Control Configuration Integer Variables Continued					
2721	Get/Set	pH Tue Dur Sec	INT	If dosing on a Tuesday, the set dose duration – Seconds element	0 to 59 Seconds
2722	Get/Set	pH Dose Wed	INT	If timed dosing per week, does a Wednesday dose need to be carried out	1076 = Yes 1077 = No
2723	Get/Set	pH Wed Time Hour	INT	If dosing on a Wednesday, the time of day the dose occurs – Hour element	0 to 23 Hour
2724	Get/Set	pH Wed Time Min	INT	If dosing on a Wednesday, the time of day the dose occurs – Minute element	0 to 59 Minute
2725	Get/Set	pH Wed Dur Min	INT	If dosing on a Wednesday, the set dose duration – Minutes element	0 to 99 Minutes
2726	Get/Set	pH Wed Dur Sec	INT	If dosing on a Wednesday, the set dose duration – Seconds element	0 to 59 Seconds
2727	Get/Set	pH Dose Thu	INT	If timed dosing per week, does a Thursday dose need to be carried out	1076 = Yes 1077 = No
2728	Get/Set	pH Thu Time Hour	INT	If dosing on a Thursday, the time of day the dose occurs – Hour element	0 to 23 Hour
2729	Get/Set	pH Thu Time Min	INT	If dosing on a Thursday, the time of day the dose occurs – Minute element	0 to 59 Minute
2730	Get/Set	pH Thu Dur Min	INT	If dosing on a Thursday, the set dose duration – Minutes element	0 to 99 Minutes
2731	Get/Set	pH Thu Dur Sec	INT	If dosing on a Thursday, the set dose duration – Seconds element	0 to 59 Seconds
2732	Get/Set	pH Dose Fri	INT	If timed dosing per week, does a Friday dose need to be carried out	1076 = Yes 1077 = No
2733	Get/Set	pH Fri Time Hour	INT	If dosing on a Friday, the time of day the dose occurs – Hour element	0 to 23 Hour
2734	Get/Set	pH Fri Time Min	INT	If dosing on a Friday, the time of day the dose occurs – Minute element	0 to 59 Minute
2735	Get/Set	pH Fri Dur Min	INT	If dosing on a Friday, the set dose duration – Minutes element	0 to 99 Minutes
2736	Get/Set	pH Fri Dur Sec	INT	If dosing on a Friday, the set dose duration – Seconds element	0 to 59 Seconds
2737	Get/Set	pH Dose Sat	INT	If timed dosing per week, does a Saturday dose need to be carried out	1076 = Yes 1077 = No

pH Control Configuration Integer Variables Continued					
2738	Get/Set	pH Sat Time Hour	INT	If dosing on a Saturday, the time of day the dose occurs – Hour element	0 to 23 Hour
2739	Get/Set	pH Sat Time Min	INT	If dosing on a Saturday, the time of day the dose occurs – Minute element	0 to 59 Minute
2740	Get/Set	pH Sat Dur Min	INT	If dosing on a Saturday, the set dose duration – Minutes element	0 to 99 Minutes
2741	Get/Set	pH Sat Dur Sec	INT	If dosing on a Saturday, the set dose duration – Seconds element	0 to 59 Seconds
2742	Get/Set	pH Dose Sun	INT	If timed dosing per week, does a Sunday dose need to be carried out	1076 = Yes 1077 = No
2743	Get/Set	pH Sun Time Hour	INT	If dosing on a Sunday, the time of day the dose occurs – Hour element	0 to 23 Hour
2744	Get/Set	pH Sun Time Min	INT	If dosing on a Sunday, the time of day the dose occurs – Minute element	0 to 59 Minute
2745	Get/Set	pH Sun Dur Min	INT	If dosing on a Sunday, the set dose duration – Minutes element	0 to 99 Minutes
2746	Get/Set	pH Sun Dur Sec	INT	If dosing on a Sunday, the set dose duration – Seconds element	0 to 59 Seconds
2747	Get/Set	pH Day Time Hour	INT	Set the time of day – Hour element, when using a background dose and the dose per is set to week.	0 to 23 Hour
2748	Get/Set	pH Day Time Min	INT	Set the time of day – Minute element, when using a background dose and the dose per is set to week.	0 to 59 Minute
2749	Get/Set	pH Dose Dur Min	INT	The set dose duration – Minutes element	0 to 99 Minutes
2750	Get/Set	pH Dose Dur Sec	INT	The set dose duration – Seconds element	0 to 59 Seconds
2751	Get/Set	pH Output Mode	INT	The relay output mode	1495 = On-Off 1496 = Pulse 1497 = Time Proportional
2752	Get/Set	pH Stroke Rate	INT	The set pump stroke rate	1 to 180 Pulses / Minute
2753	Get/Set	pH Cycle Min	INT	The time proportional cycle time – Minutes element	0 to 99 Minutes
2754	Get/Set	pH Cycle Sec	INT	The time proportional cycle time – Seconds element	0 to 59 Seconds
2755	Get/Set	pH Dose Alarm	INT	The status of the dose alarm enable	1077 = No 1078 = Yes

pH Control Configuration Integer Variables Continued					
2756	Get/Set	pH Dose Alm Hour	INT	Set the dose alarm time – Hour element	0 to 23 Hour
2757	Get/Set	pH Dose Alm Min	INT	Set the dose alarm time – Minute element	0 to 59 Minute
2758	Get/Set	pH Bleed Inh	INT	The current Bleed inhibit enabled status	1077 = No 1078 = Yes
2759	Get/Set	pH Bleed Inh Hour	INT	Set the bleed inhibit time – Hour element	0 to 23 Hour
2760	Get/Set	pH Bleed Inh Min	INT	Set the bleed inhibit time – Minute element	0 to 59 Minute
2761	Get/Set	pH Pre Bleed	INT	The current pre Bleed enabled status	1077 = No 1078 = Yes
2762	Get/Set	pH Pre Bleed Min	INT	Set the pre bleed time – Minutes element	0 to 99 Minutes
2763	Get/Set	pH Pre Bleed Sec	INT	Set the pre bleed time – Seconds element	0 to 59 Seconds
2764	Get/Set	pH Man Dose Min	INT	Set the manual dose time – Minutes element	0 to 99 Minutes
2765	Get/Set	pH Man Dose Sec	INT	Set the manual dose time – Seconds element	0 to 59 Seconds

pH Control Configuration Floating Point Variables					
2780	Get/Set	pH Vol	FLOAT	Set the volume of water required to pass before the relay will energise	0.01 to 99.99 Cubic Meters
2782	Get/Set	pH Setpoint	FLOAT	The pH setpoint value below which the pH relay will energise.	0.00 to 14.00 pH
2784	Get/Set	pH Setpoint	FLOAT	The setpoint proportional band.	0.00 to 14.00 pH

Alarm Relay Configuration					
2800	Get/Set	Alm Source	INT	The Alarm relay Trigger Source	1580 = Off 1581 = Power 1582 = Input 1583 = Dose 1584 = Water Meter 1585 = Flow 1586 = Tank 1587 = Any Error

Redox Sensor Configuration Integer Variables					
2900	Get	Redox Card	INT	Is the Redox card present	1120 = Not Present 1122 = Redox Present
2901	Get/Set	Redox Enable	INT	The current status of the Redox sensor enable	1540 = Yes 1541 = No
2902	Get/Set	Redox Mode	INT	The current status of the Redox sensor Mode	1080 = Online 1081 = Offline
2903	Get/Set	Redox Input Filter	INT	The current status of the Redox Input Filter	1050 = OUT 1051 = 10 Seconds 1052 = 20 Seconds 1053 = 40 Seconds 1054 = 1 Minutes 1055 = 3 minutes 1056 = 5 Minutes

Redox Sensor Configuration Long Variables					
2940	Get	Redox Serial No.	LONG	The Serial Number of the Redox input card	0 to 9999999

Redox Sensor Calibration Integer Variables					
2960	Get/Set	Redox Cal Access	INT	The current status of the Redox Front Calibration Access	1076 = Yes 1077 = No
2961	Get/Set	Redox Cal Rem	INT	Calibration Reminder	1076 = Yes 1077 = No
2962	Get/Set	Redox Cal Rem Interval	INT	The Calibration Reminder Interval	0-999 Days
2963	Get/Set	Redox Cal Rem Date	INT	The time of the next Calibration Reminder – Date element	1-31 Day of month
2964	Get/Set	Redox Cal Rem Month	INT	The time of the next Calibration Reminder – Month element	1-12 Month of Year
2965	Get/Set	Redox Cal Rem Year	INT	The time of the next Calibration Reminder – Year element	0-99 Year
2966	Get	Redox Cal Offset	INT	The Redox User Cal offset value	-200 to +200 Millivolts

Electrodeless Conductivity Sensor Configuration Integer Variables					
3000	Get	ECS Card	INT	Is the Electrodeless Conductivity card present	1120 = Not Present 1123 = ECS Present
3001	Get/Set	ECS Enable	INT	The current status of the Electrodeless Conductivity sensor enable	1540 = Yes 1541 = No
3002	Get/Set	ECS Mode	INT	The current status of the Electrodeless Conductivity sensor Mode	1080 = Online 1081 = Offline
3003	Get/Set	ECS Units	INT	The Electrodeless Conductivity sensor units	1005 = Siemens 1007 = TDS(ppm)
3004	Get/Set	ECS Sensor Type	INT	The Electrodeless Conductivity sensor type	1180 = ECS20 1181 = ECS40 1183 = CUSTOM

Electrodeless Conductivity Sensor Configuration Integer Variables Continued					
3005	Get/Set	ECS Sensor Temp Type	INT	The Electrodeless Conductivity temperature sensor type	1069 = PT1000 1074 = Disabled
3006	Get/Set	ECS Temp Units	INT	The Electrodeless Conductivity sensor temperature units	1040 = °C 1041 = °F
3007	Get/Set	ECS Temp Comp	INT	The current status of the Electrodeless Conductivity sensor temperature compensation	1042 = In 1043 = Out
3008	Get/Set	ECS Temp Comp Mode	INT	The Electrodeless Conductivity sensor temperature compensation mode	1046 = Auto 1047 = Manual
3009	Get/Set	ECS Temp Comp Base	INT	The Electrodeless Conductivity sensor temperature compensation base	1044 = +20°C or +68°F 1045 = +25°C or +77°F
3010	Get/Set	ECS Input Filter	INT	The current status of the Electrodeless Conductivity Input Filter	1050 = OUT 1051 = 10 Seconds 1052 = 20 Seconds 1053 = 40 Seconds 1054 = 1 Minutes 1055 = 3 minutes 1056 = 5 Minutes

