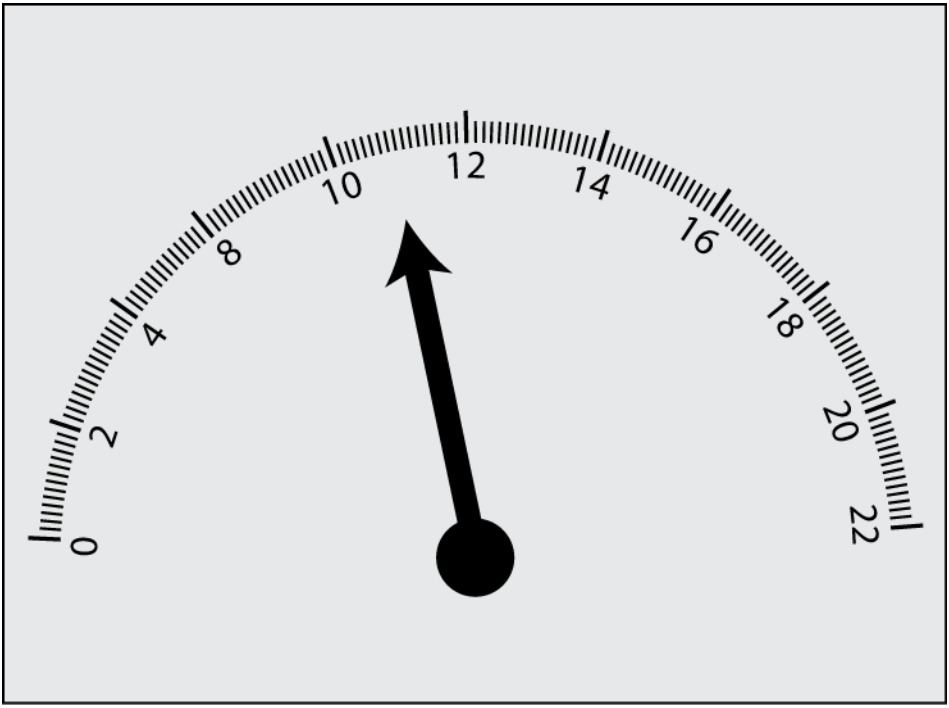
MXD70 SERIES

Multi-parameter Monitor



Setpoints, Current Outputs, And Digital Inputs Configuration Guide

Preface

Product warranty

The MXD70 Series has a warranty against defects in materials and workmanship for three years from the date of shipment. During this period Quadbeam Technologies will, at its own discretion, either repair or replace products that prove to be defective. The associated software is provided 'as is' without warranty.

Limitation of warranty

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

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

Disclaimer

Quadbeam Technologies Ltd reserves the right to make changes to this manual or the instrument without notice, as part of our policy of continued developments and improvements.

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

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MXD70 is a trademark of LTH Electronics Ltd and is used under agreement by Quadbeam Technologies Ltd.

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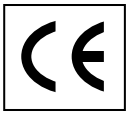
Manufacturing Standards



Electromagnetic compatibility

This instrument has been designed to comply with the standards and regulations set down by the European EMC Directive 2004/108/EC using BS EN 61326-1: 2013

Safety

This instrument has been designed to comply with the standards and regulations set down by the European Low Voltage Directive 2006/95/EC using BS EN 61010-1: 2010

Quality

This instrument has been manufactured under the following quality standard:

ISO 9001:2008. Certificate No: FM 13843

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

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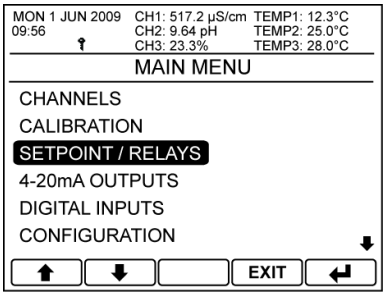
Setpoints

The MXD70 Series 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.



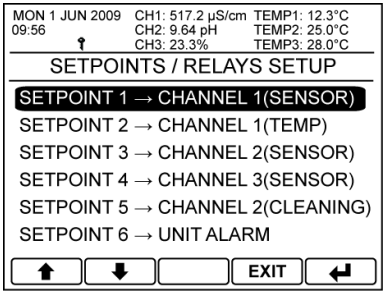
Main Menu

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

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



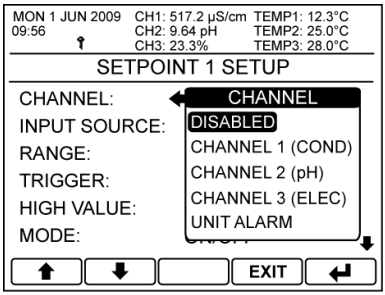
Setpoints / Relays Setup

Select the Setpoint you wish to edit.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



