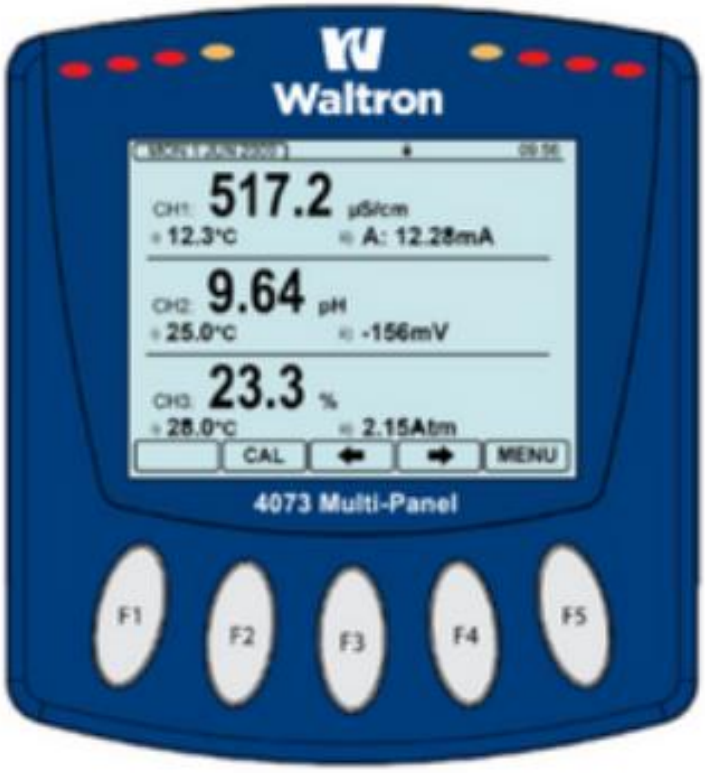
EXPERTS IN WATER CHEMISTRY SINCE 1903



4073 Multi-Parameter Analyzer

Document 101-068-1.2

WALTRON CUSTOMER COMMITMENT

This instruction manual is a technical guide to aid the customer in the set-up, operation, and maintenance of their new Waltron measuring system. Waltron provides continuous product improvement and reserves the right to make any modifications to the information contained herein without notice.

Technical questions concerning this product should be addressed to:

Waltron Technical Service Department
Flemington, New Jersey
Phone: (908)-534-5100
Fax: (908)-534-5546
www.waltron.net

Please be ready to provide the following information:

- Date analyzer was purchased
- Analyzer model and serial number
- Recent maintenance history
- Calibration values, dates, and detailed description of problem

Waltron's technical expertise and extensive experience provides personalized solutions to the water quality industry. It is Waltron's commitment to provide the customer with timely and accurate technical service and support.

Waltron fully expects the customer to be satisfied with the quality, performance, and cost of this product.

If there are any questions or concerns regarding this product, please feel free to contact Waltron at (908)-534-5100.

Thank you for choosing Waltron!

Please note the Waltron mailing and shipping address:

Waltron Bull & Roberts, LLC
25 Minneakoning Road, Suite 101
Flemington, NJ 08822

SAFETY

Please observe proper safety and handling precautions when installing, operating, maintaining, and servicing this product. The following should be noted and adhered to:

- Read and understand manual before working with analyzer.
- Pay special attention to warning labels on enclosures, containers, packages and chemicals.
- Only qualified personnel should be involved in the installation, operation, and servicing of the analyzer.
- Follow safety precautions when operating analyzer in conditions of high pressure and/or temperature.
- Keep analyzer chemicals away from heat and extreme temperatures. Reagent powders must be kept dry.
- Follow all regulations and warning labels when disposing of chemicals. Do not mix chemicals.

To obtain analyzer safety information or Safety Data Sheets (SDS), please contact Waltron or visit the website at www.waltron.net .

WARRANTY AGREEMENT

If, within one year from the date of shipment, the customer experiences any equipment defects or is not satisfied with the analyzer manufacturing, Waltron will repair, or at its option, replace any defective part(s) free of charge. This warranty requires that the defective part(s) be returned to Waltron with shipping charges prepaid.

At Waltron discretion, a Technical Service Specialist may be sent out to repair or replace the defective part(s) on location. Traveling time and expenses of the Technical Service Specialist is at the customer's expense.

Equipment sent to Waltron must be appropriately packaged and the following information must be provided prior to returning to Waltron:

- The Return Authorization (RA) number assigned to the customer by the Waltron Technical Service Department
- Customer name, address and department
- Name and telephone number of the individual responsible for returning items for repair
- Brief problem description

Ship to Waltron service center:

Waltron Bull & Roberts, LLC
25 Minneakoning Road, Suite 101
Flemington, NJ 08822

The Waltron Warranty Agreement:

- Covers expendable sensors for one month after shipment and reusable electrodes for six months after shipment.
- Does not apply to damages occurred during shipping.
- Warranty will be nullified if goods have been used for purposes other than those for which they are intended or if any seal has been removed, broken or tampered with or if the Waltron trademark or serial number has be removed, defaced, or altered.
- Does not cover expendable supply items such as reagents, tubing and electrolytes.
- Does not cover misuse or mistreatment by the user.
- Does not cover previous repair or alteration by unauthorized individuals.

Waltron does not assume responsibility for contingent liability through alleged failure or failures of products or product accessories.

CHECKLIST OF MATERIALS

- In order to ensure customer satisfaction, Waltron does its best to provide adequate and timely packaging and shipping services. Please perform the following after receiving a shipment:

- Inspect all shipping containers upon receipt and record any visible damage. If there are any outward signs of damage, please retain all containers and packages for inspection by carrier. Please retain all packing material so that it can be used for future moving and shipping needs.

- Check all items received against those on the packing list. Chemicals are usually shipped in a separate package and will be itemized accordingly.

- Verify that the number of packages received agrees with the packing list and shipping papers.

- Notify both Waltron and the carrier if any problems occur.

Important Notice:

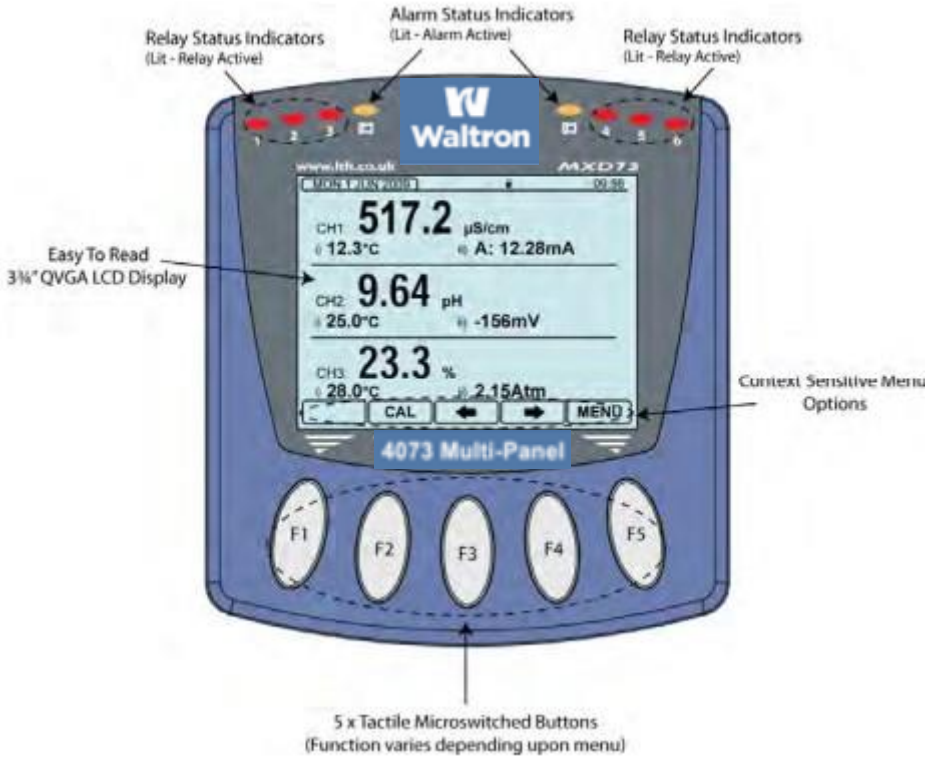
- All analyzers are inspected and tested prior to shipment.
- In normal use, the unit should require only minor maintenance and should operate correctly and without fault over a long period of time.
- Please note that if electronic components need to be replaced, it may be necessary to adjust and/or calibrate the analyzer.
- Failure to carry out correct maintenance procedures may result in inaccurate analyzer readings.

TABLE OF CONTENTS

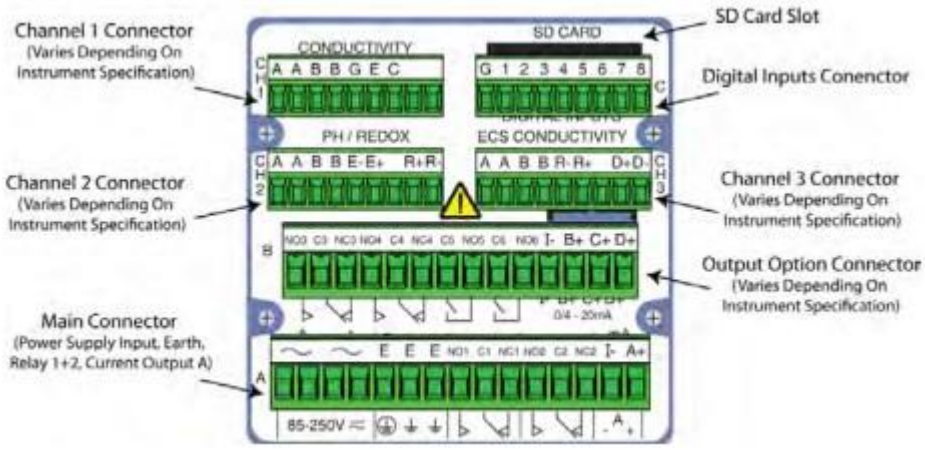
1 INTRODUCTION

1.1 GENERAL

The 4073 Multi-Panel Monitor is a microprocessor controlled multi-parameter instrument that can be installed with a user selected combination of up to 3 Sensor Input Cards. The instrument may be subsequently modified to meet changing requirements by the installation of additional, or different, cards and the attachment of the appropriate sensor(s). Utilizing a multifunction easy to read QVGA LCD the instrument displays readings and provides feedback to the operator on the status of the sensors and instruments outputs. In addition, the instrument features, depending upon configuration, up to six control relays, up to six 0/4 – 20mA current outputs and a Modbus RS485 interface. These can be used to provide fully configurable control, alarm, and feedback. The instrument also features an SD card interface which enables the user to backup and restore instrument settings, copy settings between instruments, log the sensor readings (optional extra) and to upgrade the instrument's software.



4073 Overview



4073 Rear Termination Overview

1.2 4073 INSTRUMENT SPECIFICATION

Input Expansion Slots:	3 slots, user configurable with any combination of available input add-in cards.
Output Expansion Slots:	1 slot; user configurable with an additional output option add-in card.
Ambient Operating Temperature:	-20°C to +50°C (-4°F to +122°F) for full specification.
Display:	3 ¾" QVGA back lit LCD module.
Buttons:	5 tactile feedback, micro-switched, silicone rubber.
Alarm LEDs:	2 Yellow LEDs located above the main display area for instrument's alarm status, lit = active.
Digital Inputs:	8 contact closures for remote activation of user defined operations. Can be configured to operate in either normally open or normally closed modes.
Current Output Options:	1 as standard, expandable up to a total of 4 or 6 depending on the number of relays.
Current Output Specification:	Each selectable 0-20mA or 4-20mA into 750 ohms max, 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.
Setpoints and Control Relays:	2 changes over relays as standard, expandable up to a total of either 4 change over relays, or 4 change over relays + 2 normally open relays depending on the number of current outputs.
Setpoints and Control Relays Specification:	Fully configurable setpoints with volt free contacts for each relay. Rated at 5A @ 30V DC / 5A @ 250V AC.
Setpoint LEDs:	6 Red LEDs located above main display area for setpoint status indication, lit = relay energized.
Setpoint Modes:	On/Off, Time Proportioning, Pulse Proportioning, Band and Latch. Delay timer adjustable from 00:00 to 59:59 mm:ss.

	Hysteresis 0 to 9.9%.
	Dose alarm timer, with supplementary initial charge function. Both adjustable from 00:00 to 59:59 mm:ss.
	Adjustable cycle time and proportional band in proportional modes.
Setpoint Cleaning:	Cleaning mode with adjustable duration (max 10m) and interval times (max 24h), auto offline function with recovery timer.
Setpoint Alarm:	Unit or channel alarm mode, whereby the relay can be energized under certain set conditions.
Modbus RS485 Interface (Optional):	Supports RTU and ASCII formats. Node Address: 1 to 247 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 instrument configuration, log the sensor readings (optional extra) and on site upgrading of instrument software. SD, SDHC and SDXC-FAT32 cards supported.
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.
	LV Option 18 – 32 V AC or DC, 20W max.
Instrument Housing:	UL 94-V0 PC/ABS.
Ingress Protection Rating (IEC 60529 Protection Rating):	IP66 to the front when panel mounted.
Weight:	Maximum 880 grams (instrument only).
Dimensions Front:	128 x 116 x 23 mm (H, W, D).
Dimensions Rear:	89 x 89 x 161 mm (H, W, D), including connectors.

1.3 INSTALLATION – SAFETY & EMC

This chapter describes how to install the instrument 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 safely. This could include the provision of an additional monitoring device, depending upon the application and any consequences of an instrument or sensor failure.

1.3.1 WIRING INSTALLATION

The specified performance of the instrument 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 INSTRUMENT.

LOCAL WIRING AND SAFETY REGULATIONS SHOULD BE STRICTLY ADHERED TO WHEN INSTALLING THIS UNIT. SHOULD THESE REGULATIONS CONFLICT WITH THE FOLLOWING INSTRUCTIONS, CONTACT WALTRON 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 instrument 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 instrument housing.

- The rear input card cover of the panel mount unit must be correctly re-assembled and securely fastened to maintain a continuous electro-magnetic shield around the instrument.

1.4 NOISE SUPPRESSION

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

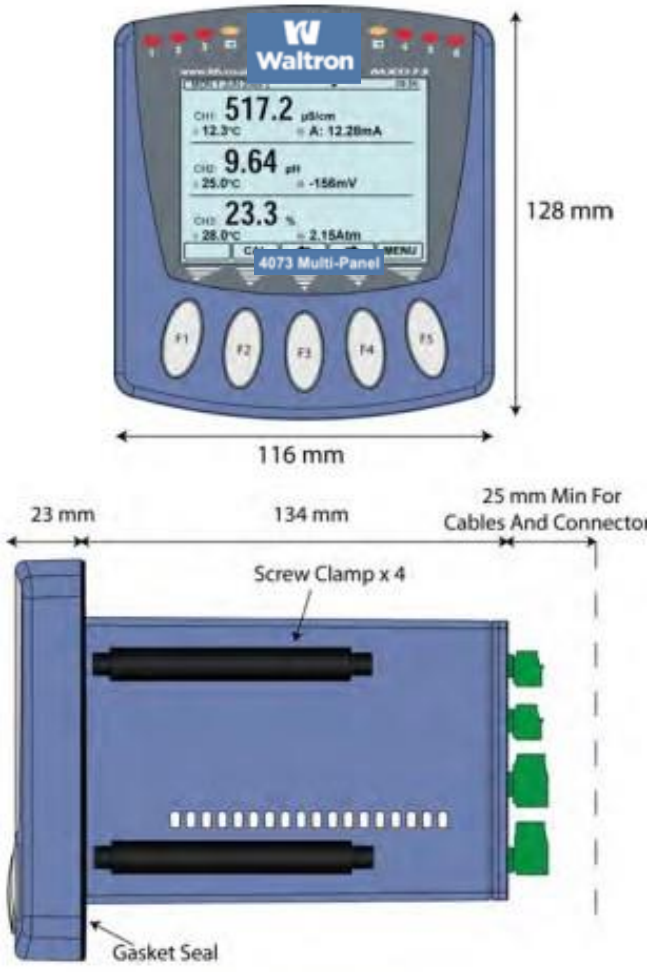
The instrument is designed with a high degree of noise rejection built in to minimize the potential for interference from these sources, but it is recommended that you apply the following wiring practices as an added precaution. Cables transmitting low level signals should not be routed near contactors,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

If noise sources are so severe that the instrument'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 instrument.
- In cases of very high background RF and HF noise environments, Waltron can supply a length of proprietary RF suppressing mains cable.

1.5 4073 INSTALLATION

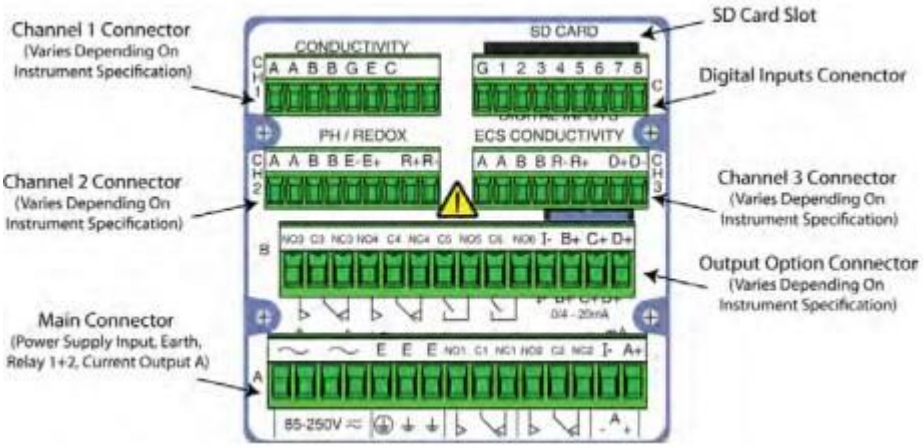
The 4073 is designed to be flush mounted and sealed in a square cut-out panel and is held in place with the four screw clamps provided.



- The panel cut-out for the instrument should be 92 mm x 92 mm (+1.0 -0.0).
- Take care to ensure that the gasket is correctly positioned before tightening the clamps. A badly fitted gasket will not give a good seal to the specified IP rating.
- Four screw clamps are supplied with the instrument and are fitted from the back of the instrument.

1.6 4073 CONNECTIONS

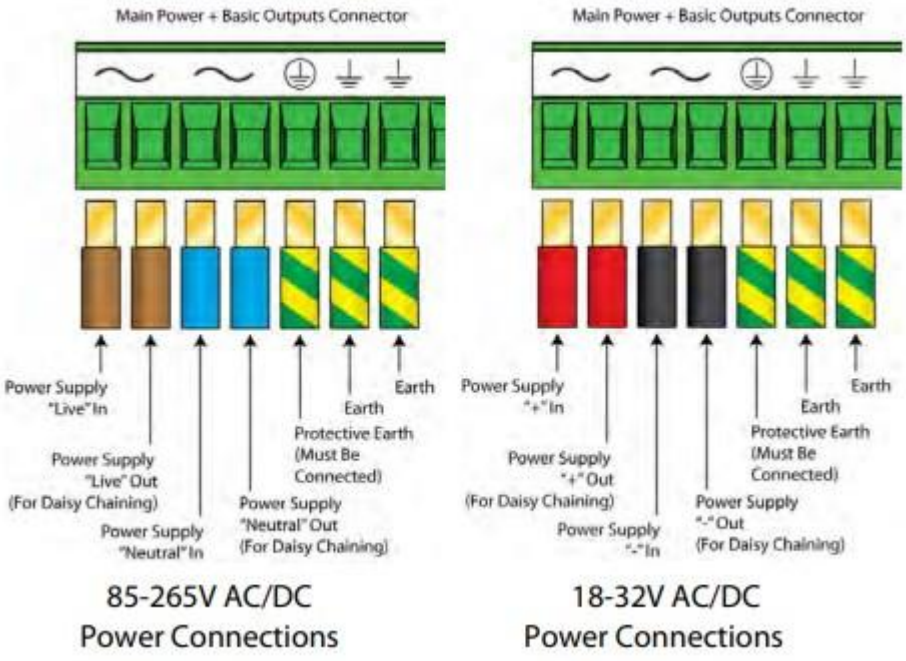
Connections to the 4073 are made with up to six plug and socket terminal blocks, accessible to the rear of the unit. The availability of the terminals will vary depending upon which options are installed.



The bottom connector houses the power input and the basic current and relay outputs. The output option connector above provides additional relay current outputs. The top right connector houses the digital inputs and SD card slot. Finally, the remaining three connectors provide the sensor inputs to channels 1, 2 & 3.

1.6.1 4073 SUPPLY VOLTAGE CONNECTIONS

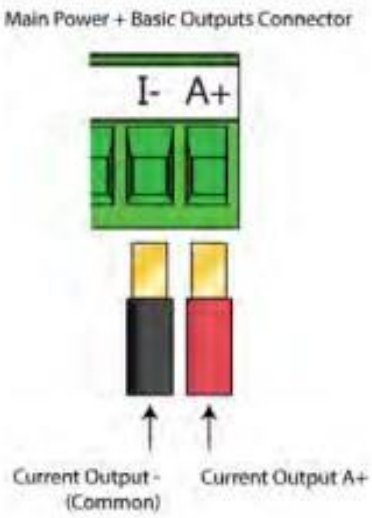
The 4073 can be powered from either an AC or DC supply voltage. The unit provides two terminals for each of the input connections ("Live" & "Neutral" for an AC input, or + & - for a DC Input), plus an "Earth" terminal. This allows the supply to be "daisy chained" to the relay contacts and/or other instruments. The instrument 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 instrument.**



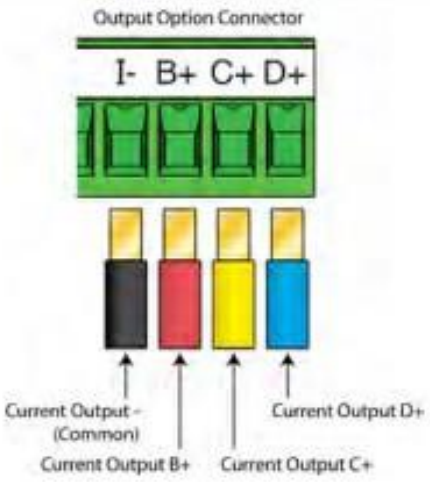
The power supply should be taken from an isolated spur and fused to a maximum of 3 Amps. If the relays require greater current, then a separate 5A fuse will be required. The incoming Earth connection must be connected to the “Protective Earth” terminal.

1.6.2 4073 CURRENT OUTPUT CONNECTIONS

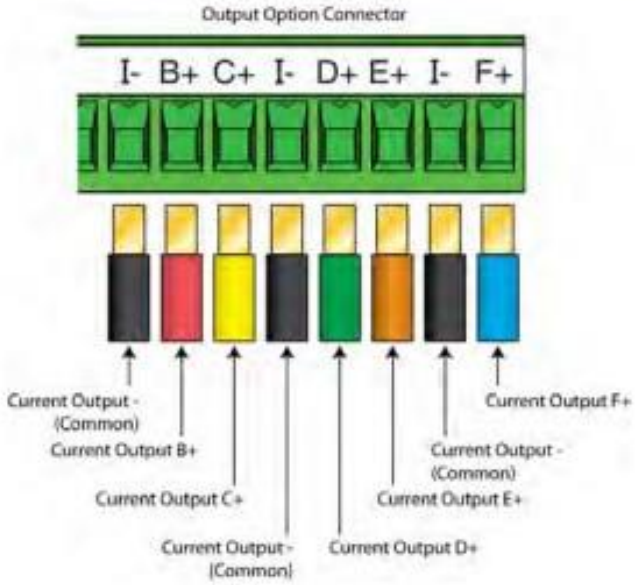
The 4073 can be supplied with up to 6 current outputs designated A to F, which can terminate into a load resistance not exceeding 750Ω. For best noise immunity use a screened twisted pair cable, with the screen connected to Earth at one end. Use a sufficiently large cable to avoid a high resistance in the overall current loop.



Current Output A Connection Detail.



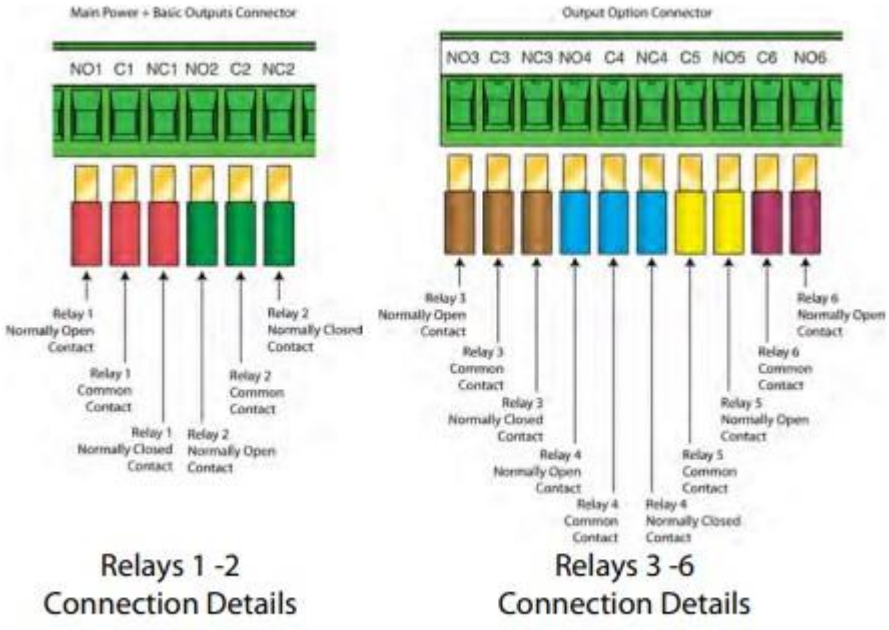
Current Outputs B - D Connection Details.



Five Current, Two Relays Output Expansion Card.
Current Outputs B - F Connection Details.

1.6.3 4073 RELAY CONNECTIONS

The 4073 can be supplied with up to 6 relays designated 1 to 6, 1 to 4 are changeover relays while 5 to 6 are normally open relays. The relay contacts are connected to the terminals only and are electrically isolated from the instrument itself. They must be connected in series with a 5 Amp fuse. A contact arc suppressor may be required to prevent excessive electrical noise, depending upon the load. To switch more than 5 Amps will require a slave relay. For convenience, the power can be looped across from the supply connections.



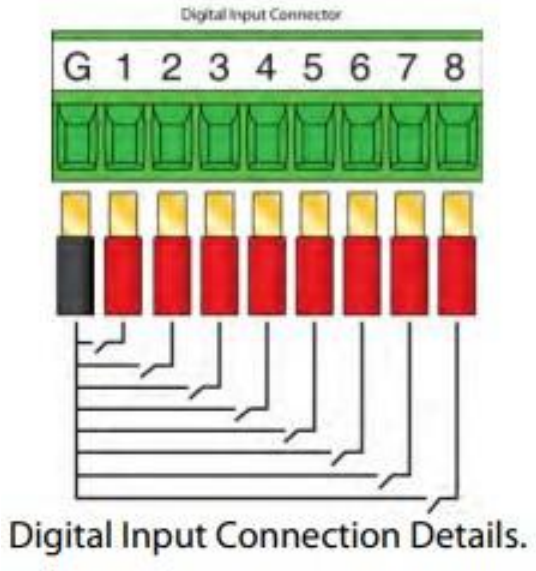
Relays 1 -2 Connection Details

Relays 3 -6 Connection Details

(N.B. Available Relays Varies Depending Upon Instrument Configuration)

1.7 DIGITAL INPUTS

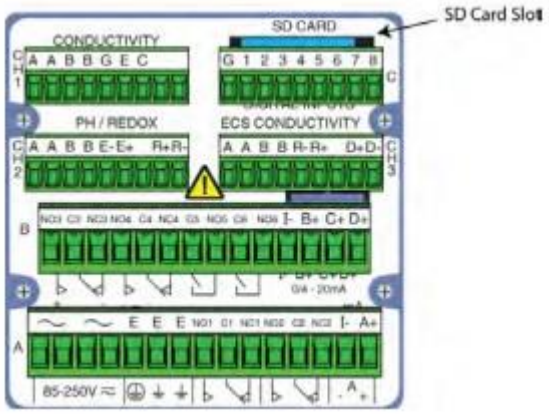
The 4073 features 8 digital inputs, which can be used to initiate a user configurable instrument operation by use of a volt free link, switch, or relay. The instrument can be configured to initiate the appropriate action when the contact either closes or opens.



Digital Input Connection Details.

1.8 SD CARD INTERFACE

The 4073 features an SD card interface which is compatible with SD, SDHC and SDXC formatted cards (N.B. SDXC cards may need formatting by the 4073 before use – see user interface guide). 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 on the top right of the card, and then push it all the way into the socket. To remove the card, push it in and then release, and the card should then come out of the socket. N.B. It may be required to pull the card out of the last bit of the socket.

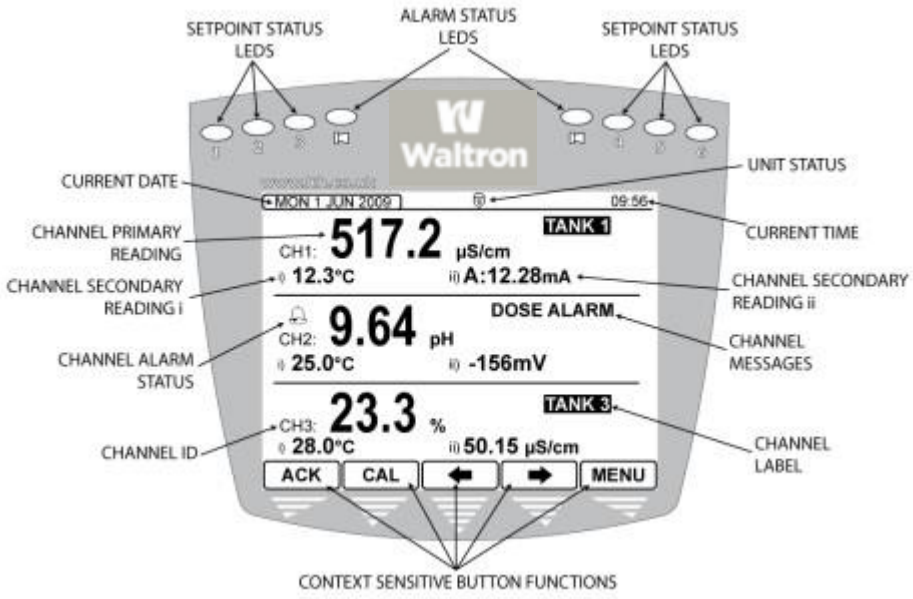


2 USER INTERFACE & DATA LOGGING GUIDE

2.1 USER INTERFACE

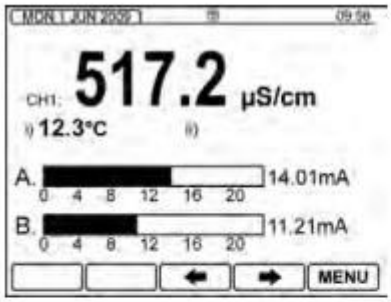
CAUTION! BEFORE PROCEEDING, ENSURE THAT THE INSTALLATION INSTRUCTIONS HAVE BEEN FOLLOWED CORRECTLY. FAILURE TO DO SO MAY RESULT IN AN ELECTRICALLY HAZARDOUS INSTALLATION OR IRREPARABLE DAMAGE TO THE INSTRUMENT.

The 4073 Series uses a high-quality backlit 3¾" QVGA LCD to display the channel readings 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 Setpoint Status LEDs that when illuminated indicate which setpoint / relay is active. Located between the setpoint LEDs there are two Alarm Status LEDs which provide clear indication of a fault within the instrument.

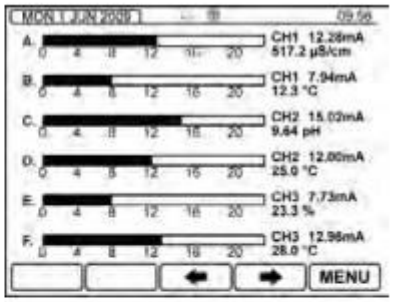


2.1.1 THE FRONT SCREEN

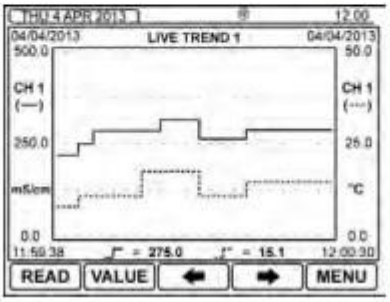
The 4073 Series front screen has the capability of showing up to three sensor input channels. Each channel shows the main sensor reading, two secondary readings and a channel label, all of which can be customized to the user's requirement. If only one channel is displayed on the front screen, then the ability to show up to two current output trends becomes available. Alternatively, a current outputs trend screen is available or if purchased, three live trend screens which can show up to 200 readings.



Front Screen Trends



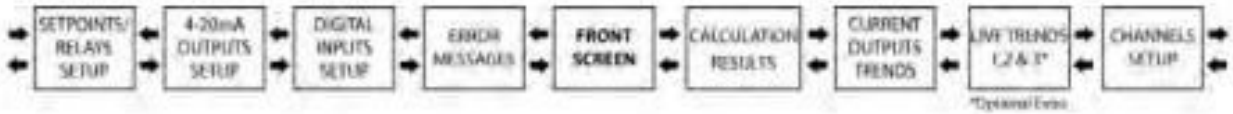
Current Output Trends



Live Trend (Optional Extra)

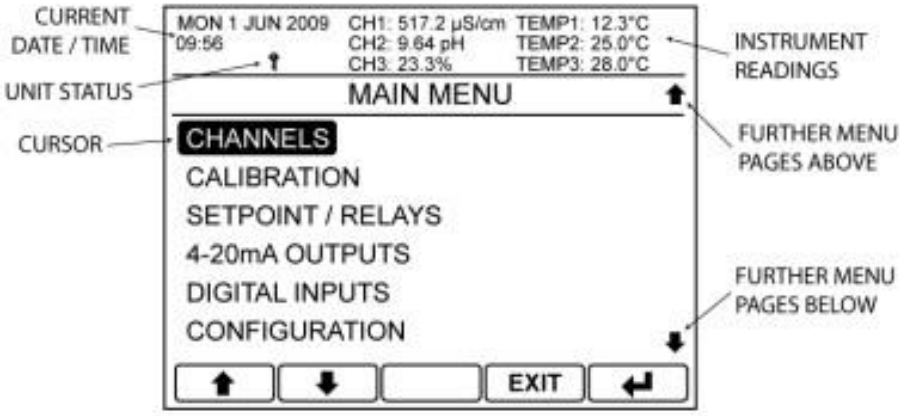
2.1.2 THE MENU SYSTEM

When the instrument is switched on it will complete a configuration check that will take approximately 20 seconds after this it will default to the front screen. 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.

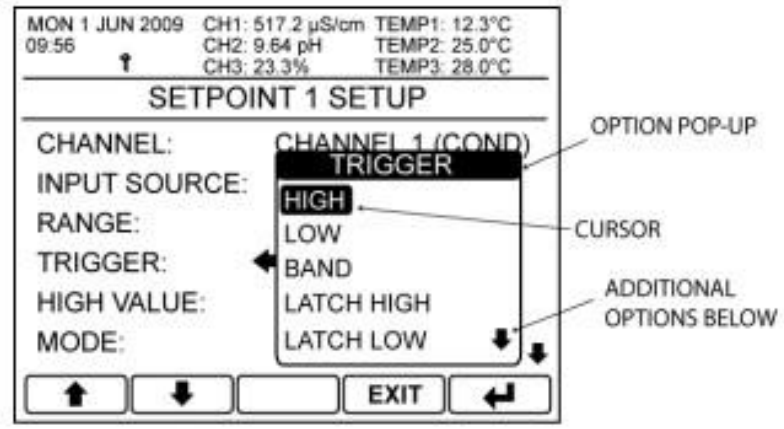


Scrolling Menu Layout

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



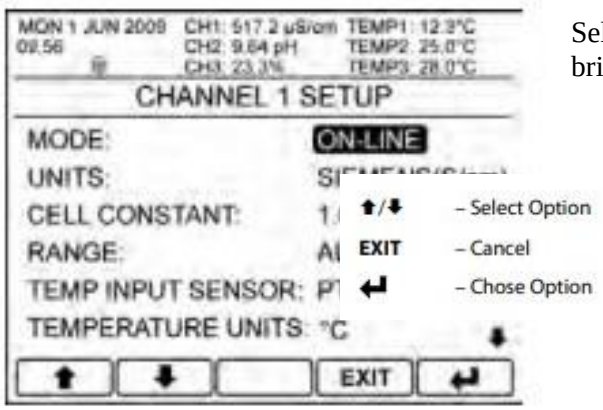
The main menu is split into two main sections. The top shows the current time & date, the unit status and the instrument's current readings. The bottom section shows the current options for that menu which may be selected by moving the cursor with the arrow buttons and pressing the enter button. The 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 the front screen. If no buttons are pressed after 2 minutes the instrument will default back to the front screen. 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.



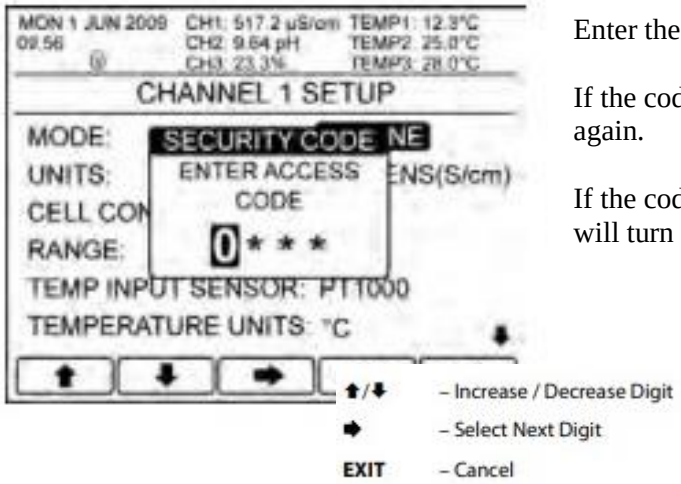
2.1.3 SECURITY CODE ACCESS

To protect the instrument setup from unauthorized or accidental tampering, a security access code system is present. This is implemented via the instrument'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 instrument'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.



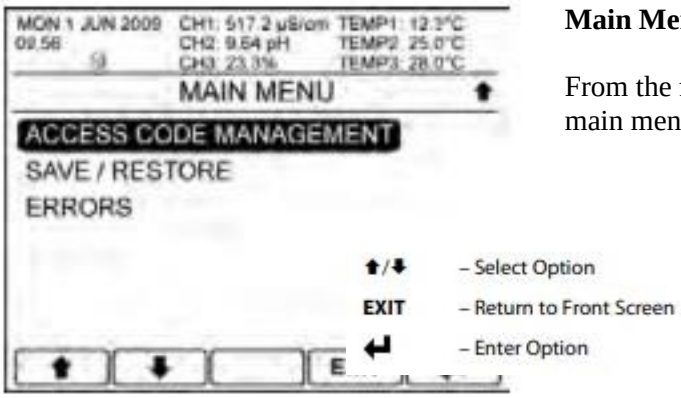
Enter the required Access Code.

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

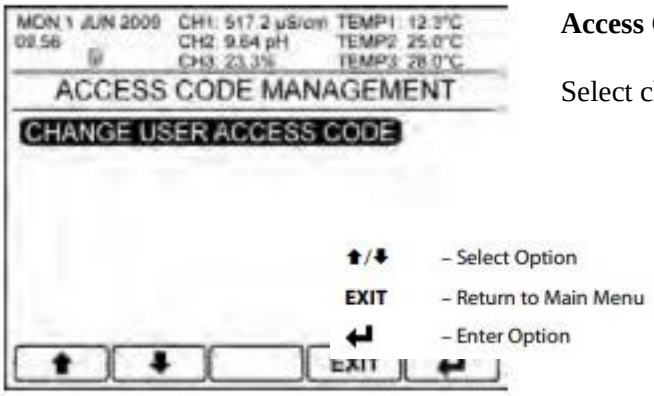
2.1.4 ACCESS CODE MANAGEMENT

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.



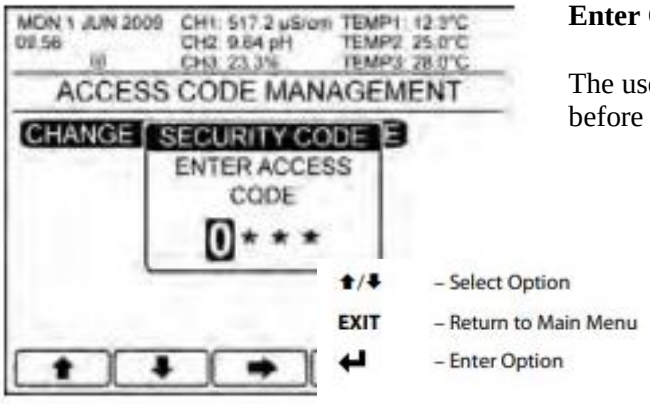
Main Menu

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



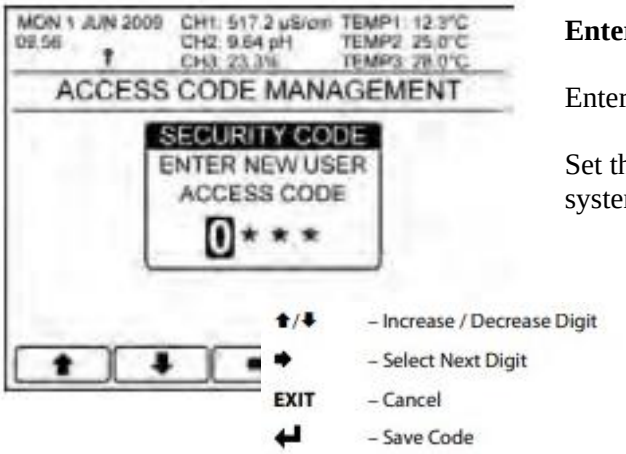
Access Code Management

Select change user access code.



Enter Current Code

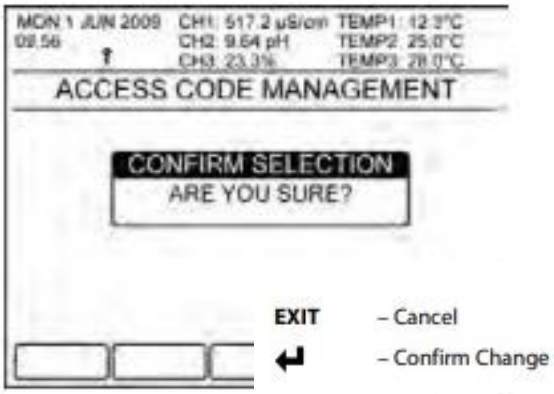
The user is required to enter the existing security code before the new code can be entered.



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 instrument.



New Code Confirmation

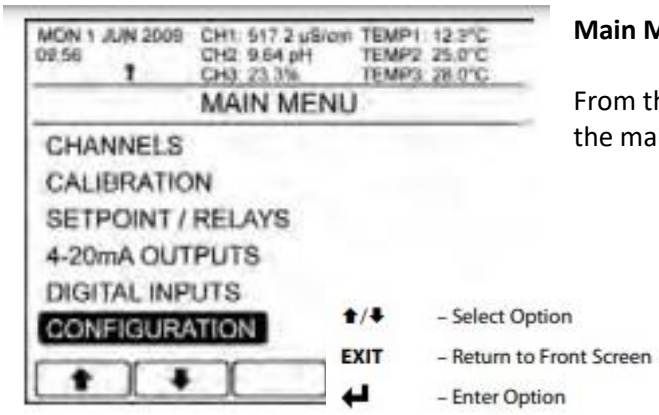
Confirm the change of the security access code.

Change Confirmation

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

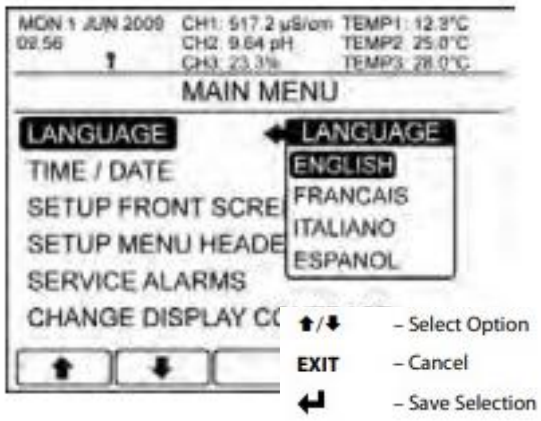
2.2 CONFIGURATION

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



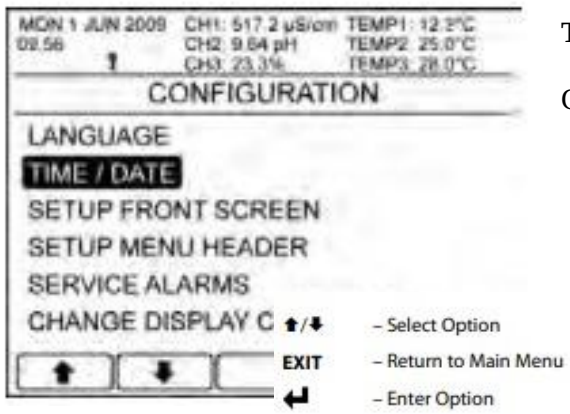
Main Menu

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



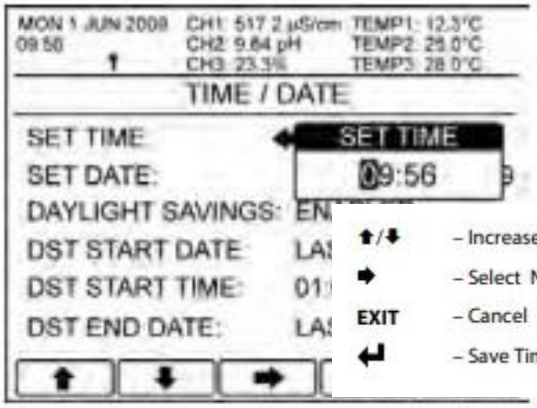
Language

The 4073 can support multilingual menus. The language of choice can be selected from this menu.



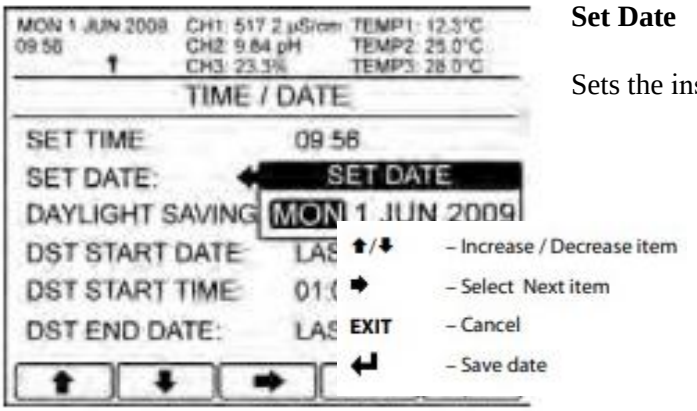
Time / Date

Configure the internal battery backed clock.



Set Time

Sets the instruments time.

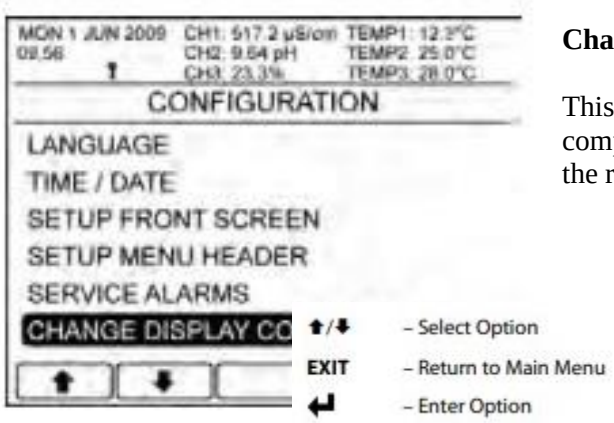


Set Date

Sets the instrument's date.

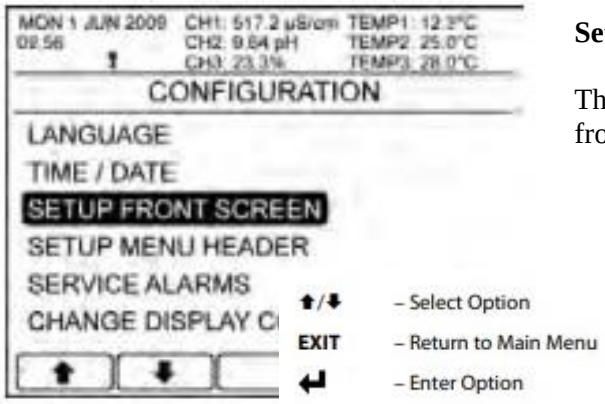
Daylight Savings

This allows the instrument to automatically adjust its time for daylight savings. The start and end times may be adjusted to allow for local differences.



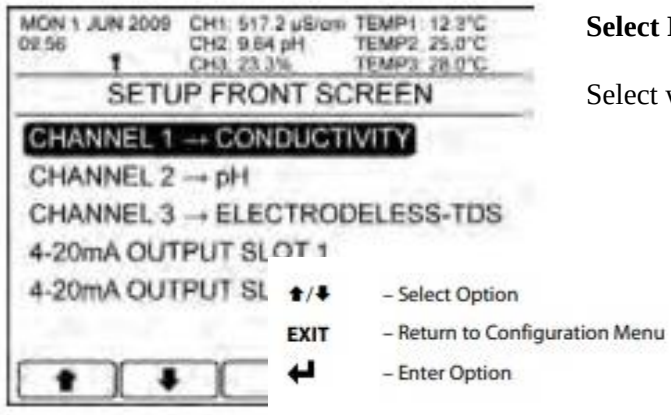
Change Display Contrast

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



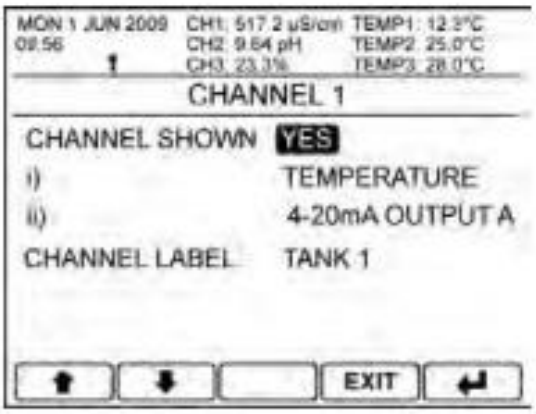
Setup Front Screen

This allows the user to customize the information the front screen displays.



Select Front Screen Channel

Select which front screen channel you wish to edit.

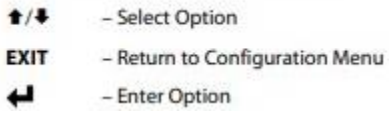


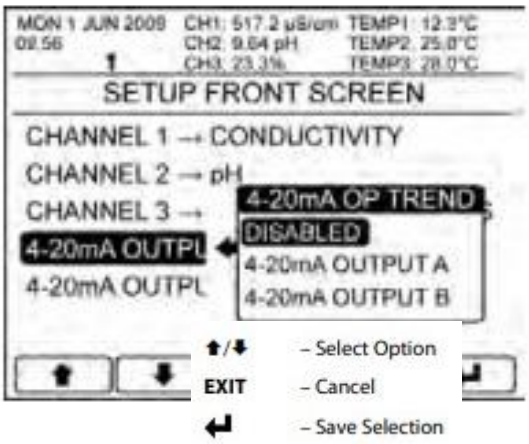
Channel Setup

- Channel shown – Select whether the channel is shown or not.

- i), ii) – Define which is displayed in either of the two secondary reading slots. Available options depend on the selected input card type but include temperature, sensor current, pressure and any associated current output values.

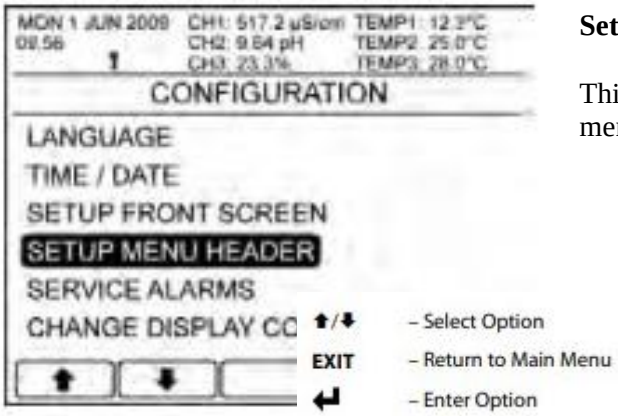
- Channel Label – Define the channel label that appears on the front screen adjacent to the channel reading (7 characters maximum).





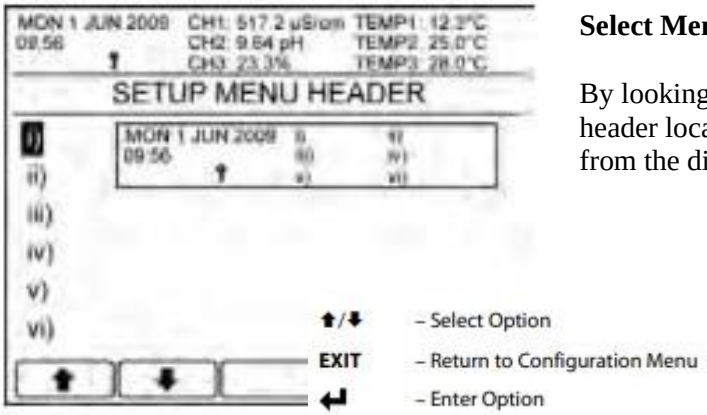
Front Screen Trend

If only one channel is displayed on the front screen the user can show up to two current output trends called 4-20mA Output Slot 1, and 4- 20mA Output Slot 2. Note that you will only be able to select the current outputs that are associated with the displayed channel.



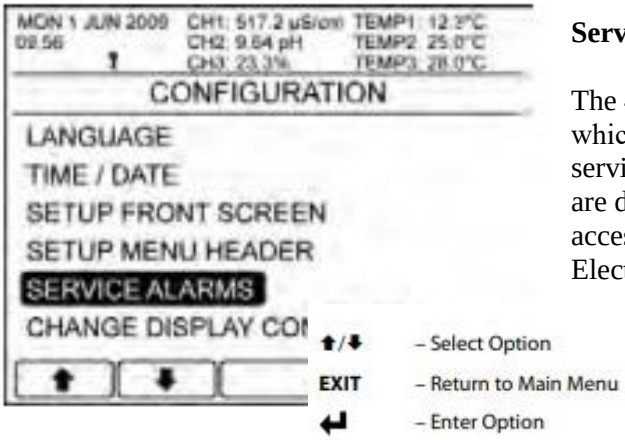
Setup Menu Header

This allows the user to customize the information the menu header displays.



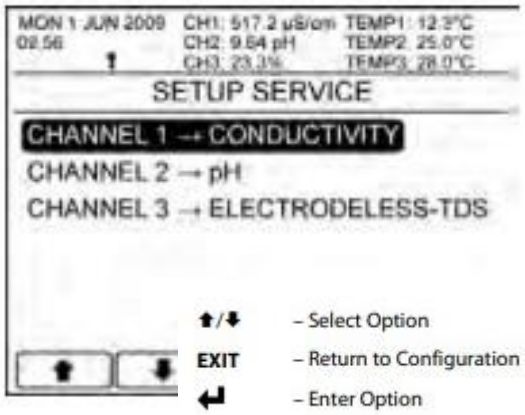
Select Menu Header

By looking at the legend shown, select which menu header location you wish to edit; then, choose the value from the displayed pop-up.



Service Alarms

The 4073 has an inbuilt Service Alarm for each channel 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 Waltron Electronics.



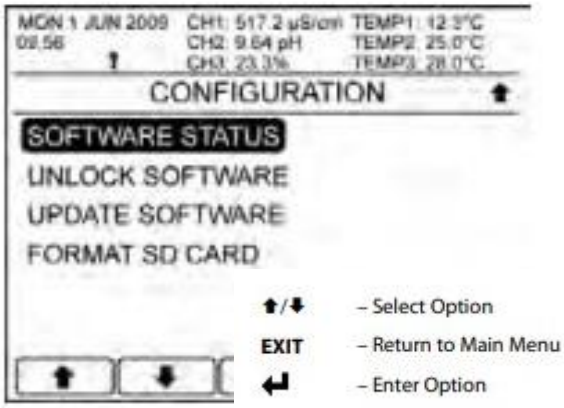
Select Service Alarm Channel

Select which service alarm the user wishes to edit.

Service alarm configuration:

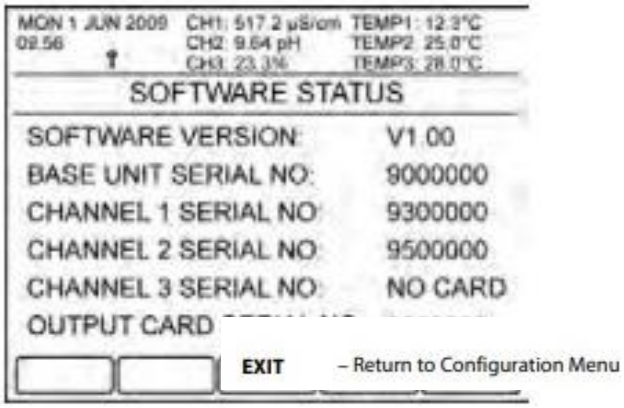
- Service Due Date: Update – Automatically increment the next service date by the service interval. Requires service security code prior to use.
- Service Reminder – Turn the service alarm on or off. Requires service security code prior to use.
- Service Interval – Set the Service Interval. Requires 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.

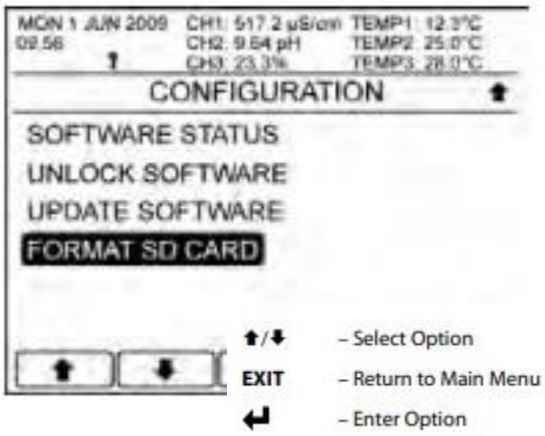
– Select Option
EXIT – Return to Select Service Alarm Menu
– Edit Option



Software Status

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



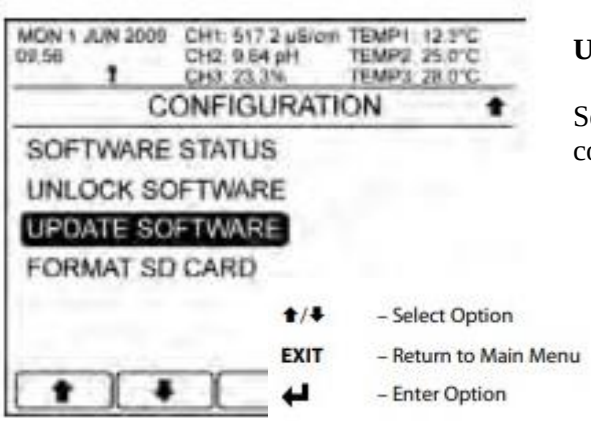


Format SD Card

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

2.3 UPDATE SOFTWARE

The 4073 operating software can be upgraded by saving the latest version from Waltron onto an 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. All units supplied after 1st October 2012 now support SDHC and SDXC cards using the fat32 format. If the card is not formatted correctly the instrument will inform the user, the card must then be reformatted using the Format SD Card function. Caution: The 4073 update may take up to 5 minutes, during which time the unit will not operate.



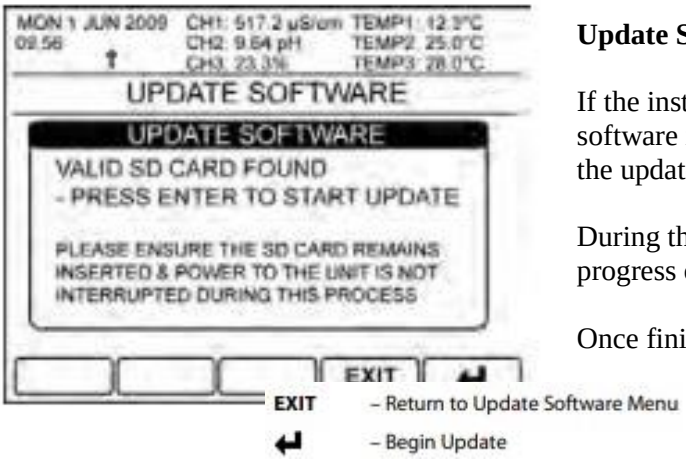
Update Software

Select the update software option from within the configuration menu.

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.



Update Software

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

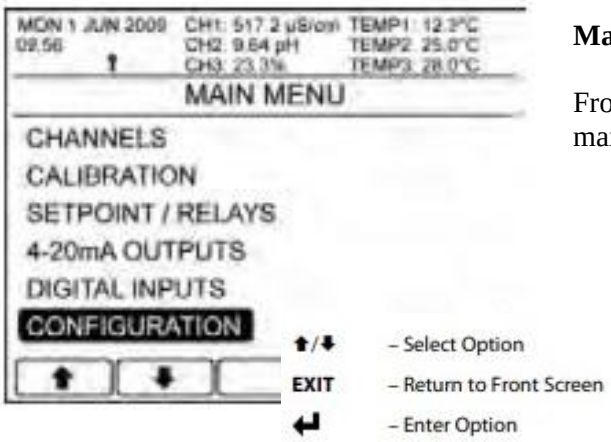
During the update the display and LEDs will indicate the progress of the update.

Once finished the instrument will restart automatically.

2.4 OPTIONAL SOFTWARE FUNCTIONS

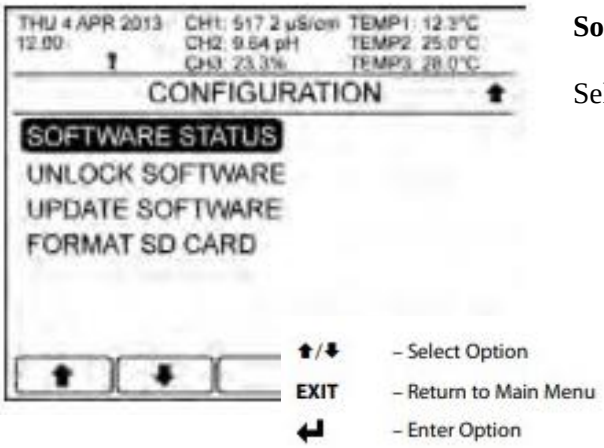
The 4073 features optional software functions which when purchased will expand the instrument's capabilities. These functions by default are locked. They can be unlocked by Waltron or your local distributor at the time of order. Alternatively, the functions may be ordered after purchase by supplying Waltron or your local distributor with the serial number of your instrument along with the purchase order. In return they will supply you with an 8 digit unlock code that is unique to the instrument 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.

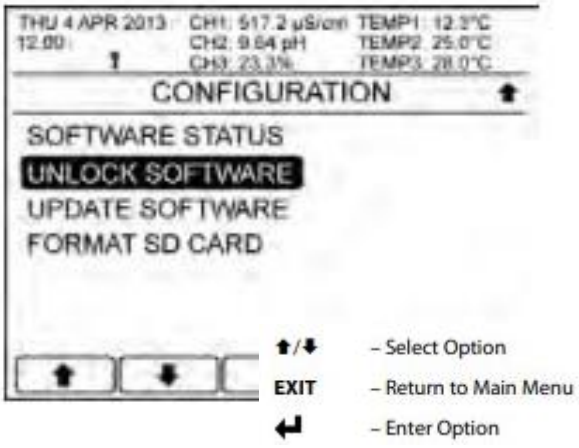


Software Status

Select Software Status.

