

Hydro-Com

User Guide

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ACKNOWLEDGEMENTS

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1 Introduction

Hydro-Com is a software tool used to configure, maintain and calibrate Hydronix microwave moisture sensors.

The program is designed for use on Windows compatible PC's running Microsoft Windows XP Service pack 3 or later.

The utility allows the user to:

- Configure a networked system using the RS485 interface of the sensors
- Change the factory default settings of the sensors
- Log readings into a file for further analysis
- Upgrade the firmware in the sensors
- Perform material calibrations
- Diagnose sensor and integration problems
- Change settings in local Ethernet Adapters

Refer to the appropriate sensor user guide for information on how to connect Hydronix sensors to a PC.

1.1 Desktop System Overview

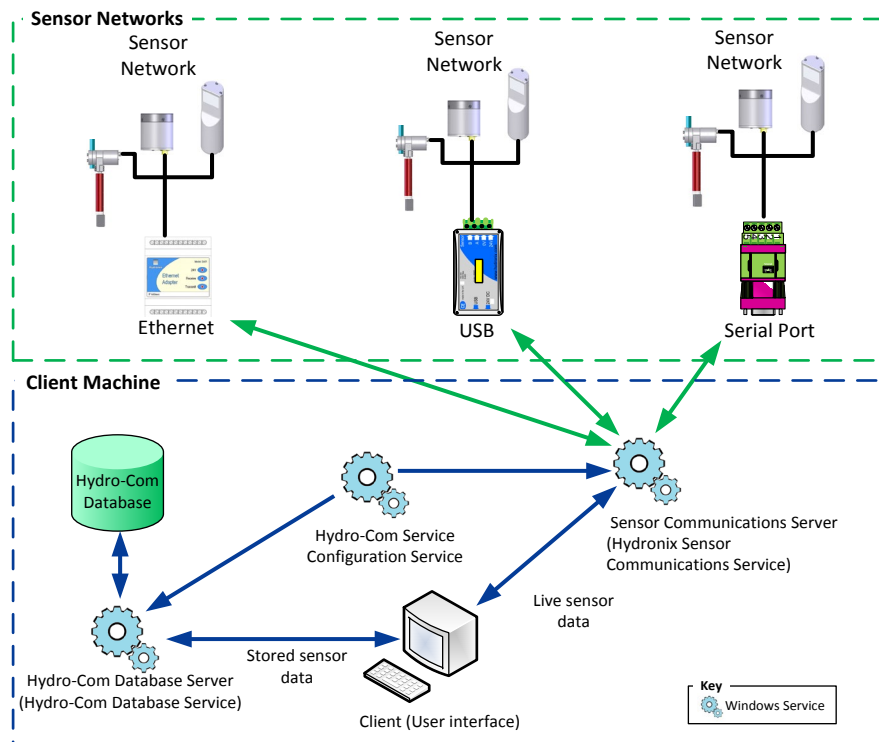


Figure 1: Hydro-Com System Overview

Hydro-Com is separated into four components: Client (User interface), Sensor Communications Server, Hydro-Com Service Configuration Service and Hydro-Com Database Server. All four components of the system can be run on the same computer or can be separated onto remote machines allowing the client to communicate with sensor networks connected to an accessible I.P Address.

Hydro-Com will communicate with any sensor network connected via an Ethernet or Com port to the Sensor Communications Server. If configured Hydro-Com is able to communicate with more than one Sensor Communications Server located on remote machines at the same time increasing the flexibility of the system to monitor and configure larger sensor networks.

1.1.1 Sensor Communications Server

The Sensor Communications Server is designed to operate as a service on a local or remote machine at the sensor network location. The Sensor Communications Server is responsible for all communications with the sensor networks available to it.

1.1.2 Hydro-Com Database

The Hydro-Com Database is located on a local or remote computer and stores all of the sensor configuration and calibration data. The database is updated every time the client connects to a sensor. The database enables the data from any sensor that has been connected to be available offline for analysis.

1.1.3 Hydro-Com Service Configuration Service

This service is used to start, stop and restart the above services. This allows changes to service configurations such as port and connection type to be changed and used once the service is restarted

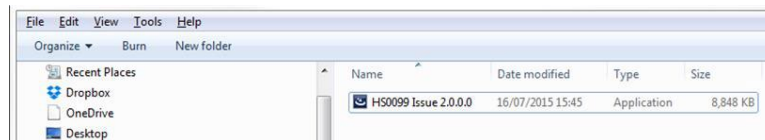
1.1.4 Client

The Hydro-Com Client interface enables the user to access the sensors on a network and to configure the database. The client can communicate with multiple Sensor Communications Servers, if configured, and with a local or remote database.

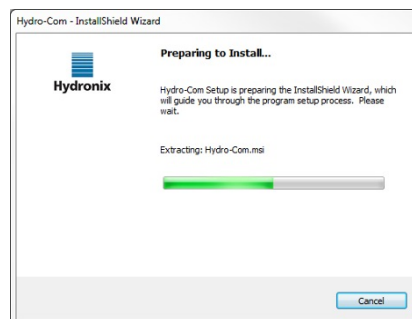
1 Software Installation

Hydro-Com software can be downloaded free of charge from the Hydronix Website at <http://www.hydronix.com>

The utility installation file is a self-extracting executable (.exe). Once downloaded, the software can be installed by double clicking on the file.



The following box will be displayed while Hydro-Com is extracted



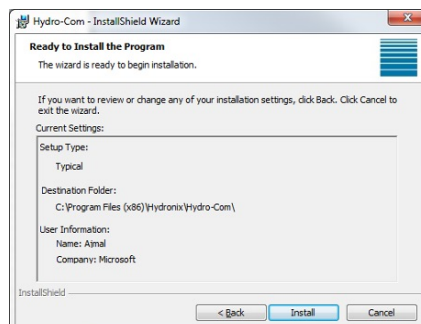
The following install wizard box will display once the file finishes extracting.

Click 'Next' to start the installation



Click 'Install' on the next screen.

The destination folder is displayed on this page, indicating where Hydro-Com will be located on the computer once installed.



Dependent on the operating system in use the installation process may take a few minutes. Once completed click 'Finish' on the following screen. The installation is now complete.

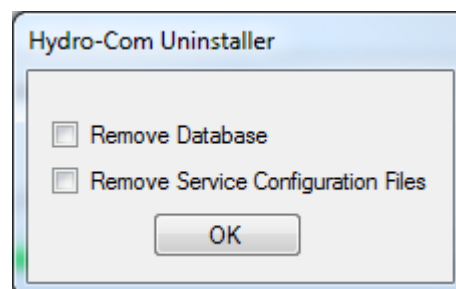


At the end of the installation a shortcut is created in the 'Start Menu'. The program can also be found in the Hydronix folder located in the program files.

2 Software Uninstall

When updating Hydro-Com software it is not necessary to uninstall the current version before installing the update. Hydro-Com will automatically uninstall the current version.

When uninstalling Hydro-Com there are options to remove the database and service configuration files. If reinstallation is planned and the same service configuration is required ensure that the option to remove the service configurations is not selected. Similarly, if upgrading the software, choose to keep the database and the service configuration files.



1 Hydro-Com Overview

Hydro-Com is a customer utility designed for use with Hydronix microwave moisture sensors. It facilitates the configuration and diagnostics of any of the latest Hydronix digital moisture sensors (Firmware version HS0102 or later). Hydro-Com will enable the user to configure older versions of the sensors, however not all of the feature in this guide will be available.

Hydro-Com is separated into three main sections: Explorer, Bookmarks and Display Area (Figure 2).

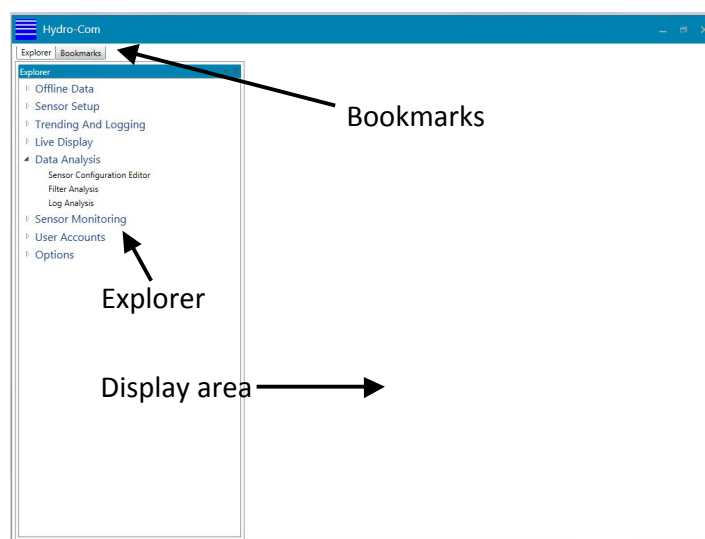


Figure 2: Hydro-Com Start-up Screen

1.1 Explorer

The Explorer uses a standard file explorer format to display available sensor networks, configure the display area and to configure the software. The Explorer is separated into five sections: Offline Data, Sensor Setup, Trending and Logging, Live display and Options.

1.1.1 Offline Data

The Offline Data contains the records for every sensor that has been connected to Hydro-Com. The database is updated automatically every time a sensor is connected. The database is separated in to three sections: Database Type, Company and Site (Figure 3).

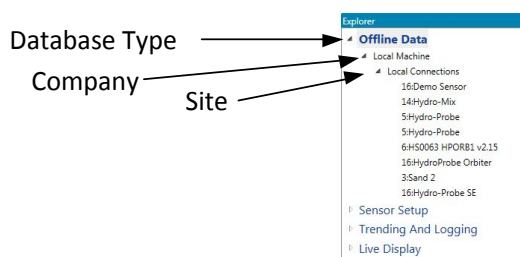


Figure 3: Offline Data Section

1.1.2 Sensor Setup

The Sensor Setup section displays live data from any sensor connected to Hydro-Com. The sensors can be connected using serial ports, USB or Ethernet. When a sensor is connected the data will also be updated to the Offline Database.

Once a connected sensor is selected the Configuration, Diagnostics and Calibration settings are available (Figure 4).

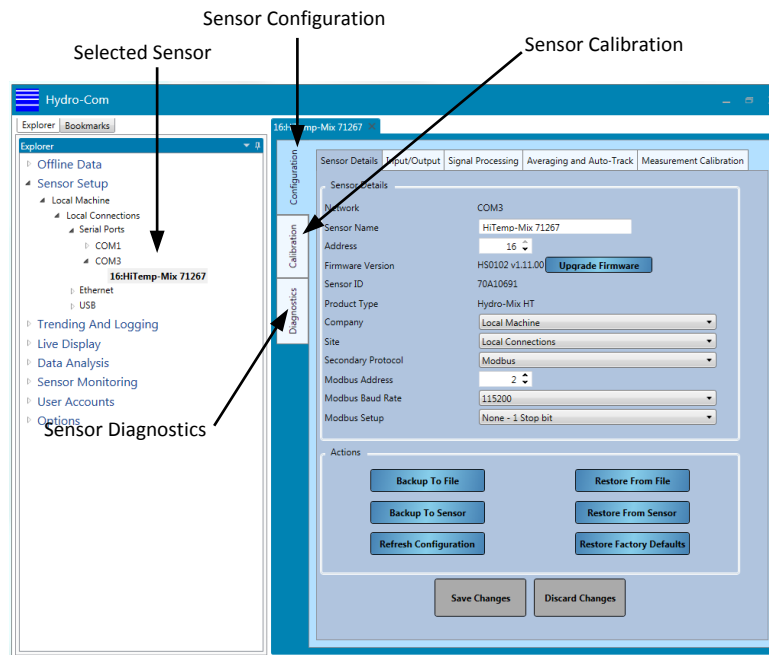


Figure 4: Sensor Setup

1.1.3 Trending and Logging

Single or multiple sensors can be logged using the Trending and Logging section (Figure 5). Once a sensor is selected it is possible to graphically display any output variable and also log the data to a text file.

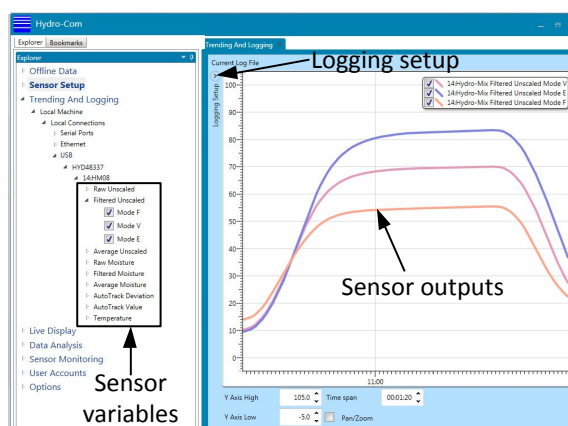


Figure 5: Trending Display

1.1.4 Live Display

The Live Display section shows the status of any selected sensor. Multiple sensors can be displayed at the same time. Separate displays can be opened to show more than one variable from each sensor or multiple sensors simultaneously (Figure 6).

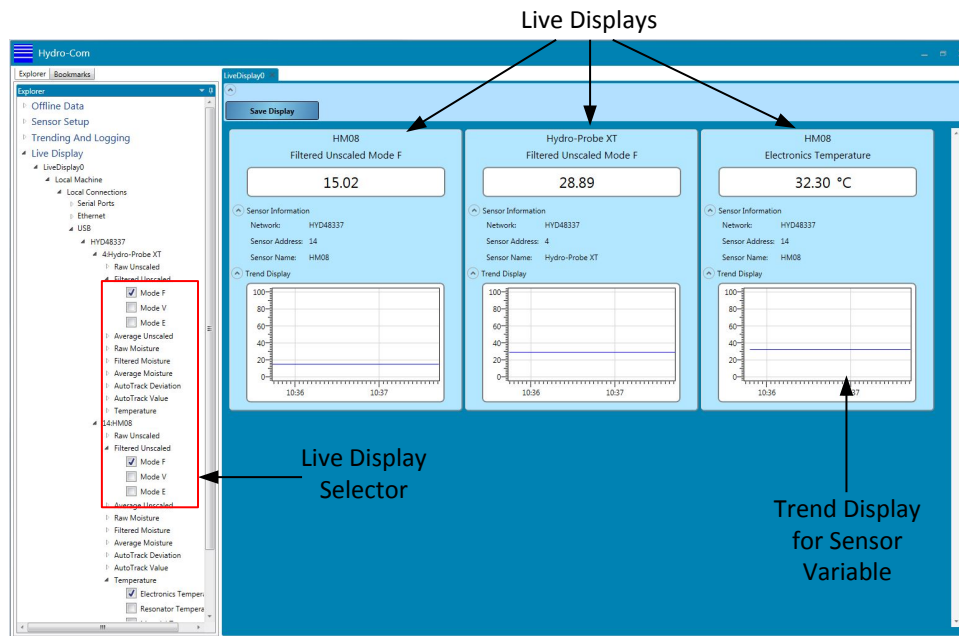


Figure 6: Live Display

1.1.5 Data Analysis

The Data analysis section enables saved sensor Configuration files and Log files to be examined. Sensor Back-up files can be edited so they can be restored to a sensor. Raw Unscaled Log files can have filters applied to enable appropriate signal filters to be set.

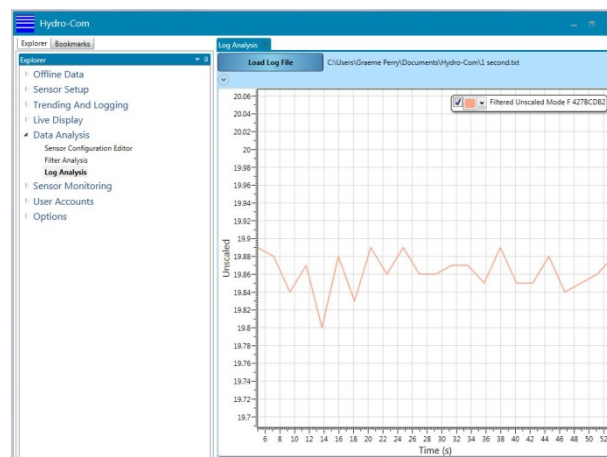


Figure 7: Data Analysis

1.1.6 Sensor Monitoring

The Sensor Monitoring section facilitates the comparison of the current calibration data stored in the sensor to the data in the Hydro-Com database. This enables the user to confirm if a sensors calibration has been updated or changed using a different instance of Hydro-Com or separate communication method.

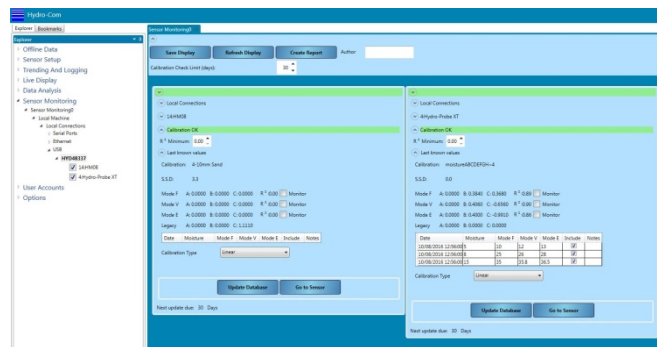


Figure 8: Sensor Monitoring

1.1.7 User Accounts

Hydro-Com can be configured to restrict access to certain sections of the software. It is recommended to restrict access to sensor settings and software configurations to authorised personnel only. When first installed Hydro-Com User Accounts are not configured so full access is granted. Once User Accounts are configured, there are four access levels available: None, Basic, Supervisor and Engineer.

1.1.8 Options

Client Configuration

The Client Configuration section is used to configure the services that are used to connect to databases and sensor communication services. It enables the configuration of which ports to use and whether a basic or secure connection is used.

The language of the system can be configured, once saved the software will launch in the required language.

It is possible to configure Hydro-Com to remember the Live Display setup. When launched Hydro-Com will automatically display the Live Display as previously saved. To save the Live Display select 'Open Live Display on Startup'.

The software can be configured to enable remote sites from this section, see Chapter 14 for details.

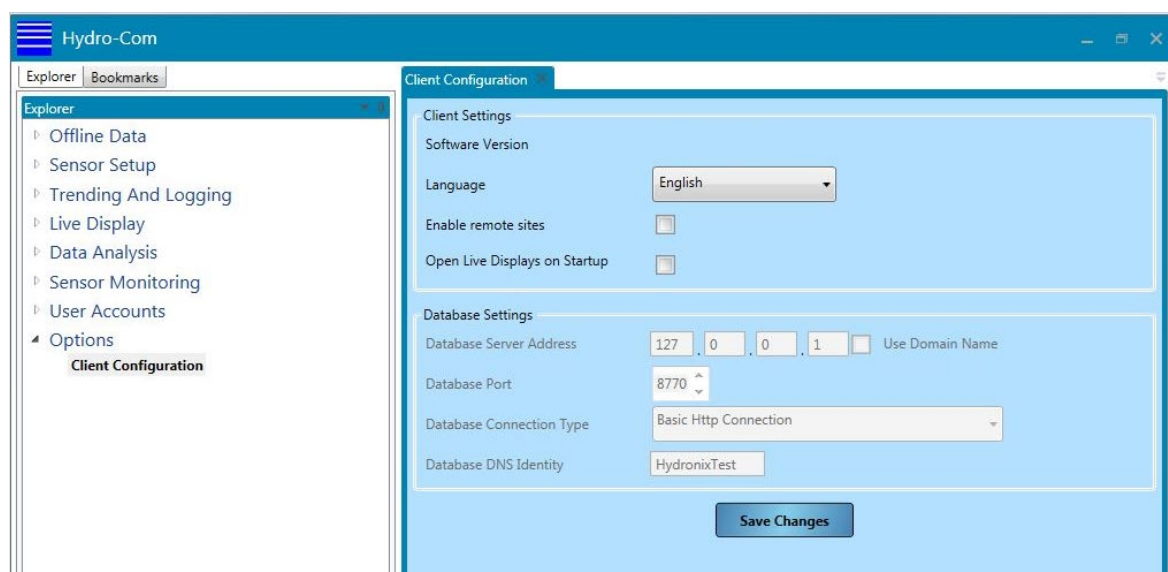


Figure 9: Options Screen

1.2 Display area

The Display area contains the details for any selected sensor as required.

