CHEMTRAC

HydroAct 4 User Manual

Chemtrac, Inc

Firmware Version: 1.19

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1. Introduction

This manual has been generated to accompany the serial number of the instrument as recorded on the front of this manual. It is specific to that serial number. Information regarding options or accessories that do not apply to this instrument do not appear in this manual. If you upgrade your firmware or your hardware please ask for a new manual to be generated for you.

This manual contains basic information to be noted during installation, operation and maintenance. It is therefore essential that this manual be read by the contractor before installing and commissioning the HydroAct 4, as well as by the relevant operating personnel/owner of the unit. It must remain available for reference at all times.

In addition to the general safety instructions under the main heading Safety Precautions, the special safety precautions outlined in other sections must also be observed.

This manual has been supplied electronically. A hard copy is available on request from hardware-support@chemtrac.com.

1.1 Safety Precautions

- Before attempting to unpack, set up, or operate this instrument, please read this entire manual.
- Make certain the unit is disconnected from the power source before attempting to service or remove any component.
- Make certain the unit is disconnected from other sources of force or pressure (for example, pneumatic or hydraulic), before attempting to service or remove any component.
- Failure to follow these precautions could result in personal injury and damage to the equipment.

1.1.1 Warnings used in this manual

This manual contains vital information relating to the safety of people and the environment, the analyzer and any equipment attached. These statements are identified by the following markings:

Refers to an imminent danger or a potential hazardous situation. Non-compliance can lead to death or extremely serious injury.

Refers to a potential hazardous situation. Non-compliance can lead to injury or property damage.

Draws attention to supplementary information to make the work easier and ensure trouble-free operation. May also appear in conjunction with safety instructions which may endanger the analyzer and its operation if disregarded.

1.1.2   Qualification and Training of Personnel

The personnel employed for installation, operation, inspection, and maintenance, must be suitably qualified for this work. The areas of responsibility, competence and supervision of the personnel must be precisely defined by the owner. Personnel who do not have the required know-how must be trained and instructed. If required, this can also be undertaken by the manufacturer/supplier on behalf of the owner.

In addition, the owner of the system must ensure that the relevant personnel are fully familiar with and have understood the contents of this manual.

1.1.3   Important Safety Instructions

When installing and using this electrical equipment, basic safety precautions should always be observed, including the following:

Read and follow all instructions. Save these instructions.

To reduce the risk of injury, do not permit children to use this product.

Risk of electric shock. Connect only to a suitable isolated, hard wired electrical outlet. It is recommended that the outlet is protected by an RCD (Residual Current Detector) or is in any event in compliance with all local electrical regulations. Do not bury the electrical supply cable.

To reduce the risk of electric shock, replace damaged electrical cable immediately.

To reduce the risk of electric shock, do not use an extension cable to connect the unit to an electric supply; provide a properly located outlet.

1.1.3.1   Hazards due to non-compliance

Failure to comply with the safety instructions may endanger not only people, but also the environment and the unit. The following hazards in particular may arise:

- Failure of major unit functions.
- Failure of specified methods for maintenance and repair.
- Danger to people due to electrical, mechanical and chemical effects.

1.1.4 Safe Operation

The safety instructions contained in this manual must be observed. The owner is responsible for ensuring compliance with local safety regulations.
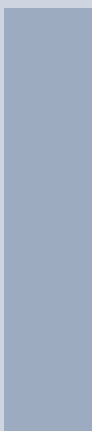
Analyzer

2. Overview

The HydroAct 4 is a compact electronic communication and control system. It is designed for use with many different measuring sensors. Any use other than the one described here compromises the safety of persons and the entire measuring system and is, therefore, not permitted. The manufacturer is not liable for damage caused by improper or non-designated use.

Every analyzer is carefully checked before leaving the factory. If for any reason, you are unhappy with your purchase, please contact the organization that you purchased the analyzer from or Chemtrac, Inc directly.
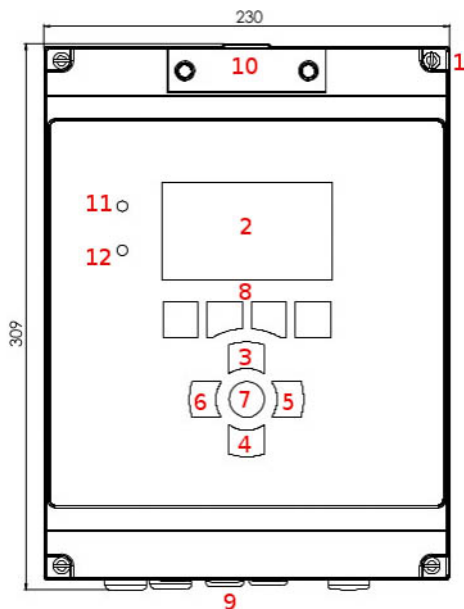
HydroAct 4 Overview
1. Front panel screws ($\times 4$)
2. Display
3. Up button
4. Down button
5. Right button
6. Left button
7. Enter/Select button
8. Soft keys
9. Cable glands
10. Micro SD access
11. Power lamp
12. Indication lamp

2.1 Safety Precautions

2.1.1 Installation, Maintenance and Inspection

The owner must ensure that all maintenance, inspection and installation work is undertaken by authorized and duly qualified personnel who have also studied this manual.

- The HydroAct 4 must always be isolated before starting any work.
- Please be aware that the HydroAct 4 may be controlling chemical dosing and as such shutting down the HydroAct 4 without due regard to the systems it is controlling can lead to chemical release.

2.1.2 Unauthorized Modification

The device may only be modified or converted in consultation with the manufacturer. Genuine spare parts and accessories authorized by the manufacturer ensure greater safety.

2.1.3 Impermissible Modes of Operation

Usage other than as described in this manual will lead to the immediate cancellation of the warranty and any other manufacturer's liability.

2.1.4 Chemicals

Should the sensors attached to the HydroAct 4 be in contact with hazardous chemicals, great care must be taken when handling the sensors.

> **Fire hazard. No parts are suitable for use in a hazardous rated area.**

> **When working with this equipment, the accident prevention regulations applicable on site must be observed and the specified personal protective equipment worn.**

> **Please unpack the equipment and ordered accessories carefully in order not to miss small parts. Immediately compare the scope of delivery to the delivery note. If there are any discrepancies, contact your supplier.**

2.2 Technical Data

Power 100-240VAC/0.25 A or 12VDC/0.8 A

Fuse 2A (100-240VAC)

Display 4.3" 480x272 24-bit color

Inputs Up to 4 configurable sensor inputs; 4-20mA, 4-20mA loop-powered, 0-2 VDC, +/- 2000 mV for pH, ORP, or ISEs, PT100, potentiometric, pulse and Modbus. Expandable to 16 inputs. Up to 8 digital inputs, expandable to 32

Outputs Up to 16 dedicated configurable analog outputs: 0-20mA, 4-20mA, 0-1 VDC, 0-10 VDC, 1-10 VDC. Unused inputs can be used as outputs allowing up to 32 output channels. Up to 32 SPST electromechanical relays rated 10A at 125 VAC, 3A at 250 VAC, 5A at 30 VDC

Communication (Optional) Modbus ASCII/RTU (RS485), Profibus DP, Modbus TCP (Ethernet), 2G/3G Modem
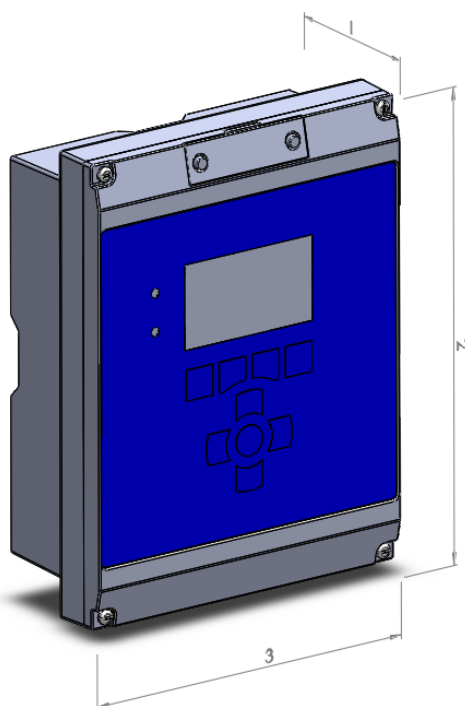
Status Log Over 1 million records

Data Log Internal - Single parameter data log or status message log over 1 million records

Weight 2kg

IP Rating IP65, Nema 4X

Enclosure Material ABS flame retardant
Seals EPDM

HydroAct 4 Dimensions
1. 103mm
2. 309mm
3. 230mm

2.3 Installation

> As with all instrumentation the installation and commissioning of this instrument is crucial to its safe and effective operation. This instrument must only be used for its purpose as outlined in this manual. It must be installed and commissioned in accordance with this manual and by trained, qualified personnel.

2.3.1 Site Selection

Please choose a suitable location for the installation of the electronics. The choice of installation point on any site is a compromise and is best undertaken by an experienced installation engineer. The following is a list of the factors that need to be taken into consideration. This list is not intended as a check-list, neither is it implied that the list is complete.

- Ensure that the mounting allows access to all serviceable parts.
- Try to mount the electronics in a position where they are not habitually hosed down in a cleaning process.
- The electronics enclosure should be mounted away from sources of heat or direct sunlight.
- Consider the length of wiring runs when mounting the instrument.
- Try to keep the electronics away from substations, motors or other large EMI emitters.
- Consider whether the sample will be representative and well mixed.
- Consider sample line run times.
- Consider sample return points.
- In a plastic run, with a low conductivity liquid sample, consider earthing the sample.
- If the instrument is controlling a dosing pump, size the pump appropriately.

2.3.2 Unpacking

Please have a copy of your order with you when you unpack your instrument. All orders are checked when they leave the factory. Please check that you have all the parts that were ordered as soon as you open the box. If anything is missing, or damaged, please contact your supplier immediately. If the instrument needs to be returned for any reason please follow the return instructions given in this manual (refer to section 7).

Please dispose of the packing in an environmentally responsible manner and in compliance with local regulations.
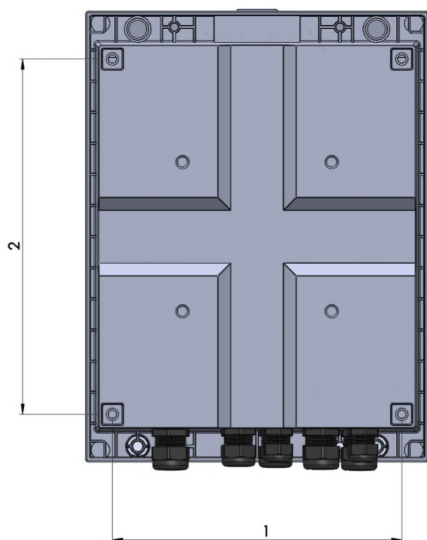
2.3.3 Mounting

The HydroAct 4 enclosure is very versatile and can be wall mounted, panel mounted or mounted on a handrail or pole[1]. The HydroAct 4 electronics should be mounted so that:

- it is away from sources of heat or direct sunlight,
- it is vertical,
- there is sufficient clearance above to allow the enclosure compartment to be opened and removed,
- it is away from sources of vibration, and
- it will not be hosed down.

2.3.3.1 Wall Mounting

The analyzer enclosure can be screwed directly onto the wall. Mark and drill the holes as per the drawing below. Insert wall plugs and secure with appropriate screws (not supplied).

HydroAct 4 Wall Mounting
1. 194mm
2. 238mm

2.3.3.2 Panel Mounting

The analyzer enclosure can be panel mounted using the optional panel mount kit. The support bracket can be used as a template for cutting and drilling the panel.

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[1]For panel or handrail mounting the enclosure requires optional mounting kits that can be ordered from Chemtrac.

HydroAct 4 Panel Mounting
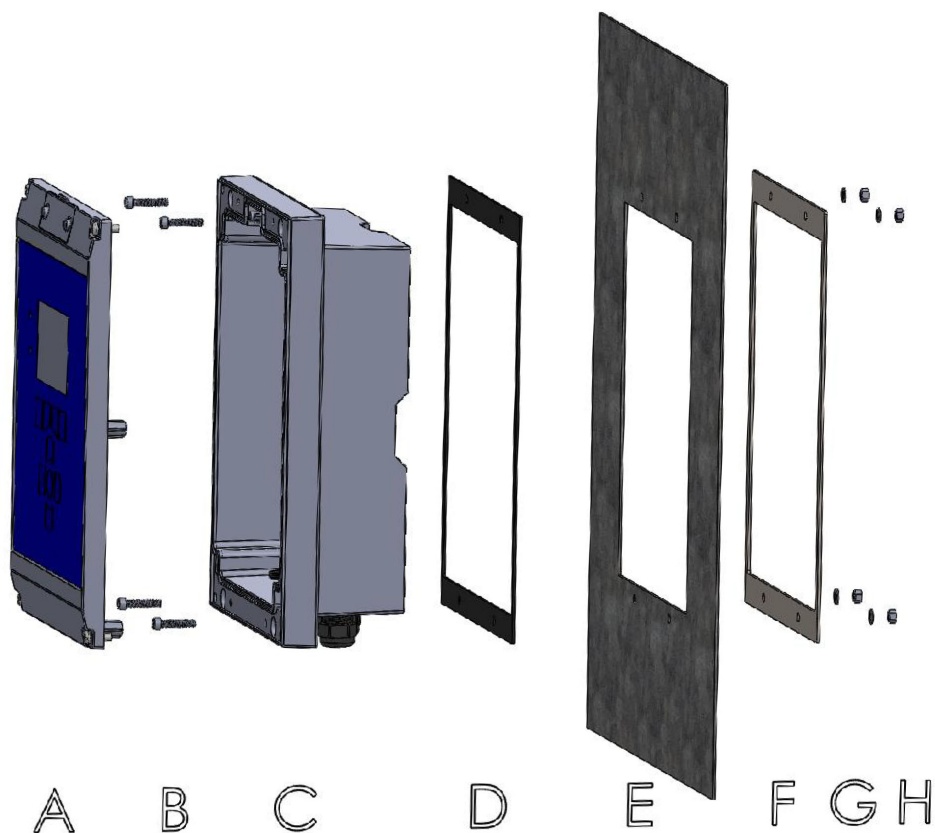
A - HydroAct 4 front section, B - Four M5 bolts, C - HydroAct 4 rear section, D - Rubber
gasket, E - Panel, F - Support bracket, G - Four M5 washers, H - Four M5 nuts.

2.3.3.3 Handrail Mounting
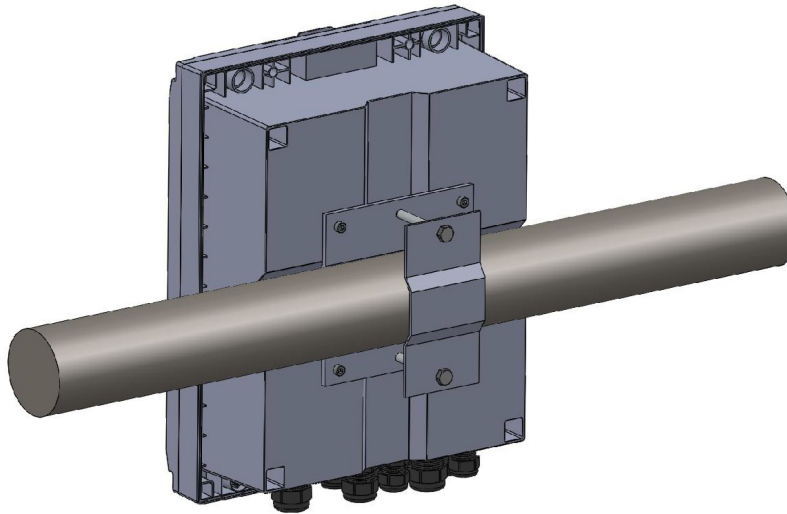
    The analyzer enclosure can be handrail mounted using the optional handrail mount kit. By turning the brackets through 90° the analyzer can also be pole mounted.
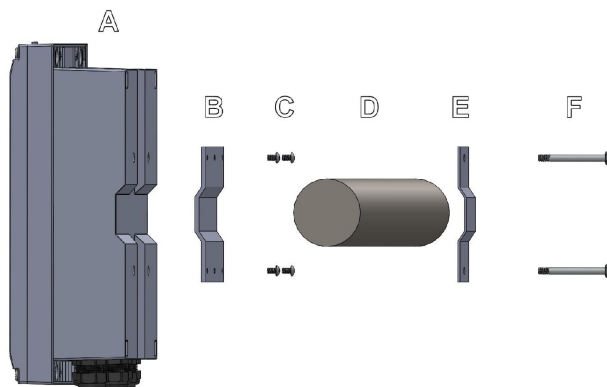
HydroAct 4 Handrail Mounting
  A HydroAct 4
  B Large bracket
  C Four M5×8mm bolts
  D Handrail
  E Small bracket
  F Two M6 bolts
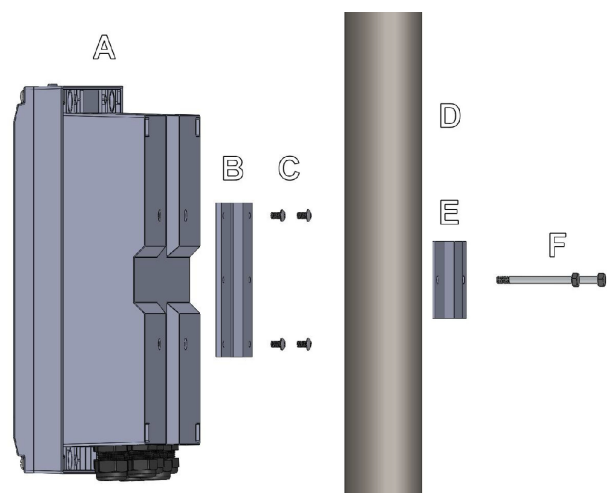
HydroAct 4 Pole Mounting
  A HydroAct 4
  B Large bracket
  C Four M5×8mm bolts
  D Pole
  E Small bracket
  F Two M6 bolts

2.3.4 Electrical Connections
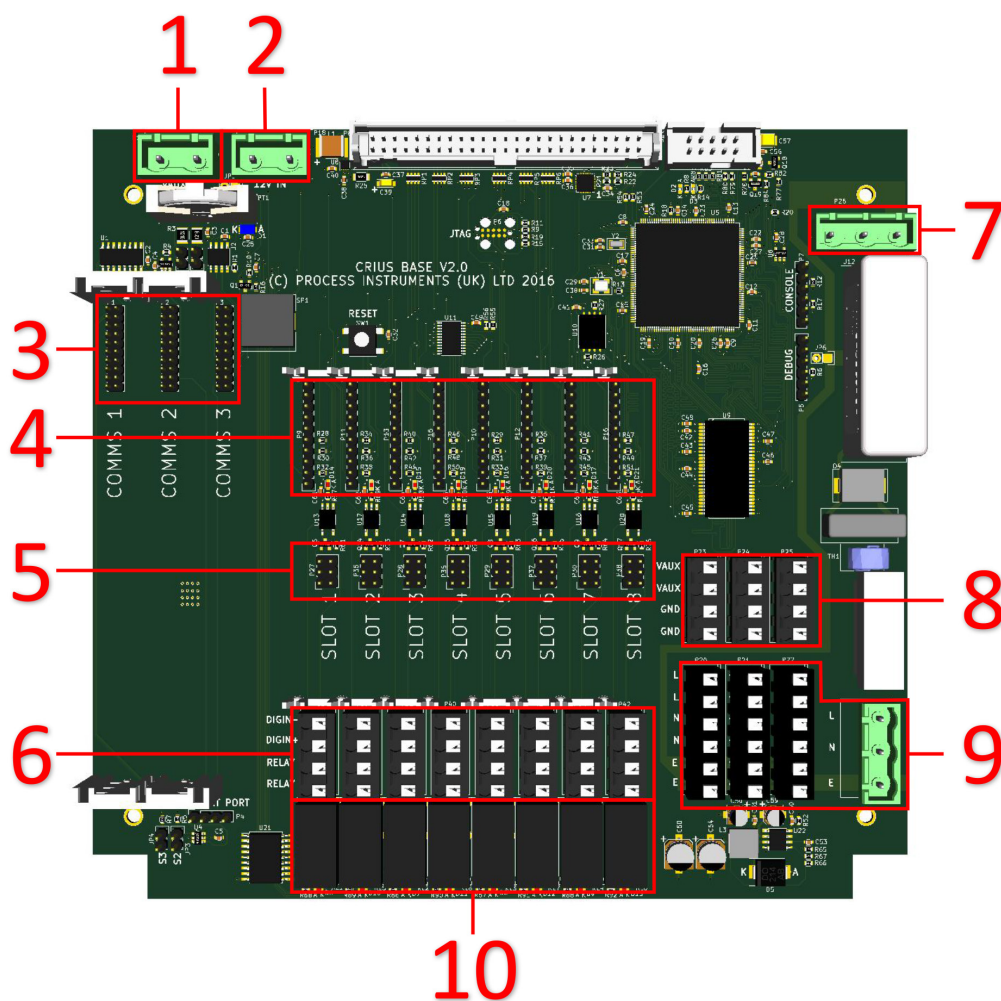
1. Auxiliary power from secondary PSU
2. 12V input from main PSU
3. Communication card slots
4. Sensor and output card slots
5. Digital input configuration jumpers
6. Relay and digital input connectors
7. AC Power to main PSU
8. Auxiliary power out[2]
9. AC power connectors
10. Electromechanical relays

The connections are made via press to open connectors or screw terminals. An insulated screwdriver can be used to operate the connector. Each instrument has a large number of possible wiring combinations depending on which sensors, inputs, outputs or communications are selected at the time of purchase. This is achieved by the use of expansion electronics cards specific to each role. These expansion cards are fitted to "Slots".