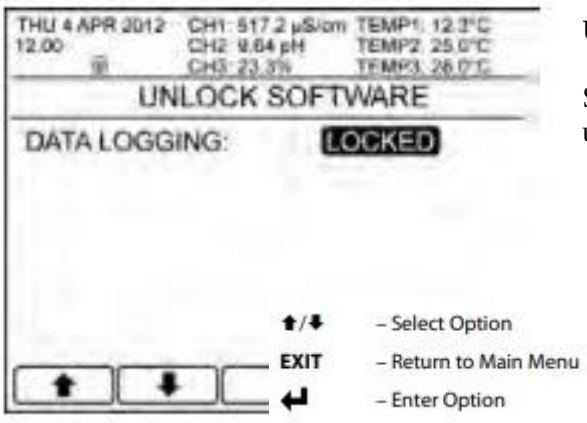
Software Status

Record the base unit serial number and supply it to Waltron or your local distributor along with your purchase order.



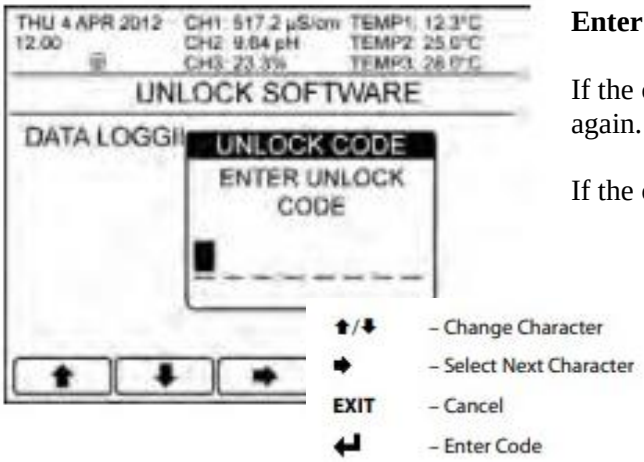
Unlock Software

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



Unlock Software

Select the optional software function you wish to unlock.



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

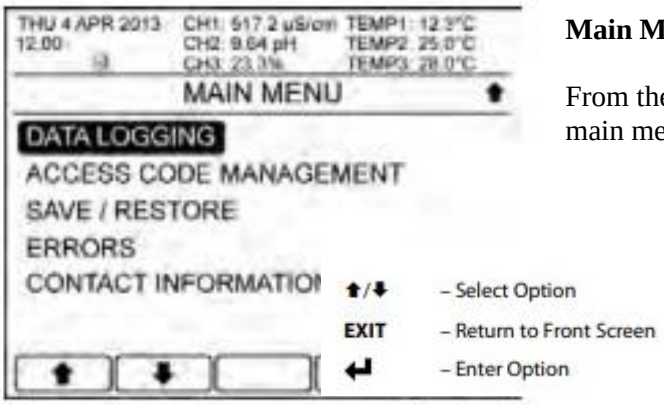
2.5 DATA LOGGING

The Data logging optional software function expands the capabilities of the 4073 series by allowing the user to record over time the status of the instrument. It consists of two separate sections, Live Trending and SD Card Data Logging, which together will help the user to analyze and improve the performance of their application. Please note by default this function is locked. It can be unlocked by Waltron or your local distributor at the time of order or through purchasing an unlock code.

2.5.1 LIVE TRENDING

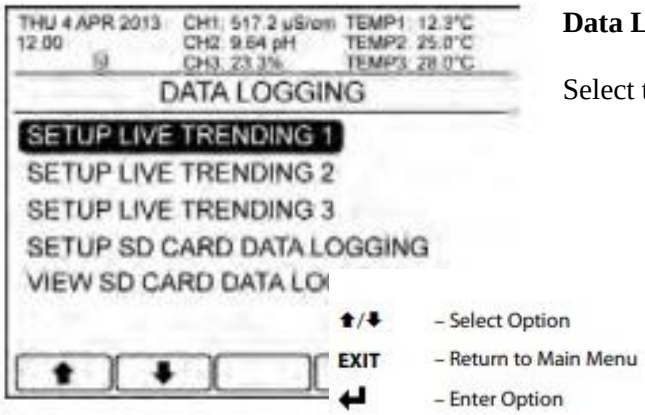
Live Trending provides the user with 3 separate live trend screens adjacent to the front screen with each showing 2 readings; these enable the user to instantly view the last 50 samples of each reading. The live trend screen also features a review mode whereby the user can further analyze the last 200 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



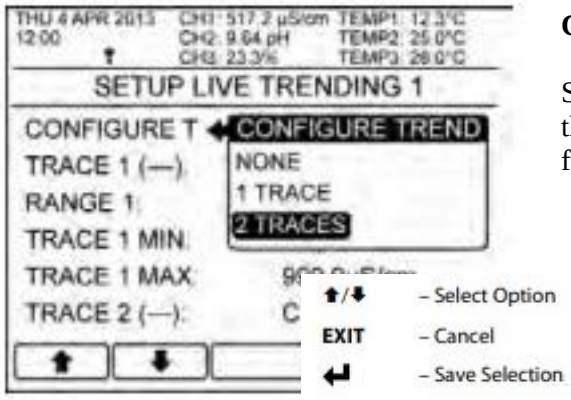
Main Menu

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



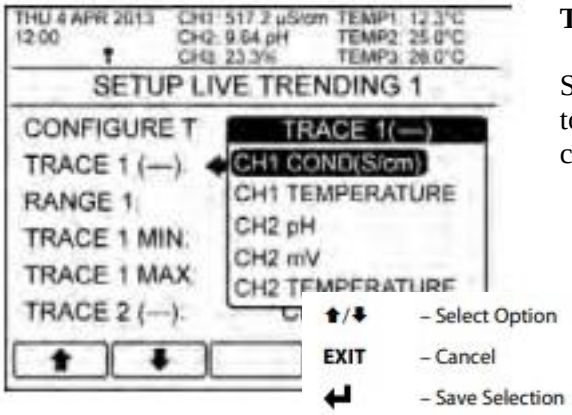
Data Logging

Select the live trend you wish to set up.



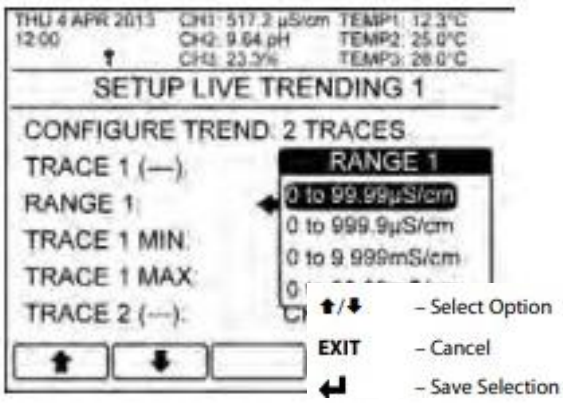
Configure Trend

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



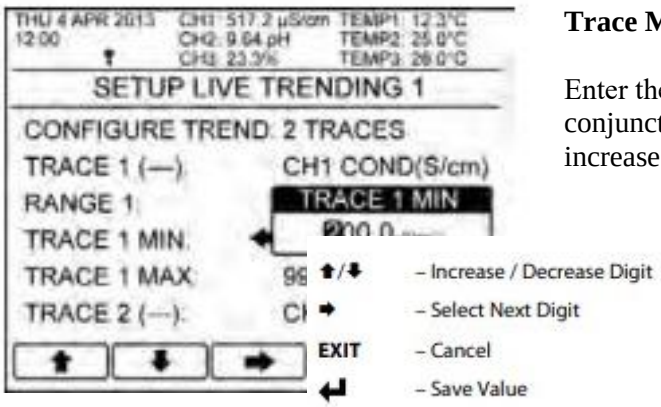
Trace 1 (—)

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



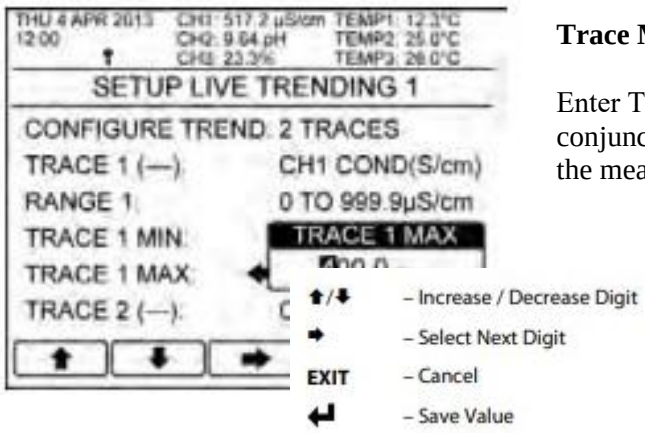
Range

If the trace's associated measurement is currently configured to use auto ranging, then a fixed range will need to be assigned to the trace.



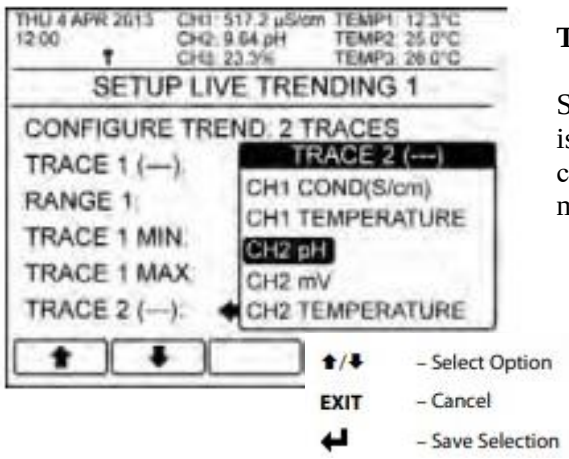
Trace Min

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



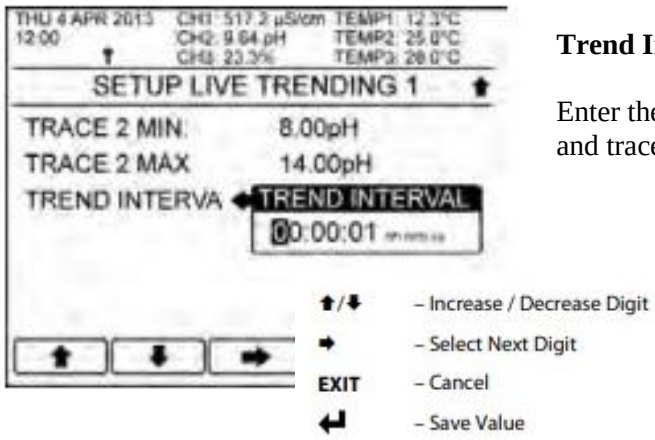
Trace Max

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



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.



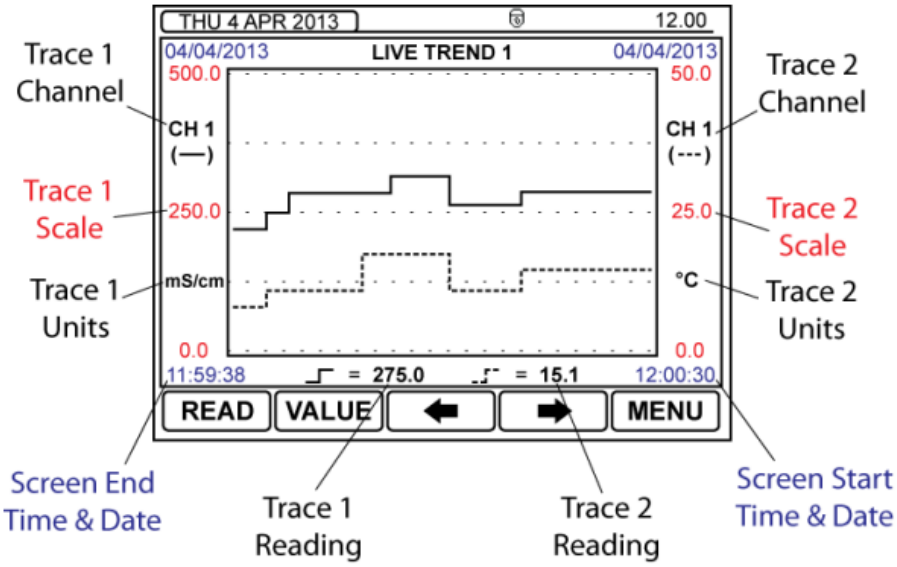
Trend Interval

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

2.5.2 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/ MAX/ AVG



MIN/ –

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

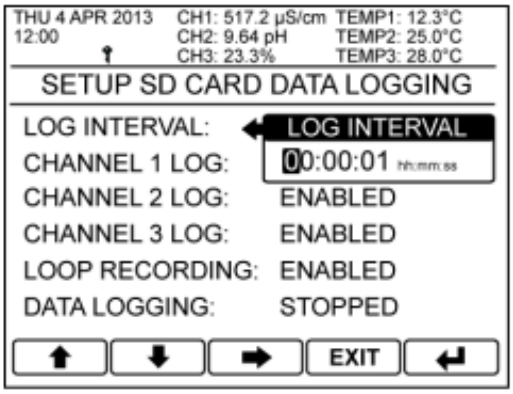
LINE/ PAGE – When in Review Mode toggles between the cursor moving a line at a time or at a page at a time.

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.



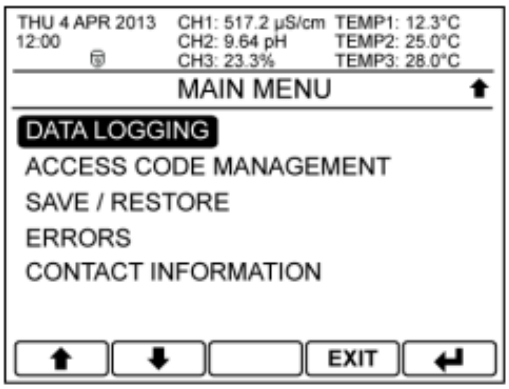
SAVE – When in Review Mode and an SD card is present, saves a copy of the current 200 readings as a time stamped excel compatible file to the Live Trend folder on the SD card.

2.5.3 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 instrument direct to the SD card. Variables logged include: the primary sensor readings, any secondary readings, the status of the setpoints, the current output readings, the status of the digital inputs and any error messages. This data can then be viewed either inside the instrument or removed and viewed in Microsoft Excel on a PC. Which channels are logged, and logging interval are configurable by the user.

2.5.4 SETUP SD CARD DATA LOGGING

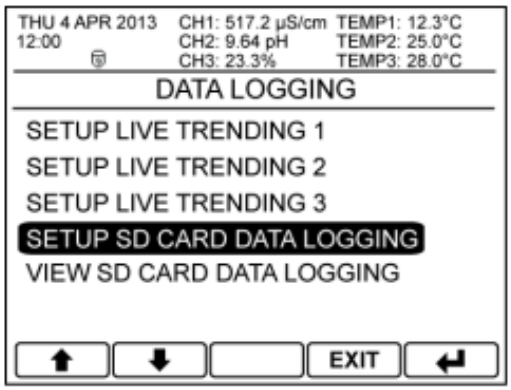
Main Menu



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

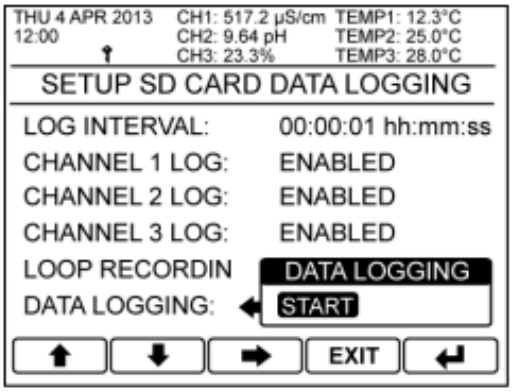
Data Logging



Select Setup SD Card Data Logging.

↑/↓ – Select Option
EXIT – Return to Main Menu
↵ – Enter Option

Log Interval

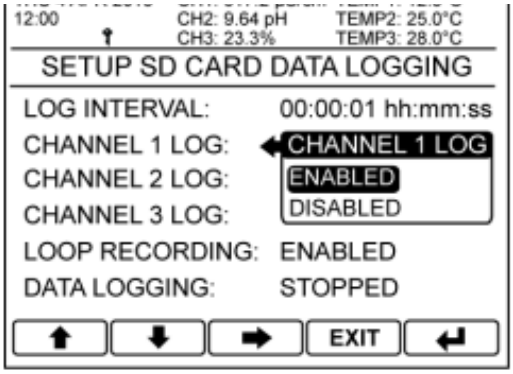


Enter the time interval of the SD card data logging.

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

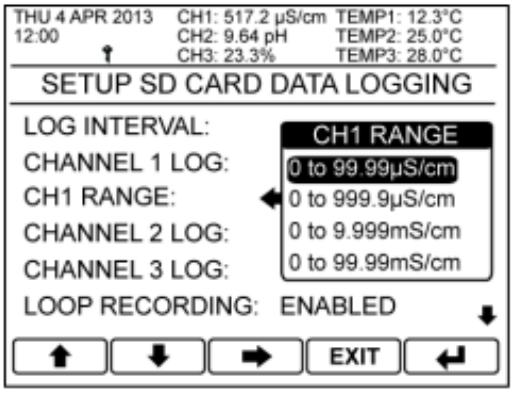
Channel Log



Enables / Disables the SD card data logging of the channel and any setpoints, current outputs, digital inputs and error messages associated with the channel.

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

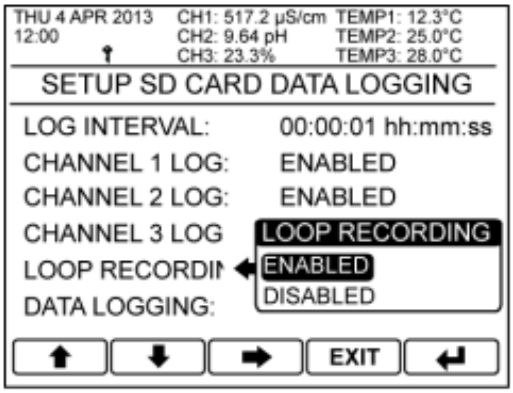
Range



If the associated measurement is currently configured to use auto ranging, then a fixed range will need to be assigned to the log.

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

Loop Recording

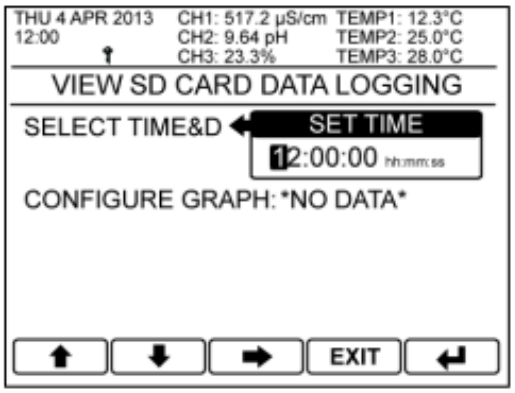


If enabled, when the SD card becomes full, the instrument will automatically delete the oldest data log file and then continue to log.

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



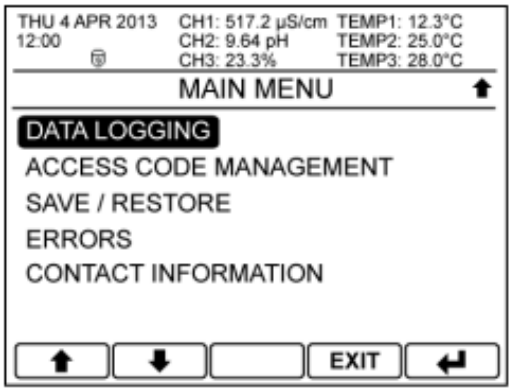
Shows the status of the data logging (Stopped / Recording) and allows the logging to be started and stopped. When the data logging is active the SD card active symbol will be shown at the top of the screen.

Note: If many 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

2.5.5 VIEW SD CARD DATA LOGGING

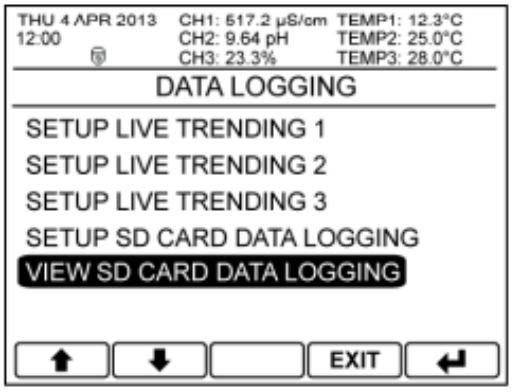
Main Menu



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

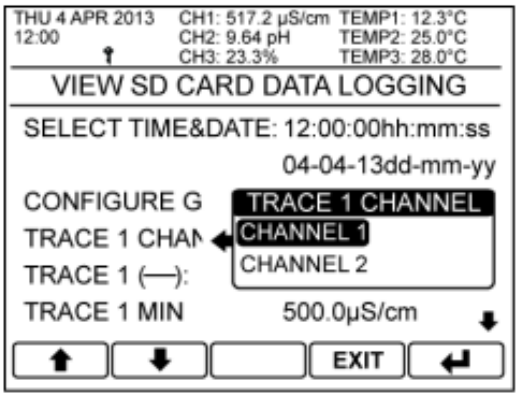
Data Logging



Select View SD Card Data Logging.

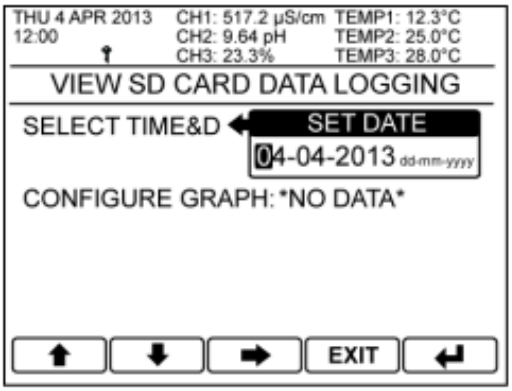
↑/↓ – Select Option
EXIT – Return to Main Menu
↵ – Enter Option

Select Time & Date



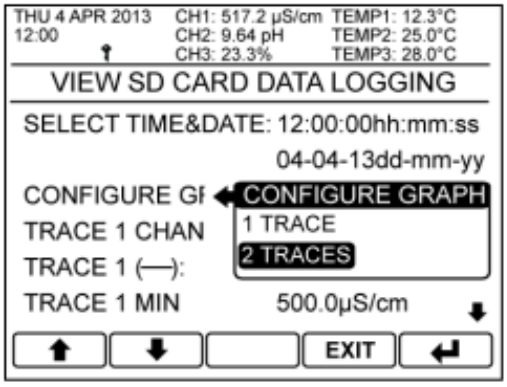
Enter the time and date of the data to be viewed. If the SD card contains no data at the selected time and date, then the configure graph shows *No Data*.

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

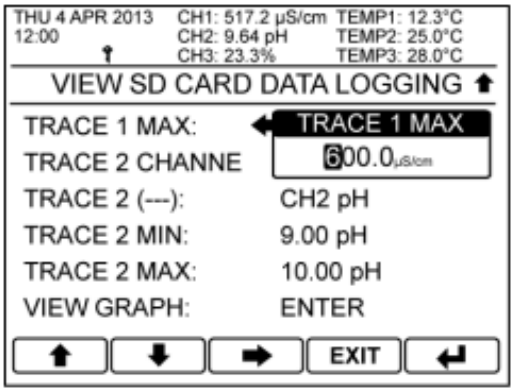
Configure Graph



Select how many traces to show on the graph.

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

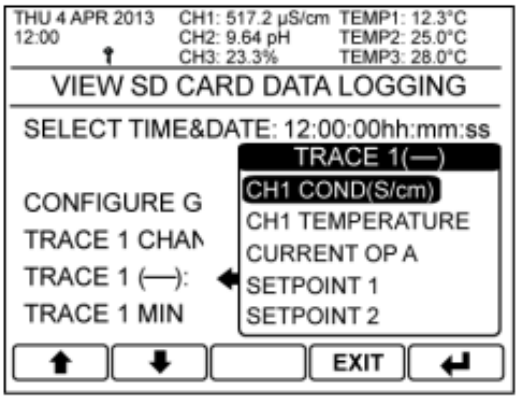
Trace Channel



Select which channel the trace is assigned to. Available channels depend upon which channels have been recorded in the selected log.

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

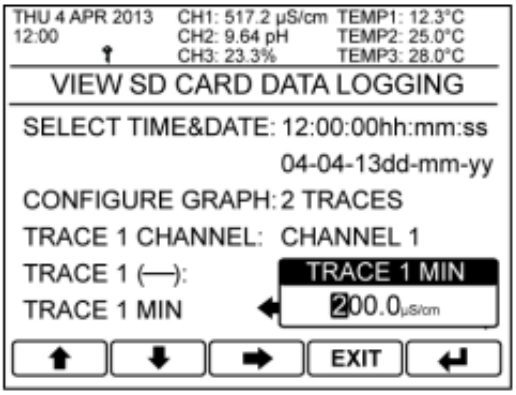
Trace 1 (—)



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.

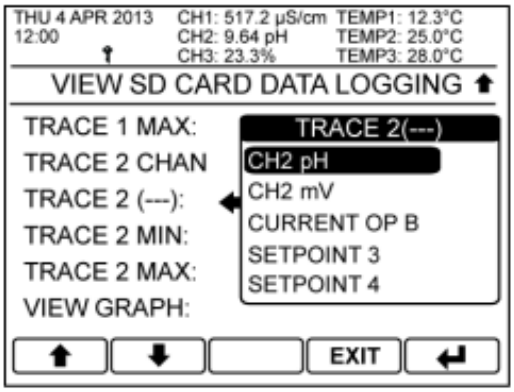
↑/↓ – Increase / Decrease Digit
→ – Select Next Digit
EXIT – Cancel
↵ – Save Value

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

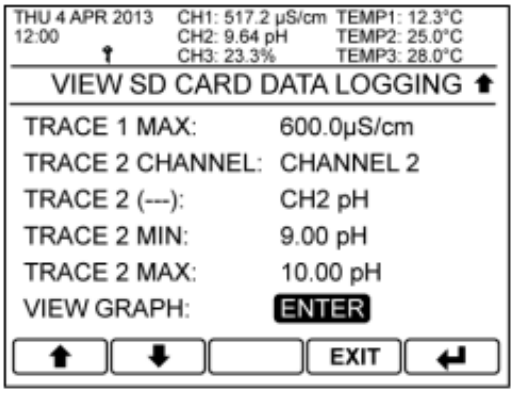
Trace 2 (---)



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

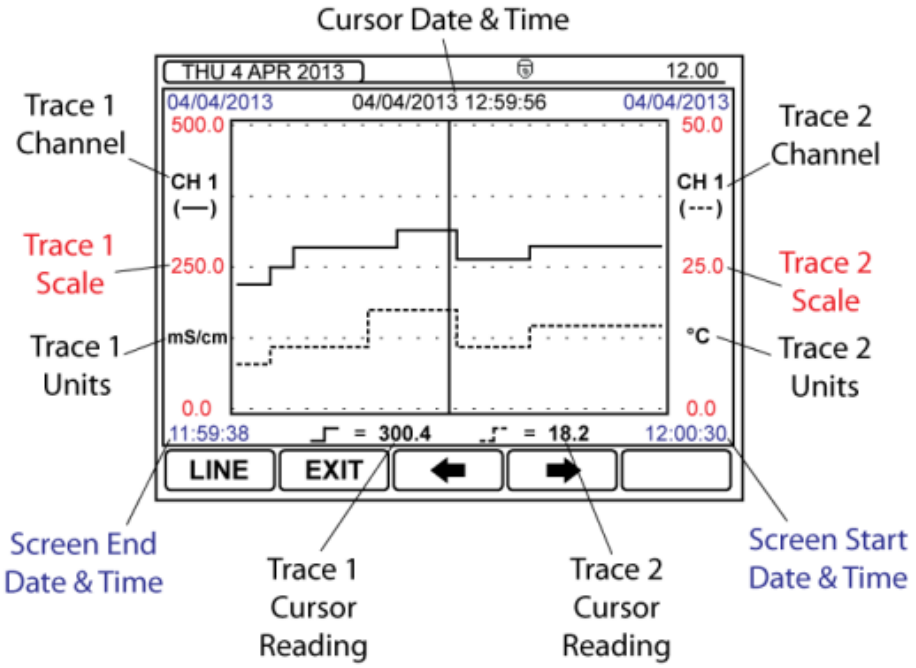


View the configured graph.

↑/↓ – Select Option
EXIT – Cancel
↵ – Enter Option

2.5.6 SD DATA CARD 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 whereby 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.

2.5.7 VIEWING THE SD CARD DATA LOG ON A PC

Before the user removes the card from the instrument, they must first stop the SD Card data logging 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.

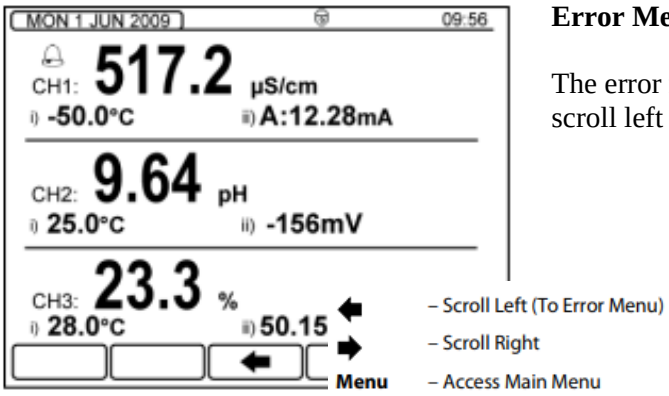
The proceeding columns contain:

- The main sensor reading and units.
- Any secondary readings and units i.e., temperature.
- The status of any setpoints associated with the logged channels, where 0 = off, 100 = fully on. When using a proportional control mode this number represents the setpoint output as a percentage of the proportional band.
- The output level of any current output associated with the logged channels.
- The status of any digital input associated with the logged channels, 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.

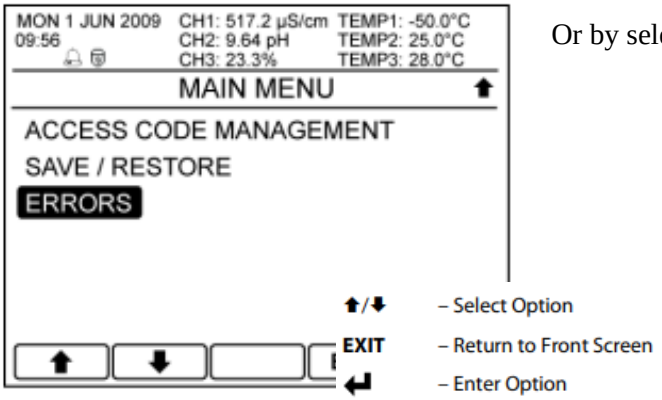
2.6 ERROR MESSAGES

If the internal diagnostics have detected an error condition, then the error LEDs will illuminate. This is accompanied by an alarm bell either next to the associated channel or in the unit status area. By pressing the left arrow on the front screen or by selecting the errors option in the main menu, the list of currently active errors can be seen. 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.

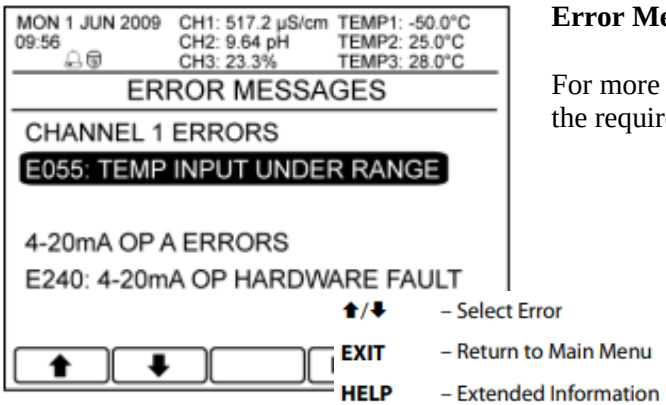


Error Menu Access

The error menu can be accessed by either pressing the scroll left button whilst on the front screen.



Or by selecting the Errors option from the main menu.

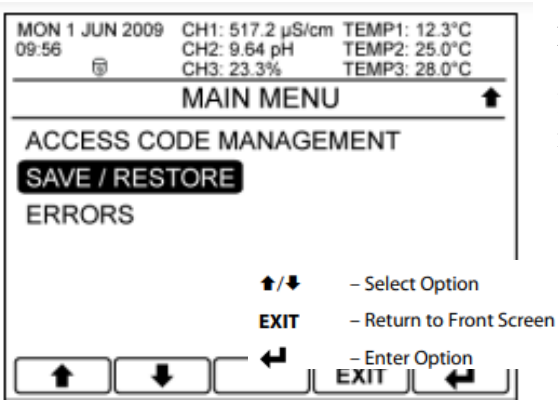


Error Messages

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

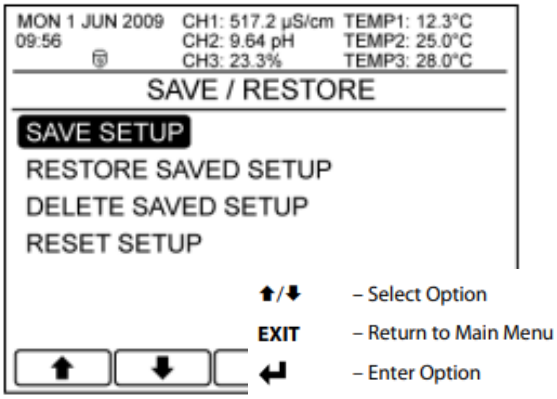
2.7 SAVE, RESTORE & RESET

The 4073 features the ability to save and restore the current configuration of a channel and its associated setpoints, current outputs, and digital inputs, into either one of two save slots inside the instrument. Alternatively, the configuration can be saved and restored via an SD card inserted into the unit, which allows the instrument's configuration to be backed up. It also provides the ability to copy the configuration from one instrument to another, providing that the input card type for each channel is the same as the second instrument. The save and restore menu also features the ability to reset either the whole instrument or each channel's configuration, user calibration; and its associated setpoints, current outputs and digital inputs, back to their factory settings.



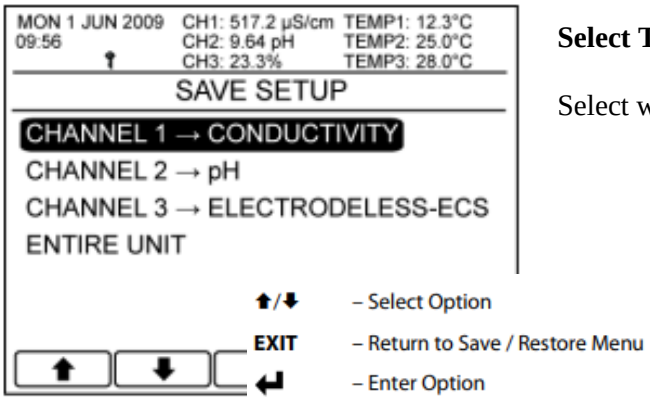
Main Menu

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



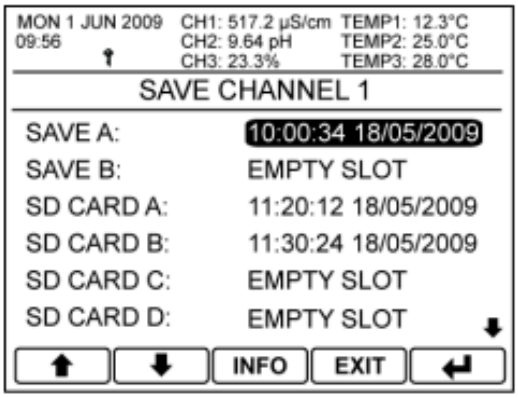
Save / Restore Menu

Select the operation you wish to carry out.



Select Target

Select which channel or alternatively the whole unit.



Select Location

Select either Save A or Save B to access the instruments 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.

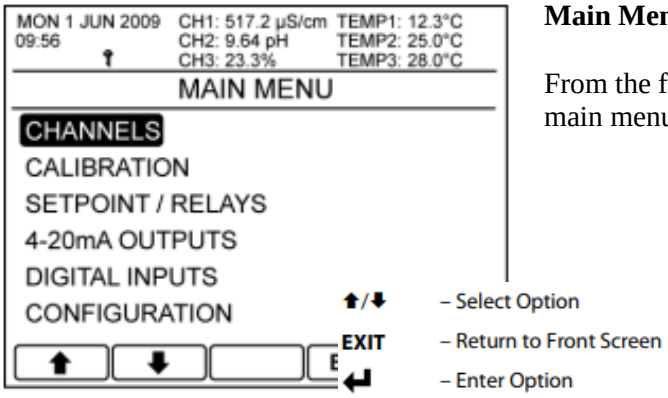
↑/↓ – Chose Location
INFO – Location Information
EXIT – Return to Save / Restore Menu
↵ – Select Location

2.8 CALCULATION

The 4073 features the ability to calculate a measurement from the input of multiple sensor channels. This result can then be used to activate the instruments setpoints / relays and drive the current outputs. The following mathematical functions are supported:

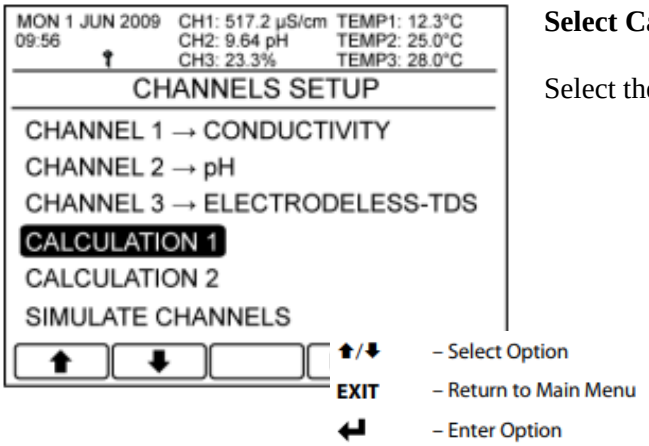
Function	Calculation Formula	Result Range	Result Units
Difference	X-Y or Y-X	Same as input variables.	Same as input variables.
Average	$\frac{X+Y}{2}$	Same as input variables	Same as input variables
Ratio	$\frac{X}{Y}$	-19.99 to 19.99	None
Passage	$\frac{Y}{X} \times 100$	-199.9 to 199.9	%
Rejection	$(1-\frac{Y}{X}) \times 100$	-199.9 to 199.9	%
Deviation	$(\frac{Y}{X} - 1) \times 100$	-199.9 to 199.9	%

Calculation Setup Menus



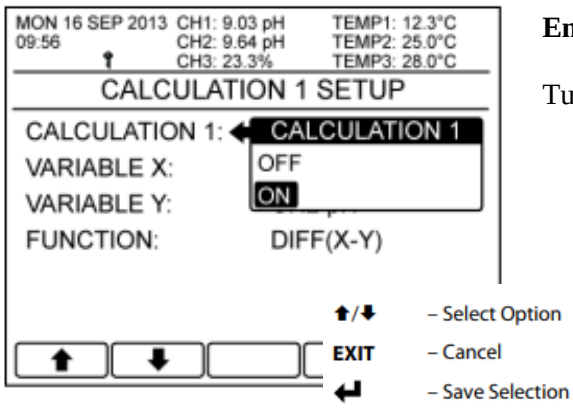
Main Menu

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



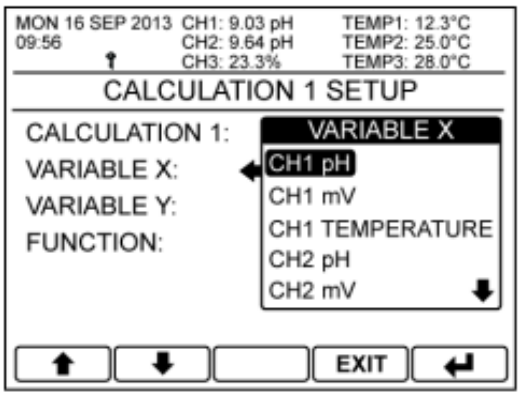
Select Calculation

Select the calculation you wish to edit.



Enable Calculation

Turn the calculation function on or off.

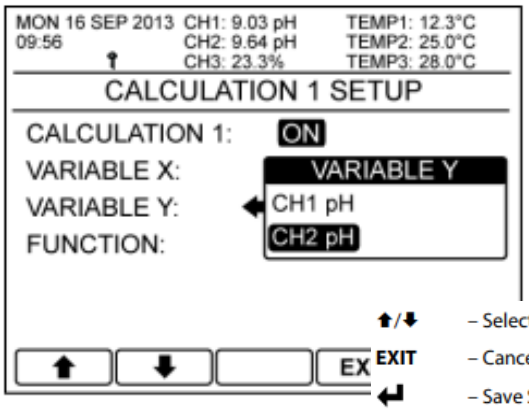


Option

election

Variable X

Select which sensor variable is used as the X term in the calculation function.



⬆/⬇ – Select Option

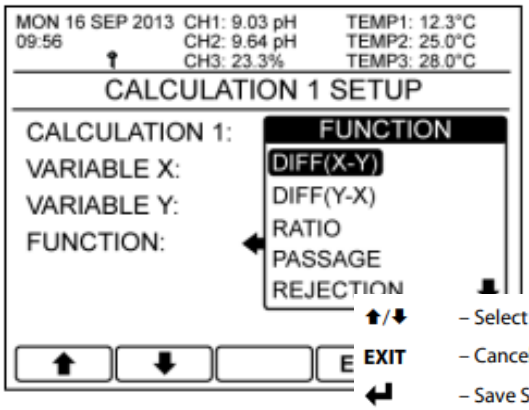
EXIT – Cancel

↵ – Save Selection

Variable Y

Select which sensor variable is used as the Y term in the calculation function.

Note: Only available variables which are identical to the X term will be shown.



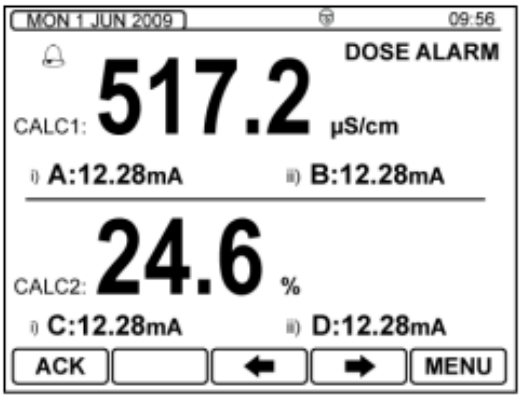
⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

Function

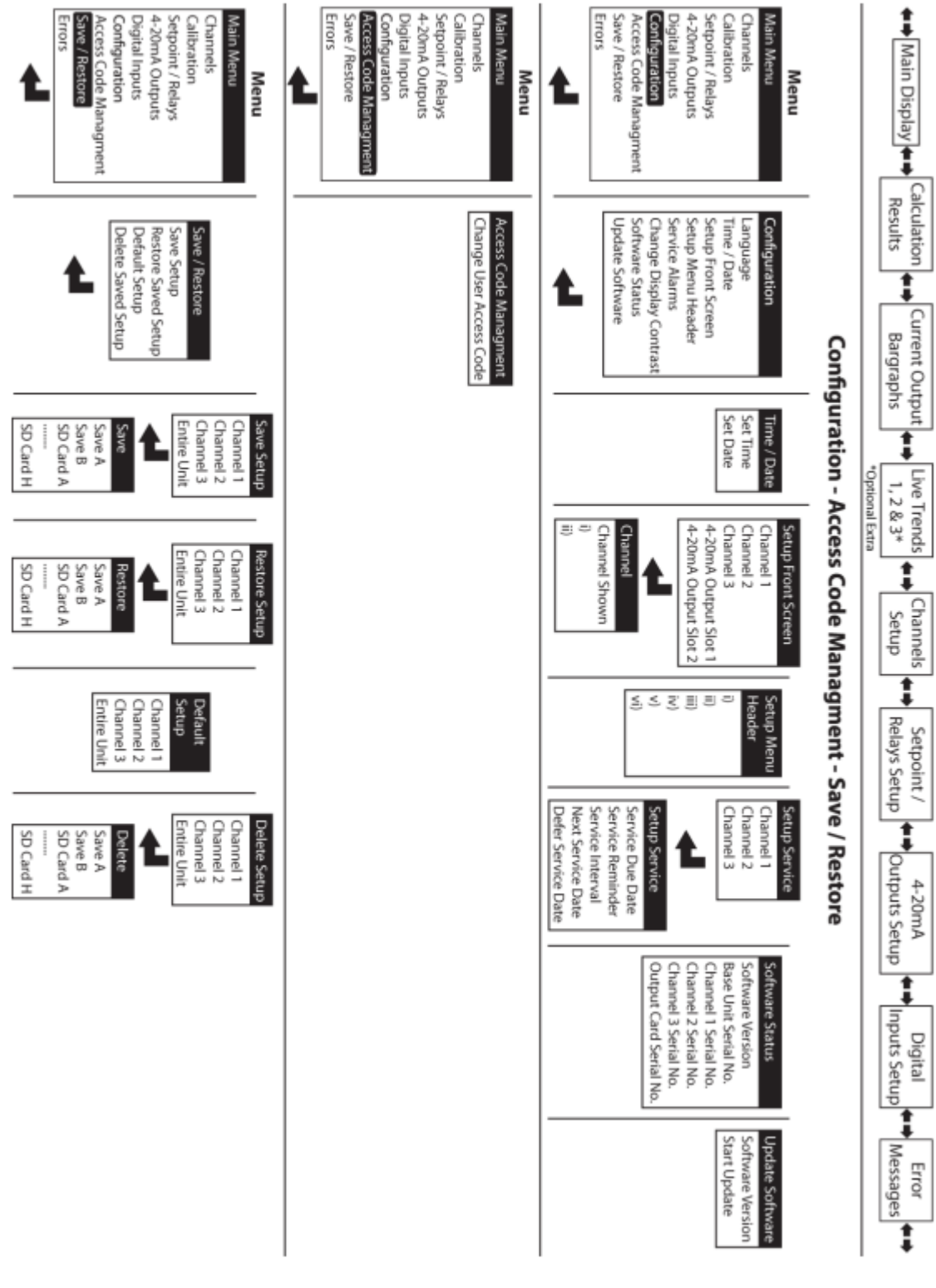
Select the mathematical function to perform with the two variables.



Calculation Result Screen

Once configured and enabled, the result of the calculation can be seen either on the main front screen or if there is not enough room, on the calculation result screen located to the right of the main front screen.

The channel label and secondary reading slots can be configured in the setup front screen menu.


Main Display
Calculation Results
Current Output Bargraphs
Live Trends 1, 2 & 3*
*Optional Extra
Channels Setup
Setpoint / Relays Setup
4-20mA Outputs Setup
Digital Inputs Setup
Error Messages
Configuration - Access Code Managment - Save / Restore
Menu
Main Menu
Channels
Calibration
Setpoint / Relays
4-20mA Outputs
Digital Inputs
Configuration
Access Code Managment
Save / Restore
Errors
Configuration
Language
Time / Date
Setup Front Screen
Setup Menu Header
Service Alarms
Change Display Contrast
Software Status
Update Software
Time / Date
Set Time
Set Date
Setup Front Screen
Channel 1
Channel 2
Channel 3
4-20mA Output Slot 1
4-20mA Output Slot 2
Channel
Channel Shown
i)
ii)
Setup Menu Header
i)
ii)
iii)
iv)
v)
vi)
Setup Service
Channel 1
Channel 2
Channel 3
Setup Service
Service Due Date
Service Reminder
Service Interval
Next Service Date
Defer Service Date
Software Status
Software Version
Base Unit Serial No.
Channel 1 Serial No.
Channel 2 Serial No.
Channel 3 Serial No.
Output Card Serial No.
Update Software
Software Version
Start Update
Access Code Managment
Change User Access Code
Save / Restore
Save Setup
Restore Saved Setup
Default Setup
Delete Saved Setup
Save Setup
Channel 1
Channel 2
Channel 3
Entire Unit
Save
Save A
Save B
SD Card A
SD Card H
Restore Setup
Channel 1
Channel 2
Channel 3
Entire Unit
Restore
Save A
Save B
SD Card A
SD Card H
Default Setup
Channel 1
Channel 2
Channel 3
Entire Unit
Delete Setup
Channel 1
Channel 2
Channel 3
Entire Unit
Delete
Save A
Save B
SD Card A
SD Card H

3 4073 CONDUCTIVITY SETUP AND OPERATING GUIDE

3.1 CONDUCTIVITY INPUT CARD SPECIFICATION

Conductivity Sensor:	Any Waltron conventional conductivity cell. Other manufacturer's cells can be accommodated.
Connection Cable:	Up to 100 meters of Waltron 54D cable.
Ranges of Measurement:	0-0.999 µS/cm to 0-999.9 mS/cm (K= 0.01 to 10.0). 0-99.99 KΩ/cm to 0-99.99 MΩ/cm (K= 0.01 to 1.0). 0-0.999 ppm to 0-99.99 ppt. (parts per thousand). See the following range / cell constant table for further information.
Cell Constant Adjustment:	Fully adjustable from 0.005 to 15.00.
Cell Constant Calibration:	± 50% of nominal cell constant.
Conductivity Accuracy:	±0.5 % of range.
Linearity:	±0.1 % of range.
Repeatability:	±0.1 % of range.
Operator Adjustment (Conductivity):	±10 % slope (gain) adjustment for solution calibration.
Temperature Sensor:	Pt100 or Pt1000 RTD. Up to 100 meters of cable. Temperature sensors can be mounted in the conductivity cell or separately.
Setpoints and Control Relays:	2 changes over relays as standard, expandable up to a total of either 4 change over relays, or 4 change over relays + 2 normally open relays depending on the number of current outputs.
Range of Temperature Measurement:	-50 °C to +160 °C (-58 °F to +320 °F) for full specification.
Temperature Accuracy:	0.2 °C (When using a 4 wire PT1000).
Operator Adjustment (Temperature):	± 50 °C or ± 122 °F.
Range of Temperature Compensation:	-10 °C to +150 °C (+14 °F to +302 °F) for full specification.

Temperature Compensation: Type Fixed UPW curve plus variable slope 0 - 3.9 %/°C over -10 to +150 °C. Selectable In or Out.

Temperature Compensation Base: Selectable at 20 °C or 25 °C.

USP Function: USP monitoring available on associated setpoints. USP pre-trigger facility is also available.

3.1.1 RANGE & SENSOR COMPATILIBITY TABLES

CONDUCTIVITY RANGE	NOMINAL CELL CONSTANT			
	0.010	0.100	1.000	10.00
0 to 9.999 µS/cm	✓	✓	×	×
0 to 99.99 µS/cm	✓	✓	✓	×
0 to 999.9 µS/cm	×	✓	✓	✓
0 to 9.999 mS/cm	×	×	✓	✓
0 to 99.99 mS/cm	×	×	Note 1	✓
0 to 999.9 mS/cm	×	×	×	Note 1

RESISTIVITY RANGE	NOMINAL CELL CONSTANT			
	0.010	0.100	1.000	10.00
0 to 99.99 kΩ-cm	×	✓	✓	×
0 to 999.9 kΩ-cm	✓	✓	×	×
0 to 9.999 MΩ-cm	✓	✓	×	×
0 to 99.99 MΩ-cm	✓	×	×	×

TOTAL DISSOLVED SOLIDS RANGE	NOMINAL CELL CONSTANT			
	0.010	0.100	1.000	10.00
0 to 9.999 ppm	✓	✓	×	×
0 to 99.99 ppm	✓	✓	✓	×
0 to 999.9 ppm	×	✓	✓	✓
0 to 9999 ppm	×	×	✓	✓
0 to 99.99 ppt	×	×	✓	✓

Note 1: Maximum measurement range will be limited by solution temperature. With the temperature compensation slope set to 2%/°C derate linearly from full scale at 25°C to 50% of scale at 100°C.

Total Dissolved Solids in ppm = µS/cm * F, where F = TDS Factor (0.50 - 0.90)

3.2 INSTALLATION AND CHOICE OF CONDUCTIVITY SENORS

The choice of the correct type of conductivity sensor, 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 conductivity system.

The following criteria are of great importance during selection:

- The choice of the best method of measurement
- Selection of the correct (optimum) cell constant
- Use of the correct materials for corrosion resistance
- Position of sensor for robustness and service access
- Ensuring a representative, uncontaminated solution sample

The following tips might be useful. The range of measurement will determine the cell constant. The epoxy resin castings are extremely resistant to most acids and alkalis. Several sensors have stainless steel boxes, and these should be avoided in the presence of chlorides, e.g., HCl.

There is also a growing tendency to passivize new pure water systems during commissioning, it is imperative that any sensors are removed from the pipework prior to this because it forms a nonconductive coating on the surface of the electrodes.

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

- The solution between the cell electrodes or around the sensor is representative of the solution.
- A moderate flow is maintained to provide an “up to date” sample. Excessive flow rates, however, can cause cavitation 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.
- Conventional conductivity cells can suffer problems associated with direct electrical contact with the solution where large electrical currents may be flowing, for example in electroplating tanks.

It is not uncommon for a cell to require cleaning on a weekly or daily basis, due to the nature of chemicals used and the presence of scale in hard water areas, experience will determine the correct maintenance periods.

3.2.1 CARE AND MAINTENANCE OF CONDUCTIVITY SENSORS

Conductivity measuring systems are designed to be trouble free in use and reliable measurements can be expected during their operating life. However, some maintenance is required. In particular, the cell and cable connections should be checked for security and freedom from corrosion. The sensor will also

require periodic cleaning, depending on the quality of the water passing through it and the type of sensor employed. A dirty sensor will always give a low conductivity reading.

The area of the cell which is sensitive to fouling is the electrode surfaces which must fully "wet" to ensure accurate measurements. Molded cells are often used in applications where a high level of contamination may be expected.

Some of these contaminants do not contribute directly to the measured conductivity, e.g., organics, rust, and suspended solids, but may form deposits on the electrode surface. In general, these may be cleaned with the bristle brush provided and a weak detergent solution mixed with scouring powder.

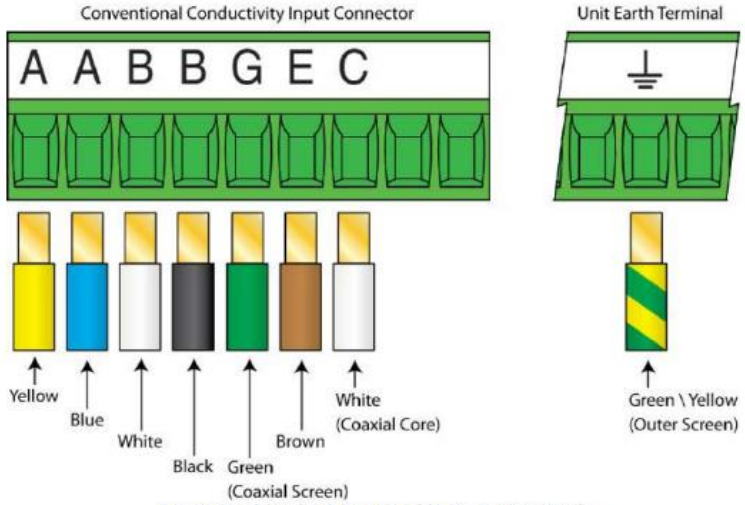
Problems may occur in hard water areas where the gradual formation of scale will reduce the active area of the electrodes. Simple brush cleaning alone will not remove a hard deposit from the electrode surface. If scaling is suspected the cell should be removed from the system and treated with a 10% solution of hydrochloric or formic acid. The presence of bubbles will indicate that scale is being dissolved. Cleaning is completed when bubbles cease and usually takes 2-3 minutes. The cell must be thoroughly rinsed to remove all traces of acid before it is replaced in the system.

Note: Follow the supplier's data sheet when handling and disposing of acids as instructed by your local authority regulations.

Cells with stainless steel electrodes are generally used in applications where low conductivity is combined with a low level of organic contamination and cleaning is rarely necessary. Errors in measurements can often be traced to faulty connections or incorrect setting on the instruments. However, if contamination is suspected the cell should be removed from the system and cleaned if necessary.

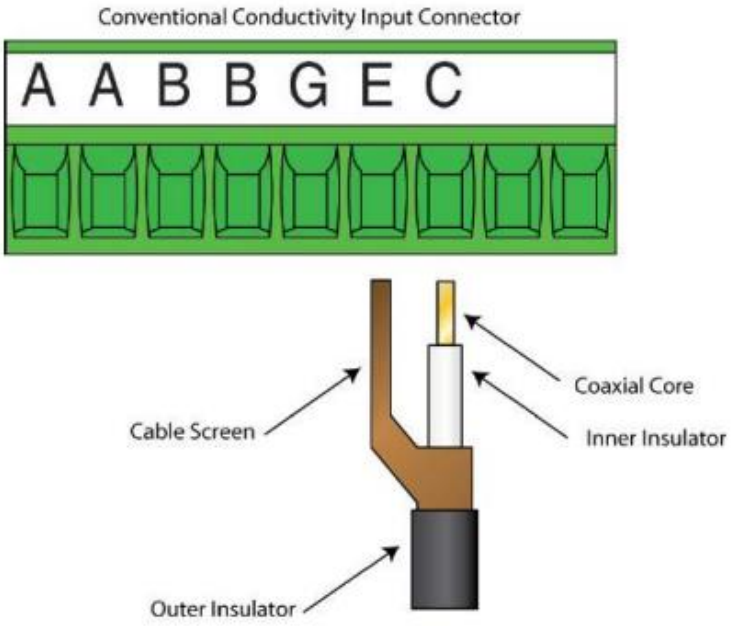
Handling of the cell electrodes will leave residues of oils and grease which will affect the wetting of the surfaces, leading to inaccurate readings. After touching the electrodes, wash them with a weak detergent solution and rinse thoroughly. After rinsing check that the surfaces 'wet' properly, that is, they maintain a complete film of water for approximately 10 seconds.

3.2.2 4073 TERMINATION INFORMATION



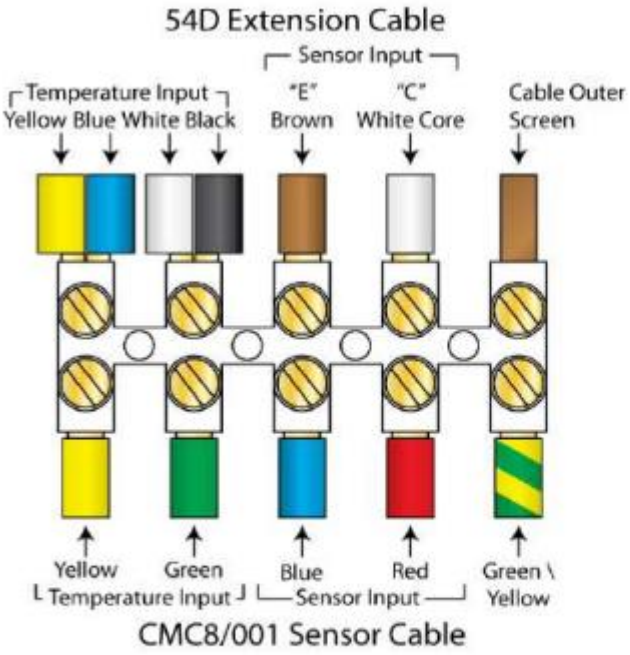
Conventional Conductivity 54D Cable Connection Details

Conventional Conductivity 54D Cable Connection Details

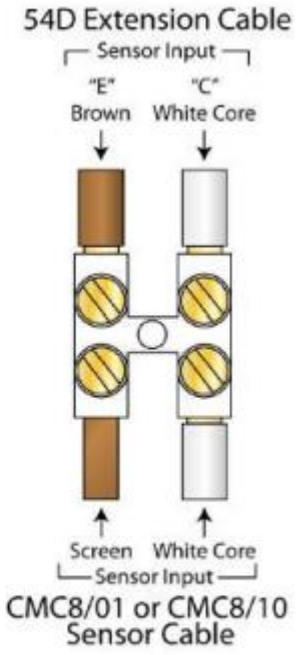


Conventional Conductivity Coax Cable (CMC8/01 & CMC8/10) Connection Details

4073 Extension Cables

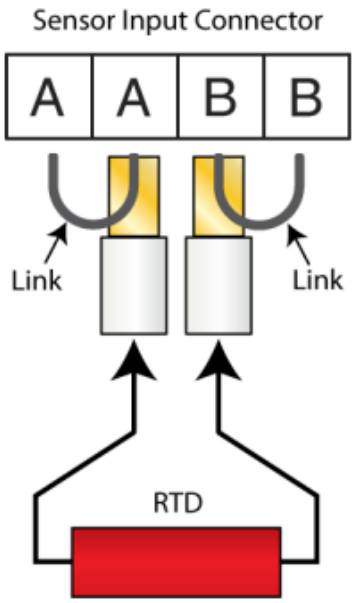


CMC8/001 Cable To 54D Extension Cable Connection Details

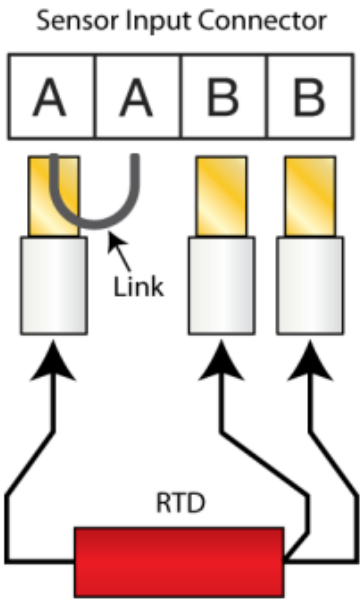


CMC8/01 or CMC8/10 Cable To 54D Extension Cable Connection Details

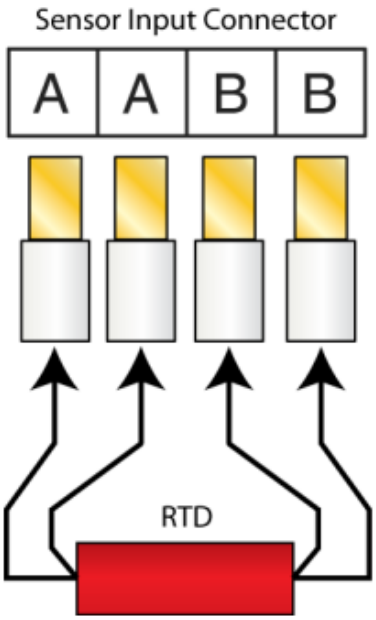
3.2.3 TEMPERATURE SENSOR CONNECTIONS



2 Wire RTD Temperature Connection



3 Wire RTD Temperature Connection

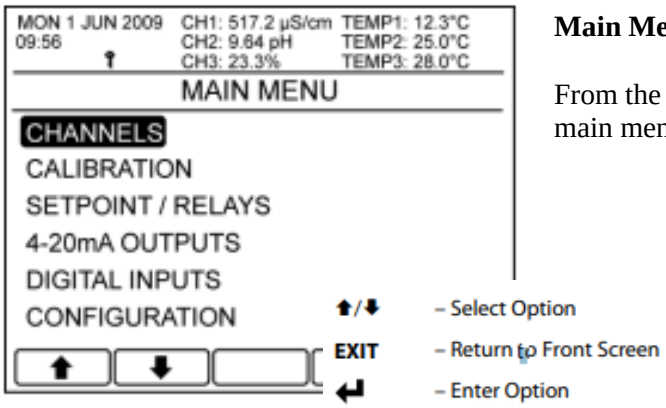


4 Wire RTD Temperature Connection

3.3 CONDUCTIVITY INPUT CHANNEL SETUP

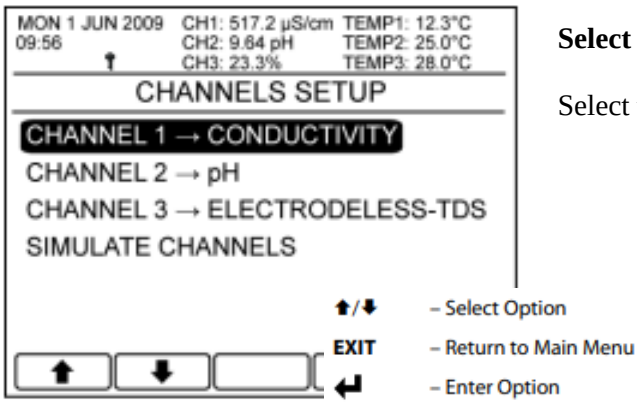
The Channels Setup menu contains the basic configurations for the sensor's input.