Electrodeless Conductivity Sensor Configuration Floating Point Variables					
3020	Get/Set	ECS Cell Const	FLOAT	The Electrodeless Conductivity Cell Constant	1.00 to 15.00
3022	Get/Set	ECS TDS Fact	FLOAT	The Electrodeless Conductivity TDS Factor	0.50 to 0.99
3024	Get/Set	ECS Temp Man Input	FLOAT	The Electrodeless Conductivity Temperature Compensation Manual Temperature Input	-20.0 to +150.0°C or -4.0 to +302.0°F
3026	Get/Set	ECS Temp Comp Slope	FLOAT	The Electrodeless Conductivity Temperature Compensation Slope	0.00 to 9.99 %/°C or 0.00 to 17.98 %/°F

Electrodeless Conductivity Sensor Configuration Long Variables					
3040	Get	ECS Serial No.	LONG	The Serial Number of the Electrodeless Conductivity input card	0 to 9999999

Electrodeless Conductivity Sensor Calibration Integer Variables					
3060	Get/Set	ECS Cal Access	INT	The current status of the Electrodeless Conductivity Front Calibration Access	1076 = Yes 1077 = No
3061	Get/Set	ECS Cal Rem	INT	Calibration Reminder	1076 = Yes 1077 = No
3062	Get/Set	ECS Cal Rem Interval	INT	The Calibration Reminder Interval	0-999 Days
3063	Get/Set	ECS Cal Rem Date	INT	The time of the next Calibration Reminder – Date element	1-31 Day of month

Electrodeless Conductivity Sensor Calibration Integer Variables Continued					
3064	Get/Set	ECS Cal Rem Month	INT	The time of the next Calibration Reminder – Month element	1-12 Month of Year
3065	Get/Set	ECS Cal Rem Year	INT	The time of the next Calibration Reminder – Year element	0-3999 Year

Electrodeless Conductivity Sensor Calibration Floating Point Variables					
3080	Get/Set	ECS Cal Temp Man Input	FLOAT	The Electrodeless Conductivity User Cal manual temperature input	-20.0 to +150.0°C or -4.0 to +302.0°F
3082	Get	ECS Cal Offset	FLOAT	The Electrodeless Conductivity User Cal Solution Offset value	80.00 to 120.00%
3084	Get	ECS Temp Cal Offset	FLOAT	The Electrodeless Conductivity Temperature User Cal Offset value	-25.0 to +25.0°C or -13.0 to +77.0°F

pH Sensor Configuration Integer Variables					
3100	Get	pH Card	INT	Is the pH card present	1120 = Not Present 1122 = pH Present
3101	Get/Set	pH Enable	INT	The current status of the pH sensor enable	1540 = Yes 1541 = No
3102	Get/Set	pH Mode	INT	The current status of the pH sensor Mode	1080 = Online 1081 = Offline
3103	Get/Set	pH Sensor Temp Type	INT	The pH temperature sensor type	1069 = PT1000 1070 = PT100 1074 = Disabled
3104	Get/Set	pH Temp Units	INT	The pH sensor temperature units	1040 = °C 1041 = °F
3105	Get/Set	pH Temp Comp Mode	INT	The pH sensor temperature compensation mode	1046 = Auto 1047 = Manual
3106	Get/Set	ECS Input Filter	INT	The current status of the Electrodeless Conductivity Input Filter	1050 = OUT 1051 = 10 Seconds 1052 = 20 Seconds 1053 = 40 Seconds 1054 = 1 Minutes 1055 = 3 minutes 1056 = 5 Minutes

pH Sensor Configuration Floating Point Variables					
3120	Get/Set	pH Temp Man Input	FLOAT	The pH Temperature Compensation Manual Temperature Input	-20.0 to +150.0°C or -4.0 to +302.0°F

pH Sensor Configuration Long Variables					
3140	Get	pH Serial No.	LONG	The Serial Number of the pH input card	0 to 9999999

pH Sensor Calibration Integer Variables					
3160	Get/Set	pH Cal Principle	INT	The pH User Cal Principle	1438 = Auto 1439 = Manual
3161	Get	pH Sensor Cond	INT	The current condition of the pH Sensor	0 = Sensor Okay 1 = Replace Sensor Soon 2 = Replace Sensor
3162	Get/Set	pH Cal Access	INT	The current status of the pH Front Calibration Access	1076 = Yes 1077 = No
3163	Get/Set	pH Cal Rem	INT	Calibration Reminder	1076 = Yes 1077 = No
3164	Get/Set	pH Cal Rem Interval	INT	The Calibration Reminder Interval	0-999 Days
3165	Get/Set	pH Cal Rem Date	INT	The time of the next Calibration Reminder – Date element	1-31 Day of month
3166	Get/Set	pH Cal Rem Month	INT	The time of the next Calibration Reminder – Month element	1-12 Month of Year
3167	Get/Set	pH Cal Rem Year	INT	The time of the next Calibration Reminder – Year element	0-3999 Year
3168	Get/Set	pH Cal Buffer Points	INT	The number of pH Custom Buffer Points	1-13

pH Sensor Calibration Floating Point Variables					
3180	Get/Set	pH Cal Temp Man Input	FLOAT	The pH User Cal manual temperature input	-20.0 to +150.0°C or -4.0 to +302.0°F
3182	Get	pH Cal Offset	FLOAT	The pH User Cal Offset value	-2.00 to +2.00pH
3184	Get	pH Cal Slope	FLOAT	The pH User Cal Slope value	70.00 to 130.00%
3186	Get	pH Temp Cal Offset	FLOAT	The pH Temperature User Cal Offset value	-25.0 to +25.0°C or -13.0 to +77.0°F
3188	Get/Set	pH Cal Buffer Temp 1	FLOAT	The pH User Cal Custom Buffer Temperature Point 1	-20.0 to +150.0°C or -4.0 to +302.0°F
3190	Get/Set	pH Cal Buffer 4pH 1	FLOAT	The pH User Cal Custom 4pH Buffer Point 1	0.00 to 14.00pH
3192	Get/Set	pH Cal Buffer 9pH 1	FLOAT	The pH User Cal Custom 9pH Buffer Point 1	0.00 to 14.00pH
3194	Get/Set	pH Cal Buffer Temp 2	FLOAT	The pH User Cal Custom Buffer Temperature Point 2	-20.0 to +150.0°C or -4.0 to +302.0°F
3196	Get/Set	pH Cal Buffer 4pH 2	FLOAT	The pH User Cal Custom 4pH Buffer Point 2	0.00 to 14.00pH
3198	Get/Set	pH Cal Buffer 9pH 2	FLOAT	The pH User Cal Custom 9pH Buffer Point 2	0.00 to 14.00pH
3200	Get/Set	pH Cal Buffer Temp 3	FLOAT	The pH User Cal Custom Buffer Temperature Point 3	-20.0 to +150.0°C or -4.0 to +302.0°F
3202	Get/Set	pH Cal Buffer 4pH 3	FLOAT	The pH User Cal Custom 4pH Buffer Point 3	0.00 to 14.00pH
3204	Get/Set	pH Cal Buffer 9pH 3	FLOAT	The pH User Cal Custom 9pH Buffer Point 3	0.00 to 14.00pH
3206	Get/Set	pH Cal Buffer Temp 4	FLOAT	The pH User Cal Custom Buffer Temperature Point 4	-20.0 to +150.0°C or -4.0 to +302.0°F

pH Sensor Calibration Floating Point Variables Continued					
3208	Get/Set	pH Cal Buffer 4pH 4	FLOAT	The pH User Cal Custom 4pH Buffer Point 4	0.00 to 14.00pH
3210	Get/Set	pH Cal Buffer 9pH 4	FLOAT	The pH User Cal Custom 9pH Buffer Point 4	0.00 to 14.00pH
3212	Get/Set	pH Cal Buffer Temp 5	FLOAT	The pH User Cal Custom Buffer Temperature Point 5	-20.0 to +150.0°C or -4.0 to +302.0°F
3214	Get/Set	pH Cal Buffer 4pH 5	FLOAT	The pH User Cal Custom 4pH Buffer Point 5	0.00 to 14.00pH
3216	Get/Set	pH Cal Buffer 9pH 5	FLOAT	The pH User Cal Custom 9pH Buffer Point 5	0.00 to 14.00pH
3218	Get/Set	pH Cal Buffer Temp 6	FLOAT	The pH User Cal Custom Buffer Temperature Point 6	-20.0 to +150.0°C or -4.0 to +302.0°F
3220	Get/Set	pH Cal Buffer 4pH 6	FLOAT	The pH User Cal Custom 4pH Buffer Point 6	0.00 to 14.00pH
3222	Get/Set	pH Cal Buffer 9pH 6	FLOAT	The pH User Cal Custom 9pH Buffer Point 6	0.00 to 14.00pH
3224	Get/Set	pH Cal 7Buffer Temp 7	FLOAT	The pH User Cal Custom Buffer Temperature Point 7	-20.0 to +150.0°C or -4.0 to +302.0°F
3226	Get/Set	pH Cal Buffer 4pH 7	FLOAT	The pH User Cal Custom 4pH Buffer Point 7	0.00 to 14.00pH
3228	Get/Set	pH Cal Buffer 9pH 7	FLOAT	The pH User Cal Custom 9pH Buffer Point 7	0.00 to 14.00pH
3230	Get/Set	pH Cal Buffer Temp 8	FLOAT	The pH User Cal Custom Buffer Temperature Point 8	-20.0 to +150.0°C or -4.0 to +302.0°F
3232	Get/Set	pH Cal Buffer 4pH 8	FLOAT	The pH User Cal Custom 4pH Buffer Point 8	0.00 to 14.00pH
3234	Get/Set	pH Cal Buffer 9pH 8	FLOAT	The pH User Cal Custom 9pH Buffer Point 8	0.00 to 14.00pH
3236	Get/Set	pH Cal Buffer Temp 9	FLOAT	The pH User Cal Custom Buffer Temperature Point 9	-20.0 to +150.0°C or -4.0 to +302.0°F
3238	Get/Set	pH Cal Buffer 4pH 9	FLOAT	The pH User Cal Custom 4pH Buffer Point 9	0.00 to 14.00pH
3240	Get/Set	pH Cal Buffer 9pH 9	FLOAT	The pH User Cal Custom 9pH Buffer Point 9	0.00 to 14.00pH
3242	Get/Set	pH Cal Buffer Temp 10	FLOAT	The pH User Cal Custom Buffer Temperature Point 10	-20.0 to +150.0°C or -4.0 to +302.0°F
3244	Get/Set	pH Cal Buffer 4pH 10	FLOAT	The pH User Cal Custom 4pH Buffer Point 10	0.00 to 14.00pH
3246	Get/Set	pH Cal Buffer 9pH 10	FLOAT	The pH User Cal Custom 9pH Buffer Point 10	0.00 to 14.00pH
3248	Get/Set	pH Cal Buffer Temp 11	FLOAT	The pH User Cal Custom Buffer Temperature Point 11	-20.0 to +150.0°C or -4.0 to +302.0°F
3250	Get/Set	pH Cal Buffer 4pH 11	FLOAT	The pH User Cal Custom 4pH Buffer Point 11	0.00 to 14.00pH
3252	Get/Set	pH Cal Buffer 9pH 11	FLOAT	The pH User Cal Custom 9pH Buffer Point 11	0.00 to 14.00pH
3254	Get/Set	pH Cal Buffer Temp 12	FLOAT	The pH User Cal Custom Buffer Temperature Point 12	-20.0 to +150.0°C or -4.0 to +302.0°F
3256	Get/Set	pH Cal Buffer 4pH 12	FLOAT	The pH User Cal Custom 4pH Buffer Point 12	0.00 to 14.00pH