1.3 Bookmarks

The Bookmarks section is a holding area for frequently used (saved) displays.

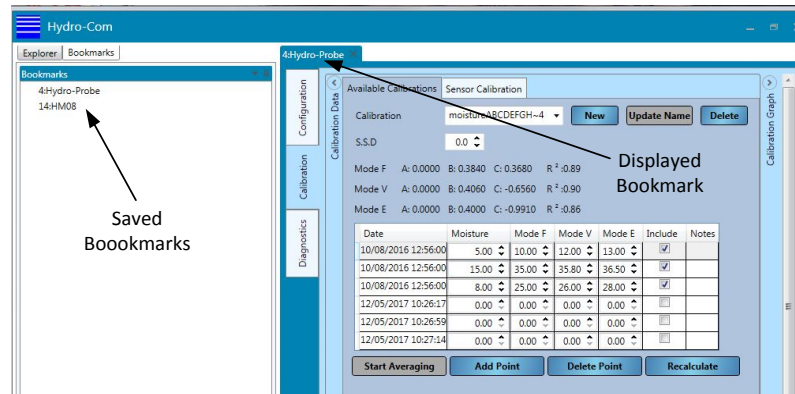
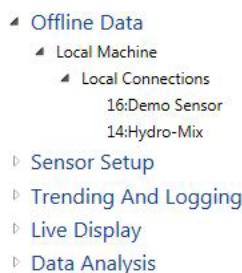


Figure 10: Bookmarks

1 Configuring the Database

The Offline Database contains the configuration and calibration data for any sensor that has been connected to Hydro-Com. The database is updated automatically every time a sensor is connected.

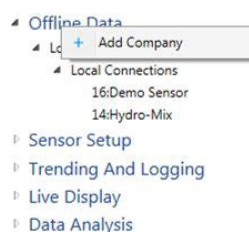
To display a list of any previously connected sensors select **Offline Data > Local Machine > Local Connections**



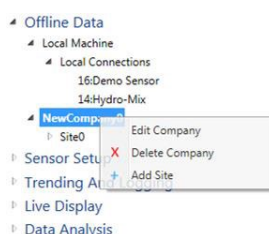
Any sensor that is connected to Hydro-Com will have its data automatically saved to the Local Machine section of the database under Local Connections. The location of the sensor data in the database can be configured in the Offline Database and the Sensor Setup sections. See page 24 or page 30 for details of how to change the database location.

1.1 Add a New Company

One or more company names can be added to the database to allow the user to organise the storage of the sensor data. To create a new company right click 'Offline Data' and select 'Add Company'. The name of the company can be changed by right clicking the company and selecting 'Edit Company'.



Each company in the database contains at least one sub section called 'Site'. The sub sections enable the sensors to be separately stored for different sites within a company in the database. To add a new site right click the company and select 'Add Site'.



The name of the site can be changed by right clicking the site name.

It is possible to edit the site server information also. This is explained further in Chapter 15.

2 Open Sensor Details

To display the sensor details select the sensor in the database in the appropriate company and site. The sensor details are displayed in the display area (Figure 11).

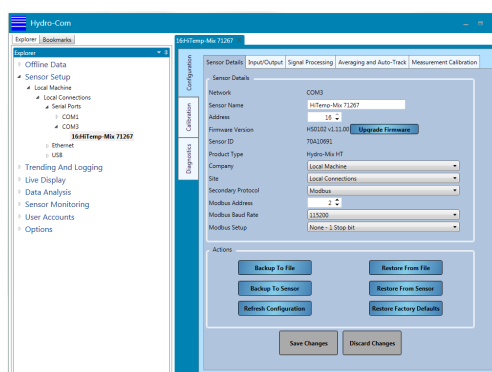


Figure 11: Sensor Details

2.1 Configuration Section

The Configuration section contains all of the sensor configuration details from the last time the sensor was connected. The Configuration section is split into five tabs. All sensor data is read only except for the database setup.

2.1.1 Sensor Details

The Sensor Details section contains the sensor name, RS485 address, firmware version, sensor ID and the sensor offline database configuration.

2.1.2 Change where the Sensor Data is Stored in the Database

The location of the sensor details can be changed in the database in the Configuration section (Figure 12). Select the required company and site using the drop down menus and click 'Save Changes' to update the database.

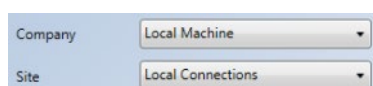


Figure 12: Sensor Database Configuration

2.1.3 Input/Output

The Input/Output section displays the analogue output and digital I/O configurations (Figure 13).

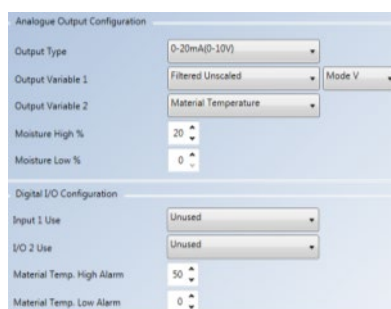


Figure 13: Offline Input/Output Display

2.1.4 Signal Processing

The Signal Processing section displays the filtering configuration settings for the sensor and also shows the measurement modes used for the Unscaled outputs (Figure 14).

Figure 14: Offline sensor Signal Processing Section

2.1.5 Averaging and Auto-Track

The Averaging and Auto-Track section displays the settings for the Averaging parameters and the Auto-Track setup (Figure 15).

Figure 15: Offline Data Averaging and Auto-Track Section

2.1.6 Measurement Calibration

The Measurement Calibration section displays the Temperature Coefficients used by the sensor and the factory Air and Water values (Figure 16).

Figure 16: Offline Data Measurement Calibration Section

To access the Measurement Calibration section the password '0336' must be entered (Figure 17).

Figure 17: Measurement Calibration Login

2.2 Calibration Section

The Calibration section (Figure 18) contains any saved calibration data for the selected sensor. This includes any data points and the resultant coefficients (A, B, C and D). The Calibration section is divided into two categories: Available Calibrations and Sensor Calibrations. A Calibration Graph is also available to graphically display the calibration data from both the Available and Sensor Calibration sections.

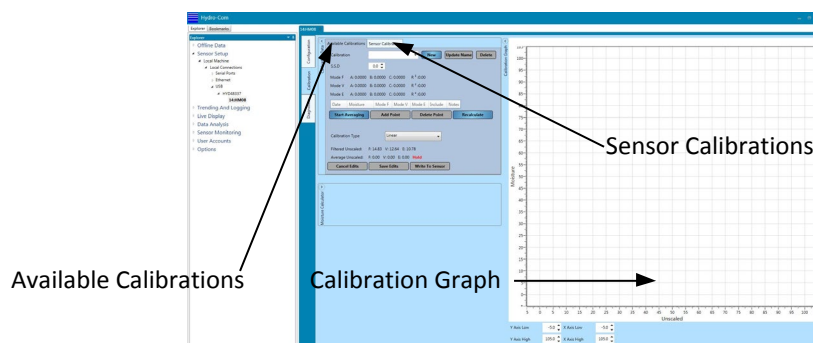


Figure 18: Calibration Section

2.2.1 Available Calibrations

The Available Calibration section displays any calibrations that have been stored in the database for a sensor. The data includes all calibration points and the coefficients calculated.

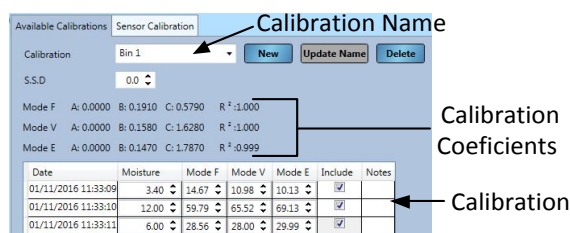


Figure 19: Available Calibrations

2.2.2 Sensor Calibrations

The Sensor Calibration section (Figure 20) displays the calibration information stored in the sensor.

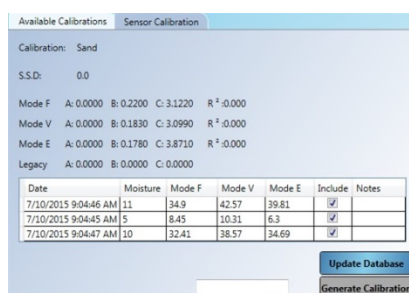


Figure 20: Sensor Calibration Data

2.2.3 Calibration Graph

The Calibration Graph graphically displays the calibration information in the database to assist with the calibration process. The graph can display any available calibrations, in all measurement modes, at the same time (Figure 21).

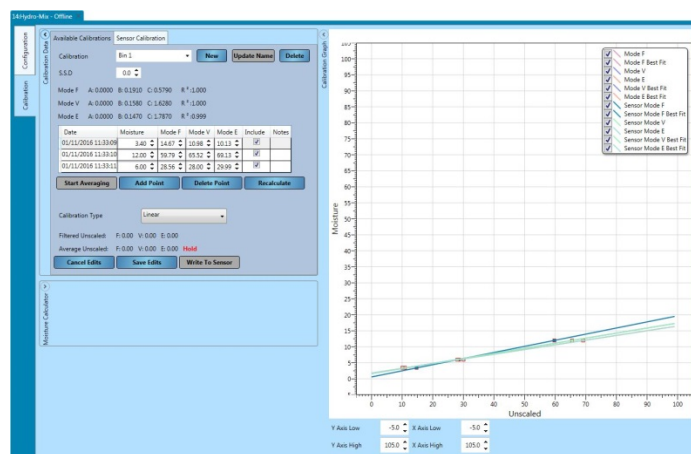


Figure 21: Calibration Graph

2.2.4 Demonstration Sensor

The Offline Database contains a Demonstration Sensor (Demo Sensor – see Figure 22). The Demo Sensor is based on a Hydro-Mix sensor and contains all of the available configuration options. This facility can be used to enable the user to become familiar with the sensor settings without changing a live sensor.

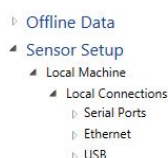
- ▲ Offline Data
 - ▲ Local Machine
 - ▲ Local Connections
 - 16: Demo Sensor**
 - 14: Hydro-Mix
 - ▶ Sensor Setup
 - ▶ Trending And Logging
 - ▶ Live Display
 - ▶ Data Analysis

Figure 22: Demo Sensor

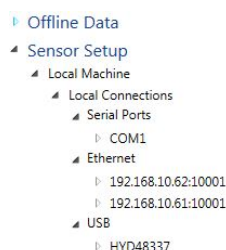
1 Connecting to a Sensor

The Sensor Setup section is used to access live data from any connected sensor. Sensor configuration, calibration and diagnostics are available. After a sensor is connected the Offline Database is automatically updated.

To access a sensor select **Sensor Setup>Local Machine>Local Connections**.



Select the connection method required, Ethernet, Serial port or USB. Expand one or all of the options to search for available ports. USB will only work with a Hydronix Sensor Interface Module configured for direct USB.



Select the required port and Hydro-Com will search for connected sensors.



All available sensors on the network will be displayed under the port number. To refresh a network when a new sensor is connected right click the required Com Port/Ethernet and select 'Refresh Network'.



Select the required sensor to add it to the Display Area.

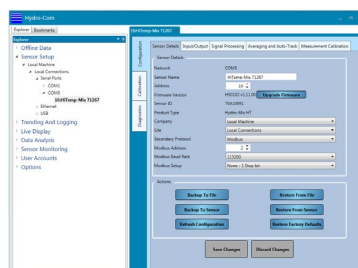


Figure 23: Sensor added to the Display Area

2 Sensor Display Area

The sensor setup section is used to configure and diagnose connected sensors and is divided into three main tabs: Configuration, Diagnostics and Calibration.

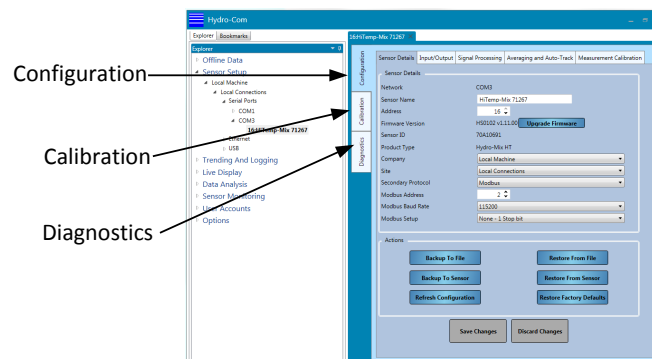


Figure 24: Sensor Setup Section

2.1 Configuration

The configuration tab is separated into five sections: Sensor Details, Input/Output, Signal Processing, Averaging and Auto-Track and Measurement Calibration.

2.1.1 Sensor Details

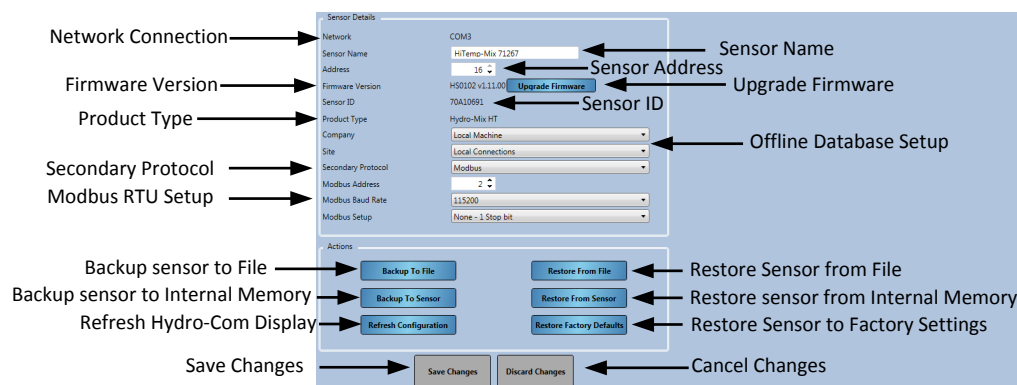


Figure 25: Sensor Details

Sensor Address

All Hydronix sensors are set to address 16 as default. If more than one sensor is connected to a network each sensor must have a unique address allocated to it. To change the sensors address, connect one sensor at a time and change the address using the selector. Click 'Save Changes' to update the sensor. Once all sensors have unique address numbers they can all be connected at the same time.

Firmware

The version number indicates the firmware installed in the sensor. The firmware held in the sensors flash memory may be upgraded from a file (HS0104) available for download from the Hydronix web site. Note the file should be saved to a local drive on your machine and not a network drive. The firmware upgrade feature of Hydro-Com uses a single upgrade file which contains the firmware for all of Hydronix sensors. Hydro-Com will select the relevant firmware for the specific sensor and upload the data. This feature will prevent incorrect firmware uploading to a sensor which can make it inoperable.

Clicking the 'Upgrade Firmware' button will invoke a file open box. Browse to the downloaded file and confirm the selection. The upgrade process can take a few minutes to complete.

Firmware Version HS0102 v1.00.00 **Upgrade Firmware**

Before you proceed it is imperative that the sensor power and communications is maintained whilst the upgrade is in progress otherwise there is a possibility that the flash memory will be left in an indeterminate state, rendering the sensor inoperable.

Offline Database Setup

The Offline Database setup is used to configure where in the Offline Database the sensor details are stored. Once the required company and site are selected, click 'Save Changes' and the sensor will be moved to the selected location in the database.

Company	Local Machine
Site	Local Connections

Figure 26: Offline Database Setup

Secondary Protocol (Modbus RTU)

The Secondary Protocol configuration enables a sensor, using firmware HS0102 v1.11.0 and above, to communicate using the Modbus RTU protocol. If enabled, the sensor will communicate using the Hydronix Hydro-Link protocol and the Modbus RTU protocol using the same RS485 communication path.

Note: Only one type of protocol message can be processed at a time.

The Modbus RTU communication is configured using the Modbus Address, Modbus Baud Rate and Modbus Setup selectors. See the Hydronix Microwave Moisture Sensor Modbus RTU Protocol Register Mapping guide HD0881 for details

Secondary Protocol	Modbus
Modbus Address	2
Modbus Baud Rate	115200
Modbus Setup	None - 1 Stop bit

Figure 27: Secondary Protocol

Backup to File and Restore from File

The Backup and Restore function enables the sensor setting to be saved to a XML file. Backing up a sensor after commissioning facilitates the restoring of a sensor if the configuration is changed accidentally. This function also enables the user to keep a record of all settings. To create a backup connect the sensor and then select 'Backup' and choose a file location. Once a backup has been created the sensor can be restored using this file. To restore a connected sensor click 'Restore' and select the relevant backup file.

Backup To File	Restore From File
-----------------------	--------------------------

Backup to Sensor and Restore from Sensor

All Hydronix sensors utilising firmware HS0102 and above have the ability to store the sensor configuration settings to the internal memory. This facility enables the user to backup the sensor configuration so it can be restored at a later date if required

Backup To Sensor	Restore From Sensor
-------------------------	----------------------------

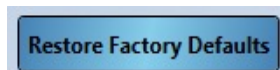
Refresh Configuration

The refresh configuration button enables the user to refresh the Hydro-Com sensor setting screens to ensure the latest values are displayed.



Restore Factory Settings

During manufacture all factory settings are stored in a reserved memory location to enable the sensor to be restored to default.



2.1.2 Input/Output

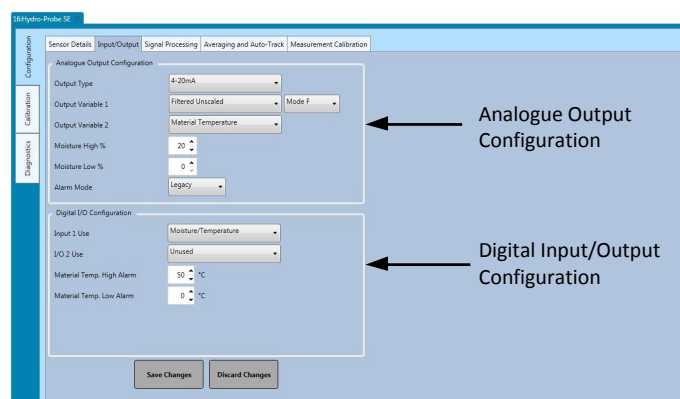


Figure 28: Input/Output Settings

Analogue Output Configuration

The Analogue Output Configuration section enables the configuration of the following sensor analogue output settings:

- Output Type
- Output Variable 1 and 2
- Output Variable Mode
- Moisture Low % and High%
- Alarm Mode

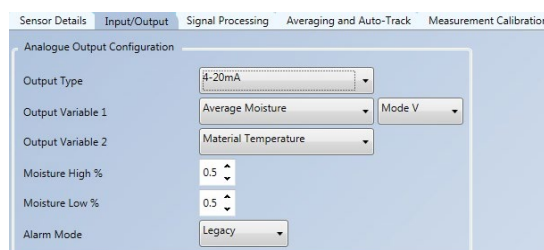


Figure 29: Analogue Output Frame

Selecting the Output Variable Mode

The Output Variable Mode selector configures which measurement mode is used for the output type. The option is only available on Moisture and Unscaled Output types. The available Measurement Modes (F, E, V and Legacy) are dependent on the sensor connected.

If a sensor has previously been calibrated using legacy software, or a Hydro-View IV (pre 2.0.0), the sensor will have Legacy coefficients stored. Legacy Mode can be selected to configure the moisture output to use these Legacy coefficients when calculating the Moisture % (See page 48 for more information on Legacy coefficients). If Legacy is selected the measurement mode used to calculate the Unscaled will be set according to the Unscaled Type 1 mode (see page 33 for details on setting Unscaled Type 1).