The connections for sensors, inputs, outputs and communication cards are detailed in Part II of this

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[2]If secondary PSU is not fitted, these connectors are linked to the main 12V PSU.

manual.

2.4   Operation

2.4.1   User Interface

The HydroAct 4 display is a 4.3", 480 × 272, 24-bit color display and is best viewed from directly in front. The user interface is accessed via nine buttons embedded in the membrane overlay. There are also two status LEDs, showing power and alarm status, and an audible buzzer.

The buttons all have a tactile feedback response. Holding the buttons in will inject multiple key presses of increasing speed until the button is released. In some cases holding a button will provide access to a different function. These are highlighted in the manual. The four buttons along the bottom of the screen, are defined for each screen by the legend above the button. The navigation and Select buttons below the display are always for navigation of the display. The Up and Down, Left and Right buttons are used for moving the "Select" target around the display.

The screen displayed once the system is started is either the default "Home" screen (see section 2.4.3), if configured, or the Main Menu.

2.4.2   Main Menu
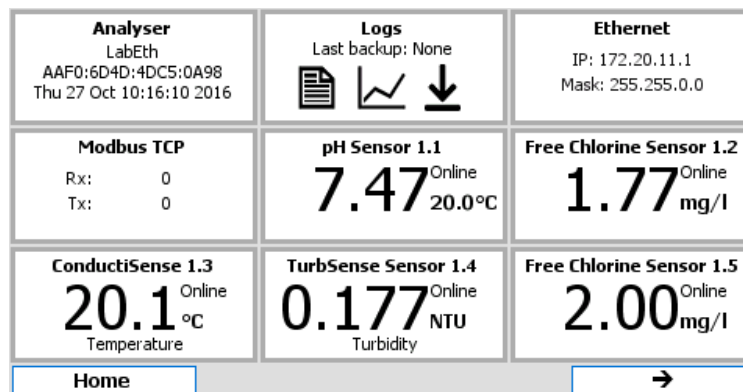
Example Main Menu

The Menu screen is a standard display in your HydroAct 4 and is a tile based display of all the different parts or "devices" that make up your analyzer. By using the Up, Down, Left, Right and Select button it is possible to navigate to any part of the analyzer by highlighting the icon and selecting it. Devices are firmware modules that control a physical device, such as a sensor, or a purely software construct, such as a PID control calculation. Some hardware devices have multiple device tiles associated with them. For example, an Ethernet communications card will add an "Ethernet" tile which allows physical interface to be configured and a "Modbus TCP" tile allowing access to the main communications protocol used on the interface.

There are two standard device tiles available on all analyzers, regardless of configuration. The "Analyzer" tile gives access to information and configuration options for the unit, e.g., selecting the language and setting the time and date. The "Logs" tile allows access to the status and data logs stored on the unit.

Selecting a device tile from the menu will open an overview or set up screen. The overview display gives the user key information for that device and may allow the entering of commonly changed variables. For example, an overview for a chlorine sensor will display the chlorine reading and sensor maintenance information, and offer the user a shortcut to calibrate the sensor.

Many screens will have an "Options" button. Pressing this button will produce a pop-up menu on the display. Some of the items on this menu will have a ▶ next to them indicating that there are further

menus accessible by highlighting the menu item and either pressing the Select button or the Right button.

2.4.3 Home Screens

Home screens are used to display information from more than one source on a single display. They are accessed by pressing "Home" from any screen displaying the soft-key and then by pressing the Left or Right button to scroll through the available Home Screens. On any Home Screen pressing Up and Down will highlight different aspects of the display which can then be accessed by pressing the "Select" button.

Home screens can simply show information about a single sensor:
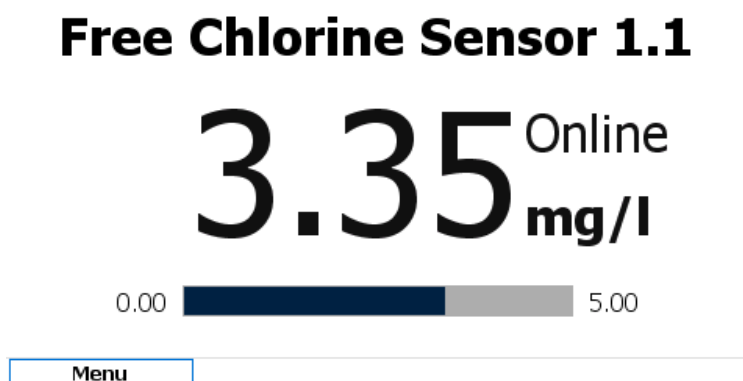
or several sensors readings and control outputs:
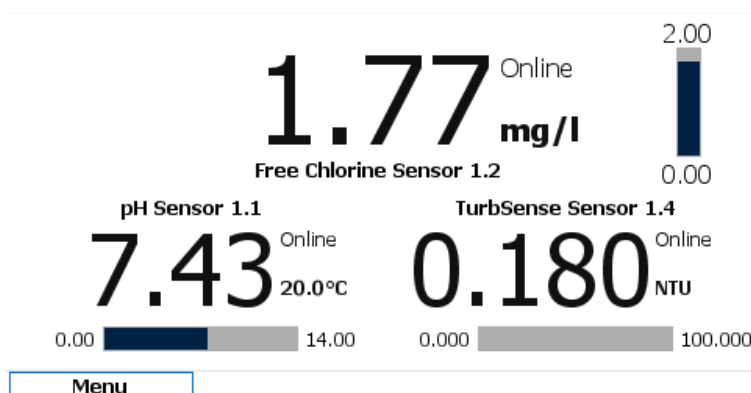
For details of how home screens are defined and configured see section 2.4.5.3.

2.4.4 User Authentication

When attempting to access a function that requires authentication you will be taken to the log in screen, where a user is selected and security code entered. Use the "Select" key to open the user drop down list, Up/Down to highlight the desired user and "Select" to move to the next step, the first box for the six digit security code entry will now be highlighted.

When entering a security code, all buttons except the fourth soft-key (top right) can be used for code entry. If the correct code is entered you will be presented with the tile requested. To indicate which user, if any, is currently logged in to the instrument, the user name will appear in the top right of the display. See section 2.4.5.4 for configuration of security options.
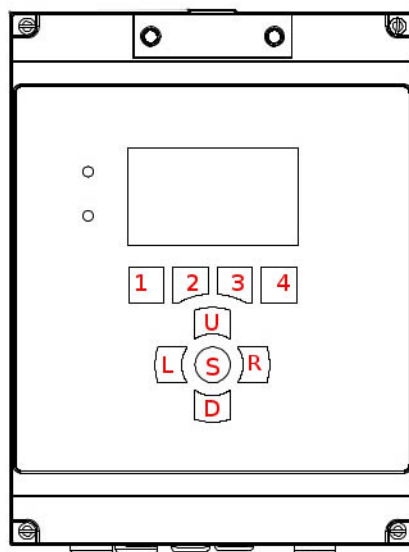
HydroAct 4 Button Layout

The analyzer is preconfigured with a default user called "user1" who has full access to the analyzer, with the default password of:

1, 1, 1, 1, 1, 1

From the button layout above.

To force a user to log out, press and hold the "Home" or "Menu" button for a few seconds until "Logout" is displayed. If default security access is enabled (see section 2.4.5.4) and different security access is required, press and hold the select button on the desired device tile in the main menu for a few seconds. The login screen will appear. Select the desired user and enter the password.

2.4.5 Analyzer Options

Selecting the Analyzer tile on the main menu will take you to the Analyzer Overview (below). From here you can access settings that relate to the analyzer setup. These typically do not affect the sensors, communications or control functions.
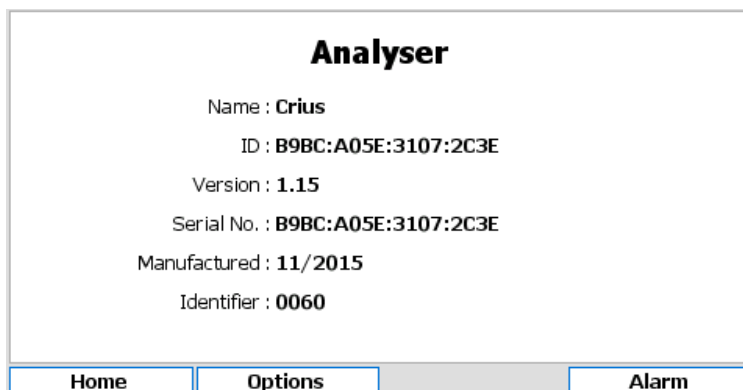
Analyzer Overview

2.4.5.1 Analyzer Setup

The date and time are used in the data logs and status logs of your controller and it is therefore important that they are set correctly. To modify the analyzer labels, time and date settings or language go to:

Options → Setup → Analyzer

Name & ID The Name and ID details allows the user to name the instrument in various ways. These tags are used to identify the instrument, e.g., when an instrument sends a text alarm, the Name and ID details are used to inform the recipient as to which instrument is in alarm. The Name would typically be the site name and the ID would typically refer to a specific analyzer.

Language The user interface of the HydroAct 4 can be set to any supported language. Use the drop down list to select the language of choice.

Time Zone Select the required time zone. The internal clock stores the time in UTC format. Therefore changing the time zone will change the current time. Daylight savings, if applicable for the selected time zone, will automatically be followed.

Time Set the required time by modifying the values using the up/down buttons

Date Select the date using the calendar widget that will appear when the date entry box is selected.

2.4.5.2 User Interface

Configuration options that affect the user interface are presented in tabbed windows. Use the keys marked "←" and "→" to move between tabs. The configuration is accessible by selecting:

Options → Setup → User Interface

Buzzer The buzzer will sound when a key is pressed or to indicate that the analyzer is in alarm. Use the checkbox to enable or disable the buzzer sounding.

Backlight Timeout In order to extend the life of the display a timeout can be set. At the end of the timeout the display will go dark. Any button press will turn the screen back on. Use the checkbox to enable or disable the backlight timeout and set the desired timeout using the up/down buttons. The timeout is in HH:MM:SS format.

Home Button On most displays the left button under the display can be set to take the user to the "Home" screen or the "Menu" screen.

Blink highlighted If this option is enabled, the element the user needs to look at blinks between two colors to attract attention.

2.4.5.2.1 Menu
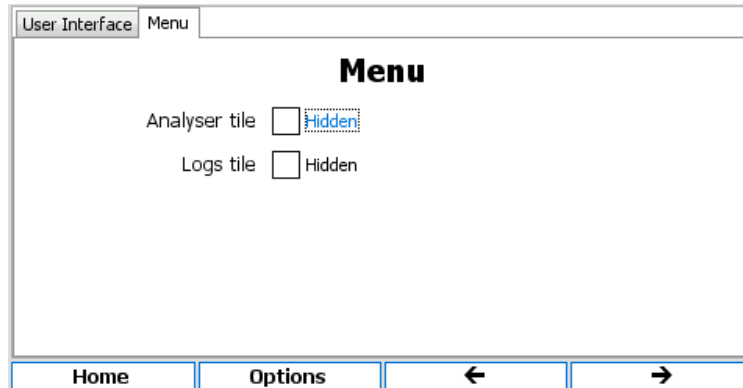
Analyzer tile If the checkbox is ticked then the Analyzer tile will be hidden as default on the main menu.

Logs tile If the checkbox is ticked then the Logs tile will be hidden as default on the main menu.
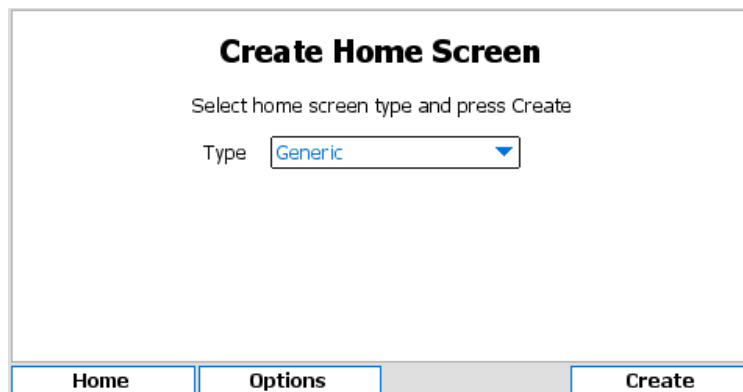
2.4.5.3 Home Screens

The HydroAct 4 has the capability to have multiple home screens which give the user options as to how the display provides information (see section 2.4.3). To set up a new home screen, edit or delete an existing home screen, select:

Options → Setup → Home Screen
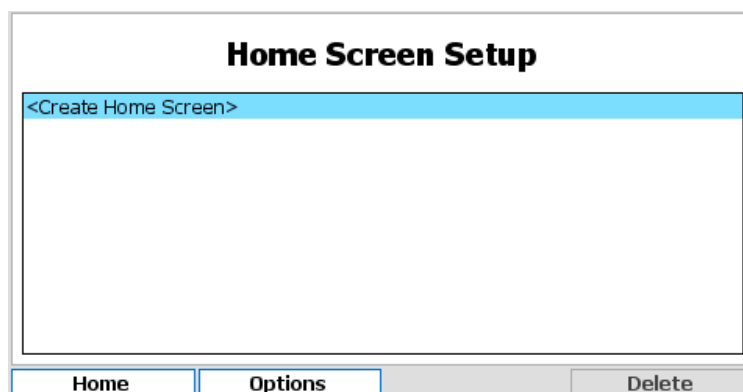
To delete a home screen highlight the home screen name with the up/down buttons and press "Delete". Pressing and holding the "Delete" key will make the "Delete All" function available. A confirmation message box will appear before all home screens are deleted. To edit the home screen, again select the name, and press the select button. To create a new home screen, select "Create Home Screen" and press select.
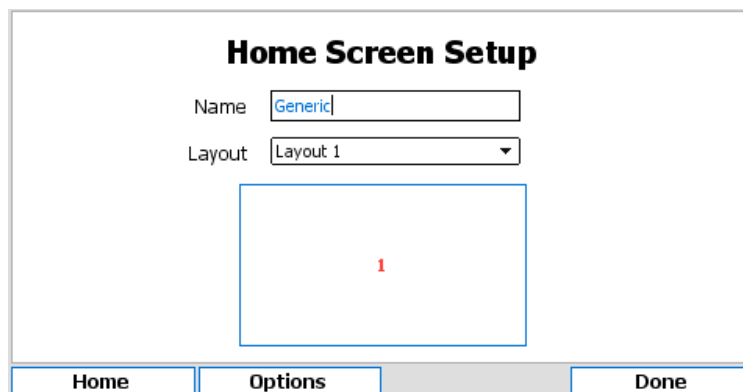
Create Home Screen

Select home screen type and press Create

Type [Generic ▼]

| Home | Options | | Create |

Select the home screen type from the drop down list. Generic home screens allow up to 4 devices to be displayed in a variety of formats. Other home screen types are application-dependent and are described below, if applicable. For this example, select "Generic" and press "Create".

Home Screen Setup

Name [Generic]

Layout [Layout 1 ▼]

1

| Home | Options | | Done |

Editing an existing Generic home screen or creating a new Generic home screen will display the above form. Select the desired layout as shown in the diagram below the layout selection box. The layout is made up of a series of windows that display selected information. The possible window arrangements for the layouts are as follows:

1

Layout 1

1
2

Layout 2
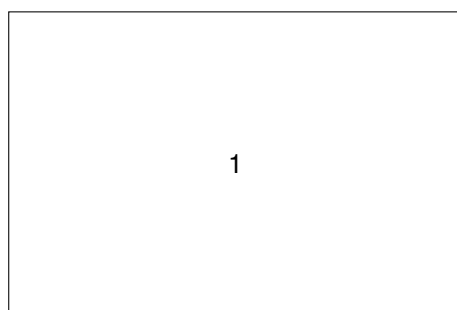
Layout 3

Layout 4
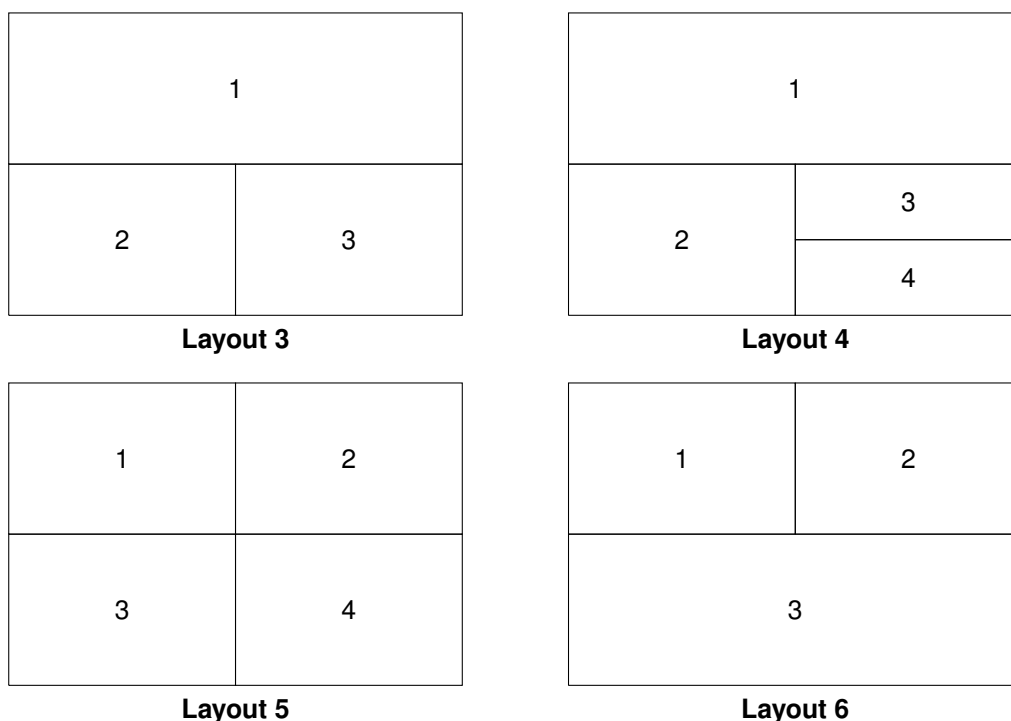
Layout 5

Layout 6

Each window can display information about a device or a data log graph. To select what is displayed in each window of a particular layout, move the selection to highlight the window and press the select button.

Type Select the type of information to display in the selected window. Options are "Device" or "Data Log".

Data Log If "Data Log" is selected in the type field, this option will be available. Select the data log to display.

Device If "Device" is selected in the Type field above, this option will be available. Select the device to display in the selected window.

Window If the device selected above has multiple types of display possible for this type of window, then this option will be available. Select the type of information to display.

2.4.5.4 Security

To access the security setup options, select:

Options → Setup → Security

Security Setup

Login timeout [00 ▲▼] : [02 ▲▼] : [00 ▲▼]
Default access [ ] Enabled
System [Advanced ▼]
Sensor [Advanced ▼]
Signal [Advanced ▼]
Output [Advanced ▼]
Control [Advanced ▼]
Event [Advanced ▼]

| Home | Options |

Login Timeout If no user activity is detected within this given time period while the main menu or home screen is displayed, then the current user will be logged out. The time is in HH:MM:SS format.

Default Access If enabled, then no user authentication will be attempted when accessing a device tile or using a quick access function from the home screen. Instead the user will be allowed access at the security level set out in the boxes below it.

