Hydro-View / Hydro-Hub Profibus Configuration Guide

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Revision history

Revision No	Software Version	Date	Description of Change
1.0.0		Nov 2019	First release

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Table of Figures

This guide details the installation and configuration of the optional Hydronix Hydro-Hub Profibus Module. The module enables Profibus communication between the Hydro-Hub/Hydro-View and a Profibus DP Master.

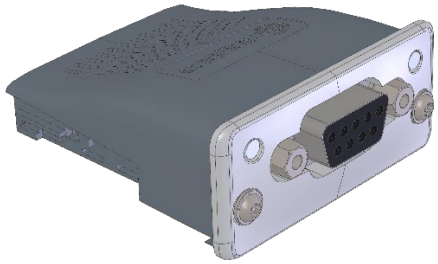


Figure 1: Hydro-Hub Profibus Module

Using Hydro-Hub Profibus Module will provide direct access to any Hydronix Sensor connected to the Hydro-Hub/Hydro-View network from the PLC.

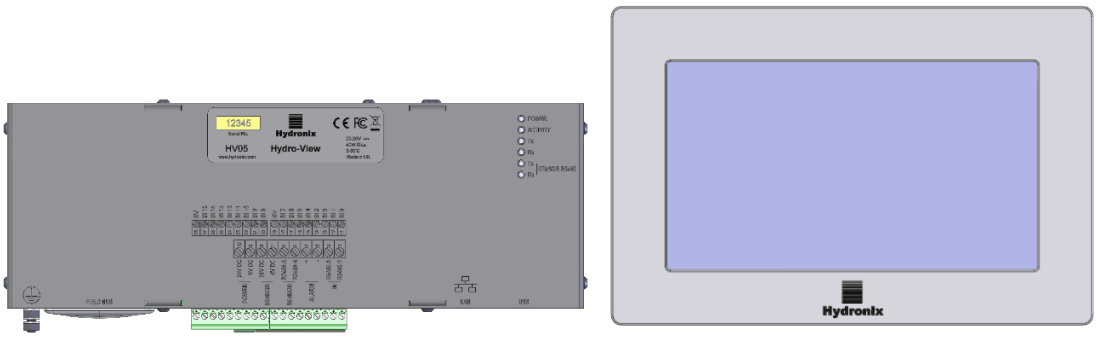


Figure 2: Hydro-Hub (L), Hydro-View (R)

In this guide the PLC in use is the Siemens S7 1200 with a CM 1242-5 Profibus Master DP module. Siemens TIA Portal v14 software has been used to configure the PLC.

Figure 3: Siemens S7-1200 PLC

Previous knowledge of Profibus DP, Siemens PLC and TIA portal v14 are required as this document is intended as a basic guide only.

For detailed Hydro-Hub/Hydro-View instructions see the Hydro-Hub/Hydro-View user guide HD0864

All references to a Hydro-Hub Profibus Module in the guide are valid for the Hydro-Hub and Hydro-View hardware. The electrical connections and configuration of the Hydro-Hub and Hydro-View are identical.