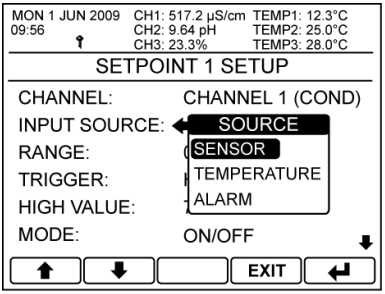
Channel

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



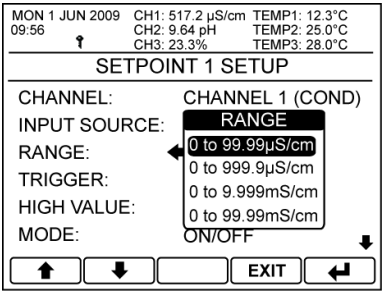
Input Source

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



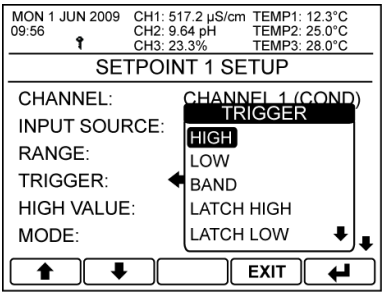
Range

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

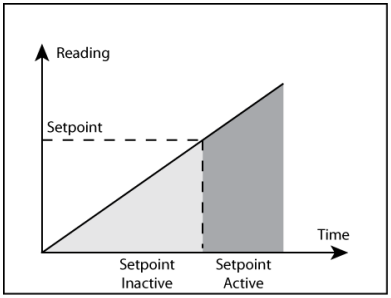
The setpoints can be configured to trigger in the following ways:

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

⬆/⬇ – Select Option

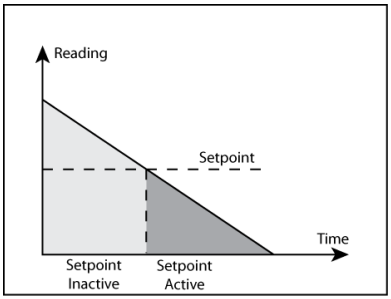
EXIT – Cancel

↵ – Save Selection



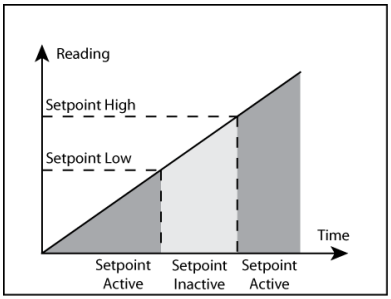
High

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



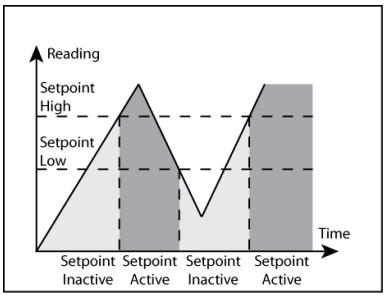
Low

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



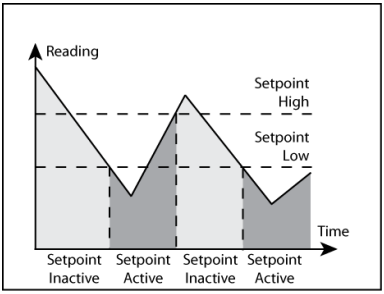
Band

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.



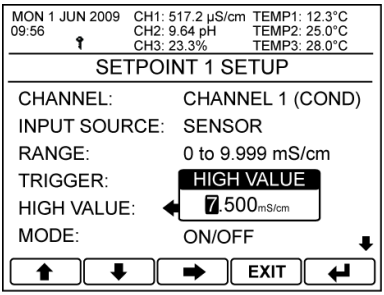
Latch Hi

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

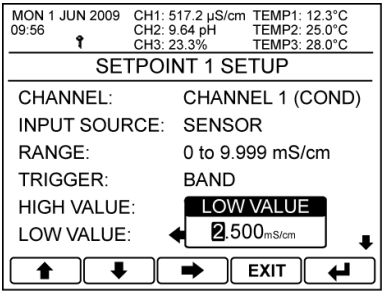
The Setpoint High value.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Low Value

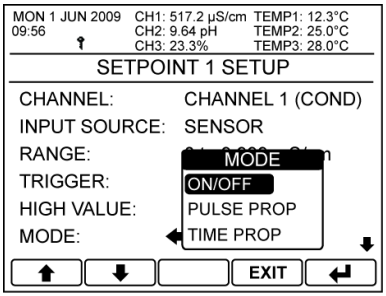
The Setpoint Low value.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Mode

The Setpoints can operate in one of three modes.

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

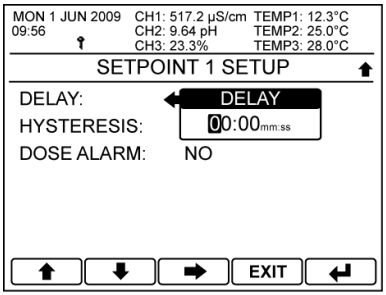
Pulse Proportional – See Setpoint proportional Mode Section.

Time Proportional – See Setpoint proportional Mode Section.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Delay

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

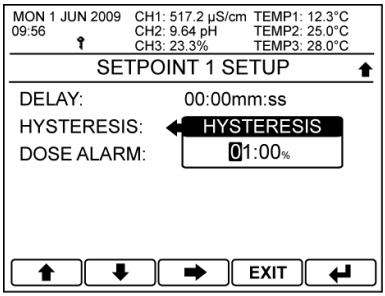
Note- Only available when Trigger is set to High or Low and Mode is On/Off.