2.4.5.4.1 Security access levels

Access to many of the analyzer functions is secured using password protection. To allow flexible security profiles the HydroAct 4 is split into six access areas:

System Controls access to analyzer-specific settings and communication options.
Sensor Controls access to sensor devices.
Signal Controls access to signal devices, such as digital inputs.
Output Controls access to output devices, such as relays and analog outputs.
Control Controls access to control devices, such as PID.
Event Controls access to event devices, such as timers and schedulers.

With each of these areas, operations have been assigned to four security levels:

None No access to the assigned area is enabled.
Basic Users with this access level can see information and perform basic maintenance tasks. Users generally can not change any settings with this access level.
Intermediate Users with this access level can perform routine maintenance tasks and change common settings.
Advanced Users with this access level can perform all available actions.

Using this security model it is possible to assign specific tasks to individual users. For example, It is possible to allow a user to calibrate sensors (intermediate access for sensors), but not change PID settings (no access for controls). Access to restricted functions will require the entry of the operator's security password.

2.4.5.5 Users

To add, remove users or modify access rights, select:

Options → Setup → Users

User Setup

user1 (1)
<+ Add User>

| Home | Options | | Delete |

To add a user, highlight "<+ Add User>" and press the select button. Enter the desired user name and access rights. To set the password, press "Password" and follow the on screen prompts. To delete a user, highlight the user name and press "Delete"[3]. To modify a user account, highlight the user name and press the select button. The user name and security access rights will then be editable.

A user can change their own password by selecting the following and following the on screen prompts.

Options → Change Password

2.4.5.6 Analyzer Information

Information regarding the analyzer hardware and software setup is useful for diagnosing problems and correctly configuring the analyzer. To access the hardware map, i.e., information about the hardware installed in the analyzer, select:

Options → Information → Hardware Map

Hardware Map

Select a node for further information

Node	Type	Version	Serial No.
1	**Base**	1.15.00	B9BC:A05E:3107:2C3E
3	Undefined	0.00.00	0000:0000:0000:0000

| Home | Options |

Information given for each Node[4] includes board number, board type, firmware version number and unique serial number. Each enclosure in a system contains a base board. These boards are numbered 1, 5, 9 and 13. Board 1 is the master board with the screen and keypad attached. Each base board has three slots for communication boards, whose node number increments from the base board they are installed on. For example, the master board, or node 1, has communication slots with nodes numbered 2, 3 and 4.

Highlighting a base board and pressing the "Select" key will open a further information screen showing the I/O plugin cards installed, their location and hardware and software version numbers.

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[3]A user can not delete their own user account. This prevents the possibility of having no privileged user accounts and effectively leaving an instrument in an unusable state.

[4]The mainboards and communication boards in an analyzer communicate over a CANBUS network. Each board has a unique Node number for identification on this network.

The HydroAct 4 makes use of several internal read-only file systems as well as the micro SD card. Information regarding the file system usage can be viewed by selecting:

Options → Information → File Systems

All entries other than "/mnt" are internal read-only file systems and the information may be useful for technical support inquiries. The "/mnt" file system refers to the micro SD card and a total size of 0.00MB indicates that the card is missing or not detected.

The device list shows which software modules are installed and active on the anlayser. To access this information, select:

Options → Information → Device List

Each installed device is listed. Use the Up and Down keys to scroll through the list.

2.4.5.7 Alarm Settings

When the analyzer detects an error condition, it will enter an alarm state. This will be indicated on the screen and sounded using the buzzer. To access the alarm configuration, select:

Options → Alarm → Setup

Alarm Setup

Re-alarm Enable   ☐ Enabled

Re-alarm Timeout   01 ↕ : 00 ↕ : 00 ↕

| Home | Options |

The "re-alarm" feature can be enabled and the timeout set. If the analyzer is in alarm and that alarm is acknowledged (see below), then the analyzer will return to the alarm state after the timeout has expired if the error condition has not been rectified. The exact reason for the active alarm is shown by selecting:

Options → Alarm → Message

When the analyzer is in alarm, the message shows the time and date of when the message was updated and an "Ack" button silences the alarm and prevents any further alarm SMS messages[5] being generated. The alarm message will change to indicate the alarm has been acknowledged.

2.4.5.8   Service Options

Service options are used to gather information for technical support personnel. Other options allow firmware upgrades and factory reset of configuration information. Operations in this menu should only be accessed when requested by a service engineer.

2.4.5.9   Device Codes

Device codes enable firmware modules. Adding new hardware or software features usually requires adding device codes. Devices codes can be entered directly using the user interface or imported from a MicroSD card. Technical support will provide instructions should this need to be done outside of the factory.

2.4.5.10   Backup, Clone and Restore Configuration
2.4.5.10.1   Backup
To create an analyzer backup navigate to:

Analyzer → Options → Backup → Backup

Select an existing file to overwrite or select "+New File" and select "Next". If creating a new file, enter the desired filename (by default the date is included in the filename). Then select "Next". When notified that the backup file has been created select "OK".

2.4.5.10.2   Restore/Clone
To begin a restore/clone operation navigate to:

Analyzer → Options → Backup → Restore

Select the file to restore/clone from and select "Next" and then "OK". If this is the analyzer on which the backup file was created a restore operation will occur. If this is a different analyzer a clone operation will occur.

---

[5]Available if a 2G/3G Modem option is installed

Configuration Files	Restore	Clone
Analyzer Settings (Name, Alarm, Users, etc)	Yes	Yes
Communications Card Settings[6]	Yes	Yes
Data Logs Setup[7]	Yes	No
Home Screens	Yes	No
Device Codes	Yes	No[8]
Device Settings	Yes	Yes
Modbus Maps	Yes	Yes

2.4.6 Logs

Selecting the log tile from the main menu will display a secondary logs menu. These available options are; Backup Logs, Status Log and Create Data Log.
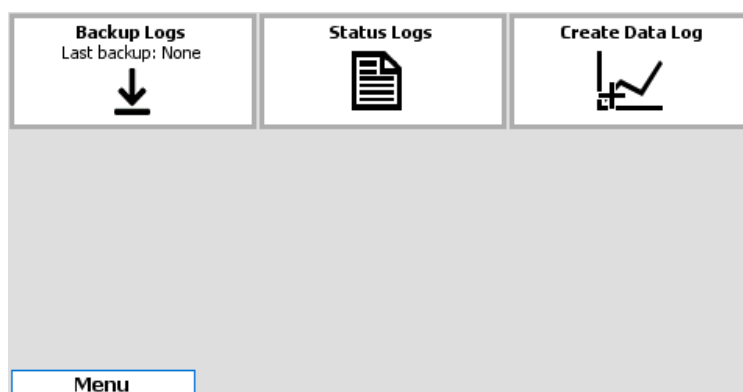
If any data logs are defined, each will be displayed as its own file.

2.4.6.1 Backup Logs

Logs can be backed up by selecting this tile. The screen will display the last time logs were successfully backed up. With a SD card inserted in to the analyzer, press the "Backup" button to begin. Log entries since the last successful backup will be written to the SD card. A progress bar will display the backup task progress and a message displayed to indicate the result.

2.4.6.2 Status Log

Selecting the Status Log tile will display the Status Log messages. These will include important information such as recording when calibrations are performed, users log in and any error messages:

---

[6]Communication cards must be present in the same order for restore/clone to function.
[7]All data log data will be cleared
[8]Same device codes must already be present on the analyzer for device configurations to be cloned successfully.

Status Logs

ID	Time	Message
2351	24/02/2017 12:55:51 GMT	pH Sensor 1.2 error: Sensor failed to read input signal
2350	24/02/2017 12:55:51 GMT	Free Chlorine Sensor 1.1 error: Sensor failed to read input s
2349	24/02/2017 12:52:07 GMT	Login by user user1
2348	24/02/2017 11:10:28 GMT	User logged out
2347	24/02/2017 06:21:22 GMT	Login by user user1
2346	24/02/2017 06:19:12 GMT	pH Sensor 1.2 error: Sensor failed to read input signal
2345	24/02/2017 06:19:12 GMT	Free Chlorine Sensor 1.1 error: Sensor failed to read input s
2344	24/02/2017 06:16:02 GMT	Login by user user1
2343	24/02/2017 05:40:59 GMT	User logged out
2342	24/02/2017 05:38:54 GMT	Login by user user1
2341	20/02/2017 07:24:58 GMT	User logged out

Home	Back	Clear	Download

Use the arrow keys to scroll up, down, left and right. Press "Clear" to delete the current status log messages and truncate the status log. Press "Download" to save the status log to SD card.

2.4.6.3 Data Logs

2.4.6.3.1 Creating a Data Log

To create a new data log, select "Create Data Log".

New Data Log

Name   [New Data Log]

Interval [30 Minutes   ▼]

Back		Next

Enter the name to identify the data log and the log interval. Available options are 1, 2, 5, 10, 15, 20, 30 minutes or 1 hour. Press "Next" to continue.

Items Logged

Free Chlorine Sensor 1.1 (Free Chlorine)
pH Sensor 1.2 (pH)
PID Controller 1.1 (Primary Output)

Back	None	All	Done

Select from a list of available parameters, signal inputs and control outputs to populate the data log. Highlight the desired measurements or press "All" to highlight all available measurements. Up to the first 4 measurements selected will be displayed on the data log graph. Press "Done" when finished. The data log will be created and data collected.

2.4.6.3.2 Viewing a Data Log
Each data log configured will be displayed as a tile in the Logs menu. Select the data log of interest to view the data.

The overview allows the renaming of the log and changing of the log interval. The "Delete" button will remove the log completely and prevent any further data logs being collected. The "Clear" button will truncate the data log and remove any historic data. The "Download" button allows the data log to be saved to SD card as comma-separated values.

To view the data log values collected, press the "Data" button. A table of recorded values will be displayed. Use the arrow keys to scroll up, down, left and right.
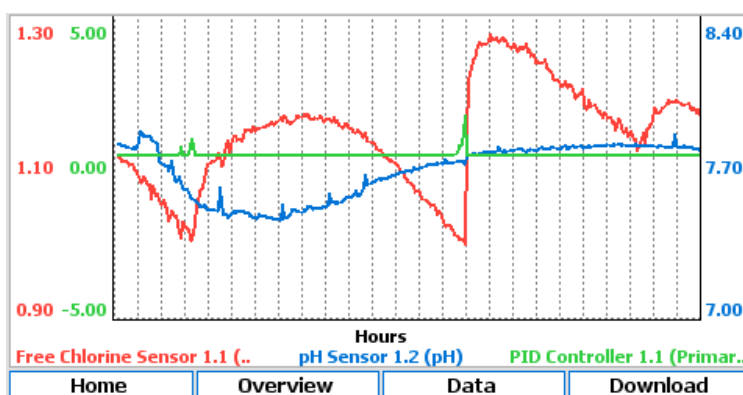
To view the data log graph, press the "Graph" button. The legend shows the line style for each measurement and axis.
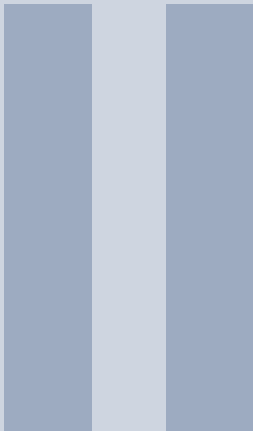
Options

3. Sensors

3.1 UV254 Sensor

3.1.1 General Information

3.1.1.1 Health and Safety

The UV254 Sensor is designed to measure the absorbance and transmittance of UV light at a wavelength of 254nm in water. The sensor is often used in clean water and waste water applications. Health and safety precautions should be taken to protect against waste water when handling a used sensor.

> **Before making or breaking any electrical or signal connections, ensure that the instrument is isolated from the electrical supply.**

Visually inspect the sensor prior to installation. If the quartz flow cell or UV lamp is broken or damaged in any way, do not use. Contact your supplier for replacement parts.

> **Ensure that all responsible personnel carefully read this manual before installing or servicing the UV254 sensor. Failure to properly install and maintain this device may impact the effectiveness of the sensor.**

The UV254 Sensor sensor contains a UV lamp, which emits light at the ultraviolet (UV) 254nm wavelength.

> **Never look directly at the UV light source, as it may cause permanent eye damage and harm unprotected skin.**

3.1.1.2 Environmental Considerations

The sensor includes a mercury lamp and a ribbon cable that are replaced periodically. Please use this product in a manner sensitive to the environment and at the end of its life dispose or recycle in a manner appropriate at that time in compliance with local regulations.

3.1.1.3   Theory of Operation

The UV254 Sensor Split-Sense Pro technology is designed to take sensor readings at 90° to each other, where one reading is through the water sample under test and the other reading is through air. The two sensor readings enable the instrument to compensate for lamp and sensor drift over time due to instrument aging and temperature. Changes inside the cabinet due to changes in ambient air temperature, intermittent exposure to sunlight, water temperature changes etc. are also compensated for. In this way, the UV transmittance (UVT) and the UV absorbance (UVA) of the test water is calculated without continuous need for calibration with DI water.

Turbidity interference is automatically compensated for within the UV254 Sensor by measuring wavelength (550nm) where there is no absorbance from organics. Even though there is turbidity compensation, all UV254 Sensor installations should be protected with a 50 micron filter. The following diagram shows the Ortho-Beam technology.
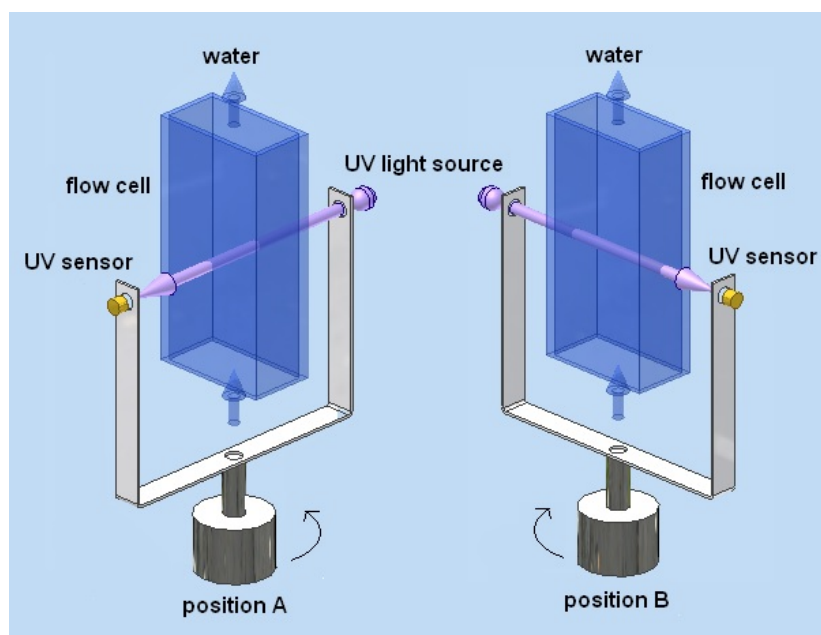
3.1.1.4   Relating the UV254 to another parameter

Light at the 254nm wavelength is of particular interest since it is a wavelength that is very readily absorbed by organic matter in the water. The UV254 absorbance parameter is proportional to the concentration of organics in the water and it is a simple process to determine a linear correlation factor that relates the UV254 parameter to other water quality parameters that provide a measure of organic matter in the water. There are several such water quality parameters including total organic carbon (TOC), chemical oxygen demand (COD), biological oxygen demand (BOD) and color (Hazen). All these parameters have slightly different biases to different types of organic matter. UV254 can often be linearly correlated to all of these parameters.[1]

The correlation factor will depend on the particular organic water quality parameter being correlated to and will also depend on the matrix of organics being measured. This means that correlations are site and application specific and so the correlation factor must be determined at the measurement site. Most natural water sources such as raw water for drinking water and municipal waste water have a good correlation between, for example TOC and UV254 absorption, and COD and UV254 absorption.

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[1]It is possible for there to be no correlation between UV254 absorbance and other water quality parameters if that parameter on a particular water source does not contain UV254 absorbing substances. An example of this would be a water supply counting a lot of dissolved sugar, as sugar won't absorb UV254 but will have a high Chemical Oxygen Demand (COD).
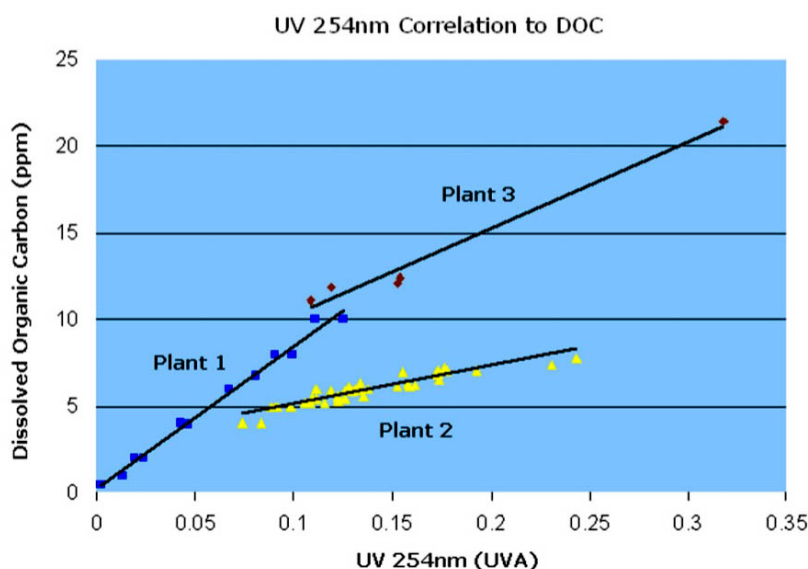
The way the UV254 Sensor provides an output for a correlated parameter is by applying an offset and calibration to the UV254 measurement. This is calculated by setting up a "virtual channel" in the instrument. This channel is then related to the original UV254 measurement by way of a formula in the form:

$$y = mx + c$$

where,

y correlated water parameter (eg. TOC, COD)
x UV254 absorbance value
m calibration slope
c calibration offset

In order to calculate m and c, sufficient data must be collected over time to generate a graph similar to the graph shown. A spreadsheet program can then fit a straight line to the data and provide the required values to be entered into the UV254 Sensor configuration. In order to derive a correlation between TOC, DOC, BOD, or COD and UVA, data will need to be gathered using both parameters over a period of time.

1. It is recommended to record the UVA numbers daily/weekly/monthly (depending on how frequently the water quality changes, the more often data is collected the more accurate the correlation will be.
2. Compare these UVA results to your other organic test parameter values (TOC, DOC, BOD, or COD) over the same period of time and graph the results to determine the relationship between the two parameters.
3. Keep in mind that the relationship will be different for every water source, i.e. the same correlation from one site could not be used on another site.
4. Once the correlation has been determined, the relationship can then be entered into the UV254 Sensor to output the value of your correlated parameter such as TOC or COD.

To set up the virtual channels see section 3.1.4.8.