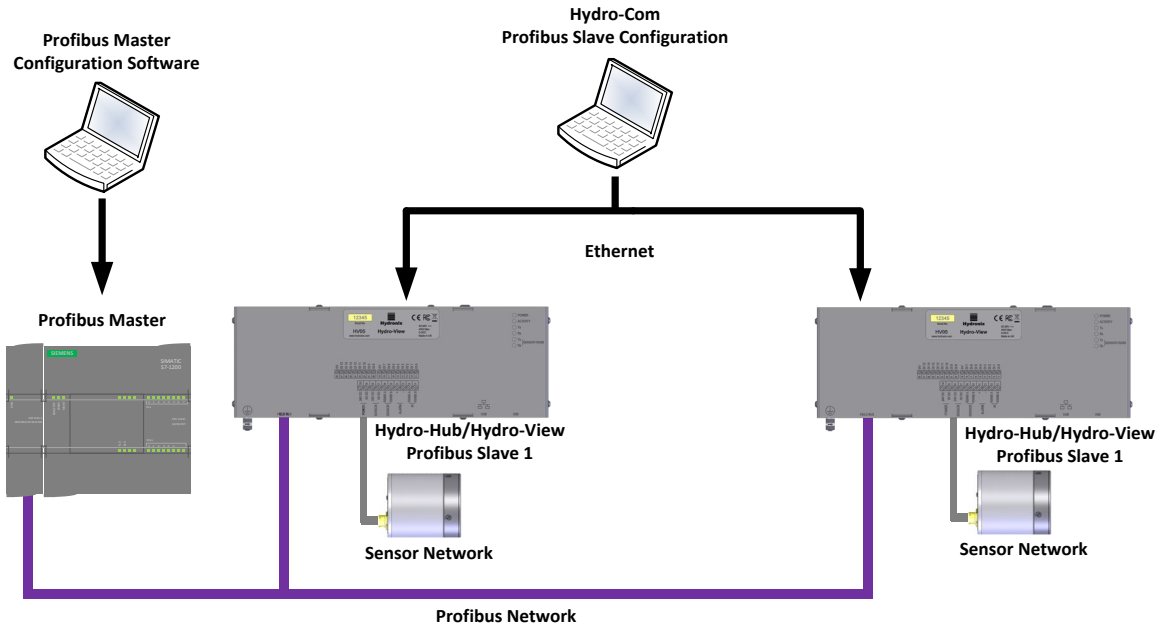


Figure 4: System Overview

1 Hydro-Hub Profibus Module

To enable Profibus communication with the Hydro-Hub/Hydro-View the optional Hydronix Profibus Module must be installed.

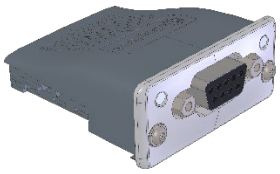


Figure 5: Profibus Module

1. Switch off the Hydro-Hub/Hydro-View
2. Remove the protection cover from the Hydro-Hub/Hydro-View

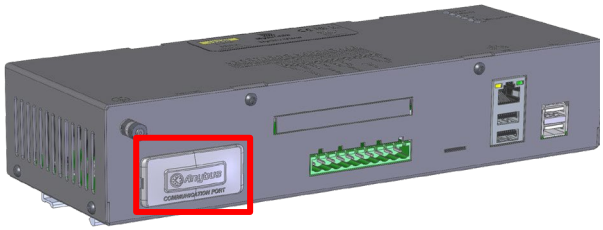


Figure 6: Protection Cover

3. Insert the Hydro-Hub Profibus Module as show in the diagram. Ensure the connector is correctly positioned.

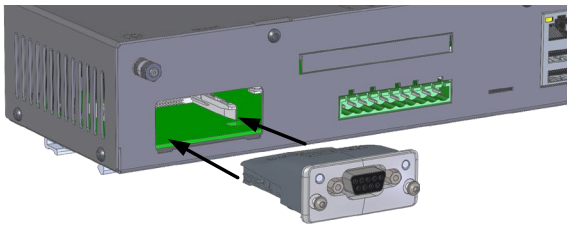


Figure 7: Installing the Hydro-Hub Profibus Module

4. Tighten the two anti-tamper screws.

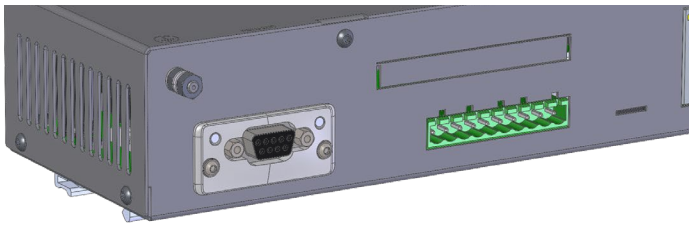


Figure 8: Hydro-Hub Profibus Module Installed

2 Wiring

The Hydro-Hub Profibus Module utilises a 9 pin D-SUB female connector. Only approved Profibus cable and connectors should be used when connecting to the PLC.