Digital Inputs/Output Setup

The Digital Input/Output setup frame is used to configure the sensors Digital Inputs and Output. The following can be set:

- Digital I/O 1
- Digital I/O 2
- Material High and Low temperature - configuration for the Material Temperature Alarm output.

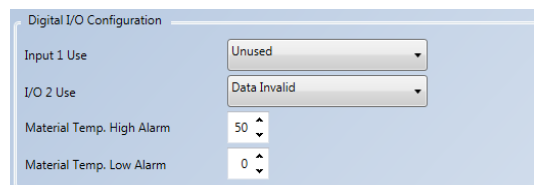


Figure 30: Digital I/O Configuration Frame

2.1.3 Signal Processing

The Signal Processing frame is used to configure the filtering applied to the sensors Raw output and to set the measurement mode used for the Unscaled output (this facility is not available with all sensors).

This signal processing section also enable the user to test filter setting on the Raw Unscaled sensor value before loading the values into the sensor.

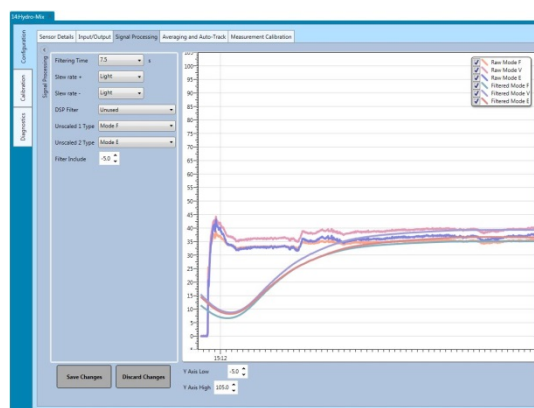


Figure 31: Signal Processing Settings

The signal processing frame enables the following to be configured:

Filtering

See the Configuration and Calibration Guide HD0679 for detail of how to configure the filtering in the sensor.

- Filtering Time (Smoothing Time)
- Slew Rate +
- Slew Rate –
- Digital Signal Processing (DSP)
- Filter Include set point

Unscaled Mode

- Unscaled 1 measurement mode type (Only with selected sensor)
- Unscaled 2 measurement mode type (Only with selected sensor)

Testing Filter Settings

Before configuring the sensor filters it is necessary to determine the most suitable settings. This can be achieved using the live filter configuration facility. The Raw Unscaled value for each available mode is displayed along with the current filtered Unscaled values. The Filter Time, Slew Rate +, Slew Rate – and the DSP filters can be adjusted to show the effect of any changes. Once the required filter settings have been selected the changes can be written to the sensor by pressing the Save Changes button.

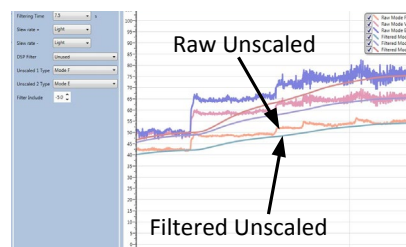


Figure 32: Live Filter Configuration Graph

2.1.4 Averaging and Auto-Track

The Averaging and Auto-Track section configures how the Raw or Filtered output from the sensor is averaged and the Auto-Track alarm set-up.

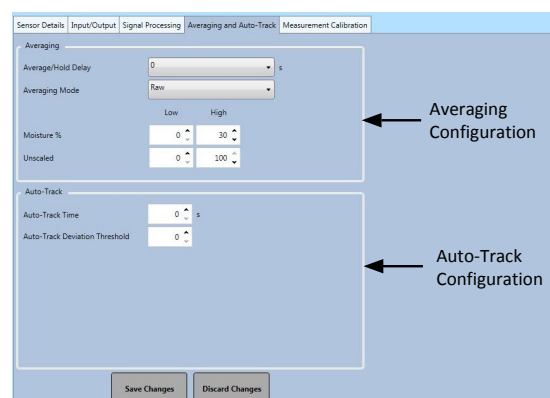


Figure 33: Averaging and Auto-Track Settings

Averaging

In the Averaging section the following can be configured

- Average/Hold Delay
- Averaging Mode

- Moisture High/Low % Limit
- Unscaled High/Low Limit

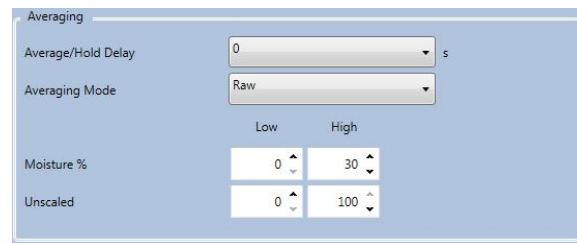
The Averaging Frame configuration window has a title bar labeled 'Averaging'. It contains two dropdown menus: 'Average/Hold Delay' set to '0' with a unit 's' to its right, and 'Averaging Mode' set to 'Raw'. Below these are two columns of spinners. The first column is labeled 'Moisture %' and has a spinner set to '0'. The second column is labeled 'Unscaled' and has a spinner set to '0'. To the right of these spinners are two more columns labeled 'Low' and 'High'. The 'Low' column has a spinner set to '0' and the 'High' column has a spinner set to '30' for Moisture % and '100' for Unscaled.

Figure 34: Averaging Frame

Auto-Track

In the Auto-Track section the following can be configured:

- Auto-Track Time
- Auto-Track Deviation Threshold

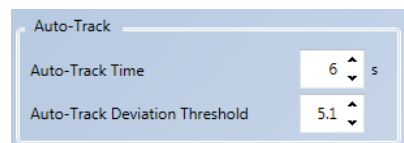
The Auto-Track Frame configuration window has a title bar labeled 'Auto-Track'. It contains two rows of spinners. The first row is labeled 'Auto-Track Time' and has a spinner set to '6' with a unit 's' to its right. The second row is labeled 'Auto-Track Deviation Threshold' and has a spinner set to '5.1'.

Figure 35: Auto-Track Frame

Auto-Track Configuration

The Auto-Track output alarm is used to indicate when the deviation in the sensors moisture reading is below the configured limit for a set amount of time. To configure the Auto-Track the user must calculate the maximum deviation that is acceptable. As well as the deviation the user must configure the amount of data points to be sampled by the sensor (seconds). Once configured, the sensor will average the moisture output over the set amount of time.

The deviation, and the time settings, will be unique for each application. They are dependent on the acceptable deviation in the moisture reading for the application.

The output alarm will be activated when the moisture deviation is below the limit for the set time. This is useful in mixer applications and for continuous flowing materials where a stable signal is required.

2.1.5 Measurement Calibration

To access the Measurement Calibration section the password '0336' must be entered.

Figure 36: Measurement Calibration Section

Temperature Compensation Frame

The coefficients used for temperature compensation are configured in this section.

Note: These values should not be changed unless advised by a Hydronix Engineer.

	Offset	Freq. (MHz)	Amplitude
Electronics	0.0	-0.0001	0.0200
Resonator	0.0	0.0033	0.3000
Material	0.0	0.0000	0.0000

Figure 37: Temperature Compensation Frame

Factory Settings Frame (Air/Water)

When it is manufactured, each sensor is individually calibrated in a controlled environment so that a zero (0) value relates to the measurement in air and 100 relates to water. This is used to give a raw output value from a Hydronix sensor which ranges from 0 to 100 and is called the Unscaled value.

The Air (Zero Unscaled) and the water (100 Unscaled) values are displayed and configured using the factory settings frame. It is not necessary to alter these in normal operation. To check if the factory setting are correct see the resonator section on page 39.

Note: Changing the calibration may adversely affect the operation of your sensor. If recalibration is required please contact Hydronix Technical Support

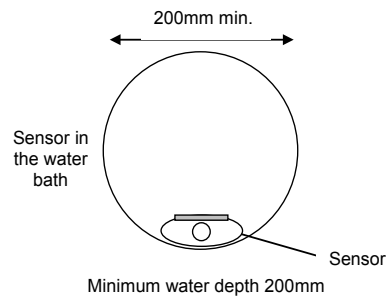
	Freq. (MHz)	Amplitude
Water	785.00	1000.00
Air	822.12	3230.90

Figure 38: Factory Settings Frame

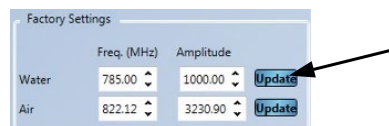
2.1.6 Performing Air and Water Factory Calibration

If a new factory Air and Water calibration is required the following procedure must be followed to ensure an accurate result. This test should only be performed after contacting Hydronix support for guidance, support@hydronix.com.

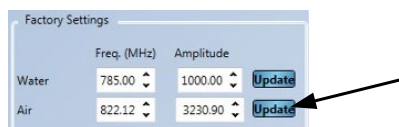
1. Clean the sensor ensuring any deposits of material are removed from the sensor face.
2. Fill a circular plastic bucket with clean fresh water at 20°C. The level of water needs to cover the sensor ceramic face-plate, and at least 200mm of water is needed in front of the ceramic.
3. Add 0.5% by weight of salt – e.g. 50g per 10 litres of water
4. Position the sensor in the water. For a Hydro-Probe Orbiter, it is suggested that the sensor is held in the bucket offset to one side with the face towards the centre of the bucket, hence the measurement is carried out with a full bucket of water in front.



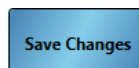
5. Allow the working temperature of the sensor to stabilise.
6. Open the Measurement calibration section in Hydro-Com and press the Update button next to the current Water value. The software will make a measurement and the new frequency and amplitude readings will be displayed in the Water reading box.



7. Remove the sensor from the water and dry the ceramic face plate
8. An air reading should be made with the sensor face-plate clean, dry and free from obstructions. Press the Update button next to the current Air value. The software will take a measurement and the new frequency and amplitude readings will be displayed in the Air reading box.



9. To upload the factory settings to the sensor press the 'Save Changes' button.



Note: Not all sensors use the amplitude measurement so will only update the frequency value. Hydro-com will detect which measurement modes the connected sensor uses.

2.1.7 Automatic Calibration (AutoCal)

When fitting a new sensing arm to a Hydro-Probe Orbiter, or replacing the ceramic on a Hydro-Mix the Air and Water factory calibrations need to be updated. However, if the sensor is installed in a mixer, it is not always possible to manually perform the air and water readings. To help with this issue an alternative function called AutoCal may be used. This makes an air reading and then estimates the water reading based on a constant air-water difference.

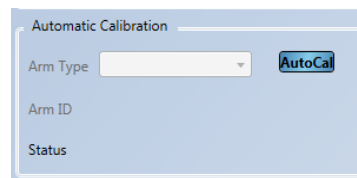


Figure 39: AutoCal

When using AutoCal with a Hydro-Probe Orbiter certain arm types require the selection of the type and length from the drop down menu. If this option is not available the connected arm is automatically detected by the Hydro-Probe Orbiter Head Unit.

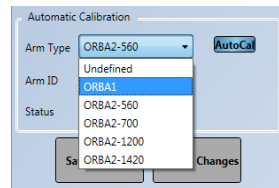


Figure 40: Arm Selection

During the AutoCal procedure, the ceramic face must be clean, dry and free from obstruction. Once the 'Automatic Calibration' button is pressed, the AutoCal measurement will start and should take approximately 30 seconds. The sensor will then be ready for use in the mixer.

Note: For conveyor belts or free fall applications, an Air and Water calibration is still required.

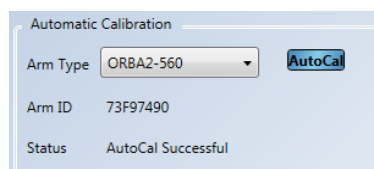


Figure 41: Successful AutoCal Procedure

Note: For the most consistent performance it is recommended that a full Air and Water calibration is performed. See page 36 for details

2.2 Diagnostics

Diagnostics is separated in to four sections: Live Diagnostics, Hardware Test, Configuration Checker and Sensor Error Log. This section enables the user to diagnose any possible faults with the sensor and to inspect the error logs.

2.2.1 Live diagnostics

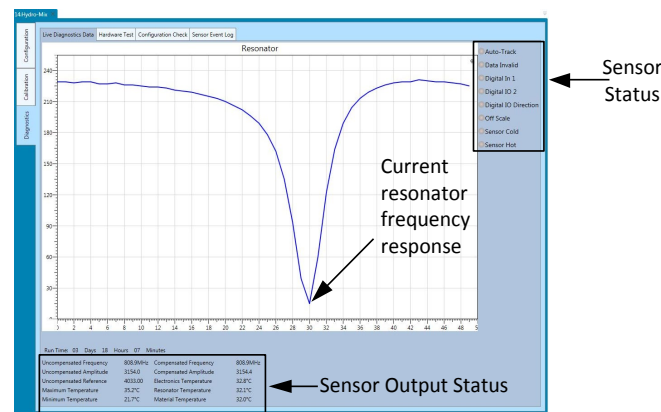


Figure 42: Live Diagnostics Page

Resonator

The Resonator Graph displays the current frequency response of the sensors resonator. The resonator response can be helpful in determining if a sensor is operating correctly.

The frequency and amplitude response should always be within the factory Air and Water values (Page 36). With the sensor clean and with no obstructions in front of the ceramic face plate the frequency and amplitude should be very close to the factory Air value. When a hand is placed on the ceramic face plate the frequency and amplitude should be within the Factory Air and Water range. Contact Hydronix support for assistance if the sensor does not operate within the Air/Water span. support@Hydronix.com

Figure 43 shows the typical resonator response with the sensor in air and with a hand on the ceramic (Some sensor will display the graph as a peak instead of a trough).

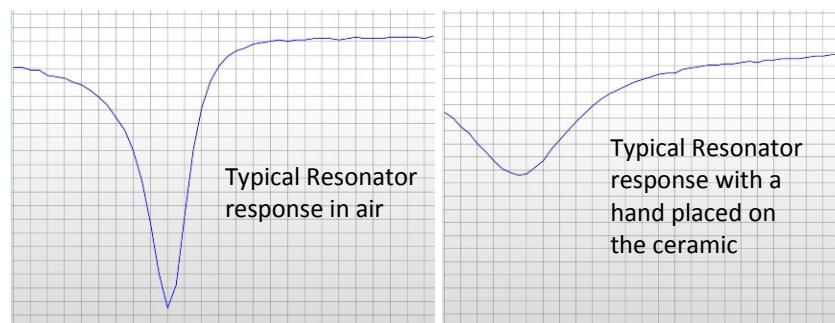


Figure 43: Typical Resonator Response

Sensor Status

The sensor status displays the current digital I/O and alarm status (Figure 44). This can be used to confirm the functionality of the digital outputs and to ensure that the sensor is operating within pre-set limits.

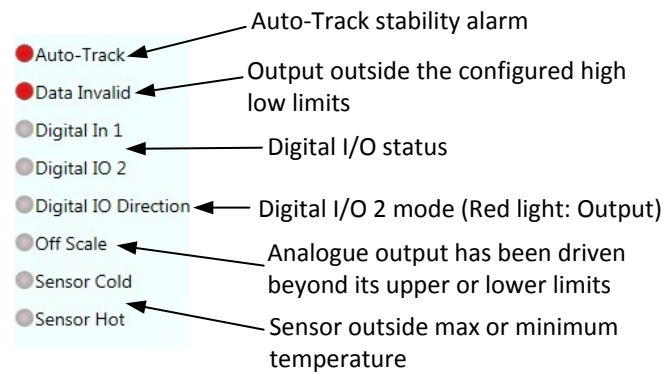


Figure 44: Current Sensor Status

Sensor Output Status

The Sensor Output Status displays the current frequency, amplitude and temperature measurements. The current run time for the sensor is also displayed (the run time indicates the amount of time the sensor has been powered up).

Run Time: 51.13:26:00	Days 51.13:26:00	Hours 51.13:26:00	Minutes
Uncompensated Frequency	809.6MHz	Compensated Frequency	809.6MHz
Uncompensated Amplitude	3168.0	Compensated Amplitude	3168.0
Uncompensated Reference	3387.00	Electronics Temperature	27.5°C
Maximum Temperature	34.00°C	Resonator Temperature	26.9°C
Minimum Temperature	15.30°C	Material Temperature	24.5°C

Figure 45: Current Sensor Output Values

2.2.2 Hardware Test

The Hardware Test frame enables the user to test the operation of the sensors analogue current loops and the digital I/O's.

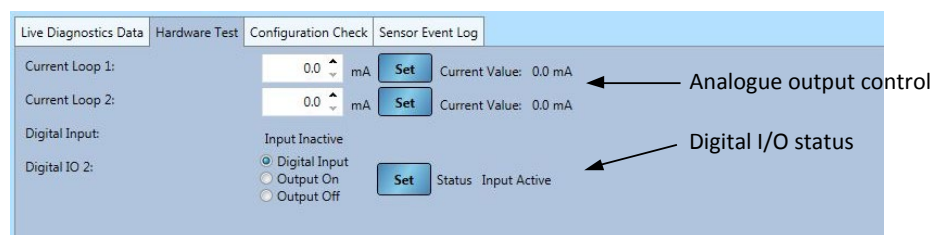


Figure 46: Hardware Test Frame

Analogue Outputs (Current Loop)

When connecting the sensors analogue outputs to a PLC it is necessary to scale the output from the sensor to ensure the PLC is displaying the correct value. Using the Hardware Test section the analogue outputs can be forced to a known value to confirm the correct operation.

To force the analogue output, set the required output to a specific value and press set. The output will now stay as set until the Hardware Test section is closed.

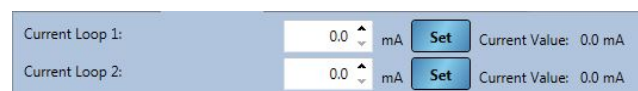
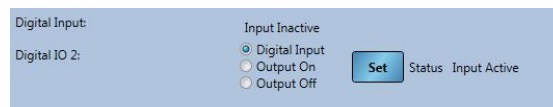


Figure 47: Analogue Output Control

Digital I/O's

The functionality of the digital inputs and output can be checked using the Digital Input and Output frame. The current status of both Digital I/O's is displayed and Digital IO 2 can be set to input or output to confirm the correct operation.



Digital Input: Input Inactive

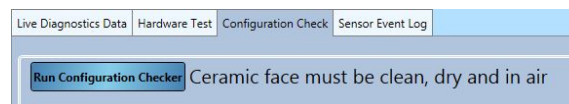
Digital IO 2: ☒ Digital Input ☐ Output On ☐ Output Off

Status Input Active

Figure 48: Digital Output Control

2.2.3 Configuration Checker

This facility will run a check on the configuration settings currently used in the sensor. Any settings found to be outside expected values will be identified as Information (Yellow), Warning (Orange) or Error (Red). To run the Configuration Checker click the 'Run Configuration' button (Figure 49).

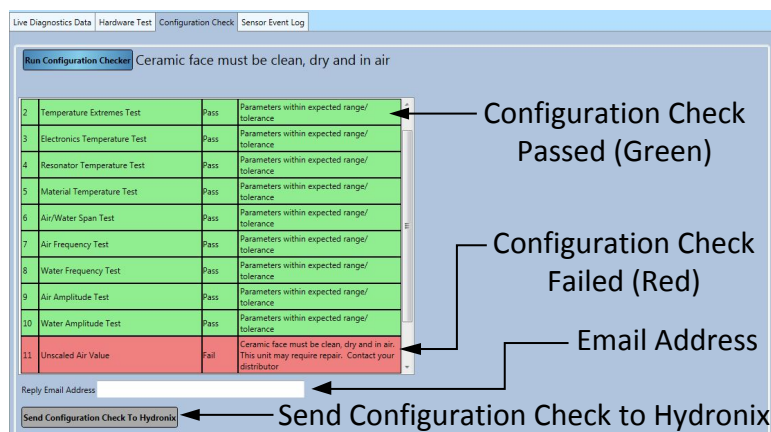


Live Diagnostics Data Hardware Test Configuration Check Sensor Event Log

Ceramic face must be clean, dry and in air

Figure 49: Configuration Checker

Once the check has been completed the results of each test will be displayed (Figure 50). Any error messages shown should be reviewed and rectified if possible.