3.1.1.5   Technical Data
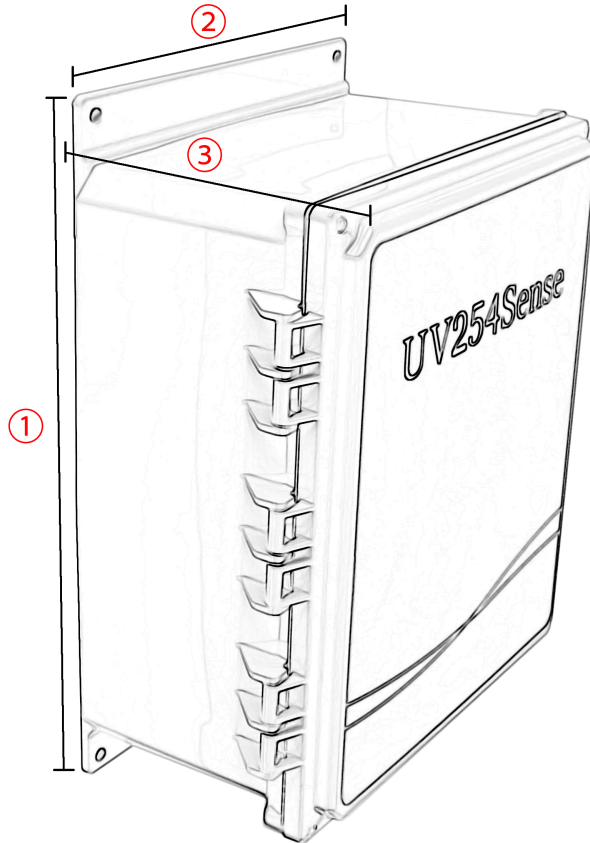
UV254 sensor profile view
  1. 430 mm
  2. 365 mm
  3. 195 mm

Range 0..5 UVA, 0..120% UVT
Accuracy $\pm$ 0.5% FS
Resolution 0.001 UVA.
Path Length 2mm, 4mm, or 10mm (to be specified at the time of order)
Sampling Time 10 seconds.
Flow Rate 300..1000ml/min
Pressure rating 20 PSI
Cleaning Automatic cleaning option (to be specified at the time of order)
Humidity Control Humidity sensor with large regenerable desiccant system
Light Source Low pressure mercury UV lamp
Lamp life 2 year expected
Enclosure IP 65 (NEMA 4X), wall mountable
Fluid Connections 1/4" push-fit inlet/outlet.
Storage Temperature -20 to 60°C
Operating Temperature 0 to 45°C
Rated Water Temperature 75°C
Weight 10kg

3.1.2 Installation

3.1.2.1 UV254 Sensor

The UV254 sensor enclosure should be mounted away from sources of heat and direct sunlight. It should be mounted so that the sensor is vertical and that there is sufficient clearance on the left-hand-side to allow the enclosure to be fully opened. The UV254 sensor should be sited away from sources of vibration and should not be hosed down.
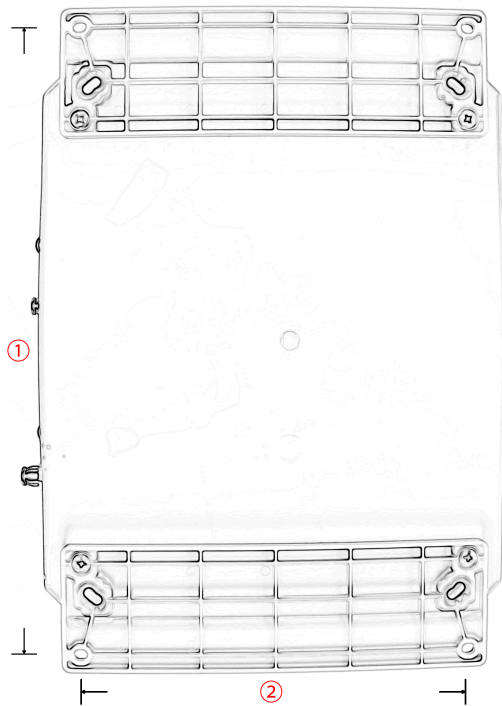
UV254 sensor rear view
1. 406 mm
2. 254 mm

3.1.2.2 Mounting and Plumbing

Piping is required to be 1/4 " OD flex tubing of whatever pressure rating is needed for the particular site. Direction of flow is shown in this side view.
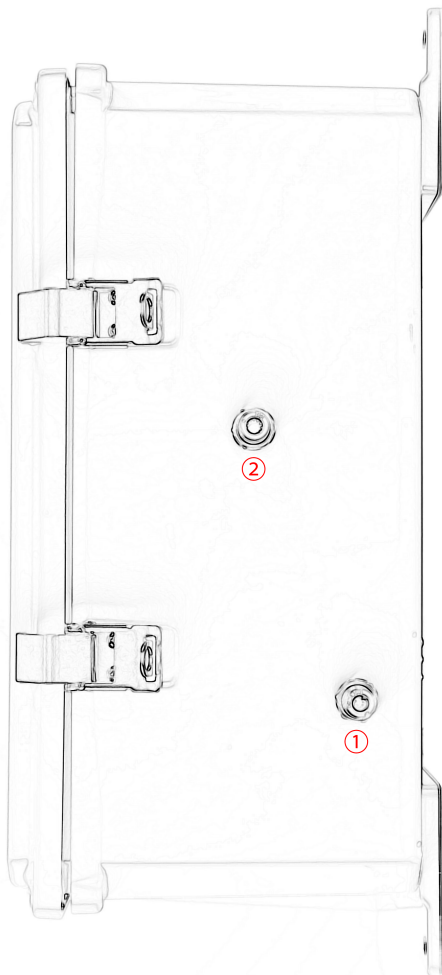
UV254 sensor side view
1. Sample inlet
2. Sample drain

The customer must install a valve to shut off the flow to the sensor when servicing is required and a flow control valve to regulate the flow to 0.3-1.0 l/min. The recommended flow rate for the sensor is approximately 0.75 l/min. This flow rate is regulated by the use of suitable flow control valve on the inlet tubing. The test water must be allowed to flow unrestricted to the drain, and water pressure at the sensor should never exceed 5 PSI (350 millibar). The UV254 sensor will operate without recalibration or cleaning for an extended period of time under most water conditions. However, if water has very high turbidity or large suspended particles, then at least a 5 micron sediment filter is recommended to ensure accurate readings. The sensor should be attached to the wall at all four provided mounting holes. The type of screws used will depend on the installation site. When selecting the type of screws to be used, ensure that they will support the weight of the instrument. Both 24VDC power and communication lines feed into the sensor via one fitting on the bottom of the sensor and must be connected to the terminal block at the bottom of the enclosure.

3.1.2.3 Wiring

Connections for AC power and between the HydroAct 4 and UV254 sensor are indicated in the following image.

Note regarding sensor card slot position:

If the analyzer is only equipped to work with a single sensor (as evident by there only being one plugin card installed in slots 1 and slots 2 to 4 being empty) then the RS-485 sensor input card for the UV254 sensor will be in the "Slot #1" position as shown in this diagram. Otherwise, if additional plugin

cards are installed in slots 2 to 4 it will be necessary to power up the HydroAct 4 and check the sensor name and/or connections diagram under the sensor menu to determine the correct slot position for the UV254 sensor input card. There will be numbers appearing at the end of the sensor name like UV254 1.1 or UV254 1.2. A designation of 1.2 indicates the sensor input card is located in slot #2, whereas a designation of 1.3 indicates slot #3. If the numbers which appear begin with 5 (e.g. UV254 5.1), then it means the sensor input card is located in slot #1 of the expansion module. The slot position in which the sensor input card is located can also be verified by going to the connections diagram under the sensor menu as described in the Connections section of this manual.

Analyzer

See note regarding slot position for the sensor input card. Sensor input card may be in a different slot position than what is shown here.

Slot #1, Slot #2, Slot #3, Slot #4, Slot #5, Slot #6, Slot #7, Slot #8

RS-485 - A
RS-485 - B
Shield

Common | +24 VDC
Common | +24 VDC

Line Power
110-220 VAC
50-60Hz

Line
Neutral
Ground

+24 VDC
Common

RS-485 (B)
RS-485 (A)

UV1 Sensor

Cuvette

Motherboard

Ribbon Cable

RS-485
A B G

Terminal 1-10: Not Used
Terminal 11: -24 VDC
Terminal 12: +24 VDC

For safety and correct operation, the sensor must be properly earthed.

3.1.2.4 Assembly

To begin, remove the UV254 sensor from the packaging and carefully inspect the instrument to ensure that no visible damage has occurred during shipping. Next, remove any packaging material that is contained in the inside of the enclosure of the instrument. It is important to note that the quartz flow cell and the rotating arm for the UV254 sensor have been shipped separately. To begin, position the flat on the motor so it is facing out as shown.
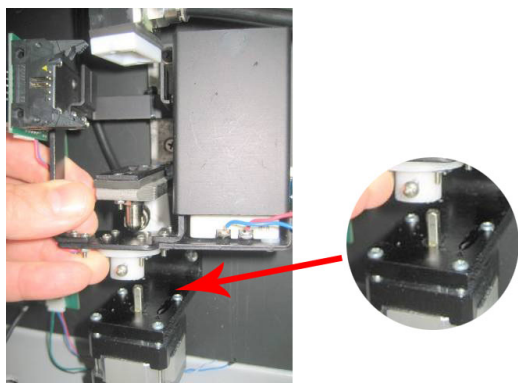
Then place the rotating arm on the motor shaft as shown on left and tighten the shaft locking screw with a Philips screwdriver.
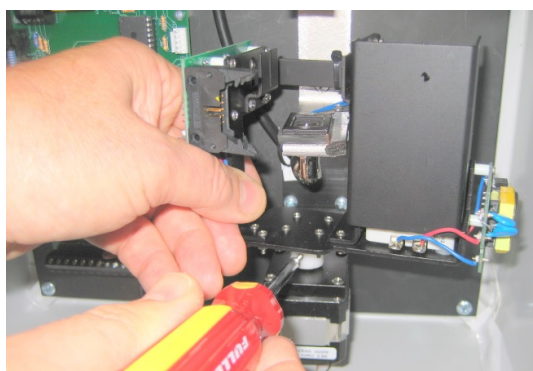
Lint free gloves must be worn after this stage.
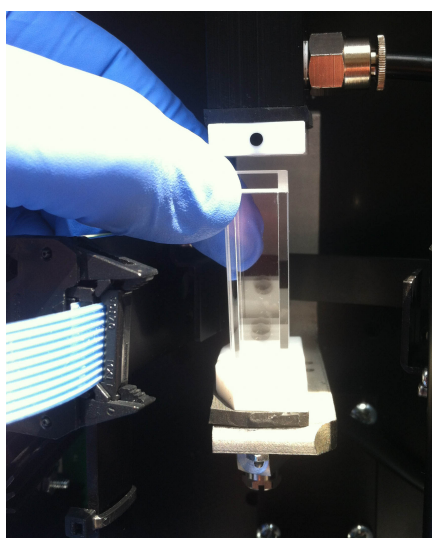
Remove the quartz flow cell carefully from the packing and insert it into position under the clamping flow tube.
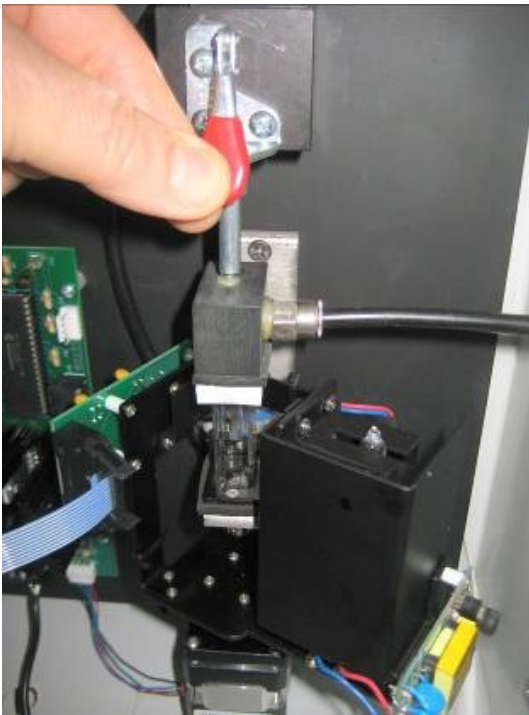
Once in place, carefully and slowly lower clamp to ensure it is aligned with the flow tube.
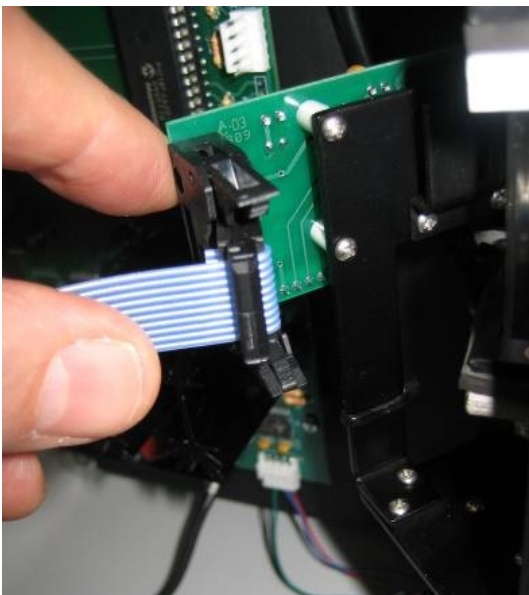
Connect the flex ribbon connector to the rotating arm as shown.
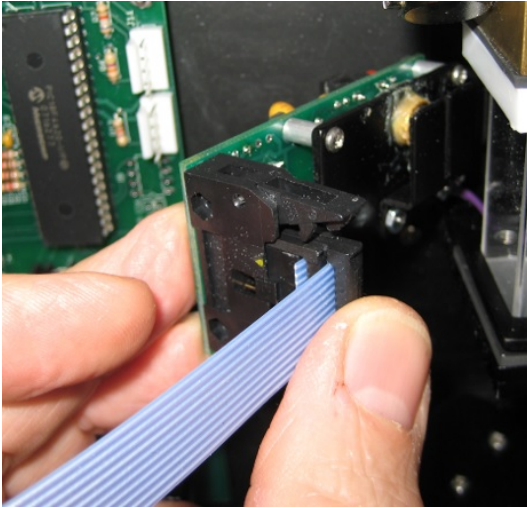
Press the connector as shown, so the top and bottom hold down clamps click into position.

3.1.2.5 Start-Up Procedure

Before plugging in the UV254 sensor, check to make sure the electrical connections are correct. Also, make sure the quartz flow cell is installed and the red flow cell lever is in the fully down position.

> **In areas of high humidity, before turning on the water flow leave the enclosure door closed for a minimum of three hours to allow for the dehumidifier to dry the air inside the enclosure. After the sensor has been installed as described above, operation of the sensor is very straightforward.**

1. After making sure that the flow rate has been set to 0.3-1.0 l/min, water pressure at the sensor is less that 5 PSI (350 millibar), and the drain is unrestricted and not kinked, open the inlet valve to allow test water to flow through the sensor and check for any leaks in the flow cell, piping and fittings for at least 10 minutes before proceeding to next step. Ensure that there are no bubbles flowing through the flow cell.
2. Plug in the power supply.
3. Configure the sensor to your application by going into the menu structure and setting such parameters as UVA or UVT etc. See section 3.1.4.

> **After installation the sensor must be zeroed (calibrated) before the UVT/UVA readings can be assumed to be accurate.**

3.1.3 Commissioning

3.1.3.1 Calibration

The monitor must be initially calibrated to a 100% UVT water sample of either DI or RO reference water before accurate UVT/UVA data can be read. Alternatively, the monitor can be calibrated to water with a known UVT or UVA as measured using a lab or portable spectrometer. **Using RO or DI water method**

Options → Maintenance → Calibration

1. Make sure the door of the UV254 sensor enclosure is closed properly. Make sure both door clamps are secure.
2. Shut off the water supply to the monitor if not already done.
3. Disconnect the 1/4 " supply tubing at the inlet connection on the UV254 sensor enclosure.
4. Fill the wash bottle supplied with DI water and connect the 1/4 " bottle tubing to the inlet connection of the sensor enclosure.

5. Hold a finger over the small vent hole in the center of the wash bottle cap.
6. Squeeze the bottle to get the DI water to flow through the sensor.
7. Once the fluid starts to flow remove your finger from the vent hole and place the bottle on top of the sensor enclosure. The fluid should continue to flow through the monitor.
8. Let about half of the DI water run through the sensor before pressing the "Calibrate" button, and the monitor will calibrate itself to 100% UVT.
9. The HydroAct 4 will report the calibration result, and if successful, the sensor has now been calibrated to DI water.
10. Disconnect the wash bottle hose from the inlet of the sensor, reconnect the supply tubing and open the value to allow the test water to flow.

Using known UVT water method

Options → Maintenance → Standardization

When using a "known" UVT sample, the calibration will automatically disable turbidity compensation.

1. Enter the known UVT of the water, then press "Apply".
2. The sensor is now calibrated to the value specified.

3.1.4   Operation

When selecting the UV254 Sensor tile from main menu, the sensor overview screen will be displayed. This shows the current reading, alarm state and maintenance information. The "Options" button allows access to other sensor options.
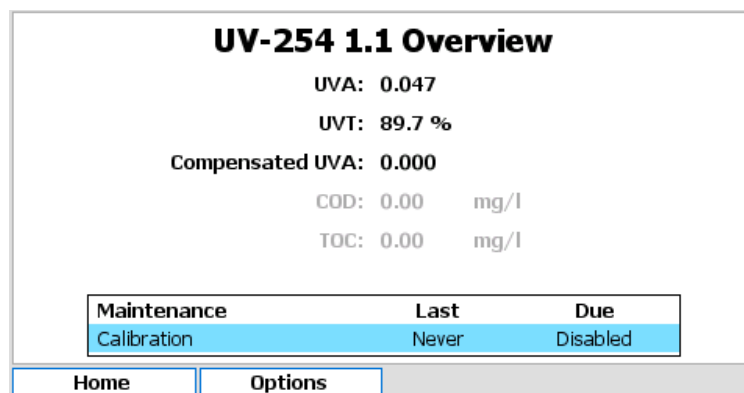
3.1.4.1   Sensor Setup

Sensor settings are accessed by selecting:

Options → Setup → Sensor Setup

Name Edit the sensor name used to identify the sensor. Up to 25 characters.

Display Options are "Show" or "Hide". This relates to whether the tile for this sensor will show on the Menu screen.

Enabled Options are "Yes" or "No". If "No" is selected the sensor will not update and will not generate alarms.

Flow Signal Allows a flow switch to be associated with a sensor. Options are "Disabled" or selectable from a list of available digital inputs.

Flush Signal Allows an external flush signal to be associated with a specific sensor. The flush signal will notify the sensor that an automatic cleaning operation is underway. Options are "Disabled" or selectable from a list of available digital inputs.

Process Signal Allows an external process signal to be associated with a specific sensor and allows the external signal to enable or disable a sensor. Options are "Disabled" or selectable from a list of available digital inputs.

Hold Delay The Sensor hold delay is used following a flush event to allow the sensor reading to recover. Time entered in HH:MM:SS format.

3.1.4.2 UVA

Parameter settings are accessed by selecting:

Options → Setup → UVA

Type A selectable list of parameter types. The selection made here will affect what options are available below.

Name Available if "User defined" is selected as the type. The name can be up to 25 characters.

Units If "User defined" is selected above, set the units using the custom units' entry screen that will be displayed when pressing the select button. Otherwise select from an appropriate list of units for the parameter type.

Precision Select the number of digits following the decimal point to display. This should be appropriate for the measurement. Options are 0 to 5.

Offline Value This is the value reported by the parameter when in 'Offline' mode, for example, if the sensor is in alarm. Options are within the range of the parameter.

Averaging Enables or disables a rolling average for the parameter to smooth the reading. Options are "Enabled" or "Disabled". Selecting "Enabled" will allow editing of the following two form fields.

Length Enter the number of data points in the rolling average buffer. Options are 2..60.

Delay Enter the delay between collecting data points for the rolling average[2]. Options are 200..5000ms.

3.1.4.3 UVT

Parameter settings are accessed by selecting:

    Options → Setup → UVT

Type A selectable list of parameter types. The selection made here will affect what options are available below.

Name Available if "User defined" is selected as the type. The name can be up to 25 characters.

Units If "User defined" is selected above, set the units using the custom units' entry screen that will be displayed when pressing the select button. Otherwise select from an appropriate list of units for the parameter type.

Precision Select the number of digits following the decimal point to display. This should be appropriate for the measurement. Options are 0 to 5.

Offline Value This is the value reported by the parameter when in 'Offline' mode, for example, if the sensor is in alarm. Options are within the range of the parameter.

Averaging Enables or disables a rolling average for the parameter to smooth the reading. Options are "Enabled" or "Disabled". Selecting "Enabled" will allow editing of the following two form fields.

Length Enter the number of data points in the rolling average buffer. Options are 2..60.

Delay Enter the delay between collecting data points for the rolling average[3]. Options are 200..5000ms.

3.1.4.4 Compensated UVA

Parameter settings are accessed by selecting:

    Options → Setup → Compensated UVA

---

[2]An averaging delay of 2000ms with a length of 30 will result in a rolling average of 1 minute (30 × 2s) with a reading taken every 2 seconds. If averaging is enabled it will apply to all aspects of the parameter value, e.g., it will apply to the value displayed, logged and outputted.

[3]An averaging delay of 2000ms with a length of 30 will result in a rolling average of 1 minute (30 × 2s) with a reading taken every 2 seconds. If averaging is enabled it will apply to all aspects of the parameter value, e.g., it will apply to the value displayed, logged and outputted.

Parameter Setup

Type [Compensated UVA ▼]

Precision [3 ⇕] Digits
Range [0.000] .. [5.000]
Offline Value [0.000]

Averaging ○ Enabled   Length [60 ⇕]
○ Disabled   Delay [0500 ⇕] ms

[Home]   [Options]

Type A selectable list of parameter types. The selection made here will affect what options are available below.

Name Available if "User defined" is selected as the type. The name can be up to 25 characters.

Units If "User defined" is selected above, set the units using the custom units' entry screen that will be displayed when pressing the select button. Otherwise select from an appropriate list of units for the parameter type.

Precision Select the number of digits following the decimal point to display. This should be appropriate for the measurement. Options are 0 to 5.