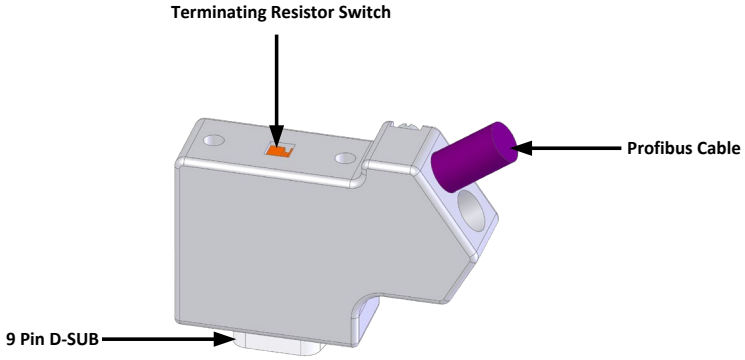


Figure 9: Example Profibus Connector

When connecting a single Hydro-Hub/Hydro-View to the PLC terminating resistors must be activated in the connector at both ends of the cable.

Figure 10: Single Slave on a Profibus Network

If additional slaves are added to the network the terminating resistors must only be active at the start and end of the cable run.

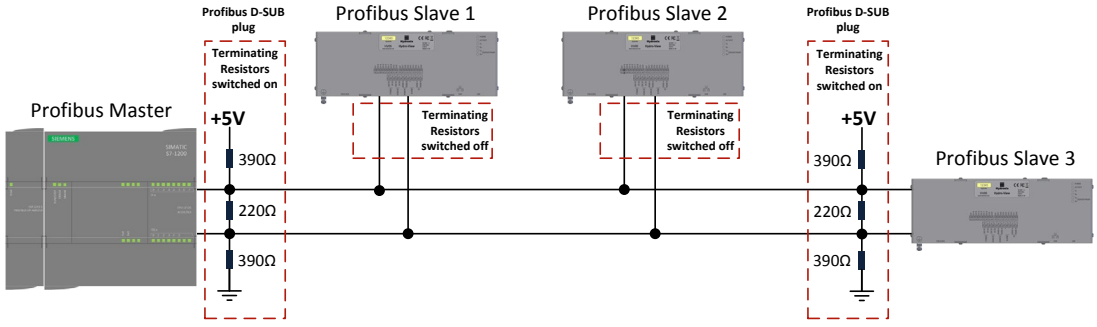


Figure 11: Multiple slaves on the Profibus Network

1 PLC Requirements

All Hydronix Hydro-Hub/Hydro-View units with the Hydro-Hub Profibus Module installed are configured to act as slaves on the Profibus network. Therefore the PLC must be configured as a master to enable communication. The PLC in this example is a S7 1200 CPU 1212C with a Profibus DP Master CM 1243-5.

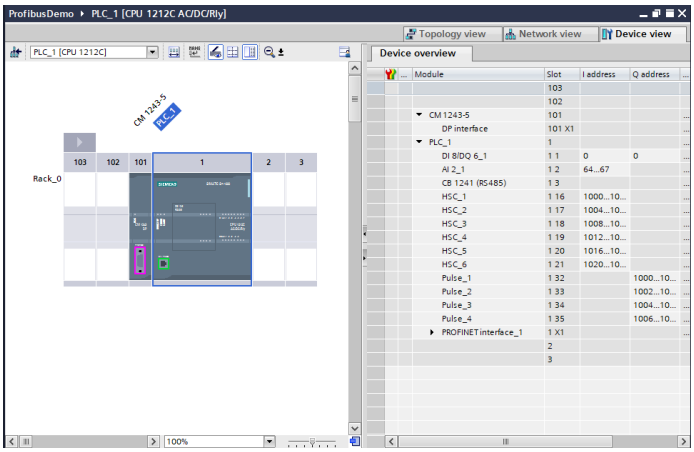


Figure 12: PLC CPU Setup

2 Add Hydro-Hub Profibus Slave

To add the Hydronix Profibus slave to the PLC network the appropriate GSD file has to be added to the PLC project. The GSD file is available from the Hydronix web site: www.hydronix.com

2.1 Install the GSD file

1. Download the GSD file from the Hydronix Web site
2. Open TIA Portal and select “Options>Manage general station description files (GSD)” from the main taskbar
3. Select the Source Path to the downloaded GSD file and click Install.
4. The GSD will be added to the Installed GSD list.