Live Diagnostics Data Hardware Test Configuration Check Sensor Event Log

Ceramic face must be clean, dry and in air

2	Temperature Extremes Test	Pass	Parameters within expected range/ tolerance
3	Electronics Temperature Test	Pass	Parameters within expected range/ tolerance
4	Resonator Temperature Test	Pass	Parameters within expected range/ tolerance
5	Material Temperature Test	Pass	Parameters within expected range/ tolerance
6	Air/Water Span Test	Pass	Parameters within expected range/ tolerance
7	Air Frequency Test	Pass	Parameters within expected range/ tolerance
8	Water Frequency Test	Pass	Parameters within expected range/ tolerance
9	Air Amplitude Test	Pass	Parameters within expected range/ tolerance
10	Water Amplitude Test	Pass	Parameters within expected range/ tolerance
11	Unscaled Air Value	Fail	Ceramic face must be clean, dry and in air. This unit may require repair. Contact your distributor

Reply Email Address:

Configuration Check Passed (Green)

Configuration Check Failed (Red)

Email Address

Send Configuration Check to Hydronix

Figure 50: Configuration Check Results

If it is not possible to resolve the error messages the Configuration Checker results can be sent to Hydronix Support for review. To send the results enter a return email address in the text box and click the 'Send Configuration Check to Hydronix' button. The results will be sent to support@Hydronix.com.




Reply Email Address:

Figure 51: Send Calibration Check Results

2.2.4 Sensor Event Log

Clicking 'Load Error Log' will display the last 48 errors stored in the sensor. This facility can be used to diagnose faults such as intermittent power supplies. Contact Hydronix support for advice when using this facility.



Elapsed Time	Reset Count	Flash Writes	Flash Errors	Reset Cause
1 Days 15 Hours 11 Minutes	363	43	1	Normal Start
1 Days 15 Hours 11 Minutes	363	43	1	Normal Start
1 Days 15 Hours 11 Minutes	362	42	1	Normal Start
1 Days 20 Hours 8 Minutes	364	44	1	Normal Start
1 Days 20 Hours 8 Minutes	364	44	1	Normal Start
1 Days 20 Hours 13 Minutes	365	45	1	Normal Start
1 Days 20 Hours 13 Minutes	365	45	1	Normal Start
1 Days 20 Hours 59 Minutes	366	46	1	Normal Start
1 Days 20 Hours 59 Minutes	366	46	1	Normal Start
1 Days 21 Hours 24 Minutes	367	47	1	Watchdog Ti
1 Days 21 Hours 24 Minutes	367	47	1	Watchdog Ti
1 Days 23 Hours 10 Minutes	368	48	1	Normal Start
1 Days 23 Hours 10 Minutes	368	48	1	Normal Start
2 Days 0 Hours 20 Minutes	369	49	1	Watchdog Ti
2 Days 0 Hours 20 Minutes	369	49	1	Watchdog Ti
2 Days 1 Hours 26 Minutes	370	50	1	Watchdog Ti
2 Days 1 Hours 26 Minutes	370	50	1	Watchdog Ti
2 Days 3 Hours 42 Minutes	371	51	1	Normal Start
2 Days 3 Hours 42 Minutes	371	51	1	Normal Start
2 Days 6 Hours 40 Minutes	371	52	1	Normal Start
2 Days 6 Hours 44 Minutes	371	54	1	Normal Start
2 Days 6 Hours 44 Minutes	371	53	1	Normal Start
2 Days 6 Hours 53 Minutes	373	57	1	Watchdog Ti
2 Days 6 Hours 53 Minutes	371	55	1	Normal Start
2 Days 6 Hours 53 Minutes	375	60	1	Watchdog Ti

- Data Invalid
- Unreliable
- Off Scale
- Sensor Hot
- Sensor Cold
- Auto-Track
- Material Temp. High Alarm
- Material Temp. Low Alarm
- Outside calibration range
- Freq./amp. out of range
- Internal voltage error
- RF recalibration error

Figure 52: Sensor Error Log

2.3 Calibration

The Calibration section displays the calibrations stored in the sensor and in the database. Existing calibrations can be edited and new calibrations can be created and uploaded to the sensor.

See Chapter 7 for detailed instructions on how to calibrate the sensor.

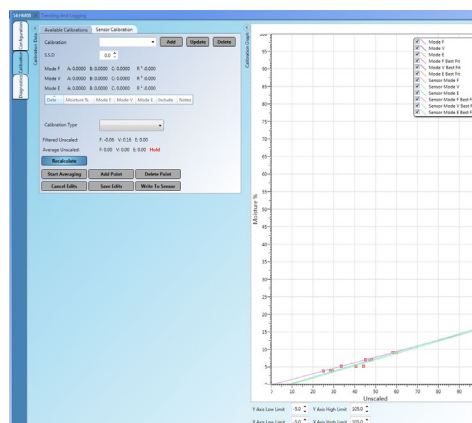


Figure 53: Calibration Section

2.3.1 Available Calibrations

The Available Calibrations section contains all of the calibration data in the database for the connected sensor. The available calibrations are selectable from the calibration drop down menu.

Each calibration created in Hydro-Com is uniquely associated with a sensor and as a result only calibrations for the selected sensor will be displayed.

New calibrations can also be created from this screen (see page 48 for instructions).

Available Calibrations: Sensor Calibration

Calibration Name: Sand

S.S.D: 0.0

Mode F: A: 0.0000 B: 0.2200 C: 3.1220 R^2 : 0.995

Mode V: A: 0.0000 B: 0.1830 C: 3.0990 R^2 : 0.998

Mode E: A: 0.0000 B: 0.1780 C: 3.8710 R^2 : 1.000

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
01/11/2016 16:32:52	5.00	8.45	10.31	6.30	<input checked="" type="checkbox"/>	
01/11/2016 16:32:53	11.00	34.90	42.57	39.81	<input checked="" type="checkbox"/>	
01/11/2016 16:32:54	10.00	32.41	38.57	34.69	<input checked="" type="checkbox"/>	

Buttons: Start Averaging, Add Point, Delete Point, Recalculate

Calibration Type: Linear

Filtered Unscaled: F: 13.77 V: 10.22 E: 9.44

Average Unscaled: F: 0.00 V: 0.00 E: 0.00 Hold

Buttons: Cancel Edits, Save Edits, Write To Sensor

Figure 54: Available Calibrations

2.3.2 Sensor Calibration

Details of the calibration stored in the sensor are displayed in the Sensor Calibration section. Dependant on the sensor connected, all the calibration points including the Unscaled and Moisture %, for each available measurement mode are displayed along with the corresponding coefficients. This data is read only.

Available Calibrations: Sensor Calibration

Calibration: Bin 1

S.S.D: 0.0

Mode F: A: 0.0000 B: 0.1910 C: 0.5790 R^2 : 1.000

Mode V: A: 0.0000 B: 0.1580 C: 1.6280 R^2 : 1.000

Mode E: A: 0.0000 B: 0.1470 C: 1.7870 R^2 : 0.999

Legacy: A: 0.0000 B: 0.0000 C: 0.0000

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
01/11/2016 11:33:00	3.40	14.67	10.98	10.13	<input checked="" type="checkbox"/>	
01/11/2016 11:33:00	12.00	59.79	65.52	69.13	<input checked="" type="checkbox"/>	
01/11/2016 11:33:00	6.00	28.56	28.00	29.99	<input checked="" type="checkbox"/>	

Calibration Type: Linear

Buttons: Update Database, Generate Calibration

New Name:

Figure 55: Sensor Calibrations

1 Live Display

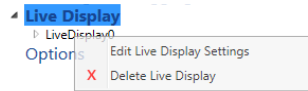
The Live Display section can be configured to display live data from any sensor connected to Hydro-Com. Several sensors can be displayed at the same time and more than one output variable can be shown from each sensor.

1.1 Display Sensor

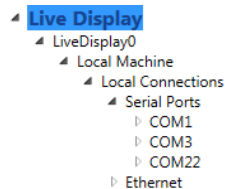
To open a Live Display select **Live Display > LiveDisplay0**



Several Live Displays can be created. To create a new display right click 'Live Display' and select 'Add Live Display'. Right click on the display and select 'Edit Live Display Settings' to change the display name.



To select a sensor expand the Live Display and select **Local Machine>Local Connections**. Expand the required connection type, Serial port, Ethernet or USB.



Select the required com port and Hydro-Com will search for available sensors. Available sensors will be listed under the com port.



Expand the required sensor and all the available output types for the sensor will be displayed. Selecting an output type will add it to the Display Area. Several different output types can be displayed.

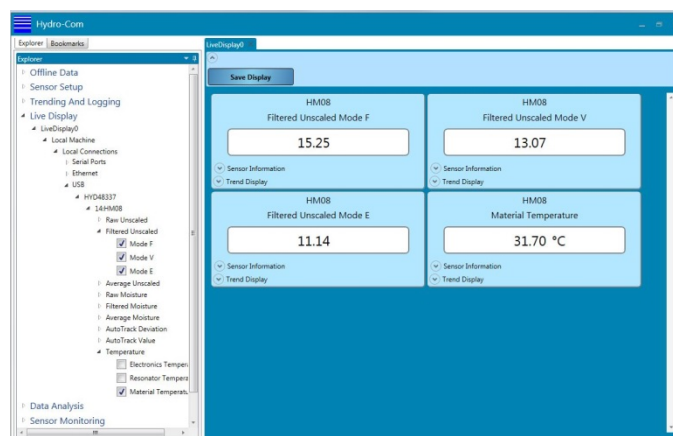


Figure 56: Sensor Live Display Outputs

Each sensor output display can be expanded to show the sensor information and to display a trend graph of the selected output.

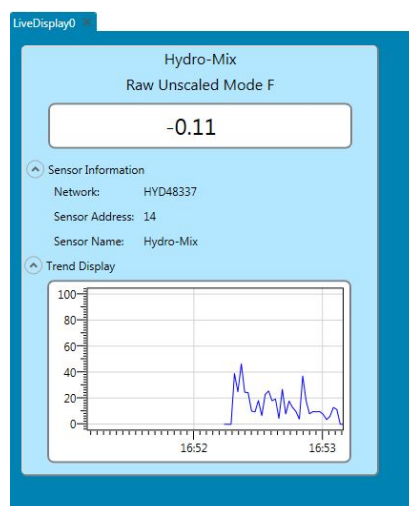


Figure 57: Expanded Live Display

1.2 Save Display

The Live Display configuration can be saved for future use. Once the display has been set as required, pressing the Save Display button will save the setup (Figure 58).

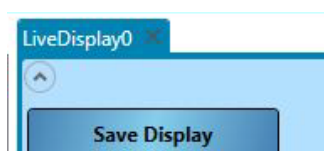


Figure 58: Save Display

After restarting Hydro-Com the live display will be automatically configured as saved when the Live Display section is accessed.

1 Introduction to Calibration

For sensor applications where the moisture % is required to be directly output, the sensor will require calibrating to the material that is to be measured.

The Hydro-Com calibration facility is used to capture Unscaled values and to read this against corresponding moisture values derived from taking and drying samples. This utility is intended for use with sensors measuring in flowing materials, such as in bins or on conveyor belts. The calibration procedure for mixer applications where water is added under controlled conditions to reach a specified moisture value is performed by the mixer control system or a Hydro-Control and not by Hydro-Com.

For full details about the calibration process see the Configuration and Calibration guide HD0679 or the specific sensor user guide.

2 Calibrating a Sensor

2.1 Coefficients

The calibration process is performed to enable the coefficients to be calculated that are required to convert the sensors Unscaled output into a true moisture %. For most applications only the B and C coefficients are required, see the Configuration and Calibration guide HD0679 for details.

All of the latest Hydronix Moisture Sensors (excluding the Hydro-Probe) have the ability to select the measurement mode used to calculate the Unscaled output. To output moisture using the different measurement modes requires separate coefficients for each mode (F, E and V). In older Hydronix sensors (Pre Firmware HS0102) the sensor has to be calibrated separately in each mode to create the coefficients.

When Hydro-Com is connected to the latest versions of the sensors (Firmware HS0102 or higher) the Unscaled values for each measurement mode are stored at the same time. This facility gives the user the ability to calculate the coefficients in every available measurement mode simultaneously. With all measurement modes calibrated it is possible to select the most appropriate mode to use for a given material without requiring the calibration process to be re-done. The sensor stores the coefficients internally for each mode enabling the sensor to output the Moisture % for any mode as required.

Mode F	A: 0.0000	B: 0.1890	C: -1.1530
Mode V	A: 0.0000	B: 0.1990	C: 0.4040
Mode E	A: 0.0000	B: 0.2100	C: -0.3960

Figure 59: Coefficients for all Measurement Modes

2.2 Calibration Data Table

All calibration data points, including the Unscaled values for each measurement mode and the resultant moisture %, are stored in the sensors memory (Only available with sensors with firmware HS0102 or higher). This enables the user to interrogate the values used to create the coefficients and the moisture spread of the collected samples. The chart will also indicate which samples have been included in the calculations.

Date	Moisture %	Mode F	Mode V	Mode E	Include	Notes
19/06/2015 14:19:00	4.10	27.78	19.16	21.73	<input checked="" type="checkbox"/>	
19/06/2015 14:20:00	8.60	52.11	39.29	41.77	<input checked="" type="checkbox"/>	
19/06/2015 14:19:00	10.10	59.41	49.82	50.70	<input checked="" type="checkbox"/>	

Figure 60: Calibration Data Table

2.3 Legacy Calibration Coefficients

When the latest versions of Hydronix Microwave Moisture sensors (Firmware HS0102 or higher) are connected to legacy products, such as Hydro-Com pre 2.0.0 and Hydro-View IV pre 2.0.0 the sensor will only have the coefficients for one measurement mode stored. This will be displayed in the sensor calibration tab under 'Legacy Coefficients'. The Legacy coefficients are read only in Hydro-Com.

If the calibration in the sensor was created using legacy software it is advisable to create a new calibration using the existing calibration data. However, this will only create a calibration in a single measurement mode. If all measurement modes are required the calibration process must be re-done. See page 58 for instructions on how to create a calibration from the legacy coefficients

Calibration:	orbiter			
S.S.D:	0.0			
Mode F	A: 0.0000	B: 0.1890	C: -1.1530	R ² :1.000
Mode V	A: 0.0000	B: 0.1990	C: 0.4040	R ² :0.987
Mode E	A: 0.0000	B: 0.2100	C: -0.3960	R ² :0.994
Legacy	A: 0.0000	B: 0.2154	C: -1.2000	

Coefficients Set Using Hydro-Com

Coefficients Set Using Legacy Software

Figure 61: Legacy Coefficients

2.4 Creating a New Calibration

To create a new calibration, click 'New', type a name in the calibration text box and select 'Save Edits'. Dependant on the sensor connected, the available measurement modes and the current calibration coefficients will be displayed.

Calibration: Sand [New] [Update Name] [Delete]

S.S.D: 0.0

Mode	A	B	C	R ²
Mode F	0.0000	0.0000	0.0000	0.000
Mode V	0.0000	0.0000	0.0000	0.000
Mode E	0.0000	0.0000	0.0000	0.000

Date: Moisture: Mode F: Mode V: Mode E: Include: Notes

[Start Averaging] [Add Point] [Delete Point] [Recalculate]

Calibration Type: Linear

Filtered Unscaled: F: -0.11 V: 0.19 E: -0.03

Average Unscaled: F: 0.00 V: 0.00 E: 0.00 Hold

[Cancel Edits] [Save Edits] [Write To Sensor]

Figure 62: New Calibration

2.5 Adding a Calibration Point

Averaging the output of the sensor over a period of time is essential for representative sampling in most applications. In the case of a Hydro-Probe mounted in a sand bin, once the gate opens the sand starts to flow until the gate closes. As the readings vary during this time the most reliable way in which to obtain a representative Unscaled value is by continuously averaging during the flow.

2.5.1 Averaging Mode

The Averaging Mode used while calculating the Average Unscaled can be set to either 'Raw' or 'Filtered' (Page 25). For applications where mechanical apparatus, such as mixer paddles or screws, pass over the sensor and affect the reading the use of the 'Filtered' value will remove the peaks and troughs in the signal. If the material flow is stable, for example, when measuring at the output from a silo or on a conveyor belt, the averaging should be set to 'Raw'.

See the Hydronix Sensor Configuration and Calibration Guide HD0679 or the appropriate sensor user guide for more details on how to set the averaging functionality for specific applications.

2.5.2 Automatic Averaging

Digital input 1 can be used to determine when to start the averaging. For a bin installation the sensor input may be generated from the bin-gate switch to give a +24VDC input when the gate is open. The same set-up can be used for other installation such as conveyor belts. A manual switch can be installed to indicate when the sensor should start averaging.

In both cases the configuration of the sensors digital input has to be set to 'Average/Hold' for this purpose (See page 24).

See the Hydronix Sensor Electrical Installation Guide HD0678 or the appropriate sensor user guide for more details on how to wire the digital input.

2.5.3 Remote Averaging

If the installation is without an input that can switch to control the averaging function, Hydro-Com has the facility to manually select the start and stop period of averaging. This is called 'Remote Averaging'. Remote Averaging is only possible if Digital Input 1 is set to 'Unused' (see page 24).

If Digital Input 1 is set to 'Unused' then a 'Start Averaging' button will appear as shown below:



Figure 63: Remote Averaging

2.5.4 Recording the Average Unscaled

After the averaging has started, either manually or automatically, the display will change from 'Hold' to 'Averaging' (Figure 64).

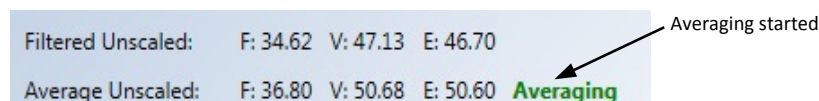


Figure 64: Sensor Averaging Started

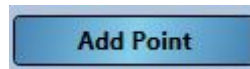
Once the averaging has stopped the display will show Hold. The Unscaled values displayed next to 'Average Unscaled' are the batch average values used in the calibration (Figure 65).

Filtered Unscaled:	F: 33.43	V: 37.58	E: 34.36	
Average Unscaled:	F: 36.80	V: 50.95	E: 50.98	Hold

Averaging Stopped

Figure 65: Sensor Averaging Stopped

Average Unscaled values are added to the calibration chart by clicking 'Add Point'.



The Unscaled values for all available measurement modes are included in the chart (Figure 66).

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
07/07/2015 16:00:39	0.00	36.80	50.95	50.98	<input type="checkbox"/>	

Figure 66: Average Unscaled Added to Calibration Chart

Multiple Unscaled values can be added to the chart as required (Figure 67).

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
07/07/2015 16:00:39	0.00	36.80	50.95	50.98	<input type="checkbox"/>	
07/07/2015 16:01:53	0.00	65.91	57.23	59.21	<input type="checkbox"/>	
07/07/2015 16:01:55	0.00	51.38	42.65	42.72	<input type="checkbox"/>	

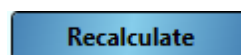
Figure 67: Multiple Unscaled Values

The corresponding moisture % associated with the Unscaled value is added manually in the Moisture % column. The required moisture and Unscaled values can be added to the calibration by clicking the include column for each point (Figure 68).

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
07/07/2015 16:00:39	0.00	36.80	50.95	50.98	<input checked="" type="checkbox"/>	
07/07/2015 16:01:53	0.00	65.91	57.23	59.21	<input checked="" type="checkbox"/>	
07/07/2015 16:01:55	0.00	51.38	42.65	42.72	<input checked="" type="checkbox"/>	

Figure 68: Moisture % Added to Chart

Click 'Recalculate' to add the points selected to the calibration graph.



The calculated calibration coefficients are updated and displayed above the chart for all available measurement modes (Figure 69). An R^2 value for each measurement modes coefficients is also included. The R^2 can be used to indicate how close the data in the calibration is to the calculated best fit line. An ideal calibration where the best fit line passes through every point will result in an R^2 of 1.