pH Sensor Calibration Floating Point Variables Continued					
3258	Get/Set	pH Cal Buffer 9pH 12	FLOAT	The pH User Cal Custom 9pH Buffer Point 12	0.00 to 14.00pH
3260	Get/Set	pH Cal Buffer Temp 13	FLOAT	The pH User Cal Custom Buffer Temperature Point 13	-20.0 to +150.0°C or -4.0 to +302.0°F
3262	Get/Set	pH Cal Buffer 4pH 13	FLOAT	The pH User Cal Custom 4pH Buffer Point 13	0.00 to 14.00pH
3264	Get/Set	pH Cal Buffer 9pH 13	FLOAT	The pH User Cal Custom 9pH Buffer Point 13	0.00 to 14.00pH
3266	Get/Set	Nominal pH Buffer 1	FLOAT	Custom Nominal pH Buffer 1	0.00 to 14.00pH
3268	Get/Set	Nominal pH Buffer 2	FLOAT	Custom Nominal pH Buffer 2	0.00 to 14.00pH

Output Card Type					
3300	Get	Output Card	INT	Is the Output card present	1410 = Not Present 1415 = Output Card Present
3301	Get	Output Serial No.	LONG	The Serial Number of the output card	0 to 9999999

Current Output A Configuration Integer Variables					
3320	Get/Set	Current Output A Source	INT	The Input Source of Current Output A	1220 = Disabled 1222 = ECS 1223 = ECS Temperature 1221 = Redox 1224 = pH 1225 = pH Temperature
3321	Get/Set	Current Output A Output Mode	INT	The Output Mode of Current Output A	1135 = 4-20mA 1136 = 0-20mA
3322	Get/Set	Current Output A Error	INT	The On Error Action of Current Output A	1130 = No Action 1131 = 0mA 1132 = 22mA 1133 = Hold Value 1134 = 4mA

Current Output A Configuration Floating Point Variables					
3335	Get/Set	Current Output A Zero	FLOAT	The Current Output A Zero Equivalent Value	-2000 to 2000 Millivolts or 0 to 9999 µS/cm or 0.00 to 14.00 pH or -20.0 to +150.0°C or -4.0 to +302.0°F
3337	Get/Set	Current Output A Span	FLOAT	The Current Output A Span Equivalent Value	-2000 to 2000 Millivolts or 0 to 9999 µS/cm or 0.00 to 14.00 pH or -20.0 to +150.0°C or -4.0 to +302.0°F

Current Output B Configuration Integer Variables					
3360	Get/Set	Current Output B Source	INT	The Input Source of Current Output B	1220 = Disabled 1222 = ECS 1223 = ECS Temperature 1221 = Redox 1224 = pH 1225 = pH Temperature
3361	Get/Set	Current Output B Output Mode	INT	The Output Mode of Current Output B	1135 = 4-20mA 1136 = 0-20mA
3362	Get/Set	Current Output B Error	INT	The On Error Action of Current Output B	1130 = No Action 1131 = 0mA 1132 = 22mA 1133 = Hold Value 1134 = 4mA

Current Output B Configuration Floating Point Variables					
3375	Get/Set	Current Output B Zero	FLOAT	The Current Output B Zero Equivalent Value	-2000 to 2000 Millivolts or 0 to 9999 µS/cm or 0.00 to 14.00 pH or -20.0 to +150.0°C or -4.0 to +302.0°F
3377	Get/Set	Current Output B Span	FLOAT	The Current Output B Span Equivalent Value	-2000 to 2000 Millivolts or 0 to 9999 µS/cm or 0.00 to 14.00 pH or -20.0 to +150.0°C or -4.0 to +302.0°F

Current Output C Configuration Integer Variables					
3400	Get/Set	Current Output C Source	INT	The Input Source of Current Output C	1220 = Disabled 1222 = ECS 1223 = ECS Temperature 1221 = Redox 1224 = pH 1225 = pH Temperature
3401	Get/Set	Current Output C Output Mode	INT	The Output Mode of Current Output C	1135 = 4-20mA 1136 = 0-20mA
3402	Get/Set	Current Output C Error	INT	The On Error Action of Current Output C	1130 = No Action 1131 = 0mA 1132 = 22mA 1133 = Hold Value 1134 = 4mA

Current Output C Configuration Floating Point Variables					
3415	Get/Set	Current Output C Zero	FLOAT	The Current Output C Zero Equivalent Value	-2000 to 2000 Millivolts or 0 to 9999 µS/cm or 0.00 to 14.00 pH or -20.0 to +150.0°C or -4.0 to +302.0°F

Current Output C Configuration Floating Point Variables Continued					
3417	Get/Set	Current Output C Span	FLOAT	The Current Output C Span Equivalent Value	-2000 to 2000 Millivolts or 0 to 9999 µS/cm or 0.00 to 14.00 pH or -20.0 to +150.0°C or -4.0 to +302.0°F

Current Output D Configuration Integer Variables					
3440	Get/Set	Current Output D Source	INT	The Input Source of Current Output D	1220 = Disabled 1222 = ECS 1223 = ECS Temperature 1221 = Redox 1224 = pH 1225 = pH Temperature
3441	Get/Set	Current Output D Output Mode	INT	The Output Mode of Current Output D	1135 = 4-20mA 1136 = 0-20mA
3442	Get/Set	Current Output D Error	INT	The On Error Action of Current Output D	1130 = No Action 1131 = 0mA 1132 = 22mA 1133 = Hold Value 1134 = 4mA

Current Output D Configuration Floating Point Variables					
3455	Get/Set	Current Output D Zero	FLOAT	The Current Output D Zero Equivalent Value	-2000 to 2000 Millivolts or 0 to 9999 µS/cm or 0.00 to 14.00 pH or -20.0 to +150.0°C or -4.0 to +302.0°F
3457	Get/Set	Current Output D Span	FLOAT	The Current Output D Span Equivalent Value	-2000 to 2000 Millivolts or 0 to 9999 µS/cm or 0.00 to 14.00 pH or -20.0 to +150.0°C or -4.0 to +302.0°F

Digital Input 1 Configuration					
3500	Get	Digital Input 1 Function	INT	The Function Digital Input 1 is set to.	1281 = Water Meter
3501	Get/Set	Digital Input 1 Polarity	INT	The polarity of the digital input	1298 = Normally Open 1299 = Normally Closed

Digital Input 2 Configuration					
3530	Get	Digital Input 2 Function	INT	The Function Digital Input 2 is set to.	1282 = Flow Switch
3531	Get/Set	Digital Input 2 Polarity	INT	The polarity of the digital input	1298 = Normally Open 1299 = Normally Closed

Digital Input 3 Configuration					
3560	Get/Set	Digital Input 3 Relay	INT	The relay digital input 3 is assigned to.	1147 = Disabled 1148 = Biocide A 1149 = Biocide B 1150 = Bleed 1151 = Inhibitor 1152 = pH 1153 = All
3561	Get/Set	Digital Input 3 Function	INT	The Function Digital Input 3 is set to.	1280 = Offline 1283 = Interlock 1284 = Tank Level 1285 = Remote Dose
3562	Get/Set	Digital Input 3 Polarity	INT	The polarity of the digital input	1298 = Normally Open 1299 = Normally Closed
3563	Get/Set	Digital Input 3 Op Level	INT	The set current output level when the digital input is active	1130 = No Action 1131 = 0mA 1132 = 22mA 1133 = Hold Value 1134 = 4mA
3564	Get/Set	Digital Input 3 Rem Dose Min	INT	Set the remote dose time – Minutes element	0 to 99 Minutes
3565	Get/Set	Digital Input 3 Rem Dose Sec	INT	Set the remote dose time – Seconds element	0 to 59 Seconds

Digital Input 4 Configuration					
3590	Get/Set	Digital Input 4 Relay	INT	The relay digital input 4 is assigned to.	1147 = Disabled 1148 = Biocide A 1149 = Biocide B 1150 = Bleed 1151 = Inhibitor 1152 = pH 1153 = All
3591	Get/Set	Digital Input 4 Function	INT	The Function Digital Input 4 is set to.	1280 = Offline 1283 = Interlock 1284 = Tank Level 1285 = Remote Dose
3592	Get/Set	Digital Input 4 Polarity	INT	The polarity of the digital input	1298 = Normally Open 1299 = Normally Closed
3593	Get/Set	Digital Input 4 Op Level	INT	The set current output level when the digital input is active	1130 = No Action 1131 = 0mA 1132 = 22mA 1133 = Hold Value 1134 = 4mA
3594	Get/Set	Digital Input 4 Rem Dose Min	INT	Set the remote dose time – Minutes element	0 to 99 Minutes
3595	Get/Set	Digital Input 4 Rem Dose Sec	INT	Set the remote dose time – Seconds element	0 to 59 Seconds