The default security access code is 1000.



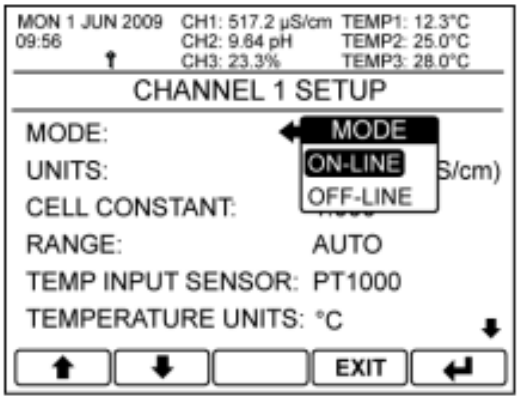
Main Menu

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



Select Channel

Select the conductivity input channel you wish to edit.

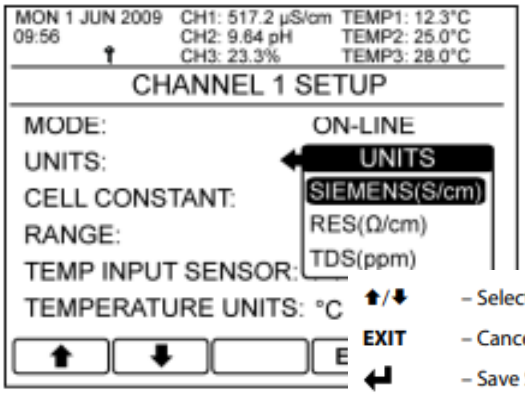


Mode

Selecting off-line causes any setpoints associated with this channel to de-energize. 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.

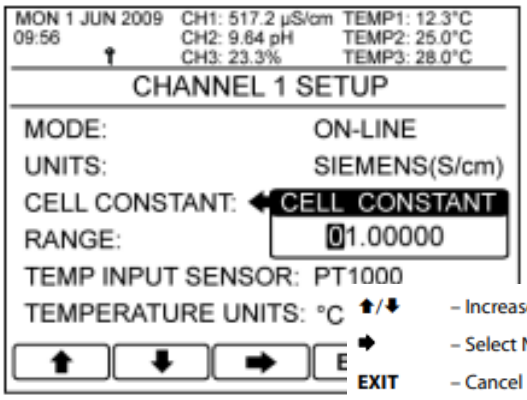
⬆/⬇ – Select Option
EXIT – Cancel
↵ – Save Selection



Units

The channel can be set up to display conductivity in Siemens/cm, resistivity in Ohms/cm or TDS (Total Dissolved Solids) in ppm.

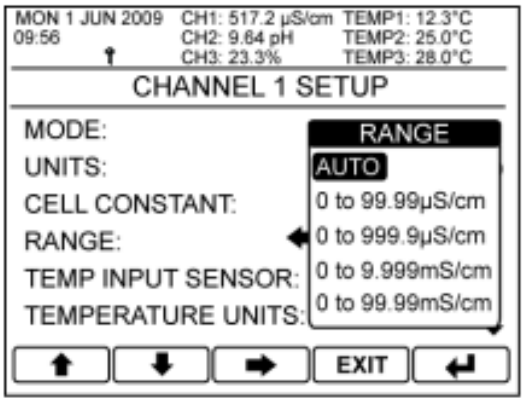
⬆/⬇ – Select Option
EXIT – Cancel
↵ – Save Selection



Cell Constant

The input channel is designed to use any one of LTH conventional conductivity sensors. This menu item enables the user to enter the cell constant which should be marked on the sensor.

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

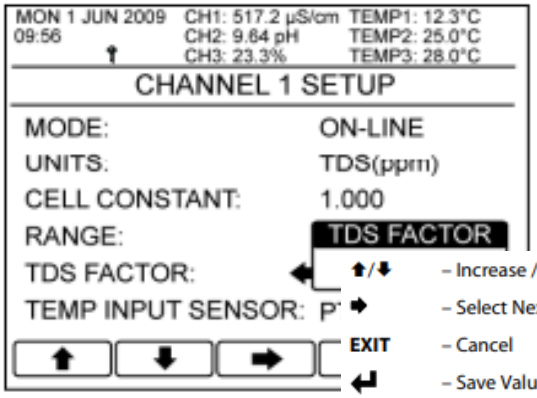


Range

Select the desired operating range for the input or select auto to let the instrument select the appropriate operating range. Available options depend upon the cell constant selected, see Range & Sensor Compatibility Tables for more details.

If a “Cannot Edit Digital Input Has Control” message appears, then an associated digital input is currently defining the operating range.

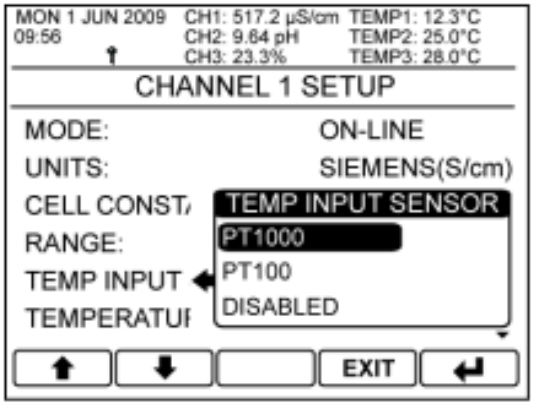
⬆/⬇ – Select Option
EXIT – Cancel
↵ – Save Selection



TDS Factor

When TDS is selected as the operating unit, 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



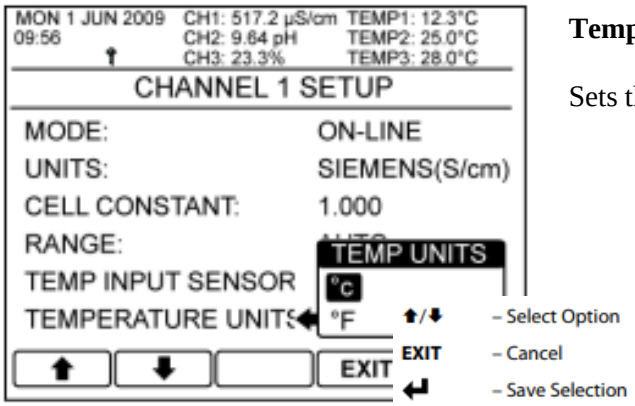
Temperature Input Sensor

Select the input channel’s temperature sensor type for use with the sensor measurement’s automatic temperature compensation.

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

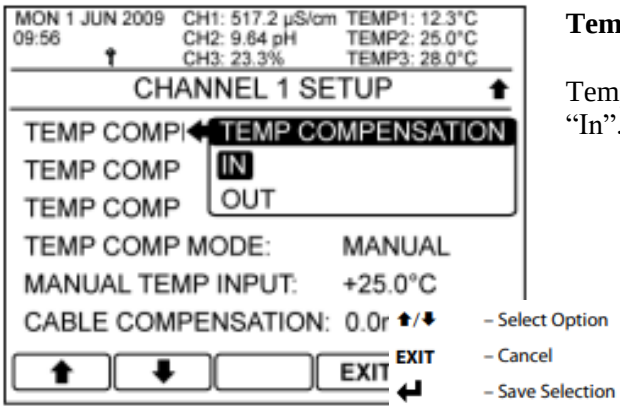
Note. Even when disabled is set a manual temperature compensation can be used.

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



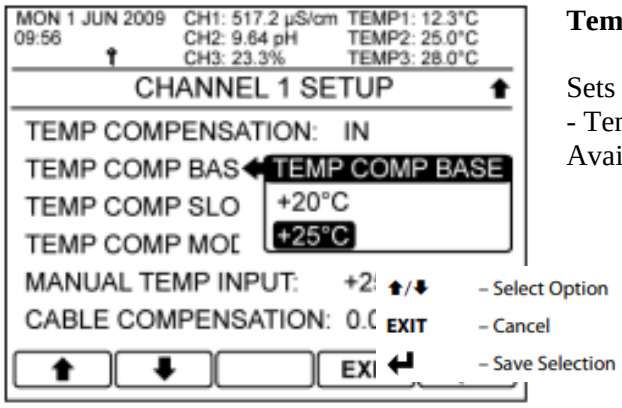
Temperature Units

Sets the temperature units used.



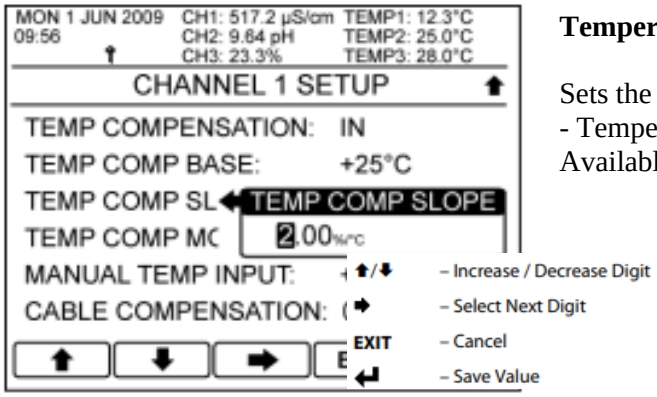
Temperature Compensation

Temperature compensation is enabled by setting this to “In”.



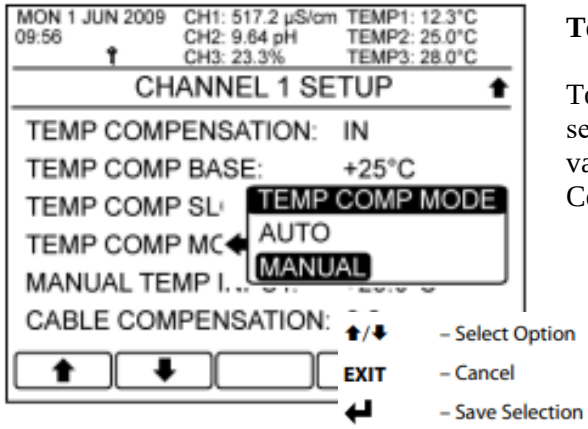
Temperature Compensation Base

Sets the temperature compensation base. See Appendix B - Temperature Coefficient for more information. Only Available if Temperature Compensation is set to “in”.



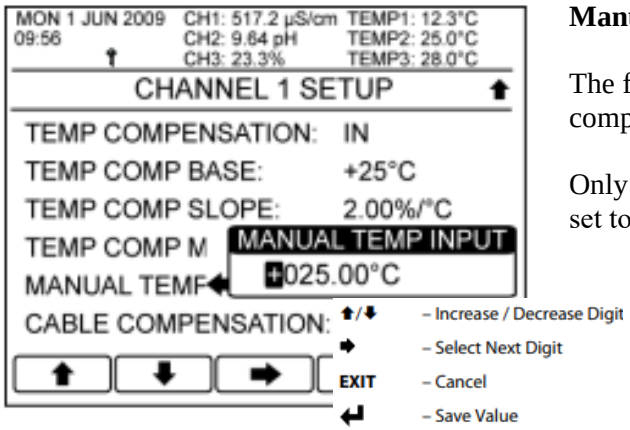
Temperature Compensation Slope

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



Temperature Compensation Mode

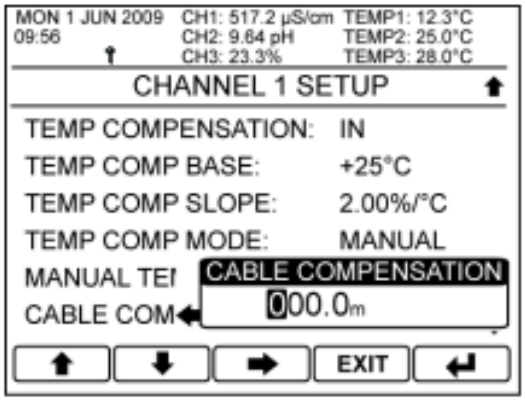
To use temperature compensation from a measured input, select “Auto”, else select “Manual” to enable a fixed value entry. Only Available if Temperature Compensation is set to in.



Manual Temperature Input

The fixed temperature value used for manual temperature compensation.

Only available when temperature compensation mode is set to “manual”.



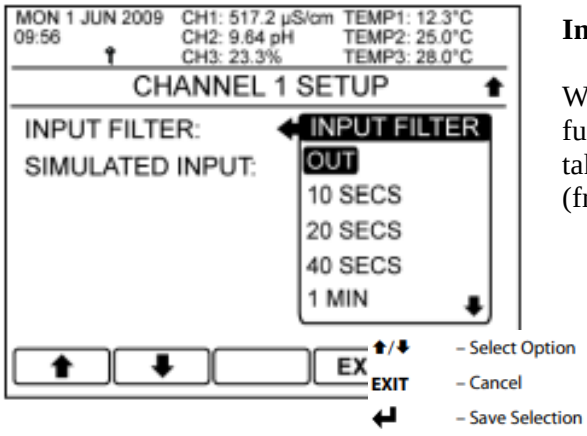
Cable Length Compensation

At high conductivities the series resistance in the cell connection cable can have a significant effect on the conductivity measurement. By entering the cable length here, the instrument can estimate the extra series resistance and subtract it from the displayed conductivity measurement.

This will greatly reduce the error; however, to achieve even greater accuracy the user can do the following.

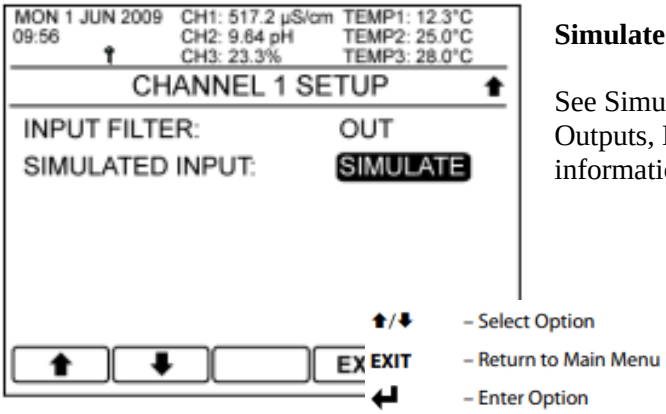
Attach a 10Ω resistor to the cable at the sensor end and set the cable length to zero. Observe the instrument reading (in mS/cm) and use that reading to determine the cable length using the following formula. Cable Length= {[(1/Reading)-10]/0.0725}

↑/↓ – 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).



Simulated Input

See Simulated Channels section of the Setpoints, Current Outputs, Digital Inputs Configuration Guide for more information.

3.4 CALIBRATION

Best Practice for Fine Tuning the 4073 Conventional Conductivity Input

The 4073 provides a facility for the operator to fine tune the calibration of the conductivity or resistivity measurement, the temperature measurement and the current output. 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. The most common causes of inaccurate conductivity readings are contaminated electrode surfaces and air trapped within the cell. Both will always give a low conductivity (high resistivity) reading. Refer to the sections in this Appendix on Care and Maintenance and Installation of Conductivity Cells for more information.

Calibration of Conductivity or Resistivity 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.

Resistance calibration of the instrument only.

This is the most accurate method of calibrating the instrument, but it will not consider any variations due to the cell constant variation or coatings of contaminants. Calibration is at a single point only so a value close to the normal operating conditions is preferable. The resistance should be connected between the C and E terminals. It is recommended that any extended lengths of cell cable are left in during this calibration, as cable resistance will have some effect on the overall calibration accuracy. This is increasingly significant at high values of conductivity (low resistivity).

The temperature compensation must be switched out when making these adjustments and the relevant cell constant noted. The resistance accuracy will determine the overall accuracy of the calibration. A non-inductive resistance must be used below 100 ohms.

Waltron can provide a conductivity simulator with traceable certification to perform this calibration. Check the table of values on the next page for specific calibration points.

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. Waltron 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 CO2.

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. Ready-made 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 B - Temperature Coefficient.

Channel 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. Waltron recommends this method for ALL pure water calibration checks and has developed a portable system specifically for this purpose. 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. For more information on the measurement of pure water refer to Appendix A - Ultra Pure Water.

Calibration of the Cell Constant

Waltron conductivity cells are supplied with a nominal cell constant value, e.g., 0.1, 1.0. The actual cell constant could be up to ±2% from this value. It is possible for Waltron to measure the actual cell constant of each cell and provide traceable certification. The user can then program this value into the instrument eliminating the errors contributed by manufacturing variations in the cell geometry. Use the cell constant menu in the channel setup menu to enter the specified cell constant.

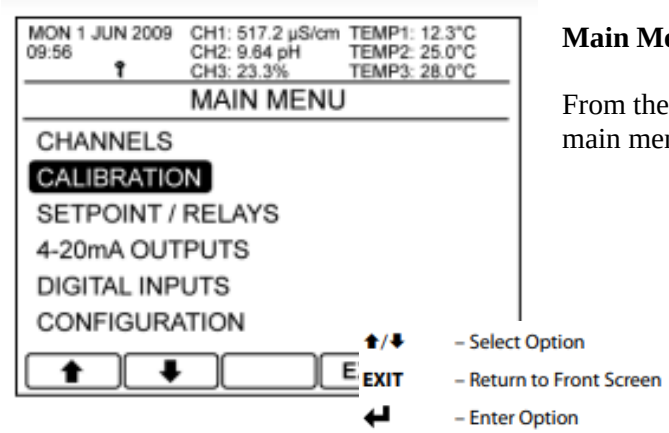
Table of calibration resistance values

Conductivity Display Reading	Nominal cell constant K=0.01	Nominal cell constant K=0.10	Nominal cell constant K=1.00	Nominal cell constant K=10.0	Resistivity Display reading
0.050 µS/cm	200K				20.00 MΩ-cm
0.100 µS/cm	100K				10.00 MΩ-cm
0.200 µS/cm	50K				5.000 MΩ-cm
0.500 µS/cm	20K				2.000 MΩ-cm
1.000 µS/cm	10K	100K			1.000 MΩ-cm
2.000 µS/cm	5K	50K			500.0 KΩ-cm
5.000 µS/cm	2K	20K			200.0 KΩ-cm
10.00 µS/cm	1K	10K	100K		100.0 KΩ-cm
20.00 µS/cm	500R	5K	50K		50.00 KΩ-cm
50.00 µS/cm	200R	2K	20K		20.00 KΩ-cm
100.0 µS/cm	100R	1K	10K	100K	10.00 KΩ-cm
200.0 µS/cm		500R	5K	50K	
500.0 µS/cm		200R	2K	20K	
1000 µS/cm		100R	1K	10K	
2.000 mS/cm			500R	5K	
5.000 mS/cm			200R	2K	
10.00 mS/cm			100R	1K	
20.00 mS/cm			50R	500R	
50.00 mS/cm			20R	200R	
100.0 mS/cm			10R	100R	
200.0 mS/cm				50R	
500.0 mS/cm				20R	
1000 mS/cm				10R	

This list of calibration resistance values will allow the user to check or modify the calibration of the instrument. Temperature compensation MUST be turned off during the test or adjustment.

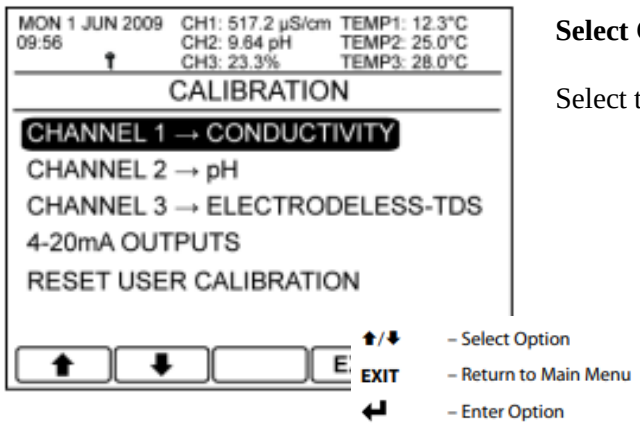
3.4.1 CALIBRATION MENU

The calibration menu provides the facility to adjust the sensor inputs to the system in which it is operating.



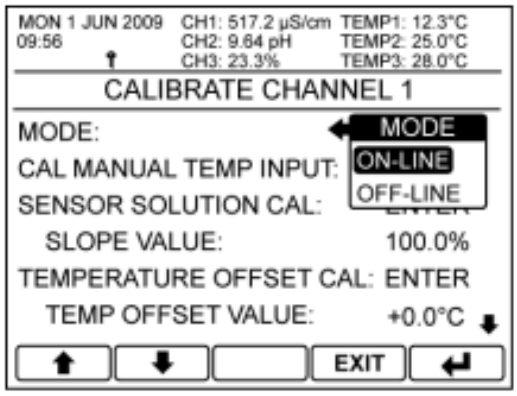
Main Menu

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



Select Channel

Select the conductivity input channel you wish to edit.

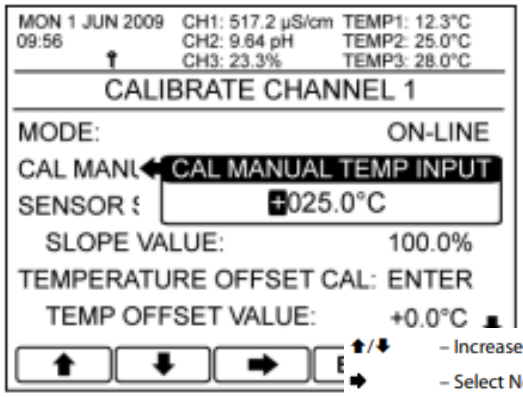


Mode

Selecting off-line causes any setpoints associated with this channel to de-energize. 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.

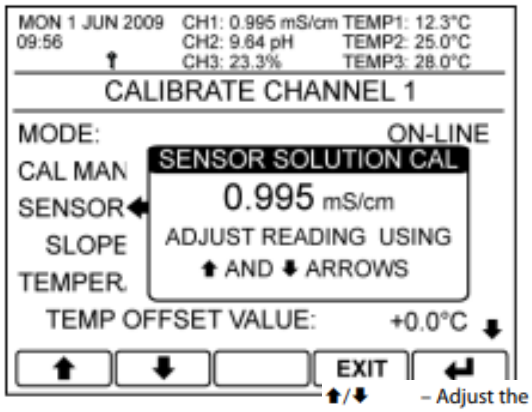


↑/↓ – Increase / Decrease Digit
→ – Select Next Digit
EXIT – Cancel
↵ – Save Value

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 channel setup menu.

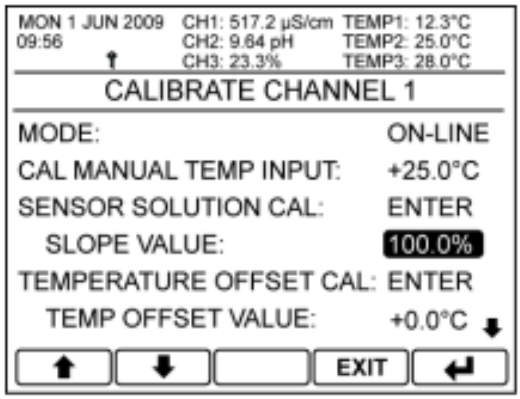


↑/↓ – Adjust the Reading Up or Down
EXIT – Cancel
↵ – Save Calibration

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.



Sensor Slope Value

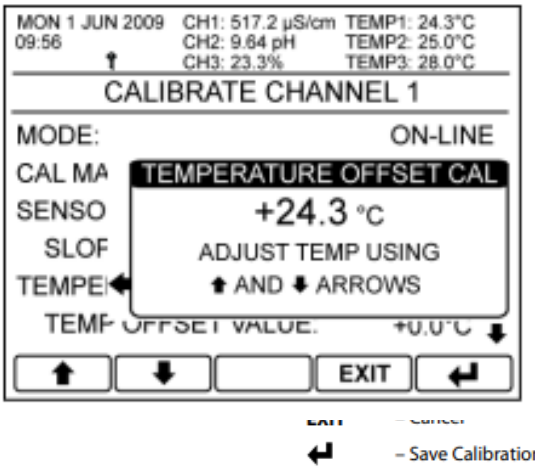
The sensor slope value that is currently being used. The value will change depending on the result of the sensor solution calibration.

Cannot be edited.

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

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

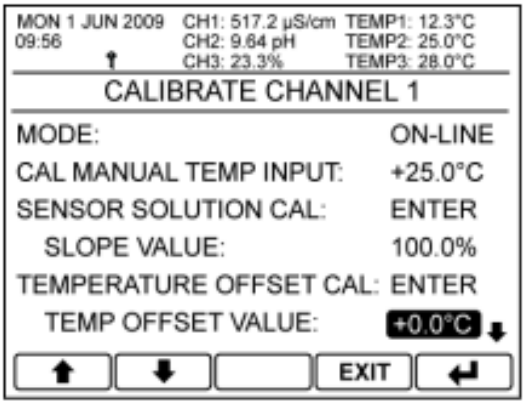
A value of less than 100% indicates that the sensor reading has had to be decreased to match the known input.



Temperature Offset Calibration

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

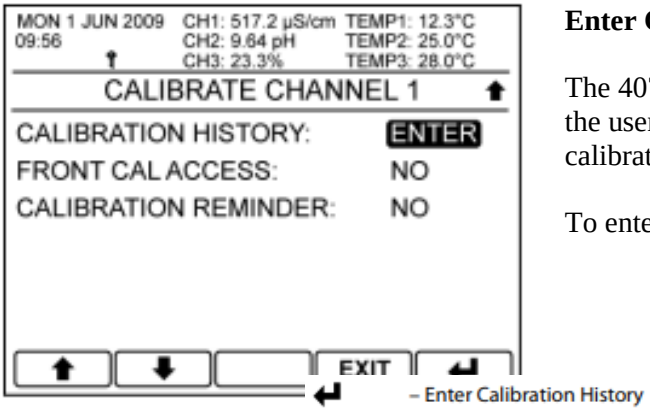
The current temperature reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows. When the reading is correct press the enter button to store the calibration. The calculated offset is shown in the next menu entry.



Temperature Offset Value

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

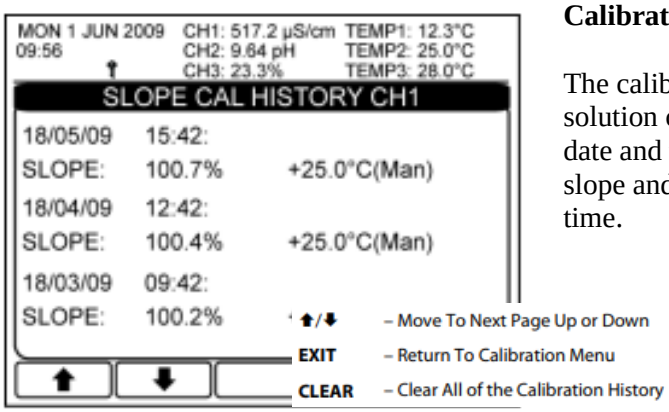
Cannot be edited.



Enter Calibration History

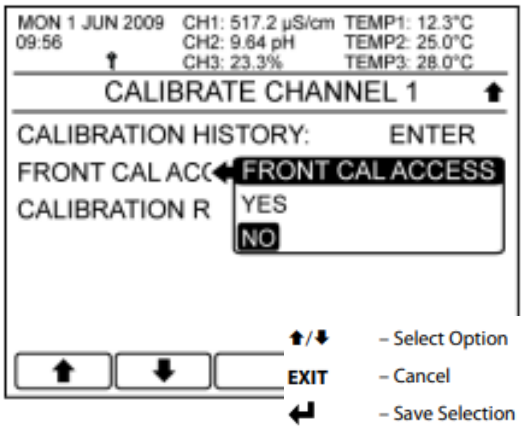
The 4073 has a calibration history feature which allows the user to review the record of sensor solution calibrations.

To enter the calibration history menu, press enter.



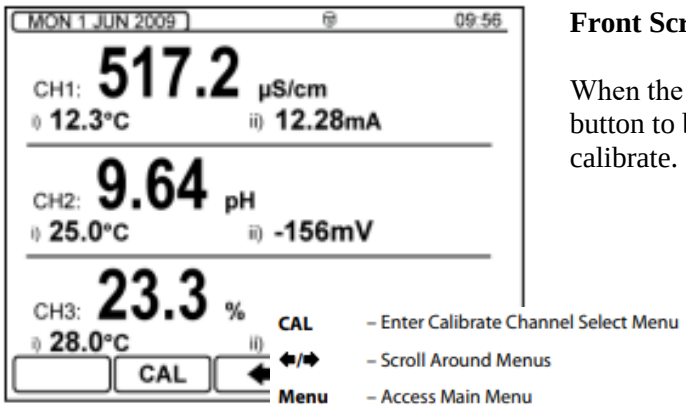
Calibration History

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.



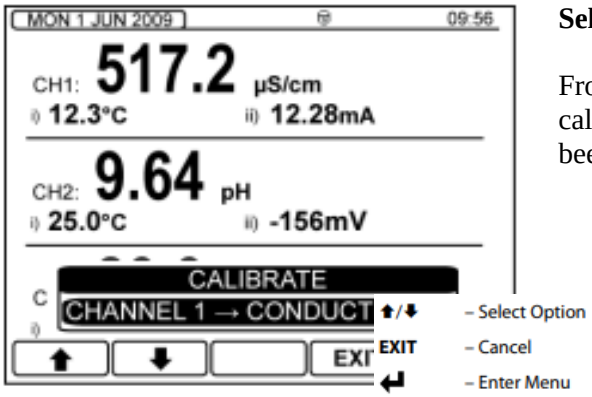
Front Screen Calibration Access Enable

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.



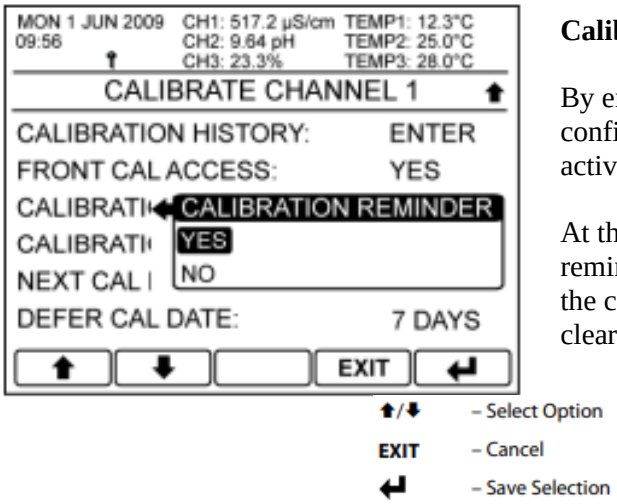
Front Screen Calibration Access

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



Select Channel to Calibrate

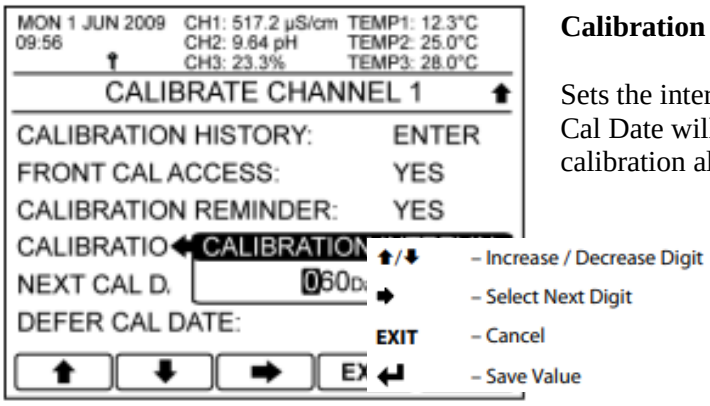
From the pop-up select the channel the user wishes to calibrate. Only channels whose front calibration access has been enabled will appear.



Calibration Reminder

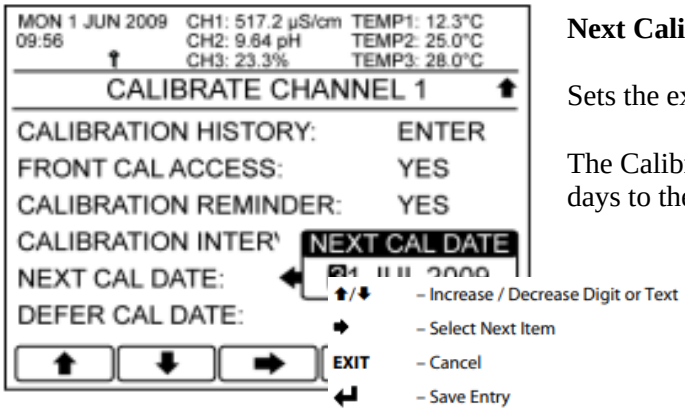
By enabling the calibration reminder, the user can configure a calibration interval, which when expired will activate an alarm and channel message on the front screen.

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



Calibration Interval

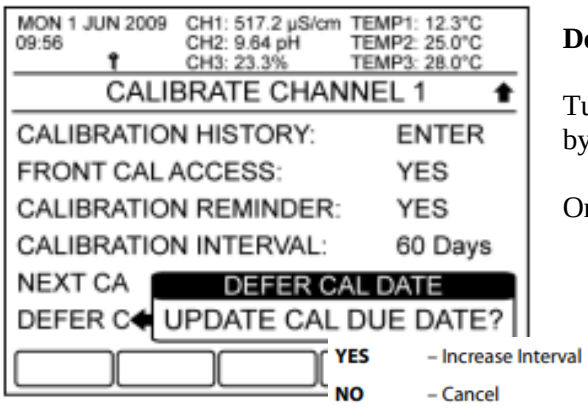
Sets the interval time for the calibration alarm. The Next Cal Date will update to show the date of the next calibration alarm.



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.



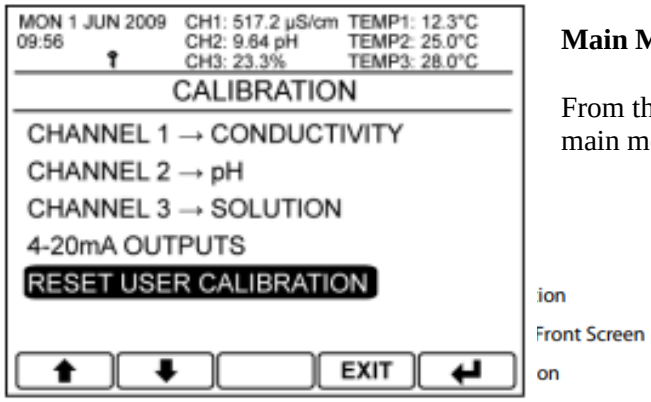
Defer Calibration Date

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

Only appears once the calibration interval has expired.

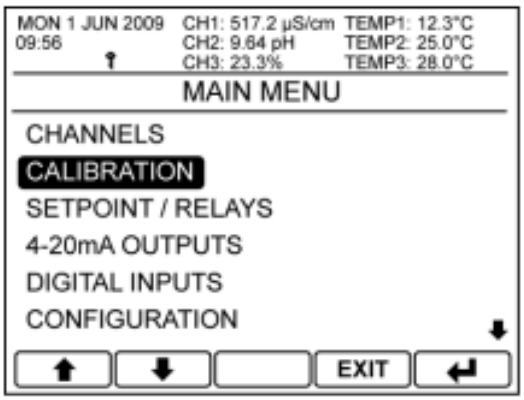
3.4.2 RESETTING THE USER CALIBRATION

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



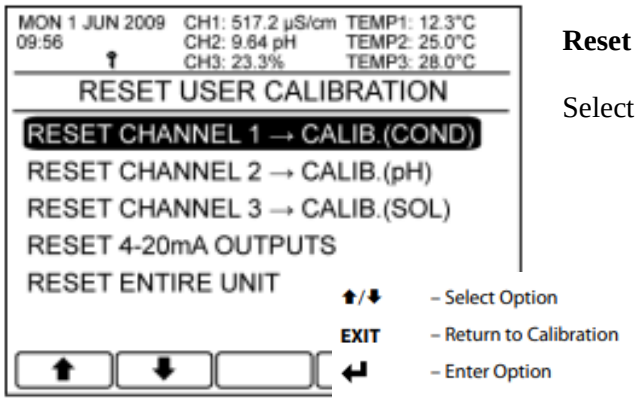
Main Menu

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



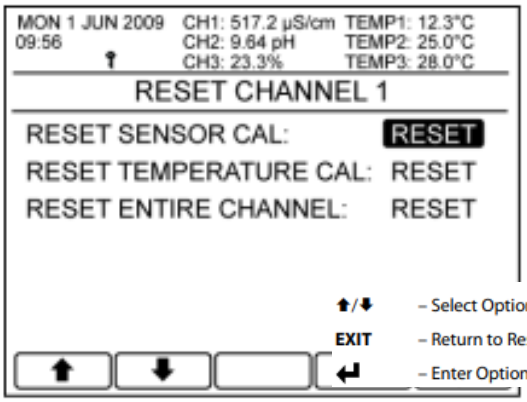
Calibration

Select Reset User Calibration.



Reset User Calibration

Select the required conductivity input channel.



Reset Channel User Calibration

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

3.5 CONDUCTIVITY USP OPERATION

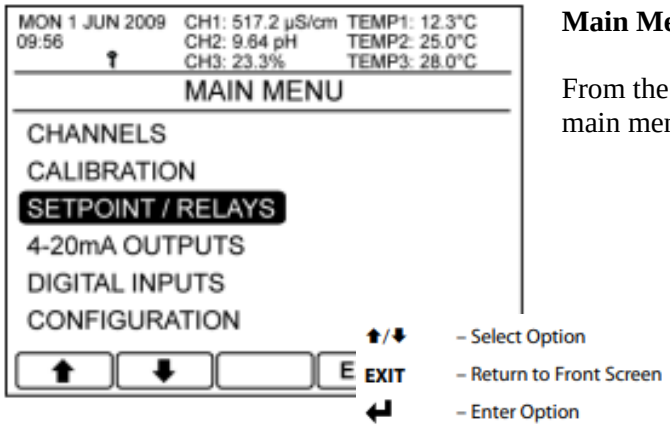
US Pharmacopoeia is used by all pharmaceutical companies as a standard set of procedures to ensure that they will comply with FDA requirements. This is applied to conductivity measurements (Section 645), which are used to determine if the water used as either a washing solution or as part of the product being manufactured meets strict quality standards.

The Directive
Conductivity is used as the first (Stage 1) test and can be an on-line measurement. The measurement is used to determine the maximum level of dissolved minerals that are in the solution, which it is ideally suited to do. However, the conductivity of a solution varies with temperature as well as the contaminants in it, and this temperature dependence varies with the type of contaminant. To compensate for this, most conductivity instruments apply a temperature compensation factor, usually 2%/°C, but due to the wide variation in the quality of different manufacturers temperature compensation systems USP has specified that all measurements must be made uncompensated. The table below lists the maximum allowed conductivity values at a series of different temperatures.

µS/cm	°C	µS/cm	°C	µS/cm	°C
0.6	0	1.4	30	2.2	60
0.8	5	1.5	35	2.4	65
0.9	10	1.7	40	2.5	70
1.0	15	1.8	45	2.7	75-90
1.1	20	1.9	50	2.9	95
1.3	25	2.1	55	3.1	100

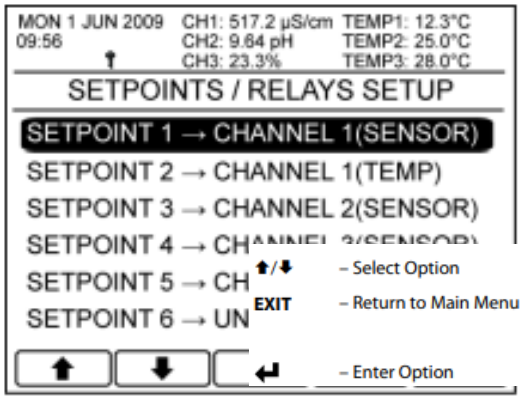
USP Operation

Any setpoint which is assigned to a “conductivity input” channel can be set to activate in accordance with the limits specified in the USP standard.



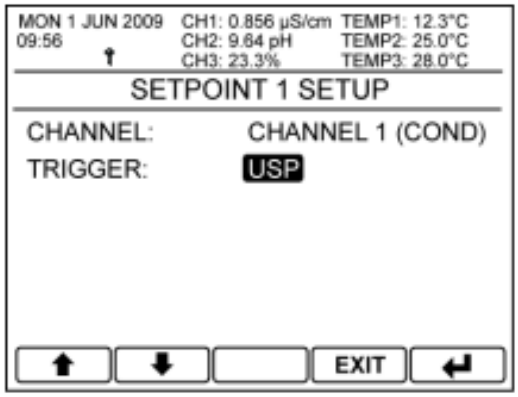
Main Menu

From the front screen press the menu button to show the main menu options and select Setpoint / Relays.



Select Setpoint

Select the Setpoint you wish to edit.



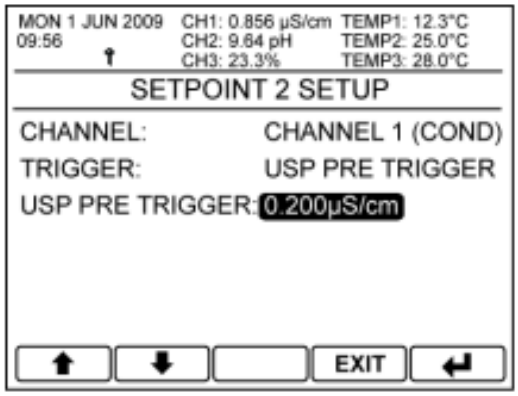
Setup Setpoint

Set “Channel” to the required conductivity input channel and “Trigger” to USP.

This causes the setpoint to operate to the USP levels stated. It will also force the selected channel’s units to “Siemens”, the cell constant to “0.01” the display range to “9.999µS” and Temperature Compensation to “Out.”

Note. The rest of the menus for this setpoint will be disabled.

– Select Option
EXIT – Return to Setpoint Channel Menu
– Enter Option



USP Pre-Trigger

In addition, any other setpoint assigned to the same channel as the USP setpoint can be configured as a pre-trigger and will cause the setpoint to activate by the pre-trigger amount before the USP level.

Example: If the USP setpoint 1 was due to activate at 1.300µS/cm and the pre-trigger setpoint 2 was set to 0.200µS/cm then setpoint 2 would trigger at 1.100µS/cm.

– Select Option
EXIT – Return to Setpoint Channel Menu
– Enter Option

3.6 APPENDIX A – ULTRA PURE WATER

UPW cell positioning, flow rate and sampling

This summary of ASTM D5391-93, combined with Waltron application notes applies to ultra-pure water applications only. These applications are very specific in nature and require great care to avoid errors in measurement.

Pure water conductivity or resistivity must be measured with a cell and temperature sensor in a flowing, closed system to prevent trace contamination from wetted surfaces and from the atmosphere. Specialized temperature compensation can be used to correct the measurement to a reference temperature of 20 or 25°C considering the temperature effects on the ionization of water, the contaminates and interactions between the two.

The cell constant for the precision cell has been determined with a secondary standard cell that has a cell constant determined by ASTM D1125.

Conductivity or resistivity can be used for detecting trace amounts of ionic contaminants in water. It is the primary means of monitoring the performance of demineralization and other high purity water treatment operations.

It is used to detect ionic contamination in boiler waters, microelectronics rinse waters, pharmaceutical process waters and to monitor and control the level of boiler and power plant cycle treatment chemicals.

Exposure of the sample to the atmosphere will cause changes in the conductivity or resistivity due to loss or gain of dissolved gases. CO2 can reach an equilibrium concentration in water of about 1 mg/l and add up to 1 µS/cm to the conductivity due to the formation of carbonic acid. This process is quite fast, depending upon conditions.

Cell, flow chamber and sample line surfaces will slowly leach trace ionic contaminates, evidenced by increasing conductivity readings with very low or zero flow rate. There must be sufficient flow to keep these contaminates from accumulating to the point where they can significantly affect the measurement. The large and convoluted surface of platinized cells precludes their use for high purity measurements for this reason.

Samples containing dissolved gases must have sufficient flow through the cell so that bubbles cannot accumulate and occupy sample volume within the cell, causing low conductivity (high resistivity) readings.

High purity conductivity measurement must not be made on a sample downstream of pH sensors due to the possible contamination of the sample with traces of reference electrolyte salts. Use a dedicated sample line or place the conductivity cell upstream from the pH sensors.

Conductivity cells mounted downstream from ion exchangers are vulnerable to catching ion exchange resin particles between the cell electrodes.

Resin particles are sufficiently conductive to short circuit the cell and cause high off scale conductivity or extremely low resistivity readings.

Resin retainers must be effective, and the cell must be installed so that it is accessible for cleaning. If this is a problem with the CMC26/001/PT43 cell use the CMC34/001/PT43 which has wider spaced electrodes of greater than 1.5 mm. This has been found to be less likely to trap such particles.

Conductivity cells, if subjected to de-mineralizer regeneration reagents, require excessive rinse time to obtain satisfactory results. Therefore, locate the cell where it will be isolated during regeneration. The cell should not be used to measure high ionic content samples of greater than 20 µS/cm (less than 0.05 MΩ.cm) since it can retain ionic contaminates and require excessive rinse down time for valid measurements.

The instrument incorporates an electronic guard to minimize the effect of cable capacitance and a 4-wire temperature measurement system to allow accurate measurements. Waltron 54D or similar cable must be used to ensure correct operation.

The cell must be in an active flowing part of the piping. Stagnant areas or dead legs must be avoided to ensure a representative sample and prevent any bubbles from adhering to the cell surfaces.

Sample lines must be designed to maintain sample integrity. Do not expose the sample to atmosphere to prevent absorption or loss of gases, particularly C02, which will affect conductivity.

The sample should be continuous at a stable flow rate of at least 100 ml/min and should be maintained to enable sample line wetted surfaces to reach equilibrium with sample conditions. Do not take measurements following changes to sample flow rate for the period required to recover from transient effects on the sampling system.

3.7 APPENDIX B – TEMPERATURE COEFFICIENT

Calculating the temperature coefficient of a solution

If the temperature coefficient of the solution being monitored is not known, the 4073 can be used to determine that coefficient. You should set the conductivity input channel to a suitable range and the temperature coefficient to 0.0%.

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 stabilize, 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:

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

Note: If 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.

3.7.1 TEMPERATURE DATA

The table below lists approximate resistance values of temperature sensors that may be used with the 4073. Not all options are available on all models.

Temperature (°C)	PT1000 RTD	PT100 RTD	1K Thermistor	3K Balco
0	1000.0Ω	100.00Ω	2691Ω	2670Ω
10	1039.0Ω	103.90Ω	1779Ω	2800Ω
20	1077.9Ω	107.79Ω	1204Ω	2930Ω
25	1097.3Ω	109.73Ω	1000Ω	3010Ω
30	1116.7Ω	111.67Ω	833.7Ω	3070Ω
40	1155.4Ω	115.54Ω	589.0Ω	3160Ω
50	1194.0Ω	119.40Ω	423.9Ω	3320Ω
60	1232.4Ω	123.24Ω	310.5Ω	3470Ω
70	1270.7Ω	127.07Ω	231.0Ω	3570Ω
80	1308.9Ω	130.89Ω	174.5Ω	3740Ω
90	1347.0Ω	134.70Ω	133.6Ω	3830Ω
100	1385.0Ω	138.50Ω	103.6Ω	4020Ω

3.8 APPENDIX C – 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 For Future Use 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 Math Error:	There has been an internal math 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 has become corrupted. Check the unit's settings and then save the settings again to the SD card store.
E016 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 SD card.

Input Channel Errors

E030 CH1 **Input Card Checksum Error**
E080 CH2 Try switching the unit off and then on again. If the message persists, consult with your
E130 CH3 supplier, as the channel's input card may require it to be returned for repair.

E031 CH1 **Setup Checksum Error E081**
E081 CH2 The current channel's configuration has for some reason become corrupted. Try
E131 CH3 switching the unit off and then on again. If the message persists reset the current channel from the Reset Unit Settings option in the Save/Restore menu or consult with your supplier, as the channel's input card may require to be returned for repair.

E032 CH1 **Store A Checksum Error**
E082 CH2 The data in channel Store A has become corrupted. Check the channel's current
E132 CH3 setup. Then save the setup back to channel's Store A in the Save/Restore menu.

E033 CH1 **Store B Checksum Error**
E083 CH2 The data in channel Store B has become corrupted. Check the channel's current setup.
E133 CH3 Then save the setup back to channel's Store B in the Save/Restore menu.

E034 CH1 **Factory Cal Checksum Error**
E084 CH2 Try switching the unit off and then on again. If the message persists, consult with your
E134 CH3 supplier, as the channel's input card may require it to be returned for repair.

E035 CH1 User Cal Checksum Error
E085 CH2 The Channel's User Cal has for some reason become corrupted. Try switching the
E135 CH3 unit off and then on again. If the message persists Reset the Channel from the Reset User Calibration option in the Calibration menu or consult with your supplier, as the channel's input card may require to be returned for repair.

E039 CH1 No Signal
E089 CH2 No Sensor connected or there is 'zero' detector current. The probe sensor units
E139 CH3 (PSU) will be set to 16000 or 32000 if turbidity. If this message persists, please consult with your supplier.

E040 CH1 Signal Overload
E090 CH2 The gain step is equal to 0 and the A/D output is over 255. This cannot happen in
E140 CH3 a liquid but could happen if the sensor is in full sunlight. The probe sensor units (PSU) will be set to 16000 or 32000 if turbidity. If this message persists, please consult with your supplier.

E041 CH1 Partial Depletion
E091 CH2 Large difference between the detectors, i.e., one very dirty. This alarm will come
E041 CH3 up if there is a difference of 3:1 between the detectors. Remove sensor and clean sensor fingers. The probe sensor units (PSU) will be set to 16000 or 32000 if turbidity. If this message persists, please consult with your supplier.

E042 CH1 Full Depletion
E092 CH2 Attenuation too high or the real probe signal goes above 14000. The probe sensor
E142 CH3 units (PSU) will be set to 16000. If this message persists, please consult with your supplier.

E043 CH1 Sensor User Offset At Limit
E093 CH2 The last Sensor Offset Calibration was out of limits, check sensor condition and
E143 CH3 connections and repeat calibration. If the message persists, please consult with your supplier.

E044 CH1 Sensor User Slope At Limit
E094 CH2 The last Sensor Slope Calibration was out of limits, check sensor condition and
E144 CH3 connections and repeat calibration. If the message persists, please consult with your supplier.

E036 CH1 Sensor Cal Out Of Spec
E086 CH2 The last Sensor Calibration was out of specification, check sensor condition and
E136 CH3 connections and repeat calibration. If the message persists, please consult with your supplier.

E095 CH2 The last Sensor Slope Calibration was less than the recommended specification,
E145 CH3 check sensor condition and connections and repeat calibration. If the message persists, please consult with your supplier.

E037 CH1 Sensor Zero Cal Out Of Spec
E087 CH2 The last Sensor Zero Calibration was out of specification, check sensor condition
E137 CH3 and connections and repeat calibration. If the message persists, please consult with your supplier.

E096 CH2 The last Sensor Slope Calibration was greater than the recommended
E146 CH3 specification, check sensor condition and connections and repeat calibration. If the message persists, please consult with your supplier.

E038 CH1 Sensor Span Cal Out Of Spec
E088 CH2 The last Sensor Span Calibration was out of specification, check sensor condition
E138 CH3 and connections and repeat calibration. If the message persists, please consult with your supplier.

E097 CH2 The sensor input is at an open circuit, then check sensor condition and
E147 CH3 connections. If the message persists, please consult with your supplier.

E048 CH1 Sensor Short Circuit
E098 CH2 The sensor input is at short circuit, check sensor condition and connections. If the
E148 CH3 message persists, please consult with your supplier.

E049	CH1	Sensor Positive Saturation
E099	CH2	The sensor input is greater than the maximum measurable input level, Check
E149	CH3	Sensor condition and connections. If the message persists, please consult with your supplier.
E050	CH1	Sensor Negative Saturation
E100	CH2	The sensor input is less than the minimum measurable input level, Check Sensor
E150	CH3	condition and connections. If the message persists, please consult with your supplier.
E051	CH1	Sensor Input Over Range
E101	CH2	The sensor reading is greater than the specified upper limit, check channel
E151	CH3	settings, Sensor condition and connections. If the message persists, please consult with your supplier.
E052	CH1	Sensor Input Under Range
E102	CH2	The sensor reading is less than the specified limit, check channel settings, Sensor
E152	CH3	condition and connections. If the message persists, please consult with your supplier.
E053	CH1	Temp Sensor Fault
E103	CH2	The temperature sensor is reading open or closed circuit, due in most cases to a
E153	CH3	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.
E054	CH1	Temp Input Over Range
E104	CH2	The temperature sensor reading is greater than the specified upper limit, check
E154	CH3	channel settings, Sensor condition and connections. If the message persists, please consult with your supplier.
E055	CH1	Temp Input Under Range
E105	CH2	The temperature reading is less than the specified limit, check channel settings,
E155	CH3	Sensor condition and connections. If the message persists, please consult with your supplier.
E056	CH1	Temp Comp Outside Limits
E106	CH2	The temperature reading is less than 0.0C or greater than 150.0C, leading to an
E156	CH3	error in compensation.
E057	CH1	Polar Zero Cal At Limit
E107	CH2	The last Polargraphic Zero Calibration was out of limits, check sensor condition
E157	CH3	and connections and repeat calibration. If the message persists, please consult with your supplier.

E058	CH1	Polar Span Cal at Limit
E108	CH2	The last Polargraphic Span Calibration was out of limits, check sensor condition
E158	CH3	and connections and repeat calibration. If the message persists, please consult with your supplier.
E059	CH1	Galvanic Zero Cal At Limit
E109	CH2	The last Galvanic Zero Calibration was out of limits, check sensor condition and
E159	CH3	connections and repeat calibration. If the message persists, please consult with your supplier.
E060	CH1	Galvanic Span Cal At Limit
E110	CH2	The last Galvanic Span Calibration was out of limits, check sensor condition and
E160	CH3	connections and repeat calibration. If the message persists, please consult with your supplier.
E061	CH1	Pressure Sensor Over Range
E111	CH2	The pressure sensor reading is greater than the specified limit for the probe.
E161	CH3	
E062	CH1	Pressure Sensor Under Range
E112	CH2	The pressure sensor reading is less than the specified limit for the probe.
E162	CH3	
E063	CH1	Pressure Above 20mA
E113	CH2	The pressure sensor input is greater than 20mA, check sensor condition and
E163	CH3	connections. If the message persists, please consult with your supplier.
E064	CH1	Pressure Below 4mA
E114	CH2	The pressure sensor input is less than 4mA, check sensor condition and
E164	CH3	connections. If the message persists, please consult with your supplier.
E065	CH1	AUX mA Input Above 20mA
E115	CH2	The sensor input is greater than 20mA, check sensor condition and connections. If
E165	CH3	the message persists, please consult with your supplier.
E066	CH1	AUX mA Input Below 4mA
E116	CH2	The sensor input is less than 4mA, check sensor condition and connections. If the
E166	CH3	message persists, please consult with your supplier.
E067	CH1	Sensor 0mV Cal Out of Spec
E117	CH2	The pH 0mV calibration for this channel is outside recommended specifications.
E167	CH3	
E068	CH1	Calibration Due
E118	CH2	The time since the last calibration was performed on this channel has exceeded
E168	CH3	the time set in the calibration menu.

E119 CH2 The Planned Service interval for this unit has expired. Please contact Waltron.
E169 CH3

E070 CH1 SD Card Checksum Error
E120 CH2 The SD Card store from which this channel was restored has become corrupted.
E170 CH3 Check the channel's settings and then save the settings again to the SD card store

E071 CH1 Gain Error
E121 CH2 The sensor gain has been exceeded. If this message persists, please consult with
E171 CH3 your supplier.

E072 CH1 Invalid Linearization Curve
E122 CH2 A minimum of 2 linearization points is required. Please check linearization curve
E172 CH3 settings in the channel setup menu for this channel.

E073 CH1 Linearization Over-Range
E123 CH2 The Planned Service interval for this unit has expired. Please contact Waltron.
E173 CH3

E074 CH1 Linearization Under-Range
E124 CH2 The SD Card store from which this channel was restored has become corrupted.
E174 CH3 Check the channel's settings and then save the settings again to the SD card store

E075 CH1 Curve Low Limit
E125 CH2 The incoming probe signal is less than the lowest point in the linearization curve.
E175 CH3

E076 CH1 Curve High Limit
E126 CH2 The incoming probe signal is greater than the highest point in the linearization
E176 CH3 curve.

E077 CH1 Custom Error
E127 CH2 Contact your supplier for details.
E177 CH3

Setpoint Errors

E180	SP1	Dose Alarm Error
E190	SP2	The Setpoint has been dosing for longer than the Dose Alarm time as defined in the
E200	SP3	setpoint menu.
E210	SP4	
E220	SP5	
E230	SP6	

E181 to E184	SP1	For Future Use
E191 to E194	SP2	
E201 to E204	SP3	
E211 to E224	SP4	
E221 to E224	SP5	
E231 to E234	SP6	

E185	SP1	Store A Checksum Error
E195	SP2	The Store A Save for the Channel associated with this Setpoint has become corrupted.
E205	SP3	Check the setpoint's settings in the setpoint menu and then save the settings again in
E215	SP4	the Channel's Store A in the Save/Restore menu.
E225	SP5	
E235	SP6	

E186	SP1	Store B Checksum Error
E196	SP2	The Store B Save for the Channel associated with this Setpoint has become corrupted.
E206	SP3	Check the setpoint's settings in the setpoint menu and then save the settings again in
E216	SP4	the Channel's Store B in the Save/Restore menu.
E226	SP5	
E236	SP6	

E187	SP1	Setup Checksum Error
E197	SP2	The Setup for this Setpoint has become corrupted. Check and correct the setpoint
E207	SP3	settings and turn the unit off and on again. If the message persists, please consult with
E217	SP4	your supplier.
E227	SP5	
E237	SP6	

E188	SP1	SD Card Checksum Error
E198	SP2	The SD Card store from which this Setpoint was restored has become corrupted. Check
E208	SP3	the setpoint's settings in the setpoint menu and then save the settings again to the SD
E218	SP4	card store.
E228	SP5	
E238	SP6	

Current Output Errors

E240	A	Current OP Hardware Fault
E250	B	The current output circuit has detected an error in the current output loop; this is most
E260	C	commonly due to either a broken loop or too large a load resistor.
E270	D	
E280	E	
E290	F	
E241	A	Sensor IP<Current OP Zero
E251	B	The sensor input level is below that set for the current output zero.
E261	C	
E271	D	
E281	E	

E291	F	
E242	A	Sensor IP>Current OP Span
E252	B	The sensor input level is above that set for the current output span.
E262	C	
E272	D	
E282	E	
E292	F	
E243	A	Sensor IP<Current OP Span
E253	B	The sensor input level is below that set for the current output span.
E263	C	
E273	D	
E283	E	
E293	F	
E244	A	Sensor IP>Current OP Zero
E254	B	The sensor input level is above that set for the current output Zero.
E264	C	
E274	D	
E284	E	
E294	F	
E245	A	Store A Checksum Error
E255	B	The Store A Save for the channel associated with this current output has become
E265	C	corrupted. Check the current output's settings in the current output menu and then save
E275	D	the settings again in the Channel's Store A in the Save/Restore menu.
E285	E	
E295	F	
E246	A	Store B Checksum Error
E256	B	The Store B Save for the channel associated with this current output has become
E266	C	corrupted. Check the current output's settings in the current output menu and then save
E276	D	the settings again in the Channel's Store B in the Save/Restore menu.
E286	E	
E296	F	

Digital Input Errors

E301	DIG 1	Store A Checksum Error
E306	DIG 2	The Store A Save for the channel associated with this digital input has become
E311	DIG 3	corrupted. Check the digital input's settings in the digital input menu and then save
E316	DIG 4	the settings again in the Channel's Store A in the Save/Restore menu.
E321	DIG 5	
E326	DIG 6	
E331	DIG 7	
E336	DIG 8	
E302	DIG 1	Store B Checksum Error
E307	DIG 2	The Store B Save for the channel associated with this digital input has become

E312	DIG 3	corrupted. Check the digital input's settings in the digital input menu and then save
E317	DIG 4	the settings again in the Channel's Store B in the Save/Restore menu.
E322	DIG 5	
E327	DIG 6	
E332	DIG 7	
E337	DIG 8	
E303	DIG 1	Setup Checksum Error
E308	DIG 2	The Setup for this Digital Input has become corrupted. Check and correct the digital
E313	DIG 3	inputs settings and turn the unit off and on again. If the message persists please
E318	DIG 4	consult with your supplier.
E323	DIG 5	
E328	DIG 6	
E333	DIG 7	
E338	DIG 8	
E304	DIG 1	SD Card Checksum Error
E309	DIG 2	The SD Card store from which this Digital Input was restored from has become
E314	DIG 3	corrupted. Check the Digital Input's settings in the digital input menu and then save
E319	DIG 4	the settings again to the SD card store.
E324	DIG 5	
E329	DIG 6	
E334	DIG 7	
E339	DIG 8	

Communication Errors

E340	CH 1	Comms Failure
E342	CH 2	The Channel's Input Card is not responding. Try switching the unit off and then on
E344	CH 3	again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E341	CH 1	Comms Error
E343	CH 2	The Channel's Input Card is not Operating Correctly. Try switching the unit off and
E345	CH 3	then on again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.

E346	UNIT	Output Comms 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.
E347	UNIT	Output Comms 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.
E348	OP	Output Option Comms 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.
E349	OP	Output Option Comms 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.

Calculation Errors

E400 E411	C1 C2	Calculation Over Range The Calculation reading is greater than the specified upper limit, check channel settings, calculation configuration, sensor condition and connections. If the message persists please consult with your supplier.
E401 E411	C1 C2	Calculation Under Range The Calculation reading is less than the specified lower limit, check channel settings, calculation configuration, sensor condition and connections. If the message persists please consult with your supplier.

E402 E412	C1 C2	Calculation Setup Checksum The Setup for this Calculation has become corrupted. Check and correct the calculation settings and turn the unit off and on again. If the message persists please consult with your supplier.
E403 E413	C1 C2	Calculation Store A Checksum The Store A Save for the channel associated with this calculation has become corrupted. Check the calculation's settings in the calculation menu and then save the settings again in the Channel's Store A in the Save/Restore menu.
E404 E414	C1 C2	Calculation Store B Checksum The Store B Save for the channel associated with this calculation has become corrupted. Check the calculation's settings in the calculation menu and then save the settings again in the Channel's Store B in the Save/Restore menu.
E405 E415	C1 C2	Calculation SD Card Checksum The SD Card store from which this Calculation was restored from has become corrupted. Check the Calculation's settings in the Calculation menu and then save the settings again to the SD card store

Modbus Errors

E420	UNIT	Modbus Setup Checksum The Modbus setup 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.

E421	UNIT	Modbus Store A Checksum The Store A Save for the Modbus Configuration has become corrupted. Check the Modbus settings in the Modbus menu and then save the settings again into Store A in the Save/Restore menu
E422	UNIT	Modbus Store B Checksum The Store B Save for the Modbus Configuration has become corrupted. Check the Modbus settings in the Modbus menu and then save the settings again into Store B in the Save/Restore menu.
E423	UNIT	Modbus SD Card Checksum The SD Card store from which the Modbus configuration 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.