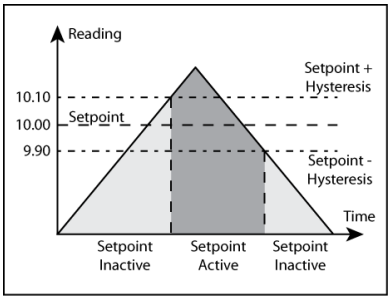
⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

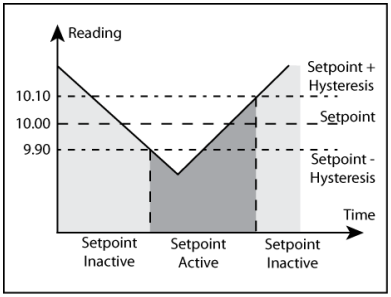
EXIT – Cancel

↵ – Save Value





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

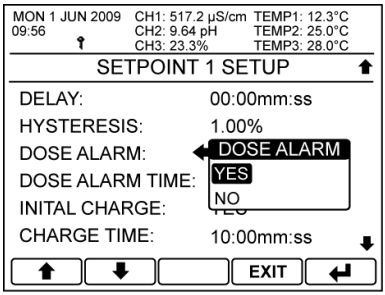
➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value

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.



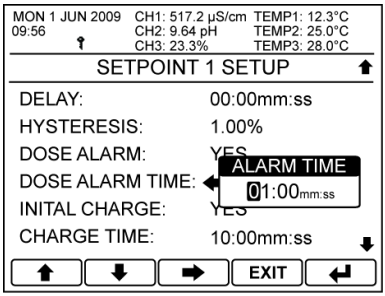
Dose Alarm

Enable the dose alarm for the selected setpoint.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Alarm Time

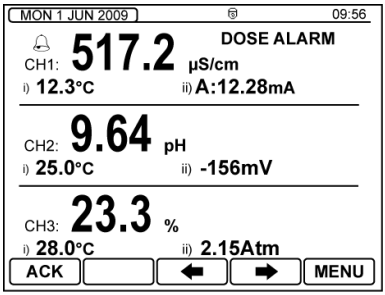
Sets the time which if the setpoint is active for longer than causes the dose alarm to activate.
During pulse or time proportional mode the cumulative "on" time that the setpoint is active will be measured.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Dose Alarm Active

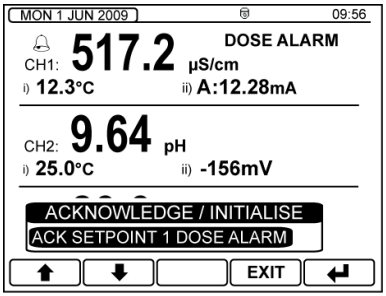
When the dose alarm activates the following happens:-

- The setpoint will de-energise.
- 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



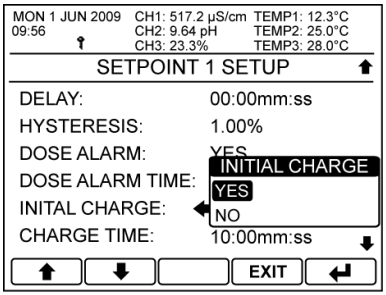
Dose Alarm Acknowledge

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 energised 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.

↑/↓ – Select Option

EXIT – Cancel

↵ – Save Selection



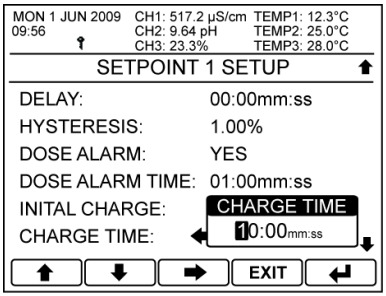
Initial Charge

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.

↑/↓ – Select Option

EXIT – Cancel

↵ – Save Selection



Charge Time

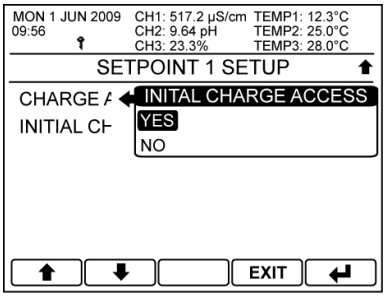
Sets the initial charge time.

↑/↓ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



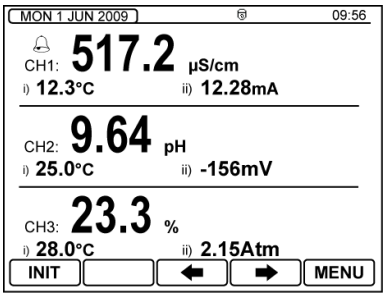
Initial Charge Access

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

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



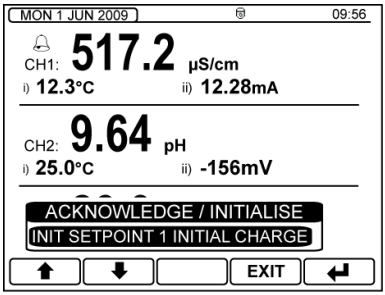
Front Screen Initial Charge

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

INIT – Enter Initial Charge Menu

⬅/➡ – Scroll Around Menus

Menu – Access Main Menu



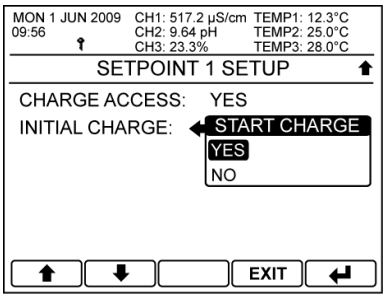
Initialise Initial Charge

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

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



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.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

Setpoint Proportional Mode

In addition to On/Off mode the MXD70 Series 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