Digital Input 5 Configuration					
3620	Get/Set	Digital Input 5 Relay	INT	The relay digital input 5 is assigned to.	1147 = Disabled 1148 = Biocide A 1149 = Biocide B 1150 = Bleed 1151 = Inhibitor 1152 = pH 1153 = All
3621	Get/Set	Digital Input 5 Function	INT	The Function Digital Input 5 is set to.	1280 = Offline 1283 = Interlock 1284 = Tank Level 1285 = Remote Dose
3622	Get/Set	Digital Input 5 Polarity	INT	The polarity of the digital input	1298 = Normally Open 1299 = Normally Closed
3623	Get/Set	Digital Input 5 Op Level	INT	The set current output level when the digital input is active	1130 = No Action 1131 = 0mA 1132 = 22mA 1133 = Hold Value 1134 = 4mA
3624	Get/Set	Digital Input 5 Rem Dose Min	INT	Set the remote dose time – Minutes element	0 to 99 Minutes
3625	Get/Set	Digital Input 5 Rem Dose Sec	NT	Set the remote dose time – Seconds element	0 to 59 Seconds

Redox Service Alarm Configuration					
3700	Get	Redox Service Reminder	INT	Is the Redox Service Reminder Enabled	1076 = Yes 1077 = No
3701	Get	Redox Service Alarm Date	INT	The Date of the next Service Alarm	1 to 31 Day of the Month
3702	Get	Redox Service Alarm Month	INT	The Month of the next Service Alarm	1 to 12 Month of the Year
3703	Get	Redox Service Alarm Year	INT	The Year of the next Service Alarm	0 to 99 Year
3704	Get	Redox Service Alarm Interval	INT	The Service Alarm Interval period	0 to 999 Days

Electrodeless Conductivity Service Alarm Configuration					
3720	Get	ECS Service Reminder	INT	Is the ECS Service Reminder Enabled	1076 = Yes 1077 = No
3721	Get	ECS Service Alarm Date	INT	The Date of the next Service Alarm	1 to 31 Day of the Month
3722	Get	ECS Service Alarm Month	INT	The Month of the next Service Alarm	1 to 12 Month of the Year
3723	Get	ECS Service Alarm Year	INT	The Year of the next Service Alarm	0 to 99 Year
3724	Get	ECS Service Alarm Interval	INT	The Service Alarm Interval period	0 to 999 Days

pH Service Alarm Configuration					
3740	Get	pH Service Reminder	INT	Is the pH Service Reminder Enabled	1076 = Yes 1077 = No

pH Service Alarm Configuration Continued					
3741	Get	pH Service Alarm Date	INT	The Date of the next Service Alarm	1 to 31 Day of the Month
3742	Get	pH Service Alarm Month	INT	The Month of the next Service Alarm	1 to 12 Month of the Year
3743	Get	pH Service Alarm Year	INT	The Year of the next Service Alarm	0 to 99 Year
3744	Get	pH Service Alarm Interval	INT	The Service Alarm Interval period	0 to 999 Days

Controller Base Configuration					
3801	Get/Set	Unit Contrast	INT	The currently set display contrast level	1 to 255 (Lighter to Darker)
3803	Get	Unit serial Number	LONG	The serial number of the base unit.	9,000,000 to 9,099,999
3811	Get	Unit Software Version	FLOAT	The software version of the base unit.	0.00 to 99.99

Water Meter Configuration					
3840	Get/Set	K Factor	FLOAT	The water meter K factor	0.1 to 500.0 m^3 of water/pulse
3842	Get/Set	Water Meter Timeout Hour	INT	The water meter time out – Hours element	0 to 23 Hours
3843	Get/Set	Water Meter Timeout Min	INT	The water meter time out – Minutes element	0 to 59 Minutes

System Clock Configuration					
3860	Get/Set	System Clock Hour	INT	The System Clock – Hour element (HH:MM)	0 to 23
3861	Get/Set	System Clock Minute	INT	The System Clock – Minute element (HH:MM)	0 to 59
3862	Get/Set	System Clock Week Day	INT	The System Clock – Day of the week	1 to 7 (Monday to Sunday)
3863	Get/Set	System Clock Date	INT	The System Clock – Date Element (DD:MM:YYYY)	0 to 31
3864	Get/Set	System Clock Month	INT	The System Clock – Month Element (DD:MM:YYYY)	0 to 12
3865	Get/Set	System Clock Century	INT	The System Clock – Century Element (DD:MM:YYYY)	0 to 3000

SD Card Data logging Configuration					
3900	Get	Data logging Function	INT	Status of Data logging Function	1540 = Unlocked 1541 = Locked
3901	Get	Status	INT	Data logging Status	1076 = Logging Data 1077 = Not Logging Data
3902	Get/Set	Interval Hours	INT	Data logging Interval (Hours)	0 to 23 Hours
3903	Get/Set	Interval Minutes	INT	Data logging Interval (Minutes)	0 to 59 Minutes
3904	Get/Set	Interval Seconds	INT	Data logging Interval (Seconds)	0 to 59 Seconds
3905	Get/Set	Loop Recording	INT	Loop recording	1076 = Enabled 1077 = Disabled

Data logging Live Trend Configuration Integer Variables						
3910 3940 3970	Get/Set	Trend 1 Trend 2 Trend 3	Traces	INT	Traces Configuration	1900 = None 1901 = 1 Trace 1902 = 2 Traces
3911 3941 3971	Get/Set	Trend 1 Trend 2 Trend 3	Interval Hours	INT	Trend Interval Minutes	0 to 23 Hours
3912 3942 3972	Get/Set	Trend 1 Trend 2 Trend 3	Interval Minutes	INT	Trend Interval Minutes	0 to 59 Minutes
3913 3943 3973	Get/Set	Trend 1 Trend 2 Trend 3	Interval Seconds	INT	Trend Interval Seconds	0 to 59 Seconds
3914 3944 3974	Get/Set	Trend 1 Trend 2 Trend 3	Primary Variable	INT	Trace 1 (Left hand axis)	Refer to Table 1 (page 232)
3915 3945 3975	Get/Set	Trend 1 Trend 2 Trend 3	Secondary Variable	INT	Trace 2 (Right hand axis)	Refer to Table 1 (page 232)

Data logging Live Trend Configuration Floating Point Variables						
3920 3950 3980	Get/Set	Trend 1 Trend 2 Trend 3	Primary Variable Min Value	FLOAT	Trace 1Minimum Value	Value Dependent on Primary Variable
3922 3952 3982	Get/Set	Trend 1 Trend 2 Trend 3	Primary Variable Max Value	FLOAT	Trace 1Maximum Value	
3924 3954 3984	Get/Set	Trend 1 Trend 2 Trend 3	Secondary Variable Min Value	FLOAT	Trace 2 Minimum Value	Value Dependent on Secondary Variable
3926 3956 3986	Get/Set	Trend 1 Trend 2 Trend 3	Secondary Variable Max Value	FLOAT	Trace 2 Maximum Value	

Standard Value Tables

Table 1 – Data Logging Live Trend Variables:

Variable		Value
Redox Sensor		1571
Electrodeless Conductivity Sensor	Conductivity	1592
	TDS	1593
Electrodeless Sensor Temperature	°C	1594
	°F	1595
pH Sensor	pH	1610
pH Sensor Temperature	°C	1614
	°F	1615
Current Output A	Redox	1630
	ECS	1631
	ECS Temp	1632
	pH	1633
	pH Temp	1634
Current Output B	Redox	1645
	ECS	1646
	ECS Temp	1647
	pH	1648
	pH Temp	1649
Current Output C	Redox	1660
	ECS	1661
	ECS Temp	1662
	pH	1663
	pH Temp	1664
Current Output D	Redox	1675
	ECS	1676
	ECS Temp	1677
	pH	1678
	pH Temp	1679

Appendix E – Modbus RS485 Coils

Note. The availability of some of the coils depends upon the configuration of the controller.

Coil #	Function
Controller Alarm Acknowledges	
100	Acknowledge the Power Fail Alarm
101	Acknowledge the Water Meter Input Alarm
Dose Alarm Acknowledges	
110	Acknowledge Biocide A Dose Alarm
111	Acknowledge Bleed Alarm
112	Acknowledge pH Control Dose Alarm
Start Manual Doses / Bleeds	
120	Start Biocide A Manual Dose
121	Start Biocide B Manual Dose
122	Start Manual Bleed
123	Start Inhibitor Manual Dose
124	Start pH Control Manual Dose
Reset User Calibrations	
130	Reset Redox Calibration
131	Reset ECS Sensor Calibration
132	Reset ECS Solution Calibration
133	Reset ECS Temperature Calibration
134	Reset pH Calibration
135	Reset pH Temperature Calibration
136	Reset Current Output A Calibration
137	Reset Current Output B Calibration
138	Reset Current Output C Calibration
139	Reset Current Output D Calibration
140	Reset Entire Unit Calibration
Reset Water Counters	
150	Reset Total Water Counter
Defer Calibration Alarms	
160	Defer Redox Calibration Alarm
161	Defer ECS Calibration Alarm
162	Defer pH Calibration Alarm
Defer Service Alarms	
170	Defer Redox Service Alarm
171	Defer ECS Service Alarm
172	Defer pH Service Alarm

Save, Restore & Reset Functions	
180	Save Entire Unit to Internal Store A
181	Save Entire Unit to Internal Store B
182	Restore Entire Unit from Internal Store A
183	Restore Entire Unit from Internal Store B
184	Erase Internal Store A
185	Erase Internal Store B
186	Reset Entire Unit

Data Logging Functions	
190	Start/Stop SD Card Data Logging
191	Save Live Trend 1 Data to SD Card
192	Save Live Trend 2 Data to SD Card
193	Save Live Trend 3 Data to SD Card

Appendix F – Modbus RS485 Discretes

Note. The availability of some of the discretes depends upon the configuration of the controller.