Mode F	A: 0.0000	B: 0.1720	C: -0.3890	R ² : 0.998	Calibration Coefficients for all Available Measurement Modes	
Mode V	A: 0.0000	B: 0.1610	C: 0.3370	R ² : 0.221		
Mode E	A: 0.0000	B: 0.1630	C: 0.1010	R ² : 0.290		

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
07/07/2015 16:00:39	6.00	36.80	50.95	50.98	<input checked="" type="checkbox"/>	
07/07/2015 16:01:53	11.00	65.91	57.23	59.21	<input checked="" type="checkbox"/>	
07/07/2015 16:01:55	8.30	51.38	42.65	42.72	<input checked="" type="checkbox"/>	

Figure 69: Updated Calibration Coefficients

Click the Calibration graph expander to display the graph (Figure 70).



Figure 70: Expanded Calibration Graph

The graph can be configured to display any, or all, of the available measurement modes and best fit lines for the calibration as well as the current calibration points stored in the sensor (not all sensors support this feature). This enables the user to select the most appropriate measurement mode for the application (Figure 71)

See the Configuration and Calibration guide HD0679 for advice on selecting the most suitable measurement mode to use.

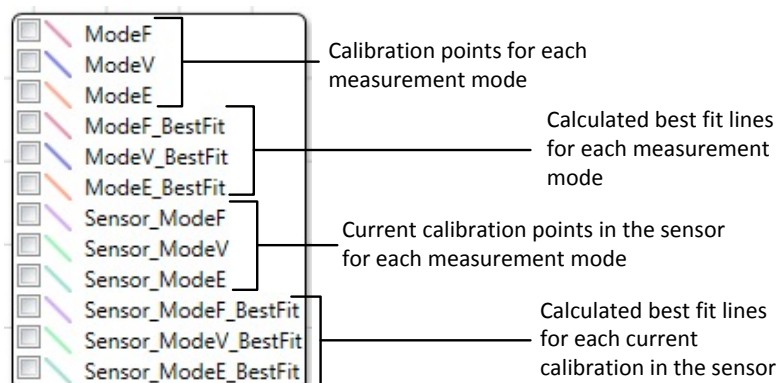


Figure 71: Calibration Graph Selection Panel

2.6 Quick Start Rules

Quick Start Rules are only available with selected sensors. Hydro-Com will display the 'Quick Start Rules' selection box if it is available with the connected sensor (Figure 72).

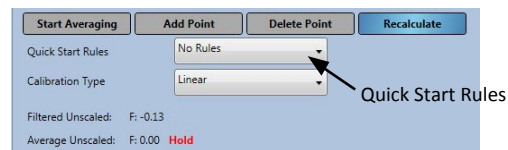


Figure 72: Quick Start Rules Selector

The calibration data points define a mathematical best fit line and it is this line, described using the variables A, B and C, which defines the calibration. The effect of the Quick Start Rules is to improve this calibration line if the calibration data does not satisfy the criteria as described in Appendix A. In such cases the mathematical best fit line is modified. The Quick Start Rules can be used where the calibration samples taken do not result in a large enough moisture variation to produce an accurate calibration. When the moisture in the material changes enough to enable calibration samples to be taken over a greater moisture spread the Quick Start Rules should no longer be used.

It should be noted that the Quick Start Rules have been designed around a sensor mounted at the suggested angle. See the individual sensor user manuals for more information.

Hydro-Com enables the selection of one of five Quick Start material types:

- 0-2mm Sand (No.8)
- 0-4mm Sand (No.4)
- 4-8mm Gravel (3/8")
- 8-16mm Stone (0.5"-0.75")
- 16-22mm Stone (1")

If however, different materials are being measured or the installation is different from the suggested method, then the Quick Start Rules should be disabled. This is application specific and should be determined by the engineer commissioning the equipment.

In the graph below, three calibration points have been entered into the table with the Quick Start Rules enabled. The data does not satisfy the complete criteria and as a result, a warning message is displayed as shown. The B and C calibration coefficients that describe this line have been modified.

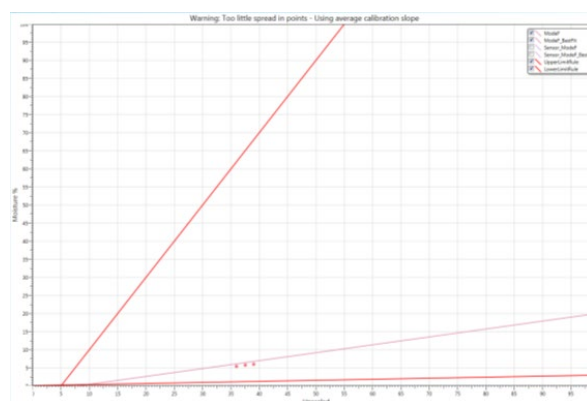


Figure 73: Quick Start Rules Applied

3 Calibration Procedure

3.1 Equipment Required

To collect calibration samples the following equipment is required:

- Microwave oven
- Weigh scales 2kg accurate to 0.1g
- Microwave safe bowls
- Metal spoon
- Heat proof gloves and eye protection
- Heat resistant mat, placed on the scales to protect it from the heat of the bowl

3.2 Collecting Samples

To collect samples and record the associated Average Unscaled values from the sensor follow the procedure detailed below:

1. Connect to the sensor using Hydro-Com and open the calibration section.
2. Create a new calibration by adding a name into the calibration text box and clicking add.

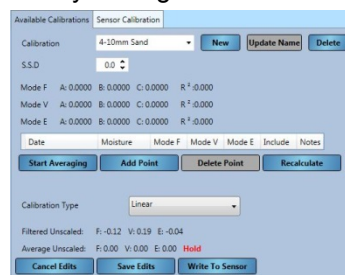


Figure 74: New Calibration

3. If automatic averaging using the bin gate signal is in use confirm that 'Averaging' is displayed on the calibration page when the bin gate opens and 'Hold' is displayed when the gate is closed. If manual averaging is to be used ensure that the averaging is only started once the material is flowing and is stopped when the gate is closed or the flow stops.

Note: If a bin gate is used to trigger the averaging the gate must not be jogged after the main dose otherwise the averaging will be re-started.

4. Once the system has been checked and is confirmed to be working correctly take a sample of the material. Using a suitable collection method collect a series of small samples from the flow of the material, aim to collect around 5kg in total of material. The material must be collected at a position close to the sensor and therefore the sensor reading relates to the particular batch of material passing the sensor.
5. Place all collected material in an air tight bucket or bag to ensure no moisture is allowed to escape.



6. The Average Unscaled for all available measurement modes is displayed on the calibration page.

Filtered Unscaled:	F: 0.00	V: 0.20	E: 0.00
Average Unscaled:	F: 15.81	V: 21.66	E: 14.26 Hold

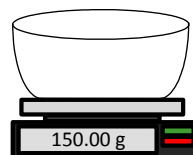
Figure 75: Average Unscaled Values Taken During Averaging

7. Add the Unscaled values to the chart by clicking 'Add Point'.

Add Point						
Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
26/06/2015 14:20:15	0.00	15.81	21.66	14.26	<input type="checkbox"/>	

Figure 76: Average Unscaled Values Added to Chart

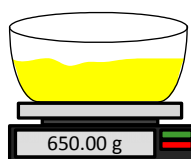
8. Thoroughly mix the collected material to ensure the moisture is evenly distributed.



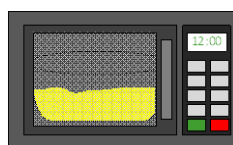
9. Weigh a clean empty heat proof bowl.
10. Place a minimum of 500g of the material in the bowl. All other material must remain in the air tight container until required.



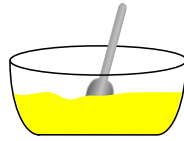
Some materials, such as grain, might require grinding before analysis. If grinding is required industrial standards should be followed using a suitable grinder.



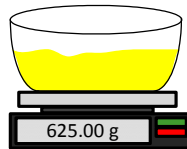
11. Weigh the bowl and wet material
12. Heat the material in the microwave for approximately five minutes. Weigh the bowl and record the result. Laboratory standards must be followed when heating especially if the material is organic as high temperatures can cause other constituents of the material to be burnt off. Check industry standards for the maximum temperature suitable for the material.



13. Carefully break up any lumps of material using a metal spoon. Do not allow any material to be lost from the bowl or to stick to the spoon. Only break up lumps once the material surface is dry.



14. Re-heat the material in the microwave for another five minutes. Weigh the material and record the result.



15. Continue to re-heat and weigh the material until the weight remains constant between two heating cycles. This indicates that the material is fully dry.
16. Repeat steps 9-15 for two more samples taken from the collected material.

Note: If using a conventional oven instead of a microwave the same procedure can be followed except the time required to heat the material must be increased accordingly. All three samples can be dried at the same time to speed up the process.

17. Calculate the moisture % of the three sub-samples using the following equation:

$$\text{Moisture \% (Dry weight)} = \frac{(B - C)}{(C - A)} \times 100$$

Where A = Weight of the empty bowl
 B = Weight of the bowl and wet material
 C = Weight of the bowl and the dry material

In the above example the moisture % calculated as:

$$\text{Moisture \% (Dry weight)} = \frac{(650 - 625)}{(625 - 150)} \times 100$$

$$\text{Moisture \% (Dry weight)} = \frac{25}{475} \times 100$$

$$\text{Moisture \% (Dry weight)} = 5.26\%$$

18. If all three sub-samples are within 0.3% moisture, take an average of the three results. If the sub-samples are not within 0.3% moisture the test must be repeated. Variations in the results indicate possible sampling or laboratory errors.
19. Manually add the moisture % result to the calibration chart

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
09/07/2015 16:21:23	5.20 ↕	16.33 ↕	19.65 ↕	16.72 ↕	<input type="checkbox"/>	

Figure 77: Moisture Added to Data Table

20. Repeat the process to collect sample at different moisture %. The aim of the calibration process is to collect samples that cover the entire expected moisture range of the material.

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
09/07/2015 16:21:23	5.20	16.33	19.65	16.72	<input type="checkbox"/>	
09/07/2015 16:21:41	10.90	37.85	49.03	48.69	<input type="checkbox"/>	
09/07/2015 16:22:20	6.50	20.61	25.00	24.90	<input type="checkbox"/>	
09/07/2015 16:25:06	9.60	33.43	39.66	37.56	<input type="checkbox"/>	

Figure 78: Several Calibration Points

21. After calibration points have been calculated selecting the 'Include' column will add the points to the calibration graph.

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
09/07/2015 16:21:23	5.20	16.33	19.65	16.72	<input checked="" type="checkbox"/>	
09/07/2015 16:21:41	10.90	37.85	49.03	48.69	<input checked="" type="checkbox"/>	
09/07/2015 16:22:20	6.50	20.61	25.00	24.90	<input checked="" type="checkbox"/>	
09/07/2015 16:25:06	9.60	33.43	39.66	37.56	<input checked="" type="checkbox"/>	

Figure 79: Selected Points

22. Click Recalculate to refresh the graph with the selected points.

Recalculate

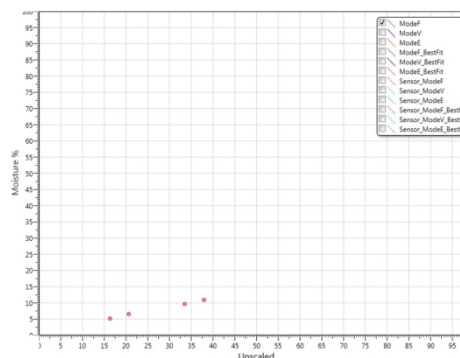


Figure 80: Calibration Points Added to the Graph

23. It is now possible to evaluate the points included and to inspect the best fit line that has been generated. The output from Hydronix moisture sensors is linear to moisture change so accurately collected and analysed samples should be on or very close to the best fit line. The latest Hydronix moisture sensors (excluding the Hydro-Probe) have the ability to switch the measurement mode used and this can be viewed on the graph. All measurement modes available can be displayed at the same time to enable comparisons to take place.

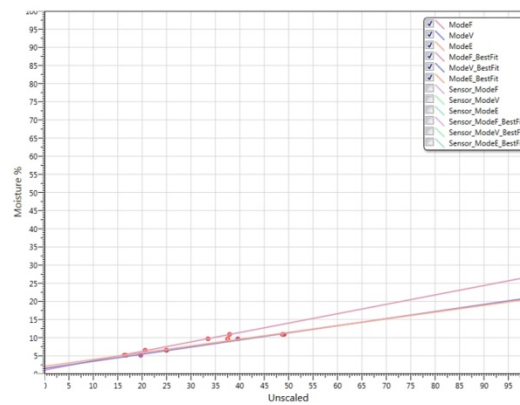


Figure 81: Calibration Graph Displaying All Available Measurement Modes

See the appropriate sensor user guide for advice on which measurement mode to select.

24. Save any changes made to the calibration.

Save Edits

25. Once a calibration has been completed successfully the data can be written to the sensor. All available measurement mode coefficients will be updated and if the sensor supports the facility the calibration points (Unscaled and Moisture %) will also be transferred to the sensor.

Select write to sensor to update the sensor.

Write To Sensor

Once updated the current calibration data will be available in the 'Sensor Calibration' tab.

Available Calibrations		Sensor Calibration				
Calibration: 4-10mm Sand						
S.S.D: 0.0						
Mode F	A: 0.0000 B: 0.2590 C: 1.0470	R ² : 0.998				
Mode V	A: 0.0000 B: 0.1960 C: 1.5160	R ² : 0.991				
Mode E	A: 0.0000 B: 0.1870 C: 2.0840	R ² : 0.982				
Legacy	A: 0.0000 B: 0.0000 C: 0.0000					
Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
01/11/2016 17:21:12	5.20	16.33	19.65	16.72	<input checked="" type="checkbox"/>	
01/11/2016 17:21:12	10.90	37.85	49.03	48.69	<input checked="" type="checkbox"/>	
01/11/2016 17:21:13	6.50	20.61	25.00	24.90	<input checked="" type="checkbox"/>	
01/11/2016 17:21:14	9.60	33.43	39.66	37.56	<input checked="" type="checkbox"/>	
Calibration Type		Linear				
New Name						
		Update Database				
		Generate Calibration				

Figure 82: Sensor Calibration Tab

4 Copy a Calibration from the Sensor to the Database

If the connected sensor's calibration data is not stored in the current database it is possible to copy the data points and coefficients from the sensor to the database. This enables the user to make a copy of a calibration created on a different version of Hydro-Com. As the data in the Sensor Calibration tab is read only, if the calibration requires updating or adjustment the data has to be copied to the database. Once the calibration is updated to the database it can be modified.

To update the calibration open the Sensor Calibration Tab.

Available Calibrations | **Sensor Calibration**

Calibration: Sand

S.S.D: 0.0

Mode F A: 0.0000 B: 0.2590 C: 1.0470 R²:0.998

Mode V A: 0.0000 B: 0.1960 C: 1.5160 R²:0.991

Mode E A: 0.0000 B: 0.1870 C: 2.0840 R²:0.982

Legacy A: 0.0000 B: 0.0000 C: 0.0000

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
01/11/2016 17:21:12	5.20	16.33	19.65	16.72	<input checked="" type="checkbox"/>	
01/11/2016 17:21:12	10.90	37.85	49.03	48.69	<input checked="" type="checkbox"/>	
01/11/2016 17:21:13	6.50	20.61	25.00	24.90	<input checked="" type="checkbox"/>	
01/11/2016 17:21:14	9.60	33.43	39.66	37.56	<input checked="" type="checkbox"/>	

Calibration Type: Linear

New Name:

Update Database **Generate Calibration**

Figure 83: Sensor Calibration Tab

The data points and the coefficients that are stored in the sensor are displayed. To update the Database click 'Update Database'.

Once updated the calibration data can be viewed in the available calibration tab by selecting it from the calibration selector.

Available Calibrations | **Sensor Calibration**

Calibration: Sand **New** **Update Name** **Delete**

S.S.D: 0.0

Mode F A: 0.0000 B: 0.2590 C: 1.0470 R²:0.998

Mode V A: 0.0000 B: 0.1960 C: 1.5160 R²:0.991

Mode E A: 0.0000 B: 0.1870 C: 2.0840 R²:0.982

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
01/11/2016 17:21:12	5.20	16.33	19.65	16.72	<input checked="" type="checkbox"/>	
01/11/2016 17:21:12	10.90	37.85	49.03	48.69	<input checked="" type="checkbox"/>	
01/11/2016 17:21:13	6.50	20.61	25.00	24.90	<input checked="" type="checkbox"/>	
01/11/2016 17:21:14	9.60	33.43	39.66	37.56	<input checked="" type="checkbox"/>	

Figure 84: Sensor Calibration Updated to the Database

The calibration data can now be edited. Once any changes have been completed the sensor can be updated with the changes by clicking 'write to sensor'.

5 Generate a Calibration from Legacy Coefficients

If a sensor has been calibrated using legacy software only one set of coefficients will have been generated and stored. These coefficients will be stored under Legacy. No calibration data points will be available, making it difficult to improve the calibration and to confirm the validity when further points are collected.

Calibration:				
S.S.D:	0.0			
Mode F	A: 0.0000	B: 0.0000	C: 0.0000	R ² :0.000
Mode V	A: 0.0000	B: 0.0000	C: 0.0000	R ² :0.000
Mode E	A: 0.0000	B: 0.0000	C: 0.0000	R ² :0.000
Legacy	A: 0.0000	B: 0.4512	C: -3.5410	

Figure 85: Legacy Coefficients

The Hydro-Com Generate Calibration utility is a facility that allows data points to be created to match the legacy coefficients. Once a calibration has been generated the data will be copied to the available calibrations for the connected sensor. Sample points at 10% moisture and 20% moisture will be created with the appropriate Unscaled value. The values will be copied to all available measurement modes.

To generate the calibration open the sensor calibration tab and enter a new calibration name in the text box. Select 'Generate Calibration'.

Figure 86: Generate a Calibration

Open the available calibrations section and the new calibration will be displayed.

Available Calibrations

Sensor Calibration

Calibration

Generated Cal

New

Update Name

Delete

S.S.D

0.0

Mode F

A: 0.0000

B: 0.4510

C: -3.5420

R²:1.000

Mode V

A: 0.0000

B: 0.4510

C: -3.5420

R²:1.000

Mode E

A: 0.0000

B: 0.4510

C: -3.5420

R²:1.000

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
01/11/2016 17:30:48	10.00	30.01	30.01	30.01	<input checked="" type="checkbox"/>	Hydro-Com
01/11/2016 17:31:16	20.00	52.17	52.17	52.17	<input checked="" type="checkbox"/>	Hydro-Com

Figure 87: Generated Calibration Added to Available Calibrations

Note that the calibration will only be valid for the measurement mode that the sensor was set to during the original calibration process. The calibration process will have to be re performed if the sensor is required to be used in a different measurement mode. This facility should not be used if the original calibration coefficients were generated with calibration rules enabled.

If additional points are added to the generated calibration, the new values can be updated to the sensor by selecting 'Write to Sensor'. The sensor will be updated with all of the available data and the legacy coefficients in the sensor will be set to zero.

Available Calibrations

Sensor Calibration

Calibration: Generated Cal

S.S.D: 0.0

Mode F A: 0.0000 B: 0.4510 C: -3.5420 R²:1.000

Mode V A: 0.0000 B: 0.4510 C: -3.5420 R²:1.000

Mode E A: 0.0000 B: 0.4510 C: -3.5420 R²:1.000

Legacy A: 0.0000 B: 0.0000 C: 0.0000

Date	Moisture	Mode F	Mode V	Mode E	Include	Notes
01/11/2016 17:30:48	10.00	30.01	30.01	30.01	<input checked="" type="checkbox"/>	Hydro-Com
01/11/2016 17:31:16	20.00	52.17	52.17	52.17	<input checked="" type="checkbox"/>	Hydro-Com

Figure 88: Legacy Coefficients Set to Zero

1 Sensor Configuration editor

The Sensor Configuration Editor facility enables the user to interrogate and edit a sensor back-up file. Any changes to the configuration file can then be updated to the sensor when required.