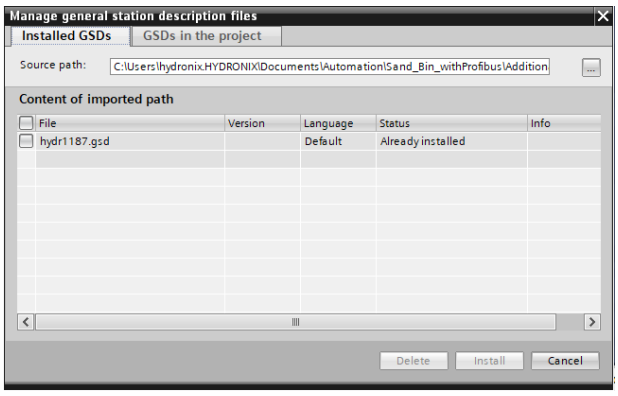


Figure 13: Installed GSD File

3 Install the Hydro-Hub Profibus Slave

To add the Hydro-Hub Profibus slave to the network “Select Devices and Networks” and open the Network View.

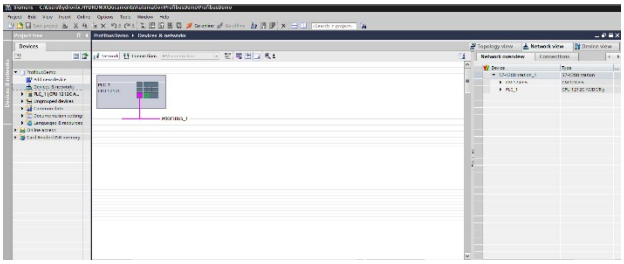


Figure 14: Network View

On the right hand task bar select “Hardware Catalogue”.

Navigate to “Other Field Devices>Profibus DP>General>Hydronix Ltd>Hydro-Hub Profibus Module”.

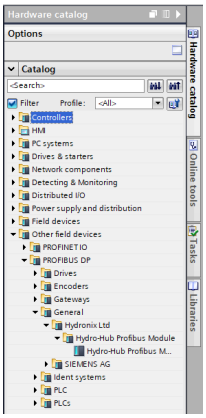


Figure 15: Hardware Catalogue

Click on the Hydro-Hub Profibus Module and drag it onto the “Devices and Networks” view next to the PLC CPU.

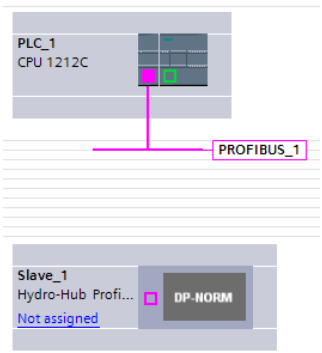


Figure 16: Hydro-Hub Slave added to Network

To provide a connection to the PLC click on the “Not Assigned” label on the Hydro-Hub Profibus Module and select the PLC.

The PLC and the Hydro-Hub Profibus module are now linked

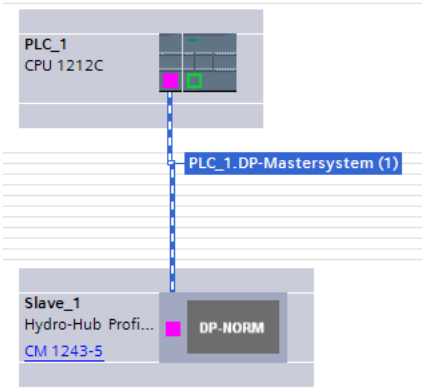


Figure 17: Hydro-Hub and PLC Profibus Link

Click on the Hydro-Hub Profibus Module to open the Properties window and select “Profibus Address”.