Discrete #	Value	Semantics of Values
Relay State		
500	Biocide A Manual Dosing State	0 = Inactive 1 = Active
501	Biocide B Manual Dosing State	0 = Inactive 1 = Active
502	Manual Bleed State	0 = Inactive 1 = Active
503	Inhibitor Manual Dosing State	0 = Inactive 1 = Active
504	pH Control Manual Dosing State	0 = Inactive 1 = Active
Level Switch State		
510	Biocide A Tank Level Switch	0 = Inactive 1 = Active
511	Biocide B Tank Level Switch	0 = Inactive 1 = Active
512	Inhibitor Tank Level Switch	0 = Inactive 1 = Active
513	pH Control Tank Level Switch	0 = Inactive 1 = Active
Pre Bleeding State		
520	Biocide A Pre Bleeding	0 = Inactive 1 = Active
521	Biocide B Pre Bleeding	0 = Inactive 1 = Active
522	Inhibitor Pre Bleeding	0 = Inactive 1 = Active
523	pH Control Pre Bleeding	0 = Inactive 1 = Active
Bleed Inhibited State		
530	Bleed Relay Inhibited	0 = Inactive 1 = Active
Redox Sensor User Calibration State		
555	Redox Sensor User Calibration	0 = Inactive 1 = Active
Electrodeless Conductivity Sensor User Calibration State		
560	Electrodeless Conductivity Sensor User Calibration	0 = Inactive 1 = Active
561	Electrodeless Conductivity Temperature User Calibration	0 = Inactive 1 = Active

pH Sensor User Calibration State		
565	pH Sensor User Calibration	0 = Inactive 1 = Active
566	pH Temperature User Calibration	0 = Inactive 1 = Active

Current Output Calibration State		
570	Current Output A User Calibration	0 = Inactive 1 = Active
571	Current Output B User Calibration	0 = Inactive 1 = Active
572	Current Output C User Calibration	0 = Inactive 1 = Active
573	Current Output D User Calibration	0 = Inactive 1 = Active

Digital Input State		
580	Digital Input 1 Status	0 = Inactive 1 = Active
581	Digital Input 2 Status	0 = Inactive 1 = Active
582	Digital Input 3 Status	0 = Inactive 1 = Active
583	Digital Input 4 Status	0 = Inactive 1 = Active
584	Digital Input 5 Status	0 = Inactive 1 = Active

Controller Errors		
600	E001 Processor RAM Error	0 = Inactive 1 = Active
601	E002 External RAM Error	0 = Inactive 1 = Active
602	E003 Internal Setup Checksum Error	0 = Inactive 1 = Active
603	E004 Output Card Checksum Error	0 = Inactive 1 = Active
604	E005 Outputs Checksum Error	0 = Inactive 1 = Active
605	E006 Power Fail	0 = Inactive 1 = Active
606	E007 Unit Setup Checksum Error	0 = Inactive 1 = Active
607	E008 Unit Store A Checksum Error	0 = Inactive 1 = Active
608	E009 Unit Store B Checksum Error	0 = Inactive 1 = Active
609	E010 Maths Error	0 = Inactive 1 = Active
610	E011 Maths Error	0 = Inactive 1 = Active

Controller Errors Continued		
611	E012 Maths Error	0 = Inactive 1 = Active
612	E013 Maths Error	0 = Inactive 1 = Active
613	E014 Contrast Chip Error	0 = Inactive 1 = Active
614	E015 Unit SD Card Checksum Error	0 = Inactive 1 = Active
615	E016 Battery Low	0 = Inactive 1 = Active
616	E017 Water Input	0 = Inactive 1 = Active
617	E018 Low Flow	0 = Inactive 1 = Active
618	E019 SD Card Full	0 = Inactive 1 = Active

Redox Sensor Input Errors		
630	E030 Redox Input Card Checksum Error	0 = Inactive 1 = Active
631	E031 Redox Setup Checksum Error	0 = Inactive 1 = Active
632	E032 Redox Store A Checksum Error	0 = Inactive 1 = Active
633	E033 Redox Store B Checksum Error	0 = Inactive 1 = Active
634	E034 Redox Factory Cal Checksum Error	0 = Inactive 1 = Active
635	E035 Redox User Cal Checksum Error	0 = Inactive 1 = Active
636	E041 Redox Sensor Input Over Range	0 = Inactive 1 = Active
637	E042 Redox Sensor Input Under Range	0 = Inactive 1 = Active
638	E047 Redox Sensor Calibration Due	0 = Inactive 1 = Active
639	E048 Redox Planned Service Due	0 = Inactive 1 = Active
640	E049 Redox SD Card Store Checksum Error	0 = Inactive 1 = Active

Electrodeless Conductivity Sensor Input Errors		
650	E080 Electrodeless Conductivity Card Checksum Error	0 = Inactive 1 = Active
651	E081 Electrodeless Conductivity Setup Checksum Error	0 = Inactive 1 = Active
652	E082 Electrodeless Conductivity Store A Checksum Error	0 = Inactive 1 = Active
653	E083 Electrodeless Conductivity Store B Checksum Error	0 = Inactive 1 = Active

Electrodeless Conductivity Sensor Input Errors Continued		
654	E084 Electrodeless Conductivity Factory Cal Checksum Error	0 = Inactive 1 = Active
655	E085 Electrodeless Conductivity User Cal Checksum Error	0 = Inactive 1 = Active
656	E086 Electrodeless Conductivity Sensor Cal Out of Specification	0 = Inactive 1 = Active
657	E091 Electrodeless Conductivity Sensor Input Over Range	0 = Inactive 1 = Active
658	E093 Electrodeless Conductivity Temperature Sensor Fault	0 = Inactive 1 = Active
659	E094 Electrodeless Conductivity Temperature Sensor Over Range	0 = Inactive 1 = Active
660	E095 Electrodeless Conductivity Temperature Sensor Under Range	0 = Inactive 1 = Active
661	E096 Electrodeless Conductivity Temperature Compensation Outside Limits	0 = Inactive 1 = Active
662	E097 Electrodeless Conductivity Sensor Calibration Due	0 = Inactive 1 = Active
663	E098 Electrodeless Conductivity Planned Service Due	0 = Inactive 1 = Active
664	E099 Electrodeless Conductivity SD Card Store Checksum Error	0 = Inactive 1 = Active

pH Sensor Input Errors		
680	E130 pH Card Checksum Error	0 = Inactive 1 = Active
681	E131 pH Setup Checksum Error	0 = Inactive 1 = Active
682	E132 pH Store A Checksum Error	0 = Inactive 1 = Active
683	E133 pH Store B Checksum Error	0 = Inactive 1 = Active
684	E134 pH Factory Cal Checksum Error	0 = Inactive 1 = Active
685	E135 pH User Cal Checksum Error	0 = Inactive 1 = Active
686	E137 pH Sensor User Cal Offset At Limit	0 = Inactive 1 = Active
687	E138 pH Sensor User Cal Slope At Limit	0 = Inactive 1 = Active
688	E139 pH Sensor User Cal Slope Below Specification	0 = Inactive 1 = Active
689	E140 pH Sensor User Cal Slope Above Specification	0 = Inactive 1 = Active
690	E141 pH Sensor Input Over Range	0 = Inactive 1 = Active
691	E142 pH Sensor Input Under Range	0 = Inactive 1 = Active
692	E143 pH Temperature Sensor Fault	0 = Inactive 1 = Active

pH Sensor Input Errors Continued		
693	E144 pH Temp Input Over Range	0 = Inactive 1 = Active
694	E145 pH Temp Input Under Range	0 = Inactive 1 = Active
695	E147 pH Sensor Calibration Due	0 = Inactive 1 = Active
696	E148 pH Planned Service Due	0 = Inactive 1 = Active
697	E149 pH SD Card Store Checksum Error	0 = Inactive 1 = Active

Biocide A Errors		
710	E180 Biocide A Dose Alarm	0 = Inactive 1 = Active
711	E181 Biocide A Store A Checksum Error	0 = Inactive 1 = Active
712	E182 Biocide A Store B Checksum Error	0 = Inactive 1 = Active
713	E183 Biocide A Setup Checksum Error	0 = Inactive 1 = Active
714	E184 Biocide A SD Card Checksum Error	0 = Inactive 1 = Active
715	E185 Biocide A Time Setting Configuration Error	0 = Inactive 1 = Active

Biocide B Errors		
720	E201 Biocide B Store A Checksum Error	0 = Inactive 1 = Active
721	E202 Biocide B Store B Checksum Error	0 = Inactive 1 = Active
722	E203 Biocide B Setup Checksum Error	0 = Inactive 1 = Active
723	E204 Biocide B SD Card Checksum Error	0 = Inactive 1 = Active
724	E205 Biocide B Time Setting Configuration Error	0 = Inactive 1 = Active

Bleed Errors		
730	E220 Bleed Alarm	0 = Inactive 1 = Active
731	E221 Bleed Store A Checksum Error	0 = Inactive 1 = Active
732	E222 Bleed Store B Checksum Error	0 = Inactive 1 = Active
733	E223 Bleed Setup Checksum Error	0 = Inactive 1 = Active
734	E224 Bleed SD Card Checksum Error	0 = Inactive 1 = Active
735	E225 Bleed Time Setting Configuration Error	0 = Inactive 1 = Active

Inhibitor Errors		
740	E241 Inhibitor Store A Checksum Error	0 = Inactive 1 = Active
741	E242 Inhibitor Store B Checksum Error	0 = Inactive 1 = Active
742	E243 Inhibitor Setup Checksum Error	0 = Inactive 1 = Active
743	E244 Inhibitor SD Card Checksum Error	0 = Inactive 1 = Active
744	E245 Inhibitor Time Setting Configuration Error	0 = Inactive 1 = Active

pH Control Errors		
750	E260 pH Control Dose Alarm	0 = Inactive 1 = Active
751	E261 pH Control Store A Checksum Error	0 = Inactive 1 = Active
752	E262 pH Control Store B Checksum Error	0 = Inactive 1 = Active
753	E263 pH Control Setup Checksum Error	0 = Inactive 1 = Active
754	E264 pH Control SD Card Checksum Error	0 = Inactive 1 = Active
755	E265 pH Control Time Setting Configuration Error	0 = Inactive 1 = Active

Alarm Relay Errors		
760	E281Alarm Relay Store A Checksum Error	0 = Inactive 1 = Active
761	E282 Alarm Relay Store B Checksum Error	0 = Inactive 1 = Active
762	E283 Alarm Relay Setup Checksum Error	0 = Inactive 1 = Active
763	E284 Alarm Relay SD Card Checksum Error	0 = Inactive 1 = Active