3.9 FAULT FINDING

NOTE: THERE ARE NO USER SERVICEABLE PARTS INSIDE THE UNIT

The 4073 Series has been designed to include a wide range of self-diagnostic test, 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 C Error

Messages gives a list that the 4073 series generates, along with their probable causes. If the fault has not been cleared after these checks have been made, please contact Waltron. To enable quick diagnosis and correction of the problem, please have as much of the following information available as possible in any communication with Waltron:

- Serial number of the instrument
- 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. (See also Care and Maintenance of Conductivity Sensors, page 7) Note: low conductivity = high resistivity.

The Instrument Appears Dead

Check that power is available to the unit. Using a voltmeter, set to AC or DC, check the power supply voltage at the connector. The design of the MXD70 Series allows the unit to accept from 85 to 250V AC or DC, an alternative option allows operation from 18 to 32V AC or DC, check the connection label for voltage specification. Check that the power cable is securely and correctly attached. There are no user serviceable fuses fitted within this unit.

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 Sensor Reading Is Constantly Over-range or Under-range

- Ensure that the sensor and temperature inputs are correctly connected and that the sensor is not faulty or damaged.

- Check that the correct range and Cell Constant has been selected within the Channel Setup menu if in doubt set to Auto Range.

- Check the temperature compensation state. 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 the sensor using a hand held meter.

- 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. If an alternative temperature sensor is being used, say Pt100 or 1K Thermistor, check that this has been selected in the Channel Setup Menu.
- Check that any in-line junction boxes and extension cables have been fitted and wired up correctly.

The display reads zero

- Check for open circuit sensor (conductivity or TDS modes)
- Check for short circuit sensor (resistivity mode)
- Check for damage to the connecting cable.
- Check that all input connections are secure.
- Check the sensor is wired up correctly.
- Check that the sensor bore is not blocked or completely filled with air.
- Check the sensor is immersed in the correct solution.

Instrument display appears to malfunction

- Switch the instrument power off and on again.
- Check that the display back-light is on, which indicates power is reaching the unit.
- See that it displays meaningful text (Issue number etc.) in its start-up sequence, indicating processing activity. The Sensor Reading Is Incorrect
- Low reading due to incomplete immersion or contamination of the electrodes.
- 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 molding.
- The sensor should be checked, when dry, with an ohmmeter. Disconnect it at the instrument and check the resistance between the E and C terminals. It should be greater than 50 MΩ between E

& C. Check the leakage from E & C in turn to the terminated screens (inner and outer). Again, 50 MΩ should be the minimum isolation resistance between them all.

- 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 conductivity 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 inner screen (G) does not contact any other terminals or metalwork at the sensor end. It should not be grounded.
- 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 calibration values have 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 Temperature Reading Is Incorrect

- Check that the temperature sensor is correctly attached. (See “Temperature Sensor Connections”).
- Check that the temperature sensor type is correctly selected in the Channel Setup menu.
- Where practical check the temperature sensor resistance against the table in Temperature Data.

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 unit is “On-Line”
- Check that the set point configuration is correct (see Setpoints, Current outputs and Digital Input configuration guide)
- If the relays are vibrating or “chattering” as they pass the set point, check the hysteresis setting and increase if necessary.
- Ensure that the relays are connected properly (see 4073 Installation guide) and that the voltage/current levels are not exceeding 5A @ 30V DC or 5A @ 250V AC.
- Check that the instrument input cables are not picking up excessive noise.

4 PH/REDOX SETUP AND OPERATING GUIDE

4.1 PH/REDOX INPUT CARD SPECIFICATION

Measurement Input:

Single ended or differential with solution ground. Up to 100 meters cable.

pH
Separate glass and reference electrode pair.
Separate Antimony and reference electrode pair.
Combination electrode.
SensorTalk digital or hybrid electrode.

Redox
Separate glass and reference electrode pair.
Separate Antimony and reference electrode pair.
Combination electrode.
SensorTalk digital or hybrid electrode.

Other manufacturer's sensors can be accommodated.

Ranges of Measurement:

0.00 to 14.00 pH, 0.000 to 14.000 pH
-1999mV to +1999mV.

Accuracy:

± 0.05 pH. ± 3mV

Linearity:

±0.1 % of range.

Repeatability:

±0.1 % of range.

Operator Adjustment:

	Slope	**Offset**
pH	60-120%	3 to 11pH
Antimony	60-120%	-4 to +4pH
Redox	NA	-400mV to +400mV

Calibration Methods:

Automatic 4pH / 9pH Buffer Calibration.
Manual Slope and Offset Adjustment.
Automatic loading of stored calibration data from pre-calibrated SensorTalk electrodes.

Custom Buffer:

13-point 4pH / 9pH custom buffer entry pre-loaded with standard LTH buffers.

Calibration Timer:

Inbuilt calibration count down timer which will trigger an alarm when calibration interval has expired.

Sensor Input Filter:	Adjustable filter that averages the sensor input over a user selectable time (10sec – 5mins).
Temperature Sensor:	Pt100, Pt1000, 3K Balco RTD input. Up to 100 meters of 3 wire cable. Temperature sensor can be mounted in the sensor or separately.
Range of Temperature Measurement:	-50 °C to +160 °C (-58 °F to +320 °F) (223.15K to 433.15K) for full specification. Note. When units are set to temperature the reading will be calculated to 2 decimal points between -9.99 and +99.99.
Temperature Accuracy:	± 0.2 °C (When using a 3 wire PT1000).
Operator Adjustment (Temperature):	± 50 °C, ± 122 °F or ± 50 K
Temperature Compensation Type:	Automatic or manual -20°C to +160°C.

4.2 INSTALLATION AND CHOICE OF PH/REDOX ELECTRODES

The choice of the correct type of pH / 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 pH / Redox system.

The following criteria are of great importance during selection:

- The chemical makeup, 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. Depending on the application it may also need periodic re-calibration, the 4073 provides an inbuilt count down timer which will trigger an alarm when calibration interval has expired.

4.2.1 SENSORTALK INTERFACE

The smart capable version of the 4073 pH/Redox card is capable of interfacing with the full range of Broadley James All-Digital Smart pH and Hybrid pH sensors. The Plug-and-Play functionality of the of the SensorTalk sensors enables “calibrate here use there”. Sensors can be accurately pre-calibrated away from the operation area with the calibration data stored in the sensor, ready for later use. When the sensor is connected to the 4073, the instrument auto-loads and applies the sensor’s calibration values.

For the biotech and pharmaceutical applications, ProCount enabled SensorTalk sensors will count all autoclave/SIP cycles autonomously, even if disconnected from the instrument. Once reconnected, the total count is accessible from the instrument.

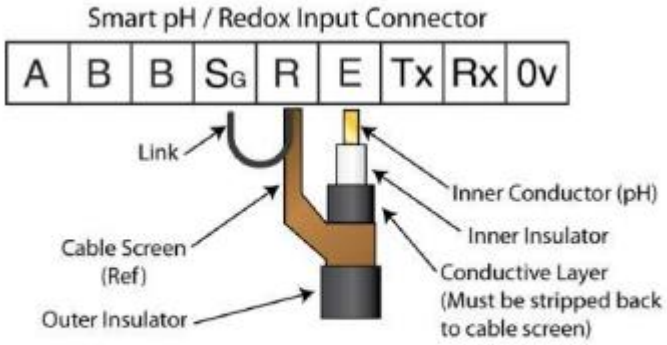
4.2.2 CARE AND MAINTENANCE OF PH/REDOX ELECTRODES

All pH and 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.

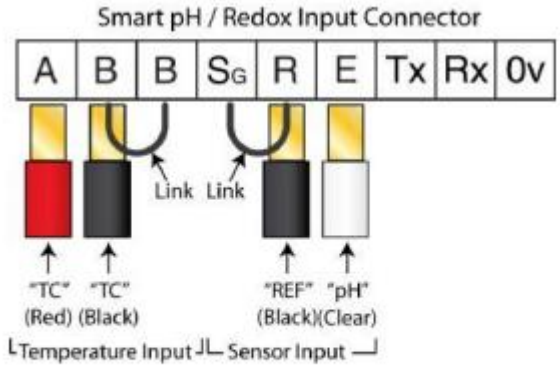
For gel-filled, non-flow electrodes the storage boot may become dried out during storage. This can result in evaporation of the water inside the electrode causing high impedance in the reference cell. If allowed to fully dry out the operation of the electrode will be irreversibly damaged. For electrodes 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 deionized 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 deionized 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.

4.2.3 SMART CAPABLE INPUT CARD TERMINATION INFORMATION

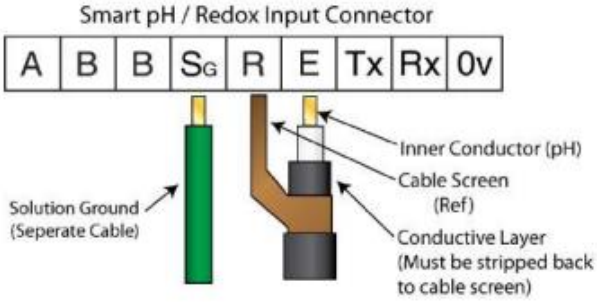


pH / Redox LN10 Coax Cable
(No TC) Connection Details

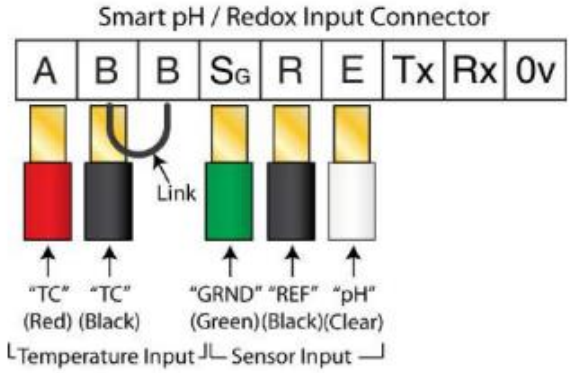


S400 ProcessProbe Cable (Solution Ground Not Fitted)
Connection Details

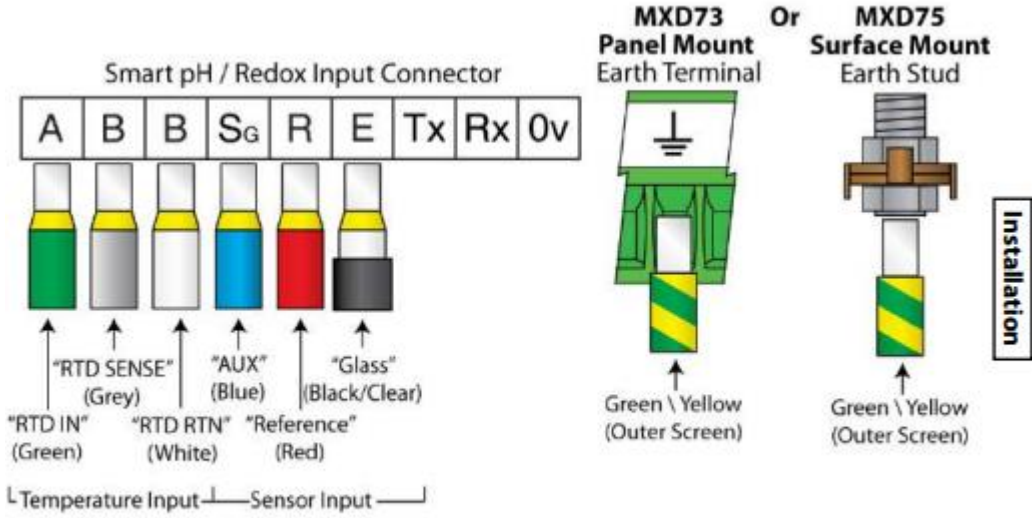
The Smart pH / Redox input card of the 4073 also provides a differential input method of wiring the pH electrode. This provides better electrical noise immunity and allows the sensor to operate in solutions where flowing electrical currents may cause measurement problems.



pH / Redox LN10 Coax Cable with Solution Ground (No TC) Connection Details



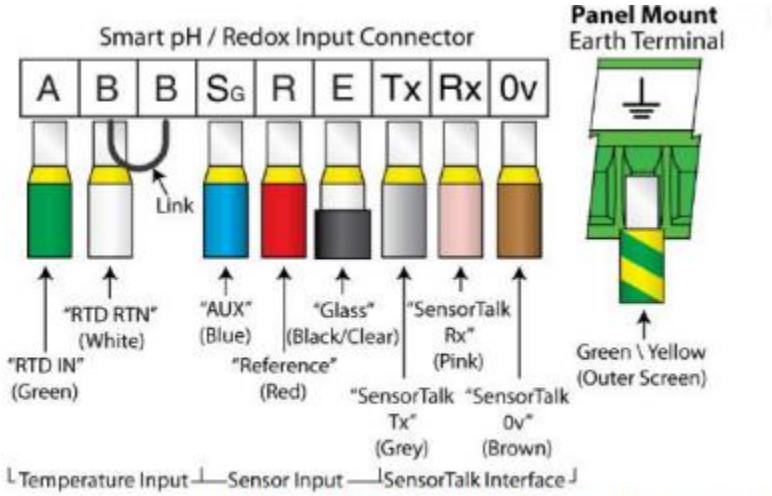
S400 ProcessProbe Cable (Solution Ground Fitted) Connection Details



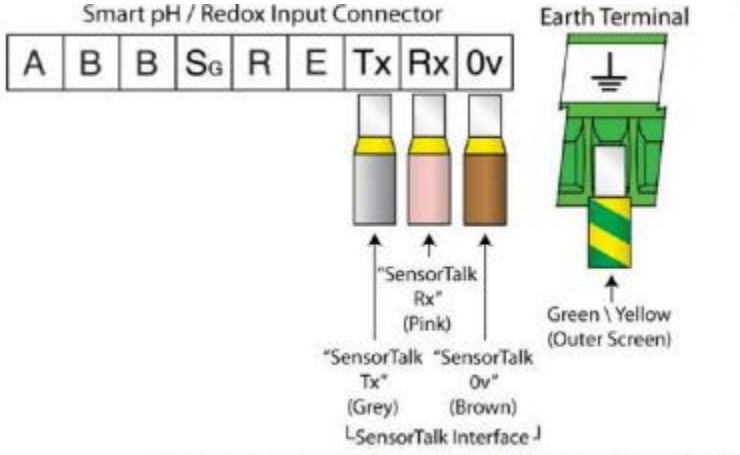
VP6 Detachable Cable Connection Details with "Solution Ground"

4.2.4 SENSORTALK SENSORS TERMINATION INFORMATION

The Smart pH / Redox input card of the 4073 is capable of interfacing with the range of SensorTalk pH / Redox electrodes from Broadley James Corporation. This allows the user to take advantage of the unique calibration functionality these sensors provide. Please note, when unplugging an existing SensorTalk sensor from the instrument please wait for the probe is removed message to appear before attaching a different sensor.

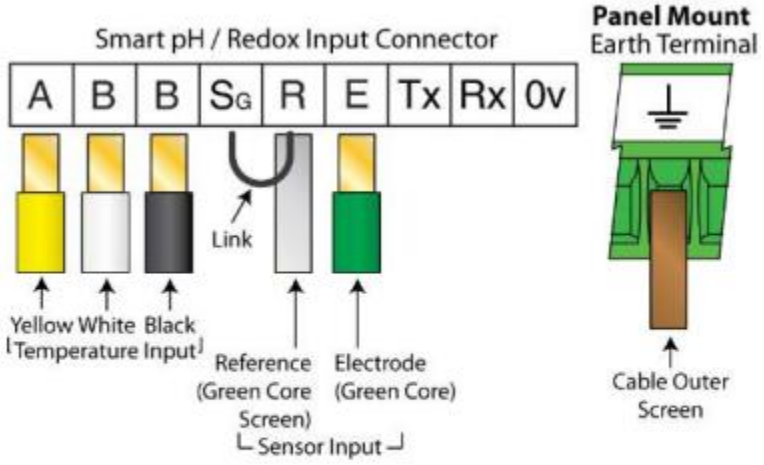


Hybrid SensorTalk Probe Cable Connection Details (Solution Ground Fitted)

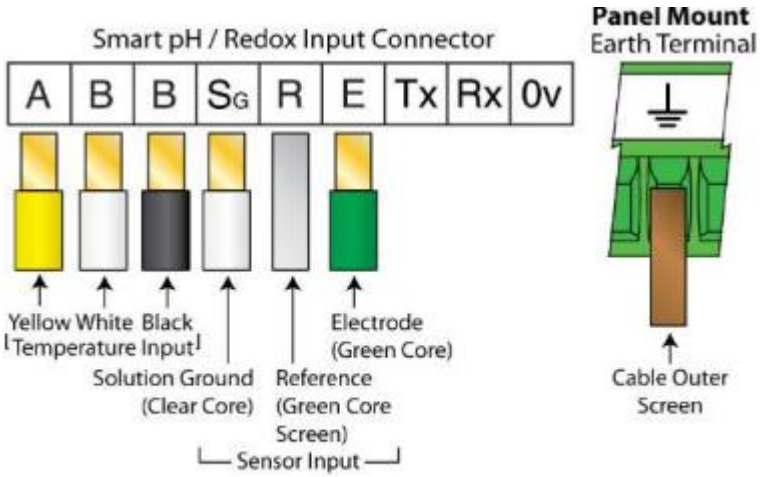


Digital SensorTalk Probe Cable Connection Detail

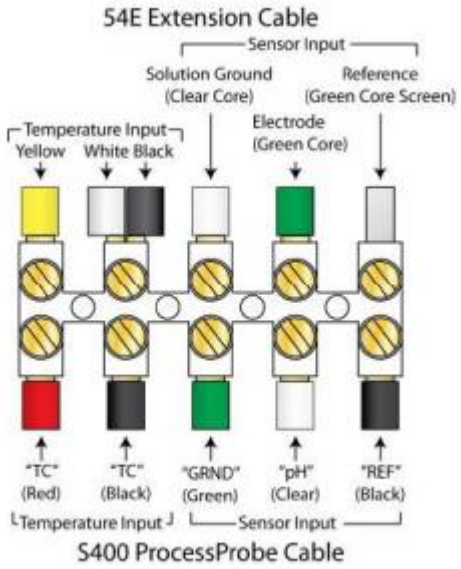
4.2.5 SMART CAPABLE INPUT CARD CABLE CONNECTION INFORMATION



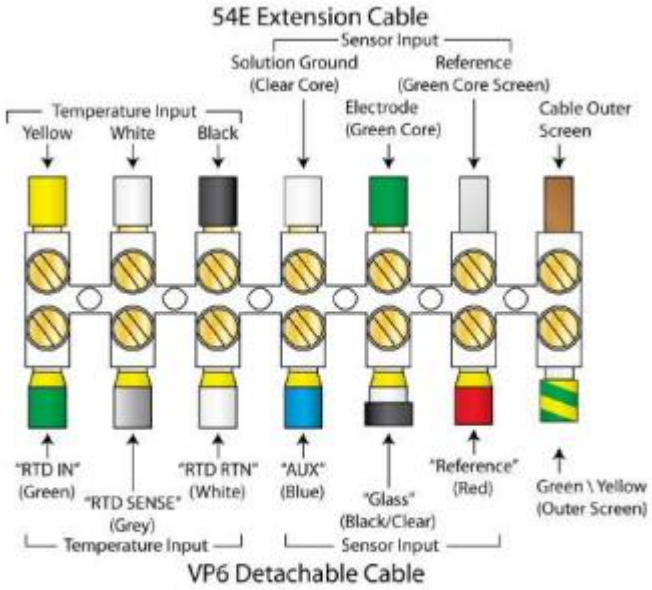
pH 54E Extension Cable Connection Details
(Solution Ground Not Fitted)



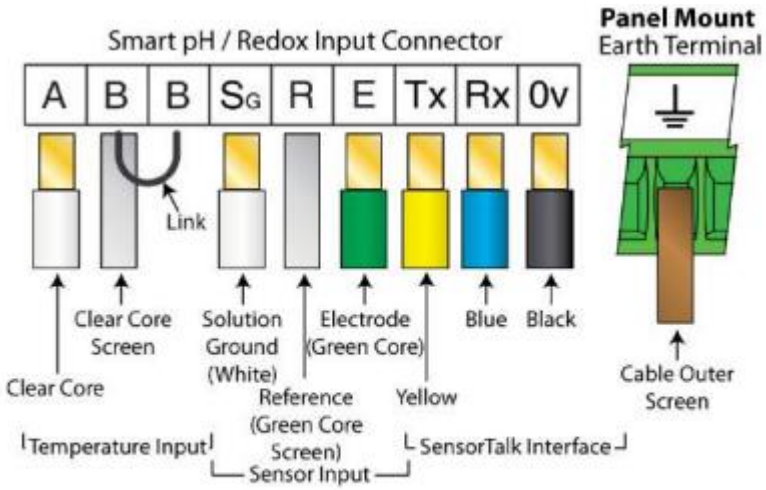
pH 54E Extension Cable Connection Details
(Solution Ground Fitted)



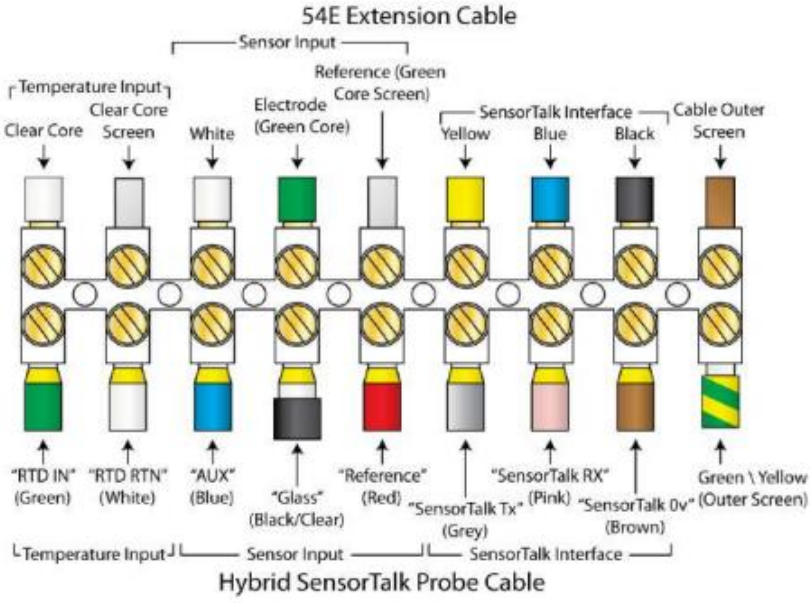
S400 ProcessProbe to 54E Extension Cable Connection Details



VP6 Detachable Cable to 54E Extension Cable Connection Details

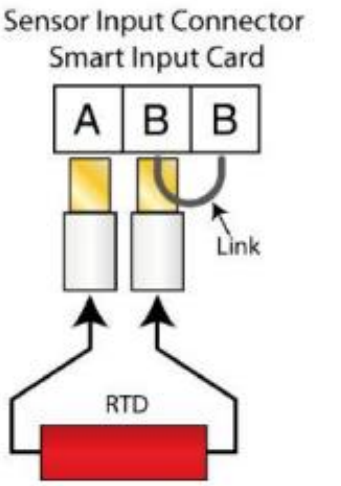


Hybrid SensorTalk 54E Extension Cable Connection Details (Solution Ground Fitted)

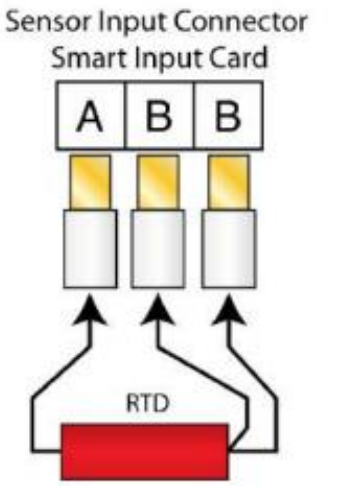


Hybrid SensorTalk Probe Cable To 54E Extension Cable Connection Details

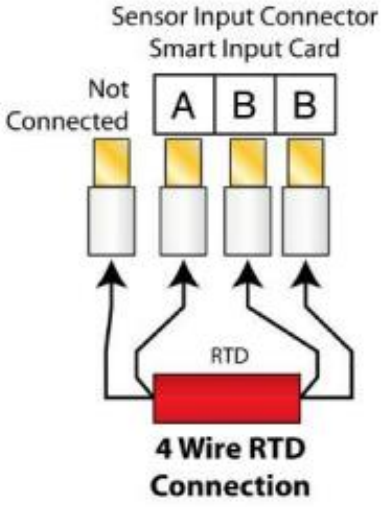
4.2.6 SMART CAPABLE INPUT CARD TEMPERATURE SENSOR CONNECTIONS



2 Wire RTD Temperature Connection

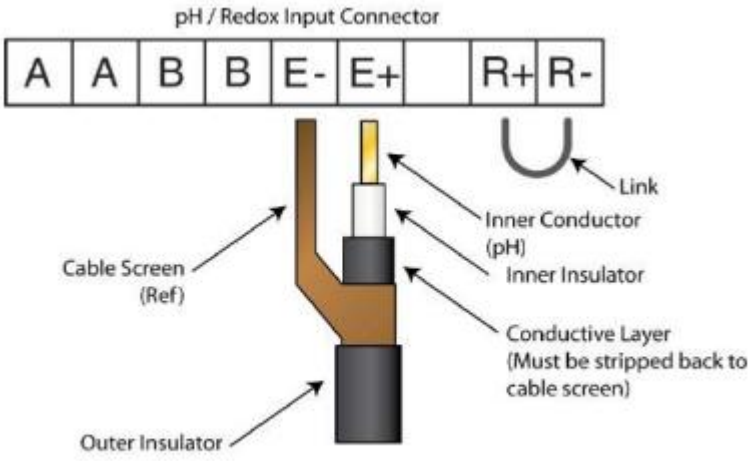


3 Wire RTD Temperature Connection

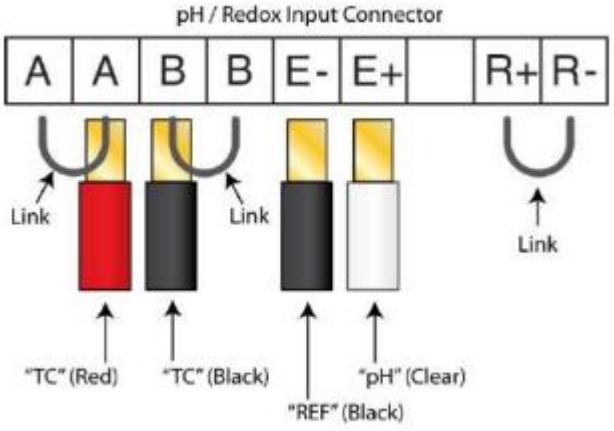


4 Wire RTD Temperature Connection

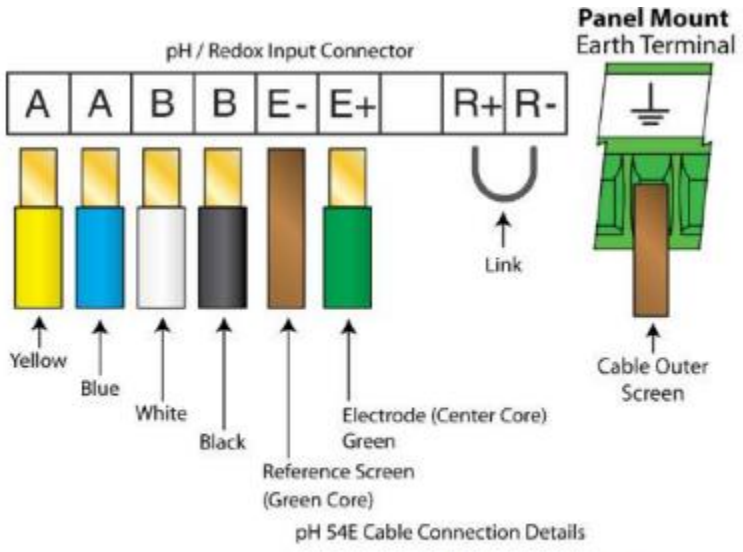
4.2.7 PREVIOUS GENERATION INPUT CARD TERMINATION INFORMATION



pH / Redox LN10 Coax Cable Connection Details

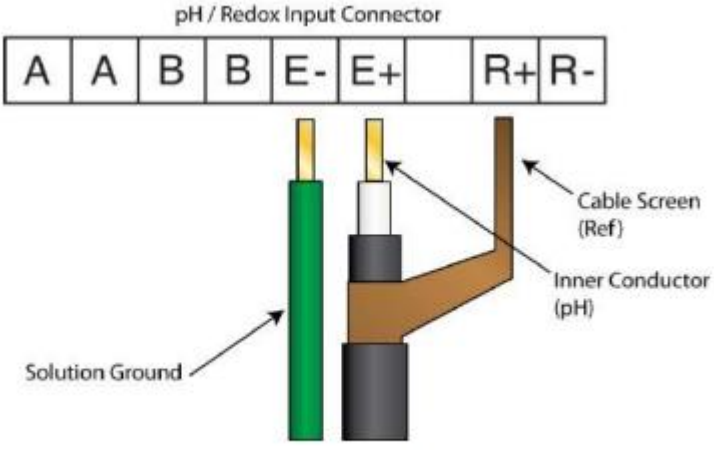


DynaProbe & ProcessProbe Cable Connection Details

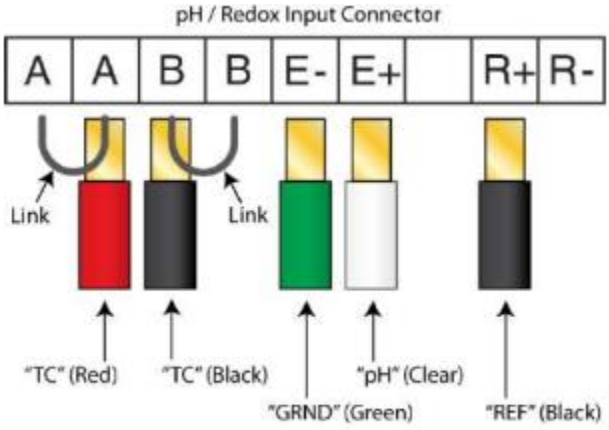


pH / Redox 54E Cable Connection Details

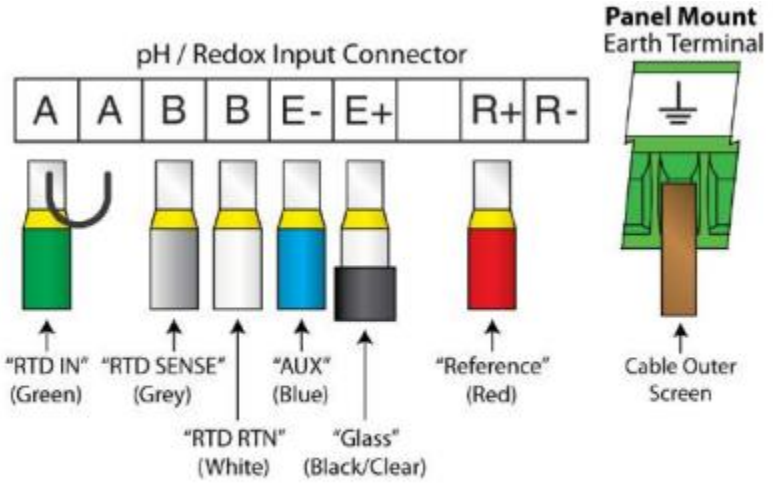
The pH / Redox input card of the 4073 also provides a differential input method of wiring the pH electrode. This provides better electrical noise immunity and allows the sensor to operate in solutions where flowing electrical currents may cause measurement problems.



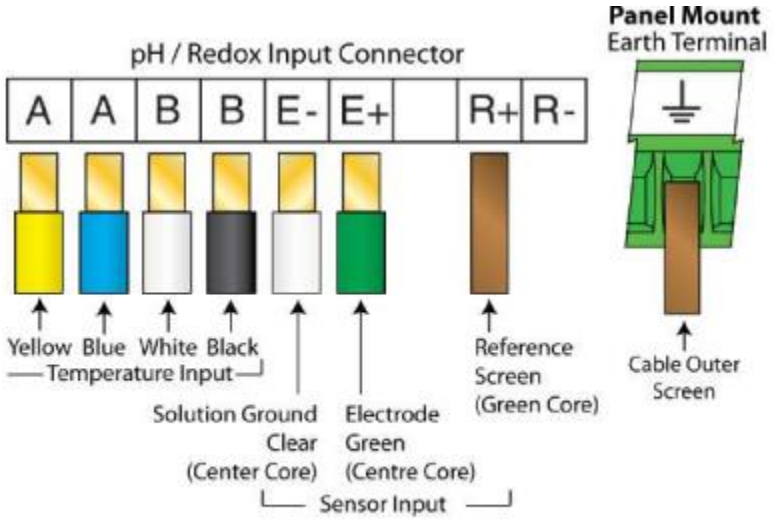
pH / Redox LN10 Coax Cable Connection Details with Separate "Solution Ground" Connection



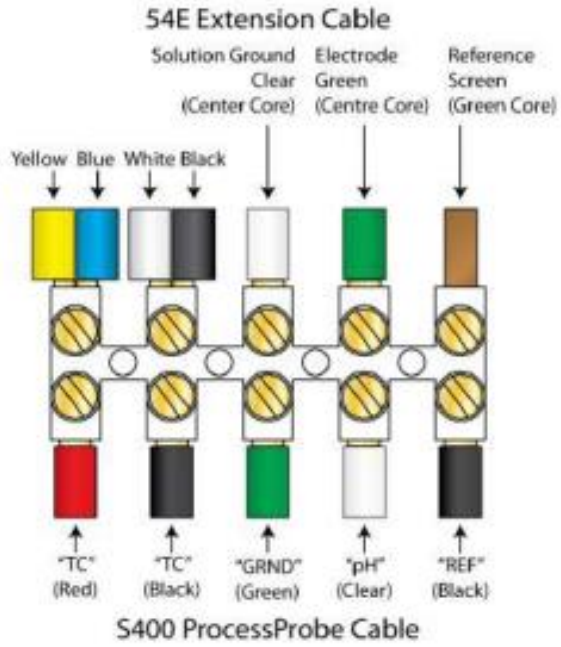
DynaProbe & ProcessProbe Cable Connection Details with "Solution Ground"



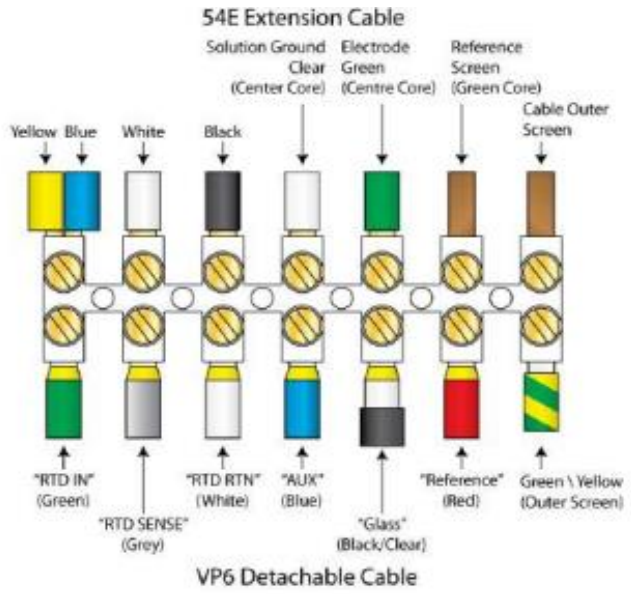
VP6 Detachable Cable Connection Details with "Solution Ground"



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

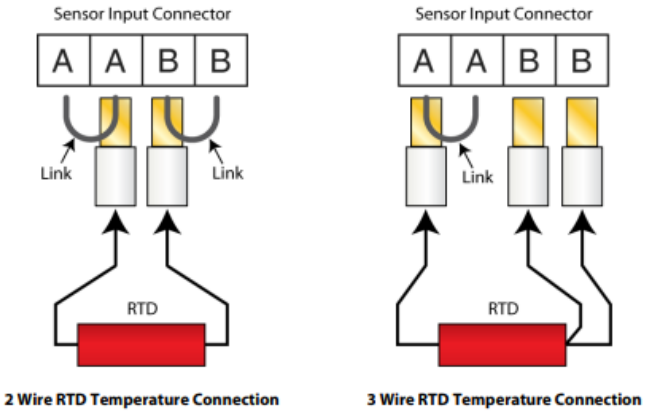


S400 ProcessProbe to 54E Extension Cable Connection Details



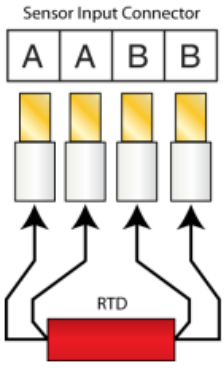
VP6 Detachable Cable to 54E Extension Cable Connection Details

4.2.8 PREVIOUS GENERATION INPUT CARD TEMPERATURE SENSOR CONNECTIONS



2 Wire RTD Temperature Connection

3 Wire RTD Temperature Connection

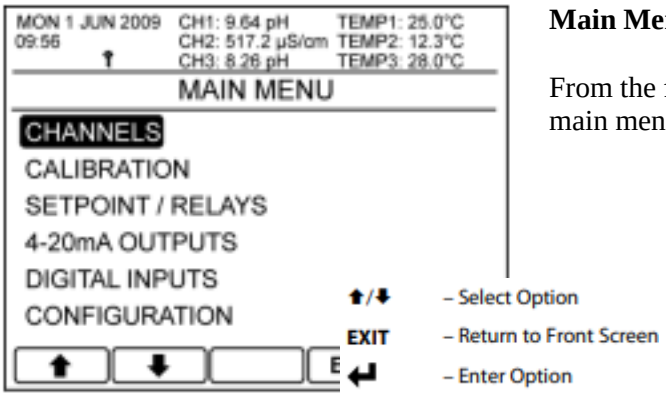


4 Wire RTD Temperature Connection

4.3 PH/REDOX INPUT CHANNEL SETUP

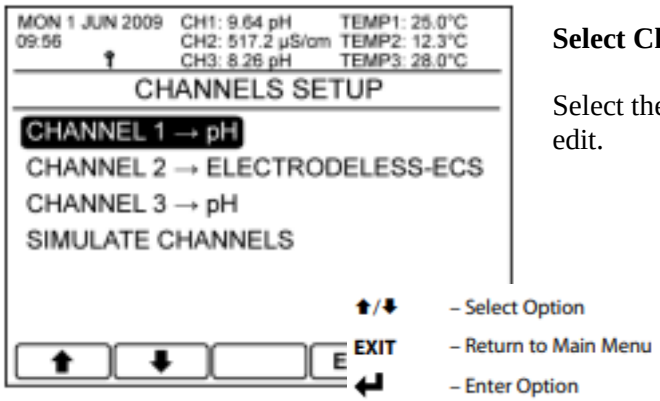
The Channels Setup menu contains the basic configurations for the sensor's input.

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



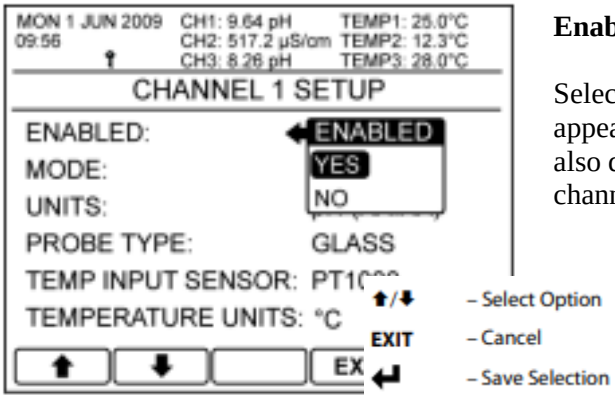
Main Menu

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



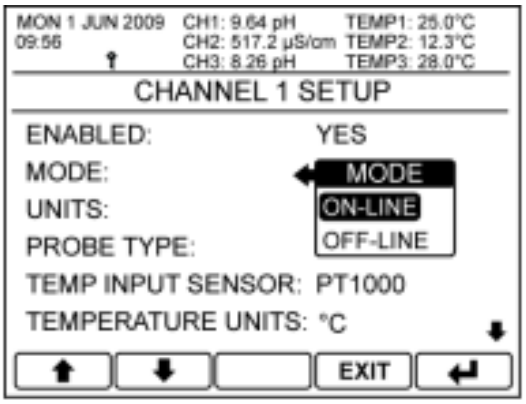
Select Channel

Select the (Smart) pH / Redox input channel you wish to edit.



Enabled

Selecting no disables the channel and prevents it from appearing as an option in output and configuration menus, also disables any error messages associated with the channel.



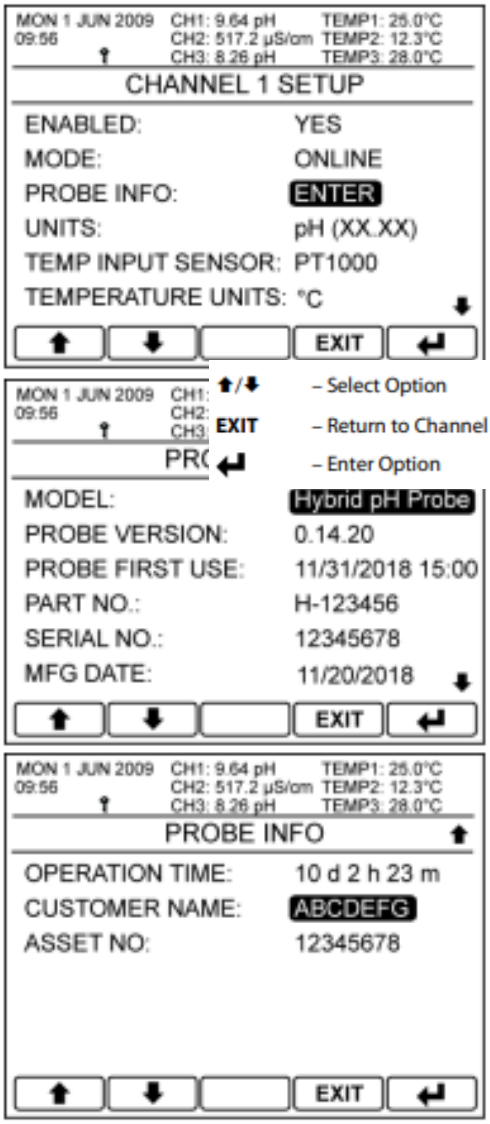
Mode

Selecting off-line causes any control setpoints / Relays associated with this channel to de-energize (any active error relays will remain energized). 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.

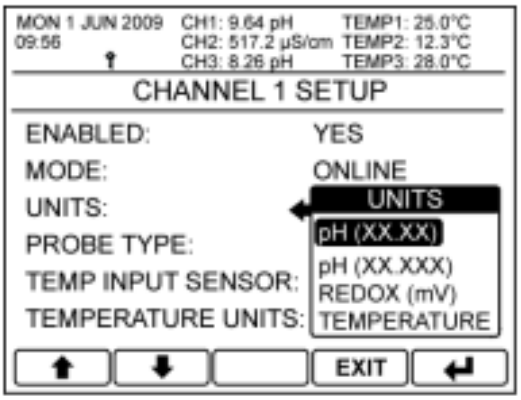
↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection



Probe Info

Shows the Model, Probe Version, First Use Date, Part Number, Serial Number, Manufacture Date and Operation Time of the connected SensorTalk probe.

Also allows the entry of customer name and asset number to be saved to the probe. Only available when a SensorTalk capable probe is connected to the instrument.



Units

The channel can be configured as a pH, Redox or an exclusively temperature input.

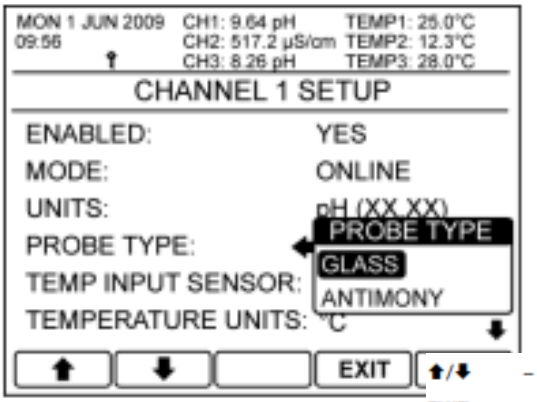
When “pH (XX.XX)” is selected the channel will automatically apply the correct temperature compensation and probe type to the electrodes raw mV input to provide a display of pH. Note, the instrument can also display the raw mV as a secondary value on the front screen, see User Interface guide for more details.

When “pH (XX.XXX)” is selected the channel will do as above but will display pH to three decimal places.

When “Redox (mV)” is selected the instrument displays the unprocessed input voltage to the electrode terminals.

When “Temperature” is selected the channel only shows the temperature input. All other sensor inputs are ignored.

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

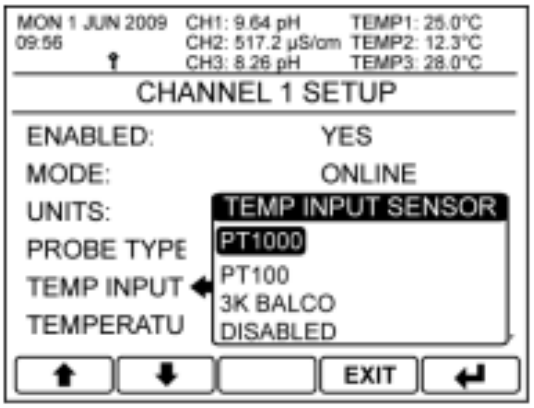


Probe Type

The input channel can scale its readings to operate with either a glass or antimony probe. This sets the isopotential point, for a glass electrode this is 7.00pH, for an antimony electrode it is 0.00pH.

! A sensor calibration must be performed when using a new sensor.

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection



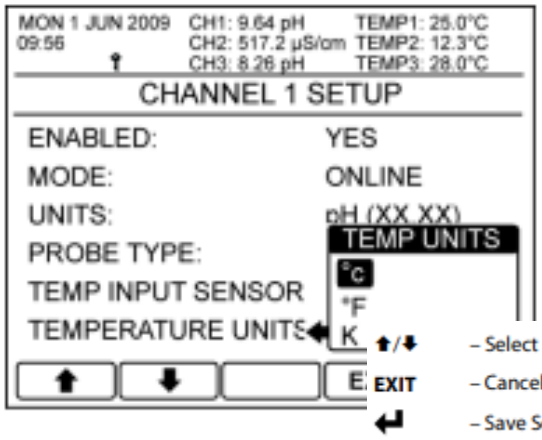
Temperature Input Sensor

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

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

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

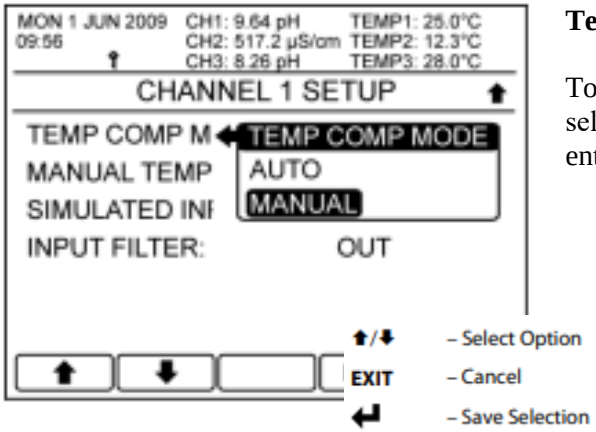
↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection



Temperature Units

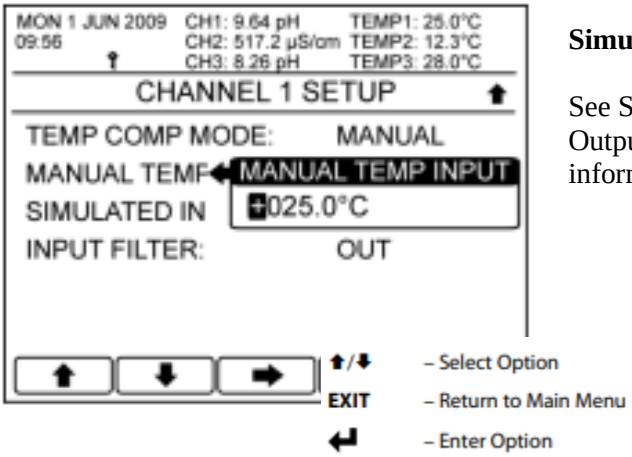
Sets the temperature units used.

Note. Kelvin is only available when units are set to temperature mode.



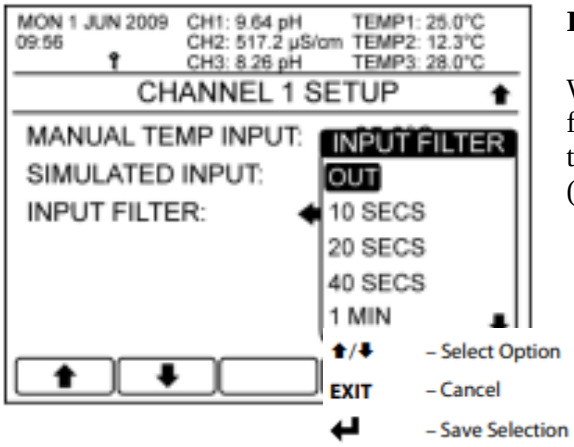
Temperature Compensation Mode

To use temperature compensation from a measured input select "Auto", else select "Manual" to enable a fixed value entry. Only Available when units set to pH.



Simulated Input

See Simulated Channels section of the Setpoints, Current Outputs, Digital Inputs Configuration Guide for more information.



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).

4.4 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 demineralized) water between standard solutions.
- Allow time for the electrode system temperature to stabilize 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-energizes 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

Waltron supplies buffer powders which are prepared from pure dry chemicals, sealed in a sachet or capsule which prevents the absorption of moisture and subsequent deterioration. Buffer solutions should be prepared in accordance with the instructions supplied with them.

The 4073 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 Waltron 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. NB. Auto calibration mode is not available when the pH probe type is set to antimony.

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 either the combined *Buffer* and *Slope* menu or individual Buffer menu. It is important to do the calibration at suitable values i.e.

Adjustment of the Buffer (Offset) value at 7.00pH
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. 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.
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.

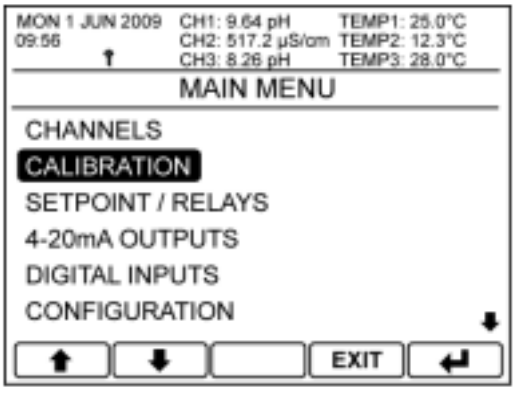
Redox Standards

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.

4.4.1 CALIBRATION MENU

The calibration menu provides the facility to adjust the sensor inputs to the system in which it is operating.

The default security access code is **1000.**



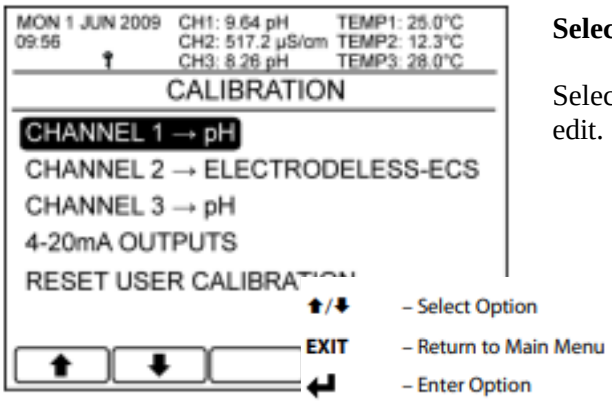
Main Menu

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

ion

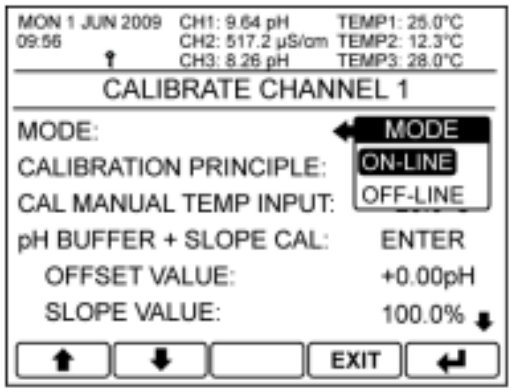
Front Screen

on



Select Channel

Select the (Smart) pH / Redox input channel you wish to edit.



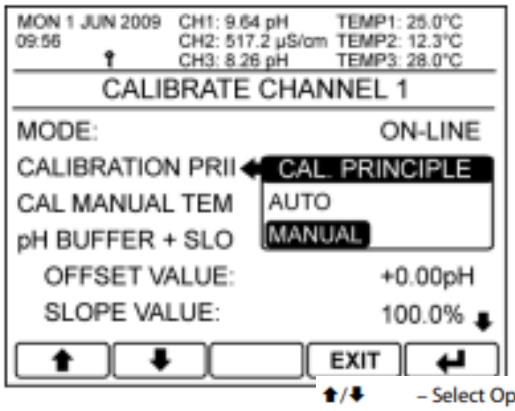
Mode

Selecting off-line causes any setpoints associated with this channel to de-energize. 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

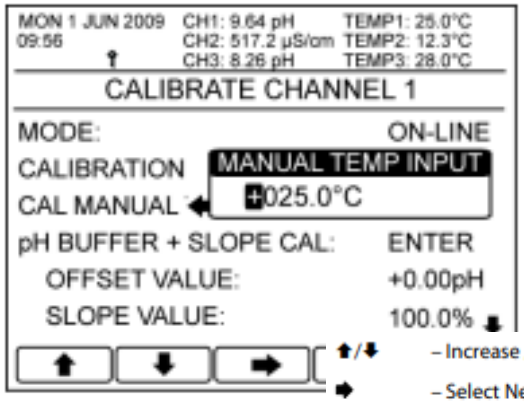


Calibration Principle

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.

Only available when units set to pH in the channel setup menu and if available probe type is set to glass.

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

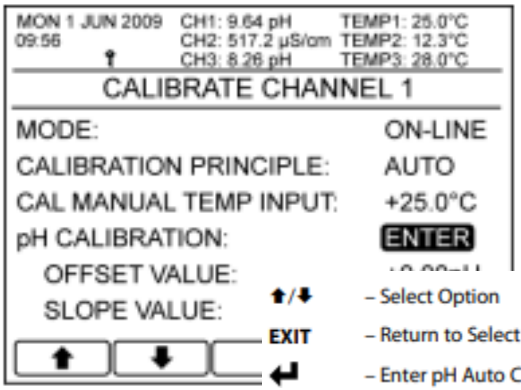


Calibration Manual Temperature Input

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 units are set to pH and temperature compensation mode has been set to manual in the channel setup menu.

↑/↓ – Increase / Decrease Digit
→ – Select Next Digit
EXIT – Cancel
↵ – Save Value

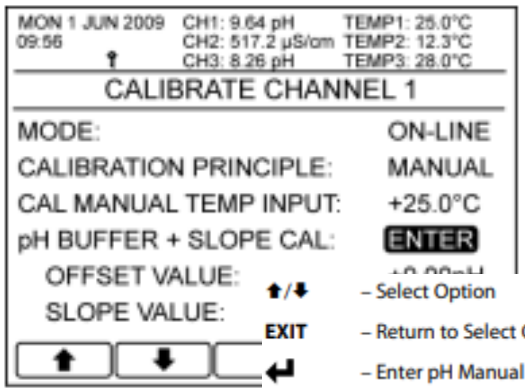


pH Calibration

Enter the pH Auto Calibration routine.

Only available when units set to pH in the channel setup menu and calibration principle is set to auto in this menu.

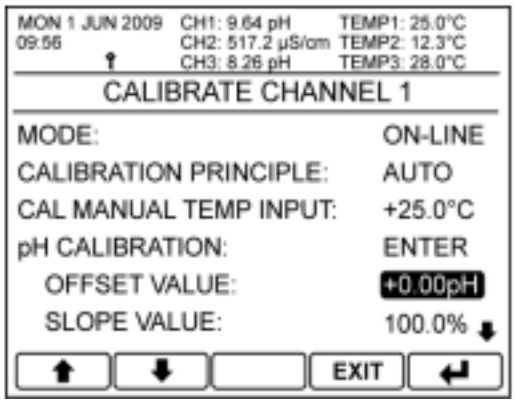
↑/↓ – Select Option
EXIT – Return to Select Calibration Channel
↵ – Enter pH Auto Calibration



pH Buffer (Offset) + Slope Calibration

Enter the pH Manual Offset and Slope Calibration Routine Only available when units set to pH in the channel setup menu and calibration principle is set to Manual in this menu.

↑/↓ – Select Option
EXIT – Return to Select Calibration Channel
↵ – Enter pH Manual Offset Calibration

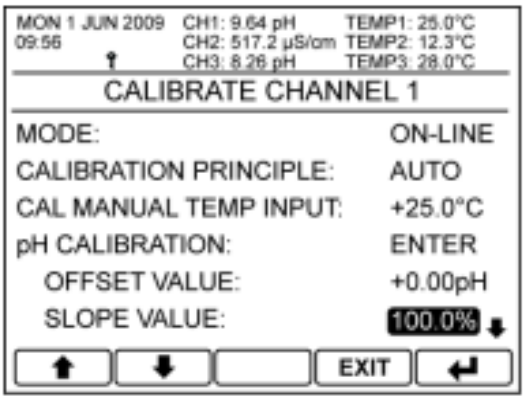


Offset Value

Displays the electrode Offset currently being used by the instrument. Only available when units set to pH in the channel setup menu.

Cannot be edited.

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

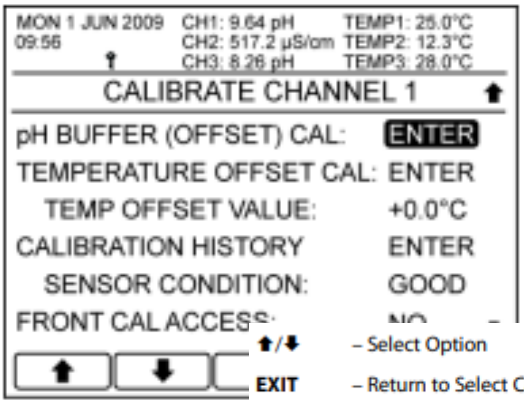


Slope Value

Displays the electrode Slope currently being used by the instrument. Only available when units set to pH in the channel setup menu.

Cannot be edited.

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



pH Buffer (Offset) Calibration

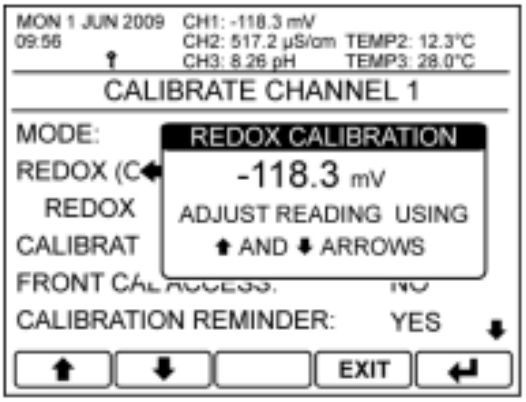
Enter the pH Manual Offset Calibration Routine

Only available when units set to pH in the channel setup menu and calibration principle is set to Manual in this menu.

↑/↓ – Select Option

EXIT – Return to Select Calibration Channel

↵ – Enter pH Manual Offset Calibration



Redox Offset Calibration

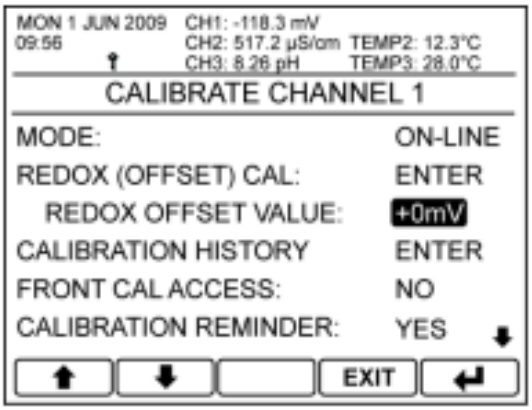
The Redox Offset calibration enables the user to adjust the sensor reading to match a known input. The current Redox sensor reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows. When the reading is correct press the enter button to store the calibration.

Only available when units set to Redox in the channel setup menu.

↑/↓ – Adjust the Reading Up or Down

EXIT – Cancel

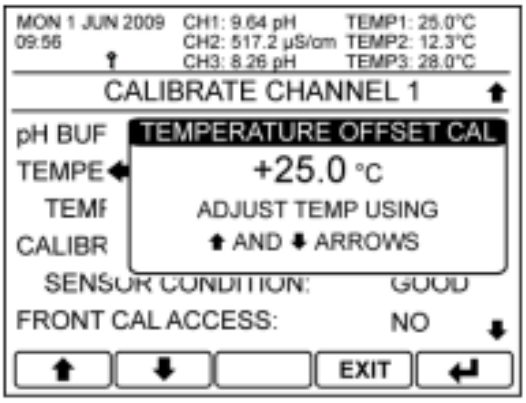
↵ – Save Calibration



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.



Temperature Offset Calibration

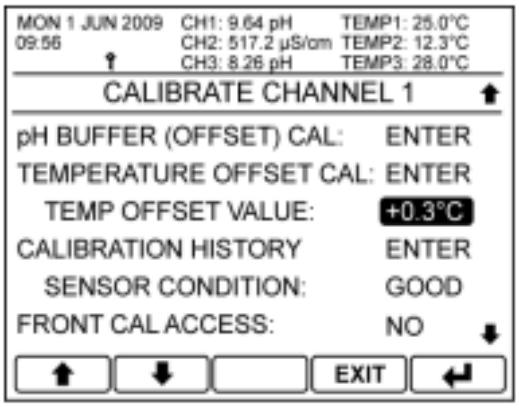
The temperature offset calibration enables the user to adjust the temperature reading to match a known input. Only available when the channel's temperature input is not set to disabled.

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

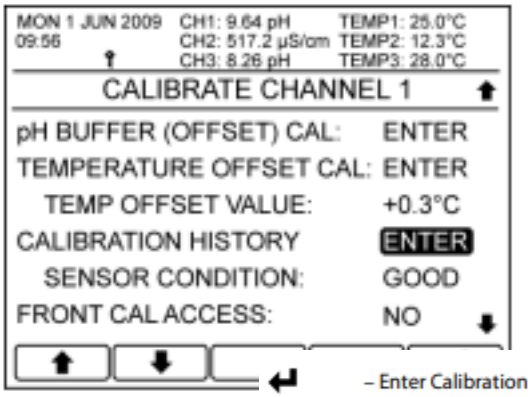
↵ – Save Calibration



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.

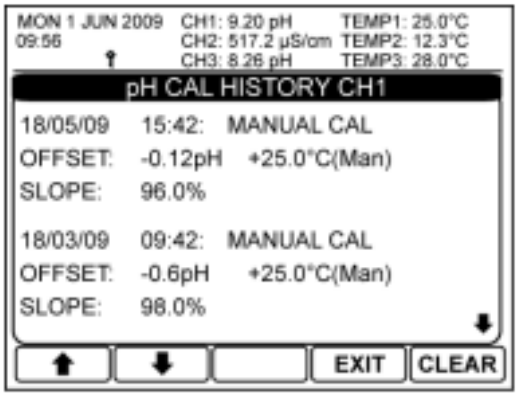


↵ – Enter Calibration History

Enter Calibration History

The 4073 has a calibration history feature which allows the user to review the record of sensor solution calibrations.