Offline Value This is the value reported by the parameter when in 'Offline' mode, for example, if the sensor is in alarm. Options are within the range of the parameter.

Averaging Enables or disables a rolling average for the parameter to smooth the reading. Options are "Enabled" or "Disabled". Selecting "Enabled" will allow editing of the following two form fields.

Length Enter the number of data points in the rolling average buffer. Options are 2..60.

Delay Enter the delay between collecting data points for the rolling average[4]. Options are 200..5000ms.

3.1.4.5 COD

Parameter settings are accessed by selecting:

Options → Setup → COD

Parameter Setup

Type [COD ▼]

Precision [2 ⇕] Digits   Units [mg/l ▼]
Range [0.00] .. [10000.00]
Offline Value [0.00]

Averaging ○ Enabled   Length [60 ⇕]
○ Disabled   Delay [0500 ⇕] ms

[Home]   [Options]

Type A selectable list of parameter types. The selection made here will affect what options are available below.

Name Available if "User defined" is selected as the type. The name can be up to 25 characters.

---

[4]An averaging delay of 2000ms with a length of 30 will result in a rolling average of 1 minute (30 × 2s) with a reading taken every 2 seconds. If averaging is enabled it will apply to all aspects of the parameter value, e.g., it will apply to the value displayed, logged and outputted.

Units If "User defined" is selected above, set the units using the custom units' entry screen that will be displayed when pressing the select button. Otherwise select from an appropriate list of units for the parameter type.

Precision Select the number of digits following the decimal point to display. This should be appropriate for the measurement. Options are 0 to 5.

Offline Value This is the value reported by the parameter when in 'Offline' mode, for example, if the sensor is in alarm. Options are within the range of the parameter.

Averaging Enables or disables a rolling average for the parameter to smooth the reading. Options are "Enabled" or "Disabled". Selecting "Enabled" will allow editing of the following two form fields.

Length Enter the number of data points in the rolling average buffer. Options are 2..60.

Delay Enter the delay between collecting data points for the rolling average[5]. Options are 200..5000ms.

3.1.4.6 TOC

Parameter settings are accessed by selecting:

Options → Setup → TOC

Type A selectable list of parameter types. The selection made here will affect what options are available below.

Name Available if "User defined" is selected as the type. The name can be up to 25 characters.

Units If "User defined" is selected above, set the units using the custom units' entry screen that will be displayed when pressing the select button. Otherwise select from an appropriate list of units for the parameter type.

Precision Select the number of digits following the decimal point to display. This should be appropriate for the measurement. Options are 0 to 5.

Offline Value This is the value reported by the parameter when in 'Offline' mode, for example, if the sensor is in alarm. Options are within the range of the parameter.

Averaging Enables or disables a rolling average for the parameter to smooth the reading. Options are "Enabled" or "Disabled". Selecting "Enabled" will allow editing of the following two form fields.

Length Enter the number of data points in the rolling average buffer. Options are 2..60.

Delay Enter the delay between collecting data points for the rolling average[6]. Options are 200..5000ms.

3.1.4.7 Modbus Setup

Modbus settings can be accessed by selecting:

---

[5]An averaging delay of 2000ms with a length of 30 will result in a rolling average of 1 minute (30 × 2s) with a reading taken every 2 seconds. If averaging is enabled it will apply to all aspects of the parameter value, e.g., it will apply to the value displayed, logged and outputted.

[6]An averaging delay of 2000ms with a length of 30 will result in a rolling average of 1 minute (30 × 2s) with a reading taken every 2 seconds. If averaging is enabled it will apply to all aspects of the parameter value, e.g., it will apply to the value displayed, logged and outputted.

Options → Setup → Modbus Setup

Modbus Setup

Slave Address	001
Mode	RTU
Baud Rate	19200
Parity	Even
Stop Bits	1
	☐ Termination Enabled
	☐ Byte Swap
	☐ Word Swap

| Home | Options |

Slave Address Enter the Modbus slave address of the sensor. This is unlikely to change from 1.

Mode Select the Modbus serial mode. Options are "ASCII" or "RTU".

Baud Rate Select the RS485 baud rate. Options are standard baud rates between 1200 and 115200.

Parity Select the RS485 parity bit option. Options are "Odd", "Even", or "None"

Stop Bits Select the number of stop bits. Options are 1 or 2.

Termination Enabled Use the checkbox to enable the use of a termination resistor.

Byte Swap To support different microprocessors that store data in different formats, the HydroAct 4 can alter the data it sends and receives to match the format expected by the sensor. The byte swap option allows the order of bytes in the 16-bit registers to be reversed.

Word Swap When two 16-bit registers are combined for larger data types, e.g., floating-point number representations, this option reverses the order of the two 16-bit words to match the format expected by the sensor.

3.1.4.8 COD

Options → Virtual Setup → COD

COD Setup

COD Enabled   ○ Yes   Correlation Parameter   ◉ UVA
              ◉ No   ○ Compensated UVA

Slope   1.00

Offset   0.00

| Home | Options |

COD Enabled Options are "Yes" or "No".

Correlation Parameter Select which parameter to utilize for the linear relationship. Options are measured UVA or UVA compensated for sample turbidity.

Slope Enter the calibration slope calculated from the linear correlation.

Offset Enter the calibration offset calculated from the linear correlation.

3.1.4.9 TOC

Options → Virtual Setup → TOC

TOC Setup

TOC Enabled ○ Yes   Correlation Parameter ⦿ UVA
             ⦿ No   ○ Compensated UVA

                            Slope   [1.00]

                            Offset   [0.00]

[Home] [Options]

TOC Enabled Options are "Yes" or "No".
Correlation Parameter Select which parameter to utilize for the linear relationship. Options are measured UVA or UVA compensated for sample turbidity.
Slope Enter the calibration slope calculated from the linear correlation.
Offset Enter the calibration offset calculated from the linear correlation.

3.1.4.10 Maintenance Setup

Options → Maintenance → Setup

Maintenance Setup

Calibration Warning [ ] Enabled
        Frequency [30 ▲▼] [Days ▼]
Last Calibration: Never

[Home] [Options]

Calibration Warning Options are "Enabled" or "Disabled".
Frequency Default is 3 months.
Last Calibration Date of the last calibration. Given in DD/MM/YY

3.1.4.11 Calibration

The calibration procedure is described in section 3.1.3.1.

3.1.4.12 Secondary Data

Options → Diagnostics → Secondary Data

Secondary Data

Temperature: 37.7 C

Humidity: 12.9 %

Lamp Reading   Water Reading

Long: 84   Long: 21142

Short: 84   Short: 20569

| Home | Options |

Conversion values here provide information about the sensor environment (temperature and humidity) and detector readings used to calculate the UV absorbance and transmittance.

There are 6 values found in this sub menu including; raw Lamp and Water readings, and internal Temperature and Humidity. These values can be used to help determine how the system is performing.

If all the numbers displayed are 0 then this indicates the system did not start up correctly (refer to the diagnostics LEDs). If Lamp and Water numbers are 0 but humidity and temperature data appears to be correct then this indicates a communication problem with the sensor board located on the rotating assembly. See troubleshooting section 3.1.6 for further details.

Lamp Numbers

Lamp numbers are not affected by sample water absorbance as they are a direct reading of the lamp output. Long and short readings should be within 20 points of each other and they should not fluctuate by more than 20 points after the sensor has warmed up. If they fluctuate much more than this it may indicate an issue with the map or with the lamp sensor.

If lamp numbers are too high this may indicate the current lamp is brighter than previous lamps. If this is the case, contact your supplier. If the lamp numbers are too low then this usually indicates the lamp needs to be changed. It is recommended to change the lamp every 18 months, but a warning will appear on the display screen when the lamp starts to get low and needs replacing.

If a new lamp is installed and the lamp numbers are still too low then this may indicate that a new lamp has lower output that the previous lamp. If the lamp reading is much lower than 2000 and the lamp is new this may indicate a faulty lamp (perhaps damaged during shipping).

Water Numbers

Long and short readings are dependent on the absorbance of the sample water stream. If either or both water values goes below 100 (and the lamp numbers are within correct range) then either the sample is close to the top of the measurement range of the instrument, or the sample cell needs to be cleaned.

With DI water in the flow cell, the Water values should be within 200 points of each other. If they are much further apart than that, cleaning should be performed as this may indicate fouling or water scaling of the flow cell. After cleaning and flushing with DI water, the water numbers can be checked again to make sure the cleaning was sufficient.

Temperature and Humidity

The internal temperature should be kept below 50 °C, the system will alarm if this temperature is reached. If this does happen it may indicate that the sensor should be moved to a cooler location. Humidity should be kept as low as possible especially when the sample water is cold as condensation can form on the flow cell which can severely affect accuracy.

3.1.4.13 Turbidity Data

Options → Diagnostics → Turbidity Data

Turbidity Data

Absorbance: 38.2309

Long: 29021

Short: 28994

| Home | Options |

Turbidity Compensation

Conversion values here provide information about the turbidity measurement that can be used to compensate the UV absorbance parameter. These values may be requested when contacting your supplier for support.

3.1.4.14 Modbus Statistics

To access the Modbus statistics diagnostic information, select:

Options → Diagnostics → Modbus Statistics

Modbus Statistics

	Rx	Tx
Packets	3501	3501
Bytes	108519	28008

	Exceptions	Timeout	Checksum
Errors	0	0	0

| Home | Options | | Reset |

Received and transmitted byte and packet counts are displayed along with error counters. Error counters for packets received with checksum errors, timeouts and exception packets generated are recorded. Counters are unsigned 32-bit and will overflow back to 0 if they reach 4,294,967,295. Alternatively, all counters can be manually reset by pressing the "Reset" button.

3.1.4.15 Status Flags

The status flags show the state of a device. These flags can either be active or not. To see the state of these status flags, select:

Options → Device Flags → Status Flags

Flags that are active are shown in black text on a white background, those that are not active are grayed out. Available flags are:

Display on main menu When active the device tile is displayed on the main menu. If inactive, the tile is hidden in the default view.

Sensor enabled This flag is enabled if the sensor is enabled.

Sensor on-line This flag is enabled if the sensor is on-line.

Sensor reading in warm up If the sensor reports that the current reading is not ready, then this flag is set.

Sensor reading in hold This flag is enabled when the sensor output value is held, usually during, or just after, self-cleaning or periods of maintenance.

Sensor process stopped If the sensor is off-line due to a process stop signal, this flag is set.

Sensor flush active This flag is set when the sensor is self-cleaning.

Sensor calibration warning reached If the calibration is due and the maintenance warning is enabled, then this flag is set

Sensor maintenance period x warning reached If the maintenance warning is enabled and the due date has passed, then this flag is set. The exact type of maintenance is sensor-specific. See section 3.1.4.10 for details.

Turbidity Compensation Disabled This flag is set if the turbidity compensation for the UV transmission has been disabled.

Cleaning Cycle Active If set, this flag indicates that a cleaning cycle is underway (only available if the auto-clean option is installed).

3.1.4.16 Error Flags

The error flags show any problems causing an error for a device. These flags can either be active or not. To see the state of these error flags, select:

Options → Device Flags → Error Flags

Flags that are active are shown in black text on a white background, those that are not active are grayed out. Available flags are:

I/O card fault detected If set, this flag indicates that a low-level hardware fault has occurred. Report to your supplier.

Incorrect I/O card found If set, this flag indicates that the I/O card fitted is of the wrong type.

I/O card in use This flag is set when two devices are attempting to use the same I/O card.

Sensor connection error This flag is set when the sensor hardware detects a physical connection fault.

Sensor failed to read input signal If set, the sensor has failed to read the state of the flow, flush or process signal.

Sensor flow alarm active This flag is set if a low/no flow condition is reported by the flow signal.

Sensor data alarm active When the sensor readings trigger a data alarm, this flag is set.

I/O card configuration failed This flag is set if the I/O plugin card fails to respond correctly. Contact your supplier for advice.

Modbus communications error This flag is set when a Modbus exception, timeout or checksum failure occurs. If clear, communication with the sensor is normal.

Device identifier mismatch If set, this flag indicates that the sensor connected to the Modbus input is not responding as expected. Check that the correct sensor is connected.

High humidity alarm This flag is set if the UV254 Sensor reports that the humidity in the enclosure is too high.

Leak detected alarm This flag is set if the UV254 Sensor detects a leak in the enclosure.

Lamp high alarm This flag is set if the UV254 Sensor reports the UV lamp output is too high.

Lamp low alarm This flag is set if the UV254 Sensor reports the UV lamp output is too low.

Lamp failure alarm This flag is set if the UV254 Sensor reports the UV lamp has failed.

Sensor failure alarm This flag is set if the UV254 Sensor reports a system fault.

3.1.4.17 Parameter Flags

The parameter flags show the state of an individual parameter of a particular sensor. These flags can either be active or not. To see the state of these parameter flags, select:

Options → Device Flags → *Parameter Name*

Flags that are active are shown in black text on a white background, those that are not active are grayed out. Available flags are:

Alarm 1 active The first parameter data alarm is active and triggered.

Alarm 2 active The second parameter data alarm is active and triggered.

Averaging enabled The value displayed for this parameter is averaged.

Threshold 1 active The first parameter threshold is active and triggered.

Threshold 2 active The second parameter threshold is active and triggered.

3.1.4.18 Alarms and Thresholds

Alarms are the means by which values obtained from sensors cause visible, audible or physical actions to occur. Alarms are not to be confused with relays. An alarm in a HydroAct 4 unit will create a visible bar across the top of the screen and sound a buzzer. One flow alarm per sensor and two data alarms per parameter are available.

Thresholds are similar to alarms except that they are events that are supposed to occur and therefore will not cause the instrument to go into "Alarm". Thresholds are most frequently used to trigger relays to cause something to happen when a parameter reaches a value.

To access the alarm and threshold configuration select:

Options → Alarms & Thresholds → *Parameter Name*

The display has a tab for each alarm and threshold. Navigate to the tab using the right and left buttons indicated on the bottom of the display or navigate through the settings using the up and down arrows. Options are:

Enabled Selecting this option turns the alarm/threshold on or off.

Set The *Value* is used to trigger the alarm or threshold[7]. The *Delay* is the amount of time the value has to exceed the set value before the alarm/threshold is triggered.

Reset The *Value* is used to clear the alarm or threshold. The *Delay* is the amount of time the value has to exceed the reset value before the alarm/threshold is cleared.

3.1.4.19 Connections

As the HydroAct 4 is a modular system the exact wiring details will be specific to each order. Electrical connections required can be viewed by selecting:

Options → Connections

---
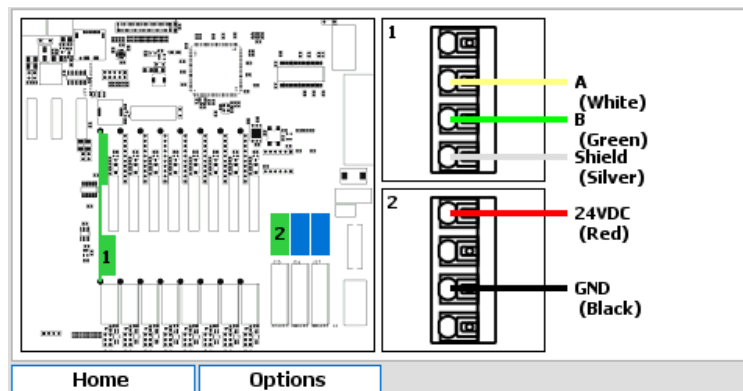
[7]A set value above a reset value will result in a rising alarm. A set value below a reset value will result in a falling alarm.

In the image above, the left side shows the position of the connector. The right side shows the connections required on the marked connectors.

| **Disconnect the power before making or breaking electrical connections.**

Power to the UV254 Sensor can be provided by the HydroAct 4. Please check that the optional power supply is fitted in the top left corner of the HydroAct 4 enclosure.

3.1.5   Maintenance

There are several sources of information available to the operator for diagnostics including: diagnostic LEDs on the main circuit board, system alarms and warning, and raw sensor data. See section 3.1.6 for further details.

3.1.5.1   Cleaning Quartz Flow Cell

The quartz flow cell can be cleaned in acid and/or cleaning solutions to remove residue that has accumulated on the inside surface. Similar to the calibration methods for the UV254 sensor, cleaning of the quartz flowcell can be performed using either the in-situ method or the manual method. The in-situ method is recommended since it is much faster and more efficient.

Cleaning solutions	**Type of fouling removed**
Lactic Acid <20% solution (CLR)	Removes lime, calcium, rust, magnesium, and other dissolved minerals.
Sulfamic Acid <10% solution (Lime Away)	Removes lime, calcium, rust, magnesium, and other dissolved minerals.
Phosphoric Acid <30% solution (Rust Off, Hasagen Blue)	Removes lime, calcium, rust, and color staining.
Citric Acid <20% solution	Removes mineral staining.
Sodium Hypochlorite <6% solution (Bleach)	Removes oil and grease.
Acetic Acid <20% solution	Removes mineral staining.
Sulfuric Acid <10% solution	Removes mineral staining.

If the power fails (regularly) or the water that is being tested stops flowing (regularly/routinely, eg at weekends), then use either Lactic Acid and Citric Acid, as described below.

3.1.5.1.1   In-situ quartz flow cell cleaning method

1. Shut off the water supply to the sensor if not already done.
2. Disconnect the 1/4" supply tubing at inlet connection on the sensor.
3. Fill the wash bottle supplied with the cleaning fluid and connect the 1/4" bottle tubing to the inlet connection on the sensor.
4. Hold a finger over the small vent hole in the center of the wash bottle cap.
5. Squeeze the bottle to get the cleaning fluid to flow through the sensor.
6. Once the fluid starts to flow remove finger from the vent hole and place bottle on top of the sensor. The fluid should continue to flow through the sensor. If it stops go to step 4.
7. Let all the fluid run through the quartz flow cell until the bottle is empty then disconnect the hose and bottle from the fitting.
8. Let the fluid remain in the quartz flow cell for several minutes until the quartz flow cell is clean.
9. Connect the supply line to the unit and open the valve to start the flow running.

10. Note that it is recommended to recalibrate the sensor at this time.

3.1.5.1.2 Manual quartz flow cell cleaning method and quartz flow cell removal

1. Shut off the sensor and close the water supply.
2. Disconnect both inlet and outlet tubing from the sensor and allow the water to completely drain from the quartz flow cell before proceeding.
3. Open door of the sensor and place a paper towel or cloth below the flow cell because some water might still be in the cell.
4. Slowly lift the red lever of the quartz flow cell clamp.
5. Grip the quartz flow cell with two fingers at the top and carefully remove from the holder.
6. Clean the quartz flow cell.
7. Place the quartz flow cell back in the holder (ensuring that there are no fingerprints on both sides of the quartz flow cell where the light path comes through).
8. Lower the red lever of the quartz flow cell clamp very slowly to lock the quartz flow cell in place, making sure the quartz flow cell is properly aligned as you lower the clamp.
9. Reconnect both inlet and outlet tubing then open the inlet valve to allow test water to flow through the sensor and check for any leaks in the flow cell, piping and fittings.
10. Check for leaks. If a leak occurs, immediately shut off the water supply and drain the flow cell and then reinstall it correctly.
11. Close the door of the sensor.

Two of the most important factors that affect the analyzer performance are the cleaning fluid used to clean the flow cell, and how often the flow cell is cleaned (cleaning frequency). The optimum cleaning fluid and cleaning frequency is dependent on the type of sample water being analyzed. For example, for drinking water treatment applications it is recommended to start with a twice per week cleaning schedule using a mineral deposit remover.

> **Sample water with low levels of organics could have high mineral content and therefore fouling and scaling is not necessarily linked to UV absorbance or organics content.**

3.1.5.2 Replacing UV Lamp

The lamp has a rated life of 12000 hours, however under normal use it should last much longer. When the message "Lamp Too Low" is displayed on the screen, it is time to order a new lamp.

> **The sensor will work for some time with this warning on the screen, but it is recommended to replace the lamp at this point as soon as possible to ensure the accuracy of the sensor.**

It is recommended that the lamp is replaced every 18 months or so for preventative maintenance. At the same time it is recommended that the blue ribbon cable is also replaced. Contact your supplier for a replacement parts. To replace the lamp follow the steps below.

1. Unplug the sensor from the power supply.
2. Shut off the water flow.
3. Drain the flow cell by disconnecting the 1/4" tubing from the external push-in fittings on the side of the sensor.
4. Remove the flow cell by pulling up on the blue handle of the toggle clamp above the flow cell.
5. Disconnect the blue ribbon cable form the rotating arm assembly.
6. Loosen the set screw that secures the rotating arm assembly to the motor shaft.
7. Lift up on the rotating arm assembly and remove the assembly.
8. Use a small, flat head screw driver to pry the lamp base from the ceramic lamp socket.
9. Press the new lamp securely into the ceramic lamp socket.
10. Replace the rotating arm assembly back onto the motor shaft and tighten the set screw on the flat of the motor shaft.
11. Replace the blue ribbon cable.