Current Output A Errors		
770	E300 Current Output A Hardware Fault	0 = Inactive 1 = Active
771	E301 Sensor Input Less Than Current Output A Zero	0 = Inactive 1 = Active
772	E302 Sensor Input Greater Than Current Output A Span	0 = Inactive 1 = Active
773	E303 Sensor Input Less Than Current Output A Span	0 = Inactive 1 = Active
774	E304 Sensor Input Greater Than Current Output A Zero	0 = Inactive 1 = Active
775	E305 Current Output A Store A Checksum Error	0 = Inactive 1 = Active
776	E306 Current Output A Store B Checksum Error	0 = Inactive 1 = Active

Current Output A Errors Continued		
777	E307 Current Output A Setup Checksum Error	0 = Inactive 1 = Active
778	E308 Current Output A SD Card Checksum Error	0 = Inactive 1 = Active

Current Output B Errors		
790	E320 Current Output B Hardware Fault	0 = Inactive 1 = Active
791	E321 Sensor Input Less Than Current Output B Zero	0 = Inactive 1 = Active
792	E322 Sensor Input Greater Than Current Output B Span	0 = Inactive 1 = Active
793	E323 Sensor Input Less Than Current Output B Span	0 = Inactive 1 = Active
794	E322 Sensor Input Greater Than Current Output B Zero	0 = Inactive 1 = Active
795	E325 Current Output B Store A Checksum Error	0 = Inactive 1 = Active
796	E326 Current Output B Store B Checksum Error	0 = Inactive 1 = Active
797	E327 Current Output B Setup Checksum Error	0 = Inactive 1 = Active
798	E328 Current Output B SD Card Checksum Error	0 = Inactive 1 = Active

Current Output C Errors		
810	E340 Current Output C Hardware Fault	0 = Inactive 1 = Active
811	E341 Sensor Input Less Than Current Output C Zero	0 = Inactive 1 = Active
812	E342 Sensor Input Greater Than Current Output C Span	0 = Inactive 1 = Active
813	E343 Sensor Input Less Than Current Output C Span	0 = Inactive 1 = Active
814	E344 Sensor Input Greater Than Current Output C Zero	0 = Inactive 1 = Active
815	E345 Current Output C Store A Checksum Error	0 = Inactive 1 = Active
816	E346 Current Output C Store B Checksum Error	0 = Inactive 1 = Active
817	E347 Current Output C Setup Checksum Error	0 = Inactive 1 = Active
818	E348 Current Output C SD Card Checksum Error	0 = Inactive 1 = Active

Current Output D Errors		
830	E360 Current Output D Hardware Fault	0 = Inactive 1 = Active
831	E361 Sensor Input Less Than Current Output D Zero	0 = Inactive 1 = Active

Current Output D Errors Continued		
832	E362 Sensor Input Greater Than Current Output D Span	0 = Inactive 1 = Active
833	E363 Sensor Input Less Than Current Output D Span	0 = Inactive 1 = Active
834	E364 Sensor Input Greater Than Current Output D Zero	0 = Inactive 1 = Active
835	E365 Current Output D Store A Checksum Error	0 = Inactive 1 = Active
836	E366 Current Output D Store B Checksum Error	0 = Inactive 1 = Active
837	E367 Current Output D Setup Checksum Error	0 = Inactive 1 = Active
838	E368 Current Output D SD Card Checksum Error	0 = Inactive 1 = Active

Digital Input 1 Errors		
850	E380 Digital Input 1 Store A Checksum Error	0 = Inactive 1 = Active
851	E381 Digital Input 1 Store B Checksum Error	0 = Inactive 1 = Active
852	E382 Digital Input 1 Setup Checksum Error	0 = Inactive 1 = Active
853	E383 Digital Input 1 SD Card Checksum Error	0 = Inactive 1 = Active

Digital Input 2 Errors		
860	E390 Digital Input 2 Store A Checksum Error	0 = Inactive 1 = Active
861	E391 Digital Input 2 Store B Checksum Error	0 = Inactive 1 = Active
862	E392 Digital Input 2 Setup Checksum Error	0 = Inactive 1 = Active
863	E393 Digital Input 2 SD Card Checksum Error	0 = Inactive 1 = Active

Digital Input 3 Errors		
870	E400 Digital Input 3 Store A Checksum Error	0 = Inactive 1 = Active
871	E401 Digital Input 3 Store B Checksum Error	0 = Inactive 1 = Active
872	E402 Digital Input 3 Setup Checksum Error	0 = Inactive 1 = Active
873	E403 Digital Input 3 SD Card Checksum Error	0 = Inactive 1 = Active

Digital Input 4 Errors		
880	E410 Digital Input 4 Store A Checksum Error	0 = Inactive 1 = Active
881	E411 Digital Input 4 Store B Checksum Error	0 = Inactive 1 = Active

Digital Input 4 Errors Continued		
882	E412 Digital Input 4 Setup Checksum Error	0 = Inactive 1 = Active
883	E413 Digital Input 4 SD Card Checksum Error	0 = Inactive 1 = Active

Digital Input 5 Errors		
890	E420 Digital Input 5 Store A Checksum Error	0 = Inactive 1 = Active
891	E421 Digital Input 5 Store B Checksum Error	0 = Inactive 1 = Active
892	E422 Digital Input 5 Setup Checksum Error	0 = Inactive 1 = Active
893	E423 Digital Input 5 SD Card Checksum Error	0 = Inactive 1 = Active

Controller Communication Errors		
910	E440 Redox Card Communication Failure	0 = Inactive 1 = Active
911	E441 Redox Card Communication Error	0 = Inactive 1 = Active
912	E442 Electrodeless Conductivity Card Communication Failure	0 = Inactive 1 = Active
913	E443 Electrodeless Conductivity Card Communication Error	0 = Inactive 1 = Active
914	E444 pH Card Communication Failure	0 = Inactive 1 = Active
915	E445 pH Card Communication Error	0 = Inactive 1 = Active
916	E446 Internal Outputs Communication Failure	0 = Inactive 1 = Active
917	E447 Internal Outputs Communication Error	0 = Inactive 1 = Active
918	E448 Output Option Card Communication Failure	0 = Inactive 1 = Active
919	E449 Output Option Card Communication Error	0 = Inactive 1 = Active

Data Logging Errors		
930	E450 Data logging Setup Checksum Error	0 = Inactive 1 = Active
931	E451 Data logging Store A Checksum Error	0 = Inactive 1 = Active
932	E452 Data logging Store B Checksum Error	0 = Inactive 1 = Active
933	E453 Data logging SD Card Checksum Error	0 = Inactive 1 = Active

Blank

Appendix G – Error Messages

Internal Error Messages		
E001	**UNIT**	**Processor RAM Read/Write Error** Try switching the unit off and then on again. If the message persists, consult with your supplier, as this unit may require to be returned for repair.
E002	**UNIT**	**External RAM Read/Write Error** Try switching the unit off and then on again. If the message persists, consult with your supplier, as this unit may require to be returned for repair.
E003	**UNIT**	**Internal Setup Checksum Error** The instrument configuration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists, Reset Whole unit from the Reset Unit Settings option in the Save/Restore menu or consult with your supplier, as this unit may require a repair.
E004	**UNIT**	**Output Card Setup Checksum Error** Try switching the unit off and then on again. If the message persists, consult with your supplier, as this unit may require to be returned for repair.
E005	**UNIT**	**Internal Outputs Setup Checksum Error** Try switching the unit off and then on again. If the message persists, consult with your supplier, as this unit may require to be returned for repair.
E006	**UNIT**	**Power Fail** The Instrument has had its power turned off. Check instrument time.
E007	**UNIT**	**Unit Setup Checksum Error** The instrument configuration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists Reset the whole unit from the Load Default Settings option in the Save/Restore menu or consult with your supplier, as this unit may require a repair.
E008	**UNIT**	**Unit Store A Checksum Error** The data in Unit Store A has been corrupted. Save the current setup back to Unit Store A in the Save/Restore menu.
E009	**UNIT**	**Unit Store B Checksum Error** The data in Unit Store B has been corrupted. Save the current setup back to Unit Store B in the Save/Restore menu.
E010 to E013	**UNIT**	**Maths Error** There has been an internal maths calculation failure. As such, it should not appear if the software is functioning properly. The error message should clear after approx. 5 seconds. If the error continues to be displayed consult with your supplier, as this unit may require to be returned for repair.
E014	**UNIT**	**Contrast Chip Error** The Contrast Chip is not operating correctly. Try switching the unit off and then on again. If the message persists, consult with your supplier, as this unit may require to be returned for repair.
E015	**UNIT**	**Unit SD Card Checksum Error** The SD Card store from which the entire unit was restored from has become corrupted. Check the unit's settings and then save the settings again to the SD card store.

Internal Error Messages Continued

E016	**UNIT**	**Battery Low** The backup battery voltage is low, under normal circumstances the unit recharges the battery. Try switching the unit off and then on again. If the message still persists, consult with your supplier.
E017	**UNIT**	**Water Input** The System water flow has stopped or that there is a problem with the water meter.
E018	**UNIT**	**Low Flow** The flow switch has been activated. Any relay that has been configured will be inhibited.
E019	**UNIT**	**SD Card Full** The SD card has become full. To continue use, either replace with a blank SD card or remove existing files from the SD Card.

Input Card Errors

E030 **E080** **E130**	**Redox** **ECS** **pH**	**Input Card Checksum Error** Try switching the unit off and then on again. If the message persists, consult with your supplier, as the input card may require to be returned for repair.
E031 **E081** **E131**	**Redox** **ECS** **pH**	**Setup Checksum Error** The current input cards configuration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists reset the input card from the Reset Unit Settings option in the Save/Restore menu or consult with your supplier, as the input card may require to be returned for repair.
E032 **E082** **E132**	**Redox** **ECS** **pH**	**Store A Checksum Error** The data in Store A has become corrupted. Check the input card's setup. Then save the setup back to Store A in the Save/Restore menu.
E033 **E083** **E133**	**Redox** **ECS** **pH**	**Store B Checksum Error** The data in Store B has become corrupted. Check the input card's setup. Then save the setup back to Store B in the Save/Restore menu.
E034 **E084** **E134**	**Redox** **ECS** **pH**	**Factory Cal Checksum Error** Try switching the unit off and then on again. If the message persists, consult with your supplier, as the input card may require to be returned for repair.
E035 **E085** **E135**	**Redox** **ECS** **pH**	**User Cal Checksum Error** The Input Card's User Cal has for some reason become corrupted. Try switching the unit off and then on again. If the message persists Reset the input card from the Reset User Calibration option in the Calibration menu or consult with your supplier, as the input card may require to be returned for repair.
E086 **E136**	**ECS** **pH**	**Sensor Cal Out Of Spec** The last Sensor Calibration was out of specification, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E137	**pH**	**Sensor User Offset At Limit** The last Sensor Offset Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.