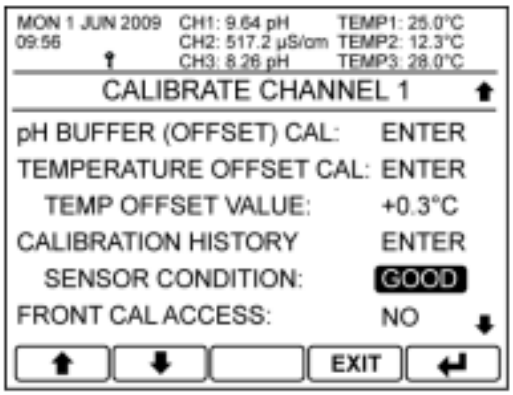
To enter the calibration history menu press enter.



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.

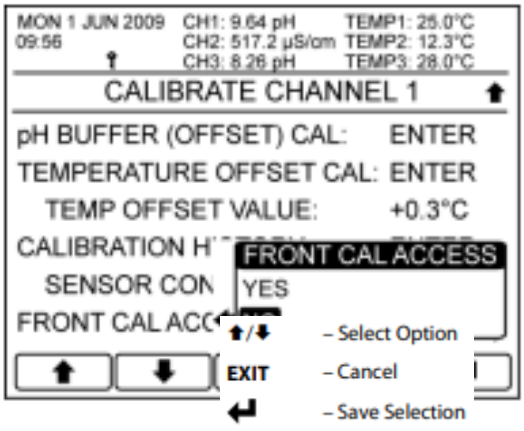


Sensor Condition

The 4073 is capable of analyzing the result of the pH electrode offset and slope calibration and indicates to the user the condition the electrode is in.

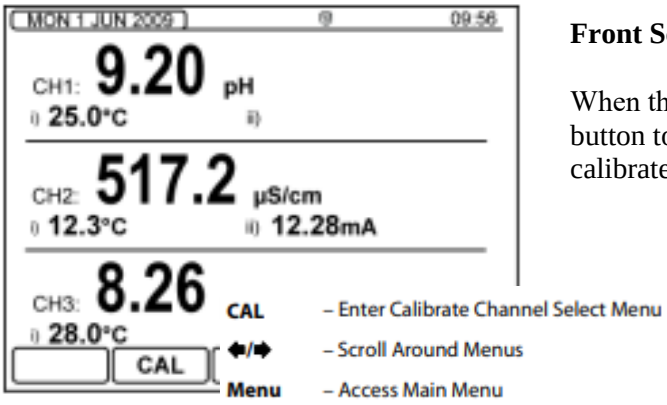
- Good – The electrode is operating within set parameters.
- Replace Soon – The electrode is getting towards the end of is operating life.
- Replace – The electrode is exhausted and should be replaced.

Cannot be edited, only available when units set to pH in the channel setup menu.



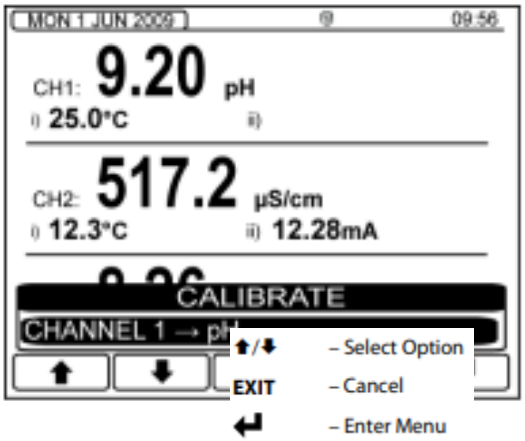
Front Screen Calibration Access Enable

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.



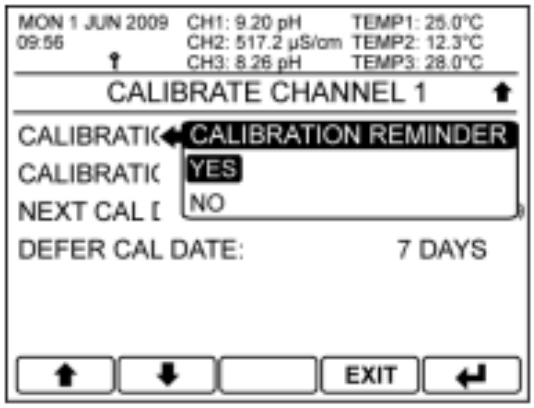
Front Screen Calibration Access

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



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.



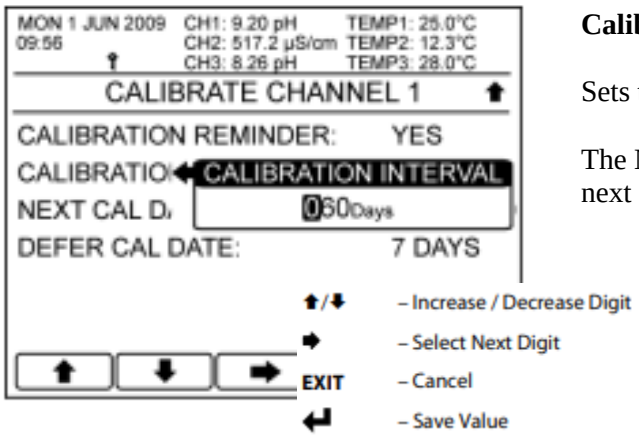
Calibration Reminder

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.

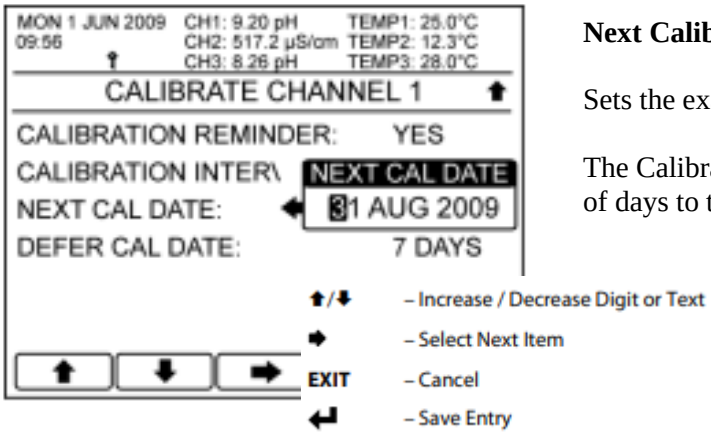
↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection



Calibration Interval

Sets the interval time for the calibration alarm.

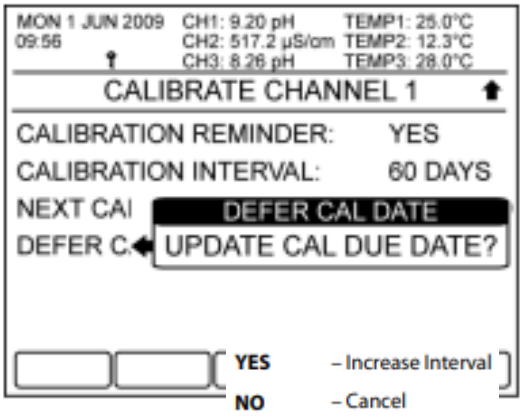
The Next Cal Date will update to show the date of the next calibration alarm.



Next Calibration Date

Sets the exact date of the next calibration alarm.

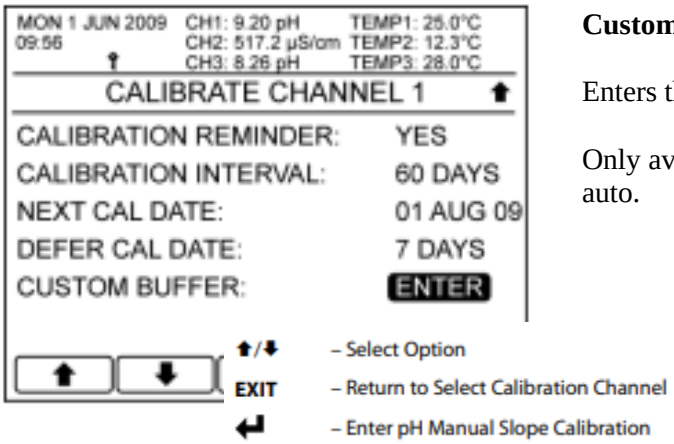
The Calibration Interval will update to show the number of days to the next calibration date



Defer Calibration Date

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

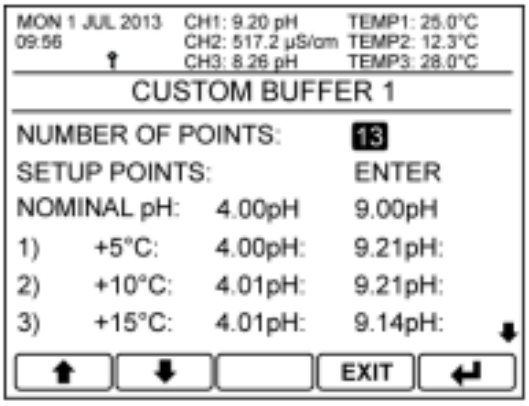
Only appears once the calibration interval has expired.



Custom Buffer Entry

Enters the custom buffer setup menu.

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



Custom Buffer Menu

The custom buffer menu allows the user to enter in custom buffer solution values at fixed temperatures for the nominated pH values chosen, 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.

Nominal pH – Define the two pH buffers chosen for Auto calibration.

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 Waltron standard buffer defaults.

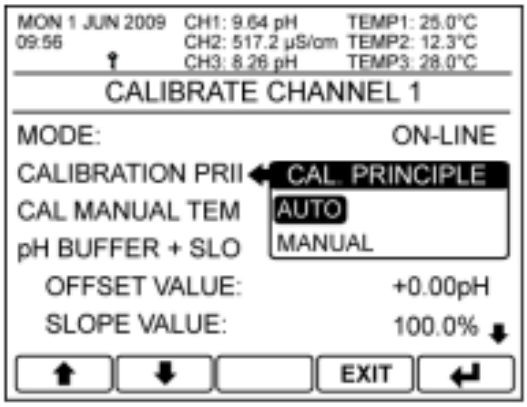
⬆/⬇	– Select option or Increase / Decrease Digit
➡	– Select Next Digit
EXIT	– Cancel or Return to Calibration Menu
↵	– Save Entry

4.4.2 AUTO PH SENSOR CALIBRATION

The Auto pH sensor calibration is a two point offset and slope calibration, which requires the use of two pH buffer solutions chosen by the user. These are nominal values from which the instrument converts to exact buffer values due to temperature variations. To accomplish this, the instrument requires buffer values at different temperatures relevant to the buffer solutions chosen to be configured.

Alternatively the default configuration uses 4 and 9 pH buffer solutions with the buffer table preconfigured with the following two Waltron buffers: 4pH and 9pH.

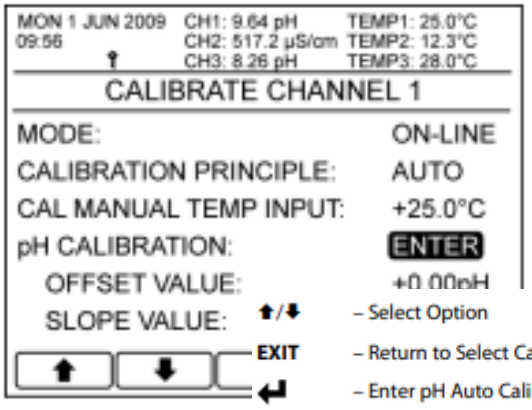
In order for the auto calibration to work correctly, the buffer temperature must either be measured by the instrument during calibration, or if manual temperature compensation is being used the buffer temperature must be entered in the “Calibration Manual Temperature Input” in the calibration menu.



Calibration Principle

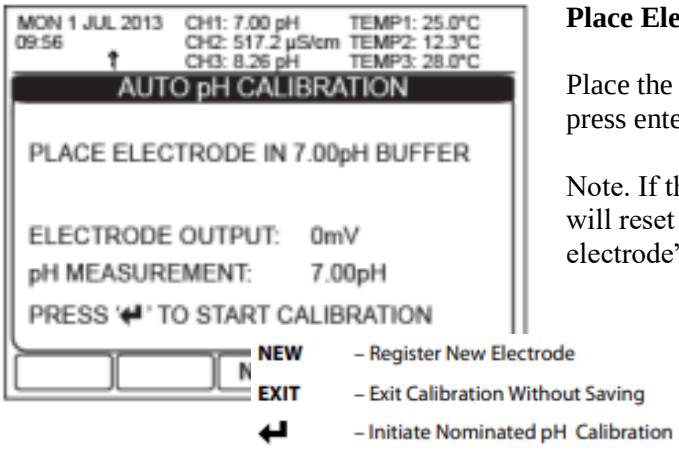
To use Auto calibration first set the calibration principle to Auto.

Note. Calibration Principle is only available when units are set to pH and probe type to glass, both in the channel setup menu.



pH Auto Calibration

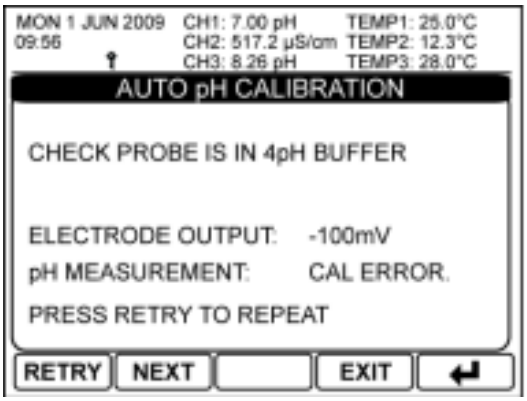
To start the pH calibration, select the “pH Calibration” item from the desired channel’s calibration menu.



Place Electrode In Nominal pH Buffer 1

Place the electrode in the first nominated pH 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.



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.

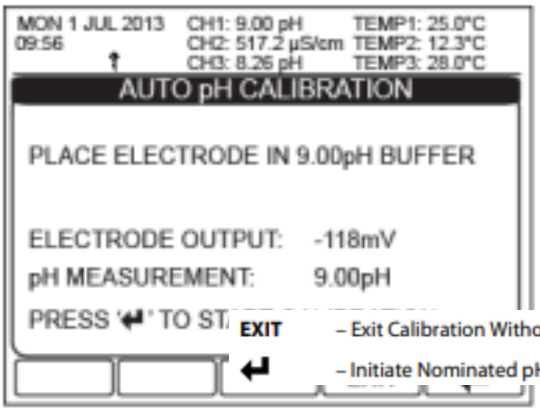
Check that the electrode is connected correctly and that the correct buffer has been used. Then press “Retry” to repeat the calibration.

PREV – Go to Previous Calibration Point

SKIP – Skip to Next Calibration Point

EXIT – Exit Calibration Without Saving

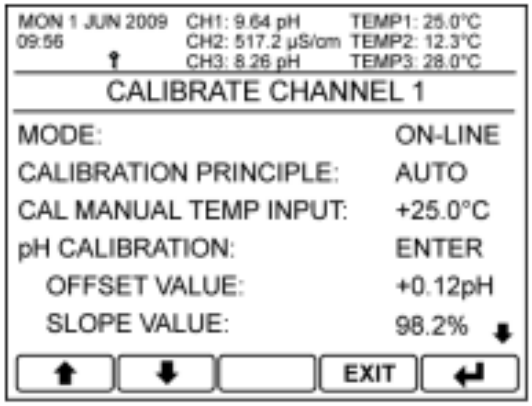
↵ – Initiate Calibration



Place Electrode In Nominal pH Buffer 2

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

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



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.

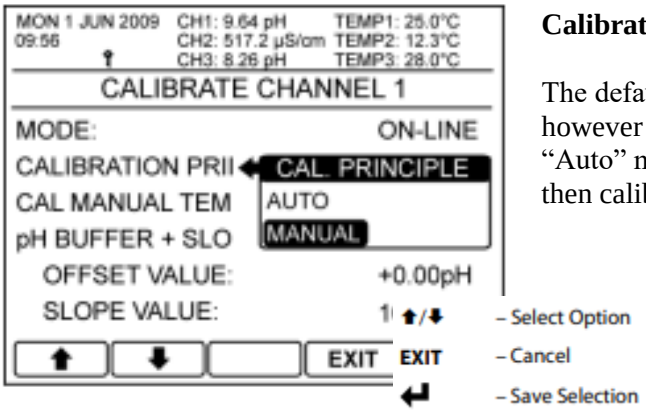
4.4.3 MANUAL PH SENSOR CALIBRATION

When using Manual calibration mode it is possible to do either a single point Buffer (Offset) Cal or a combined two point Buffer and Slope calibration. This is accomplished by using either the pH Buffer (Offset) Cal or pH buffer + Slope Cal menu items. The combined Buffer and Slope calibration is done in the following 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).

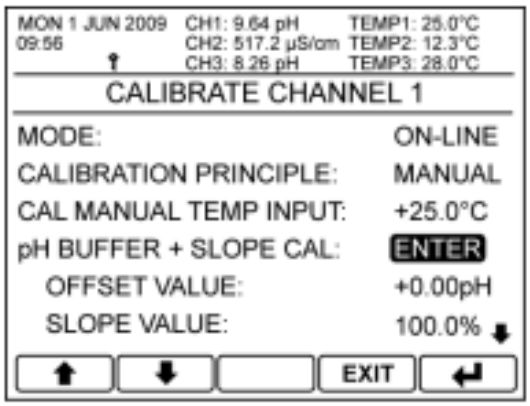
As actual pH buffer values are used no compensation is made for the variation of the buffer solution with temperature in the instrument. It is important therefore to know the actual buffer value at the temperature

of the solution. 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.



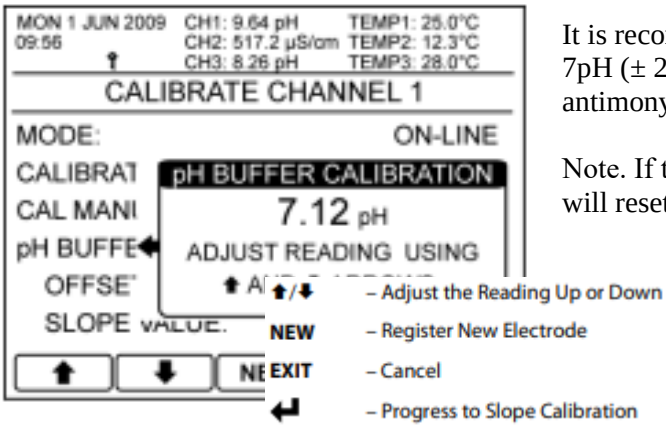
pH Buffer + Slope Calibration – Buffer Calibration

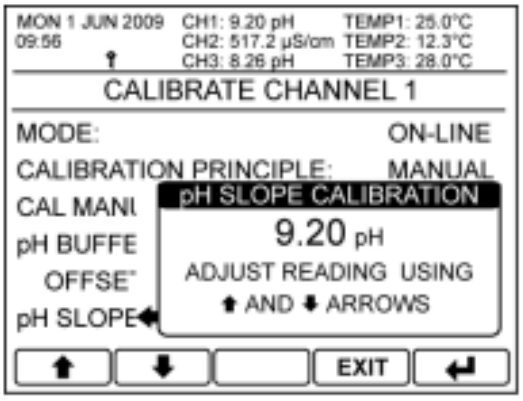
The pH buffer calibration enables the user to adjust the sensor buffer until the displayed reading matches the known input. To activate the function, select “pH Buffer + Slope Cal” and press enter.

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 and progress to the slope 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.



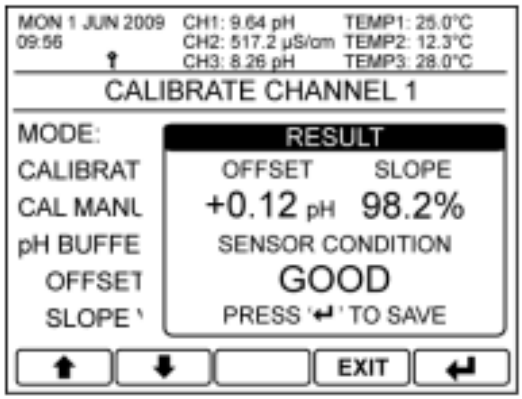


pH Slope Calibration

The pH slope calibration enables the user to adjust the sensor slope until the displayed reading matches the known input. If using the “pH Buffer + Slope Cal” menu, the instrument will automatically progress onto the slope calibration once the Buffer calibration has been done.

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.

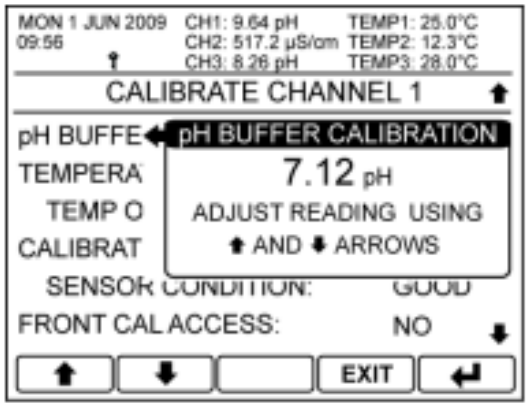
The slope limits are 80% to 110% for a glass electrode and 75% to 115% for a antimony electrode.



Result

The adjusted offset and slope values, as well as the calculated sensor condition from the calibration routine, is displayed here.

If only a single point calibration is required then use the following pH buffer calibration.



pH Buffer (Offset) Calibration

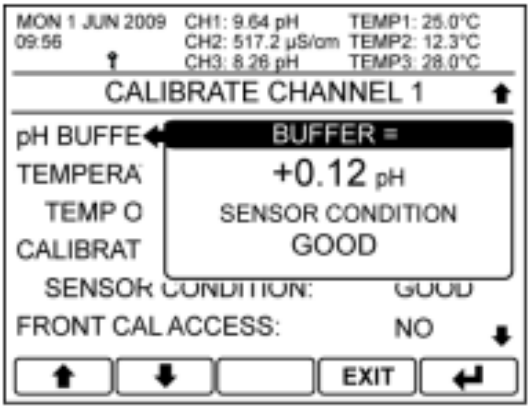
The pH buffer calibration enables the user to adjust the sensor buffer until the displayed reading matches the known input. To activate the function select “pH Buffer (Offset) Cal” and press enter.

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



Result

The adjusted offset value, as well as the calculated sensor condition from the calibration routine is displayed here.

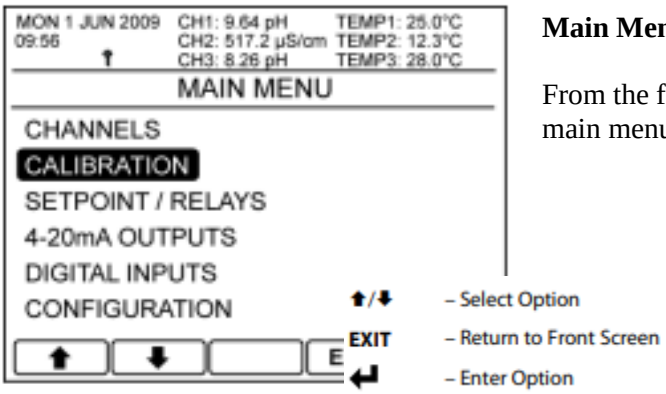
4.4.4 BUFFER SOLUTIONS

The following table gives the Waltron 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)	**4pH Buffer**	**7pH Buffer**	**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

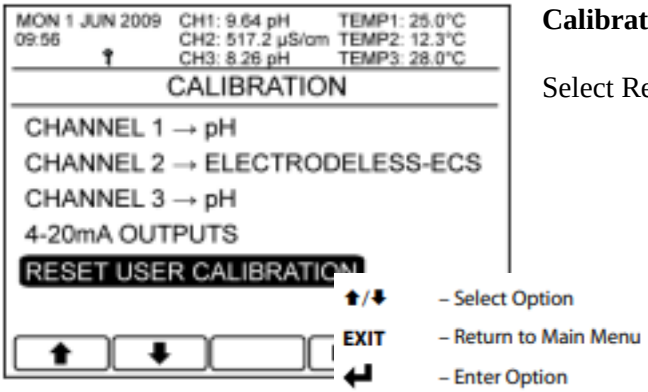
4.4.5 RESETTING THE USER CALIBRATION

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



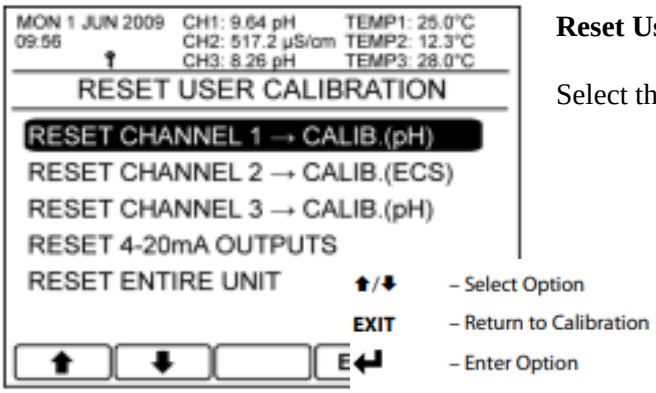
Main Menu

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



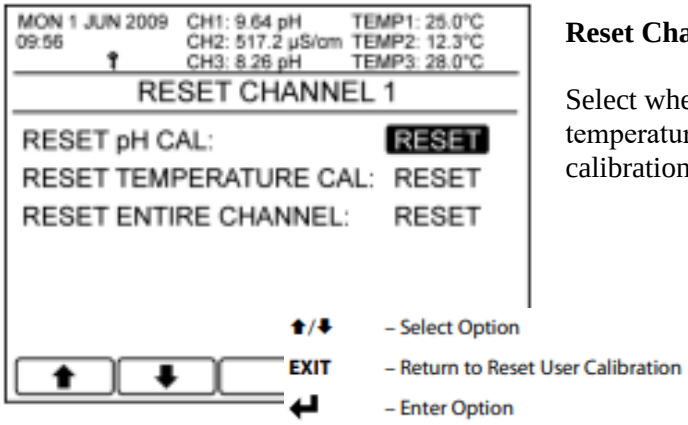
Calibration

Select Reset User Calibration.



Reset User Calibration

Select the required (smart) pH / Redox input channel.



Reset Channel User Calibration

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

4.5 APPENDIX A – TEMPERATURE DATA

The table below lists approximate resistance values of temperature sensors that may be used with the 4073. Not all options are available on all input types.

Temperature (°C)	PT1000 RTD	PT100 RTD	3K Balco RTD
0	1000.0Ω	100.00Ω	2663 Ω
10	1039.0Ω	103.90Ω	2798 Ω
20	1077.9Ω	107.79Ω	2933 Ω
25	1097.3Ω	109.73Ω	3000 Ω
30	1116.7Ω	111.67Ω	3068 Ω
40	1155.4Ω	115.54Ω	3203 Ω
50	1194.0Ω	119.40Ω	3338 Ω
60	1232.4Ω	123.24Ω	3473 Ω
70	1270.7Ω	127.07Ω	3608 Ω
80	1308.9Ω	130.89Ω	3743 Ω
90	1347.0Ω	134.70Ω	3878 Ω
100	1385.0Ω	138.50Ω	4013 Ω

4.6 APPENDIX B – 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	For Future Use
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.
E016	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 SD card

Input Channel Errors

E030 E080 E130	CH 1 CH 2 CH 3	Input Card Checksum Error Try switching the unit off and then on again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E031 E081 E131	CH 1 CH 2 CH 3	Setup Checksum Error The current channel's configuration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists reset the current channel from the Reset Unit Settings option in the Save/Restore menu or consult with your supplier, as the channel's input card may require to be returned for repair.
E032 E082 E132	CH 1 CH 2 CH 3	Store A Checksum Error The data in the channel's Store A has become corrupted. Check the channel's current setup. Then save the setup back to channel's Store A in the Save/Restore menu.
E033 E083 E133	CH 1 CH 2 CH 3	Store B Checksum Error The data in the channel's Store B has become corrupted. Check the channel's current setup. Then save the setup back to channel's Store B in the Save/Restore menu.
E034 E084 E134	CH 1 CH 2 CH 3	Factory Cal Checksum Error Try switching the unit off and then on again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E035 E085 E135	CH 1 CH 2 CH 3	User Cal Checksum Error The Channel's User Cal has for some reason become corrupted. Try switching the unit off and then on again. If the message persists Reset the Channel from the Reset User Calibration option in the Calibration menu or consult with your supplier, as the channel's input card may require to be returned for repair.
E036 E086 E136	CH 1 CH 2 CH 3	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.
E037 E087 E137	CH 1 CH 2 CH 3	Sensor Zero Cal Out Of Spec The last Sensor Zero Calibration was out of specification, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.

E038 E088 E138	CH 1 CH 2 CH 3	Sensor Span Cal Out Of Spec The last Sensor Span Calibration was out of specification, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E039 E089 E139	CH 1 CH 2 CH 3	No Signal No Sensor connected or there is 'zero' detector current. The probe sensor units (PSU) will be set to 16000 or 32000 if turbidity. If this message persists, please consult with your supplier.
E040 E090 E140	CH 1 CH 2 CH 3	Signal Overload The gain step is equal to 0 and the A/D output is over 255. This cannot happen in a liquid but could happen if the sensor is in full sunlight. The probe sensor units (PSU) will be set to 16000 or 32000 if turbidity. If this message persists, please consult with your supplier.
E041 E091 E141	CH 1 CH 2 CH 3	Partial Depletion Large difference between the detectors, i.e. one very dirty. This alarm will come up if there is a difference of 3:1 between the detectors. Remove sensor and clean sensor fingers. The probe sensor units (PSU) will be set to 16000 or 32000 if turbidity. If this message persists, please consult with your supplier.
E042 E092 E142	CH 1 CH 2 CH 3	Full Depletion Attenuation too high or the real probe signal goes above 14000. The probe sensor units (PSU) will be set to 16000. If this message persists, please consult with your supplier.
E043 E093 E143	CH 1 CH 2 CH 3	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.
E034 E094 E144	CH 1 CH 2 CH 3	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.
E035 E095 E145	CH 1 CH 2 CH 3	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.

E046 E096 E146	CH 1 CH 2 CH 3	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.
E047 E097 E147	CH 1 CH 2 CH 3	Sensor Open Circuit The sensor input is at open circuit, check sensor condition and connections. If the message persists please consult with your supplier.
E048 E098 E148	CH 1 CH 2 CH 3	Sensor Short Circuit The sensor input is at short circuit, check sensor condition and connections. If the message persists please consult with your supplier.
E049 E099 E149	CH 1 CH 2 CH 3	Sensor Positive Saturation The sensor input is greater than the maximum measurable input level, Check Sensor condition and connections. If the message persists please consult with your supplier
E050 E100 E150	CH 1 CH 2 CH 3	Sensor Negative Saturation The sensor input is less than the minimum measurable input level, Check Sensor condition and connections. If the message persists please consult with your supplier
E051 E101 E151	CH 1 CH 2 CH 3	Sensor Input Over Range The 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.
E052 E102 E152	CH 1 CH 2 CH 3	Sensor Input Under Range The sensor reading is less than the specified limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.
E053 E103 E153	CH 1 CH 2 CH 3	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.

E054 E104 E154	CH 1 CH 2 CH 3	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.
E055 E105 E155	CH 1 CH 2 CH 3	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.
E056 E106 E156	CH 1 CH 2 CH 3	Temp Comp Outside Limits The temperature reading is less than 0.0C or greater than 150.0C, leading to an error in compensation.
E057 E107 E157	CH 1 CH 2 CH 3	Polar Zero Cal At Limit The last Polargraphic Zero Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E058 E108 E158	CH 1 CH 2 CH 3	Polar Span Cal At Limit The last Polargraphic Span Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E059 E109 E159	CH 1 CH 2 CH 3	Galvanic Zero Cal At Limit The last Galvanic Zero Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E060 E110 E162	CH 1 CH 2 CH 3	Galvanic Span Cal At Limit The last Galvanic Span Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E061 E111 E161	CH 1 CH 2 CH 3	Pressure Sensor Over Range The pressure sensor reading is greater than the specified limit for the probe.

E062 E112 E162	CH 1 CH 2 CH 3	Pressure Sensor Under Range The pressure sensor reading is less than the specified limit for the probe.
E063 E113 E163	CH 1 CH 2 CH 3	Pressure Above 20mA The pressure sensor input is greater than 20mA, check sensor condition and connections. If the message persists please consult with your supplier.
E064 E114 E164	CH 1 CH 2 CH 3	Pressure Below 4mA The pressure sensor input is less than 4mA, check sensor condition and connections. If the message persists please consult with your supplier.
E065 E115 E165	CH 1 CH 2 CH 3	AUX mA Input Above 20mA The sensor input is greater than 20mA, check sensor condition and connections. If \ the message persists please consult with your supplier.
E066 E116 E166	CH 1 CH 2 CH 3	AUX mA Input Below 4mA The sensor input is less than 4mA, check sensor condition and connections. If the message persists please consult with your supplier.
E067 E117 E167	CH 1 CH 2 CH 3	Sensor 0mV Cal Out of Spec The pH 0mV calibration for this channel is outside recommended specifications.
E068 E118 E168	CH 1 CH 2 CH 3	Calibration Due The time since the last calibration was performed on this channel has exceeded the time set in the calibration menu.
E069 E119 E169	CH 1 CH 2 CH 3	Planned Service Due The Planned Service interval for this unit has expired. Please contact Waltron.

E070 E120 E170	CH 1 CH 2 CH 3	SD Card Checksum Error 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.
E071 E121 E171	CH 1 CH 2 CH 3	Gain Error The sensor gain has been exceeded. If this message persists, please consult with your supplier.
E072 E122 E172	CH 1 CH 2 CH 3	Invalid Linearization Curve A minimum of 2 linearization points are required. Please check linearization curve settings in the channel setup menu for this channel.
E073 E123 E173	CH 1 CH 2 CH 3	Linearization Over-Range The linearization result is greater than 9999 (or 100.0% when using %).
E074 E124 E174	CH 1 CH 2 CH 3	Linearization Under-Range The linearization result is less than 0.
E075 E125 E175	CH 1 CH 2 CH 3	Curve Low Limit The incoming probe signal is less than the lowest point in the linearization curve.
E076 E126 E176	CH 1 CH 2 CH 3	Curve High Limit The incoming probe signal is greater than the highest point in the linearization curve.
E077 E127 E177	CH 1 CH 2 CH 3	Custom Error Contact your supplier for details.

Setpoint Errors

E180	SP1	Dose Alarm Error
E190	SP2	The Setpoint has been dosing for longer than the Dose Alarm time as defined in the
E200	SP3	setpoint menu.
E210	SP4	
E220	SP5	
E230	SP6	

E181 to E184	SP1	For Future Use
E191 to E194	SP2	
E201 to E204	SP3	
E211 to E224	SP4	
E221 to E224	SP5	
E231 to E234	SP6	

E185	SP1	Store A Checksum Error
E195	SP2	The Store A Save for the Channel associated with this Setpoint has become corrupted.
E205	SP3	Check the setpoint's settings in the setpoint menu and then save the settings again in
E215	SP4	the Channel's Store A in the Save/Restore menu.
E225	SP5	
E235	SP6	

E186	SP1	Store B Checksum Error
E196	SP2	The Store B Save for the Channel associated with this Setpoint has become corrupted.
E206	SP3	Check the setpoint's settings in the setpoint menu and then save the settings again in
E216	SP4	the Channel's Store B in the Save/Restore menu.
E226	SP5	
E236	SP6	

E187	SP1	Setup Checksum Error
E197	SP2	The Setup for this Setpoint has become corrupted. Check and correct the setpoint
E207	SP3	settings and turn the unit off and on again. If the message persists, please consult with
E217	SP4	your supplier.
E227	SP5	
E237	SP6	

E188	SP1	SD Card Checksum Error
E198	SP2	The SD Card store from which this Setpoint was restored has become corrupted. Check
E208	SP3	the setpoint's settings in the setpoint menu and then save the settings again to the SD
E218	SP4	card store.
E228	SP5	
E238	SP6	

Current Output Errors

E240	A	Current OP Hardware Fault
E250	B	The current output circuit has detected an error in the current output loop; this is most

E260	C	commonly due to either a broken loop or too large a load resistor.
E270	D	
E280	E	
E290	F	
E241	A	Sensor IP<Current OP Zero
E251	B	The sensor input level is below that set for the current output zero.
E261	C	
E271	D	
E281	E	
E291	F	
E242	A	Sensor IP>Current OP Span
E252	B	The sensor input level is above that set for the current output span.
E262	C	
E272	D	
E282	E	
E292	F	
E243	A	Sensor IP<Current OP Span
E253	B	The sensor input level is below that set for the current output span.
E263	C	
E273	D	
E283	E	
E293	F	
E244	A	Sensor IP>Current OP Zero
E254	B	The sensor input level is above that set for the current output Zero.
E264	C	
E274	D	
E284	E	
E294	F	
E245	A	Store A Checksum Error
E255	B	The Store A Save for the channel associated with this current output has become
E265	C	corrupted. Check the current output's settings in the current output menu and then save
E275	D	the settings again in the Channel's Store A in the Save/Restore menu.
E285	E	
E295	F	
E246	A	Store B Checksum Error
E256	B	The Store B Save for the channel associated with this current output has become
E266	C	corrupted. Check the current output's settings in the current output menu and then save
E276	D	the settings again in the Channel's Store B in the Save/Restore menu.
E286	E	
E296	F	

Digital Input Errors

E301	DIG 1	Store A Checksum Error
E306	DIG 2	The Store A Save for the channel associated with this digital input has become

E311	DIG 3	corrupted. Check the digital input's settings in the digital input menu and then save
E316	DIG 4	the settings again in the Channel's Store A in the Save/Restore menu.
E321	DIG 5	
E326	DIG 6	
E331	DIG 7	
E336	DIG 8	
E302	DIG 1	Store B Checksum Error
E307	DIG 2	The Store B Save for the channel associated with this digital input has become
E312	DIG 3	corrupted. Check the digital input's settings in the digital input menu and then save
E317	DIG 4	the settings again in the Channel's Store B in the Save/Restore menu.
E322	DIG 5	
E327	DIG 6	
E332	DIG 7	
E337	DIG 8	
E303	DIG 1	Setup Checksum Error
E308	DIG 2	The Setup for this Digital Input has become corrupted. Check and correct the digital
E313	DIG 3	inputs settings and turn the unit off and on again. If the message persists please
E318	DIG 4	consult with your supplier.
E323	DIG 5	
E328	DIG 6	
E333	DIG 7	
E338	DIG 8	
E304	DIG 1	SD Card Checksum Error
E309	DIG 2	The SD Card store from which this Digital Input was restored from has become
E314	DIG 3	corrupted. Check the Digital Input's settings in the digital input menu and then save
E319	DIG 4	the settings again to the SD card store.
E324	DIG 5	
E329	DIG 6	
E334	DIG 7	
E339	DIG 8	

Communication Errors

E340	CH 1	Comms Failure
E342	CH 2	The Channel's Input Card is not responding. Try switching the unit off and then on

E344	CH 3	again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E341 E343 E345	CH 1 CH 2 CH 3	Comms Error The Channel's Input Card is not Operating Correctly. Try switching the unit off and then on again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E346	UNIT	Output Comms 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.
E347	UNIT	Output Comms 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.
E348	OP	Output Option Comms 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.
E349	OP	Output Option Comms 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.

Calculation Errors

E400	C1	Calculation Over Range

E411	C2	The Calculation reading is greater than the specified upper limit, check channel settings, calculation configuration, sensor condition and connections. If the message persists please consult with your supplier.
E401	C1	Calculation Under Range
E411	C2	The Calculation reading is less than the specified lower limit, check channel settings, calculation configuration, sensor condition and connections. If the message persists please consult with your supplier.
E402	C1	Calculation Setup Checksum
E412	C2	The Setup for this Calculation has become corrupted. Check and correct the calculation settings and turn the unit off and on again. If the message persists please consult with your supplier.
E403	C1	Calculation Store A Checksum
E413	C2	The Store A Save for the channel associated with this calculation has become corrupted. Check the calculation’s settings in the calculation menu and then save the settings again in the Channel's Store A in the Save/Restore menu.
E404	C1	Calculation Store B Checksum
E414	C2	The Store B Save for the channel associated with this calculation has become corrupted. Check the calculation’s settings in the calculation menu and then save the settings again in the Channel's Store B in the Save/Restore menu.
E405	C1	Calculation SD Card Checksum
E415	C2	The SD Card store from which this Calculation was restored from has become corrupted. Check the Calculation's settings in the Calculation menu and then save the settings again to the SD card store

Modbus Errors

E420	UNIT	Modbus Setup Checksum The Modbus setup 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.
E421	UNIT	Modbus Store A Checksum The Store A Save for the Modbus Configuration has become corrupted. Check the Modbus settings in the Modbus menu and then save the settings again into Store A in the Save/Restore menu
E422	UNIT	Modbus Store B Checksum The Store B Save for the Modbus Configuration has become corrupted. Check the Modbus settings in the Modbus menu and then save the settings again into Store B in the Save/Restore menu.
E423	UNIT	Modbus SD Card Checksum The SD Card store from which the Modbus configuration 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.

4.7 FAULT FINDING

NOTE: THERE ARE NO USER SERVICEABLE PARTS INSIDE THE UNIT

The 4073 has been designed to include a wide range of self-diagnostic test, 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 previously in this section gives a list that the 4073 generates, along with their probable causes. If the fault has not been cleared after these checks have been made, contact Waltron. Please have as much of the following information available as possible in any communication with Waltron, to enable quick diagnosis and correction of the problem.

- Serial number of the instrument, input and output cards.
- 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 Instrument Appears Dead

Check that power is available to the unit. Using a voltmeter, set to AC or DC, check the power supply voltage at the connector. The design of the 4073 allows the unit to accept from 85 to 250V AC or DC, an alternative option allows operation from 18 to 32V AC or DC, check the connection label for voltage specification. Check that the power cable is securely and correctly attached. There are no user serviceable fuses fitted within this unit.

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 Waltron or your local distributor should this problem arise.

The Sensor Reading Is Constantly Over-range or Under-range

- Ensure that the sensor and temperature inputs are correctly connected and that the sensor is not faulty or damaged.

- Check that the correct range, sensor type or cell constant has been entered within the Channel Setup menu; if in doubt, set to Auto Range.

- Check the temperature compensation state. 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 display reads zero

- Check for open circuit sensor (conductivity or TDS modes)

- Check for damage to the connecting cable.

- Check that all input connections are secure.

- Check the sensor is wired up correctly.

- Check the sensor is immersed in the correct solution.

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.

The 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 molding.

- 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 values have 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 Temperature Reading Is Incorrect

- Check that the temperature sensor is correctly attached.

- Check that the temperature sensor type is correctly selected in the Channel Setup menu

- Where practical check the temperature sensor resistance against the table in Temperature Data.

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 unit is “On-Line”
- Check that the set point configuration is correct (see Setpoints, Current Outputs and Digital Input configuration guide)
- If the relays are vibrating or “chattering” as they pass the set point, check the hysteresis setting and increase if necessary.
- Ensure that the relays are connected properly (see 4073 Installation guide) and that the voltage/current levels are not exceeding 5A @ 30V DC or 5A @ 250V AC.
- Check that the instrument input cables are not picking up excessive noise.

5 ELECTRODELESS CONDUCTIVITY SETUP AND OPERATING GUIDE

5.1 ELECTRODELESS CONDUCTIVITY INPUT CARD SPECIFICATION

Measurement Input:	ECS20 or ECS40 Series electrodeless conductivity sensor.
Connection Cable:	Up to 100 meters.
Ranges of Measurement:	0-999.9µS/cm, 0-9.999mS/cm, 0-99.99ms/cm, 0-999.9mS/cm 0-999.9 ppm, 0-9999 ppm, 0-99.99 ppt (parts per thousand). 0 to 16.00% NaOH – Sodium Hydroxide 0 to 30.00% NaCl – Sodium Chloride 0 to 15.00% HCl – Hydrochloric Acid 0 to 25.00% H2SO4 – Sulphuric Acid 0 to 25.00% H3PO4 – Phosphoric Acid 0 to 25.00% HNO3 – Nitric Acid 0 to 41.00 ppt Salinity Custom Range - Defined by a user entered 2 to 9 point curve. (Two independent curves per channel). User defined scale: 0 to 999.9, 0 to 99.99, 0 to 999.9, and 0 to 9999. User defined units up to 5 characters.
Range Selection:	Internal single or auto range, or external range selection via digital inputs.
Cell Constant Adjustment:	Fully adjustable from 00.00 to 10.00
Conductivity Accuracy:	± 1% of range.
Linearity:	±0.1% of Range
Repeatability:	±0.1% of Range
Operator Adjustment (Conductivity):	Conductivity ± 10% slope. Solution ±20% offset.

Temperature Sensor:	Pt1000 RTD input. Up to 100 meters of cable. Temperature sensor can be mounted in the sensor or separately.
Range of Temperature Measurement:	-50 °C to +160 °C (-58 °F to +320 °F) for full specification.
Temperature Accuracy:	± 0.2 °C (When using a 3 wire PT1000).
Operator Adjustment (Temperature):	± 50 °C, ± 122 °F or ± 50 K
Range of Temperature Compensation:	-10 °C to +150 °C (+14 °F to +302 °F) for full specification.
Temperature Compensation Type:	Variable slope 0 - 3.9 %/°C over -10 to +150 °C. Selectable In or Out.
Temperature Compensation Base:	Selectable at 20 °C or 25 °C.

5.2 INSTALLATION AND CHOICE OF ELECTRODELESS CONDUCTIVITY SENSORS

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

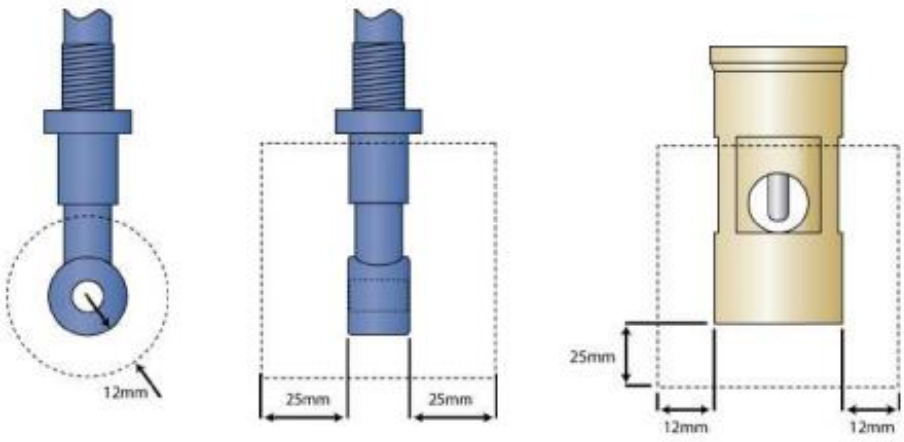
The electrodeless method of measuring conductivity has many advantages over conventional methods in particular the sensors will operate with virtually zero maintenance and provide reliable measurements over extended periods of time.

Waltron provides a selection of electrodeless sensors in a variety of materials including PEEKTM a food grade material with excellent chemical resistance and high temperature performance. Contact Waltron 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 cavitation 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.

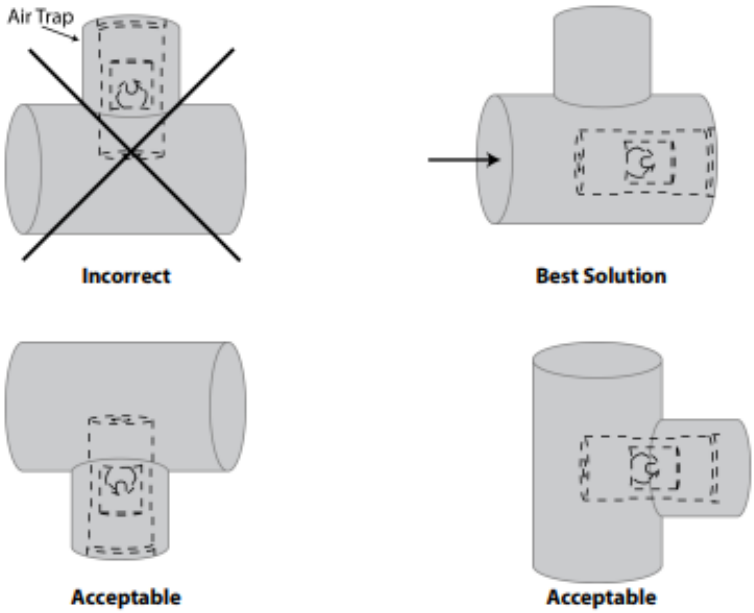
The electrodeless sensor will need a minimum clearance around it when installed or making measurements in a sample. Do not rest it on the bottom of a tank or vessel. See the following figures for details.



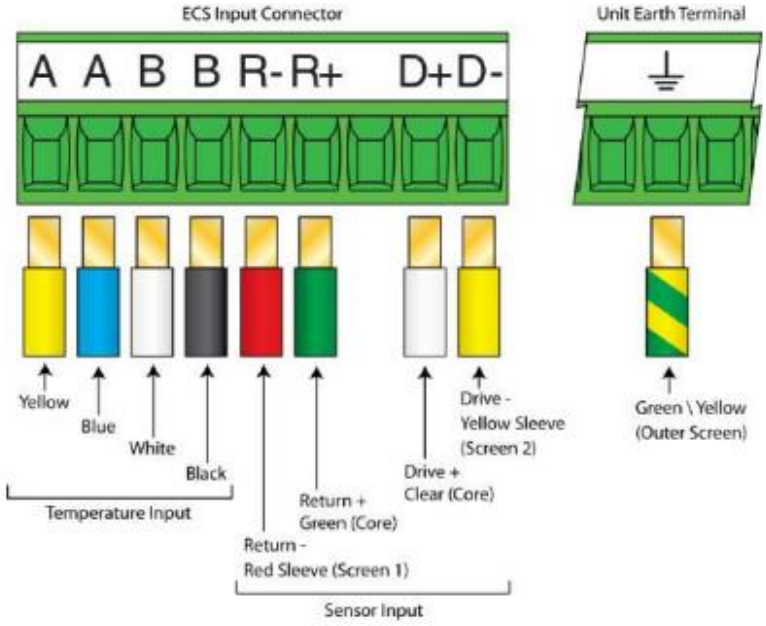
ECS20 SERIES SENSORS **ECS40 SERIES SENSORS**

Sensor Installation Clearance

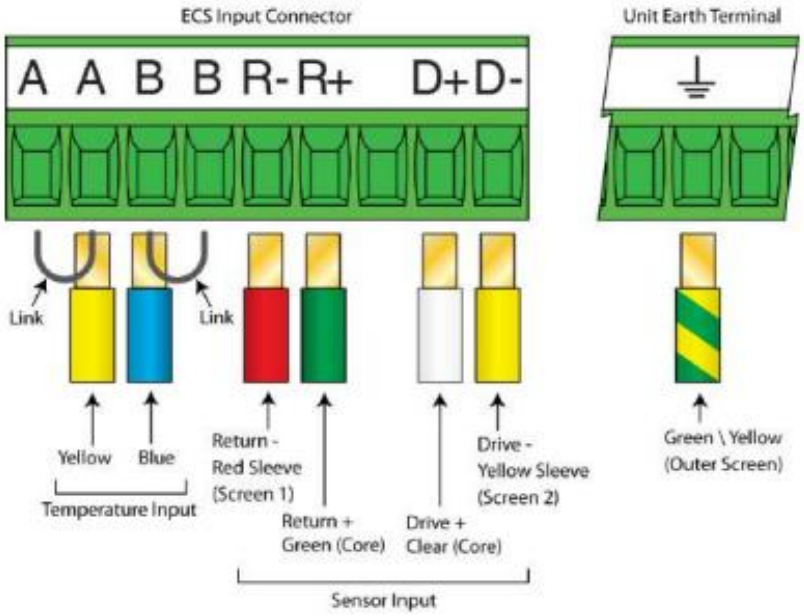
Care should also be taken to ensure to position of the sensor within the flow is correct.



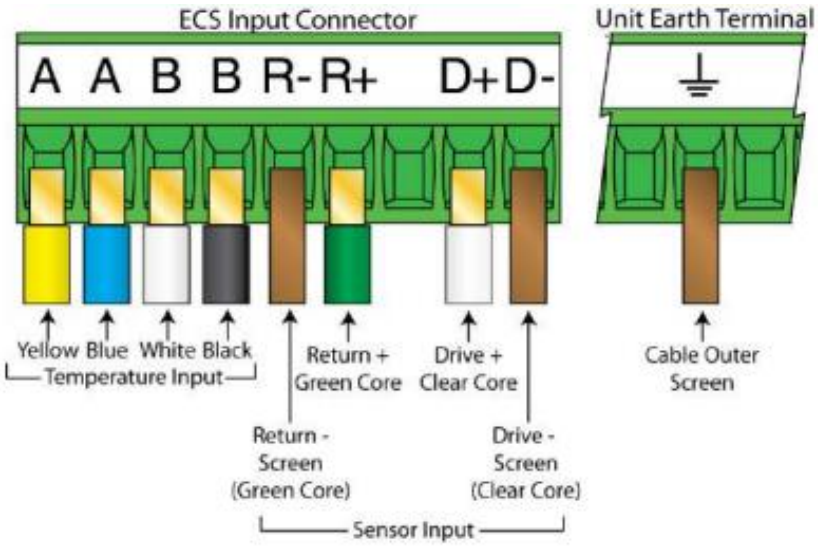
5.2.1 4073 PANEL MOUNT TERMINATION INFORMATION



Electrodeless Conductivity 54E Cable Connection Details

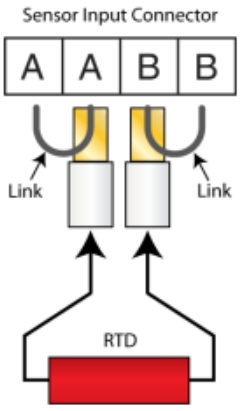


Electrodeless Conductivity 54H Cable Connection Details

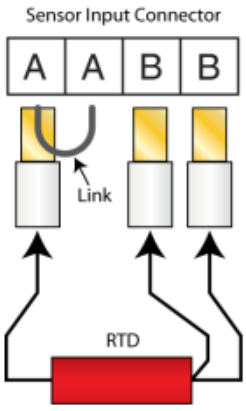


Electrodeless Conductivity 54E Extension Cable Connection Details

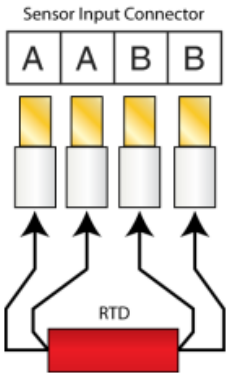
5.2.2 TEMPERATURE SENSOR CONNECTIONS



2 Wire RTD Temperature Connection



3 Wire RTD Temperature Connection



4 Wire RTD Temperature Connection

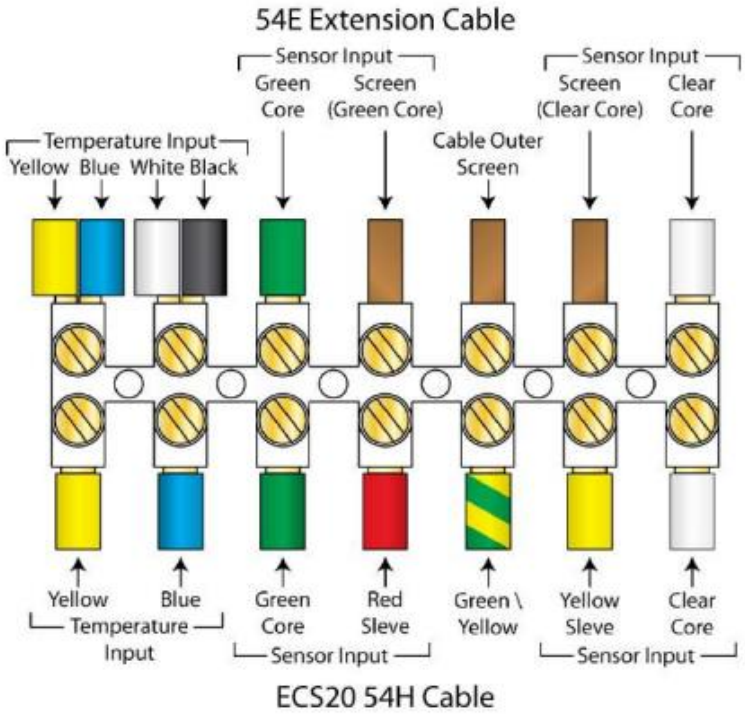
5.2.3 EXTENSION CABLE ARRANGEMENT

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.

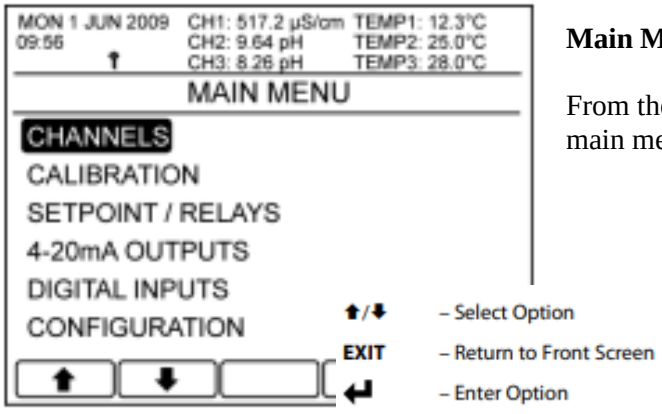


ECS20 54H Cable To 54E Extension Cable Connection Details

5.3 ELECTRODELESS CONDUCTIVITY INPUT CHANNEL SETUP

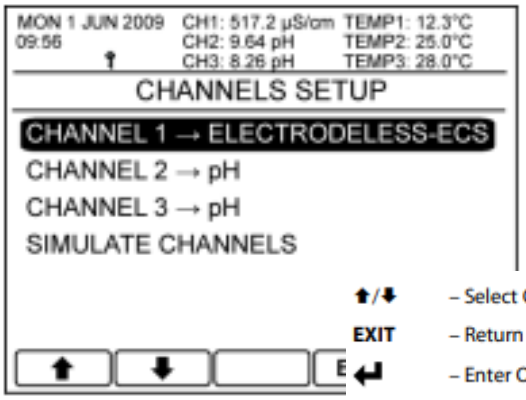
The Channels Setup menu contains the basic configurations for the sensor's input.

The default security access code is **1000.**



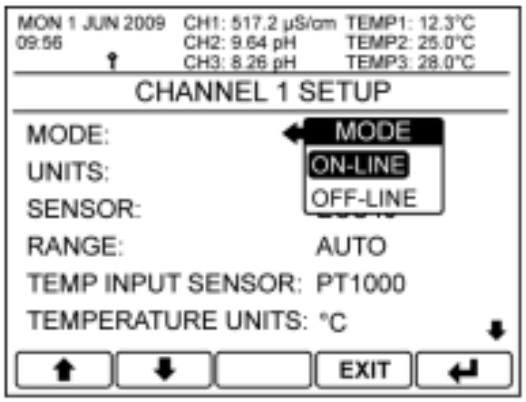
Main Menu

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



Select Channel

Select the electrodeless conductivity input channel you wish to edit.



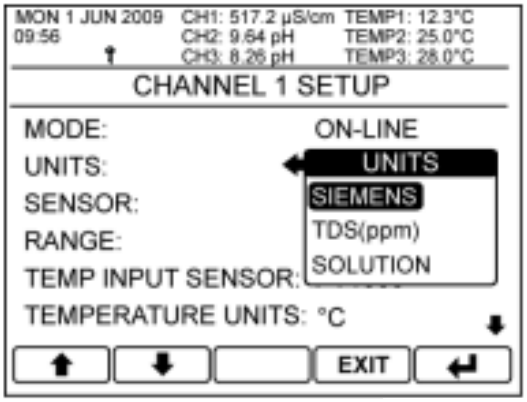
Mode

Selecting off-line causes any setpoints associated with this channel to de-energize. 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

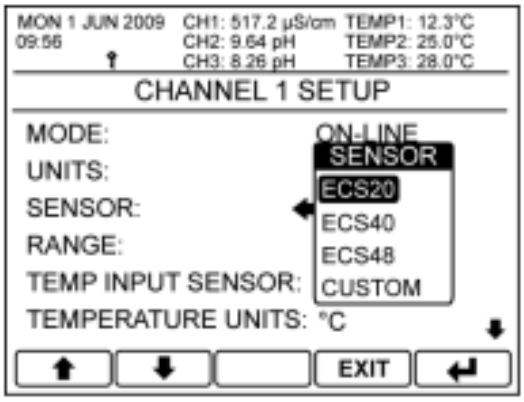


Units

The channel can be setup to display conductivity in Siemens/cm, TDS (Total Dissolved Solids) in ppm, or Solution.

When solution is selected the channel will automatically apply the correct conversion and temperature conversion and display the concentration as “%” with an indication of the solution type selected (see range selection).

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

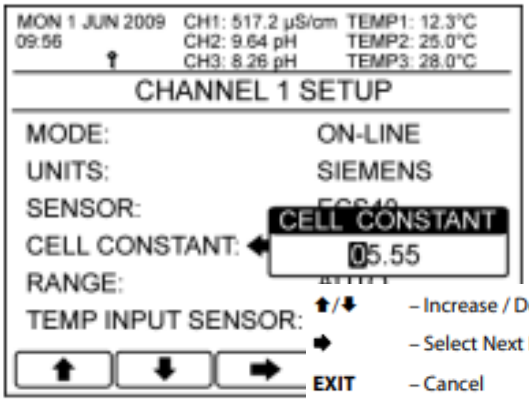


Sensor Type

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 instrument or the sensor cable is changed.

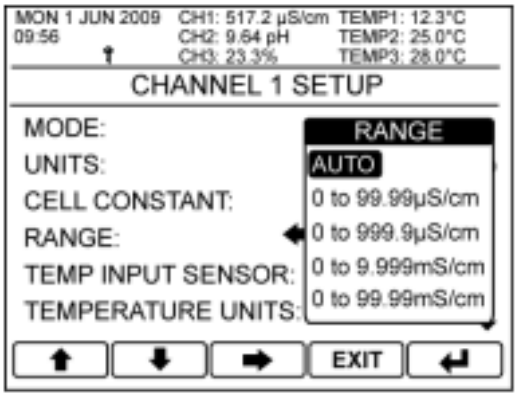
↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection



↑/↓ – Increase / Decrease Digit
→ – Select Next Digit
EXIT – Cancel
↵ – Save Value

Cell Constant

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



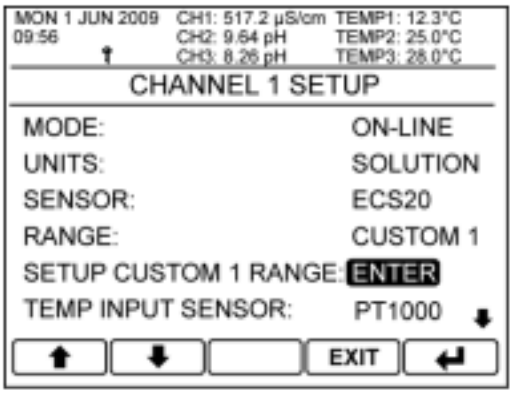
Range

Select the desired operating range for the input or select auto to let the instrument select the appropriate operating range.

If units have been set to solution then the user can select what concentration to display or alternatively if one of the two custom ranges is selected then the user can then use a custom range as defined in the custom range menu (see setup custom range menu in this section for more information).

If a "Cannot Edit Digital Input Has Control" message appears, then an associated digital input is currently defining the operating range.