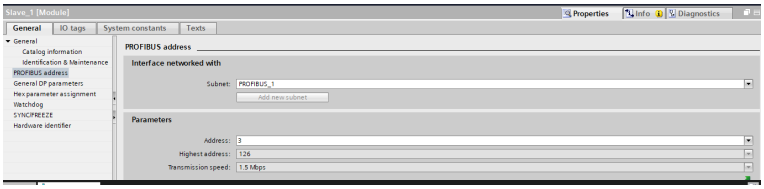


Figure 18: Profibus Address

Each Profibus device on the network must have a unique Address. This address must **NOT** be the same as the PLC Profibus module. The address of the PLC module can be checked by clicking on the module. Set the Hydro-Hub Profibus Module address, ensure a note is taken of the address as this will be required when configuring the Hydro-Hub. In this example it has been set to 3.

The Hydro-Hub Profibus Module communicates using pre-set communication pathways. These are detailed in the GSD file. Double click on the Hydro-Hub Profibus Module to access the Slave device window.

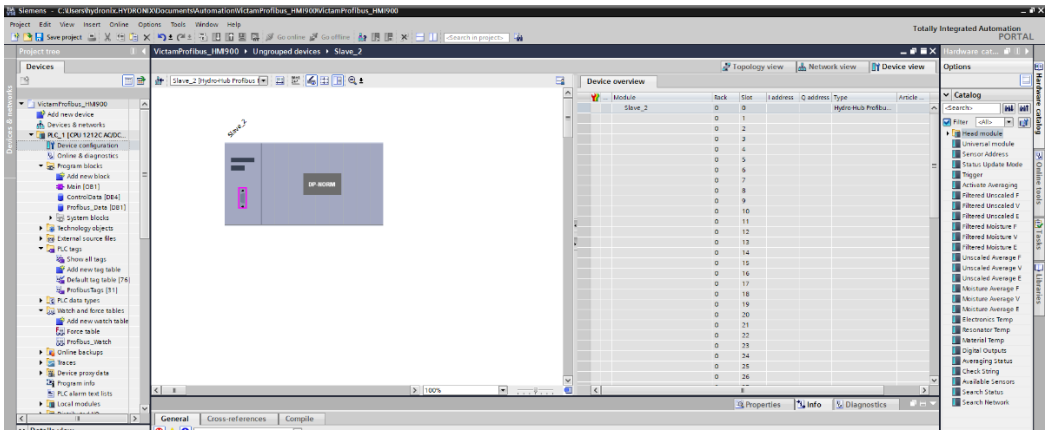


Figure 19: Slave Device Window

To enable the communication between the Slave and the PLC, the slave must be configured using the available Modules.

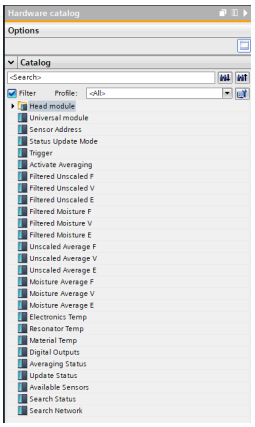


Figure 20: Hydro-Hub Profibus I/O Modules

All I/O Modules from “Sensor Address” to “Search Network” are required for the Hydro-Hub Profibus Module to operate.

Double click on each Module in turn to add them to the Module Rack. The PLC will allocate an appropriate I/O address.

Note: every module must be added in the correct order with no spaces

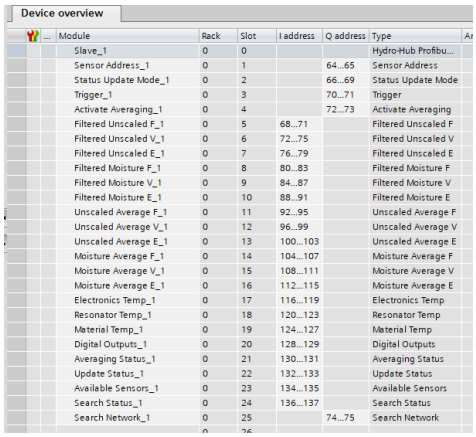


Figure 21: Modules Added to Profibus Slave

Select Network View and click on the PLC CPU. Compile the software and then download to the PLC.