Input Card Errors Continued

E138	**pH**	**Sensor User Slope At Limit** The last Sensor Slope Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E139	**pH**	**Sensor User Slope < Spec** The last Sensor Slope Calibration was less than the recommended specification, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E140	**pH**	**Sensor User Slope > Spec** The last Sensor Slope Calibration was greater than the recommended specification, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E041 **E091** **E141**	**Redox** **ECS** **pH**	**Sensor Input Over Range** The sensor reading is greater than the specified upper limit, check input card settings, Sensor condition and connections. If the message persists please consult with your supplier.
E042 **E142**	**Redox** **pH**	**Sensor Input Under Range** The sensor reading is less than the specified limit, check input card settings, Sensor condition and connections. If the message persists please consult with your supplier.
E093 **E143**	**ECS** **pH**	**Temp Sensor Fault** The temperature sensor is reading open or closed circuit, due in most cases to a damaged sensing element or incorrect wiring. Check that the temperature sensor is set to the correct type in the channel setup menu. Under this condition, the unit will default to the fixed temperature setting for compensation purposes. If the message persists please consult with your supplier.
E094 **E144**	**ECS** **pH**	**Temp Input Over Range** The temperature sensor reading is greater than the specified upper limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.
E095 **E145**	**ECS** **pH**	**Temp Input Under Range** The temperature reading is less than the specified limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.
E096	**ECS**	**Temp Comp Outside Limits** The temperature reading is less than 0.0C or greater than 150.0C, leading to an error in compensation.
E047 **E097** **E147**	**Redox** **ECS** **pH**	**Calibration Due** The time since the last calibration was performed on this channel has exceeded the time set in the calibration menu.
E048 **E098** **E148**	**Redox** **ECS** **pH**	**Planned Service Due** The Planned Service interval for this unit has expired. Please contact LTH Electronics at the details below: LTH Electronics ltd, Chaul End Lane, Luton, Beds LU4 8EZ Tel. 0044 (0) 1582 593693, Fax 0044 (0) 1582 598036 Email sales@lth.co.uk NB. LTH overseas users should contact their LTH distributor – See www.lth.co.uk for details.

Input Card Errors Continued

E049	**Redox**	**SD Card Checksum Error**
E099	**ECS**	The SD Card store from which this channel was restored from has become corrupted. Check the channel's settings and then save the settings again to the SD card store.
E149	**pH**	

Dosing and Control Relay Errors

E180	**Bio A**	**Dose Alarm Error**
E220	**Bleed**	The relay has been active for longer than the Dose Alarm time as defined in the relay menu.
E260	**pH Cont**	
E181	**Bio A**	**Store A Checksum Error**
E201	**Bio B**	The Store A Save for the relay has become corrupted. Check the relay's settings and then save the settings again in the Store A in the Save/Restore menu.
E221	**Bleed**	
E241	**Inhib**	
E261	**pH Cont**	
E281	**Alarm**	
E182	**Bio A**	**Store B Checksum Error**
E202	**Bio B**	The Store B Save for the relay has become corrupted. Check the relay's settings and then save the settings again in the Store B in the Save/Restore menu.
E222	**Bleed**	
E242	**Inhib**	
E262	**pH Cont**	
E282	**Alarm**	
E183	**Bio A**	**Setup Checksum Error**
E203	**Bio B**	The Setup for this relay has become corrupted. Check and correct the relay settings and turn the unit off and on again. If the message persists please consult with your supplier.
E223	**Bleed**	
E243	**Inhib**	
E263	**pH Cont**	
E283	**Alarm**	
E184	**Bio A**	**SD Card Checksum Error**
E204	**Bio B**	The SD Card store from which this relay was restored from has become corrupted. Check the relay's settings and then save the settings again to the SD card store.
E224	**Bleed**	
E244	**Inhib**	
E264	**pH Cont**	
E284	**Alarm**	
E185	**Bio A**	**Time Setting Configuration Error**
E205	**Bio B**	The dosing or control relay time settings have been incorrectly configured.
E225	**Bleed**	
E245	**Inhib**	
E265	**pH Cont**	

Current Output Errors

E300	**A**	**Current Output Hardware Fault**
E320	**B**	The current output circuit has detected an error in the current output loop; this is most commonly due to either a broken loop or too large a load resistor.
E340	**C**	
E360	**D**	
E301	**A**	**Sensor Input < Current Output Zero**
E321	**B**	The sensor input level is below that set for the current output zero.
E341	**C**	
E361	**D**	
E302	**A**	**Sensor Input > Current Output Span**
E322	**B**	The sensor input level is above that set for the current output span.
E342	**C**	
E362	**D**	
E303	**A**	**Sensor Input < Current Output Span**
E323	**B**	The sensor input level is below that set for the current output Span.
E343	**C**	
E363	**D**	
E304	**A**	**Sensor Input > Current Output Zero**
E324	**B**	The sensor input level is above that set for the current output Zero.
E344	**C**	
E364	**D**	
E305	**A**	**Store A Checksum Error**
E325	**B**	The Store A Save for the current output has become corrupted. Check the current output's settings in the current output menu and then save the settings again in the Save/Restore menu.
E345	**C**	
E365	**D**	
E306	**A**	**Store B Checksum Error**
E326	**B**	The Store B Save for the current output has become corrupted. Check the current output's settings in the current output menu and then save the settings again in the Save/Restore menu.
E346	**C**	
E366	**D**	
E307	**A**	**Setup Checksum Error**
E327	**B**	The Setup for this current output has become corrupted. Check and correct the current output's settings and turn the unit off and on again. If the message persists please consult with your supplier.
E347	**C**	
E367	**D**	
E308	**A**	**SD Card Checksum Error**
E328	**B**	The SD Card store from which this current output was restored from has become corrupted. Check the current output's settings and then save the settings again to the SD card store.
E348	**C**	
E368	**D**	

Digital Input Errors

E380	**DIG 1**	**Store A Checksum Error**
E390	**DIG 2**	The Store A Save for the digital input has become corrupted. Check the digital input's settings in the digital input menu and then save the settings again in the Save/Restore menu.
E400	**DIG 3**	
E410	**DIG 4**	
E420	**DIG 5**	
E381	**DIG 1**	**Store B Checksum Error**
E391	**DIG 2**	The Store B Save for the digital input has become corrupted. Check the digital input's settings in the digital input menu and then save the settings again in the Save/Restore menu.
E401	**DIG 3**	
E411	**DIG 4**	
E421	**DIG 5**	

Digital Input Errors Continued

E382	**DIG 1**	**Setup Checksum Error**
E392	**DIG 2**	The Setup for this Digital Input has become corrupted. Check and correct the digital
E402	**DIG 3**	inputs settings and turn the unit off and on again. If the message persists please
E412	**DIG 4**	consult with your supplier.
E422	**DIG 5**	
E383	**DIG 1**	**SD Card Checksum Error**
E393	**DIG 2**	The SD Card store from which this Digital Input was restored from has become
E403	**DIG 3**	corrupted. Check the Digital Input's settings in the digital input menu and then save
E413	**DIG 4**	the settings again to the SD card store.
E423	**DIG 5**	

Modbus Errors

E430	**UNIT**	**Setup Checksum Error** The Setup for the Modbus has become corrupted. Check and correct the Modbus settings and turn the unit off and on again. If the message persists please consult with your supplier.
E431	**UNIT**	**Store A Checksum Error** The Store A Save for Modbus has become corrupted. Check the Modbus settings in the Modbus menu and then save the settings again in Store A in the Save/Restore menu.
E432	**UNIT**	**Store B Checksum Error** The Store B Save for Modbus has become corrupted. Check the Modbus settings in the Modbus menu and then save the settings again in Store B in the Save/Restore menu.
E433	**UNIT**	**SD Card Checksum Error** The SD Card store from which the Modbus setup was restored from has become corrupted. Check the Modbus settings in the Modbus menu and then save the settings again to the SD card store.

Communication Errors

E440	**Redox**	**Communication Failure**
E442	**ECS**	The Input Card is not responding. Try switching the unit off and then on again. If
E444	**pH**	the message persists, consult with your supplier, as the input card may require to be returned for repair.
E441	**Redox**	**Communication Error**
E443	**ECS**	The Input Card is not Operating Correctly. Try switching the unit off and then on
E445	**pH**	again. If the message persists, consult with your supplier, as the input card may require to be returned for repair.
E446	**Unit**	**Output Communication Failure** The Basic Internal Outputs are not responding. Try switching the unit off and then on again. If the message persists, consult with your supplier, as the unit may require to be returned for repair.
E447	**Unit**	**Output Communication Error** The Basic Internal Outputs are not Operating Correctly. Try switching the unit off and then on again. If the message persists, consult with your supplier, as the unit may require to be returned for repair.

Communication Errors Continued

E448	**OP Card**	**Output Option Communication Failure** The Output Option Card is not responding. Try switching the unit off and then on again. If the message persists, consult with your supplier, as the Output Option card may require to be returned for repair.
E449	**OP Card**	**Output Option Communication Error** The Output Option Card is not Operating Correctly. Try switching the unit off and then on again. If the message persists, consult with your supplier, as the Output Option Card may require to be returned for repair.

Data Logging Errors

E450	**UNIT**	**Setup Checksum Error** The Setup for the Data Logging has become corrupted. Check and correct the Data Logging settings and turn the unit off and on again. If the message persists please consult with your supplier.
E451	**UNIT**	**Store A Checksum Error** The Store A Save for Data Logging has become corrupted. Check the Data Logging settings in the Data Logging menu and then save the settings again in Store A in the Save/Restore menu.
E452	**UNIT**	**Store B Checksum Error** The Store B Save for Data Logging has become corrupted. Check the Data Logging settings in the Data Logging menu and then save the settings again in Store B in the Save/Restore menu.
E453	**UNIT**	**SD Card Checksum Error** The SD Card store from which the Data Logging setup was restored from has become corrupted. Check the Data Logging settings in the Data Logging menu and then save the settings again to the SD card store.