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

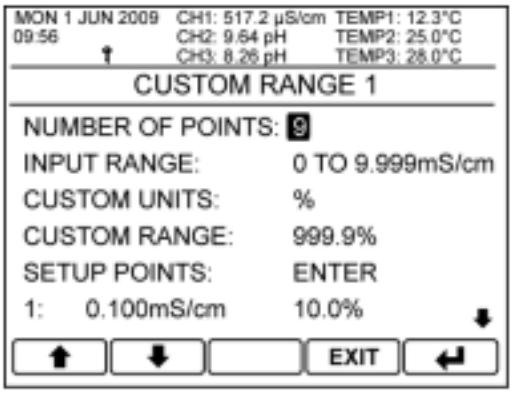


Setup Custom Solution Range

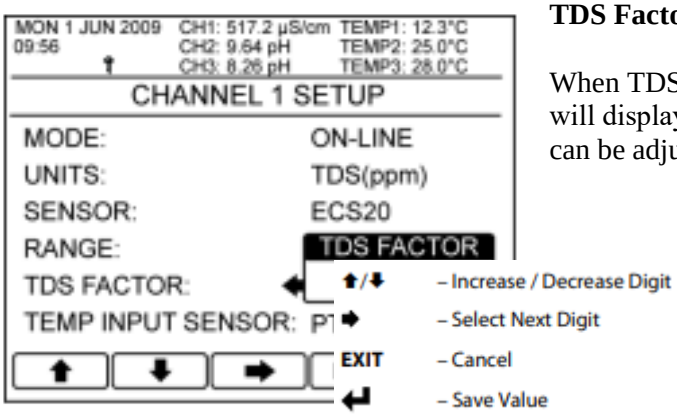
The electrodeless conductivity input provides the user with the facility to enter two different customized conversions from conductivity to a user defined concentration, for solutions not specifically defined in the standard ranges.

To use this first set the units to "Solution", then the range to one of the two custom ranges. The "Setup Custom X Range" menu will appear, select this and press enter.

The new screen provides the following options:

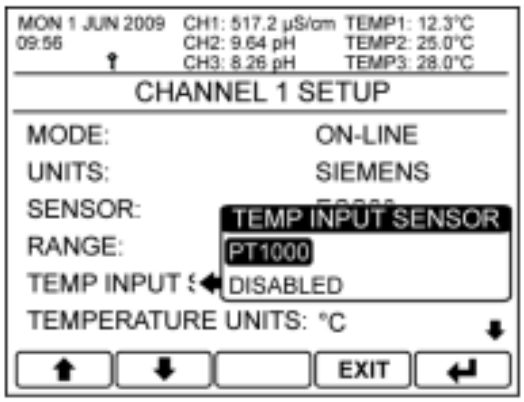


- Number of points – Define the number of data entry points which make up the custom curve (not including the zero point as the unit will always assume that the concentration zero is equal to the conductivity zero).
- Input Range – The conductivity range over which the custom curve will operate.
- Custom Units –Enter the units the conversion will use (5 Characters maximum).
- Custom Range –Enter the range over which the converted reading will operate.
- Setup Points – Automatically define the data points one after another. It is recommended that the points are added in ascending order of conductivity.
- Data Points – Alternatively the user can edit a single point by selecting it in the menu.



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.



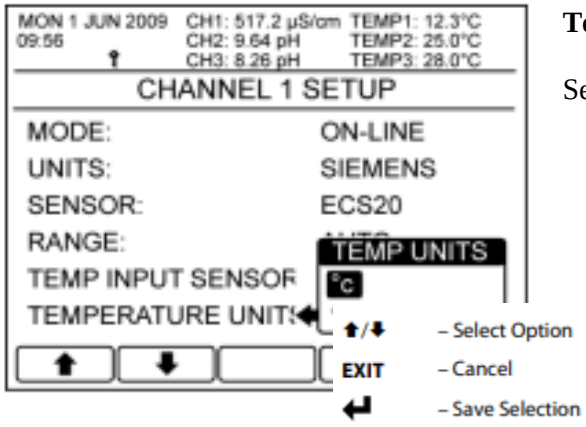
Temperature Input Sensor

Select the input channel’s temperature sensor type for use with the sensor measurement’s automatic temperature compensation.

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

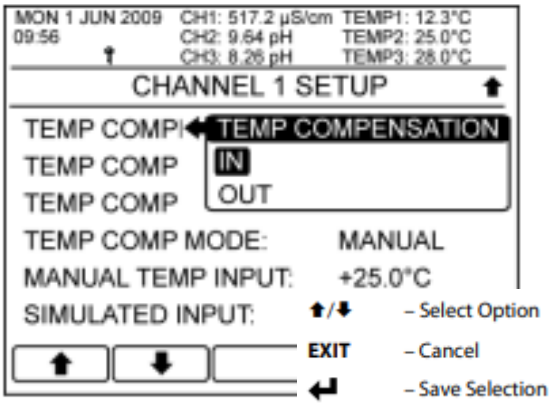
Note. Even when disabled is set a manual temperature compensation can be used.

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection



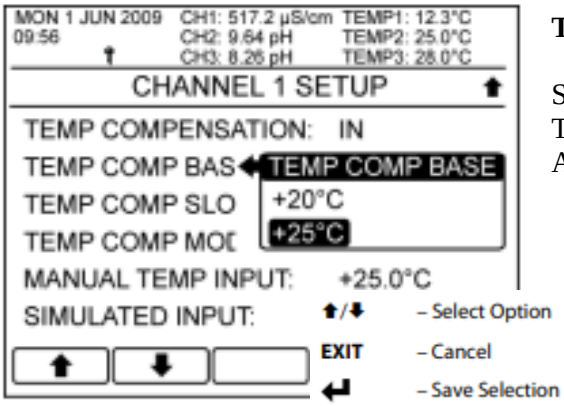
Temperature Units

Sets the temperature units used.



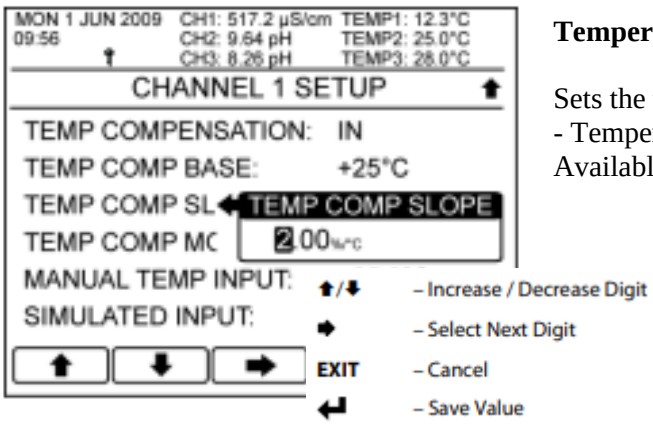
Temperature Compensation

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



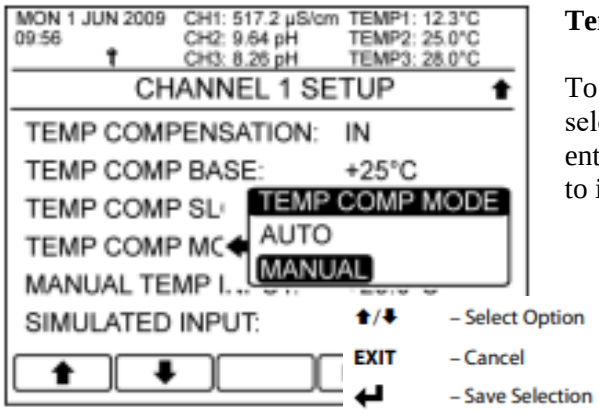
Temperature Compensation Base

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



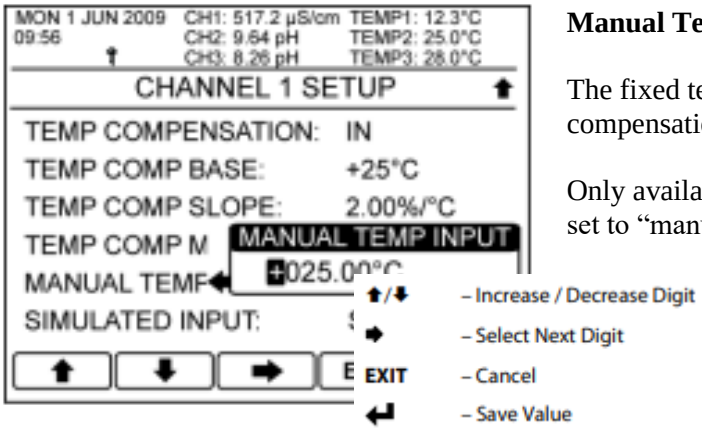
Temperature Compensation Slope

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



Temperature Compensation Mode

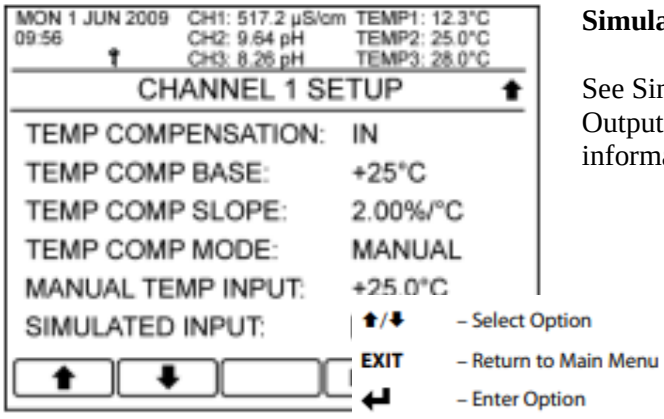
To use temperature compensation from a measured input select “Auto”, else select “Manual” to enable a fixed value entry. Only Available if Temperature Compensation is set to in.



Manual Temperature Input

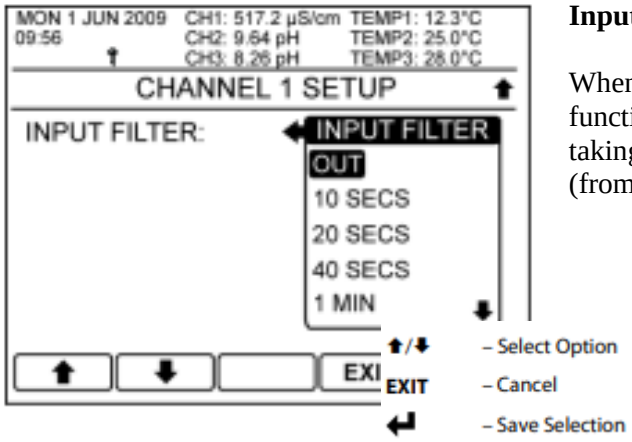
The fixed temperature value used for manual temperature compensation.

Only available when temperature compensation mode is set to “manual”.



Simulated Input

See Simulated Channels section of the Setpoints, Current Outputs, Digital Inputs Configuration Guide for more information.



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).

5.4 CALIBRATION

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

Four 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.
- Current output adjustment.

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. Waltron 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 CO2.

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. Ready-made solutions are available from Waltron with traceable certification if required.

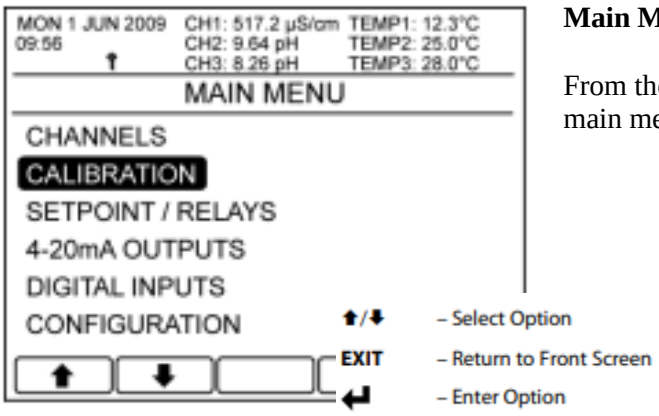
Standard solutions will be supplied with a conductivity value quoted at a reference temperature. This temperature is the base temperature and the calibration should be performed at that temperature, with the temperature compensation switched out. Alternatively, the temperature compensation should be 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 B - Temperature Coefficient.

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.

5.4.1 CALIBRATION MENU

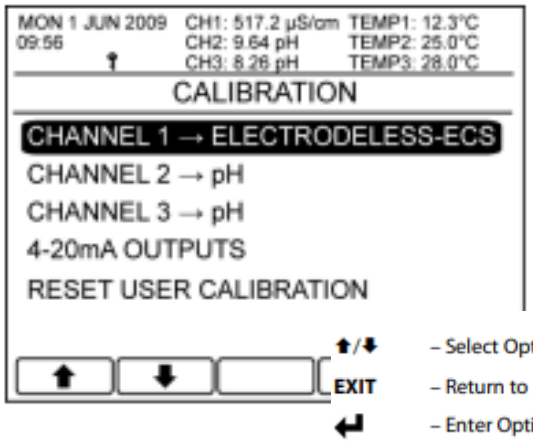
The calibration menu provides the facility to adjust the sensor inputs to the system in which it is operating.

The default security access code is **1000.**



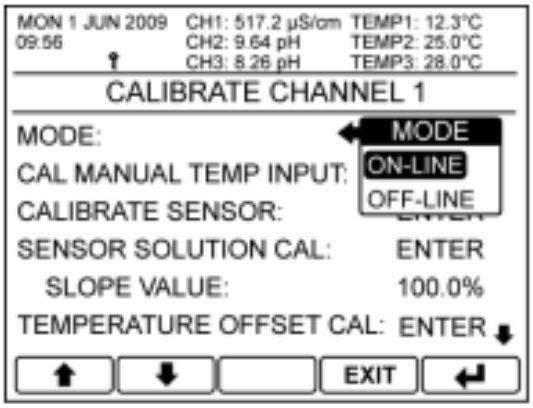
Main Menu

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



Select Channel

Select the electrodeless conductivity input channel you wish to edit.

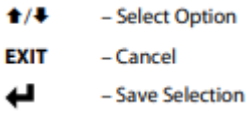


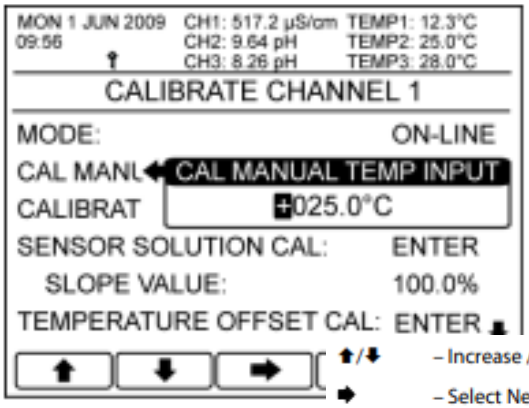
Mode

Selecting off-line causes any setpoints associated with this channel to de-energize. 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.

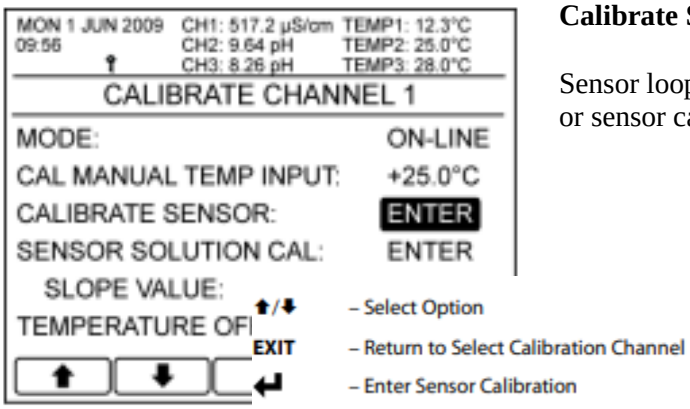




Calibration Manual Temperature Input

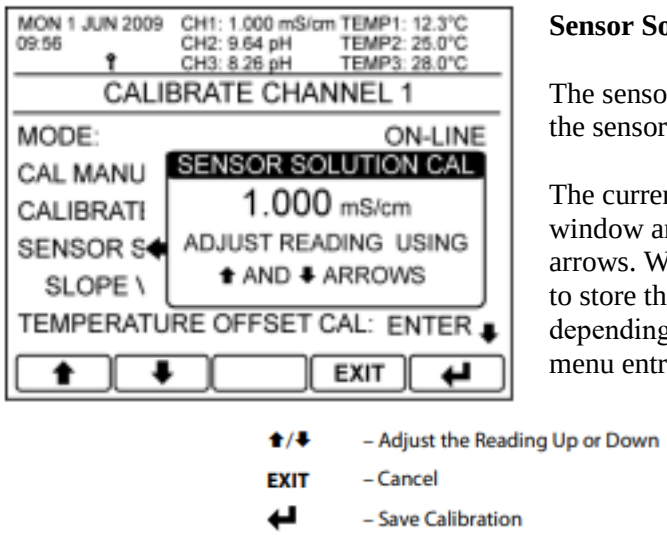
This setting allows a different fixed temperature value to be used when calibrating; makes it easier to calibrate a standard solution at a different temperature to the process.

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



Calibrate Sensor

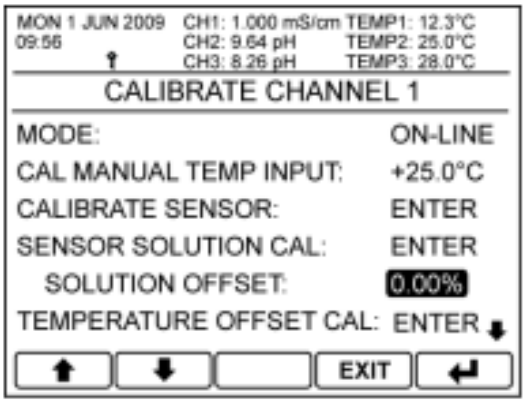
Sensor loop calibration. Must be carried out when a sensor or sensor cable is changed.



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 or offset, depending on the channel's units, are shown in the next menu entry.



Sensor Slope or Offset Value

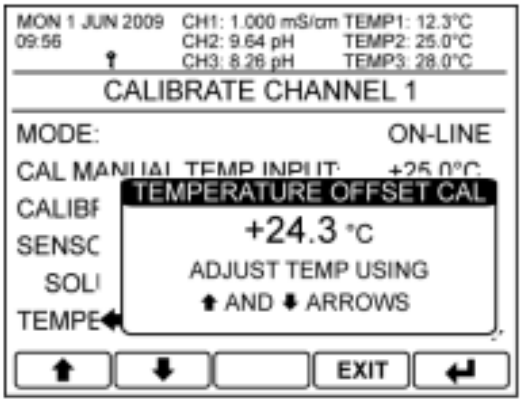
Depending on the channel's units, the sensor slope or offset value currently being used. The value will change depending on the result of the sensor solution calibration.

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

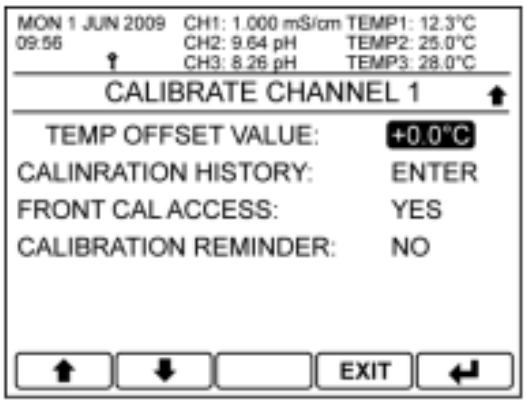
The temperature offset calibration enables the user to adjust the temperature reading to match a known input.

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.

ading Up or Down

EXIT – Cancel

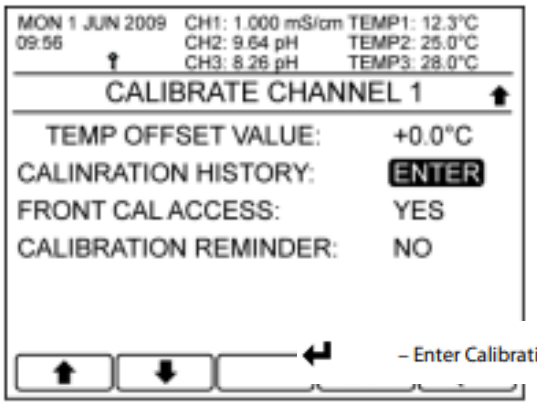
↵ – Save Calibration



Temperature Offset Value

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

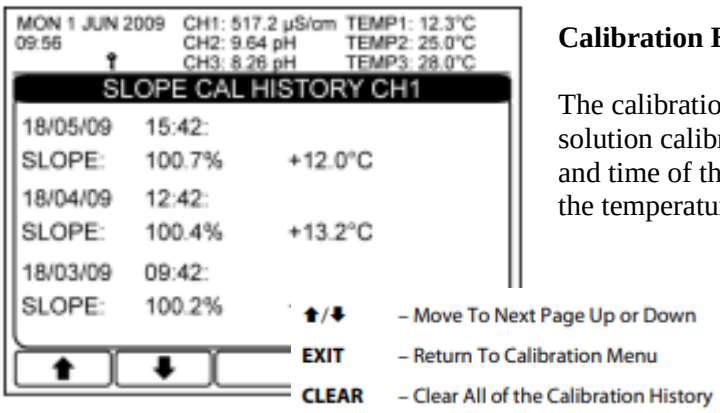
Cannot be edited.



Enter Calibration History

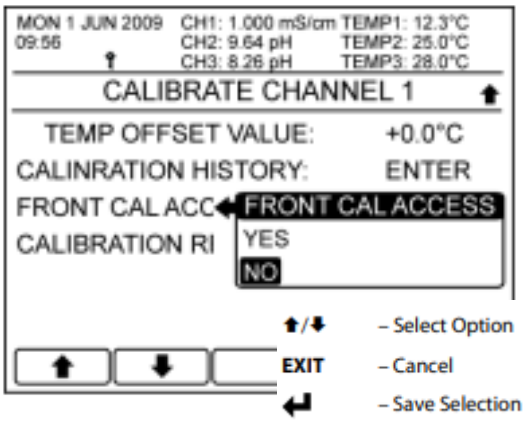
The 4073 has a calibration history feature which allows the user to review the record of sensor solution calibrations. To enter the calibration history menu press enter.

↵ – Enter Calibration History



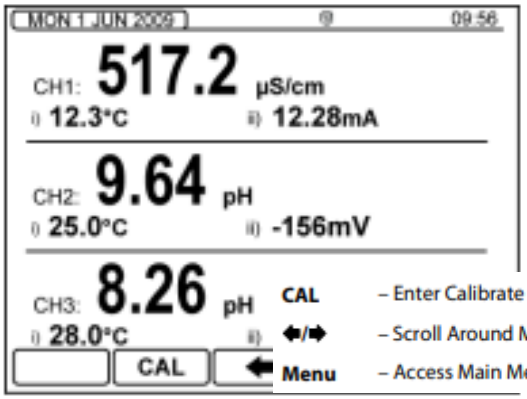
Calibration History

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.



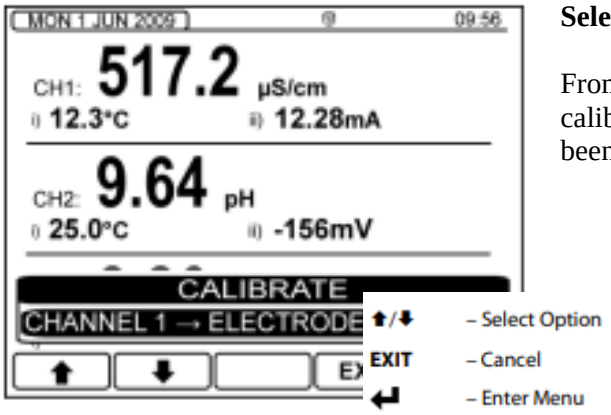
Front Screen Calibration Access Enable

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.



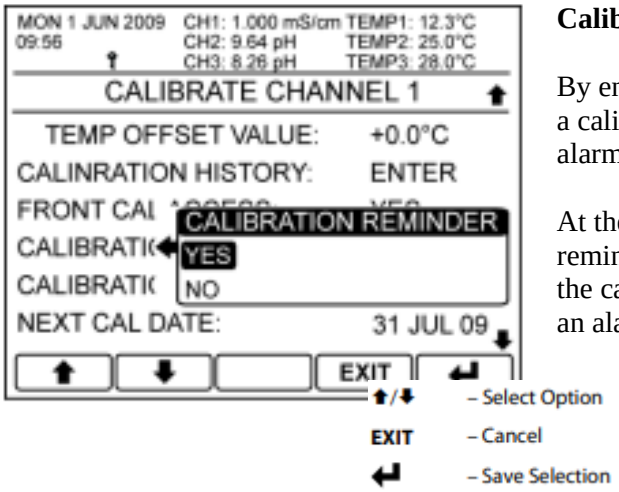
Front Screen Calibration Access

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



Select Channel to Calibrate

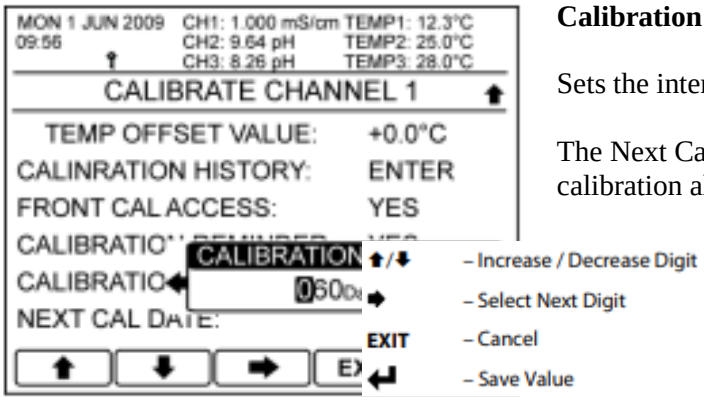
From the pop-up select the channel the user wishes to calibrate. Only channels whose front calibration access has been enabled will appear.



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.

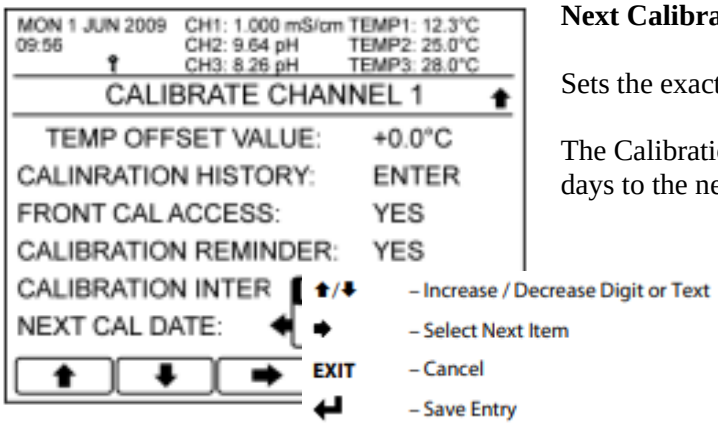
At the end a sensor solution calibration, if calibration reminder is enabled, the user will be prompted to update the cal due date by the calibration interval and so clearing an alarm if active.



Calibration Interval

Sets the interval time for the calibration alarm.

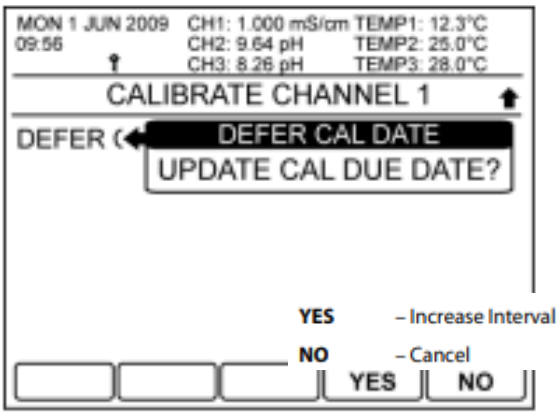
The Next Cal Date will update to show the date of the next calibration alarm.



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.



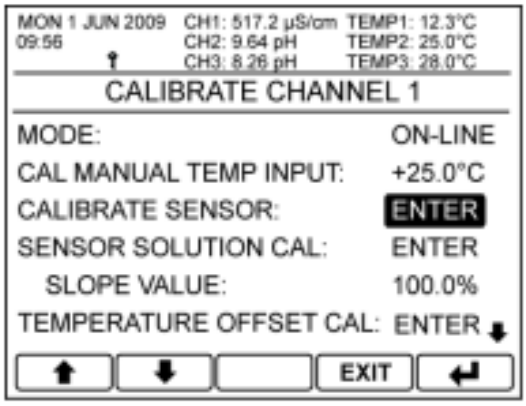
Defer Calibration Date

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

Only appears once the calibration interval has expired.

5.4.2 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 four loop resistors (Black, Glue, Green, Pink) supplied with the input card must be used, once completed do not discard the resistors as they will be required for future calibration and checks. The resistors must be removed prior to installing the sensor into a pipe or tank.

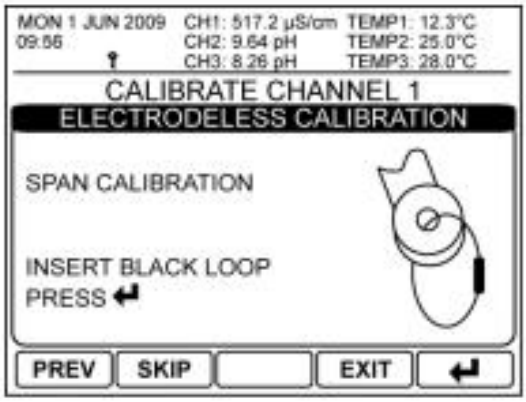


ibration Channel

ition

Calibrate Sensor

To start the sensor loop calibration select the “Calibrate Sensor” item from the desired channel’s calibration menu.

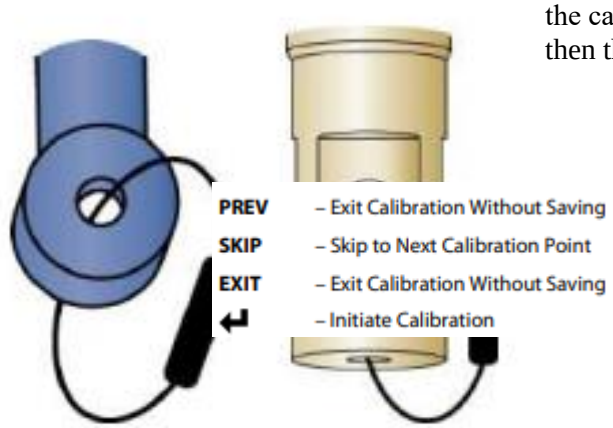


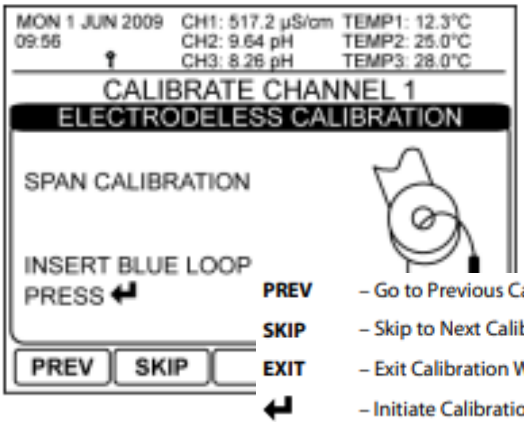
Insert Black Loop

Attach the Black (5000Ω) 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.

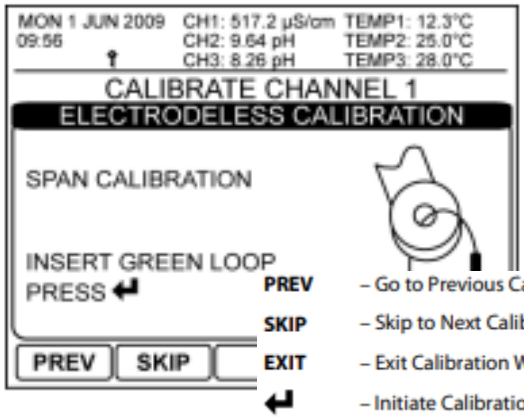
If the fail message appears then there has been a calibration problem check the loop resistor, the sensor and the cable. If all appears correct press the “prev” button then the enter button to restart the calibration.





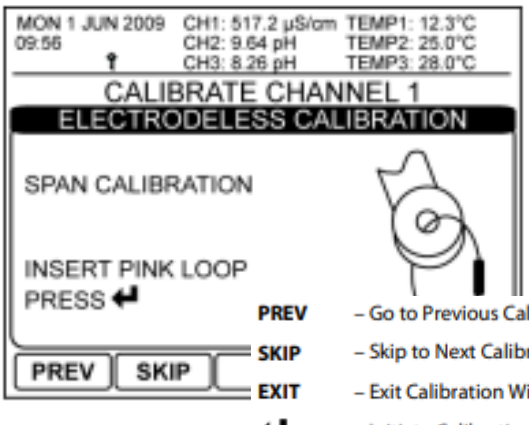
Insert Blue Loop

Remove the previous loop resistor and attach the Blue (500 Ω) loop resistor to the sensor as shown previously, then press the enter button.



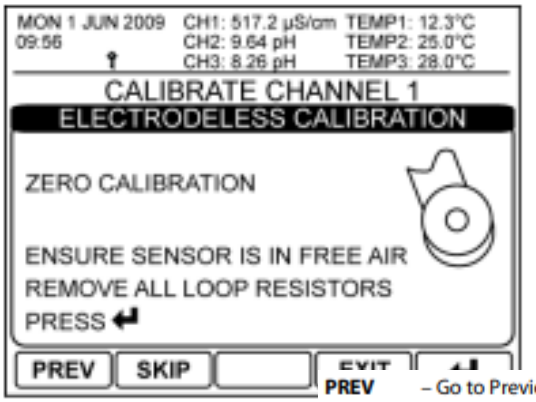
Insert Green Loop

Remove the previous loop resistor and attach the Green (50 Ω) loop resistor to the sensor as shown previously, then press the enter button.



Insert Pink Loop

Remove the previous loop resistor and attach the Pink (5 Ω) loop resistor to the sensor as shown previously, then press the enter button.



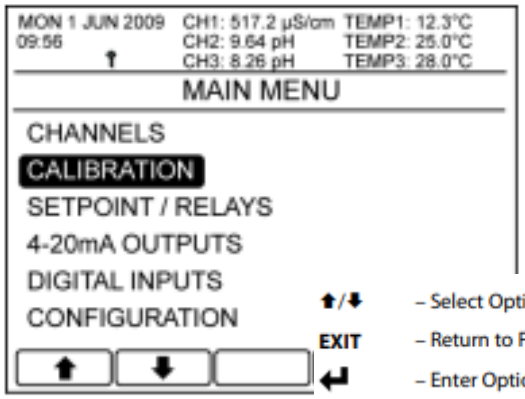
Zero Calibration

Remove the previous 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.

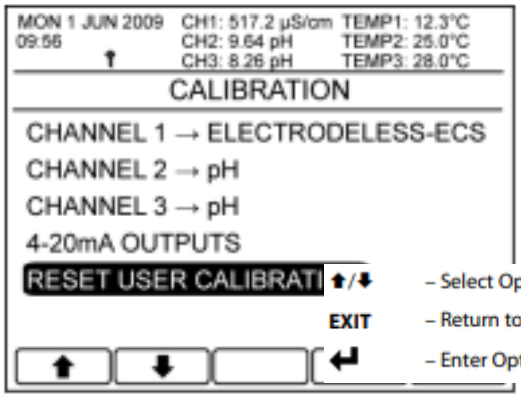
5.4.3 RESETTING THE USER CALIBRATION

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



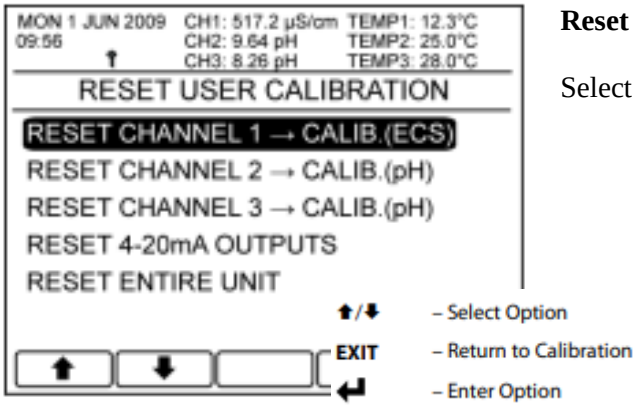
Main Menu

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



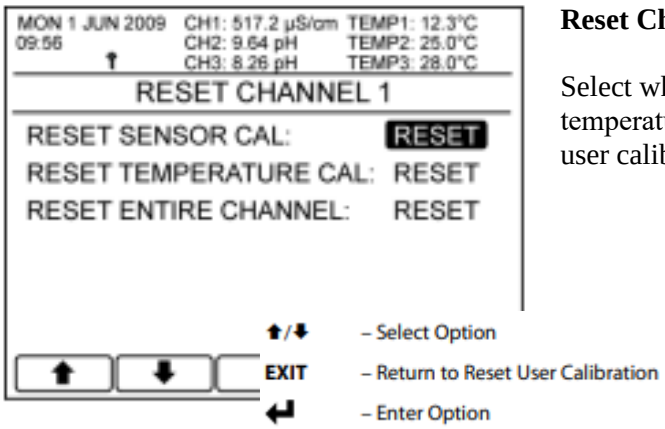
Calibration

Select Reset User Calibration.



Reset User Calibration

Select the required conductivity input channel.



Reset Channel User Calibration

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

5.5 APPENDIX A – SOULTION CONVERSION

The following table provides some of the data points which have been used in the instrument to make the conversion between conductivity and solution concentration.

Temperature Compensated Conductivity (mS/cm @ 25°C)							
% wt / vol	NaOH	NaCl	HCl	H_2SO_4	H_3PO_4	HNO_3	Salinity
1	53.2	17.6	103.0	48.5	11.25	60.0	20.0
5	223.0	78.3	432.0	237.0	32.9	275.0	90.0
10	358.0	140.0	709.0	427.0	61.1	498.0	170.0
20	414.0	226.0	----------	709.0	117.0	763.0	320.0

Note: Salinity range is displayed by the instrument in parts per thousand concentration (p.p.t.), which is the concentration in % shown above, multiplied by 100.

Temperature Compensation Slope (% / °C)							
% / °C	NaOH	NaCl	HCl	H_2SO_4	H_3PO_4	HNO_3	Salinity
----------	1.79	1.90	1.27	1.03	0.86	1.19	1.92

5.6 APPENDIX B – TEMPERATURE COEFFICIENT

Calculating the Temperature Coefficient of a Solution

If the temperature coefficient of the solution being monitored is not known, the instrument can be used to determine that coefficient. You should set the channel to a suitable range and the 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 stabilize, 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:

$$\alpha = \frac{(Gx-Gy) \times 100\%}{Gy(Tx-25) - Gx(Ty-25)}$$ (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.

5.6.1 TEMPERATURE DATA

The table below lists approximate resistance values of temperature sensors that may be used with the 4073. Not all options are available on all models.

Temperature (°C)	PT1000 RTD	PT100 RTD	1K Therm-istor	3K Balco
0	1000.0Ω	100.00Ω	2691Ω	2663Ω
10	1039.0Ω	103.90Ω	1779Ω	2798Ω
20	1077.9Ω	107.79Ω	1204Ω	2933Ω
25	1097.3Ω	109.73Ω	1000Ω	3000Ω
30	1116.7Ω	111.67Ω	833.7Ω	3068Ω
40	1155.4Ω	115.54Ω	589.0Ω	3203Ω
50	1194.0Ω	119.40Ω	423.9Ω	3338Ω
60	1232.4Ω	123.24Ω	310.5Ω	3473Ω
70	1270.7Ω	127.07Ω	231.0Ω	3608Ω
80	1308.9Ω	130.89Ω	174.5Ω	3743Ω
90	1347.0Ω	134.70Ω	133.6Ω	3878Ω
100	1385.0Ω	138.50Ω	103.6Ω	4013Ω

5.7 APPENDIX D – 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	For Future Use
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.
E016	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 SD card

Input Channel Errors

E030 E080 E130	CH 1 CH 2 CH 3	Input Card Checksum Error Try switching the unit off and then on again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E031 E081 E131	CH 1 CH 2 CH 3	Setup Checksum Error The current channel's configuration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists reset the current channel from the Reset Unit Settings option in the Save/Restore menu or consult with your supplier, as the channel's input card may require to be returned for repair.
E032 E082 E132	CH 1 CH 2 CH 3	Store A Checksum Error The data in the channel's Store A has become corrupted. Check the channel's current setup. Then save the setup back to channel's Store A in the Save/Restore menu.
E033 E083 E133	CH 1 CH 2 CH 3	Store B Checksum Error The data in the channel's Store B has become corrupted. Check the channel's current setup. Then save the setup back to channel's Store B in the Save/Restore menu.
E034 E084 E134	CH 1 CH 2 CH 3	Factory Cal Checksum Error Try switching the unit off and then on again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E035 E085 E135	CH 1 CH 2 CH 3	User Cal Checksum Error The Channel's User Cal has for some reason become corrupted. Try switching the unit off and then on again. If the message persists Reset the Channel from the Reset User Calibration option in the Calibration menu or consult with your supplier, as the channel's input card may require to be returned for repair.
E036 E086 E136	CH 1 CH 2 CH 3	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.
E037 E087 E137	CH 1 CH 2 CH 3	Sensor Zero Cal Out Of Spec The last Sensor Zero Calibration was out of specification, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.

E038 E088 E138	CH 1 CH 2 CH 3	Sensor Span Cal Out Of Spec The last Sensor Span Calibration was out of specification, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E039 E089 E139	CH 1 CH 2 CH 3	No Signal No Sensor connected or there is 'zero' detector current. The probe sensor units (PSU) will be set to 16000 or 32000 if turbidity. If this message persists, please consult with your supplier.
E040 E090 E140	CH 1 CH 2 CH 3	Signal Overload The gain step is equal to 0 and the A/D output is over 255. This cannot happen in a liquid but could happen if the sensor is in full sunlight. The probe sensor units (PSU) will be set to 16000 or 32000 if turbidity. If this message persists, please consult with your supplier.
E041 E091 E141	CH 1 CH 2 CH 3	Partial Depletion Large difference between the detectors, i.e. one very dirty. This alarm will come up if there is a difference of 3:1 between the detectors. Remove sensor and clean sensor fingers. The probe sensor units (PSU) will be set to 16000 or 32000 if turbidity. If this message persists, please consult with your supplier.
E042 E092 E142	CH 1 CH 2 CH 3	Full Depletion Attenuation too high or the real probe signal goes above 14000. The probe sensor units (PSU) will be set to 16000. If this message persists, please consult with your supplier.
E043 E093 E143	CH 1 CH 2 CH 3	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.
E034 E094 E144	CH 1 CH 2 CH 3	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.
E035 E095 E145	CH 1 CH 2 CH 3	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.

E046 E096 E146	CH 1 CH 2 CH 3	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.
E047 E097 E147	CH 1 CH 2 CH 3	Sensor Open Circuit The sensor input is at open circuit, check sensor condition and connections. If the message persists please consult with your supplier.
E048 E098 E148	CH 1 CH 2 CH 3	Sensor Short Circuit The sensor input is at short circuit, check sensor condition and connections. If the message persists please consult with your supplier.
E049 E099 E149	CH 1 CH 2 CH 3	Sensor Positive Saturation The sensor input is greater than the maximum measurable input level, Check Sensor condition and connections. If the message persists please consult with your supplier
E050 E100 E150	CH 1 CH 2 CH 3	Sensor Negative Saturation The sensor input is less than the minimum measurable input level, Check Sensor condition and connections. If the message persists please consult with your supplier
E051 E101 E151	CH 1 CH 2 CH 3	Sensor Input Over Range The 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.
E052 E102 E152	CH 1 CH 2 CH 3	Sensor Input Under Range The sensor reading is less than the specified limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.
E053 E103 E153	CH 1 CH 2 CH 3	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.

E054 E104 E154	CH 1 CH 2 CH 3	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.
E055 E105 E155	CH 1 CH 2 CH 3	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.
E056 E106 E156	CH 1 CH 2 CH 3	Temp Comp Outside Limits The temperature reading is less than 0.0C or greater than 150.0C, leading to an error in compensation.
E057 E107 E157	CH 1 CH 2 CH 3	Polar Zero Cal At Limit The last Polargraphic Zero Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E058 E108 E158	CH 1 CH 2 CH 3	Polar Span Cal At Limit The last Polargraphic Span Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E059 E109 E159	CH 1 CH 2 CH 3	Galvanic Zero Cal At Limit The last Galvanic Zero Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E060 E110 E162	CH 1 CH 2 CH 3	Galvanic Span Cal At Limit The last Galvanic Span Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E061 E111 E161	CH 1 CH 2 CH 3	Pressure Sensor Over Range The pressure sensor reading is greater than the specified limit for the probe.

E062 E112 E162	CH 1 CH 2 CH 3	Pressure Sensor Under Range The pressure sensor reading is less than the specified limit for the probe.
E063 E113 E163	CH 1 CH 2 CH 3	Pressure Above 20mA The pressure sensor input is greater than 20mA, check sensor condition and connections. If the message persists please consult with your supplier.
E064 E114 E164	CH 1 CH 2 CH 3	Pressure Below 4mA The pressure sensor input is less than 4mA, check sensor condition and connections. If the message persists please consult with your supplier.
E065 E115 E165	CH 1 CH 2 CH 3	AUX mA Input Above 20mA The sensor input is greater than 20mA, check sensor condition and connections. If \ the message persists please consult with your supplier.
E066 E116 E166	CH 1 CH 2 CH 3	AUX mA Input Below 4mA The sensor input is less than 4mA, check sensor condition and connections. If the message persists please consult with your supplier.
E067 E117 E167	CH 1 CH 2 CH 3	Sensor 0mV Cal Out of Spec The pH 0mV calibration for this channel is outside recommended specifications.
E068 E118 E168	CH 1 CH 2 CH 3	Calibration Due The time since the last calibration was performed on this channel has exceeded the time set in the calibration menu.
E069 E119 E169	CH 1 CH 2 CH 3	Planned Service Due The Planned Service interval for this unit has expired. Please contact Waltron.

E070 E120 E170	CH 1 CH 2 CH 3	SD Card Checksum Error 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.
E071 E121 E171	CH 1 CH 2 CH 3	Gain Error The sensor gain has been exceeded. If this message persists, please consult with your supplier.
E072 E122 E172	CH 1 CH 2 CH 3	Invalid Linearization Curve A minimum of 2 linearization points are required. Please check linearization curve settings in the channel setup menu for this channel.
E073 E123 E173	CH 1 CH 2 CH 3	Linearization Over-Range The linearization result is greater than 9999 (or 100.0% when using %).
E074 E124 E174	CH 1 CH 2 CH 3	Linearization Under-Range The linearization result is less than 0.
E075 E125 E175	CH 1 CH 2 CH 3	Curve Low Limit The incoming probe signal is less than the lowest point in the linearization curve.
E076 E126 E176	CH 1 CH 2 CH 3	Curve High Limit The incoming probe signal is greater than the highest point in the linearization curve.
E077 E127 E177	CH 1 CH 2 CH 3	Custom Error Contact your supplier for details.

Setpoint Errors

E180	SP1	Dose Alarm Error
E190	SP2	The Setpoint has been dosing for longer than the Dose Alarm time as defined in the
E200	SP3	setpoint menu.
E210	SP4	
E220	SP5	
E230	SP6	

E181 to E184	SP1	For Future Use
E191 to E194	SP2	
E201 to E204	SP3	
E211 to E224	SP4	
E221 to E224	SP5	
E231 to E234	SP6	

E185	SP1	Store A Checksum Error
E195	SP2	The Store A Save for the Channel associated with this Setpoint has become corrupted.
E205	SP3	Check the setpoint's settings in the setpoint menu and then save the settings again in
E215	SP4	the Channel's Store A in the Save/Restore menu.
E225	SP5	
E235	SP6	

E188	SP1	SD Card Checksum Error
E198	SP2	The SD Card store from which this Setpoint was restored has become corrupted. Check
E208	SP3	the setpoint's settings in the setpoint menu and then save the settings again to the SD
E218	SP4	card store.
E228	SP5	
E238	SP6	

E186	SP1	Store B Checksum Error
E196	SP2	The Store B Save for the Channel associated with this Setpoint has become corrupted.
E206	SP3	Check the setpoint's settings in the setpoint menu and then save the settings again in
E216	SP4	the Channel's Store B in the Save/Restore menu.
E226	SP5	
E236	SP6	

E187	SP1	Setup Checksum Error
E197	SP2	The Setup for this Setpoint has become corrupted. Check and correct the setpoint
E207	SP3	settings and turn the unit off and on again. If the message persists, please consult with
E217	SP4	your supplier.
E227	SP5	
E237	SP6	

Current Output Errors

E240	A	Current OP Hardware Fault
E250	B	The current output circuit has detected an error in the current output loop; this is most
E260	C	commonly due to either a broken loop or too large a load resistor.
E270	D	
E280	E	
E290	F	
E241	A	Sensor IP<Current OP Zero
E251	B	The sensor input level is below that set for the current output zero.
E261	C	
E271	D	
E281	E	
E291	F	
E242	A	Sensor IP>Current OP Span
E252	B	The sensor input level is above that set for the current output span.
E262	C	
E272	D	
E282	E	
E292	F	
E243	A	Sensor IP<Current OP Span
E253	B	The sensor input level is below that set for the current output span.
E263	C	
E273	D	
E283	E	
E293	F	
E244	A	Sensor IP>Current OP Zero
E254	B	The sensor input level is above that set for the current output Zero.
E264	C	
E274	D	
E284	E	
E294	F	
E245	A	Store A Checksum Error
E255	B	The Store A Save for the channel associated with this current output has become
E265	C	corrupted. Check the current output's settings in the current output menu and then save
E275	D	the settings again in the Channel's Store A in the Save/Restore menu.
E285	E	
E295	F	
E246	A	Store B Checksum Error
E256	B	The Store B Save for the channel associated with this current output has become
E266	C	corrupted. Check the current output's settings in the current output menu and then save
E276	D	the settings again in the Channel's Store B in the Save/Restore menu.
E286	E	
E296	F	

Digital Input Errors

E301	DIG 1	Store A Checksum Error
E306	DIG 2	The Store A Save for the channel associated with this digital input has become
E311	DIG 3	corrupted. Check the digital input's settings in the digital input menu and then save
E316	DIG 4	the settings again in the Channel's Store A in the Save/Restore menu.
E321	DIG 5	
E326	DIG 6	
E331	DIG 7	
E336	DIG 8	
E302	DIG 1	Store B Checksum Error
E307	DIG 2	The Store B Save for the channel associated with this digital input has become
E312	DIG 3	corrupted. Check the digital input's settings in the digital input menu and then save
E317	DIG 4	the settings again in the Channel's Store B in the Save/Restore menu.
E322	DIG 5	
E327	DIG 6	
E332	DIG 7	
E337	DIG 8	
E303	DIG 1	Setup Checksum Error
E308	DIG 2	The Setup for this Digital Input has become corrupted. Check and correct the digital
E313	DIG 3	inputs settings and turn the unit off and on again. If the message persists please
E318	DIG 4	consult with your supplier.
E323	DIG 5	
E328	DIG 6	
E333	DIG 7	
E338	DIG 8	
E304	DIG 1	SD Card Checksum Error
E309	DIG 2	The SD Card store from which this Digital Input was restored from has become
E314	DIG 3	corrupted. Check the Digital Input's settings in the digital input menu and then save
E319	DIG 4	the settings again to the SD card store.
E324	DIG 5	
E329	DIG 6	
E334	DIG 7	
E339	DIG 8	

Communication Errors

E340 E342 E344	CH 1 CH 2 CH 3	Comms Failure The Channel's Input Card is not responding. Try switching the unit off and then on again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E341 E343 E345	CH 1 CH 2 CH 3	Comms Error The Channel's Input Card is not Operating Correctly. Try switching the unit off and then on again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E346	UNIT	Output Comms 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.
E347	UNIT	Output Comms 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.
E348	OP	Output Option Comms 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.
E349	OP	Output Option Comms 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.

Calculation Errors

E400 E411	C1 C2	Calculation Over Range The Calculation reading is greater than the specified upper limit, check channel settings, calculation configuration, sensor condition and connections. If the message persists please consult with your supplier.
E401 E411	C1 C2	Calculation Under Range The Calculation reading is less than the specified lower limit, check channel settings, calculation configuration, sensor condition and connections. If the message persists please consult with your supplier.
E402 E412	C1 C2	Calculation Setup Checksum The Setup for this Calculation has become corrupted. Check and correct the calculation settings and turn the unit off and on again. If the message persists please consult with your supplier.
E403 E413	C1 C2	Calculation Store A Checksum The Store A Save for the channel associated with this calculation has become corrupted. Check the calculation's settings in the calculation menu and then save the settings again in the Channel's Store A in the Save/Restore menu.
E404 E414	C1 C2	Calculation Store B Checksum The Store B Save for the channel associated with this calculation has become corrupted. Check the calculation's settings in the calculation menu and then save the settings again in the Channel's Store B in the Save/Restore menu.
E405 E415	C1 C2	Calculation SD Card Checksum The SD Card store from which this Calculation was restored from has become corrupted. Check the Calculation's settings in the Calculation menu and then save the settings again to the SD card store

Modbus Errors

E420	UNIT	Modbus Setup Checksum The Modbus setup 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.
E421	UNIT	Modbus Store A Checksum The Store A Save for the Modbus Configuration has become corrupted. Check the Modbus settings in the Modbus menu and then save the settings again into Store A in the Save/Restore menu
E422	UNIT	Modbus Store B Checksum The Store B Save for the Modbus Configuration has become corrupted. Check the Modbus settings in the Modbus menu and then save the settings again into Store B in the Save/Restore menu.
E423	UNIT	Modbus SD Card Checksum The SD Card store from which the Modbus configuration 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.

SensorTalk Errors

E450 E480 E510	CH 1 CH 2 CH 3	LED Off Temperature Exceeded The probe's photoluminescence system is turned off as a result of the probe's temperature exceeding the defined threshold setting.
E451 E481 E511	CH 1 CH 2 CH 3	CIP Temperature Exceeded A Clean-In-Place cycle is occurring, the probe's photoluminescence system is turned off and an CIP event is recorded to the probe's log. This is a result of the probe's temperature exceeding the defined threshold setting.
E452 E482 E512	CH 1 CH 2 CH 3	SIP Temperature Exceeded A Steam-In-Place cycle is occurring, the probe's photoluminescence system is turned off and an SIP event is recorded to the probe's log. This is a result of the probe's temperature exceeding the defined threshold setting.
E453 E483 E513	CH 1 CH 2 CH 3	Comms Error The Channel's Input Card is not Operating Correctly. Try switching the unit off and then on again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.

5.8 FAULT FINDING

NOTE: THERE ARE NO USER SERVICEABLE PARTS INSIDE THE UNIT

The 4073 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 previously in this section gives a list of errors that the 4073 generates, along with their probable causes. If after these checks the fault has not been cleared contact Waltron. Please have as much of the following information available as possible in any communication with Waltron, to enable quick diagnosis and correction of the problem.

- Serial number of the instrument, input and output cards.
- The approximate date of purchase.
- The software version of the instrument.
- 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 Instrument Appears Dead

Check that power is available to the unit. Using a voltmeter, set to AC or DC, check the power supply voltage at the connector. The design of the 4073 allows the unit to accept from 85 to 250V AC or DC, an alternative option allows operation from 18 to 32V AC or DC, check the connection label for voltage specification. Check that the power cable is securely and correctly attached. There are no user serviceable fuses fitted within this unit.

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 Waltron or your local distributor should this problem arise.

The Sensor Reading Is Constantly Over-range or Under-range

- Ensure that the sensor and temperature input is correctly connected (see Installation Section) and that the sensor is not faulty or damaged.

- Check that the correct range, sensor type or cell constant has been entered within the Channel Setup menu if in doubt set to Auto Range.

- Check the temperature compensation state 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 display reads zero

- Check for open circuit sensor (conductivity or TDS modes)
- Check for damage to the connecting cable.
- Check that all input connections are secure.
- Check the sensor is wired up correctly.
- Check the sensor is immersed in the correct solution.

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.

The 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.
- Check that the temperature sensor type is correctly selected in the Channel Setup menu.
- Where practical check the temperature sensor resistance against the table.

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 unit is “On-Line”
- Check that the set point configuration is correct (see Setpoints, Current Outputs and Digital Input Configuration Guide)
- If the relays are vibrating or “chattering” as they pass the set point, check the hysteresis setting and increase if necessary.
- Ensure that the relays are connected properly (see 4073 Installation guide) and that the voltage/current levels are not exceeding 5A @ 30V DC or 5A @ 250V AC.
- Check that the instrument input cables are not picking up excessive noise.

The 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 molding.
- 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 values have 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 Temperature Reading Is Incorrect

- Check that the temperature sensor is correctly attached.
- Check that the temperature sensor type is correctly selected in the Channel Setup menu
- Where practical check the temperature sensor resistance against the table in Temperature Data.

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 unit is “On-Line”.
- Check that the set point configuration is correct (see Setpoints, Current Outputs and Digital Input configuration guide)
- If the relays are vibrating or “chattering” as they pass the set point, check the hysteresis setting and increase if necessary.
- Ensure that the relays are connected properly (see 4073 Installation guide) and that the voltage/current levels are not exceeding 5A @ 30V DC or 5A @ 250V AC.
- Check that the instrument input cables are not picking up excessive noise.

6 AUXILIARY MA INPUT SETUP AND OPERATING GUIDE

6.1 AUXILIARY MA INPUT CARD SPECIFICATION

Measurement Input:	0 to 24mA input, fully isolated from instrument supply
Loop Modes:	mA Input – Standard mA input from transmitter, 100Ω input impedance, max loop voltage 35V. Loop Powered – The input card will supply 24V to power the current loop. 3 Wire – The input card can supply an alternative 24V 30mA Max output via the "24V" pin to power a 3 wire transmitter.
Input Mode:	0 – 20 mA (Linear) 0– 20 mA (Linear) 2 Custom Curves (Non-Linear)
Display Ranges:	9999 to +9999 0 to 999.9 0 to 99.99 0 to 9.999
Custom Units:	Maximum of 5 Alphanumeric Characters.
Error States:	Input under 4mA (when using 4-20mA Input) Input over 20mA
Accuracy:	±0.1% of Range
Linearity:	±0.1% of Range
Repeatability:	±0.1% of Range
Calibration Methods:	Reading Offset Calibration. Automatic 2 Point 0/4mA and 20mA Calibration
Calibration Timer:	Inbuilt calibration count down timer which will trigger an alarm when calibration interval has expired.
Sensor Input Filter:	Adjustable filter that averages the sensor input over a user selectable time (10sec – 5mins).

6.2 INSTALLATION

The 4073 Auxiliary mA Input Card allows the user to read the current output of a variety of loop powered and self-powered transmitters.

Self-Powered Transmitters

For self-powered transmitters the current input of the input card is isolated from the instrument‘s power supply thus allowing the input to be connected in series with other devices on the loop if the loop is fed from a single ended transmitter.

Loop Powered Transmitters

For loop powered transmitters the following information may need to be considered:

Loop Voltage Drops
One of a current input instruments most important specification is the total resistance or burden it presents to the connected transmitter’s output driver. Most transmitters’ data sheets specify the maximum loop resistance the transmitter can drive while still providing a full scale 20mA output (the worst case level with regards to burden). Therefore knowing the input impedance of the MXD70 Auxiliary mA Input Card and assuming the maximum current developed in the loop will be 20mA. By using ohms law the maximum voltage drop of the current input is as follows:

Current Input Maximum Voltage Drop = 100Ω x 0.020A = 2 Volts

Transmitter Ratings
The maximum power dissipation of the transmitter can be calculated by combining all the voltage drops in the loop with the minimum operating voltage of the transmitter, take this number away from the current loop operating voltage and them multiply it by the maximum loop current. If the power dissipation is too high then the user will need to externally power the current loop with a lower voltage.

Wiring Resistance
In addition to any voltage drop caused by the transmitter and the current input circuit the user will also have to take into account any voltage losses caused by the wiring resistance. This voltage loss can be calculated by multiplying the combined resistance to and from the transmitter by the maximum current flowing through the wire. This figure along with the voltage dropped by the transmitter and current input circuit will define the minimum operating voltage of the loop.

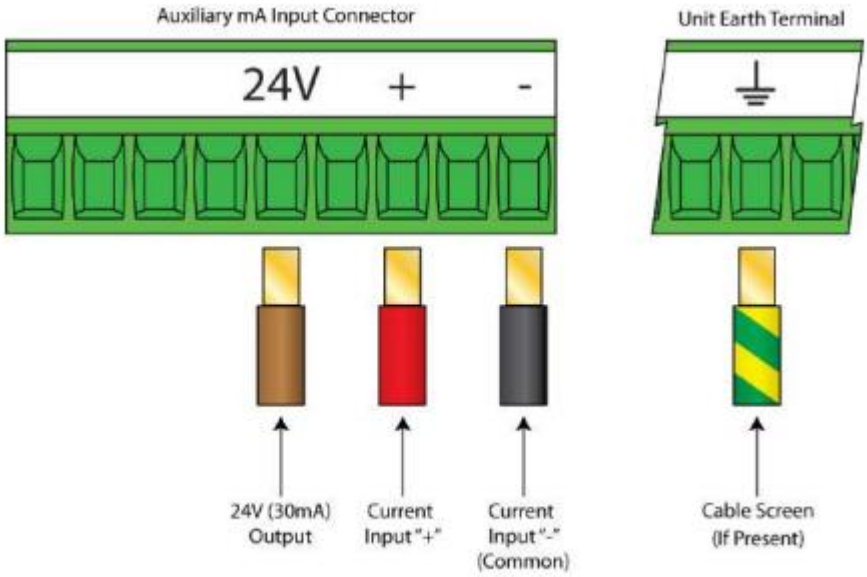
Vmin = VTmin + VCIPmax + (0.02 x RWiring)

Where: Vmin = Loop minimum supply voltage
VTmin = Transmitter minimum operating voltage
VCIPmax = Current Input Maximum Voltage Drop
RWiring = Wiring resistance = 2 x Distance x Cable Resistance (typically 0.035Ω/m)

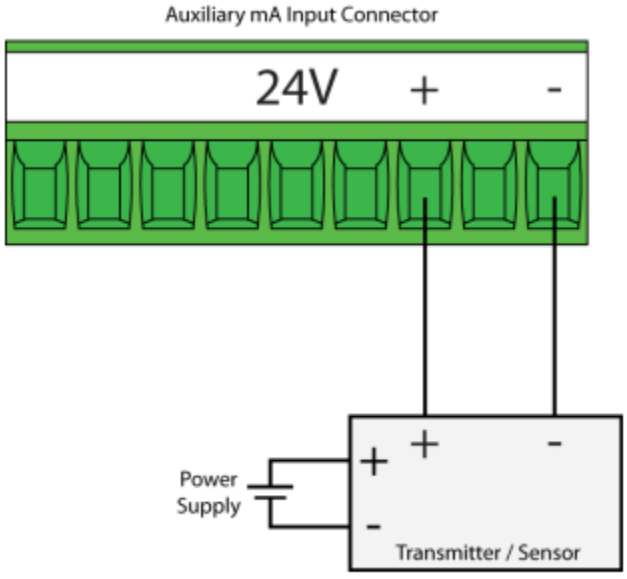
3 Wire Transmitters

For low powered 3 wire transmitters the input card can supply a 24V 30mA output via the 24V connection, thus allowing for the removal of an additional external power supply to the transmitter.