This facility will only work with sensor back-up files created using Hydro-Com 2.4.0.0 or above.

To create a sensor back-up file see section 2.1.1 Sensor Details.

To open a sensor back-up file expand Data Analysis in the Explorer and click on Sensor Configuration Editor. Select the required sensor back-up in the Open File Dialog window.

- ▶ Offline Data
- ▶ Sensor Setup
- ▶ Trending And Logging
- ▶ Live Display
- ▲ Data Analysis
 - Sensor Configuration Editor
 - Filter Analysis
 - Log Analysis
- ▶ Sensor Monitoring
- ▶ User Accounts
- ▶ Options

Figure 89: Sensor Configuration Editor

Once opened the Sensor Configuration, Calibration and Diagnostics tabs will be displayed. All data can be viewed and edited. Any changes can be saved by clicking the 'Backup to File' button. The original file can be overwritten or a new file can be created. The new file can now be loaded into the sensor using the sensor Setup Section

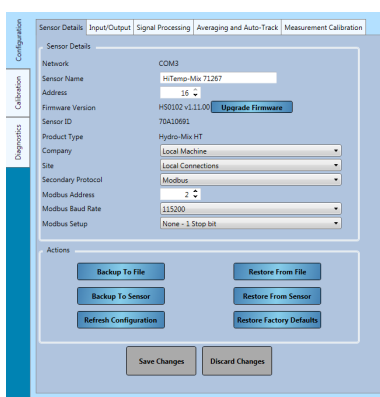


Figure 90: Sensor Configuration

2 Filter Analysis

Filter Analysis enables the user to view a Raw Unscaled sensor log created using the Trending and Logging facility in Hydro-Com. The Raw Unscaled Log can be analysed to determine the appropriate signal filtering required.

This facility will only work with log files configured with a log rate of Raw and the sensor variables set to Raw Unscaled. See Chapter 12 Trending and Logging for details.

To display a log file, expand Data Analysis in the explorer and click Filter Analysis.

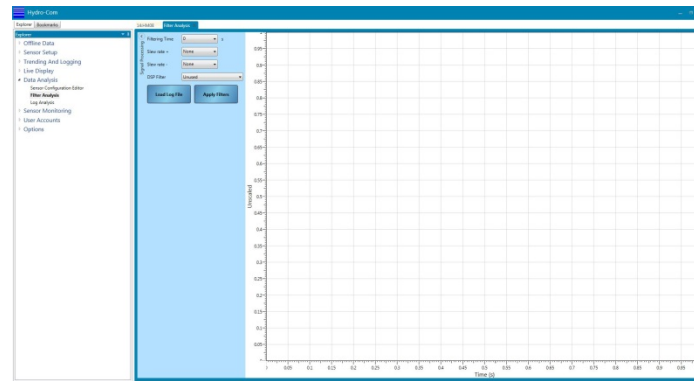


Figure 91: Filter Analysis

Click 'Load Log File' and select the required file in the Open File Dialog window.

The Raw Unscaled vales are displayed on the graph with no signal filters applied (Figure 92).

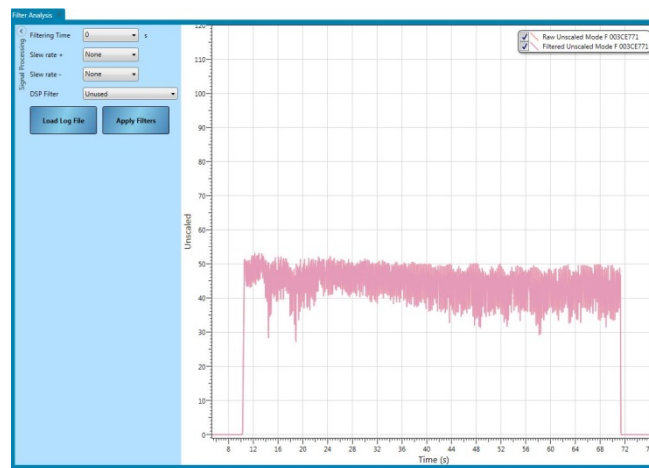


Figure 92: No Filters Applied

The Raw Unscaled sensor log can be modified to show the effect of applying signal filtering. To apply the filtering to the Raw Unscaled configure the filters as required and click 'Apply Filters (Figure 93).

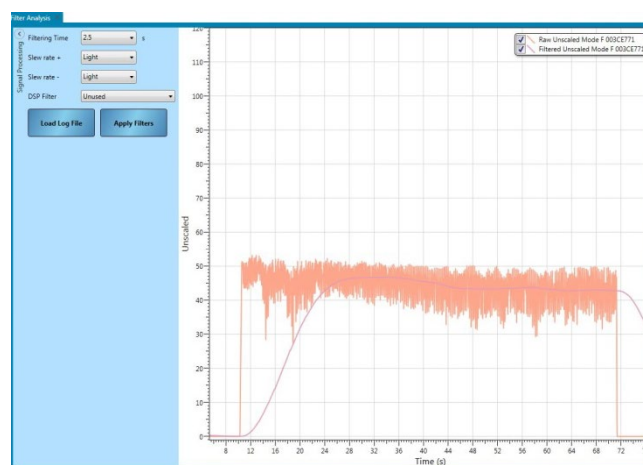


Figure 93: Filters Applied

2.1 Log Analysis

The Log analysis facilitates the viewing of any sensor output log trace created using Hydro-Com.

To open a log file click Load Log File (Figure 94).

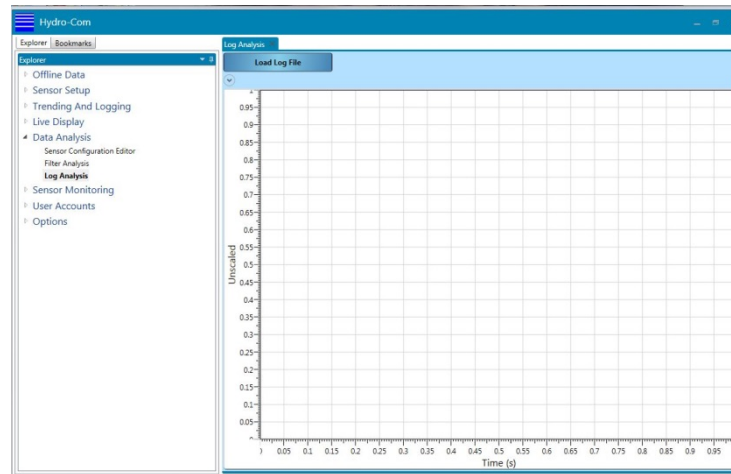


Figure 94: Log Analysis

The log analysis graph can be zoomed using the mouse wheel or the computer arrow keys.

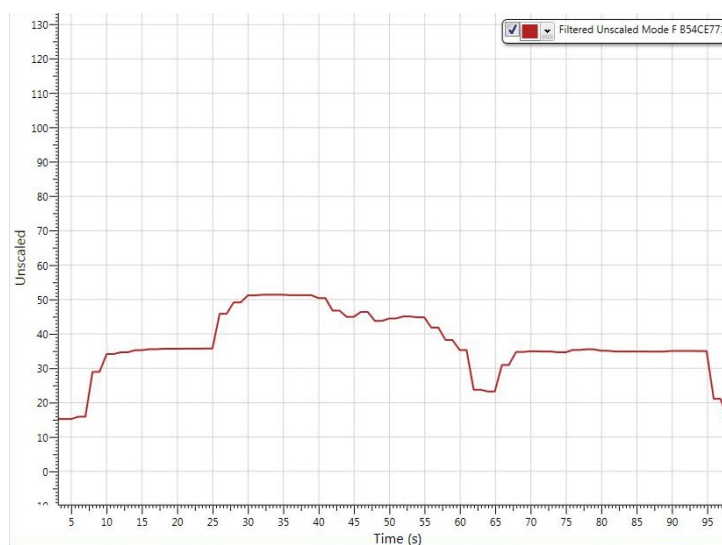


Figure 95: Sensor Log

1 Calibration Monitoring

Every installed version of Hydro-Com, unless configured for remote sites (see page 79 for details), has its own Offline Database storing the last known data for any connected sensor. The stored data enables Hydro-Com to compare the current calibration values held in the sensor to the Offline Database. If the sensors calibration has been modified using a different version of Hydro-Com or a separate system this can be highlighted to the user. The sensor Monitoring section can be configured to flag any changes to the calibration data or potential inaccuracy of any connected sensor.

1.1 Setting Up the Sensor Monitoring Display

1.1.1 Adding Sensors

To enable a connected sensor to be monitored it has to be added to the monitoring display. To add the sensor to the display open the Sensor monitoring section and navigate to the required connection method. Expand the required connection method and the system will search for any connected sensors on the network (Figure 96). If connected sensors cannot be found right click to search again.



Figure 96: Available Sensors

Select the required sensors by clicking the tick box (Figure 97).



Figure 97: Selected sensors

All selected sensors are added to the display (Figure 98).

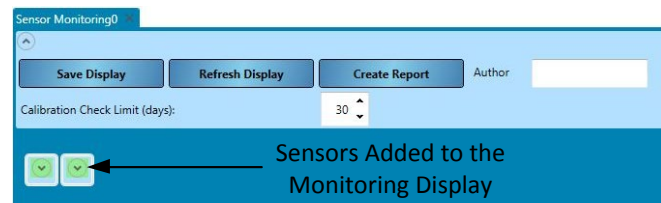


Figure 98: Sensors Added to the Display

Any number of connected sensors can be added to the display. To view the sensor details and calibration data expand the relevant sensor (Figure 99).

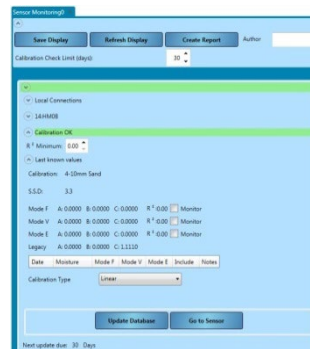


Figure 99: Expanded Sensor View

1.1.2 Calibration Check Limit

The calibration Check Limit configures the maximum days between a calibration check before the system will alarm (Figure 100).



Figure 100: Calibration Check Limit

If the user has not updated the Hydro-Com database with the current sensor calibration data within the time limit an error message will be displayed.

To update the Hydro-Com database the user must click the Update Database button for each connected sensor (Figure 101).



Figure 101: Update Database

1.1.3 R² Minimum

The R² indicated how close the calibration data points are to the best fit line. The higher the R² value the closer the points are to the line, the maximum value is 1.

The Sensor Monitoring facility checks the R² value for each calibration and will raise an error if the value is lower than the configured R² Minimum.

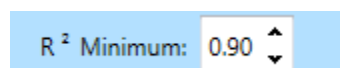


Figure 102: R² Minimum

1.1.4 Selecting the Data to Check

To enable Hydro-Com to check the calibration data the user must first select which calibration data is required. For each sensor all available measurement modes are displayed, (this is only available for compatible multi measurement mode sensors). The required calibration is selected by clicking the check box next to the calibration coefficients (Figure 103).

Mode F	A: 0.0000	B: 0.3840	C: 0.3680	R^2 : 0.89	<input checked="" type="checkbox"/> Monitor
Mode V	A: 0.0000	B: 0.4060	C: -0.6560	R^2 : 0.90	<input type="checkbox"/> Monitor
Mode E	A: 0.0000	B: 0.4000	C: -0.9910	R^2 : 0.86	<input type="checkbox"/> Monitor

Figure 103: Selected Measurement Mode

Once the calibrations have been selected, click Refresh Display to run the calibration check.



1.1.5 Save sensor Monitoring Setup

Once configured the Sensor Monitor display can be saved to enable the user to use the same setting when Hydro-Com is restarted. To save the Sensor Monitoring setup click Save Display.



1.2 Sensor Monitoring Data Overview

For each sensor added to Sensor Monitoring the last known calibration data, stored in the Hydro-Com database, will be displayed. All available Measurement Mode calibration data is individually shown.

Figure 104: Sensor Monitoring Overview

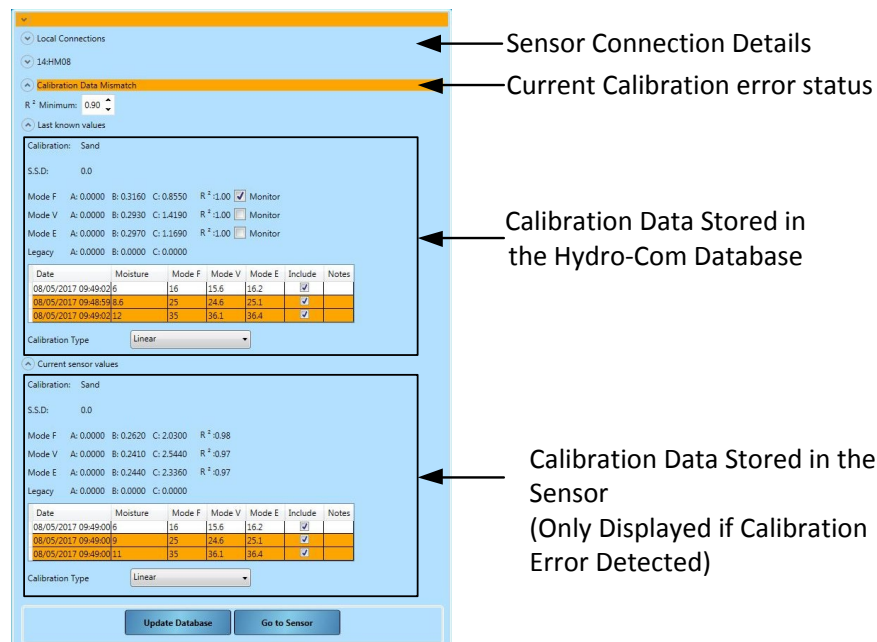


Figure 105: Sensor Monitoring Data

1.3 Calibration Errors

If an error has been detected between the Hydro-Com database and current sensor data, the Sensor Monitoring display will highlight the issues using colour coded bands.

1.3.1 Green

If the calibration in the sensor matches the database values and all the data is within recommended limits a green band will be displayed. The calibration data from the sensor must have been updated to the database within the configured Calibration Check Limit (Days).

1.3.2 Orange

If an orange band is displayed Hydro-Com has detected discrepancies in the data. The error will be highlighted in the text on the orange band.

Calibration Tolerance Error

The calculated R^2 value for the calibration is lower than the configured limit.

Calibration Data Mismatch

The calibration data in the sensor does not match the data in the Hydro-Com database.

If the data in the sensor is correct, click "Update Database" to copy the sensor calibration data into the Hydro-Com database.

If the data in the sensor has been modified and it needs to be reverted back to the Hydro-Com database values click "Go to Sensor". If the sensor was originally calibrated using the current version of Hydro-Com the calibration values can be written back to the sensor. If a different computer was used then the user will need to contact the person responsible for the calibration.

Calibration Check Required

The database has not been updated within the time limit.

Click Update Database to upload the sensor calibration data to the Hydro-Com database and to reset the error.

A Calibration Line Could not be generated

It was not possible to generate a calibration best fit line.

Warning: Calibration B value out of Tolerance

If the Calibration Quick Start Rules have been enabled (Page 52) this error will be raised if the B value is not within the limits for the selected rule.

Warning: Too Little Spread in Points

If the Calibration Quick start Rules have been enabled (Page 52) this alarm is raised when the spread in the data points is not sufficient to create a reliable calibration.

1.3.3 Red

The sensor is not connected to Hydro-Com so no data was available

1.4 Create Calibration Report

Hydro-Com has the facility to produce a report on the calibration checks performed on the connected sensors. The report lists the current status for each sensor in PDF format.

To create the report click Create Report (Figure 106), an author name can be added if required.



Figure 106: Create Report

1.5 Using the Sensor Monitoring calibration check**1.5.1 Calibration Check**

The following diagram (Figure 107) shows a single sensor that has been calibrated on site using Hydro-Com. The site has written all calibration data to the sensor and the site database has been updated.

Calibration Check OK

A second connection to the sensor has been established, using the sensor Communications Service, by the sites Quality Assurance Manager (QA). The calibration data in the sensor has been copied to the QA Managers database, both the sensor and QA database values match. The sensor Monitoring calibration check has passed.

Calibration Check Fail (Calibration Mismatch)

Since the last check by the QA manager the calibration in the sensor has been modified using the site PC. The values in the QA manager's database no longer match the values in the sensor. The sensor monitor calibration check now fails.

Resolving the error

To resolve the error the QA manager will check with the site to confirm that the calibration changes are valid. If the calibration is approved the QA manager can update their database by clicking Update Database. The values in the sensor and the QA database will now match. If the changes are not approved the QA manager will arrange for the calibration to be corrected by the site operatives.

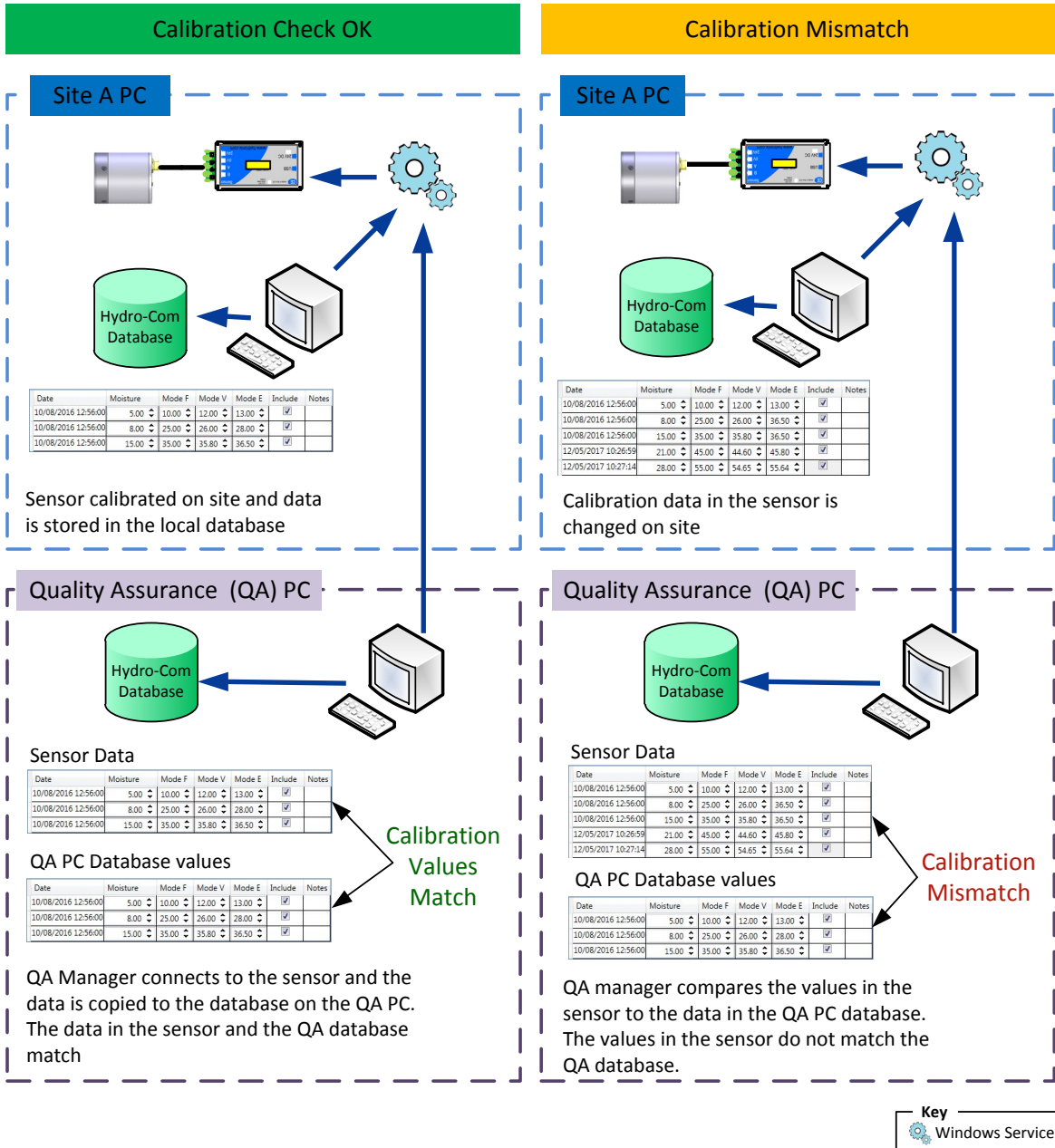


Figure 107: Calibration Data Check

To enable the user to access regularly used features of Hydro-Com the Bookmarks facility can be used. Bookmarks enable faster access to preconfigured Hydro-Com facilities.