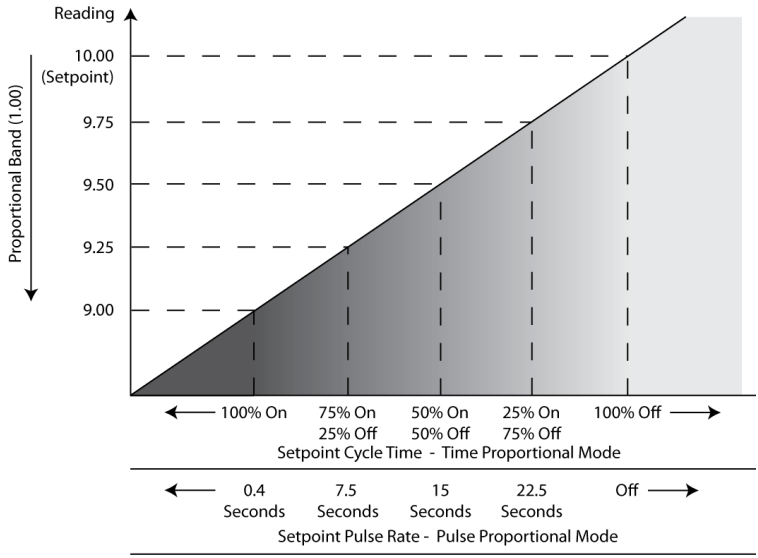
The Pulse Proportional mode is intended to drive solenoid type dosing pumps which have the facility to accept an external pulse input. The setpoint relay operates by producing a pulse of 0.2 seconds in duration and with a maximum period of one pulse per 30 seconds. The pulse rate increases as the measurement 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.

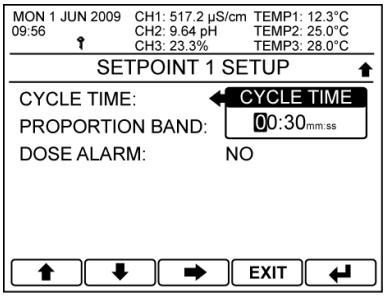
For example if the user sets a proportional band of 1.00, the setpoint trigger to LOW, and a setpoint value of 10.00. When the reading falls just below 10.00 the setpoint will begin to pulse at its longest period of once per 30 seconds. As the reading falls further from the setpoint the period will decrease 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 energised 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.)





Cycle Time

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

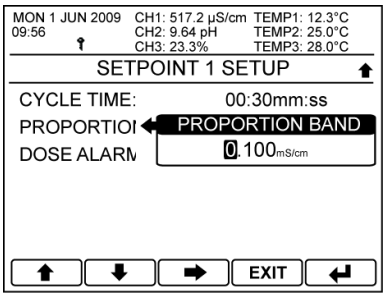
Note – Time Proportional mode only.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Proportional Band

Enter the size of the proportional band in measurement units.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value

Setpoint Alarm Mode

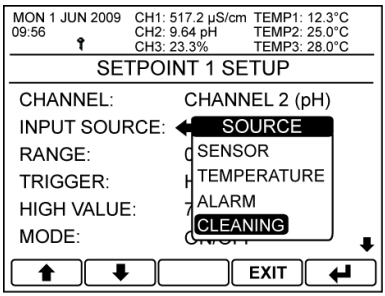
By Selecting Alarm in the setpoints input source the setpoint can be configured as an alarm output triggered by one of a number of events.

- **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 energised 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.

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.



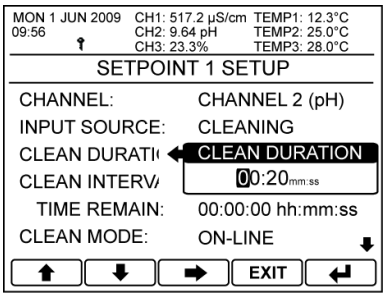
Input Source

If available select cleaning from the list of options.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Clean Duration

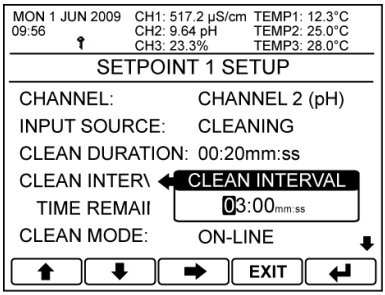
Enter the duration of the cleaning operation.
For the duration of the clean, cleaning will appear in the associated sensor input display section on the front screen.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Clean Interval

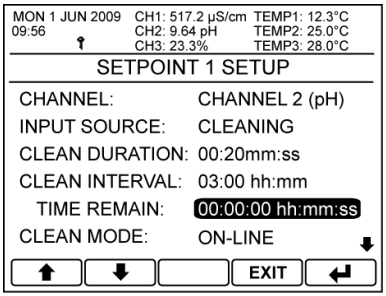
Enter the time between cleaning operations.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

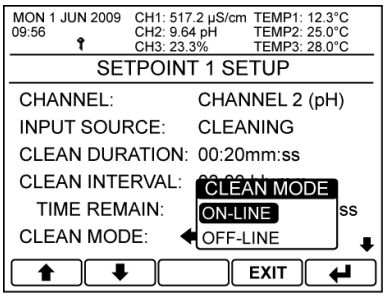
↵ – Save Value



Time Remaining

Shows the time remaining till the next clean operation.

Note – Cannot be edited.