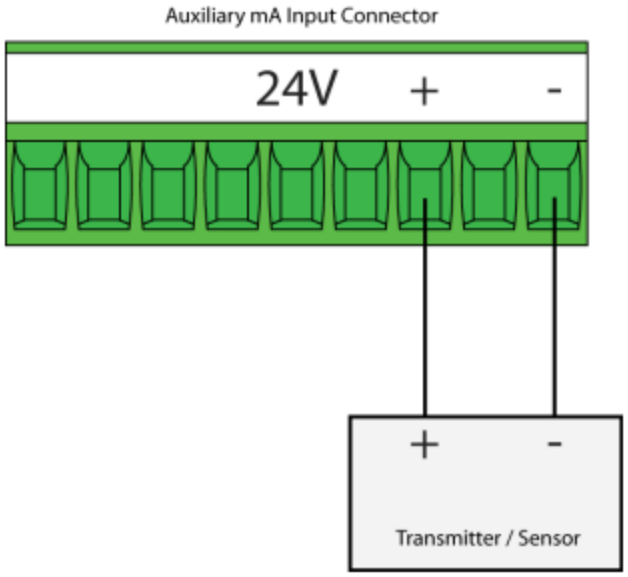
6.2.1 PANEL MOUNT TERMINATION INFORMATION



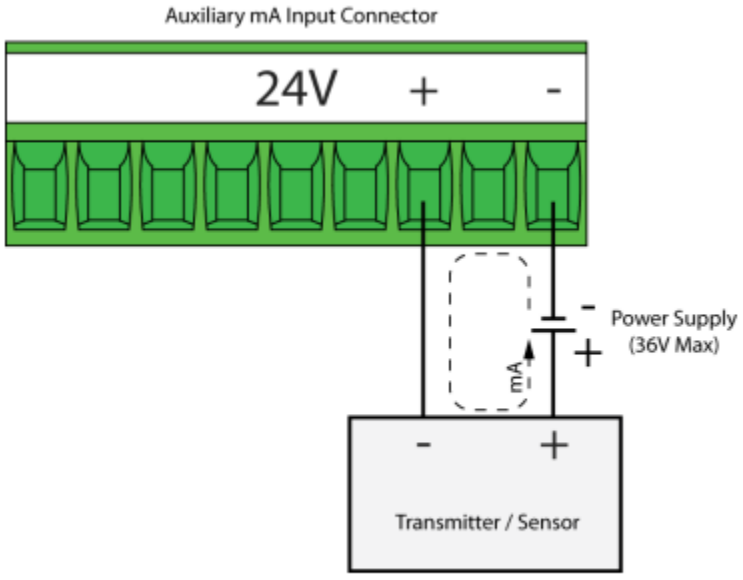
Auxiliary mA Input Connection Details



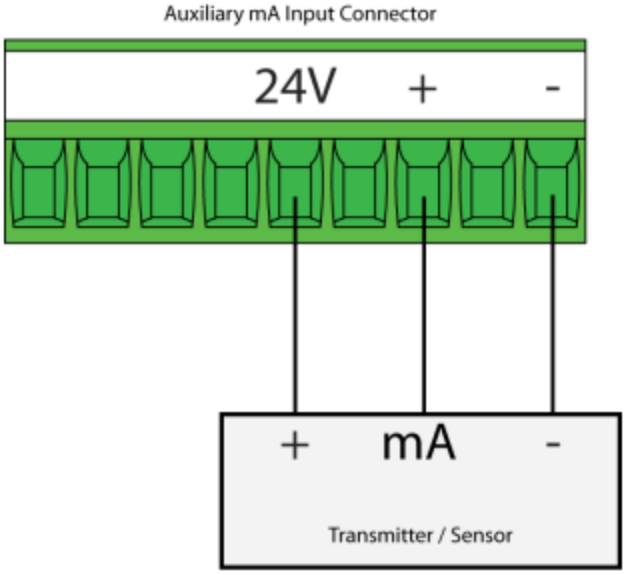
Locally Powered Transmitter Loop Connection Details
Loop Mode Set to "mA Input"



Internally Powered Loop Connection Details
Loop Mode Set to "24V Loop"
(MXD70 powers the loop with 24V)



Externally Powered Loop Connection Details
Loop Mode Set to "mA Input"

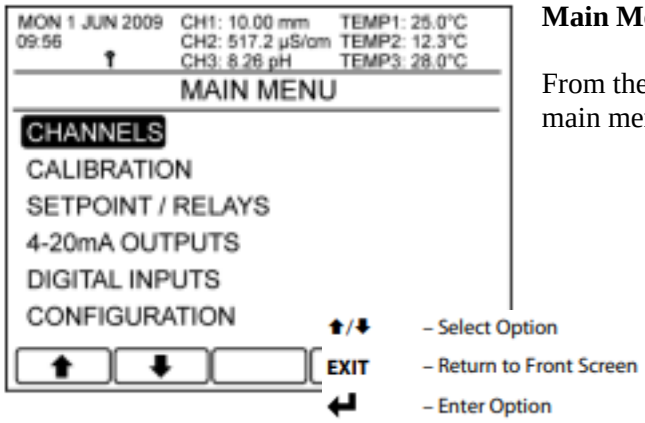


3 Wire Transmitter Loop Connection Details
(NB. The 24V Can Supply 30mA Max)
Loop Mode Set to "mA Input"

6.3 AUXILIARY MA INPUT CHANNEL SETUP

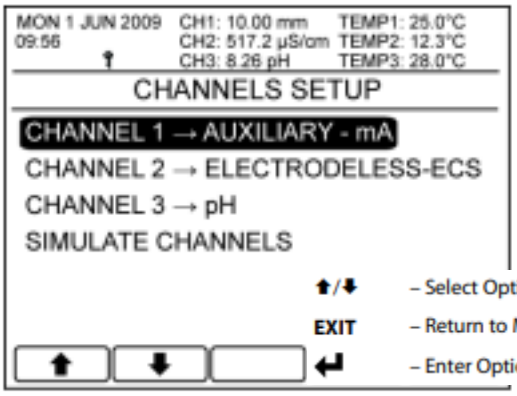
The Channels Setup menu contains the basic configurations for the sensor's input.

The default security access code is **1000.**



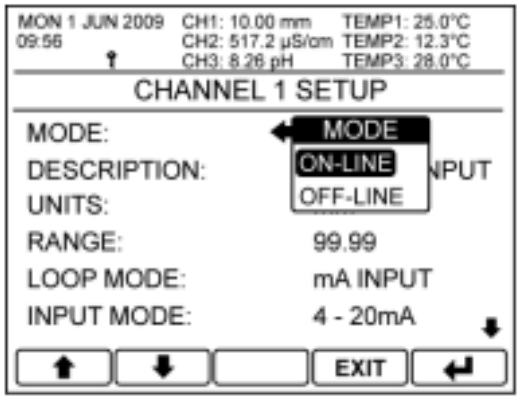
Main Menu

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



Select Channel

Select the Auxiliary mA input channel you wish to edit.

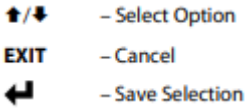


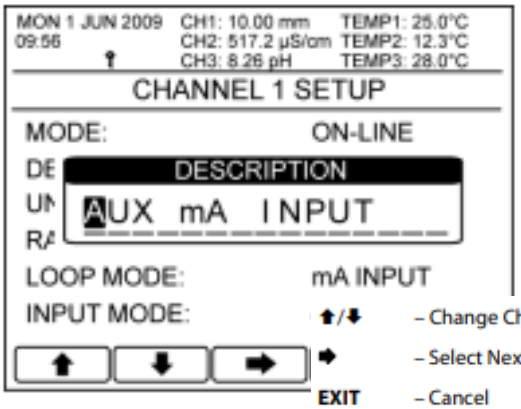
Mode

Selecting off-line causes any setpoints associated with this channel to de-energize. 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.

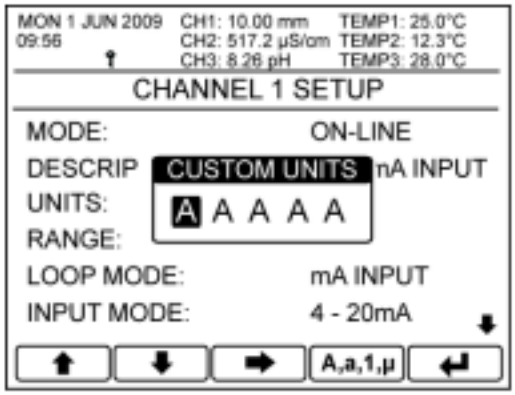




Description

Change the menu description of the Auxiliary mA Input Card. Improves the ease of use throughout the instrument.

Limited to 15 characters, though in some menus only the first 5 characters will be displayed.



Units

Set the operating units of the scaled input using a maximum of 5 characters.

Note: If you hold down the “A,a,1,µ“ Button for approximately 5 seconds the unit will automatically set the character to “blank”.

Only the first two characters of the units are displayed in the menu header. Available characters:

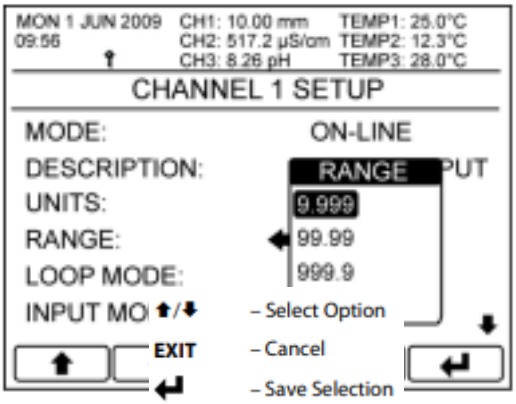
A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z	a	b	c	d
e	f	g	h	i	j	k	l	m	n
o	p	q	r	s	t	u	v	w	x
y	z	1	2	3	4	5	6	7	8
9	0	µ		#	%	(	)	+	-
.	/	:	=	\	^	Σ	Ω	π	°
±	²	³	⁰	β					

⬆/⬇ – Change Character

➡ – Select Next Character

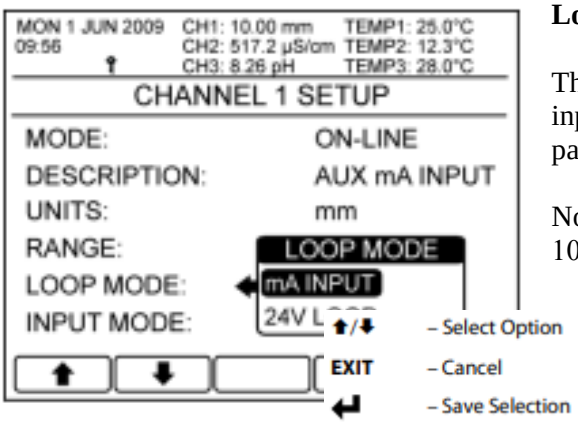
A,a,1,µ – Jump To Next Character Subset

↵ – Save Selection



Range

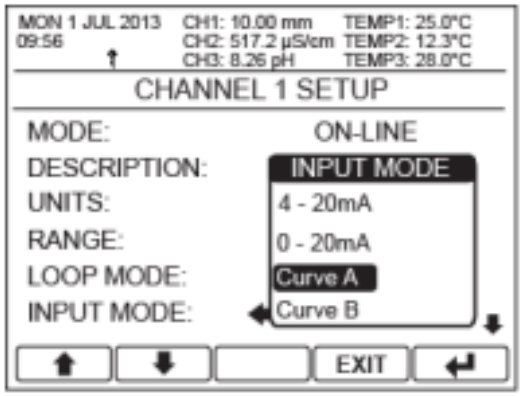
Select the operating range over which the input is scaled. Note only the “9999” range allows signed values.



Loop Mode

The input channel has the ability to support both direct mA input and 24V looped powered systems by setting this parameter.

Note. For direct input configuration the input resistance is 100Ω.



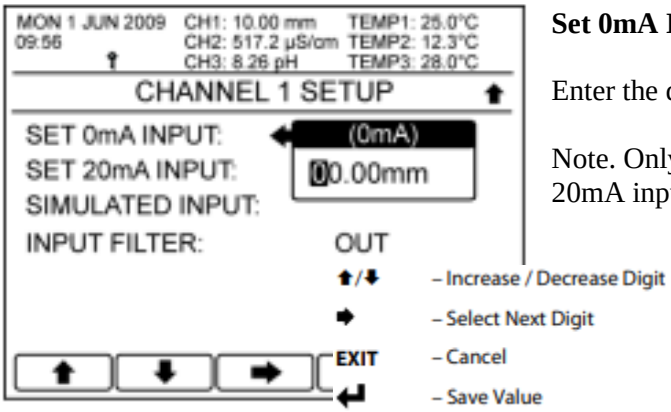
Input Mode

The input can be configured so that the incoming current is scaled across a 4 – 20mA, 0 – 20mA or linearized across desired points entered in to one of the two available custom curves.

If 4-20mA is selected and the input current falls below 4mA, a channel error is generated.

If a curve is chosen and the input falls below the lowest or highest entered mA input point, a channel error will be generated.

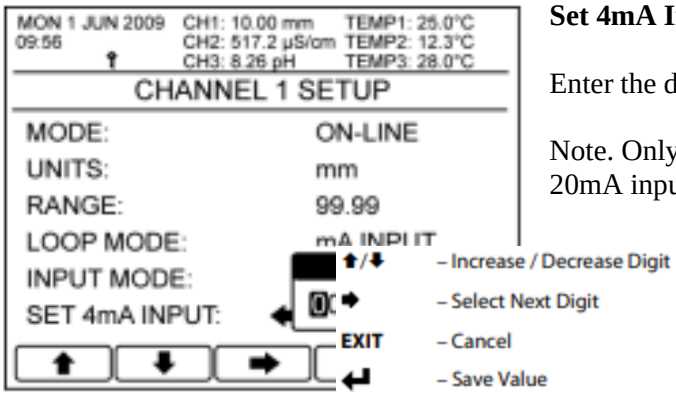
↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection



Set 0mA Input

Enter the displayed value equivalent to a 0mA input.

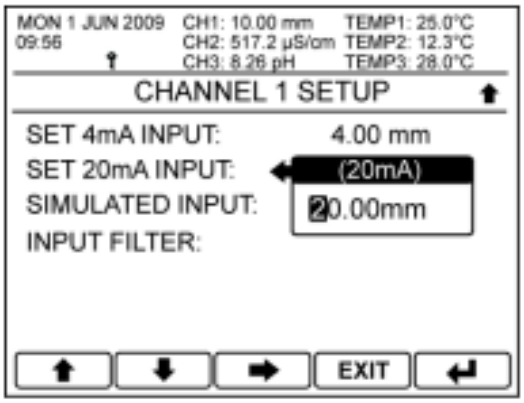
Note. Only available when input mode is set to 0mA – 20mA input.



Set 4mA Input

Enter the displayed value equivalent to a 4mA input.

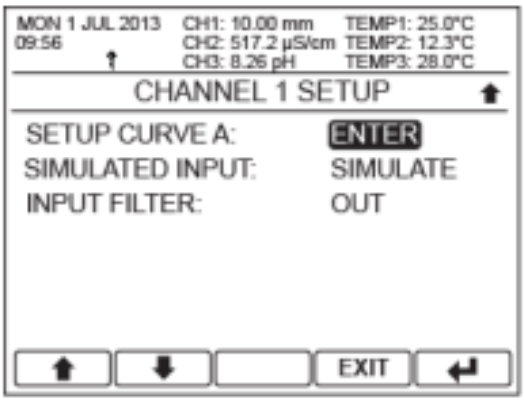
Note. Only available when input mode is set to 4mA – 20mA input.

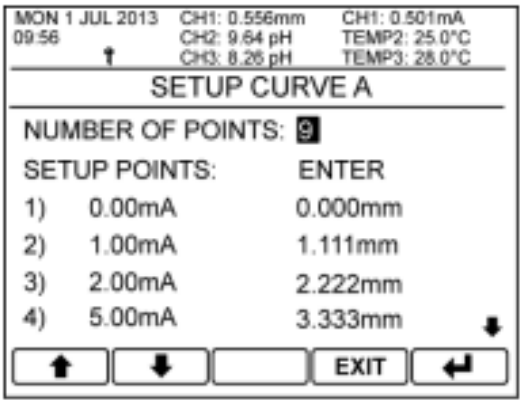


Set 20mA Input

Enter the displayed value equivalent to a 20mA input.

Note. Only available when input mode is set to 4mA – 20mA input.





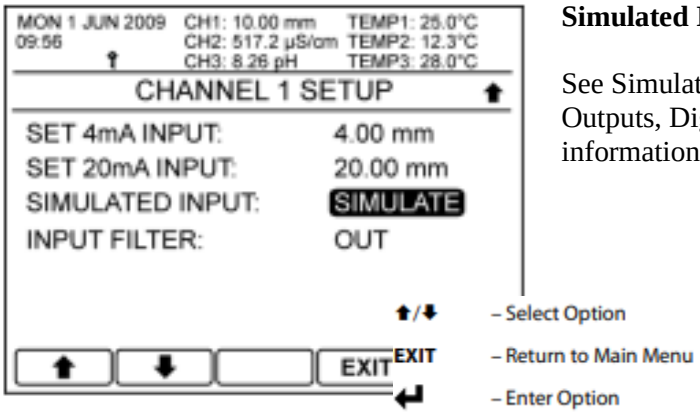
Setup Custom Curve

The Auxiliary mA input provides the user with the facility to enter a custom relationship between the incoming mA measurement and the displayed value.

To enter the relationship, first set the input mode to “Curve A”, or “Curve B”. Then select the “Setup Curve X” menu.

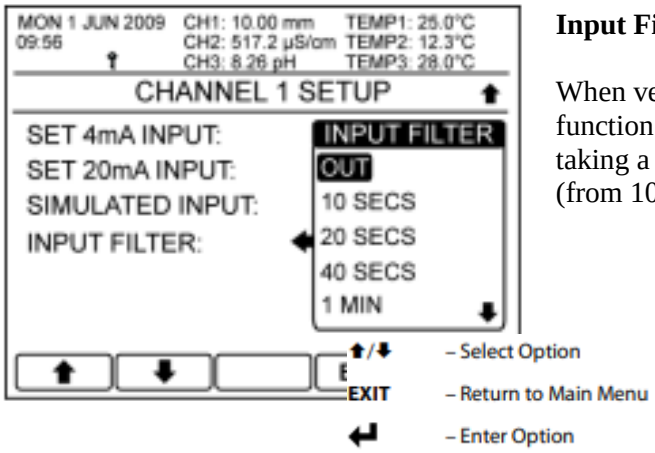
The new screen provides the following options.

- Number of points – Define the number of data entry points which make up the custom curve (Maximum of 10)
- Setup Points – Automatically define the points one after another.
- Data Points – Alternatively the user can edit a single point by selecting it in the menu.
- Reset Curve – Reset all points back to zero.



Simulated Input

See Simulated Channels section of the Setpoints, Current Outputs, Digital Inputs Configuration Guide for more information.



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).

6.4 CALIBRATION

Calibration Procedures

The user is provided with two methods of calibrating the Auxiliary mA Input Card:

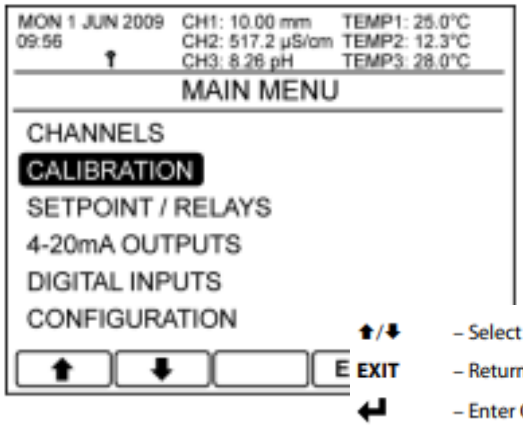
- 2 Point Calibration – Selected by entering the “Aux mA Input Cal” menu item in the calibration menu. This allows the user to calibrate a fixed mA input of 0mA, 4mA, or 20mA against a known current source. Available calibration values depend upon the “Input Mode” menu setting in the channel setup menu.

- Solution Calibration – Selected by entering the “Sensor Solution Cal” menu item in the calibration menu, this allows the user to adjust the scaled reading to match a known input. The amount of offset applied is shown in the “Offset value” menu item and is effective across the full scale of the current input.

6.4.1 CALIBRATION MENU

The calibration menu provides the facility to adjust the sensor inputs to the system in which it is operating.

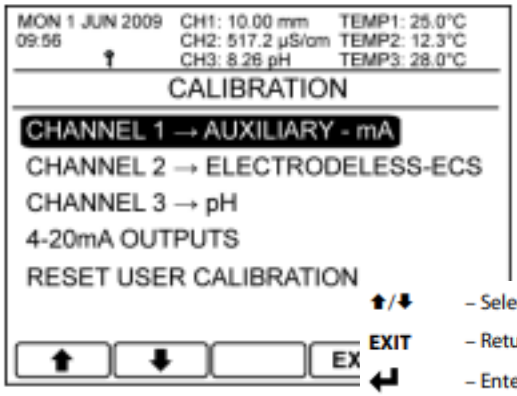
The default security access code is **1000.**



↑/↓ – Select Option
EXIT – Return to Front Screen
↵ – Enter Option

Main Menu

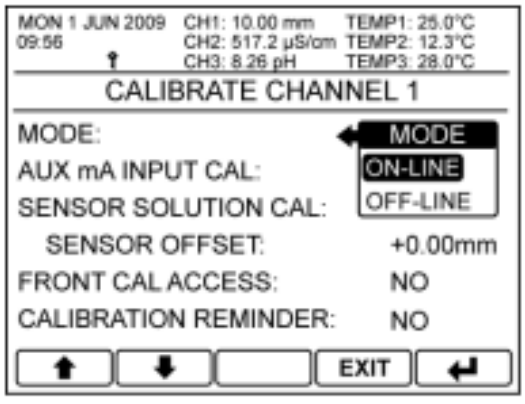
From the front screen press the menu button to show the main menu options and select Calibration.



↑/↓ – Select Option
EXIT – Return to Main Menu
↵ – Enter Option

Select Channel

Select the Auxiliary mA input channel you wish to edit.

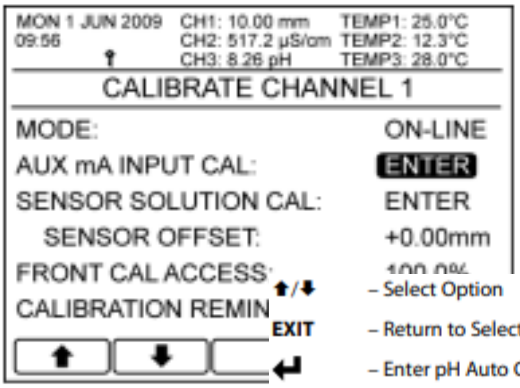


↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

Mode

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

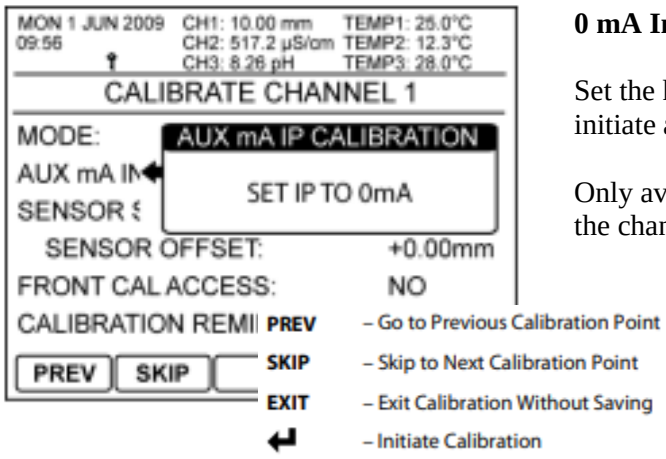
When the unit is placed in an off-line state “off-line” will appear in the channel messages section on the front screen. If a “Cannot Edit Digital Input Has Control” message appears, then an associated digital input is currently controlling the on-line / off-line state of the channel.



Auxiliary mA Input Calibration

Enter the Auxiliary mA Input Calibration routine.

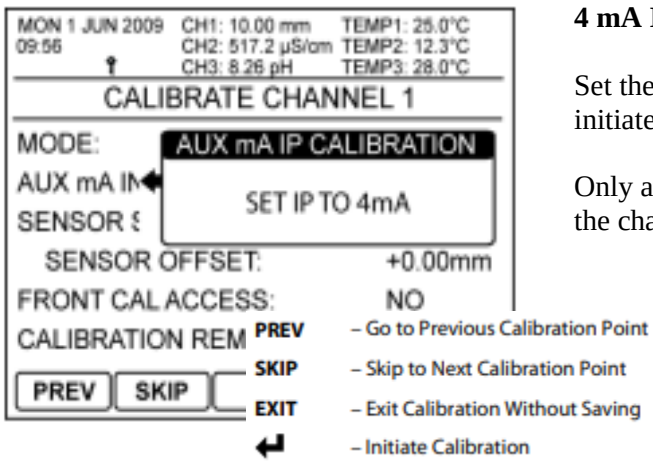
Allows the user to calibrate the mA input to a known current source.



0 mA Input Calibration

Set the known current input to 0mA and press enter to initiate a calibration.

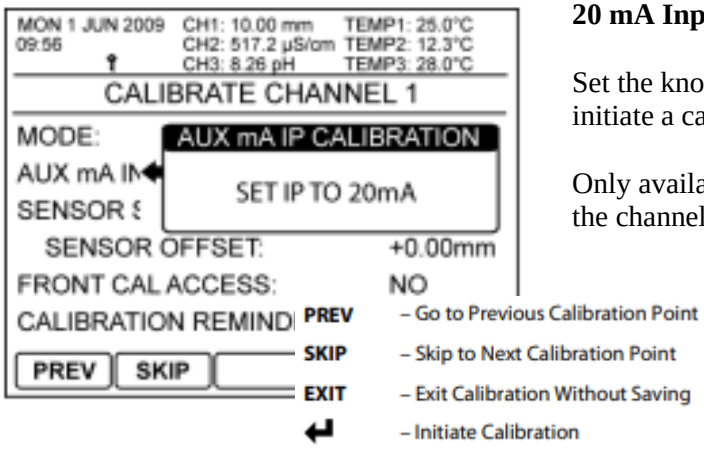
Only available when the input mode is set to 0 – 20mA in the channel setup menu.



4 mA Input Calibration

Set the known current input to 4mA and press enter to initiate a calibration.

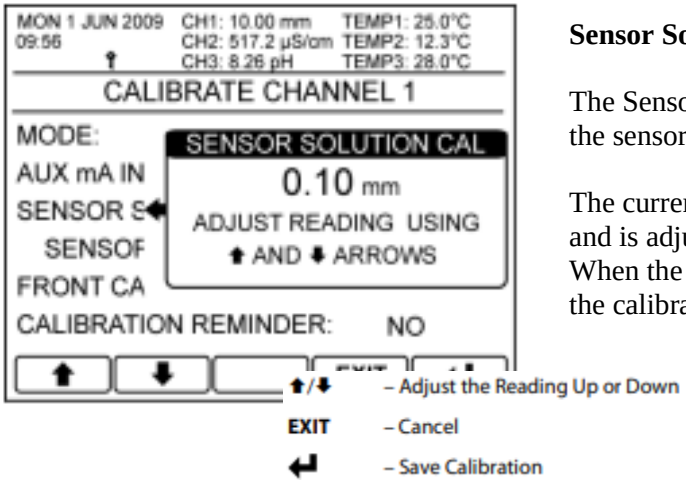
Only available when the input mode is set to 4 – 20mA in the channel setup menu.



20 mA Input Calibration

Set the known current input to 20mA and press enter to initiate a calibration.

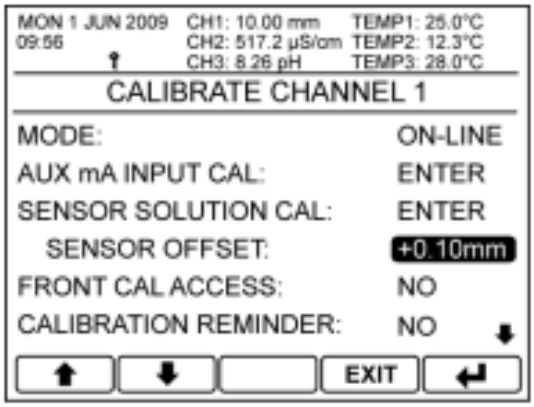
Only available when the input mode is set to 4 – 20mA in the channel setup menu.



Sensor Solution Calibration

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

The current 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.

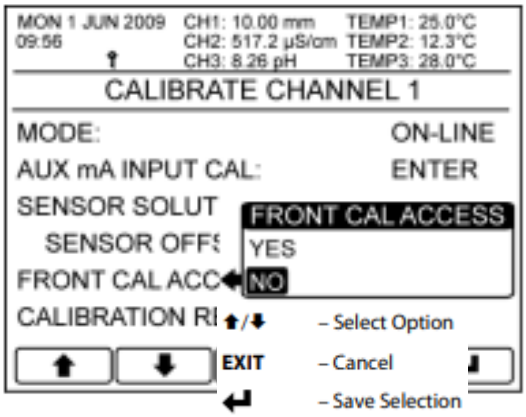


Sensor Offset Value

Displays the Sensor Offset currently being used by the instrument.

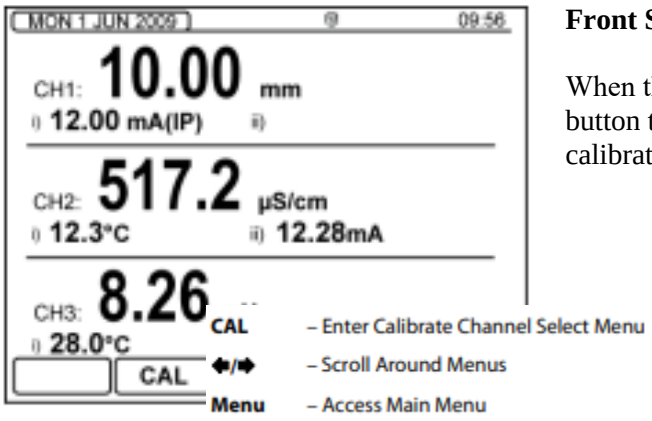
Cannot be edited.

Changed by using sensor solution calibration.



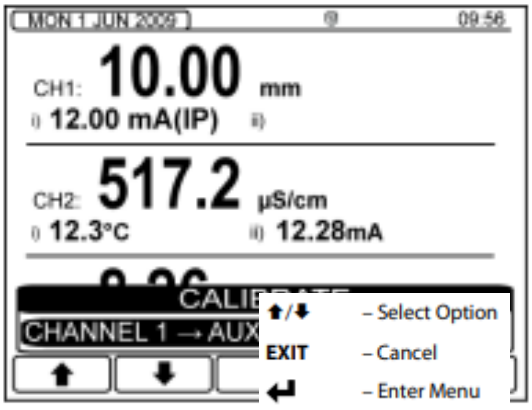
Front Screen Calibration Access Enable

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.



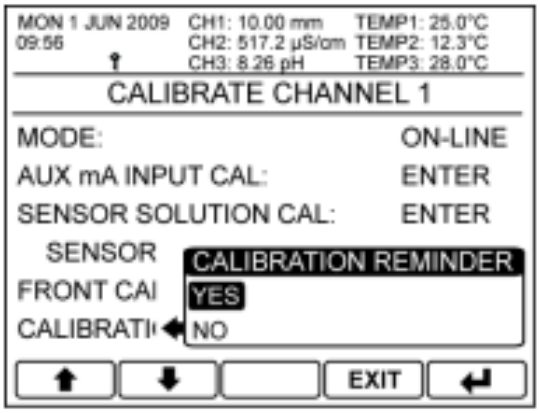
Front Screen Calibration Access

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



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.



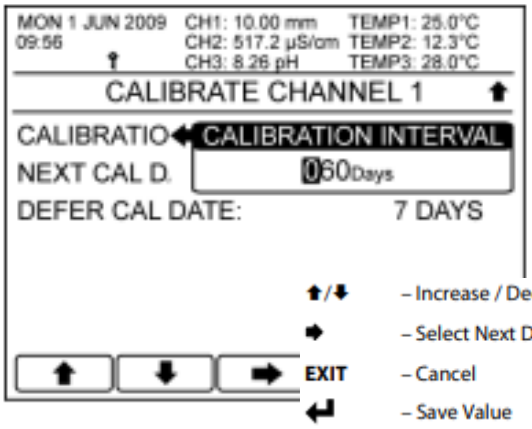
Calibration Reminder

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

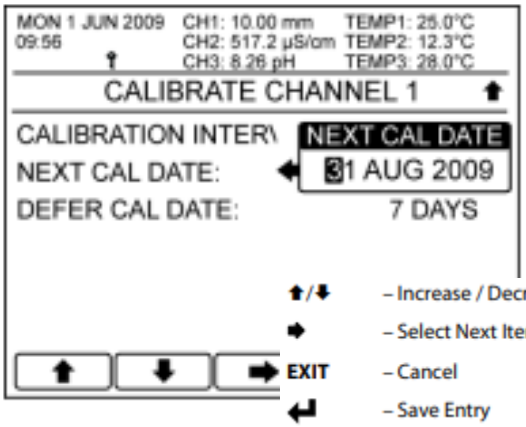


Calibration Interval

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

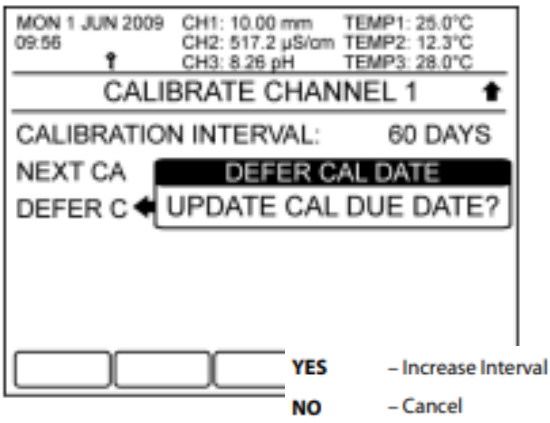


Next Calibration Date

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



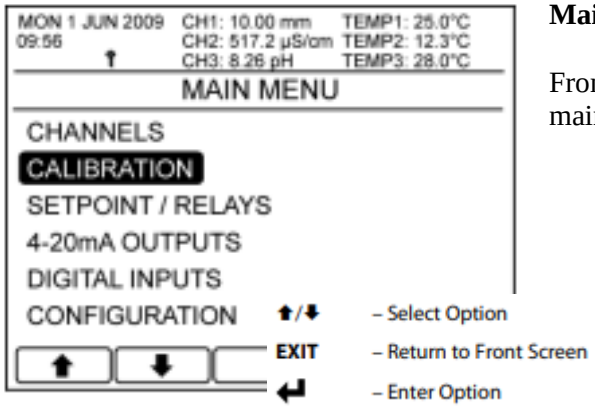
Defer Calibration Date

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

Only appears once the calibration interval has expired.

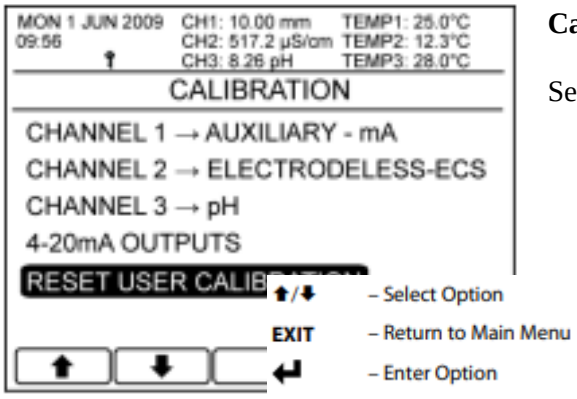
6.4.2 RESETTING THE USER CALIBRATION

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



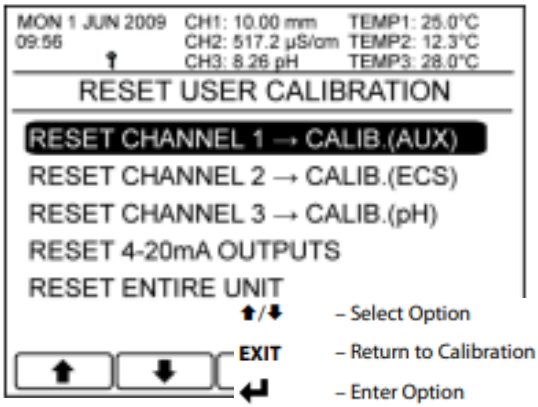
Main Menu

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



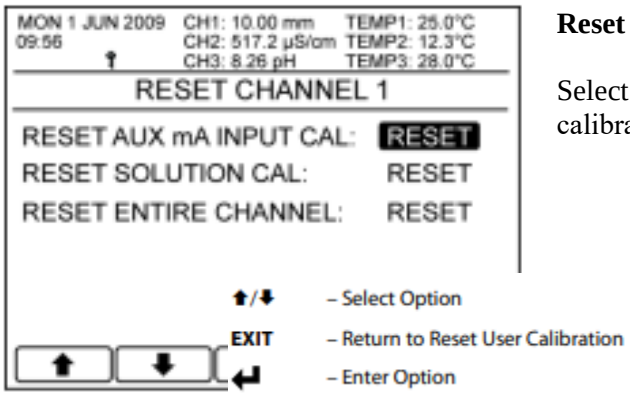
Calibration

Select Reset User Calibration.



Reset User Calibration

Select the required Auxiliary mA input channel.



Reset Channel User Calibration

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

6.5 APPENDIX A – 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	For Future Use
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.
E016	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 SD card

Input Channel Errors

E030 E080 E130	CH 1 CH 2 CH 3	Input Card Checksum Error Try switching the unit off and then on again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E031 E081 E131	CH 1 CH 2 CH 3	Setup Checksum Error The current channel's configuration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists reset the current channel from the Reset Unit Settings option in the Save/Restore menu or consult with your supplier, as the channel's input card may require to be returned for repair.
E032 E082 E132	CH 1 CH 2 CH 3	Store A Checksum Error The data in the channel's Store A has become corrupted. Check the channel's current setup. Then save the setup back to channel's Store A in the Save/Restore menu.
E033 E083 E133	CH 1 CH 2 CH 3	Store B Checksum Error The data in the channel's Store B has become corrupted. Check the channel's current setup. Then save the setup back to channel's Store B in the Save/Restore menu.
E034 E084 E134	CH 1 CH 2 CH 3	Factory Cal Checksum Error Try switching the unit off and then on again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E035 E085 E135	CH 1 CH 2 CH 3	User Cal Checksum Error The Channel's User Cal has for some reason become corrupted. Try switching the unit off and then on again. If the message persists Reset the Channel from the Reset User Calibration option in the Calibration menu or consult with your supplier, as the channel's input card may require to be returned for repair.
E036 E086 E136	CH 1 CH 2 CH 3	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.
E037 E087 E137	CH 1 CH 2 CH 3	Sensor Zero Cal Out Of Spec The last Sensor Zero Calibration was out of specification, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.

E038 E088 E138	CH 1 CH 2 CH 3	Sensor Span Cal Out Of Spec The last Sensor Span Calibration was out of specification, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E039 E089 E139	CH 1 CH 2 CH 3	No Signal No Sensor connected or there is 'zero' detector current. The probe sensor units (PSU) will be set to 16000 or 32000 if turbidity. If this message persists, please consult with your supplier.
E040 E090 E140	CH 1 CH 2 CH 3	Signal Overload The gain step is equal to 0 and the A/D output is over 255. This cannot happen in a liquid but could happen if the sensor is in full sunlight. The probe sensor units (PSU) will be set to 16000 or 32000 if turbidity. If this message persists, please consult with your supplier.
E041 E091 E141	CH 1 CH 2 CH 3	Partial Depletion Large difference between the detectors, i.e. one very dirty. This alarm will come up if there is a difference of 3:1 between the detectors. Remove sensor and clean sensor fingers. The probe sensor units (PSU) will be set to 16000 or 32000 if turbidity. If this message persists, please consult with your supplier.
E042 E092 E142	CH 1 CH 2 CH 3	Full Depletion Attenuation too high or the real probe signal goes above 14000. The probe sensor units (PSU) will be set to 16000. If this message persists, please consult with your supplier.
E043 E093 E143	CH 1 CH 2 CH 3	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.
E034 E094 E144	CH 1 CH 2 CH 3	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.
E035 E095 E145	CH 1 CH 2 CH 3	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.

E046 E096 E146	CH 1 CH 2 CH 3	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.
E047 E097 E147	CH 1 CH 2 CH 3	Sensor Open Circuit The sensor input is at open circuit, check sensor condition and connections. If the message persists please consult with your supplier.
E048 E098 E148	CH 1 CH 2 CH 3	Sensor Short Circuit The sensor input is at short circuit, check sensor condition and connections. If the message persists please consult with your supplier.
E049 E099 E149	CH 1 CH 2 CH 3	Sensor Positive Saturation The sensor input is greater than the maximum measurable input level, Check Sensor condition and connections. If the message persists please consult with your supplier
E050 E100 E150	CH 1 CH 2 CH 3	Sensor Negative Saturation The sensor input is less than the minimum measurable input level, Check Sensor condition and connections. If the message persists please consult with your supplier
E051 E101 E151	CH 1 CH 2 CH 3	Sensor Input Over Range The 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.
E052 E102 E152	CH 1 CH 2 CH 3	Sensor Input Under Range The sensor reading is less than the specified limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.
E053 E103 E153	CH 1 CH 2 CH 3	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.

E054 E104 E154	CH 1 CH 2 CH 3	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.
E055 E105 E155	CH 1 CH 2 CH 3	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.
E056 E106 E156	CH 1 CH 2 CH 3	Temp Comp Outside Limits The temperature reading is less than 0.0C or greater than 150.0C, leading to an error in compensation.
E057 E107 E157	CH 1 CH 2 CH 3	Polar Zero Cal At Limit The last Polargraphic Zero Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E058 E108 E158	CH 1 CH 2 CH 3	Polar Span Cal At Limit The last Polargraphic Span Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E059 E109 E159	CH 1 CH 2 CH 3	Galvanic Zero Cal At Limit The last Galvanic Zero Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E060 E110 E162	CH 1 CH 2 CH 3	Galvanic Span Cal At Limit The last Galvanic Span Calibration was out of limits, check sensor condition and connections and repeat calibration. If the message persists please consult with your supplier.
E061 E111 E161	CH 1 CH 2 CH 3	Pressure Sensor Over Range The pressure sensor reading is greater than the specified limit for the probe.

E062 E112 E162	CH 1 CH 2 CH 3	Pressure Sensor Under Range The pressure sensor reading is less than the specified limit for the probe.
E063 E113 E163	CH 1 CH 2 CH 3	Pressure Above 20mA The pressure sensor input is greater than 20mA, check sensor condition and connections. If the message persists please consult with your supplier.
E064 E114 E164	CH 1 CH 2 CH 3	Pressure Below 4mA The pressure sensor input is less than 4mA, check sensor condition and connections. If the message persists please consult with your supplier.
E065 E115 E165	CH 1 CH 2 CH 3	AUX mA Input Above 20mA The sensor input is greater than 20mA, check sensor condition and connections. If \ the message persists please consult with your supplier.
E066 E116 E166	CH 1 CH 2 CH 3	AUX mA Input Below 4mA The sensor input is less than 4mA, check sensor condition and connections. If the message persists please consult with your supplier.
E067 E117 E167	CH 1 CH 2 CH 3	Sensor 0mV Cal Out of Spec The pH 0mV calibration for this channel is outside recommended specifications.
E068 E118 E168	CH 1 CH 2 CH 3	Calibration Due The time since the last calibration was performed on this channel has exceeded the time set in the calibration menu.
E069 E119 E169	CH 1 CH 2 CH 3	Planned Service Due The Planned Service interval for this unit has expired. Please contact Waltron.

E070 E120 E170	CH 1 CH 2 CH 3	SD Card Checksum Error 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.
E071 E121 E171	CH 1 CH 2 CH 3	Gain Error The sensor gain has been exceeded. If this message persists, please consult with your supplier.
E072 E122 E172	CH 1 CH 2 CH 3	Invalid Linearization Curve A minimum of 2 linearization points are required. Please check linearization curve settings in the channel setup menu for this channel.
E073 E123 E173	CH 1 CH 2 CH 3	Linearization Over-Range The linearization result is greater than 9999 (or 100.0% when using %).
E074 E124 E174	CH 1 CH 2 CH 3	Linearization Under-Range The linearization result is less than 0.
E075 E125 E175	CH 1 CH 2 CH 3	Curve Low Limit The incoming probe signal is less than the lowest point in the linearization curve.
E076 E126 E176	CH 1 CH 2 CH 3	Curve High Limit The incoming probe signal is greater than the highest point in the linearization curve.
E077 E127 E177	CH 1 CH 2 CH 3	Custom Error Contact your supplier for details.

Setpoint Errors

E180	SP1	Dose Alarm Error
E190	SP2	The Setpoint has been dosing for longer than the Dose Alarm time as defined in the
E200	SP3	setpoint menu.
E210	SP4	
E220	SP5	
E230	SP6	

E181 to E184	SP1	For Future Use
E191 to E194	SP2	
E201 to E204	SP3	
E211 to E224	SP4	
E221 to E224	SP5	
E231 to E234	SP6	

E185	SP1	Store A Checksum Error
E195	SP2	The Store A Save for the Channel associated with this Setpoint has become corrupted.
E205	SP3	Check the setpoint's settings in the setpoint menu and then save the settings again in
E215	SP4	the Channel's Store A in the Save/Restore menu.
E225	SP5	
E235	SP6	

E186	SP1	Store B Checksum Error
E196	SP2	The Store B Save for the Channel associated with this Setpoint has become corrupted.
E206	SP3	Check the setpoint's settings in the setpoint menu and then save the settings again in
E216	SP4	the Channel's Store B in the Save/Restore menu.
E226	SP5	
E236	SP6	

E187	SP1	Setup Checksum Error
E197	SP2	The Setup for this Setpoint has become corrupted. Check and correct the setpoint
E207	SP3	settings and turn the unit off and on again. If the message persists, please consult with
E217	SP4	your supplier.
E227	SP5	
E237	SP6	

E188	SP1	SD Card Checksum Error
E198	SP2	The SD Card store from which this Setpoint was restored has become corrupted. Check
E208	SP3	the setpoint's settings in the setpoint menu and then save the settings again to the SD
E218	SP4	card store.
E228	SP5	
E238	SP6	

Current Output Errors

E240	A	Current OP Hardware Fault
E250	B	The current output circuit has detected an error in the current output loop; this is most

E260	C	commonly due to either a broken loop or too large a load resistor.
E270	D	
E280	E	
E290	F	
E241	A	Sensor IP<Current OP Zero
E251	B	The sensor input level is below that set for the current output zero.
E261	C	
E271	D	
E281	E	
E291	F	
E242	A	Sensor IP>Current OP Span
E252	B	The sensor input level is above that set for the current output span.
E262	C	
E272	D	
E282	E	
E292	F	
E243	A	Sensor IP<Current OP Span
E253	B	The sensor input level is below that set for the current output span.
E263	C	
E273	D	
E283	E	
E293	F	
E244	A	Sensor IP>Current OP Zero
E254	B	The sensor input level is above that set for the current output Zero.
E264	C	
E274	D	
E284	E	
E294	F	
E245	A	Store A Checksum Error
E255	B	The Store A Save for the channel associated with this current output has become
E265	C	corrupted. Check the current output's settings in the current output menu and then save
E275	D	the settings again in the Channel's Store A in the Save/Restore menu.
E285	E	
E295	F	
E246	A	Store B Checksum Error
E256	B	The Store B Save for the channel associated with this current output has become
E266	C	corrupted. Check the current output's settings in the current output menu and then save
E276	D	the settings again in the Channel's Store B in the Save/Restore menu.
E286	E	
E296	F	

Digital Input Errors

E301	DIG 1	Store A Checksum Error
E306	DIG 2	The Store A Save for the channel associated with this digital input has become

E311	DIG 3	corrupted. Check the digital input's settings in the digital input menu and then save
E316	DIG 4	the settings again in the Channel's Store A in the Save/Restore menu.
E321	DIG 5	
E326	DIG 6	
E331	DIG 7	
E336	DIG 8	
E302	DIG 1	Store B Checksum Error
E307	DIG 2	The Store B Save for the channel associated with this digital input has become
E312	DIG 3	corrupted. Check the digital input's settings in the digital input menu and then save
E317	DIG 4	the settings again in the Channel's Store B in the Save/Restore menu.
E322	DIG 5	
E327	DIG 6	
E332	DIG 7	
E337	DIG 8	
E303	DIG 1	Setup Checksum Error
E308	DIG 2	The Setup for this Digital Input has become corrupted. Check and correct the digital
E313	DIG 3	inputs settings and turn the unit off and on again. If the message persists please
E318	DIG 4	consult with your supplier.
E323	DIG 5	
E328	DIG 6	
E333	DIG 7	
E338	DIG 8	
E304	DIG 1	SD Card Checksum Error
E309	DIG 2	The SD Card store from which this Digital Input was restored from has become
E314	DIG 3	corrupted. Check the Digital Input's settings in the digital input menu and then save
E319	DIG 4	the settings again to the SD card store.
E324	DIG 5	
E329	DIG 6	
E334	DIG 7	
E339	DIG 8	

Communication Errors

E340	CH 1	Comms Failure
E342	CH 2	The Channel's Input Card is not responding. Try switching the unit off and then on

E344	CH 3	again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E341 E343 E345	CH 1 CH 2 CH 3	Comms Error The Channel's Input Card is not Operating Correctly. Try switching the unit off and then on again. If the message persists, consult with your supplier, as the channel's input card may require to be returned for repair.
E346	UNIT	Output Comms 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.
E347	UNIT	Output Comms 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.
E348	OP	Output Option Comms 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.
E349	OP	Output Option Comms 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.

Calculation Errors

E400	C1	Calculation Over Range

E411	C2	The Calculation reading is greater than the specified upper limit, check channel settings, calculation configuration, sensor condition and connections. If the message persists please consult with your supplier.
E401	C1	Calculation Under Range
E411	C2	The Calculation reading is less than the specified lower limit, check channel settings, calculation configuration, sensor condition and connections. If the message persists please consult with your supplier.
E402	C1	Calculation Setup Checksum
E412	C2	The Setup for this Calculation has become corrupted. Check and correct the calculation settings and turn the unit off and on again. If the message persists please consult with your supplier.
E403	C1	Calculation Store A Checksum
E413	C2	The Store A Save for the channel associated with this calculation has become corrupted. Check the calculation’s settings in the calculation menu and then save the settings again in the Channel's Store A in the Save/Restore menu.
E404	C1	Calculation Store B Checksum
E414	C2	The Store B Save for the channel associated with this calculation has become corrupted. Check the calculation’s settings in the calculation menu and then save the settings again in the Channel's Store B in the Save/Restore menu.
E405	C1	Calculation SD Card Checksum
E415	C2	The SD Card store from which this Calculation was restored from has become corrupted. Check the Calculation's settings in the Calculation menu and then save the settings again to the SD card store

Modbus Errors

E420	UNIT	Modbus Setup Checksum The Modbus setup 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.
E421	UNIT	Modbus Store A Checksum The Store A Save for the Modbus Configuration has become corrupted. Check the Modbus settings in the Modbus menu and then save the settings again into Store A in the Save/Restore menu
E422	UNIT	Modbus Store B Checksum The Store B Save for the Modbus Configuration has become corrupted. Check the Modbus settings in the Modbus menu and then save the settings again into Store B in the Save/Restore menu.
E423	UNIT	Modbus SD Card Checksum The SD Card store from which the Modbus configuration 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.

6.6 FAULT FINDING

NOTE: THERE ARE NO USER SERVICEABLE PARTS INSIDE THE UNIT

The 4073 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 previously in this section gives a list that the 4073 generates, along with their probable causes. If after these checks the fault has not been cleared contact Waltron. Please have as much of the following information available as possible in any communication with Waltron, to enable quick diagnosis and correction of the problem.

- Serial number of the instrument, input and output cards.
- 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 transmitter 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 Instrument Appears Dead

Check that power is available to the unit. Using a voltmeter, set to AC or DC, check the power supply voltage at the connector. The design of the 4073 allows the unit to accept from 85 to 250V AC or DC, an alternative option allows operation from 18 to 32V AC or DC, check the connection label for voltage specification. Check that the power cable is securely and correctly attached. There are no user serviceable fuses fitted within this unit.

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 Waltron or your local distributor should this problem arise.

The Input Reading Is Constantly Over-range, Under-range or Incorrect

- Ensure that the transmitter input is correctly connected (see Installation Section) and that the transmitter is not faulty or damaged.
- Check that loop mode is correctly set within the Channel Setup menu.
- Check that Input mode is correctly set within the Channel Setup menu.

- Check that the input scaling has been configured correctly (see Auxiliary mA Input Channel Setup).
- Check that no error messages are being displayed.
- Check the instrument calibration using a mA simulator, Adjust the channel calibration if necessary (see Calibration Section).
- Use another instrument to check the transmitter.

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 the current output has been configured properly.

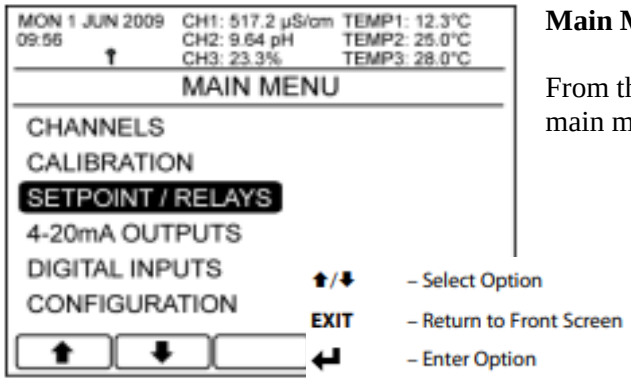
Relays Appear to Malfunction

- Check that the unit is “On-Line”.
- Check that the set point configuration is correct (see Setpoints, Current Outputs and Digital Input Configuration Guide) .
- If the relays are vibrating or “chattering” as they pass the set point, check the hysteresis setting and increase if necessary.
- Ensure that the relays are connected properly (see 4073 Installation guide) and that the voltage/current levels are not exceeding 5A @ 30V DC or 5A @ 250V AC.
- Check that the instrument input cables are not picking up excessive noise.

7 SETPOINTS, CURRENT OUTPUTS, AND DIGITAL INPUTS CONFIGURATION GUIDE

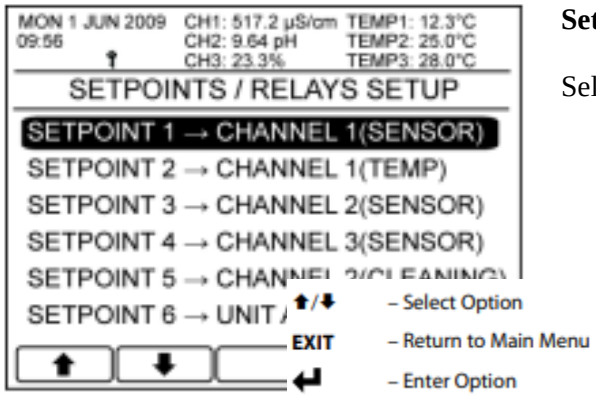
7.1 SETPOINTS

The 4073 can be fitted with up to six setpoint relays designated 1 – 6. Setpoints 1 – 4 are “Change Over” relays while 5 – 6 are “Normally Open” relays. Each individual setpoint can be assigned to any one of the Sensor Input Channels. The Setpoint/Relays menu contains all of the necessary setup functions to configure the setpoint sources. The instrument indicates the status of the enabled setpoints by means of 6 LED indicators located above the main instrument display. A lit LED indicates that the setpoint / Relay is active. If the LED is blinking it indicates a dose alarm has occurred on that setpoint.



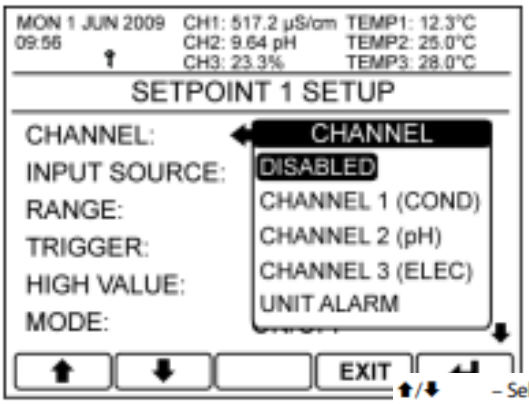
Main Menu

From the front screen press the menu button to show the main menu options and select Setpoint/Relays.



Setpoints / Relays Setup

Select the Setpoint you wish to edit.

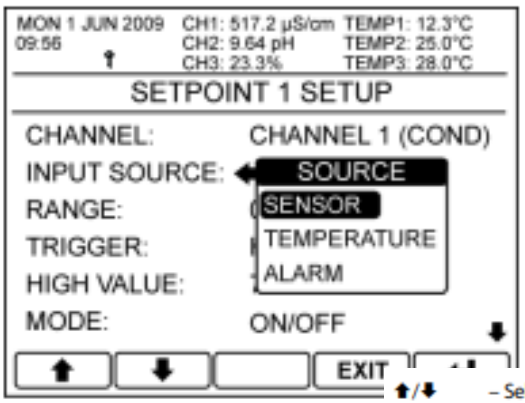


Channel

The “Sensor Input Channel” the setpoint is to be associated with. The channels shown depend on the configuration of the instrument. For more information regarding the Unit Alarm option see the setpoint alarm mode section.

To disable the setpoint select the disabled option. This will turn off the setpoint and clear any error messages associated with it.

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

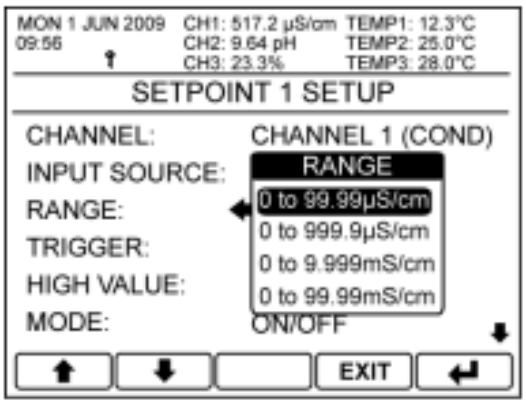


Input Source

The input source for the selected setpoint. Available options vary depending on whether the appropriate source is enabled in the channel’s setup menu.

Alarm option – see the setpoint alarm mode section.
Cleaning option – see the setpoint cleaning mode section (not available on all input card types.)

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection



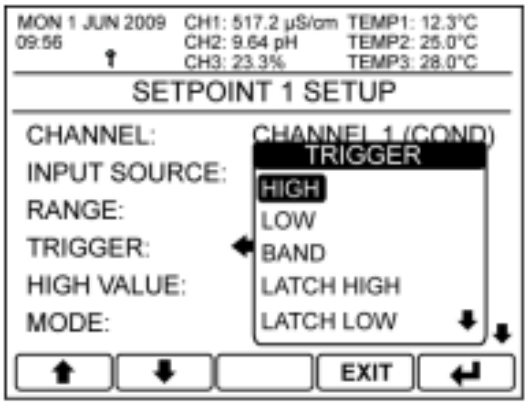
Range

The setpoint’s operating range.

This is only available if the associated Sensor Input Channel has a range option and is set to Auto in the channel’s setup menu.

The available options will depend on the cell constant of the sensor used, consult the input card’s manual for more information.

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

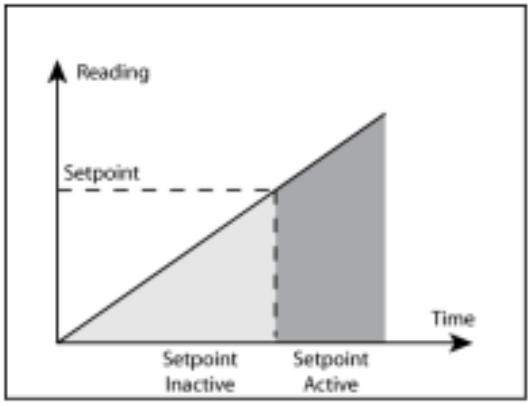


Trigger

The setpoints can be configured to trigger in the following ways:

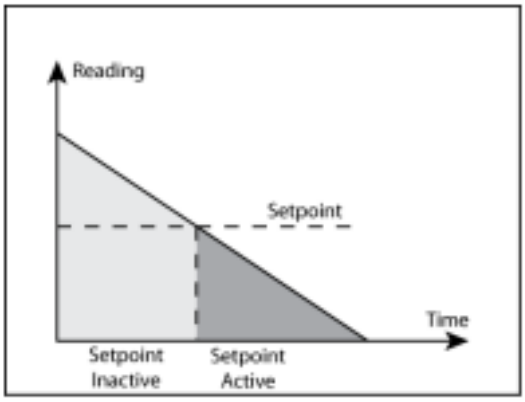
- High
- Low
- Band
- Latch High
- Latch Low
- USP (Conductivity Only – see Conductivity manual for information)

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection



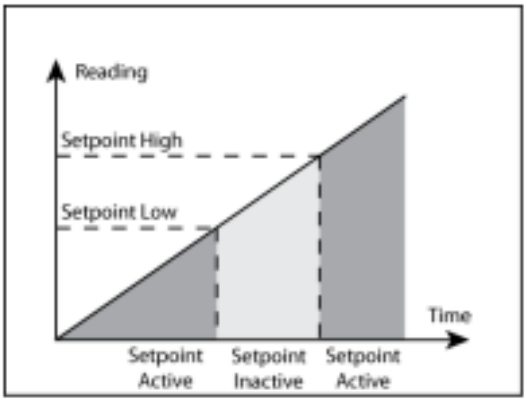
High

The setpoint will activate when the associated Sensor Input Channel's input becomes greater than the setpoint level.



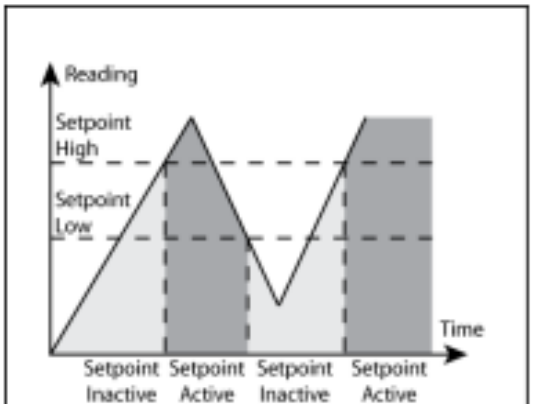
Low

The setpoint will activate when the associated Sensor Input Channel's input becomes less than the setpoint level.



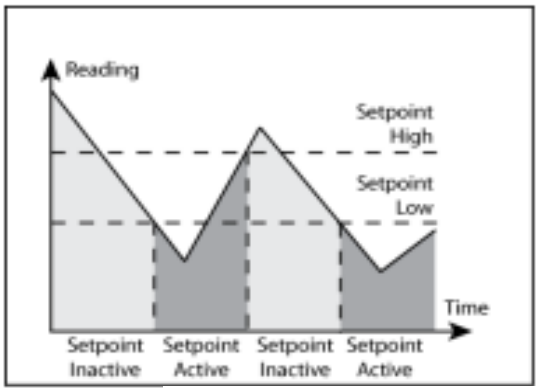
Band

The setpoint will activate when the associated Sensor Input Channel's input is either greater than the setpoint high level or less than the setpoint low level.



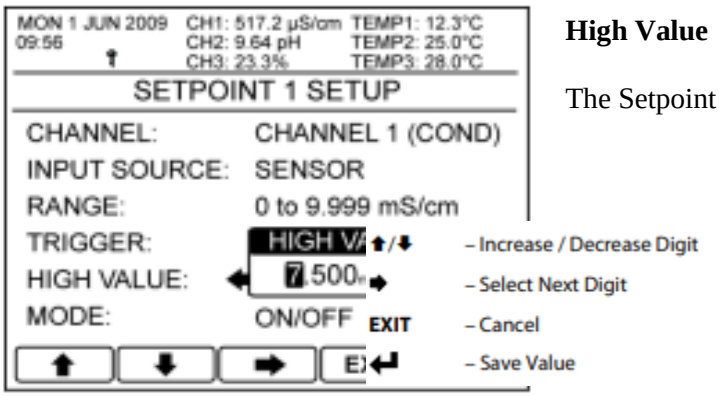
Latch High

The setpoint will activate when the associated Sensor Input Channel's input is greater than the setpoint high level and will remain active until the input falls below the setpoint low level. It will then remain inactive until the input level rises above the setpoint high level.