12. Reinstall the flow cell being careful the flow cell is properly aligned before lowering the toggle clamp.
13. Make sure the toggle clamp is pressed all the way down and the 1/4" tubing is reconnected before starting the water flow again.
14. Check for leaks. If a leak occurs, immediately shut off the water supply and drain the flow cell and then reinstall it correctly.
15. Supply power to the sensor.
16. Close the door and watch the "Secondary Data" described in section 3.1.4.12 to make sure raw sensor values are at expected levels.

The Water and Lamp values should be between 2000 and 3500 with DI water in the flow cell. These values will increase as the UV lamp warms up and so these values should be checked several minutes after the UV Lamp turns on. If the raw sensor values do not reach the levels indicated, or they are too high, then contact your supplier or your supplier for assistance.

3.1.5.3 Ribbon Cable Replacement

The blue cable that connects the main circuit board to the sensor board is located on the rotating assembly and is a teflon, high flex 10 conductor cable. It is designed to withstand long term exposure to the deep UV light present inside the cabinet. However, even this high flex cable will need to be replaced from time to time. It is recommended that the blue ribbon cable be replaced every 12 to 18 months as pre-emptive maintenance. The replacement is a very simple procedure requiring no tools. Simply unclip the end connectors that secure the old cable by opening the wing clips, pull out the connectors and replace with the new cable. Make sure to use the wrong clips on the board connectors to secure the new cable.

> **A spare cable is included with every new unit and is attached to the inside of the cabinet door. To order more cables please contact your supplier.**

3.1.5.4 Dehumidifier for Humidity Control

The UV254 Sensor includes a dehumidifier to control the humidity inside the sensor. The dehumidifier is located inside the UV254 Sensor at the bottom left corner and will maintain low relative humidity to prevent condensation from forming on the quartz flow cell walls. The dehumidifier is designed to maintain low humidity inside the UV254 Sensor for 6-12 months before regeneration. To regenerate simply remove the dehumidifier and plug into a 110-240 VAC wall outlet for 10-12 hours. The color bar on the front will turn dark blue when the dehumidifier is fully regenerated. There is no limit to the number of times the dehumidifier can be regenerated. When replacing the dehumidifier back inside the UV254 Sensor ensure that the dehumidifier is close to the left inside wall of sensor when in place.

> **The dehumidifier unit may take several minutes and possibly up to an hour to properly dry the air inside the sensor.**

Each time the door to the cabinet is opened this drying process starts over, so it is recommended to keep the cabinet door closed as much as possible when in a high ambient humidity environment. The humidity alarm is triggered if the humidity level is 25% RH or above. This level of humidity is not necessarily harmful to the sensor. The main problem posed by humidity is the increased potential for condensation forming on the flow cell especially if the sample water is very cold, as this can severely affect the accuracy of the sensor.

In order to check to see the progress of the drying process, use the "Humidity" entry under "Secondary Data" described in section 3.1.4.12 to check the current relative humidity inside the sensor. At sites where humidity is known to not be excessively high, and where water temperature is known to be room temperature or above, it may not be necessary to use the dehumidifier, as condensation likely will not form on the flow cell under these conditions.

3.1.6 Troubleshooting

3.1.6.1 Leak detected

Possible cause	Possible solution
A leak has been detected inside the analyzer.	Immediately shut off the water flow to the analyzer. Assess the damage inside the analyzer and call your supplier for further instructions. If the automated cleaning system is connected to the analyzer it will have been signaled to shut off the water flow assuming no electrical short has occurred. The automated cleaning system requires power and signals from the analyzer to shut of the water flow.

3.1.6.2 Humidity high

Possible cause	Possible solution
Humidity inside the analyzer is approaching a level that could cause condensation on the flow cell if water temperature is low enough.	The humidity alarm is tripped when the humidity level inside the analyzer is greater than 25%RH. If the water temperature is cold then condensation could occur on the flow cell windows at this level of humidity. The dehumidifier included with the analyzer can be used to reduce humidity to a level that will prevent condensation no matter what the water temperature. If the sample water is warm, condensation on the flow cell may not be likely. In this case it may be possible to ignore or turn off the humidity alarm.

3.1.6.3 Lamp too high

Possible cause	Possible solution
The lamp output is too high and is out of range of the sensor.	If a new lamp has been installed it may be necessary to adjust the internal gain of the sensor. This can be performed by adjusting lamp sensor and water sensor potentiometer setting on the main menu. Note that higher potentiometer values decrease the sensor values. Note that if adjustment is necessary it is recommended to adjust both lamp and water potentiometers by the same amount to ensure best performance.

3.1.6.4 Lamp failed

Possible cause	Possible solution
The lamp output is too low to provide accurate measurements.	The lamp may need to be replaced if the lamp use is close to or more than 4000 hrs. Contact your supplier for replacement. Note that the lamp may take several minutes to ignite after closing the door, especially after shipping.

3.1.6.5 Lamp too low

Possible cause	Possible solution
The lamp output is low but not too low for the analyzer to provide accurate measurements.	It is nearly time for the lamp to be replaced, however, the lamp output is still high enough for the analyzer to produce accurate measurements.

3.1.6.6 All the numbers displayed in the Secondary Data Menu are 0

Possible cause	Possible solution
If all the numbers displayed are 0 then this indicates the system did not start up correctly (refer to the diagnostics LEDs).	Restart the machine.

3.1.6.7 All the Lamp and Water numbers displayed in the Secondary Data Menu are 0 but humidity and temperature data appears to be correct

Possible cause	Possible solution
If Lamp and Water numbers are 0 but humidity and temperature data appears to be correct then this indicates a communication problem with the sensor board located on the rotating assembly.	Check the sensor board.

3.1.6.8 Diagnostics LEDs
The diagnostic LEDs are located on the smaller of the two circuit boards that is mounted on the back plate of the analyzer. The diagnostic LEDs allow determination of the current state of the firmware. The LEDs can be used to determine issues such as a damaged reference micro-switch, an internal communication issue, a blown fuse, etc..

LED numbering is provided on the circuit board.

LED 4	LED 3	LED 2	LED 1	Possible cause	Possible solution
off	off	off	off	No power	Check power connections. Check fuse on main circuit board. If blown replace with 20mm x5mm.
on	on	off	off	Bad reference position check	Check reference micro-switch on motor bracket. If damaged it may need to be replaced. Check set screw attaching rotating mechanism to motor shaft is tightened on the flat of the motor shaft. If motor does not move at all shortly after start up, check motor connection to main circuit board. Possible bad motor or motor controller on main circuit board.
on	off	on	off	Communication error to sensor board	Check connection from main circuit board to sensor board. Check for breaks in the blue ribbon cable. May need to replace the sensor board.

4. Controls

4.1 PID Control

4.1.1 General Information

4.1.1.1 Theory of Operation

The PID control calculates an error value as the difference between a desired setpoint and a measured sensor input, called the process variable. The control then calculates an output using this error value based on proportional, integral and derivative terms. The output of these terms is combined to give a final output.
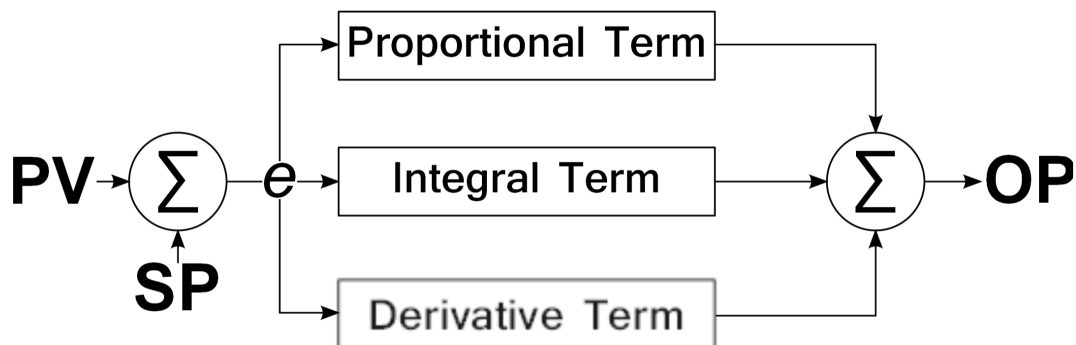

Figure 4.1: PID Calculation

The PID implementation of the HydroAct 4 is very flexible and can be configured as any permutation of P, I and D. This allows P, I, PI, PD or PID controllers to be implemented using the same interface. The optimal control response for any application requires the correct selection of control components. Some examples are given below.

P Controller A simple linear control algorithm ideally suited to recirculating systems with small deviations such as those found in pools and spas. Major deviations may result in an overshoot

and control offsets are to be expected. Control offsets in a purely proportional system are referred to as proportional droop. Offsets occur in systems where there is an opposing process affecting the process variable. For example, chlorine will evaporate from a pool surface. When the rate of loss is equal to the rate of chlorine addition then a steady state will be achieved. This equilibrium point will be at a chlorine concentration below the set point. A dosing pump being controlled by a P controller will be slightly off when the setpoint is reached.

PI Controller Integral action enables PI controllers to eliminate offset, which is a major weakness of a P controller. PI controllers provide a balance of complexity and capability that makes them by far the most widely used algorithm in process control applications. A dosing pump controlled by a PI controller will still be pumping when the setpoint is reached.

PD Controller PD control is useful for fast response controllers that can tolerate, or are not affected by, a control offset. Derivative action acts on the rate of change of the process variable error. This provides a fast response but is susceptible to measurement noise. PD controllers can be useful in applications where overshoot can not be tolerated, such as batch pH neutralization.

PID Controller Used in applications where control provided by other permutations of P, I and D actions are inadequate. The PID controller calculates an error value between a measured process variable and a desired setpoint. The calculated error is used in three separate calculations that calculate an output proportional to the error (the proportional term), an output proportional to the magnitude and duration of the error (the integral term) and an output proportional to the rate of change of the error (derivative term). The PID controller output is the sum of the three constituent terms as shown in figure 4.1. The result is in the form a decimal fraction[1] that is converted to a percentage for control output.

4.1.1.1.1 Proportional Term

The proportional term produces an output value that is proportional to the current error value. The proportional response can be adjusted by multiplying the error by the proportional gain, adjustable in the PID configuration.

$$P_{out} = K_p.e$$

where P_{out} is the proportional term output, K_p is the proportional gain and e is the error.

A large proportional gain value gives a large change in the output for a given change in the error. If the proportional gain is too high, the system can become unstable and overshoot will occur. Too small a gain value results in a small output response to a large input error, and a less responsive controller. If the proportional gain is too low, the control action may be too small when responding to system disturbances and may not achieve a setpoint.

4.1.1.1.2 Integral term

The Integral term is proportional to both the magnitude of the error and the duration of the error. The integral in a PID controller is the sum of all the measured error over time and gives the accumulated offset that should have been corrected previously. The accumulated error is then multiplied by the integral gain, adjustable in the PID configuration.

$$I_{out(t)} = I_{out(t-1)} + K_i.e$$

where I_{out} is the integral term output, K_i is the integral gain and e is the error.

The integral term accelerates the movement of the process towards setpoint and eliminates the residual steady state error that occurs with a pure proportional controller. However, since the integral term responds to accumulated errors from the past, it can cause the present value to overshoot the setpoint value.

---

[1]Value is in the range 0..1, where 1 is equivalent to 100%

4.1.1.1.3 Derivative Term

The derivative term is calculated by determining the slope of the error over time and multiplying this rate of change by the derivative gain, adjustable in the PID configuration.

$$D_{out} = K_d[\frac{e - p}{\delta t}]$$

where D_{out} is the derivative term output, K_d is the derivative gain, δt is the loop time, e is the error and p is the previous error.

The derivative term slows the rate of change of the process variable. Derivative control is used to reduce the magnitude of the overshoot produced by the integral component and improve the process stability. However, the derivative term is susceptible to noise in the process variable signal and can result in an unstable system if the noise is too high.

4.1.2 Operation

When selecting the PID control tile from the main menu of the HydroAct 4, the control overview tile will be displayed.

The overview display of the PID controller is designed to allow the user to see the output and key information, and also be able to see key actions without having to enter the setup of the PID. Information shown includes the process variable, the target setpoint, the controller output and its operational mode. Options available for user input are:

Run Mode Options include: "Off", "Manual", "Automatic".

Manual Value Sets the output when in manual mode. Options are between 0.00%..100.00%.

Setpoint Edit the setpoint within the range of the process variable.

Also on the display is a "Boost" button, if it is enabled. This engages the "Boost" function. See section 4.1.2.6 for details. If the control is in fail mode due to an error, the "Reset" button will be available to restart the control.

The following sections describe the functionality found in the pop-up menu that appears when pressing "Options".

4.1.2.1 Control Setup

This control is configured via the user interface of the HydroAct 4. To access the configuration, log in with advanced privileges and select:

Options → Setup → Control Setup

Name Enter the device name used to identify the control on the menu tiles, alarm messages etc. The name can be up to 25 characters.

Display Setting used to determine if device tile is shown on default main menu screen. Options are "Show"or "Hide"

Enabled Select whether to enable or disable the control device.

Process Signal Select whether to use a signal input to control the device process run/stop state. Controls in process stop are inhibited or paused. Options are "Disabled" or choice from a list of signal inputs.

Start Delay If a control is enabled and not in a process stop state, it can be in one of three states; started, running or fail. If a start delay is set, when a control is enabled or comes out of a process stop, it enters the mode specified by the start mode below. After the start delay has elapsed the control will automatically move into the run mode. The time specified is in HH:MM:SS.

Start Mode Select the start mode if a start delay is specified. Options are "Off", "Manual" or "Automatic".

Run Mode Select the run mode. Options are "Off", "Manual" or "Automatic".

Fail Mode If an error occurs the control will enter an alarm state and switch to the mode selected here. Options are "Off" or "Manual".

4.1.2.2 Process Variable

This variable is configured via the user interface of the HydroAct 4. To access the configuration go to:

Options → Setup → Process Variable

Options to select the control process variable are:

Sensor Select from a list of sensors.

Parameter Select from a list of parameters.

Update delay Update delay is the frequency that the feedback loop updates its output. The value is in HH:MM:SS format. The maximum update delay is 24 hours.

4.1.2.3 Output Setup

The output is configured via the user interface of the HydroAct 4. To access the configuration go to:

Options → Setup → Output Setup

Manual Value Set the manual output value. The control output is set to this value if "Manual" is selected above. If the control has multiple output values, further tabs are available to define the output for each value. Values from 0.00% to 100.00% for any of "Start", "Run" or "Fail" Mode.

Output Limits[2]
Minimum Set minimum output. Values from 0..100%
Maximum Set maximum output. Values from 0..100%

4.1.2.4 PID Setup

The analyzer breaks down the setup of the PID control loop into different screens accessed from the tabs at the top of the display. Navigate around the screen using the "←" and "→" buttons.

4.1.2.4.1 Setpoint Tab

Type Select "Static" if setpoint value is to be specified via user interface or "Dynamic" if setpoint is set remotely via 4..20mA input (i.e., from a SCADA or PLC). If "Static" is selected enter the target setpoint value. If "Dynamic" is selected choose the input parameter from the drop down lists.

---

[2]Output limits allow the user to put minimum and maximum limits on the control algorithm.

Ramping Enable or disable setpoint ramping. Large step changes in process variable errors can produce excessive PID output movements that could result in large over or undershoot, particularly for controllers using the I or D terms. These step changes are likely when the controller is first switched on or if the setpoint is changed. Setpoint ramping gradually moves the setpoint from its current value, or current process variable reading when the controller is first turned on, to the target value. This avoids the discontinuity present in a simple step change.

Ramping Factor If ramping is enabled, set the ramping factor. Values from 0.00 to 1.00. A value of 0.00 will prevent the setpoint from ramping at all, while a value of 1.00 will effectively turn this feature off.

4.1.2.4.2 PID Tuning Tab

Action Select "Direct" if dosing increases process variable value (e.g., sodium hypochlorite addition increases free chlorine reading), or "Reverse" if dosing decreases value (e.g., acid dosing decreases pH).

Bumpless Transfer Bumpless transfer is only applied when the controller is running. It will not operate during the start delay. Bumpless transfer is designed to allow smooth transitions between automatic and manual control modes. It avoids large changes in pump output when changing the control mode. Bumpless transfer from automatic to manual control sets the manual output value to the last calculated control output. For bumpless transfer from manual to automatic mode, some integral control must be used. The initial integral error is set so that the pump output is equal to the current manual value. The PID algorithm will then make appropriate changes to this value to achieve the setpoint.

Scale Factor Scaling factor applied to calculated error. For example, a scaling factor $\times 1000.0$ will convert an ORP reading ($\pm$ 2000mV) into a -2.0..+2.0 error range to which the proportional, integral and derivative functions are applied. Values from $\times 0.1$ to $\times 1000.0$.

Proportional Sets the proportional gain. Values from 0.000 to 10,000.000. A value of 0.000 disables proportional control.

Integral Sets the integral gain. Values from 0.000 to 10,000.000. A value of 0.000 disables integral control.

Derivative Sets the derivative gain. Values from 0.000 to 10,000.000. A value of 0.000 disables derivative control.

4.1.2.4.3 IWP Tab

Integral windup refers to the situation when the process variable spends a significant amount of time away from the setpoint. During this time the integral term accumulates a significant error (referred to as windup) and an overshoot occurs whilst the accumulated error is negated by errors in the opposite direction (the error is unwound). To prevent this excessive overshoot integral windup protection (IWP) limits the maximum windup, both positive and negative. Integral windup protection is only available if the integral gain is greater than 0 (i.e., there is an integral part to the control).

Enabled Enables the integral windup protection feature. Options are "Yes" or "No".
Minimum The smallest accumulated error the integral term is allowed to wind up, usually negative or commonly zero. Values from -1000.00/% to +1000.00/%
Maximum The largest accumulated error that the integral term is allowed to windup, usually positive. Values from -1000.00/% to +1000.00/%

4.1.2.4.4 Overfeed Protection Tab

Overfeed protection is designed to identify problems associated with dosing equipment. Blocked injectors, empty day tanks and dosing pump failures are likely causes to trigger this feature. This alarm may identify the problem before the detrimental effects of control loss are encountered. If the PID output is judged to be having no effect then the controller will enter the specified fail mode, log the event in the system log and sets off a control alarm. Manual intervention is required to rectify the fault and reset the PID controller by setting the desired run mode using the PID Setup or Overview screens.

Enabled This enables overfeed protection. If enabled the parameters below are available for configuration.
Timeout Time period in which the process variable must respond to dosing before overfeed protection activates. Values in HH:MM:SS
Interval Amount the process variable must move towards setpoint to reset the timeout timer set above.
Deadband Overfeed protection is disabled when process variable is within this value of setpoint.

4.1.2.4.5 Boost Tab

Boost allows for a temporary secondary setpoint or a fixed control output. This can be used for shock dosing of a swimming pool or periodic increased dosing for additional disinfection of a bottle plant washer. When activated the boost function will either change the PID setpoint to the secondary value (usually higher) or set the control output to the selected level and will maintain it for a pre-determined time. It will then disable the function for a configurable period to prevent overuse.

Enabled Enables the boost feature and allows users to initiate the boost from the "Boost Status" option.

Action Options are "Output" or "Setpoint". Selecting "Output" allows the user to set a pre-determined control output. Selecting "Setpoint" allows the user to set a new target for the PID control.

Value Set the new output value or target setpoint, based on the selection above.

Duration Set the duration of the boost. Value is in HH:MM:SS format, up to 24 hours.

Delay Set the inhibition delay, the time after a boost before a user can initiate a subsequent boost. Value is in HH:MM:SS format, up to 24 hours.

4.1.2.4.6 Options Tab

Fail-safe on PV Alarm. If the process variable goes into data alarm the controller will go into fail-safe mode.

4.1.2.5 Alarms and Thresholds

Alarms are the means by which values obtained from sensors cause visible, audible or physical action to occur. Alarms are not to be confused with relays[3], as very flexible firmware and electronics are utilized. An alarm in a HydroAct 4 unit will be visible on the screen and sound a buzzer. Two output alarms per control output are available. Thresholds are similar to alarms except that they are events that are supposed to occur and therefore will not cause the instrument to go into "Alarm". Thresholds are used to trigger relays to cause something to happen when a control output reaches a value.