1 Adding a Bookmark

To add a bookmark open one of the facilities available with Hydro-Com, this can be Sensor Setup, Live Display, Trending and Logging or Sensor Monitoring. Once the required options have been configured, right click on the tab at the top of the page and select Add to Bookmarks.

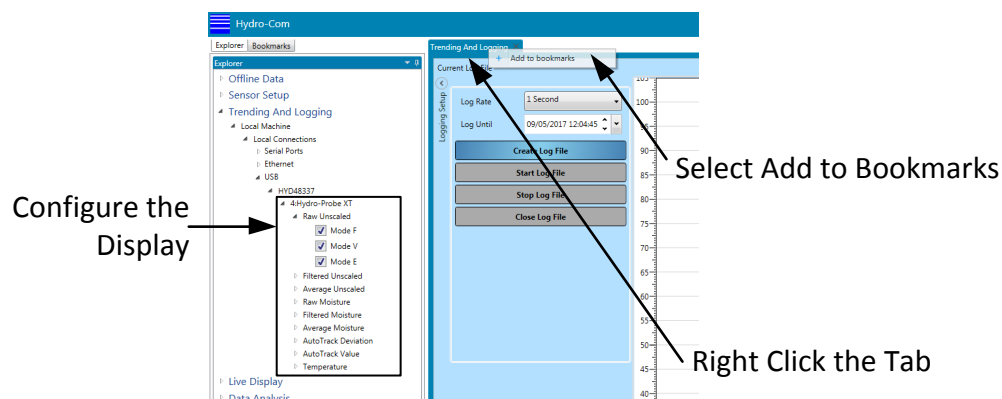


Figure 108: Add a Bookmark

2 Delete a Bookmark

To delete a Bookmark from the list, right click on the Bookmark and select "Delete Bookmark".

3 Using the Bookmarks

All saved Bookmarks are available from the Bookmarks section (Figure 109).

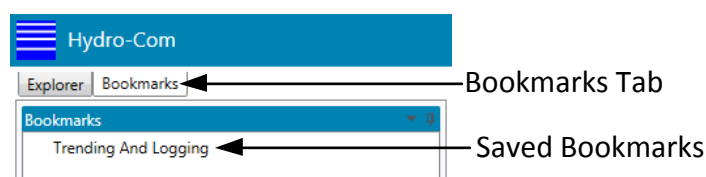


Figure 109: Bookmarks Tab

Hydro-Com will display the requested screen as it was configured when the Bookmark was created.

To enable control over the access to sensor and software configuration settings Hydro-Com can be configured with user accounts. When Hydro-Com is installed no user accounts are configured so full access is granted.

1 User Account Access Levels

Four user account levels are available: None, Basic, Supervisor and Engineer.

None (Logged out)

Access is restricted to the Live Display section and User Account log in

Basic

Basic level restricted the user to the Calibration section, Sensor Diagnostics, Live Display, System Language and User Account Login.

Supervisor

Supervisor level enables access to all Hydro-Com features except for software configuration.

Engineer

Engineer level enables full access to all features

2 Configuring User Accounts

To create a User Account expand User Accounts in the Explorer and select 'Setup'.

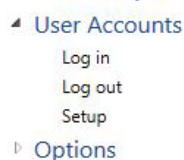


Figure 110: User Accounts Setup

Click 'Add User' to create a new account.



Add a User Name, select the Access Level and set a Password. Click 'Add User'.

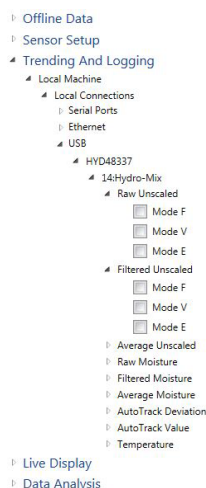
At least one account with engineer access must be created.

User Accounts can also be modified and deleted.

Note: If Hydro-Com is configured with user accounts and the password has been forgotten please contact Hydronix for assistance using the following email address: support@hydronix.com

1 Selecting a Sensor

To log a sensor open the Trending and Logging section and select the appropriate connection method, either Com Port or Ethernet. Select the required sensor and all available output types will be listed under the sensor name. The available output types depend on the sensor connected.



2 Adding a Sensor Variable to the Graph

Selecting an output type from the list will add the variable to the trending graph.

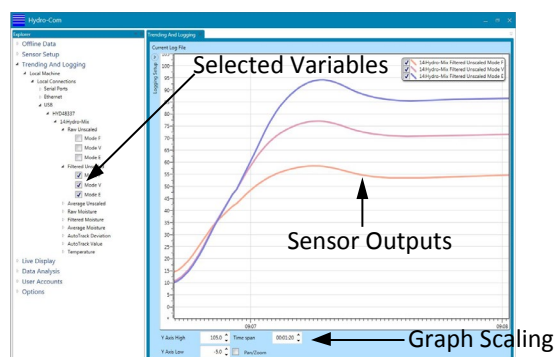


Figure 111: Trending Log Displaying Three Sensor Variables

The output can be temporarily removed from the graph using the display selector.

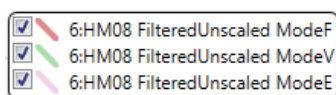


Figure 112: Graph Display Selector

3 Graph Scaling

It is possible to change the scaling of both the X axis (time) and the Y axis to view the trend in more or less detail as required. By clicking the "Pan/Zoom" button it is possible to manually pan and zoom the graph using the mouse. Switching "Pan/Zoom" off the graph will auto scale again.

4 Logging Sensor Outputs to File

The Logging and Trending section enables the user to log the outputs of any connected sensors to produce a long-term trend text file. The logging facility is accessed via the logging setup section (Figure 113).

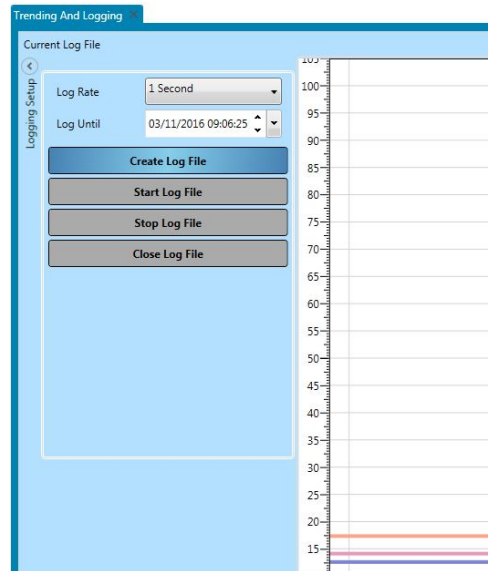


Figure 113: Logging Setup Section

4.1 Setting up the Log File

To create a log file select the log rate and time limit from the selection boxes. If Raw is selected Hydro-Com will log 25 times per second.

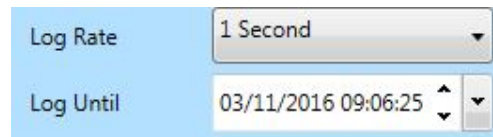
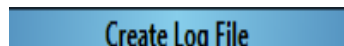


Figure 114: Logging Rate and Time Limit

4.2 Start Logging

To start logging a sensor a log file has to be created first. To create a log file click 'Create Log File'



After the file has been created the 'Start Log File' button will be available.



Once the logging has commenced Hydro-Com will log until the time limit is reached or it is stopped manually using the 'Stop Log File' button. If logging is started again the new values will be appended to the bottom of the file.

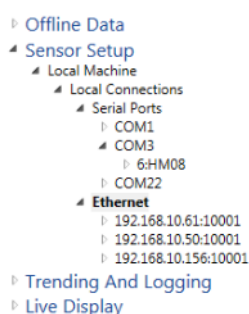
Select close log file to close the file when the logging is completed.

1 Ethernet Adaptor Defaults

By default, the Ethernet Adapter will use an automatically generated IP Address which will be allocated by the network DHCP server. As this may change over time, it is recommended that a static IP Address is used for the Ethernet Adapter. The allocated address should be on the same Subnet as the address allocated by DHCP, but outside the range of DHCP addresses. Contact your Network Administrator to find a suitable address.

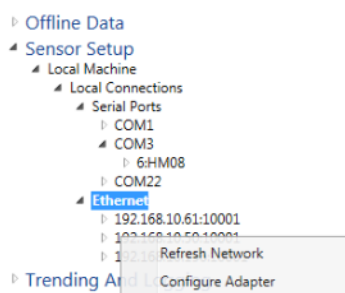
2 Finding an Ethernet Adaptor on the Network

Hydro-Com will automatically search for Ethernet adapters on the network when Ethernet is selected in the local connections section. All available Ethernet adapters will be listed after a short delay.



3 Changing the Ethernet Adaptor IP Address

Once Hydro-Com has found the required Ethernet adaptor right click the adaptor and select 'Configure Adaptor'.



A new tab will appear in the display area containing the Ethernet Adaptor configuration settings

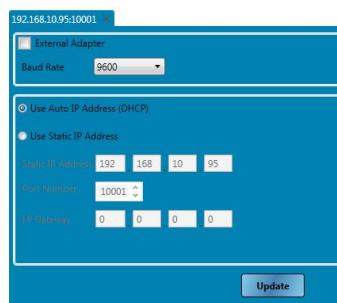


Figure 115: Ethernet Adaptor Configuration

To fix the IP Address, click on “Use static IP Address” and enter the IP Address in the box provided. It is recommended to leave the Port Number and Gateway set to the defaults. Click ‘Update’, the adaptor will now use the static IP Address.

Figure 116: Ethernet Adaptor Set to Static IP

When a static IP Address has been assigned, it is recommended to write the address on the front of the Ethernet Adaptor in the space provided.

4 Baud Rate

The Baud rate between the sensor and the Ethernet adapter can be configured as required (Figure 117). Due to external factors and cabling issues it is always recommended to configure the baud rate to 9600, this will provide the most reliable communication with the sensor.

Figure 117: Baud Rate

5 External Adapter

If using a non Hydronix supplied Ethernet adapter the External Adapter facility can be used. This enables non-standard adapters to communicate with Hydronix sensors and Hydro-Com. The adapter must be configured to communicate via port number 10001.

Hydronix cannot guarantee the compatibility of any connected external Ethernet adapter. It is always recommended to use the Hydronix supplied adapter. If the adaptor is protected by a firewall port forwarding will need to be configured for port number 10001

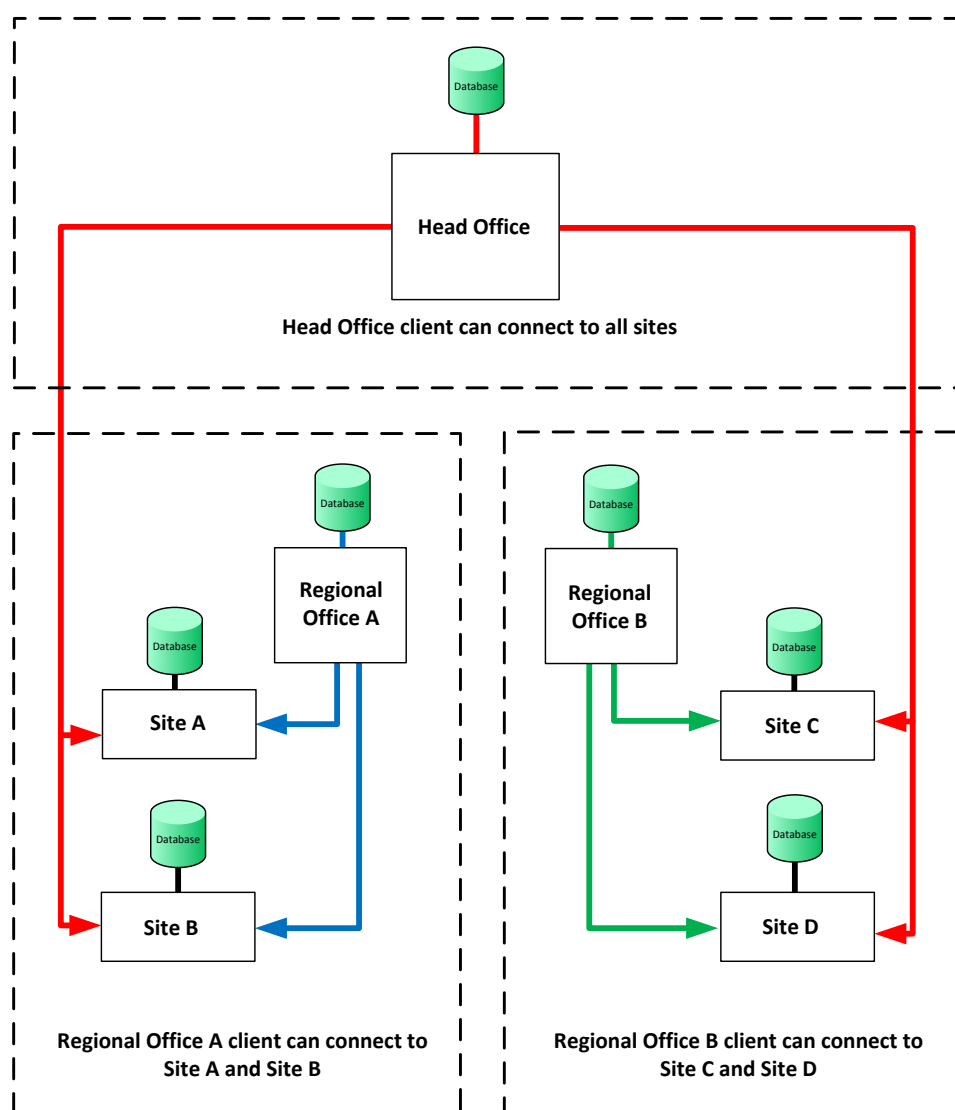
To connect to an external adapter select “External Adapter” (Figure 118). The address of the adapter can be entered as an IP address or, if configured, using a domain name. Select Update to add the adapter.

Figure 118: External Adapter

1 Distributed Services Structure

Each installation of Hydro-Com consists of 4 components:

- Hydronix Hydro-Com Database Server – For communication with a database
- Hydronix Sensor Communication Server – For communication with sensor networks
- Hydronix Hydro-Com Service Configuration Service – For controlling start/stop and restart of Hydronix Hydro-Com Database Service and Hydronix Sensor Communication Service
- Hydro-Com – A client application with user interface to send commands and receive data from the services as required by the user allowing configuration and display



Individual Site clients should be set-up to only access their own database and sensor networks

Any Hydro-Com client can connect to any database or Sensor Service if access is permitted

Figure 119 - System Overview

2 Connection Types

Hydro-Com can use two types of connection. These are:

- Basic Http – an unencrypted connection suitable for internal machines and secure networks such as Microsoft Windows domains. Hydro-Com uses this by default.
- WS Http – end to end, SSL encrypted channel suitable for communication over public networks. Hydro-Com is distributed with a test certificate called “HydronixTest”. It is suitable **for test purposes only**. This certificate should be replaced by a certificate from a suitable certificate authority before production use. Username/password encryption is also used to ensure end to end encryption. It is necessary to manually configure network firewalls to open the ports required to communicate with the services from public networks.

If the port numbers are changed it is necessary to first add firewall exception rules for the new port and setting the level of access (i.e. private, domain or public access) prior to changing the ports in Hydro-Com. Once changed the rules for the old port numbers should be removed.

3 Enable Remote Sites

Hydro-Com has the ability to connect to a remote database and several remote sensor communications services. If Remote Sites is enabled Hydro-Com can connect to sensors and databases not directly connected to the local computer.

Before Hydro-Com can connect to a remote databases or remote sensor services the system must be configured to enable remote access. To configure Remote Sites select Options and then expand Client Configuration and click ‘Enable Remote Sites’ (Figure 120).

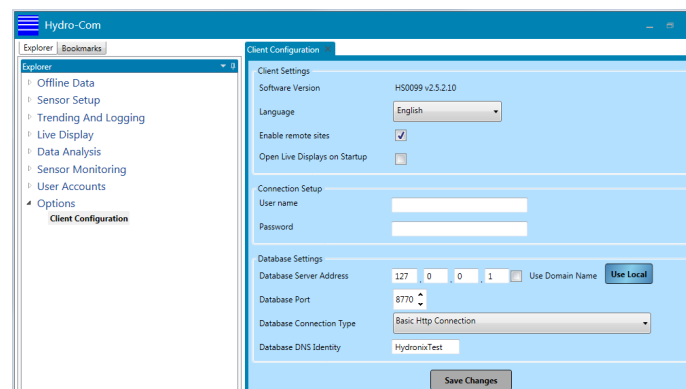


Figure 120: Enable Remote Sites

To configure the Remote Sites a password and user name must be set, click Save changes to update the configuration. Once the password is saved the Database Server Configuration and Service Configuration Manager Settings will be available in the Option section (Figure 121).

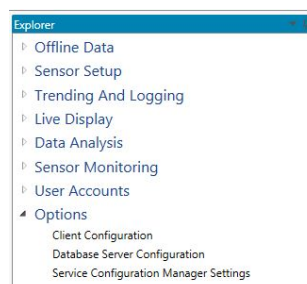


Figure 121: Remote Sites Options

Note: The password and user name will also be used for the Database Server Configuration and Sensor Configuration Manager, these can be changed later in the appropriate Options section.

4 Client Configuration

The Hydro-Com client can only connect to one database at a time. The database can store the addresses of multiple sensor network services making it possible to connect to several sites at once. To configure which database the client will connect to select 'Client Configuration' from 'Options'.

The screenshot shows the 'Client Configuration' window. It has two main sections: 'Client Settings' and 'Database Settings'.
 In 'Client Settings':
 - Software Version: H50099 v2.4.0.7
 - Language: English (dropdown menu)
 - Enable remote sites: ☒
 - Remember Live Display Setup: ☒
 In 'Database Settings':
 - Database Server Address: 127.0.0.1 (IP input fields) with a 'Use Domain Name' checkbox and a 'Use Local' button.
 - Database Port: 8770 (spin box)
 - Database Connection Type: Basic Http Connection (dropdown menu)
 - Database DNS Identity: HydronixTest (text input)
 At the bottom is a 'Save Changes' button.

Figure 122: Client Configuration

Client Configuration determines the address and the connection type used by the client. By default this is the machine that the client has been installed on. 127.0.0.1 is a special loopback address defined by Microsoft Windows which points outgoing messages back to the receiver of the network interface controller (NIC) that sent it. It is also known as "localhost" in web browsers.

In "Client Configuration" it is possible to review or configure the following:

- Software Version - This is the version number of the Hydro-Com client.
- Language - The language the client will use.
- Remember Live Display Setup - Launches the software with the last Live Display configuration displayed.
- Enable Remote Sites - This will allow the user to connect to other machines running the Hydro-Com database and sensor communication services.
- Database Server Address - By default set to the loopback address. This should be set to the I.P. address of the machine hosting the desired database service. It is possible to reset to default by pressing "Use Local".
- Database Port - By default this is set to port 8770 and on installation the machine firewall is configured to allow access to this port via private and domain networks. If public access to the port is required this must be configured in windows manually.
- Database Connection Type - This can be either basic or WS Http. If WS Http is used it is important to make sure a valid certificate is installed.
- Database DNS Identity - This should be set to the name of the certificate used for SSL encryption of the channel

5 Database Server Configuration

This page is used to configure database services. These are on the server side and should not be confused with outgoing connections to the server described in Client Configuration.