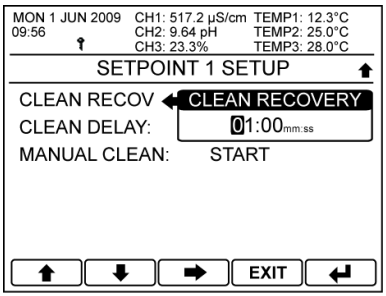
Clean Mode

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-energise 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.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Clean Recovery

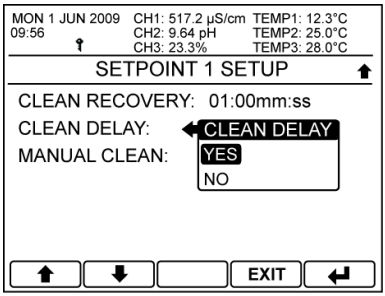
If cleaning "Off-line" then the user can introduce an additional post cleaning delay before coming back "On-line", this provides the sensor a period to stabilise.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



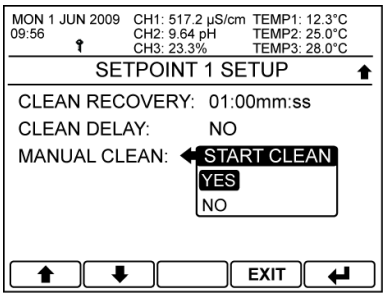
Clean Delay

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.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Manual Clean

This manually starts a clean cycle.

Note this can also be accomplished via the digital inputs, see Digital Inputs section.

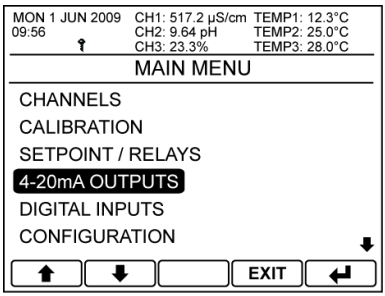
⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

Current Outputs

The MXD70 Series 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).



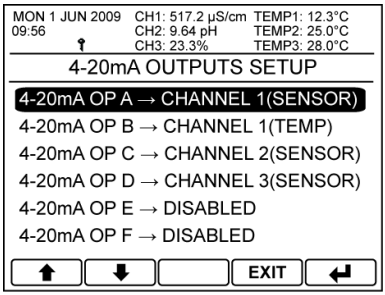
Main Menu

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

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



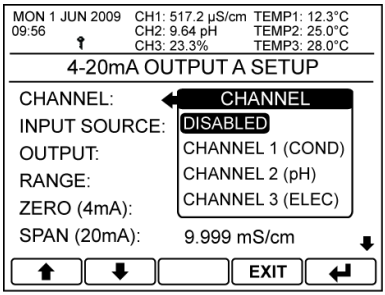
Outputs Setup

Select the Current Output you wish to edit.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



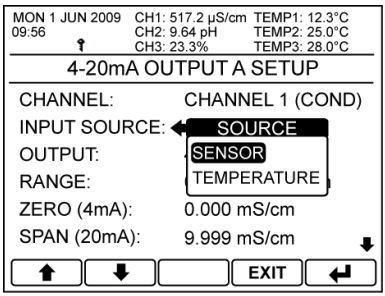
Channel

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



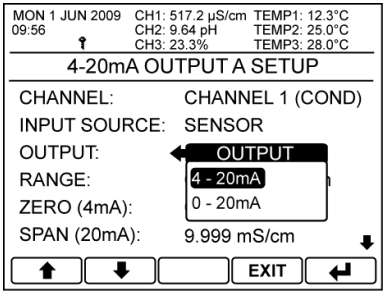
Input Source

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



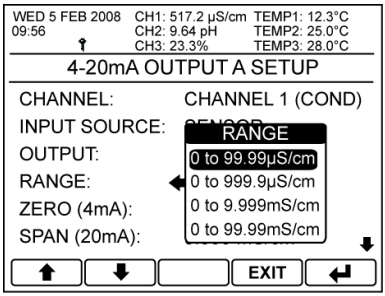
Output

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

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



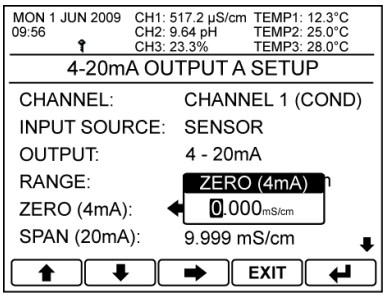
Range

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.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Zero (0/4mA)

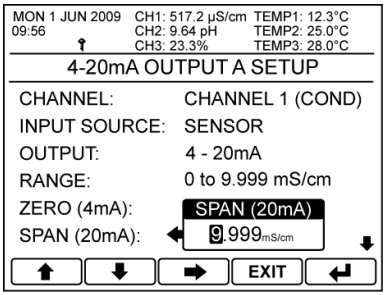
Enter the desired sensor value to be represented by 0mA or 4mA (depends on current output scaling). An inverse relationship can be achieved by setting the Zero greater than the Span.
If the sensor reading falls outside this and the span value an error / alarm will be activated.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Span (20mA)

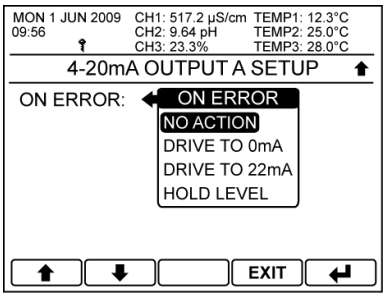
Enter the desired sensor value to be represented by 20mA. An inverse relationship can be achieved by setting the Span less than the Zero.
If the sensor reading falls outside this and the zero value an error / alarm will be activated.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



On Error

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

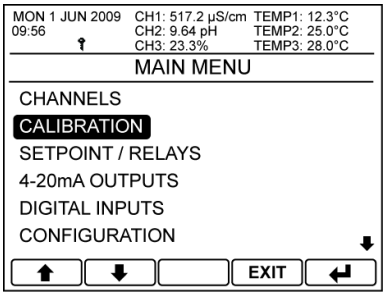
⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