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Appendix H – Fault Finding

NOTE: THERE ARE NO USER SERVICEABLE PARTS INSIDE THE UNIT

The MTD75 has been designed to include a wide range of self-diagnostic tests, some of which are performed at switch on, and some on a continuous basis. This guide aims to provide a route to diagnosing and correcting any faults that may occur during normal operation. The table shown in "Appendix G – Error Messages" gives a list of the error messages that the MTD75 series generates, along with their probable causes. If after these checks the fault has not been cleared contact LTH. Please have as much of the following information available as possible in any communication with LTH, to enable quick diagnosis and correction of the problem.

- Serial number of the controller and its hardware configuration.
- The approximate date of purchase.
- Details of the program settings and application.
- Electrical environment and supply details.
- Circumstances under which the fault occurred.
- The nature of the fault or faults.
- Any error messages that are displayed.
- The sensor type, cable length and type.
- Current output configuration.
- Relay connection configuration.

It is often worthwhile to check the measurement by an independent method, for example using a handheld meter.

The Controller Appears Dead

Check that the front panel controller fuse is in working condition (See page 31). Check that power is available to the controller. Using a voltmeter, set to AC or DC, check the power supply voltage at the connector. The design of the MTD75 allows the unit to accept from 85 to 250V AC or DC. Check that the power cable is securely and correctly attached.

The Display Shows a Power Failure! Message

This is a warning to the user that power has been interrupted at some time. Therefore, some doses may have been missed. Whilst on the front screen press the ACK button and select power fail to clear the message.

The Access Code Does Not Work

It is probable that the access code has either been changed or the operator does not recall the code correctly. Contact LTH or your local distributor should this problem arise.

The Redox Sensor Reading Is Constantly Over-range or Under-range

- Ensure that the sensor input is correctly connected (See page 36) and that the sensor is not faulty or damaged.

The Redox Sensor Reading Is Incorrect

- Check that no error messages are being displayed. Check that the sensor cable has been correctly connected (See page 36).
- Check the instrument calibration using a Redox simulator, Adjust the channel calibration if necessary (See page 111).
- Use another instrument to check the sensor.

The Redox Sensor Is Not Functioning Correctly

- Check that the sensor not broken or cracked.
- Check the reference probe KCl (where applicable) for leakage or contamination.
- Ensure all probe protective caps have been removed.
- Check that any junction boxes used are correctly connected.
- Check that a suitable high impedance, low noise cable has been used.
- Check for damaged or broken cables.
- Check for damp, grease, or liquids near connectors, junction boxes, or terminations.
- Where extension cables have been used, try connecting the sensor directly to the instrument.

The Electrodeless Conductivity Sensor Reading Is Constantly Over-range or Under-range

- Ensure that the sensor and temperature inputs are correctly connected (See page 42) and that the sensor is not faulty or damaged.
- Check that the correct sensor type or cell constant has been entered within the Channel Setup menu (See page 101).
- Check the temperature compensation state (See page 101) If the compensation is set to “Manual” check that the fixed temperature is at the correct level. If the compensation is “Automatic” check that the temperature reading on the main display is correct.
- Check that the sensor is “seeing” a representative sample, trapped air will give a low reading.
- Ensure the input is correctly connected and the sensor is not faulty or damaged.
- Check the sensor and its cable for possible short circuits. Consider the fact that the conductivity may be higher than the range of the instrument.
- Check the Pt1000 RTD temperature sensor connections.
- Check that any in-line junction boxes and extension cables have been fitted and wired up correctly.

The Electrodeless Conductivity Sensor Reading Is Incorrect

- Low reading due to incomplete immersion.
- There may be some trapped matter within the sensor bore.
- High conductivity readings caused by a short circuit or leakage of liquid contamination into the sensor moulding.
- Low conductivity can be caused by accumulation of trapped air or gas coming out of solution. Check that no "air traps" exist in the sensor installation.
- High conductivity readings caused by leakage of solution into the sensor. This usually indicates that the sensor material has been fractured and the sensor must be replaced.
- First check that the temperature resistance is correct, otherwise the temperature compensation circuit will cause false or erratic readings. Temporarily switching out the temperature compensation can help to show if this is the cause of the problem.
- If another electrodeless sensor is available, this can be used to determine whether the fault lies with the instrument or the sensor.
- Check that the sensor cable is not damaged or broken and that the outer screen does not make contact with any other terminals or metal work.
- Check that the sensor cable is sufficiently distant from power cables or electrical noise sources.
- Check that the correct sensor type has been installed.
- Check that the correct range has been selected.
- Check that the correct sensor loop resistor calibration value (500Ω) has been used.
- Check that the calibration procedure has been followed precisely.
- Check that the temperature compensation has been set up as required.
- Check that the sensor cable does not exceed the maximum specified length (sensor 5m + extension 95m).

The pH Sensor Reading Is Constantly Over-range or Under-range

- Ensure that the sensor and temperature input is correctly connected (See page 47) and that the sensor is not faulty or damaged.
- Check the temperature compensation state (See page 107). If the compensation is set to "Manual" check that the fixed temperature is at the correct level. If the compensation is "Automatic" check that the temperature reading on the main display is correct.

The pH Sensor Reading Is Incorrect

- Check that no error messages are being displayed. Check that the sensor cable has been correctly connected (See page 47).
- Check that the Temperature reading is correct.
- Check the instrument calibration using a pH simulator, Adjust the pH calibration if necessary (See page 125).
- Use another instrument to check the sensor.

The pH Sensor Is Not Functioning Correctly

- Check that the sensor glass is not broken or cracked.
- Check the reference probe KCl (where applicable) for leakage or contamination.
- Ensure all probe protective caps have been removed.
- Check that any junction boxes used are correctly connected.
- Check that a suitable high impedance, low noise cable has been used.
- Check for damaged or broken cables.
- Check for damp, grease, or liquids near connectors, junction boxes, or terminations.
- Where extension cables have been used, try connecting the sensor directly to the instrument.

The Temperature Reading Is Incorrect

- Check that the temperature sensor is correctly attached (See Installation Section).
- Check that the temperature sensor type is correctly selected in the Sensor Setup menu.
- Where practical check the temperature sensor resistance against the table on page 183.

Current Output Is Incorrect or Noisy

- Check that the maximum load for the current loop has not been exceeded. (750Ω).
- Check that the terminals have been wired correctly.
- Check that the cable screen is attached to Earth at one end and that the cable does not pass too close to a power cable.
- Check that he current output has been configured properly.

Relays Appear to Malfunction

- Check that the controller's sensors are "On-Line" in the Sensor Setup menu.
- Check that the relay configuration is correct.
- Ensure that the relays are connected properly see Installation section.
- Check that the instrument input cables are not picking up excessive noise.
- Check that the front panel fuses are in working condition (See page 31).

Instrument display appears to malfunction

- Switch the instrument power off and on again.
- Check that the display back-light is on, indicating power is reaching the unit.
- See that it displays meaningful text (Issue number etc.) in its start-up sequence, indicating processing activity.

Problems with pH Cables and Connectors

The cable connecting the pH probe to the controller is the most common cause of problems in pH measurement systems. The importance of the following recommendations cannot be over stressed.

Input Resistance
The high input resistance, required for the optimum performance from a pH electrode system, will be seriously degraded if any grease, dirt, or dampness is allowed to collect around any of the connections between the probe and the instrument. This includes any connectors or junction boxes which may be used. Particular attention must be paid to the method of extending the pH electrode cable. A general rule would be the fewer connections there are, the less problems are likely to occur.

Input Cable
The choice of cable is important. Only polythene or PTFE cables are acceptable. Secondly, any vibration or cable movement on a standard co-axial cable will give rise to fluctuations in the readings. To prevent this a low noise cable must be employed. This type of cable can be identified as having a black impregnated polythene layer which is exposed when the outer braid is separated for connection. This must be completely removed at the terminations to avoid a possible short circuit between the electrode and reference pair.

In all cases the screening braid must not be separated from the core conductor by more than 5mm in order to avoid "hum" pickup.

Cables should be kept as short as possible and must be run separately (100mm separation typically) from any power carrying cable.

Cable Length
The response of the instrument to a sudden change in the sensor input will be determined mainly by the source resistance of the electrode and the length of the connection cable. For a typical pH electrode of 1000MΩ resistance, in combination with a typical cable, the time taken to settle to its new value is about 0.5 seconds per metre of cable (depending on the cable capacitance).

Problems with Electrodes
The combination electrodes supplied by LTH are of low resistance and will be less affected by humidity than other, high resistance systems. In any case, the connecting leads and cable connectors must be kept dry, and the cable screen must not be allowed to come into contact with any earthed metal parts. The glass bulb must be kept in a moist condition for correct operation. If the electrode is allowed to dry out, it may be recovered by immersing in a saturated KCl solution or dilute acid for at least 24 hours before use.

Electrodes can be expected to last for at least one year under normal operating conditions before replacement becomes necessary. However operation at elevated temperatures or pressures, and the presence of sulphides or ionic metals, will shorten the electrode life. If the electrode cannot be set up against solutions or shows a sluggish response to changes in pH, it should be replaced.

Guarantee and Service

Products manufactured by LTH Electronics Ltd are guaranteed against faulty workmanship and materials for a period of three years from the date of despatch, except for finished goods not of LTH manufacture, which are subject to a separate agreement.

All sensors made by LTH Electronics Ltd are thoroughly tested to their published specification before despatch. As LTH have no control over the conditions in which their sensors are used, no further guarantee is given, although any complaints concerning their operation will be carefully investigated.

Goods for attention under guarantee (unless otherwise agreed) must be returned to the factory carriage paid and, if accepted for free repair, will be returned to the customer's address free of charge. Arrangements can also be made for repair on site, in which case a charge may be made for the engineer's time and expenses.
If any services other than those covered by the guarantee are required, please contact LTH direct.

N.B. Overseas users should contact their LTH nominated representative. Special arrangements will be made in individual cases for goods returned from overseas.

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