To access the configuration:

Options → Alarms & Thresholds

---

[3]A mechanical or electronic device mounted on the electronics within the instrument that can switch (much like a light switch). The number and type of relays is specified at the time of order.

The display has a tab for each alarm and threshold. Navigate to the tab using the Right and Left buttons or through the settings using the Up and Down arrows.

Options are:

**Enabled** Selecting this option turns the alarm/threshold on or off.

Set The *Value* is used to trigger the alarm or threshold[4]. The *Delay* is the amount of time the value has to exceed the set value before the alarm/threshold is triggered.

Delay The amount of time the value has to exceed the set point before the alarm/threshold is triggered. HH:MM:SS up to 24 hours.

4.1.2.6 Boost Status

Selecting this will show the user the status of the boost function including the delay controls. Access this information at:

Menu → Options → Boost Status
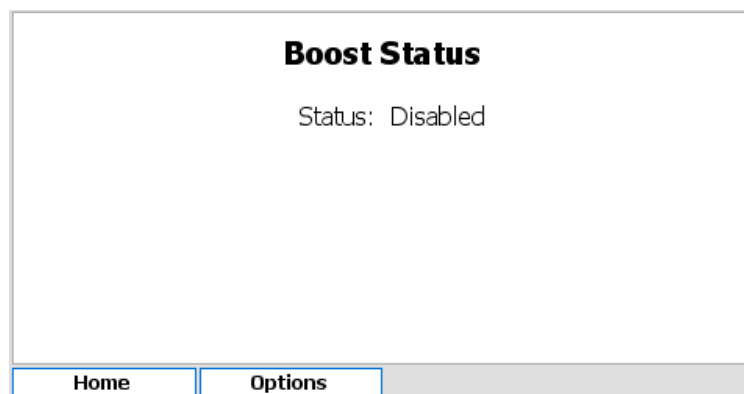
4.1.2.7 Status Flags

The status flags show the state of a device. These flags can either be active or not. To see the state of these status flags, select:

Options → Device Flags → Status Flags

Flags that are active are shown in black text on a white background, those that are not active are grayed out. Available flags are:

Display on main menu When active the device tile is displayed on the main menu. If inactive, the tile is hidden in the default view.

Control enabled This flag is set if the control is enabled.

Control process stopped If this flag is set, the control is stopped due to the process run/stop signal state.

Control started This flag is set when the control is started, i.e., the control is either in start-up or run mode.

Control running This flag is set when the control is in run mode.

Primary Output pump output limit reached This flag is set when the primary output loop is limited by the pump miniumum or maximum output settings.

Secondary Output pump output limit reached This flag is set when the secondary output loop (if used) is limited by the pump miniumum or maximum output settings.

Tertiary Output pump output limit reached This flag is set when the tertiary output loop (if used) is limited by the pump miniumum or maximum output settings.

---

[4]A set value above a reset value will result in a rising alarm. A set value below a reset value will result in a falling alarm.

Loop **Output threshold *N* active** If set, this flag indicates that the threshold *N* (where *N* is either 1 or 2) is active for the given output.

Proportional control enabled If set, this flag indicates that the proportional control is active in the current PID configuration.

Integral control enabled If set, this flag indicates that the integral control is active in the current PID configuration.

Derivative control enabled If set, this flag indicates that the derivative control is active in the current PID configuration.

Bumpless transfer enabled This flag is set when bumpless transfer is enabled.

Integral wind-up protection enabled This flag is set when integral wind-up protection is enabled.

Integral wind-up protection active If set, this flag indicates that integral wind-up protection is currently active.

Boost enabled This flag is set when the boost feature is enabled.

Boost active If set, this flag indicates the control is currently modified by the boost feature.

Boost Inhibited This flag is set when the boost feature is inhibited from further activation.

4.1.2.8 Error Flags

The error flags show any problems causing an error for a device. These flags can either be active or not. To see the state of these error flags, select:

Options → Device Flags → Error Flags

Flags that are active are shown in black text on a white background, those that are not active are grayed out. Available flags are:

Process run/stop signal error If set, this flag indicates that the control can not read the state of the run/stop signal.

Process variable read error This flag is set if the control can not read the process variable.

Loop **Output alarm *N* active** If set, this flag indicates that the alarm *N* (where *N* is either 1 or 2) is active for the given output. *Loop* is either primary, secondary or tertiary (most controls only have a primary output).

Error reading PID setpoint If set, this flag indicates the control is unable to read the setpoint value when using dynamic setpoints.
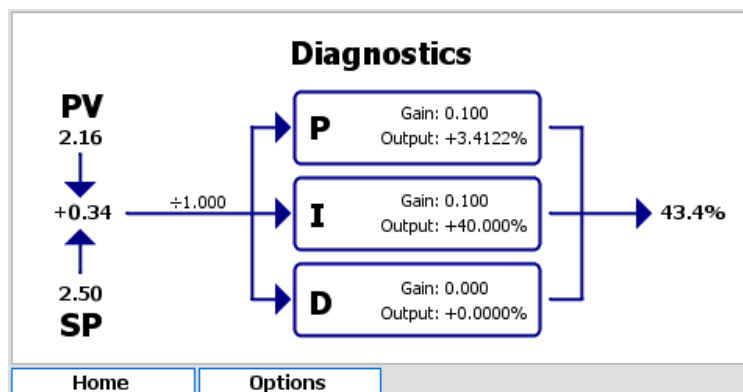
Fail-safe mode active This flag is set if the control enters failsafe mode.

Overfeed protection active This flag is set if over feed protection has been activated.

4.1.2.9 Diagnostics

The PID controller diagnostic information can be accessed using:

Options → Diagnostics

Information displayed is only relevant if the control is in automatic mode.

This display shows the diagram of the PID control and the current totalized PID output. For diagnostic information in automatic mode, the display is updated when the control loop is executed and there may be a delay equal to the loop time before all information is available. Process variable input (PV), and setpoint (SP) are shown pointing to the current error. The error feeds into each of the three P, I and D terms via the scale factor shown above the line. Each term shows the gain factor applied and the output calculated. These are summed together and trimmed within the set output limits to determine the control output.

5. Outputs

Outputs are the means by which values from measuring sensors, control outputs or system status are transmitted to another device. For example to a SCADA[1] for data acquisition or to a pump for dosing control. The two types of output used by HydroAct 4 are the analog output[2] and relay[3].

In order to utilize the full capability of the instrument it is necessary to link the signal/value and an output device, such as an alarm, threshold or control options for the relays or analog outputs.

Chemtrac utilizes the latest in firmware and electronic innovations and as such analog outputs and relays are extremely flexible, and are not tied to individual sensors. In the past outputs were typically fixed to a specific sensor or control and the range was also the same as the range of the sensor. More recently the capability of the analog output to be more flexible has come about with advances in electronics.

5.1 Analog Outputs

5.1.1 General Information

Analog outputs are typically a current output varying between 4mA and 20mA (although other options are available), and are proportional to a varying signal of interest generated by the instrument. Analog outputs are installed by plugging in a small output board into one of the available slots. Other output options in addition to 4..20 mA are shown below.

5.1.2 Technical Data

Supported modes 0..20mA, 4..20mA, 0..1V, 0..10V, 1..10V
Maximum voltage output 15V DC (0/4..20mA only)

---

[1]Supervisory Control and Data Acquisition, a central data logging and control system

[2]A current or voltage output, proportional to a signal generated in the instrument

[3]A mechanical or electronic device mounted on the electronics within the instrument that can switch. The number and type of relays is specified at the time of order

5.1.3   Commissioning

When cables attach to analog outputs the instrument is forced to drive into different resistances. This can result in the analog range being slightly affected. For example a 4-20mA output at the analyzer could end up being 3.95mA to 19.9mA at the end of the cable. The HydroAct 4 has the capability to drive more or less current to account for this resistance so that the analog output is exactly that required at the end of the cable. This is achieved by calibrating the zero (offset) and span (top of the scale) of the analog output.

5.1.3.1   Calibrate Offset

This configuration screen is accessed by navigating via the Options Menu:

Options → Maintenance → Calibrate Offset
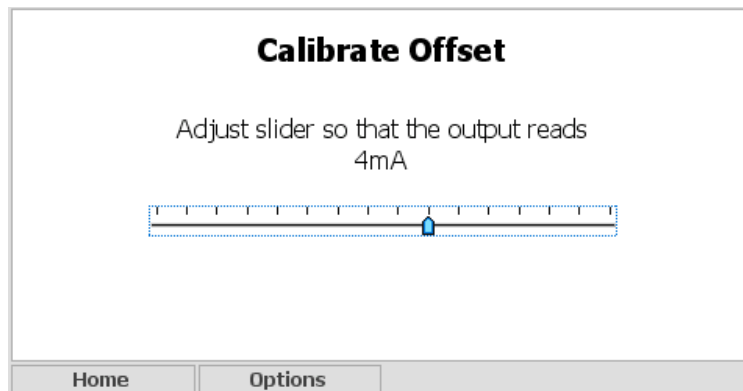
Select the slider and then use the Left and Right buttons to adjust the zero.

5.1.3.2   Calibrate Span

This configuration screen is accessed by navigating via the Options Menu:

Options → Maintenance → Calibrate Span
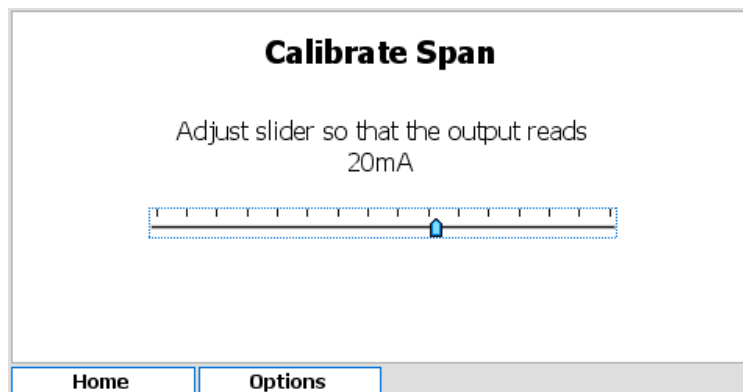
Select the slider and then use the Left and Right buttons to adjust the span.

5.1.4   Operation

To access the analog output setup and maintenance options, select the relevant device tile in the main menu and press "Select". The output setup screen will be displayed initially, though other functions are available by pressing the "Options" button.

5.1.4.1 Setup

The setup of the analog output is split into three sections. Later sections can be accessed separately from the menu or by selecting "Next" from any of the previous pages. To access the analog output setup:

Options → Setup → Output Setup

Name Device name to identify the control in menus. Text can be up to 25 characters long.
Display Options are to "Show" or "Hide" the device tile on the menu screen.
Enabled Options are "Yes" or "No".
Mode Options Options are "Manual" which allows the user to manually set an output value; "Data Output" which maps the output to an analog data source such as a parameter; and "Control Output" which maps the output to an analyzer generated control signal.
   The "Next" button is a shortcut to the following configuration screen.

5.1.4.2 Options for Manual Mode

5.1.4.2.1 Map Output

This configuration screen is accessed by pressing "Next" from the Output Setup configuration screen or navigating via the Options Menu.

Options → Setup → Map Output

5.1.4.2.2 Configuration

This configuration screen is accessed by pressing "Next" from the Map Output above screen or navigating via the Options Menu.

Options → Setup → Configuration

Configuration

Type   4..20mA ▼

Manual Value   0.0   %

Home   Options

Type   Choose the type of analog output from the drop down box. See technical data for a list of supported output types. See section 5.1.2.

Manual Value   Enter the manual value of the output as a percentage. For example if 4..20mA output type is selected a manual value of 50% will force the current output to 12mA.

5.1.4.3   Options for Data Output Mode

5.1.4.3.1   Map Output

This configuration screen is accessed by pressing "Next" from the Output Setup screen or navigating via the Options Menu.

Options → Setup → Map Output

Map Output

Sensor   pH Sensor 1.1 ▼

Parameter   pH ▼

Home   Options   Next

Sensor   Select the appropriate sensor from the drop down list.

Parameter   Choose the appropriate parameter from the drop down list. If the selected sensor has only one parameter this option may not be available.

The "Next" button is a shortcut to the following configuration screen.

5.1.4.3.2   Configuration Setup

This configuration screen is accessed by pressing "Next" from the Map Output screen or navigating via the Options Menu.

Options → Setup → Configuration

Type Choose the type of analog output from the drop down box. See the technical data in section
      5.1.2 for a list of supported outputs.

Minimum Enter the parameter value that translates to a minimum output of e.g. 4mA if "type" is set to
      4..20mA.

Maximum Enter the parameter value that translates to a maximum output of e.g. 20mA if "type" is set
      to 4..20mA.

    The minimum and maximum values can be anywhere within the range of a parameter. For example
the data output for a chlorine sensor with a range of 0..10ppm, the output could be ranged 0..10ppm
(common) but could be ranged, for example 2.4..5.3ppm.

5.1.4.4 Options for Control Output Mode
5.1.4.4.1 Map Output
This configuration screen is accessed by pressing "Next" from the Output Setup screen or navigating
via the Options Menu.

        Options → Setup → Map Output

Control Select from a list of available control devices.

Output If the control selected above has more than one output value, this option will be available.
      Select the appropriate output value.

    The "Next" button is a shortcut to the following configuration screen.

5.1.4.4.2 Configuration
This configuration screen is accessed by pressing "Next" from the Map Output screen or navigating via
the Options Menu.

        Options → Setup → Configuration

Configuration

Type 4..20mA ▼

Home   Options

Type Choose the type of analog output from the drop down box. See the technical data in section
      5.1.2 for a list of supported outputs.

5.1.4.5 Status Flags

The status flags show the state of a device. These flags can either be active or not. To see the state of
these status flags, select:

      Options → Device Flags → Status Flags

    Flags that are active are shown in black text on a white background, those that are not active are
grayed out. Available flags are:

Display on main menu When active the device tile is displayed on the main menu. If inactive, the tile
      is hidden in the default view.

Output calibrating offset This flag is set when calibrating the analog output offset.

Output calibrating span This flag is set when calibrating the analog output span.

5.1.4.6 Error Flags

The error flags show any problems causing an error for a device. These flags can either be active or
not. To see the state of these error flags, select:

      Options → Device Flags → Error Flags

    Flags that are active are shown in black text on a white background, those that are not active are
grayed out. Available flags are:

Output mapping error This indicates that one of the outputs is mapped incorrectly e.g., mapped to a
      sensor or control that no longer exists.

I/O card fault detected If set, this flag indicates that a low-level hardware fault has occurred. Report
      to Chemtrac.

Incorrect I/O card found If set, this flag indicates that the I/O card fitted is of the wrong type.

I/O card in use This flag is set when two devices are attempting to use the same I/O card.

I/O card configuration failed This flag is set if the I/O plugin card fails to respond correctly. Contact
      Chemtrac for advice.

5.1.4.7 Connections

This screen is accessed by navigating via the Options Menu:

      Options → Connections
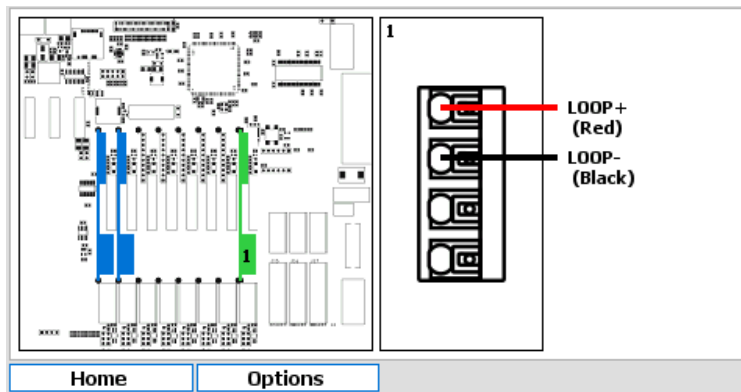
The image above is for an output with the types selected as 0..20mA or 4..20mA. The connections will reflect the configuration of the device and differ between current and voltage outputs.

5.2 Relay Output

5.2.1 General Information

Relay outputs, typically mechanical reed relays are installed at time of manufacture. A relay is a mechanical or electronic device mounted on the electronics within the instrument that can switch. The number and type of relays must be specified at time of order. In order to take advantage of the full capability of modern electronics, it is necessary to "map"[4] the various alarms, thresholds and other options to the relays.

5.2.2 Technical Data

Maximum Current 10A at 125 VAC, 3A at 250 VAC, 5A at 30 VDC

5.2.3 Operation

To access the relay output setup and maintenance options, select the relevant device tile in the main menu and press "Select". The output setup screen will be displayed initially, though other functions are available by pressing the "Options" button.

5.2.3.1 Setup

The setup of the analog output is split into three sections. Later sections can be accessed separately from the options or by selecting "Next" from any of the previous sections.

To access the relay output setup:

Options → Setup → Output Setup

---

[4]This describes the link between a signal/value generated by the instrument and an output device (relay or analog).

Output Setup

Name | Relay 1.1|

Display | ○ Show   Enabled | ○ Yes
      ◉ Hide   ◉ No

Mode | Manual   ▼

Home   Options   Next

Name Device name to identify control in menus. Text can be up to 25 characters long.

Display Options are "Show" or "Hide" the device tile on the menu screen.

Enabled Options are "Yes" or "No". This option must be enabled for the option to function.

Mode Options Options are "Manual" which sets a relay to manual output; "Control Output" which maps a relay to a control output and allows the setup of either pulse width modulation or pulse frequency modulation; "Data Output" which outputs a pulse for each set increment of a sensor parameter value; "Device Status Flags" which allows the mapping of a relay to activate if the status of a device changes; "Device Error Flags" which allows the mapping of a relay to activate if a device goes into error; "Parameter Flags" which allows the mapping of a relay to activate on selected parameter flags and "System Flags" which allows the mapping of a relay to activate on a system alarm state.

5.2.3.2 Options for Manual Mode

5.2.3.2.1 Map Output

This configuration screen is accessed by pressing "Next" from the Output Setup configuration screen or navigating via the Options Menu.

Options → Setup → Map Output

Map Output

There are no configuration options for this device setting.

Home   Options   Next
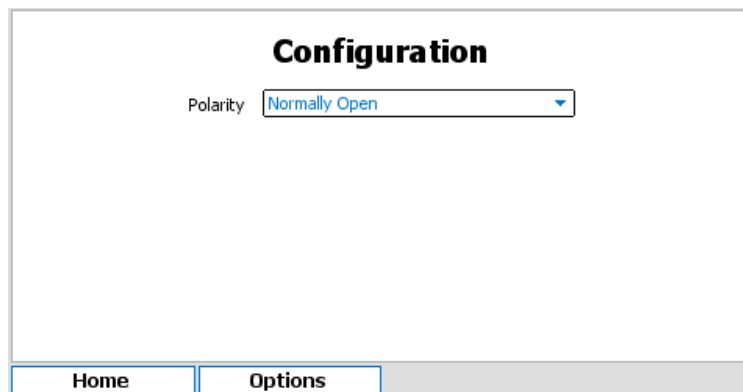
The "Next" button is a shortcut to the following configuration screen.

5.2.3.2.2 Configuration

This configuration screen is accessed by pressing "Next" from the Map Output screen or navigating via the Options Menu.

Options → Setup → Configuration

Configuration

Polarity Normally Open ▼
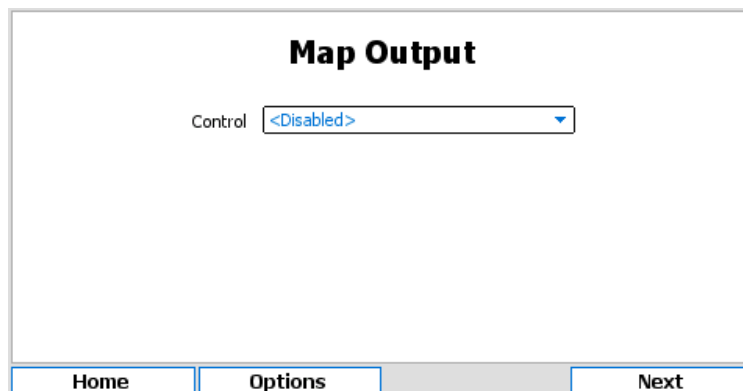
Home   Options

Polarity Options are "Normally Open" and "Normally Closed".

5.2.3.3 Options for Control Output Mode

5.2.3.3.1 Map Output

This configuration screen is accessed by pressing "Next" from the Output Setup configuration screen or navigating via the Options Menu.

Options → Setup → Map Output

Map Output

Control <Disabled> ▼

Home   Options   Next

Control Choose from a list of available controls to output the control value.

The "Next" button is a shortcut to the following configuration screen.