Current Output Calibration

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



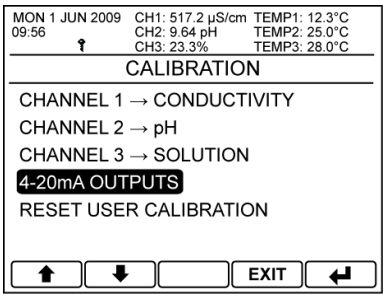
Main Menu

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

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



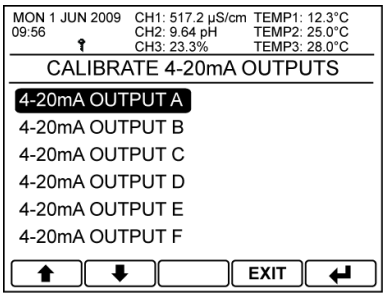
Calibration

Select 4-20mA Outputs.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



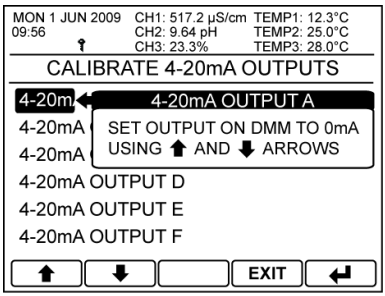
Calibrate 4-20mA Outputs

Select the current output you wish to calibrate.

⬆/⬇ – Select Option

EXIT – Return to Calibration

↵ – Enter Option



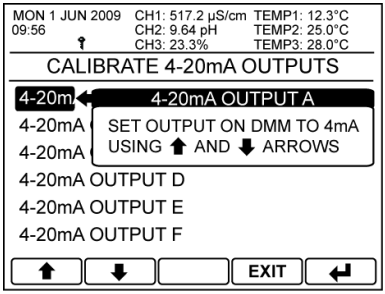
Adjust 0mA Output

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

⬆/⬇ – Adjust Output

EXIT – Cancel

↵ – Save Adjustment



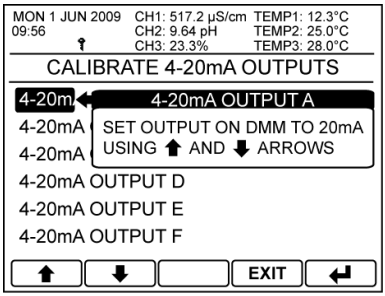
Adjust 4mA Output

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

⬆/⬇ – Adjust Output

EXIT – Cancel

↵ – Save Adjustment



Adjust 20mA Output

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

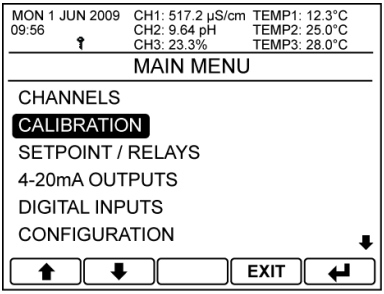
⬆/⬇ – Adjust Output

EXIT – Cancel

↵ – Save Adjustment

Resetting the current Output user Calibration

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



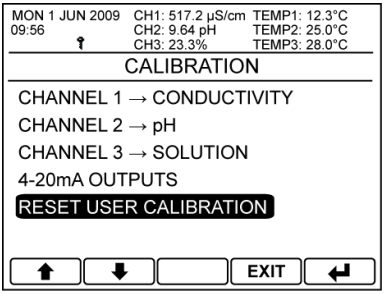
Main Menu

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

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



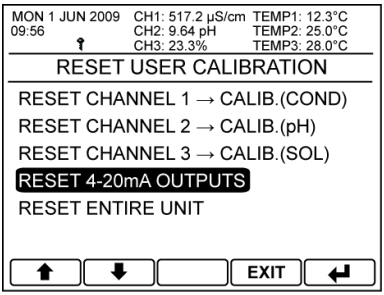
Calibration

Select Reset User Calibration.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



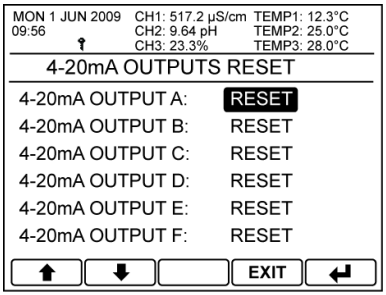
Reset User Calibration

Select Reset 4-20mA Outputs.

⬆/⬇ – Select Option

EXIT – Return to Calibration

↵ – Enter Option



4-20mA Outputs Reset

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

⬆/⬇ – Select Option

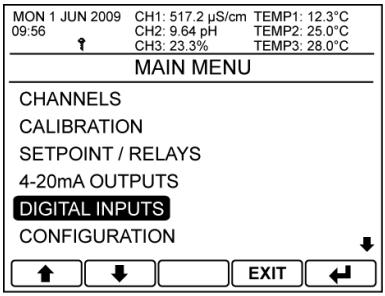
EXIT – Return to Reset User Calibration

↵ – Enter Option

Blank

Digital Inputs

The MXD70 Series 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.



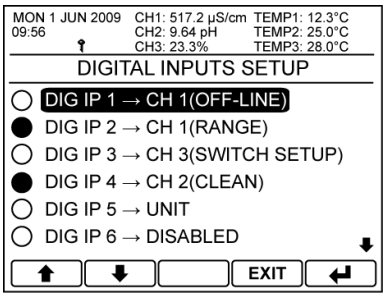
Main Menu

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

⬆/⬇ – Select Option

EXIT – Return to Calibration

↵ – Enter Option



Digital Inputs Setup

Select the Digital Input you wish to edit.