Figure 123 - Database Server Configuration

By default the Database Server Configuration section configures the database service specified in Client Configuration. By changing the connection settings it is possible to configure any database service.

The database server configuration page allows configuration of the following:

- Database Server Address – The I.P address of the database service
- User name
- Password
- Basic Http Connection, Database Port – the port used for basic http communication
- Basic Http Connection, Enable Connection – Select whether this endpoint is available for use
- WS Http Connection, Database Port – the port used for WS http communication
- WS Http Connection, Database DNS Identity – The name of the certificate used for SSL encryption
- WS Http Connection, Enable Connection – Select whether this endpoint is available for use

6 Service Configuration Manager Settings

This page is used to configure service configuration services. It can be found under Options - >Service Configuration Manager Settings. This service is used to restart the database and sensor services once they have been reconfigured. It can only be done using a WS Http secure connection.

Figure 124 - Service Configuration Manager Service

This page enables the configuration of the following:

- I.P Address – The I.P. address of the service configuration service to configure
- User name
- Password

- Port – The port which the service configuration service is running on
- DNS Identity – The name of the certificate used for SSL encryption

7 Edit Site

It is possible to store connection details for many different companies and sites as required. See Chapter 4 for information on how to add companies and sites. To edit a site, navigate to the site from either “Offline Data”, “Sensor Setup” or “Trending and Logging”. Right click on the site name and select “Edit Site” (Figure 125).

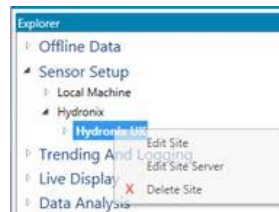


Figure 125: Edit Site

Selecting “Edit Site” will display the following view.

Figure 126: Site Information form

It is possible to store contact information about the site such as site contact name, site address and contact details for site personnel. It is also possible to set up the communication path. This can be set up using the following:

- Host – The I.P address of the machine the sensor communication service is running on
- Basic Http Connection, Network Discovery Port – The port number used for discovering potential networks such as COM ports and Ethernet ports
- Basic Http Connection, Sensor Communications Port – The port used for communicating with the sensor
- Basic Http Connection, Enable Connection - Choose to communicate using a basic http connection
- WS Http Connection, Network Discovery Port – The port number used for discovering potential networks such as COM ports and Ethernet ports using a secure connection
- WS Http Connection, Sensor Communications Port – The port used for communicating with the sensor using a secure connection
- WS Http Connection, Sensor Communications DNS Identity – This is the name of the certificate used for communication
- WS Http Connection, Enable Connection - Choose to communicate using a WS http connection

It is only possible to use either basic or secure connection. It is not possible to use both at the same time.

8 Edit Site Server

To edit the sensor communication service of any site first navigate to the site in either the Offline Data, Sensor Setup or Trending and Logging menus, right click the site name and select “Edit Site Server”

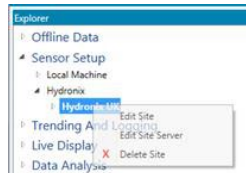


Figure 127: Edit Site Server

If a secure connection is being used a log on box is displayed and the correct user name and password must be provided to communicate with the site server

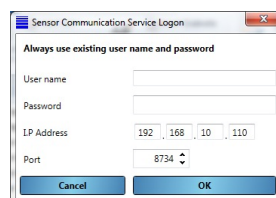


Figure 128: Sensor Communications Log In

If the correct user name and password is entered (or a basic connection is used) the site server set-up page will be displayed (Figure 129).



Figure 129: Edit Site Server

The I.P address used is the same as the one configured on the Edit Site Screen. The following parameters can be set:

- Basic Http Connection, Network Discovery Port – The port number used for discovering potential networks such as COM ports and Ethernet ports
- Basic Http Connection, Sensor Communications Port – The port used for communicating with the sensor
- Basic Http Connection, Enable Connection - Choose to communicate using a basic http connection
- WS Http Connection, Network Discovery Port – The port number used for discovering potential networks such as COM ports and Ethernet ports using a secure connection
- WS Http Connection, Sensor Communications Port – The port used for communicating with the sensor using a secure connection
- WS Http Connection, Sensor Communications DNS Identity – This is the name of the certificate used for communication

- WS Http Connection, Enable Connection - Choose to communicate using a WS http connection
- WS Http Connection User name
- WS Http Connection Password

9 Example Remote Connections

The following are examples of remote site setups.

9.1 Local Database with Remote Sensor Network

In this example the database is located on the client machine (127.0.0.1) and a sensor communications service at 154.154.118.110 is being used to connect to a remote sensor network. All data from the connect sensors will be saved to the local client machine. Both connection methods are using the secure WS HTTP connection.

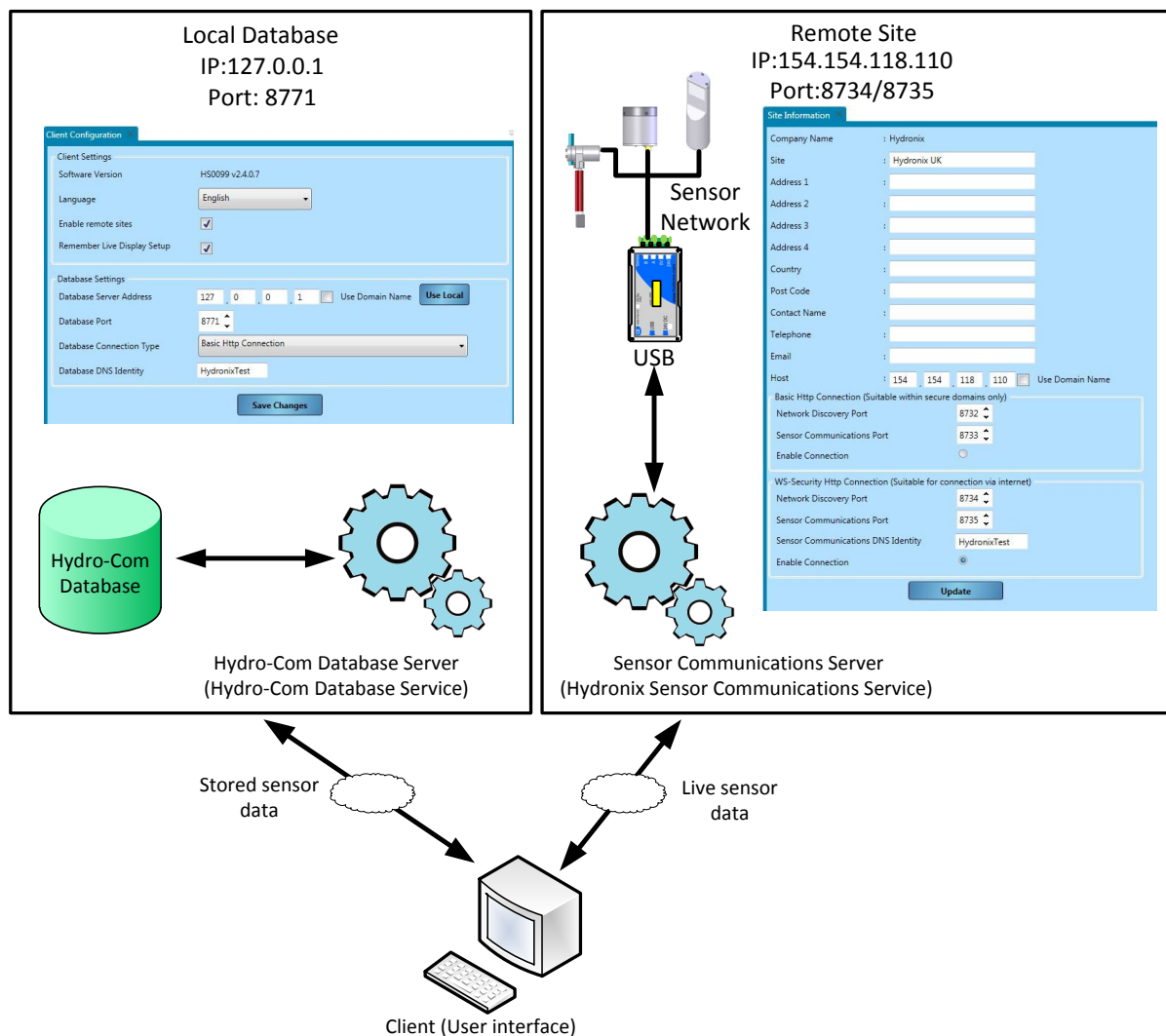


Figure 130: Local Database Example

9.2 Remote Database and Remote Sensor Network

In this example the Database is located at a company head office at 131.117.176.187. The local Client machine is connecting to the Head Office database and to a remote sensor communications service at 154.154.118.110. All data from the sensor obtained using the local client machine will be saved to the database at the head office.

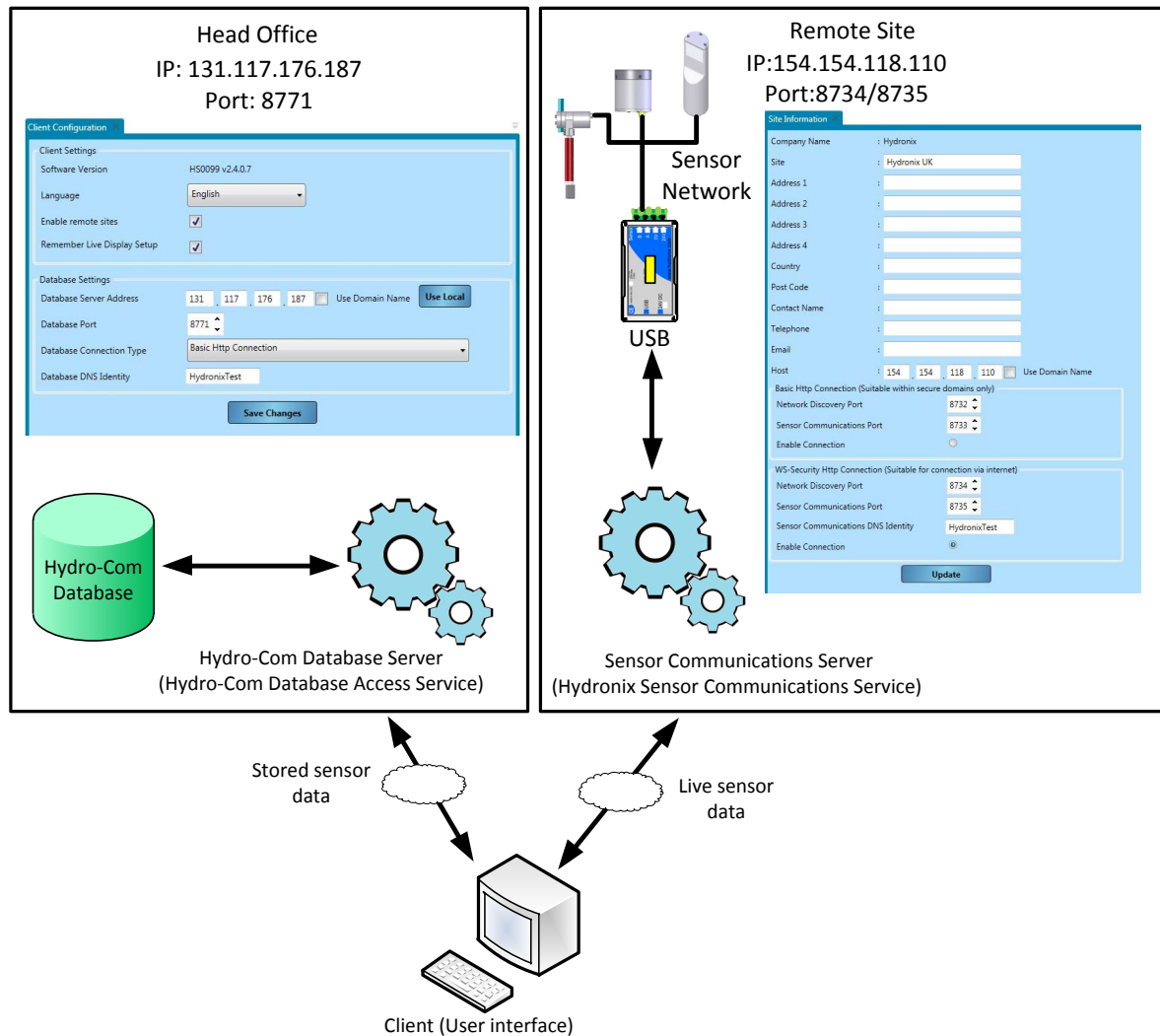


Figure 131: Head Office Database

The following table lists the most common faults found when using the sensor. If you are unable to diagnose the problem from this information then please contact Hydronix Technical Support

1 Symptom: Near Constant Moisture Reading

Possible explanation	Check	Required result	Action required on failure
Empty bin or sensor uncovered	Sensor is covered by material	100mm minimum depth of material	Fill the bin
Material 'stuck' in bin	Material is stuck above sensor	A smooth flow of material over the face of the sensor when the gate is open	Look for causes of erratic flow of material. Reposition sensor if problem continues.
Build-up of material on sensor face	Signs of build-up such as dried solid deposit on ceramic face	Ceramic faceplate should be kept clean by the action of material flow	Check the relevant sensor user guide for the correct angle
Incorrect input calibration within control system	Control system input range	Control system accepts output range of sensor	Modify control system, or reconfigure sensor
Sensor in alarm condition – 0mA on 4-20mA range	Moisture content of material by bake-out	Must be within working range of sensor	Adjust sensor range and/or calibration
Interference from mobile phones	Use of mobile phones close to sensor	No RF sources operating near to sensor	Prevent use within 5m of sensor
Average/Hold switch has not operated	Apply signal to digital input	Average moisture reading should change	Verify with Hydro-Com diagnostics
No power to sensor	DC power at junction box.	+15Vdc to +30Vdc	Locate fault in power supply/ wiring
No sensor output at control system	Measure sensor output current at control system	Varies with moisture content	Check cabling back to junction box
No sensor output at junction box	Measure sensor output current at terminals in junction box.	Varies with moisture content	Check sensor output configuration
Sensor has shut down	Disconnect power for 30 seconds and retry or measure current drawn from power supply.	Normal operation is 70mA – 150 mA	Check operating temperature is within specified range

Internal failure or incorrect configuration	Remove sensor, clean face and check reading (a) with ceramic face open and (b) with hand pressed firmly on ceramic face. Activate Average/Hold input if required	Reading should change over a reasonable range	Verify operation with Hydro-Com diagnostics.
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2 Symptom: Inconsistent or Erratic Readings That Do Not Track Moisture Content

Possible explanation	Check	Required result	Action required on failure
Debris on sensor	Debris, such as cleaning rags hanging over sensor face	The sensor must always be kept clear of debris	Improve material storage. Fit wire mesh grids to tops of bins
Material 'stuck' in bin	Material is stuck above sensor	A smooth flow of material over the face of the sensor when gate is open	Look for causes of erratic flow of material. Reposition sensor if problem continues
Build-up of material on sensor face	Signs of build-up such as dried solid deposit on ceramic face	Ceramic face should always be kept clean by the action of the material flow	Check the relevant sensor user guide for the correct angle
Inappropriate calibration	Ensure calibration values are appropriate to working range.	Calibration values spread throughout range avoiding extrapolation.	Perform further calibration measurements.
Ice forming in material	Material temperature.	No ice in material	Do not rely on moisture readings
Average/Hold signal is not in use	Control system is calculating batch average readings.	Average moisture readings must be used in batch weighing applications.	Modify control system and/or reconfigure sensor as required.
Incorrect use of Average/Hold signal	Average/Hold input is operating during the main flow of material from the bin	Average/Hold should be active during main flow only – not during jogging period.	Modify timings to include main flow and exclude jogging from measurement.
Inappropriate sensor configuration	Operate the Average/Hold input. Observe sensor behaviour.	The output should be constant with Average/Hold input OFF and changing with the input ON.	Sensor output configured correctly for the application.
Inadequate ground connections	Metalwork and cable ground connections	Ground potential differences must be minimized	Ensure equipotential bonding of metalwork.

3 Symptom: Hydro-Com unable to find Local Com port, Ethernet, USB or Database.

Possible explanation	Check	Required result	Action required on failure
Services not running	All three Hydronix services are running. Type "Services.MSC" into the windows search bar to display all services	All three Hydronix Services running	Restart the services by clicking on the service and pressing "Restart the service". Restart Hydro-Com.

4 Symptom: Hydro-Com Unable to set-up or Connect to Remote Database or Sensor Communications Service

Possible explanation	Check	Required result	Action required on failure
Incorrect IP Address	Check the Database or Sensor Service IP address has been entered correctly	IP Address match	Confirm the IP address of the remote services.
Port access not configured	Check the connect ports have been added to the firewall exceptions list	Port configured	Add to the firewall exceptions list
No Network/Internet access	Check Network/Internet connection at both the remote and client end	Network/Internet connection open	Connect to the network/Internet
Services not running on the remote or local machine	All three services are running on both local and remote machines. Type "Services.MSC" into the windows search bar to display all services	All three services running	Restart the services by clicking on the service and pressing "Restart the service". Restart Hydro-Com on the local machine
Incorrect security access levels	Check the configured security access levels on the remote machine	Client connecting with the configured access method, either Basic or WS.	Configure the remote services to allow access. It is recommended for security reasons that when using remote site to set the security access to WS HTTP.

1 Quick Start Rules

- Limiting slopes (B) for any calibration will be a maximum of 2.0 and a minimum of 0.06.
- One-point calibrations:
 - The calibration slope will be set to be the average of the two known sand calibrations.
 - If the Unscaled value at zero moisture is less than 5 the Unscaled value at zero moisture will be set to be 5 and a new calibration slope calculated through this point and the single point entered.
 - If the Unscaled value at zero moisture is greater than 50 the Unscaled value at zero moisture will be set to be 50 and a new calibration slope calculated through this point and the single point entered.
 - If the resulting slope is greater than the maximum or less than the minimum calibration slopes then no calibration will be carried out and the user will be informed of this.
- More than 1 point calibration – spread in points: Moisture < 1% or Unscaled < 2
 - A single point calibration will be carried out.
- More than 1 point calibration – spread in points: Moisture < 3% or Unscaled < 6
 - If the calculated slope is greater than the selected materials quick start calibration slope set the calculated slope to the quick start calibration slope - If the calculated slope is less than the selected quick start calibration slope set the calculated slope to the quick start calibration slope – otherwise leave the slope as it is. (Recalculate intercept value from average from all points)
 - If the Unscaled value at zero moisture is less than 5 the Unscaled value at zero moisture will be set to be 5 and a new calibration slope calculated through this point and the average of the points entered.
 - If the Unscaled value at zero moisture is greater than 50 the Unscaled value at zero moisture will be set to be 50 and a new calibration slope calculated through this point and the average of the points entered.
 - If the resulting slope is greater than the maximum or less than the minimum calibration slopes then no calibration will be carried out and the user will be informed of this.
- More than 1 point calibration – spread in points: Moisture > 3% and Unscaled > 6
 - Calibration slope is calculated and the user is warned if:
 - If the Unscaled value at zero moisture is less than 5.
 - If the Unscaled value at zero moisture is greater than 50.
 - If the resulting slope is greater than the maximum or less than the minimum calibration.

1 Document Cross Reference

This section lists all of the other documents that are referred to in this User Guide. You may find it beneficial to have a copy available when reading to this guide.

Document Number	Title
HD0678	Sensor Electrical Installation Guide
HD0679	Sensor Configuration and Calibration Guide
HD0881	Hydronix Microwave Moisture Sensor Modbus RTU Register Mapping

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