5.2.3.3.2 Configuration

This configuration screen is accessed by pressing "Next" from the Map Output configuration screen or navigating via the Options Menu.

Options → Setup → Configuration

Configuration

Polarity | Normally Open ▼
Mode | Pulse Width Modulation ▼
Pulse Width | 02 ▲▼ : 06 ▲▼
Deadband | 02 ▲▼ s

Home | Options

In all cases the polarity and output mode of the relay will need to be configured. Pulse width modulation outputs a repeated pulse with a fixed width. The control signal is output by increasing the proportion of time the relay is active in any pulse as the value increases. Pulse frequency modulation outputs pulses of a fixed activated width, but increases the frequency of the pulses in respect of the control output value.

Polarity Options are "Normally Open" and "Normally Closed".

Mode Options are "Pulse Width Modulation" or "Pulse Frequency Modulation".

When "Pulse Width Modulation" is selected further options are:

Pulse Width Define the maximum pulse width in MM:SS. The relay will energize for a proportion of this time based on the control output value.

Deadband Defines the minimum pulse width that would be output. This can be used to avoid relay chatter due to a small control output value.

Configuration

Polarity | Normally Open ▼
Mode | Pulse Frequency Modulation ▼
Pulse Width | 0000 ▲▼ ms
Maximum Frequency | 0.00 Hz

Home | Options

When "Pulse Frequency Modulation" is selected further options are:

Pulse Width Define the length of pulses output. Options are between 0..5000 ms.

Maximum Frequency As the control output value increases, the frequency of pulses outputs increase. This setting defines the maximum frequency of pulse outputs.

5.2.3.4 Options for Data Output Mode

5.2.3.4.1 Map Output

This configuration screen is accessed by pressing "Next" from the Output Setup screen or navigating via the Options Menu.

Options → Setup → Map Output

Sensor Select the appropriate sensor from the drop down list.

Parameter Choose the appropriate parameter from the drop down list. If the selected sensor has only one parameter this option may not be available.

The "Next" button is a shortcut to the following configuration screen.

5.2.3.4.2 Configuration Setup

This configuration screen is accessed by pressing "Next" from the Map Output screen or navigating via the Options Menu.

Options → Setup → Configuration

Polarity Options are "Normally Open" and "Normally Closed".

Frequency Set the pulse frequency as a desired increase in parameter value.

Pulse Width Set the pulse width. The values are in milliseconds and increment in steps of 200ms.
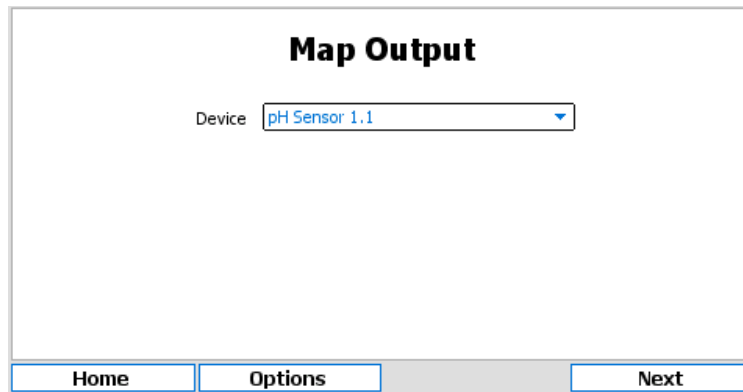
Pulse Gap Set the minimum pulse gap. The values are in milliseconds and increment in steps of 200ms.

5.2.3.5 Options for Device Status Flags

5.2.3.5.1 Map Output

This configuration screen is accessed by pressing "Next" from the Output Setup configuration screen or navigating via the Options Menu.
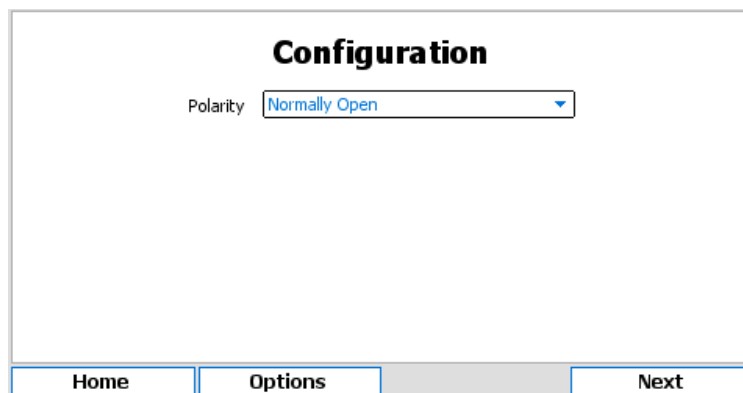
Options → Setup → Map Output
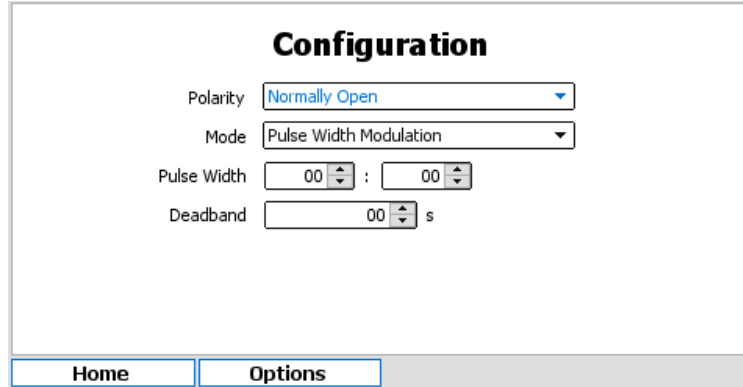
Device Choose from a list of available devices.

The "Next" button is a shortcut to the following configuration screen.

5.2.3.5.2 Configuration

This configuration screen is accessed by pressing "Next" from the Map Output configuration screen or navigating via the Options Menu.

Options → Setup → Configuration

Polarity Options are "Normally Open" and "Normally Closed". The device status flags available depend on the device mapped above. See the status flag descriptions for that device for details.
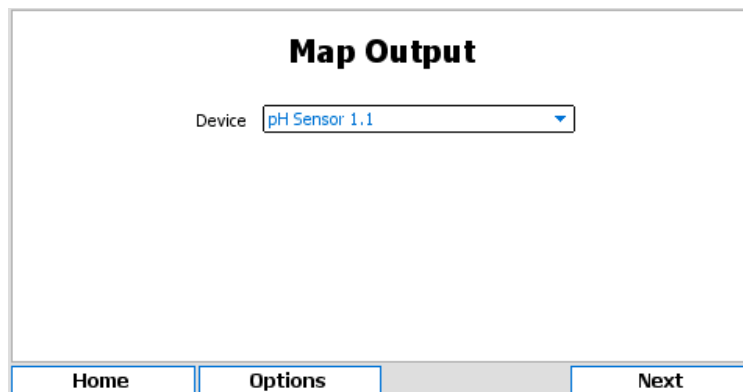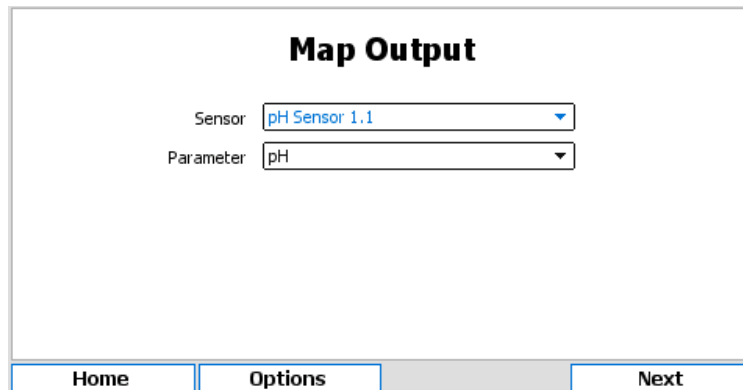
Press the "Next" button to select the device status flags used to activate the relay.

5.2.3.6 Options for Device Error Flags

5.2.3.6.1 Map Output

This configuration screen is accessed by pressing "Next" from the Output Setup screen or navigating via the Options Menu.

Options → Setup → Map Output

Device Choose from a list of available devices.

The "Next" button is a shortcut to the following configuration screen.

5.2.3.6.2 Configuration

This configuration screen is accessed by pressing "Next" from the Map Output screen or navigating via the Options Menu.
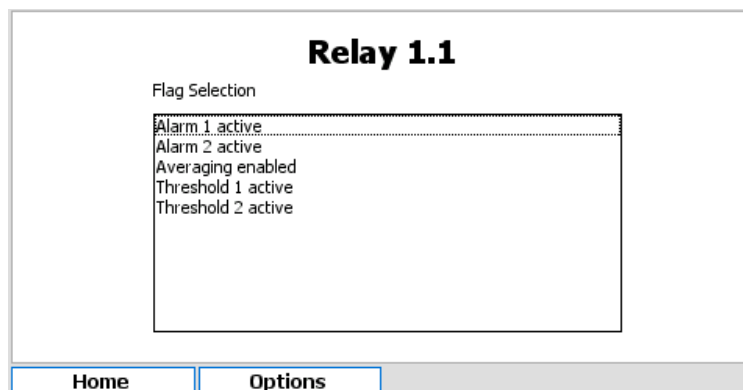
Options → Setup → Map Configuration

Polarity Options are "Normally Open" and "Normally Closed". The device error flags available will depend on the device mapped above. See that device description for details.

Press the "Next" button to select the device error flags used to activate the relay.

5.2.3.7 Options for Parameter Flags

5.2.3.7.1 Map Output

This configuration screen is accessed by pressing "Next" from the Output Setup screen or navigating via the Options Menu.

Options → Setup → Map Output

Sensor Choose the appropriate sensor from the drop down list.
Parameter Choose the appropriate parameter from the drop down list.
    The "Next" button is a shortcut to the following configuration screen.
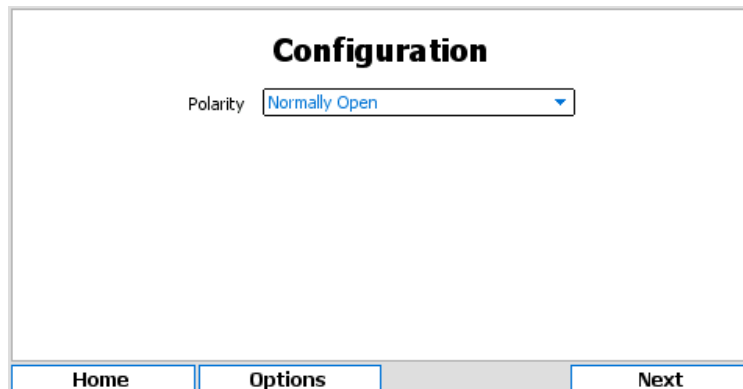
5.2.3.7.2 Configuration
This configuration screen is accessed by pressing "Next" from the Map Output screen or navigating via
the Options Menu.

        Options → Setup → Configuration

Polarity Options are "Normally Open" and "Normally Closed".
    The "Next" button is a shortcut to the following configuration screen.

5.2.3.7.3 Relay Selection
This configuration screen is accessed by pressing "Next" from the Configuration screen.
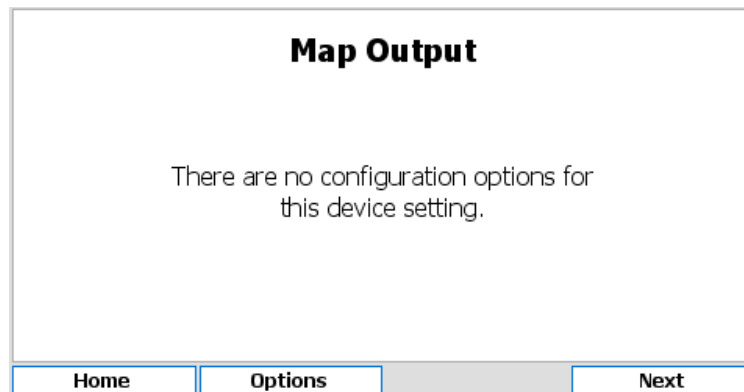
Flags that are active are shown in black text on a white background, those that are not active are grayed out. Selecting the flag will cause the relay to activate if that parameter flag becomes active.

5.2.3.8 Options for System Status

5.2.3.8.1 Map Output

This configuration screen is accessed by pressing "Next" from the Output Setup configuration screen or navigating via the Options Menu.
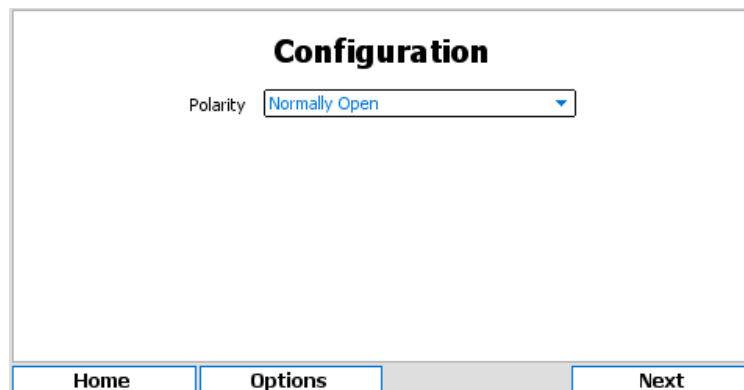
Options → Setup → Map Output

Map Output

There are no configuration options for this device setting.

| Home | Options | | Next |

5.2.3.8.2 Configuration

This configuration screen is accessed by pressing "Next" from the Output Setup configuration or navigating via the Options Menu.

Options → Setup → Configuration

Configuration

Polarity Normally Open ▼

| Home | Options | | Next |

Polarity Options are "Normally Open" and "Normally Closed". The "Next" button is a shortcut to the following configuration screen.

5.2.3.8.3 Relay Selection

This configuration screen is accessed by pressing "Next" from the Configuration screen.
The system status show the state of the device.
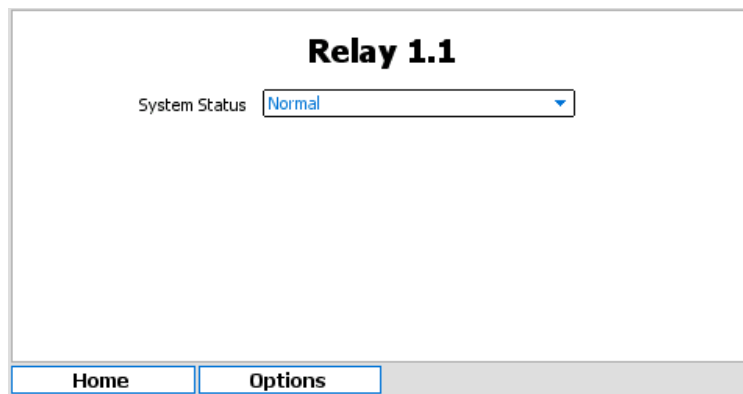
System Status Options are "Normal", "Alarm Active" or "Alarm Acknowledged"

5.2.3.9 Status Flags

The status flags show the state of a device. These flags can either be active or not. To see the state of these status flags, select:

>   Options → Device Flags → Status Flags

Flags that are active are shown in black text on a white background, those that are not active are grayed out. Available flags are:

Display on main menu When active the device tile is displayed on the main menu. If inactive, the tile is hidden in the default view.

Relay polarity This reflects the relay polarity, if set the relay is normally closed.

Relay output state This reflects the relay activation state. Taken together with the relay polarity above, it is possible to determine if the relay is open or closed.

5.2.3.10 Error Flags

The error flags show any problems causing an error for a device. These flags can either be active or not. To see the state of these error flags, select:

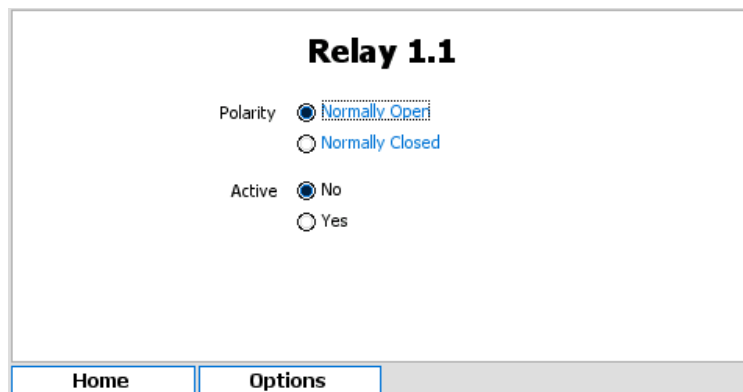>   Options → Device Flags → Error Flags

Flags that are active are shown in black text on a white background, those that are not active are grayed out. Available flags are:

Output mapping error This indicates that one of the outputs is mapped incorrectly e.g., mapped to a sensor or control that no longer exists.

5.2.3.11 Test Output

It is possible to test a relay. The relays polarity and active state can be manually changed. Leaving this configuration screen will return the relay to its previous state. To do this navigate to:
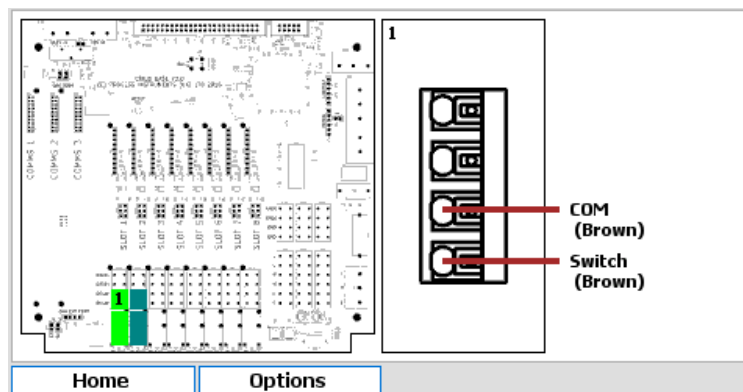
>   Options → Test Output

Options are
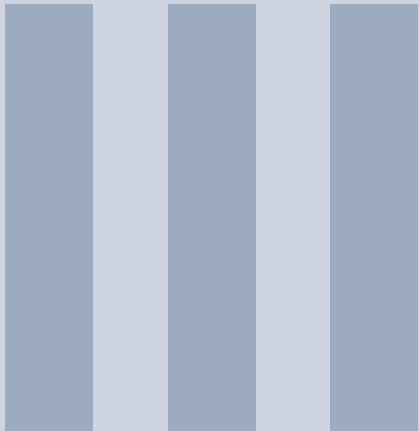**Polarity** Options are "Normally Open" or "Normally Closed"
Active Options are "No" or "Yes"

5.2.3.12   Connections

Options → Connections

This screen identifies the terminals to use for electrical connections for this relay. The left hand pane identifies the terminal block and the right hand pane the connectors on the terminal block.

Documentation

6. Warranty

Chemtrac, Inc warrants its product to be free of defects in material and workmanship for a period of one year from date of shipment to the original customer unless specifically agreed elsewhere. Upon receipt of written notice from the customer, Chemtrac shall issue a returns form for the defective product and, upon its receipt, shall repair or replace (at the discretion of Chemtrac) the defective equipment or components. Chemtrac assumes no responsibility for equipment damage or failure caused by:

1. Improper installation, operation, or maintenance of the equipment.
2. Abnormal wear and tear on moving parts caused by some processes.
3. Acts of nature (i.e. lightning, flooding, etc.).

This warranty represents the exclusive remedy of damage or failure of the equipment. Under no circumstances shall Chemtrac be liable for any special, incidental, or consequential damage, such as loss of production, profits or product quality. The warranty cannot be guaranteed if the customer fails to service and maintain the equipment in accordance with Chemtrac written instructions and policies, as stated in the Operations Manual.

Any costs associated with this warranty, such as the cost of returning the products to Chemtrac or the cost of returning a repaired unit to the customer lies with the customer. Any warranty replacements will be covered by the warranty, with the same terms and conditions as the original.

7. Returns

If the analyzer has to be repaired, please return it cleaned to your local service organization or Chemtrac, Inc at the address below. To return your equipment for repair:

- Contact Chemtrac support, open a service ticket and request a returns form.
- Complete the returns form, including the contaminant declaration.
- Enclose the completed returns form with the packaging and shipping documents.
- Address the package to "The Service Department" at the address below and mark the box with the service ticket number to ensure the package is dealt with as efficiently as possible.
- Please use the original packaging, if possible.

No repair can be undertaken without a returns form with a completed contaminant declaration. This is required to comply with our Health and Safety responsibilities.

7.1 Contact Details

Address

Chemtrac, Inc
1555 Oakbrook Drive
Suite 100
Norcross, GA 30093

Email hardwaresupport@chemtrac.com
Phone 800 442 8722