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

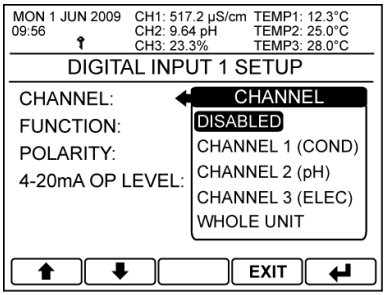
○ – Digital Input Open Circuit

● – Digital Input Closed Circuit

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



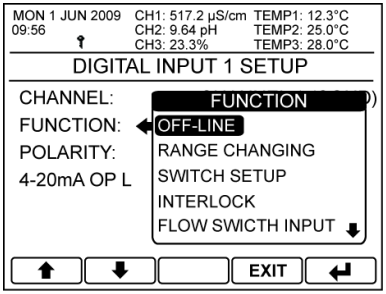
Channel

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

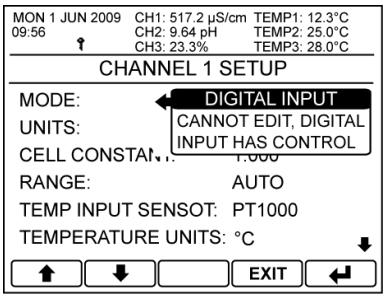
The digital input can be configured to operate in the following ways:

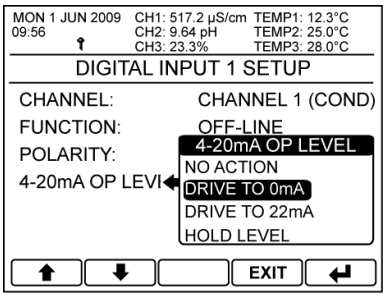
- ❖ Offline
- ❖ Interlock
- ❖ Flow Switch Input
- ❖ Tank Level Switch
- ❖ Clean
- ❖ Range Changing
- ❖ Switch Setup
- ❖ Calibration
- ❖ CIP

⬆/⬇ – 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-energise.
They are also accompanied by a message on the front screen informing the user which action is currently active.

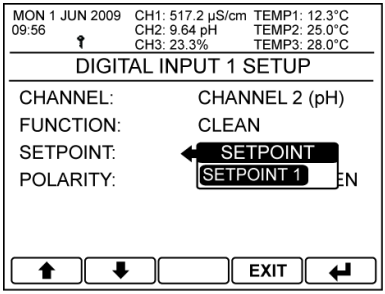
Note – When a digital input is assigned to one of these functions the user can no longer take the associated channel offline using the menu item in the channel setup menu or the channel calibration menu. As indicated by the "Cannot Edit, Digital Input Has Control" message.

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

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



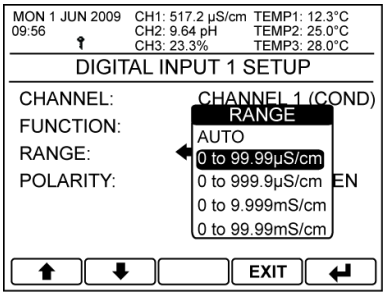
Clean

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

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



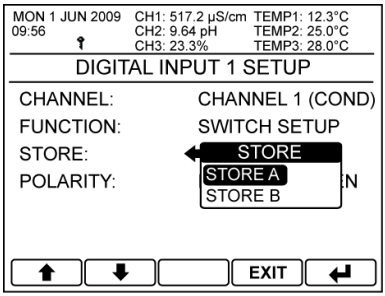
Range Changing

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.

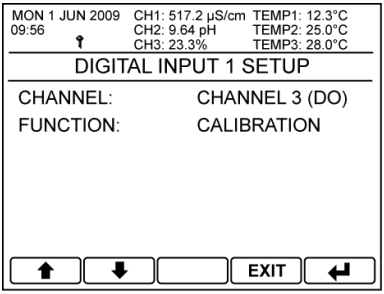
For information regarding saving the setup, see the Save and Restore section of the user interface guide.

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

⬆/⬇ – Select Option

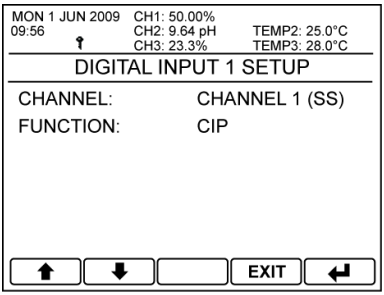
EXIT – Cancel

↵ – Save Selection



Calibration

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

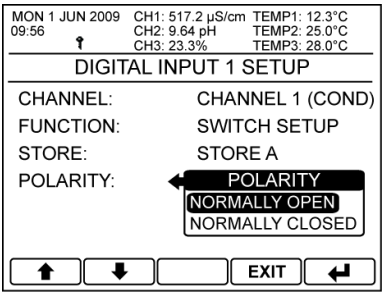


CIP

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 energise 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).

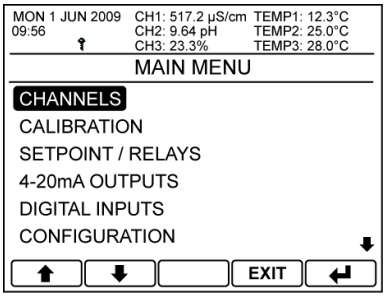
↑/↓ – Select Option

EXIT – Cancel

↵ – Save Selection

Simulate Channels

The facility exists within the MXD70 series 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.