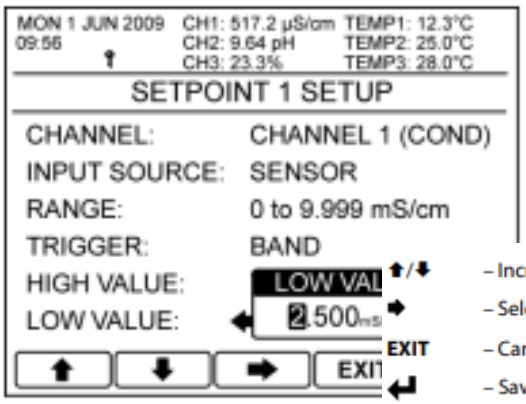
Latch Low

The setpoint will activate when the associated Sensor Input Channel's input is less than the setpoint low level and will remain active until the input rises above the setpoint high level. It will then remain inactive until the input level falls below the setpoint low level.



High Value

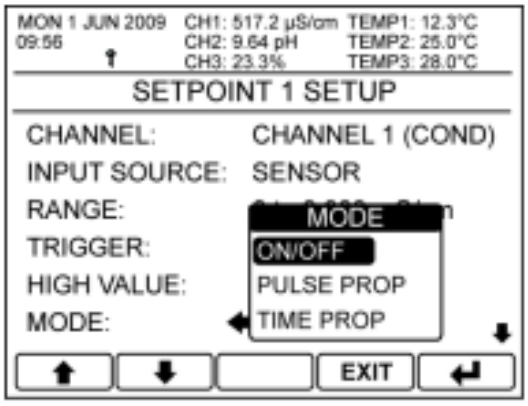
The Setpoint High value.



↑/↓ – Increase / Decrease Digit
→ – Select Next Digit
EXIT – Cancel
↵ – Save Value

Low Value

The Setpoint Low value.



Mode

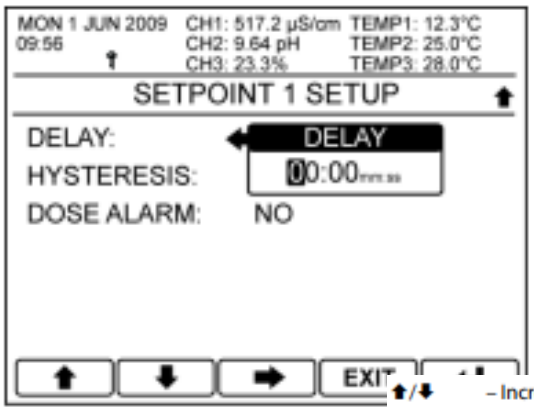
The Setpoints can operate in one of three modes.

On/Off Mode – The setpoint energizes when the setpoint is activated and de-energizes when the setpoint is de-activated.

Pulse Proportional – See Setpoint proportional Mode Section.

Time Proportional – See Setpoint proportional Mode Section.

↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

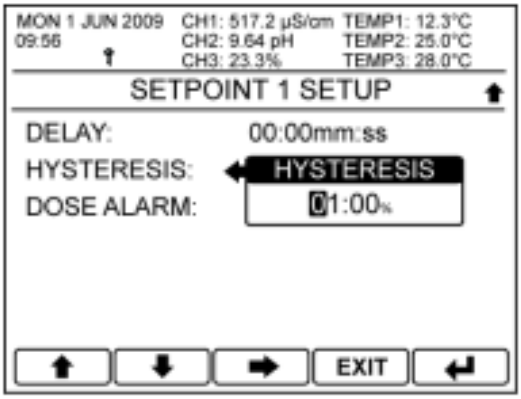


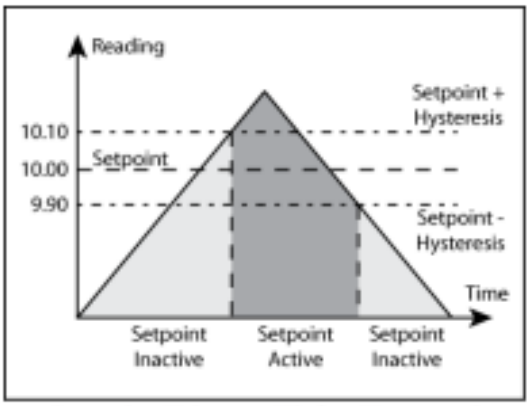
↑/↓ – Increase / Decrease Digit
→ – Select Next Digit
EXIT – Cancel
↵ – Save Value

Delay

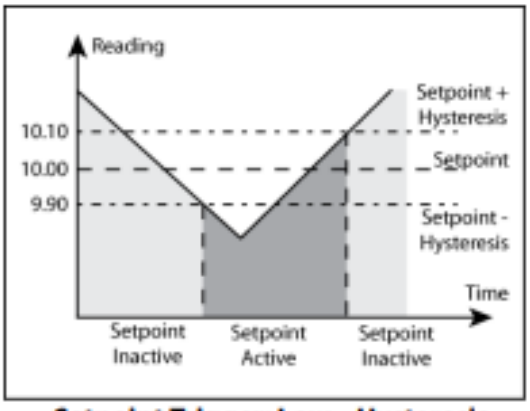
In order to prevent short duration changes at the input affecting the setpoint operation a delay can be set before the setpoint is energized. If the input is still the same after the delay, then the setpoint will be energized.

Note- Only available when Trigger is set to High or Low and Mode is On/Off.





Setpoint Trigger: High – Hysteresis



Setpoint Trigger: Low – Hysteresis

Hysteresis

A facility to apply hysteresis to the setpoint level allows the user to avoid setpoint "Chatter" when the sensor input level approaches the setpoint level.

"Chatter" is caused when the sensor input is sufficiently close to the set point value and noise on the signal repeatedly crosses the set point level, thus causing the relay to switch on and off rapidly.

The hysteresis level should therefore be set to be greater than the input noise level.

The Hysteresis value is a percentage of the setpoint value applied both + and – to the setpoint. For example, if the setpoint was 10.00 and the Hysteresis was 1% then the hysteresis band would operate from 9.90 to 10.10.

Hysteresis operates as follows:

Trigger High – The setpoint is inactive until the reading is greater than the Setpoint High + (Setpoint High X Hysteresis %). It remains active until it goes below Setpoint High – (Setpoint High X Hysteresis %).

Trigger Low – The setpoint is inactive until the reading is less than the Setpoint Low – (Setpoint Low X Hysteresis %). It remains active until it goes above Setpoint Low + (Setpoint Low X Hysteresis %).

Trigger Band – The setpoint uses both high and low.

Note. Hysteresis is only available when setpoint trigger is set to High, Low or Band.

↑/↓ – Increase / Decrease Digit

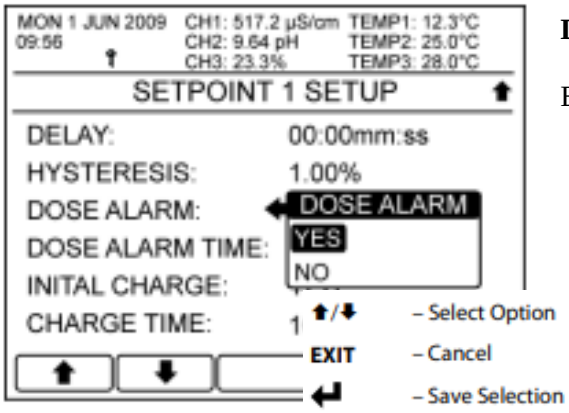
→ – Select Next Digit

EXIT – Cancel

↵ – Save Value

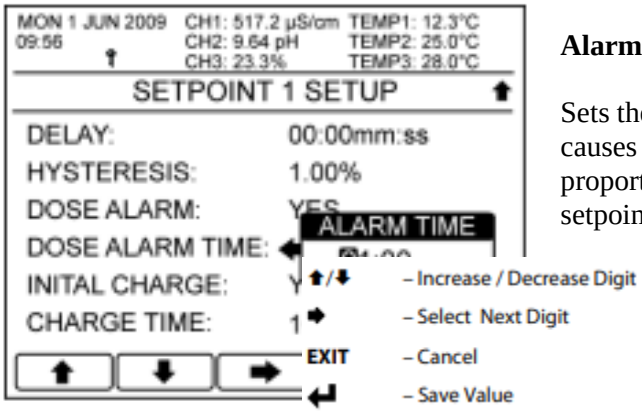
7.2 SETPOINT DOSE ALARM

The dose alarm timer can be used to prevent overdosing under many different fault conditions, such as sensor failure or application problems.



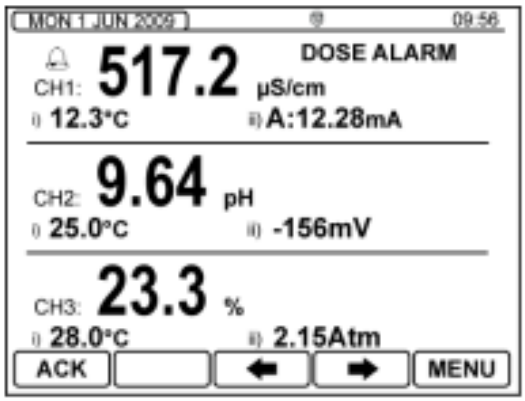
Dose Alarm

Enable the dose alarm for the selected setpoint.



Alarm Time

Sets the time which if the setpoint is active for longer than causes the dose alarm to activate. During pulse or time proportional mode the cumulative “on” time that the setpoint is active will be measured.

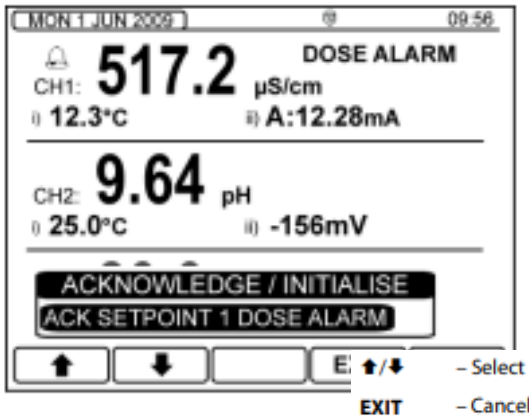


Dose Alarm Active

When the dose alarm activates the following happens:-

- The setpoint will de-energize.
- The associated setpoint led will flash.
- The Dose Alarm error message will appear next to the associated input channel on the front screen.
- ACK will appear as a function to acknowledge the setpoint on the front screen.
- An error will be set for that input channel.

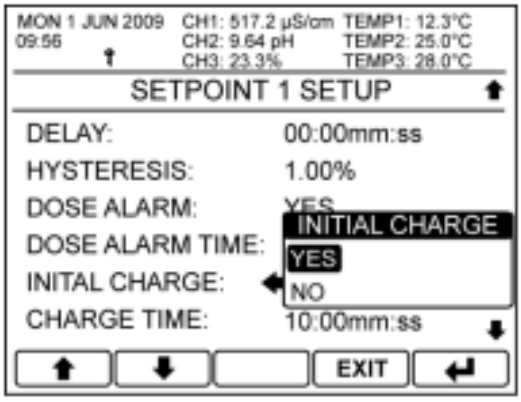
ACK – Enter Setpoint Acknowledge Menu
⬅/➡ – Scroll Around Menus
Menu – Access Main Menu



Dose Alarm Acknowledge

To cancel the dose alarm and reactivate the setpoint, select the required setpoint from the shown list and press enter.

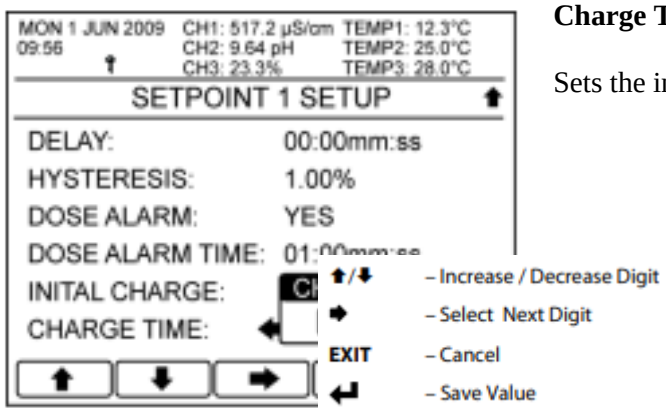
Note – If, once reset, the setpoint again remains energized for the length of the dose alarm timer then the dose alarm will once again activate. If this problem persists then a dosing problem will need to be investigated.



Initial Charge

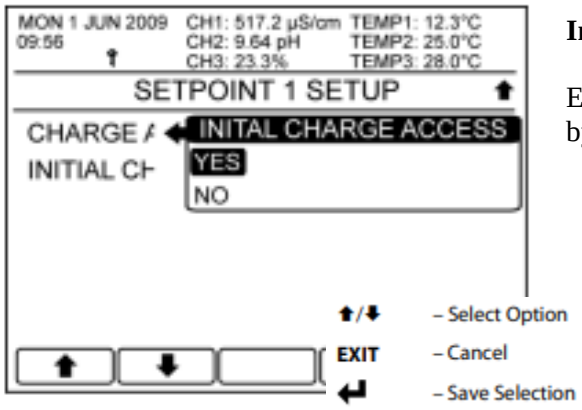
This allows the user to have a one-time over-ride of the Dose Alarm to use for example when filling a tank for the first time.

The user enters a charge time and then initiates the charge time. The unit will then disable the dose alarm until either the relay becomes inactive because the setpoint has been reached or the charge timer reaches zero in which event the unit will automatically display a Dose Alarm.



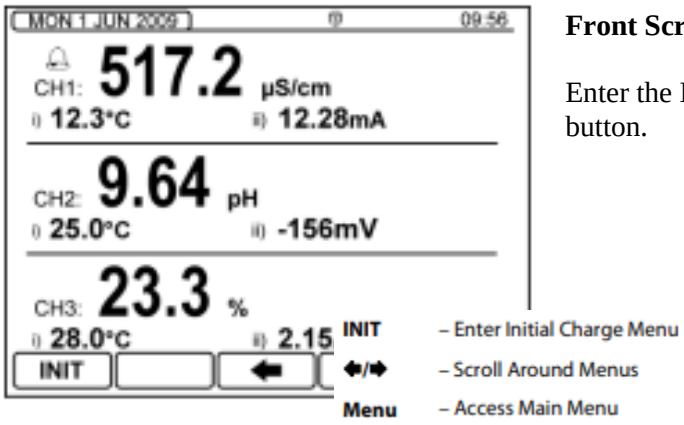
Charge Time

Sets the initial charge time.



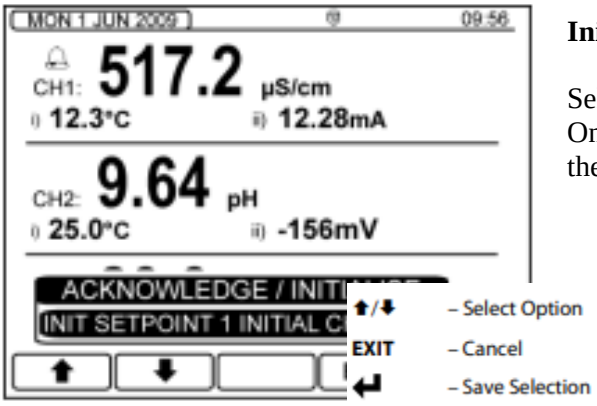
Initial Charge Access

Enabling this allows the user to initialize the initial charge by means of a menu on the front screen.



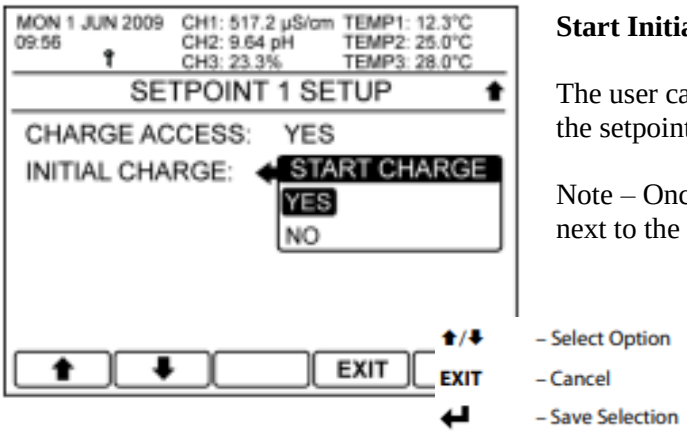
Front Screen Initial Charge

Enter the Initial Charge Menu by means of the INIT button.



Initialize Initial Charge

Select which setpoint to initialize the initial charge. Note – Once started the Initial charge timer will appear next to the associated input channel on the front screen



Start Initial Charge

The user can also start the initial charge via this option in the setpoint menu.

Note – Once started the Initial charge timer will appear next to the associated input channel on the front screen.

7.3 SETPOINT PROPORTIONAL ALARM

In addition to On/Off mode, the 4073 also provides two forms of pseudo proportional control which can be used to control the levels to a defined value when used in conjunction with a pump or valve. When the reading deviates from the programmed set point level, the relay pulses at a rate proportional to that deviation. Note – Only available when Setpoint Trigger is set to either High or Low.

Pulse Proportional Mode

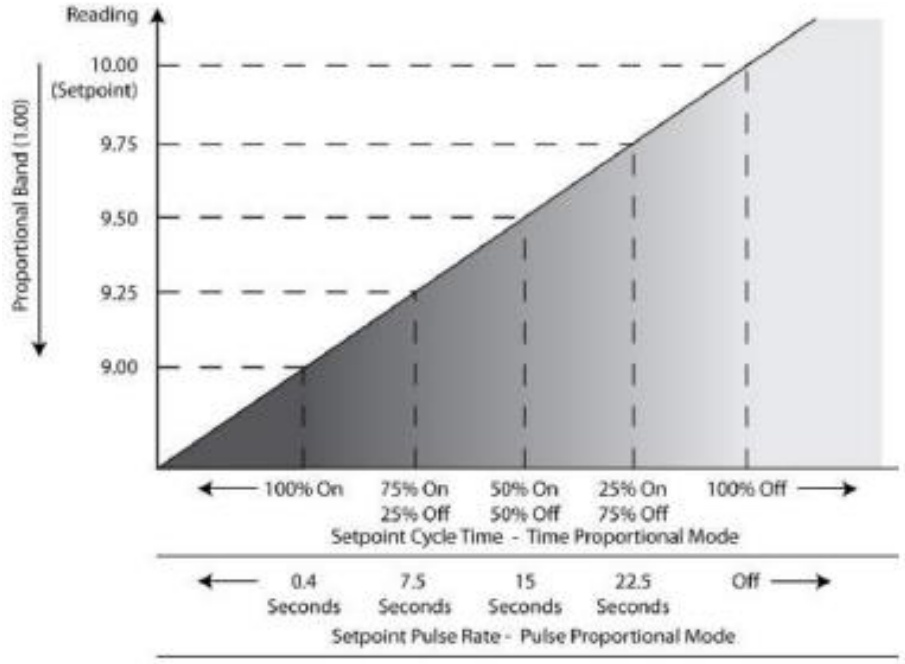
The Pulse Proportional mode is intended to drive solenoid type dosing pumps which have the facility to accept an external pulse input. The setpoint relay operates by producing a pulse of 0.2 seconds in duration and with a maximum period of one pulse per 30 seconds. The pulse rate increases as the measurement moves further from the set point, until it reaches the minimum period of one pulse per 0.4 seconds at the limit of the proportional band.

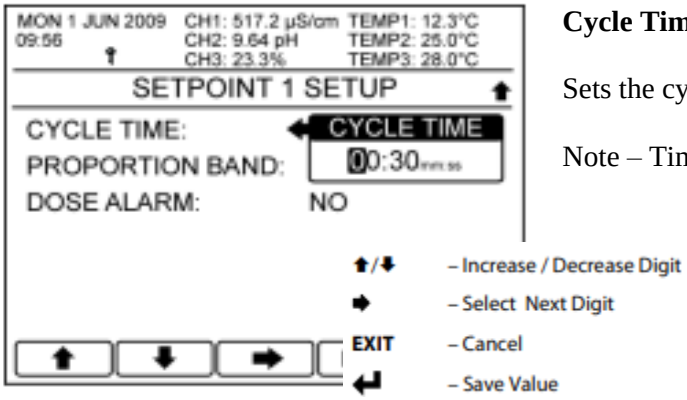
For example if the user sets a proportional band of 1.00, the setpoint trigger to LOW, and a setpoint value of 10.00. When the reading falls just below 10.00, the setpoint will begin to pulse at its longest period of once per 30 seconds. As the reading falls further from the setpoint the period will decrease until it reaches its minimum of one pulse every 0.4 seconds at the limit of the proportional band. (See Setpoint Pulse Rate – Pulse Proportional Mode section on the diagram below.)

Time Proportional Mode

Time Proportional Mode allows a user defined cycle time to control any on/off device such as a solenoid valve or dosing pump over a user set proportional band.

For example if the user sets a proportional band of 1.00, the setpoint trigger to LOW, and a setpoint value of 10.00. When the reading falls below 9.00 the setpoint would be energized 100% of the cycle time. As the input rises and approaches the set point the setpoint starts to cycle on and off with the on time reducing and the off time increasing, respectively until it reached the setpoint and would be off for 100% of the cycle time. The cycle time is adjustable and is the sum of the on and off times. (See Setpoint Cycle Time – Time Proportional Mode section on the diagram below.)





↑/↓ – Increase / Decrease Digit

→ – Select Next Digit

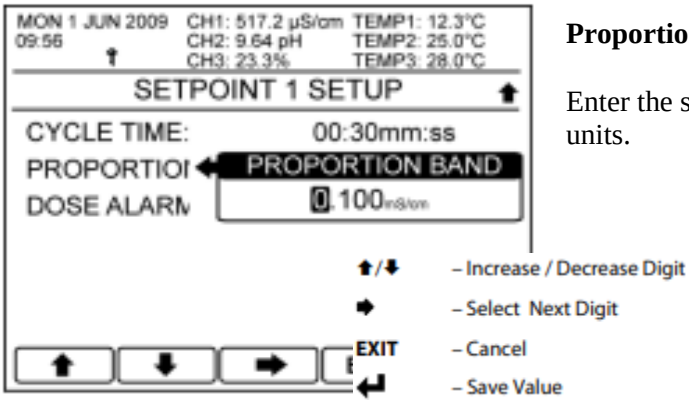
EXIT – Cancel

↵ – Save Value

Cycle Time

Sets the cycle time (sum of both On and Off periods).

Note – Time Proportional mode only



↑/↓ – Increase / Decrease Digit

→ – Select Next Digit

EXIT – Cancel

↵ – Save Value

Proportional Band

Enter the size of the proportional band in measurement units.

7.4 SETPOINT ALARM MODE

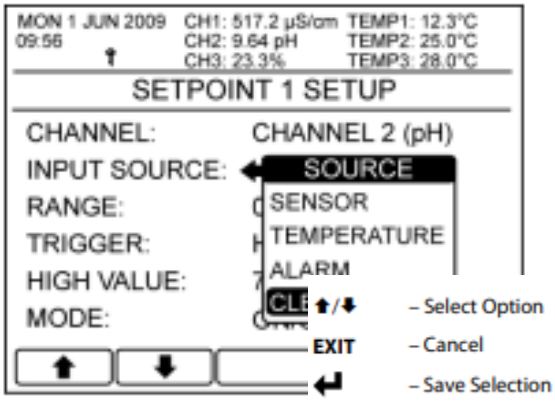
By Selecting Alarm in the setpoints input source the setpoint can be configured as an alarm output triggered by one of a number of events.

- **Sensor Error** – When a sensor related error is detected on the associated sensor input channel.
- **Dose Alarm** – When any of the dose alarms active on a setpoint associated with this setpoints sensor input channel.
- **Calibration** – When a calibration is in progress on the associated sensor input channel.
- **Off-Line** – When the associated sensor input channel has been taken "Off-Line."
- **Any Error** – When any error is detected on the associated sensor input channel.
- **Cleaning** – When a cleaning operation is in progress on a setpoint associated with this setpoints sensor input channel.
- **Calibration Due** – When if enabled the calibration due timer has expired on the associated sensor input channel.
- **Gain Error** – When a gain error is present on the associated sensor input channel. Only available when set to a suspended solids input channel.
- **Power Failure** – Holds the relay in a permanently energized state until the unit is powered down. Only available when using unit alarm

Note – By selecting Unit Alarm in the setpoint channel option each alarm option will activate if they occur on any of the instruments three sensor input channels.

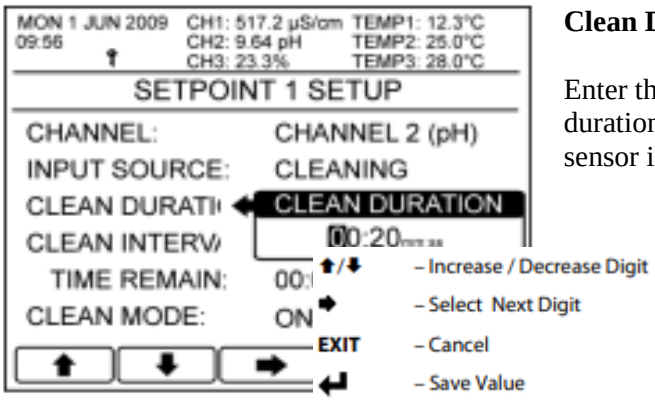
7.5 SETPOINT CLEANING MODE

The Setpoints can be configured to operate a jet spray wash or rotary electrode cleaning system on a timed cycle. Its purpose is to prevent accumulation of particulate matter on the active surfaces of the sensor. Note that cleaning is not available on all sensor input types.



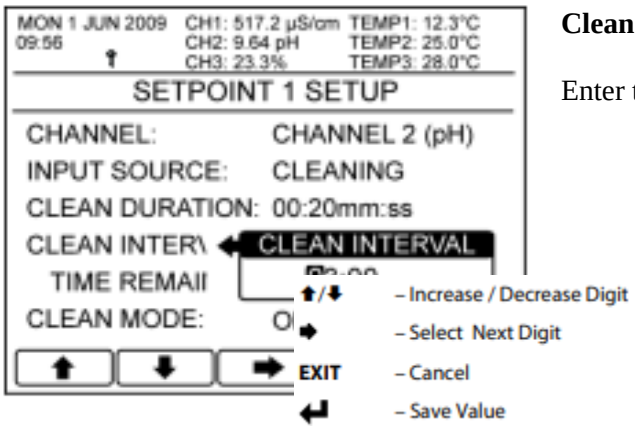
Input Source

If available select cleaning from the list of options.



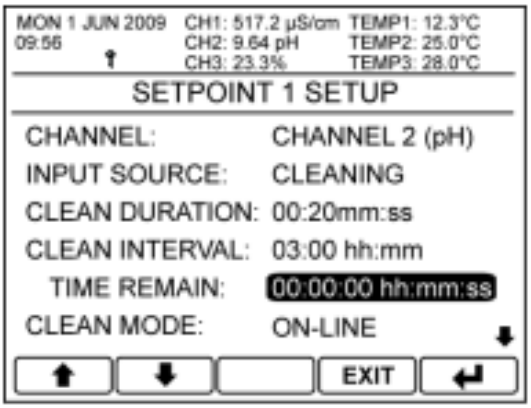
Clean Duration

Enter the duration of the cleaning operation. For the duration of the clean, cleaning will appear in the associated sensor input display section on the front screen.



Clean Interval

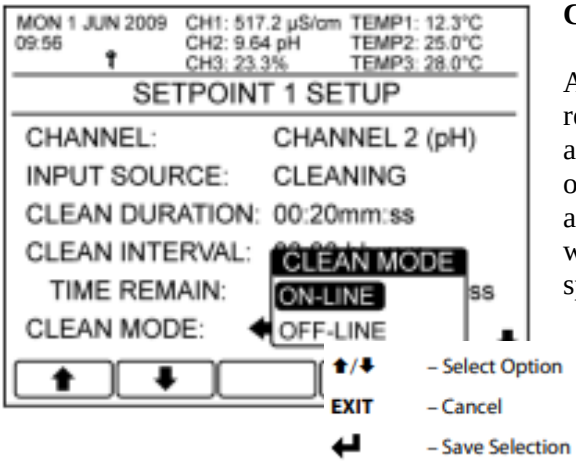
Enter the time between cleaning operations.



Time Remaining

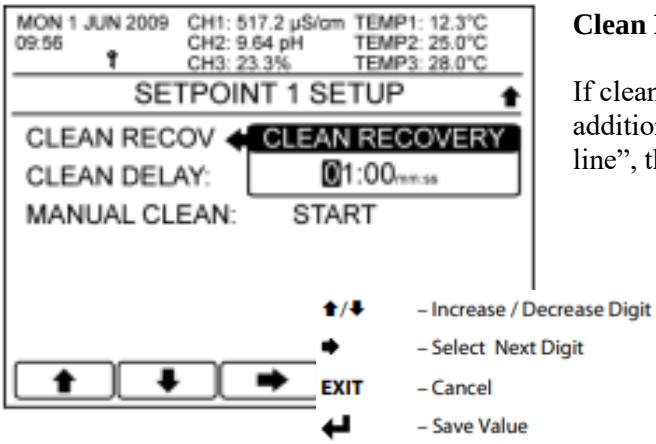
Shows the time remaining until the next clean operation.

Note – Cannot be edited.



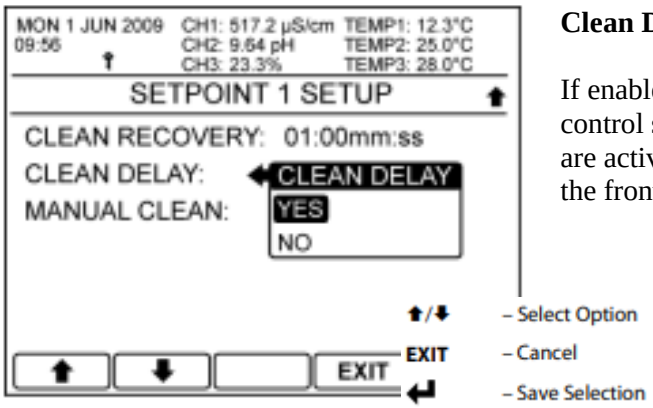
Clean Mode

Associated sensor input channel state when cleaning. It is recommended that off-line is selected. This will automatically take the associated sensor input channel offline, de-energize associated setpoints and hold associated current outputs, during a clean operation. This will prevent any undesired control actions resulting from spraying cleaning solution onto the sensor.



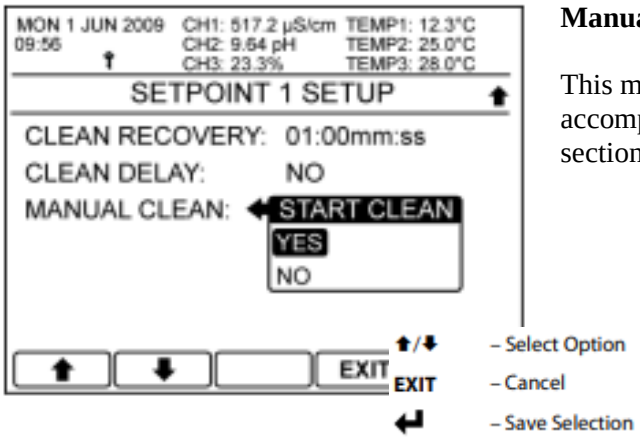
Clean Recovery

If cleaning “Off-line” then the user can introduce an additional post cleaning delay before coming back “On-line”, this provides the sensor a period to stabilize.



Clean Delay

If enabled this causes the clean cycle to wait if any other control setpoints associated with the sensor input channel are active. This is shown by a clean delayed message on the front screen.

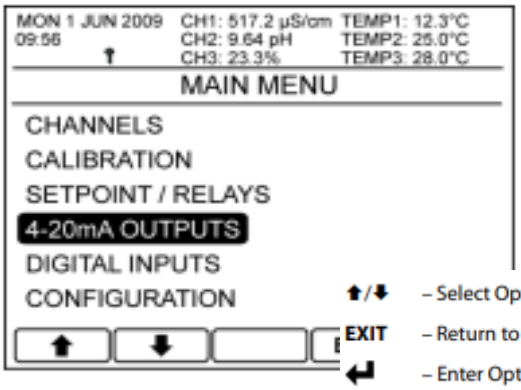


Manual Clean

This manually starts a clean cycle. Note this can also be accomplished via the digital inputs, see Digital Inputs section.

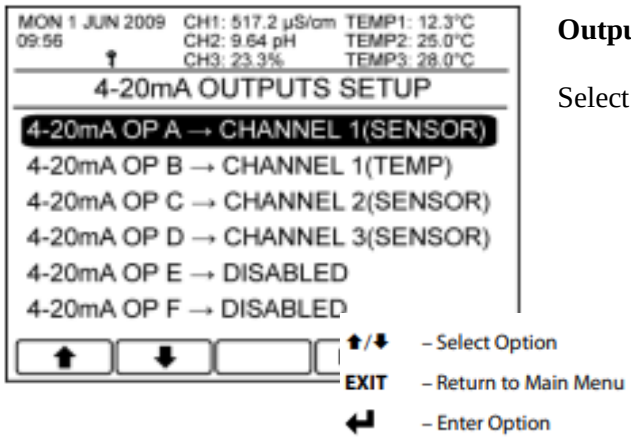
7.6 CURRENT OUTPUTS

The 4073 can be fitted with up to six current outputs designated A – F. Each individual current output can be assigned to any one of the Sensor Input Channels. 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 or alternatively if displaying only one sensor input channel, two trends can be shown on the front screen (see Configuration – Setup Front Screen , User Interface).



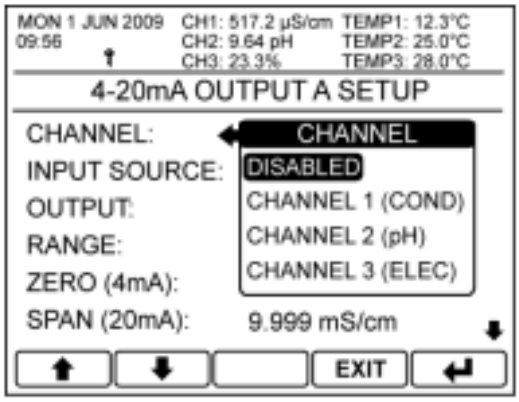
Main Menu

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



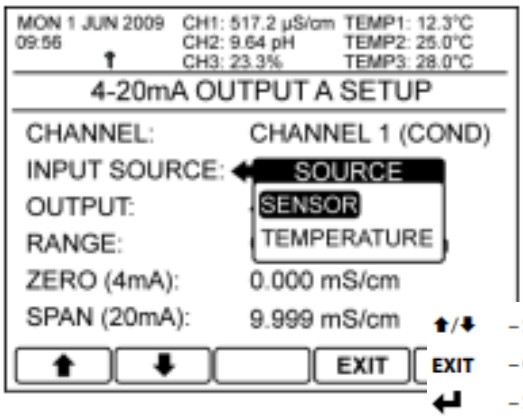
Outputs Setup

Select the Current Output you wish to edit.



Channel

The “Sensor Input Channel” the current output is to be associated with. The channels shown depend on the configuration of the instrument. To disable the current output select the disabled option. This will turn off the output, remove it’s reading from the front screen, the current output trend screen and the menu header. It will also clear any error messages associated with it.

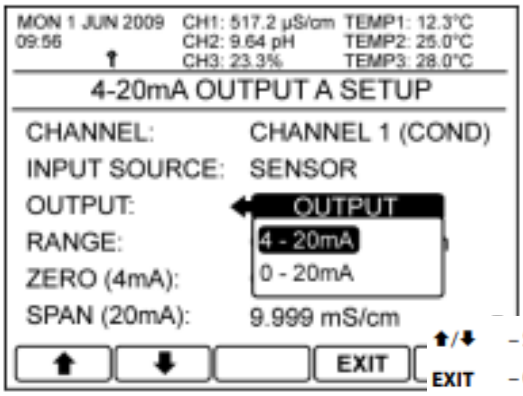


↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

Input Source

The input source for the selected current output.

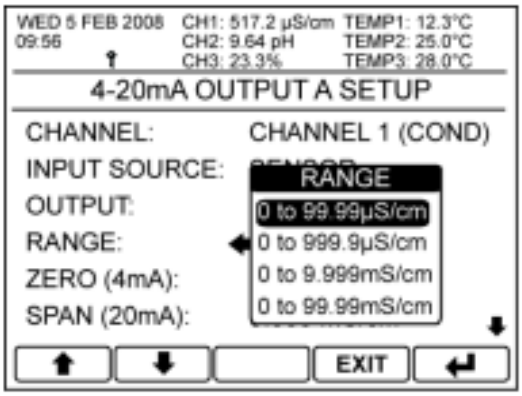
Available options vary depending on whether the appropriate source is enabled in the channel's setup menu.



↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

Output

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

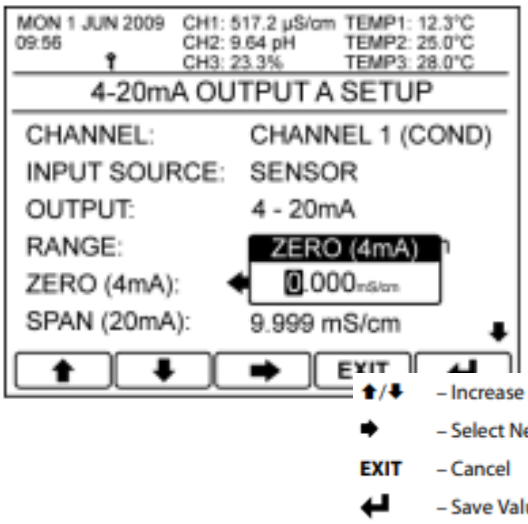


↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

Range

The current output's operating range. This is only available if the associated Sensor Input Channel has a range option and is set to Auto in the channel's setup menu.

The available options will depend on the cell constant of the sensor used, consult the input cards manual form more information.

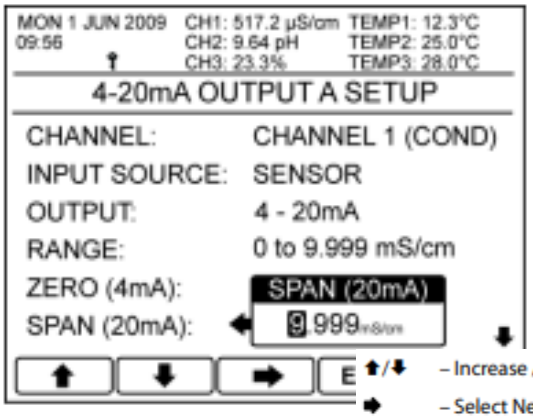


↑/↓ – Increase / Decrease Digit
→ – Select Next Digit
EXIT – Cancel
↵ – Save Value

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.

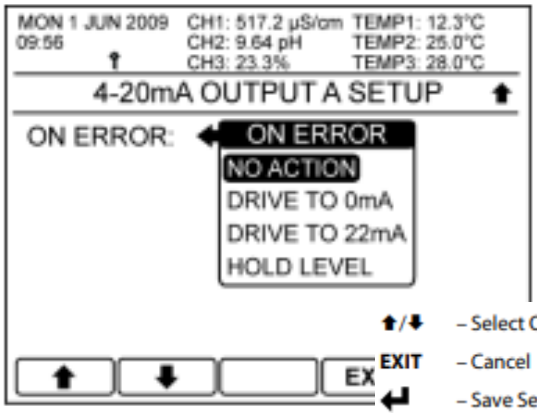


↑/↓ – Increase / Decrease Digit
→ – Select Next Digit
EXIT – Cancel
↵ – Save Value

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.



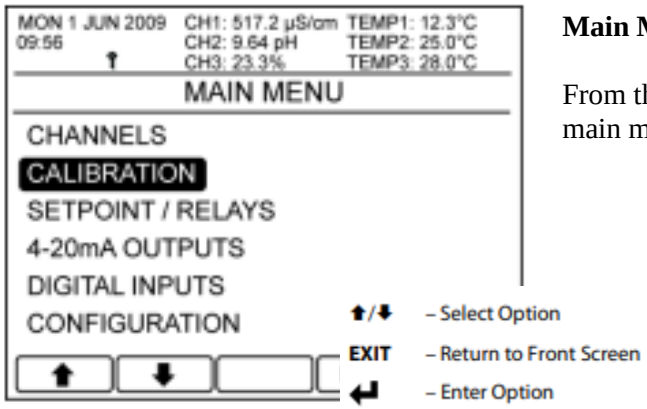
↑/↓ – Select Option
EXIT – Cancel
↵ – Save Selection

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.

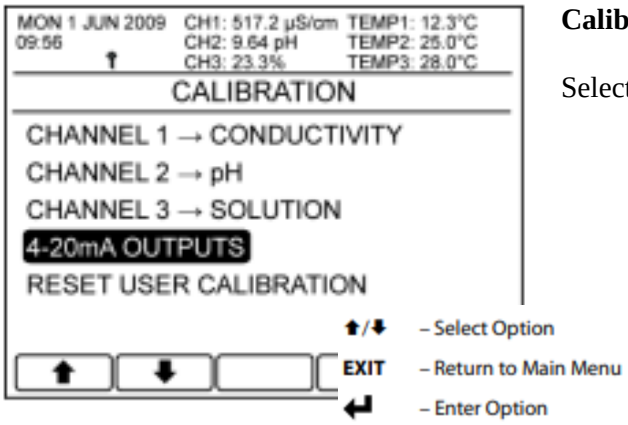
7.6.1 CURRENT OUTPUT CALIBRATION

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.



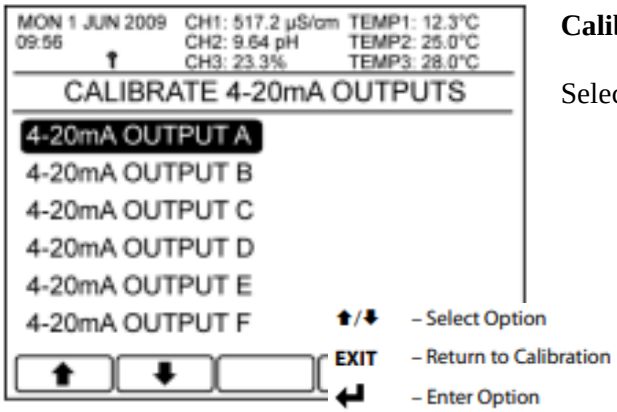
Main Menu

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



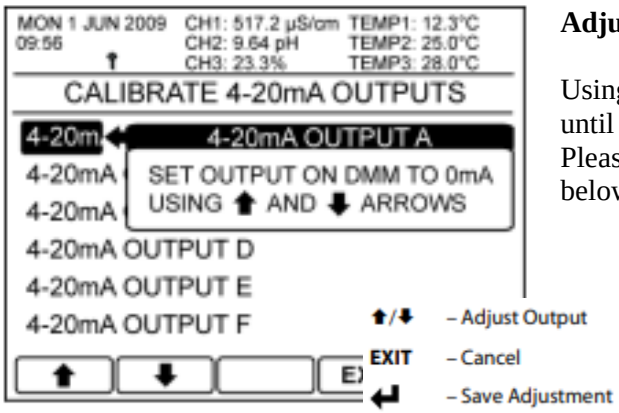
Calibration

Select 4-20mA Outputs.



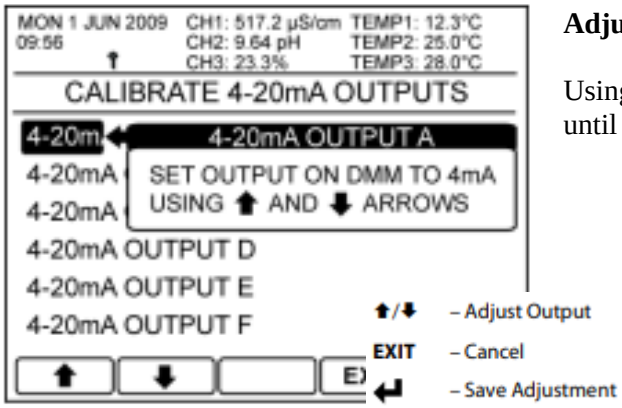
Calibrate 4-20mA Outputs

Select the current output you wish to calibrate.



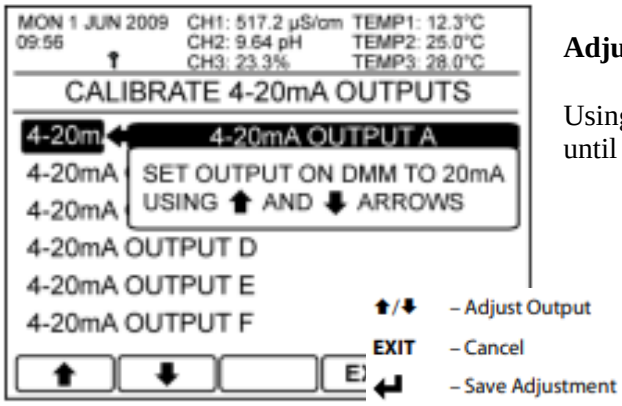
Adjust 0mA Output

Using the up and down 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 4mA Output

Using the up and down buttons, adjust the current output until it reads the desired value on your current meter.

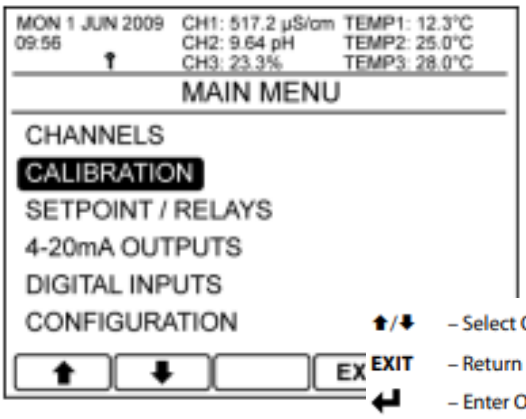


Adjust 20mA Output

Using the up and down buttons, adjust the current output until it reads the desired value on your current meter.

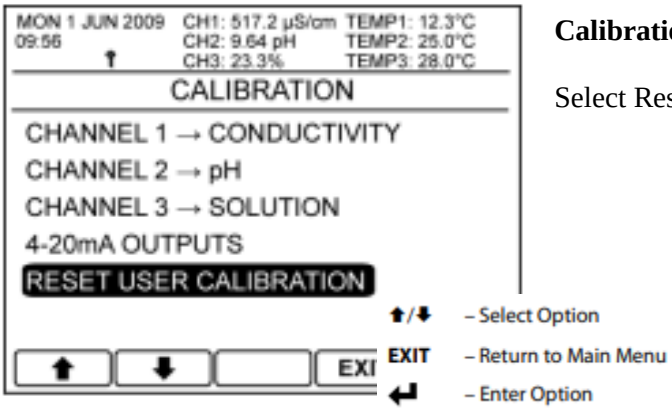
7.6.2 RESETTING THE CURRENT OUTPUT USER CALIBRATION

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



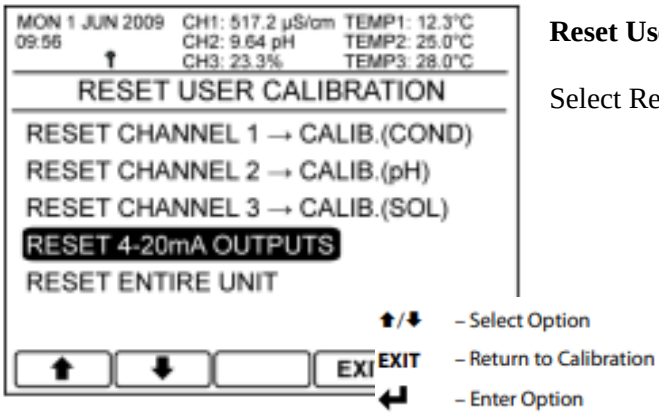
Main Menu

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



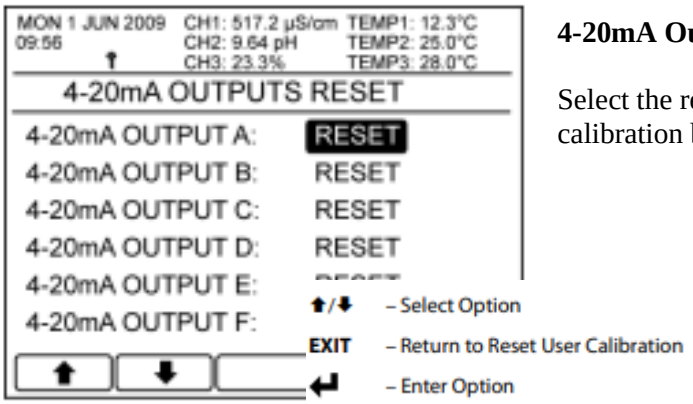
Calibration

Select Reset User Calibration.



Reset User Calibration

Select Reset 4-20mA Outputs.

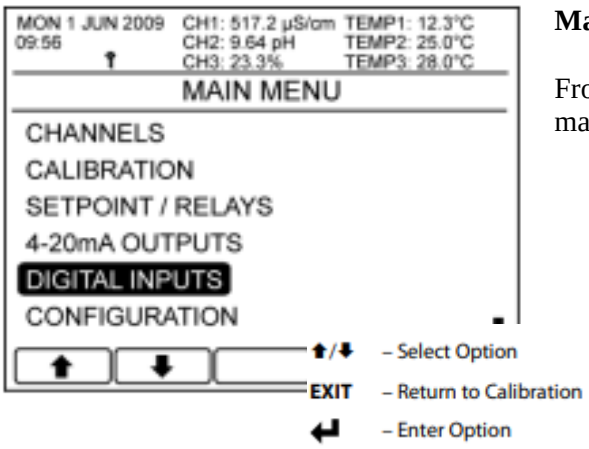


4-20mA Outputs Reset

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

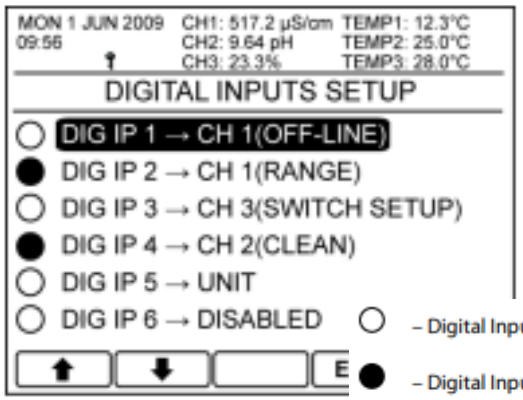
7.7 DIGITAL INPUTS

The 4073 is fitted with eight digital inputs designated 1 – 8. Each individual digital input can be assigned to any one of the Sensor Input Channels or to the instrument as a whole. The digital input menu contains all of the necessary setup functions to configure the digital input sources. These inputs are intended to be switched using a volt free link, switch or relay. The user can select whether closing or opening the contact initiates the configured action.



Main Menu

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



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

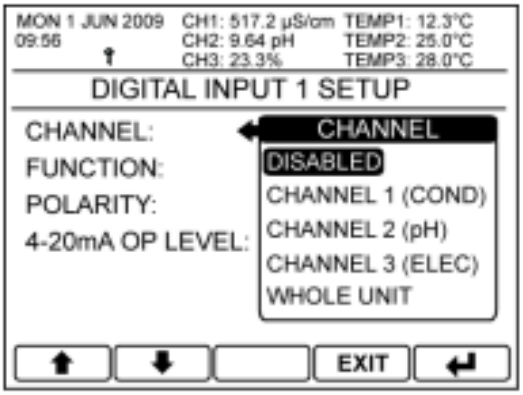
○ – Digital Input Open Circuit

● – Digital Input Closed Circuit

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Channel

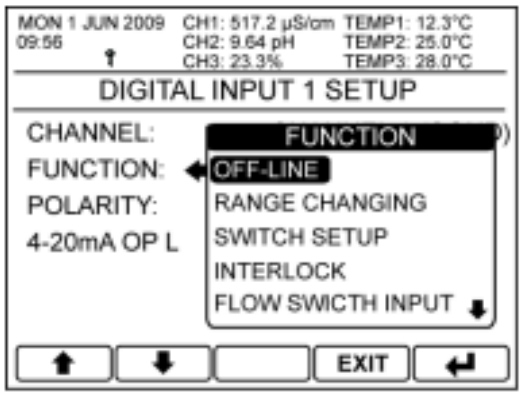
The “Sensor Input Channel” the digital input is to be associated with. The channels shown depend on the configuration of the instrument. Alternatively, if Whole Unit is selected, the action will affect all of the input channels.

To disable the digital input select the disabled option.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Function

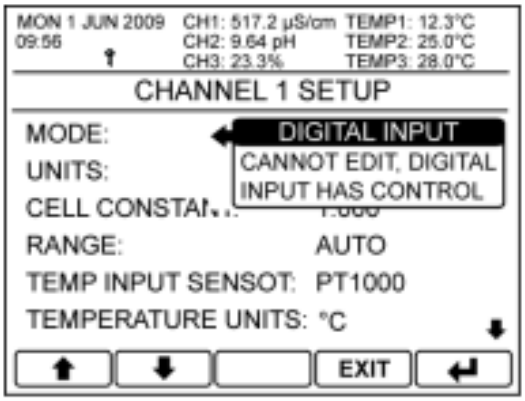
The digital input can be configured to operate in the following ways:

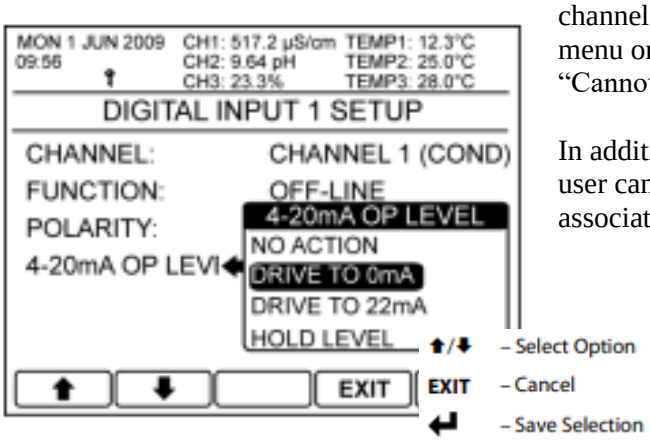
- Offline
- Interlock
- Flow Switch Input
- Tank Level Switch
- Clean
- Range Changing
- Switch Setup
  - Calibration
  - CIP

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection





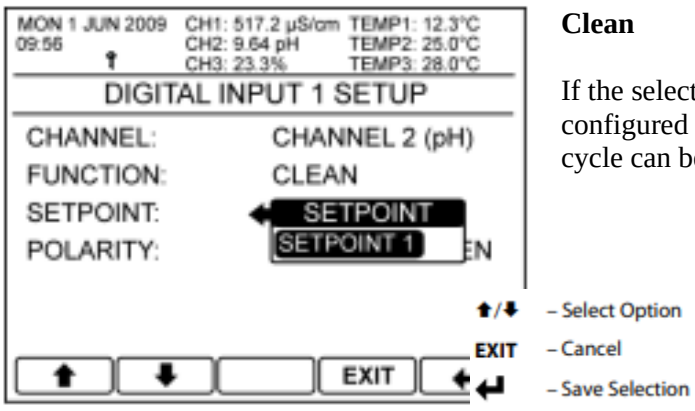
Offline, Interlock, Flow Switch Input, Tank Level Switch

These four functions when active will take the associated sensor input channel “offline”. This causes any setpoints associated with the channel to de-energize.

They are also accompanied by a message on the front screen informing the user which action is currently active.

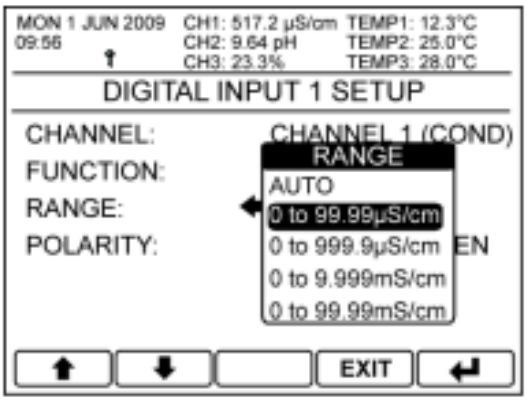
Note – When a digital input is assigned to one of these functions the user can no longer take the associated channel offline using the menu item in the channel setup menu or the channel calibration menu. As indicated by the “Cannot Edit, Digital Input Has Control” message.

In addition to de-energizing any associated setpoints, the user can also define the operation the current outputs associated with the sensor input channel.



Clean

If the selected, Input Sensor Channel has a setpoint configured for a cleaning operation, an external cleaning cycle can be initiated using this function.



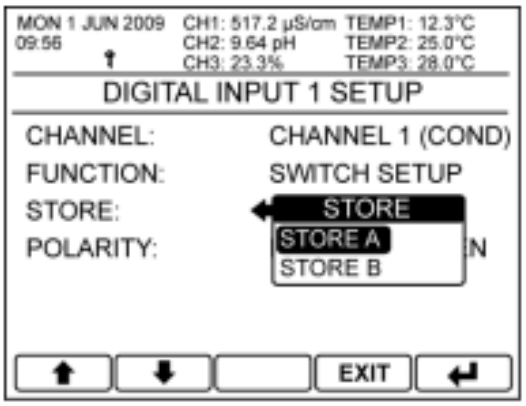
Range Changing

The digital input is used to change the displayed range of the selected sensor input channel. This also affects the operating range of both the setpoints and current outputs associated with the sensor input channel. When Auto is selected the setpoints and current outputs will revert to the internally set ranges.

The available options will depend on the cell constant of the sensor used, consult the input cards manual for more information.

Note – This is only available if the associated Sensor Input Channel has a range option.

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



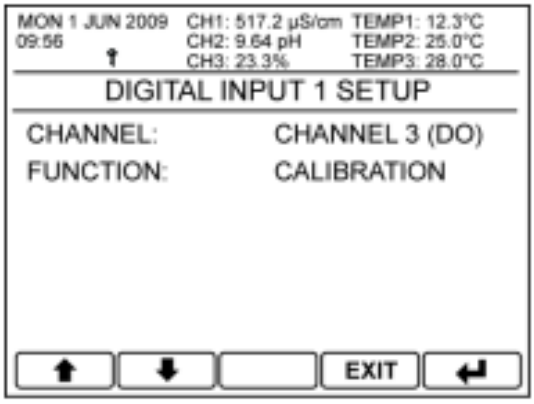
Switch Setup

The digital input is used to load in an alternative sensor input channel configuration (Sensor Setup, Setpoint Setup and Current Output Setup) that have been stored in one of the two internal channel stores. Whilst the digital input is active no parameters assigned to the sensor input channel can be edited. The original configuration is restored upon the digital input going inactive.

For information regarding saving the setup, see the Save and Restore section of the user interface guide.

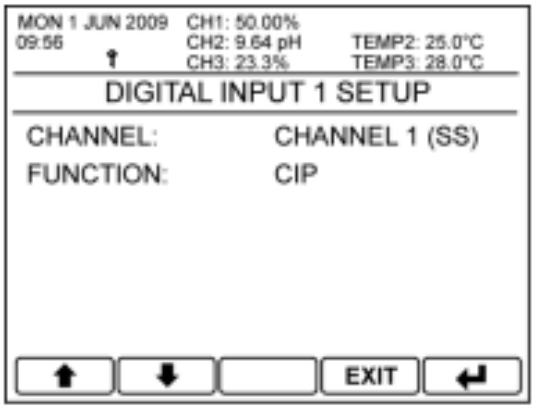
NOTE – Only one store at a time can be loaded per channel.

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



Calibration

Initialize a dissolved oxygen span calibration. See Dissolved Oxygen input card manual for more information.

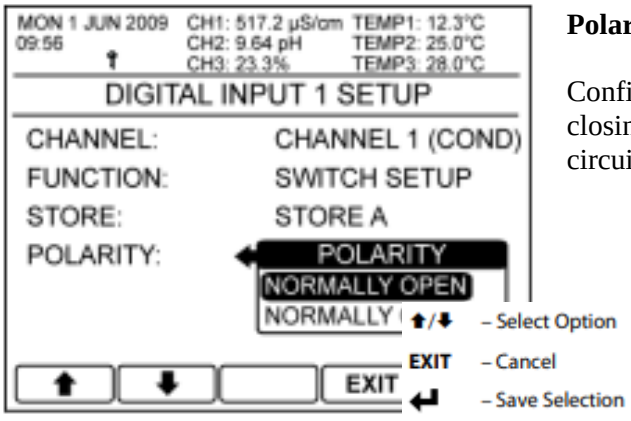


CIP

The CIP input indicates to the associated sensor channel that a CIP event is in progress so that the sensor can be disabled, to prevent overstressing the probe. When active a “CIP ACTIVE” message appears next to the associated channel and the probe signal will go to 0000.

As this will affect the setpoints and current outputs associated with this channel the user is recommended to assign an additional digital input to this channel set it to offline and energize the digital input in tandem with the CIP input.

Note. CIP is only available on Suspended Solids and Turbidity input channels.

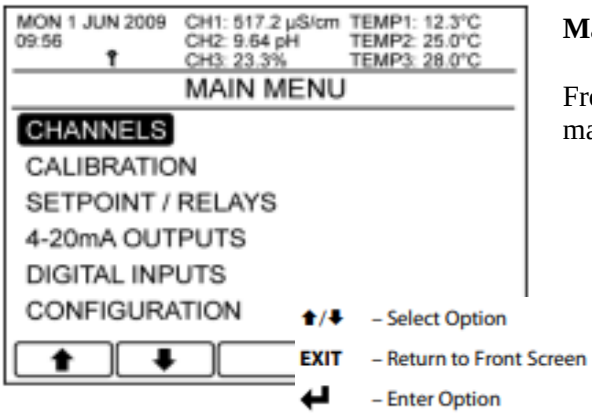


Polarity

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

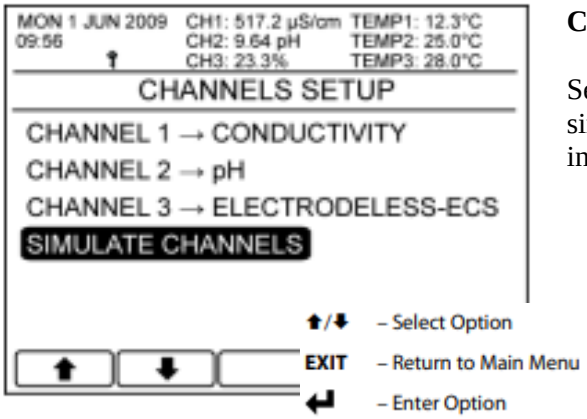
7.8 SIMULATE CHANNELS

The facility exists within the 4073 to simulate the input sensor levels to test the setpoint and current output operation. This function allows the user to cycle up and down through the sensor range whilst displaying the current output level, and with the relays responding accordingly.



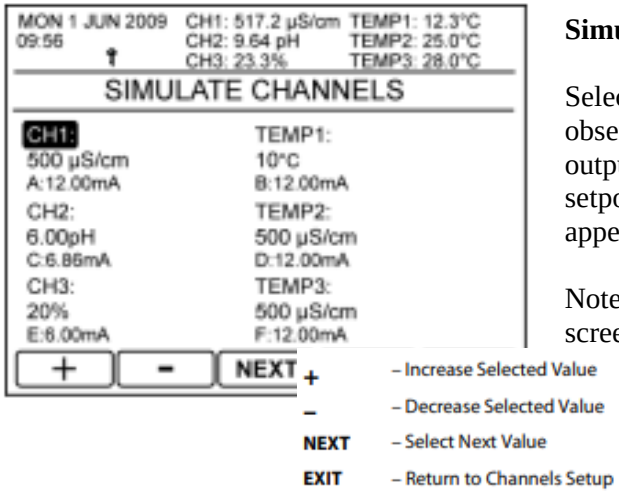
Main Menu

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



Channels Setup

Select Simulate Channels, or alternatively to only simulate one channel select Simulated Input in the individual channel setup menu.



Simulate Channels

Select the sensor or temperature you wish to simulate and observe the associated setpoints operate and current outputs move. Only input sensors or temperatures with setpoints or current outputs associated with them will appear.

Note – This menu will not “time out” back to the front screen.