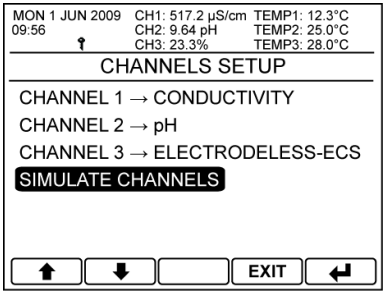
Main Menu

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

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



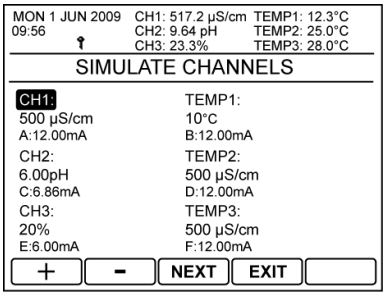
Channels Setup

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

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



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.

+ – Increase Selected Value

– – Decrease Selected Value

NEXT – Select Next Value

EXIT – Return to Channels Setup

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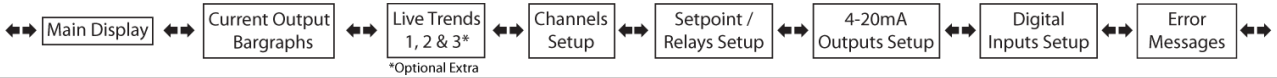
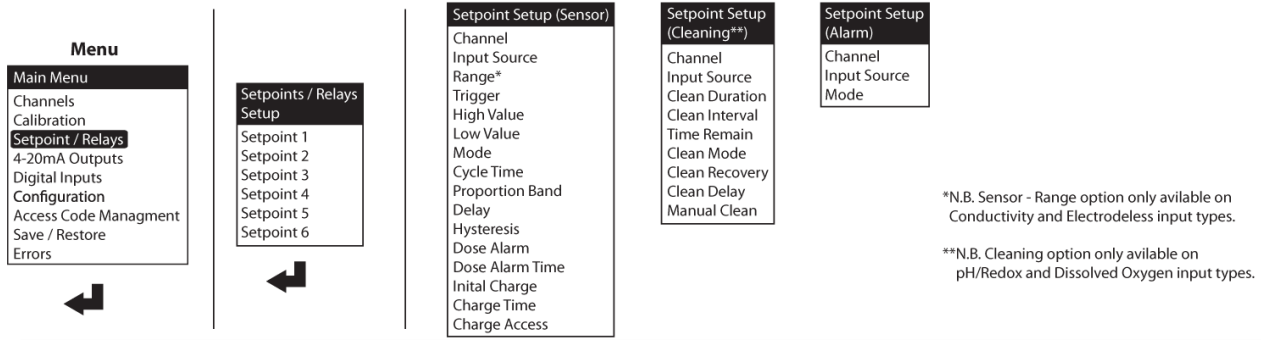
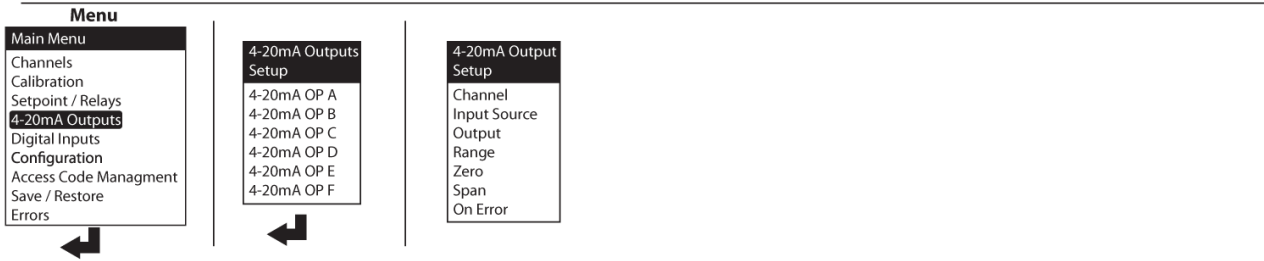
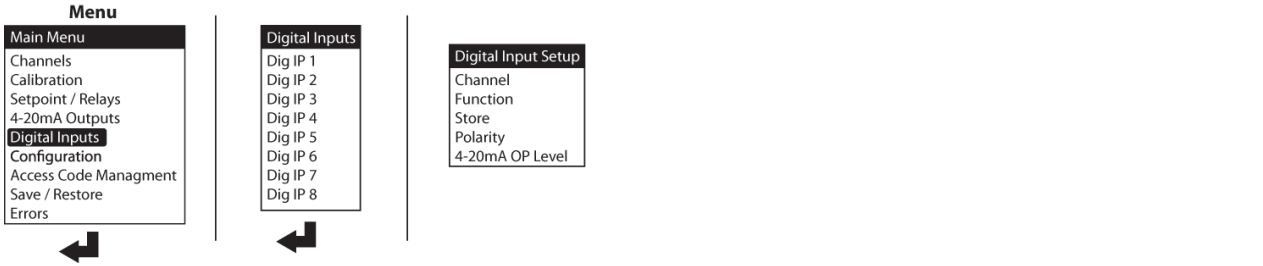


Setpoint/Relays - 4-20mA Outputs - Digital Inputs



*N.B. Sensor - Range option only avilable on Conductivity and Electrodeless input types.

**N.B. Cleaning option only avilable on pH/Redox and Dissolved Oxygen input types.