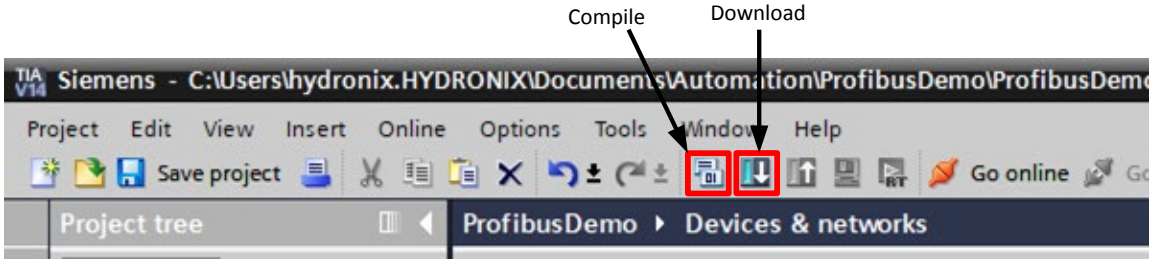


Figure 22: Download To CPU

If connecting to the PLC for the first time the search for device screen will show.

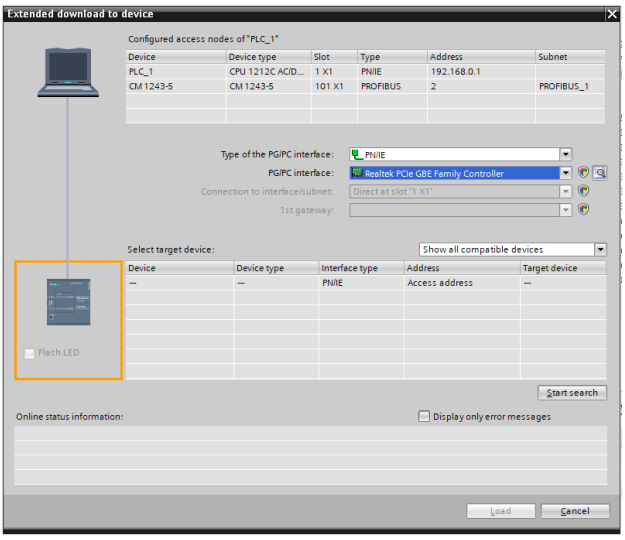


Figure 23: Search for Device

Select the connection method from the “Type of PG/PC interface” selector and click search.

Once the PLC is found click Load

In the Load Preview page ensure” Stop all” is selected. This will stop the PLC running and overwrite any existing programmes.

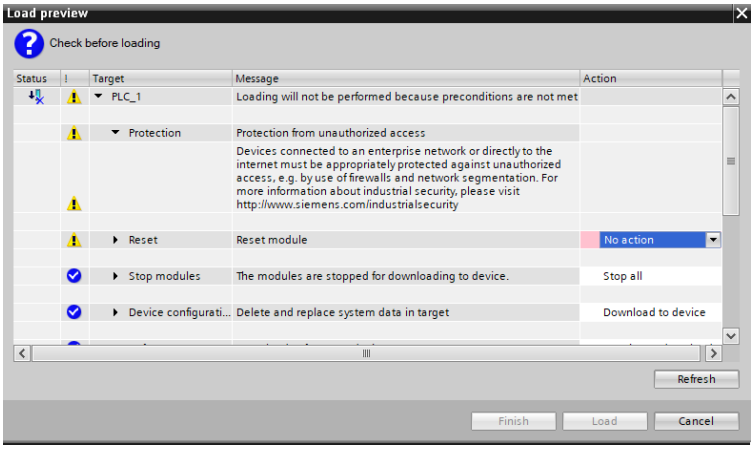


Figure 24: Stop All

Once loaded the LED on the CM 1243-5 module will flash red to indicate that there is no connection currently setup. See Chapter 4 for details on how to configure the connection.

The only configuration required in the Hydro-Hub to enable Profibus communication is the Fieldbus Address. The Fieldbus address must match the address configured in the Slave module in the PLC programme. See the Hydro-View/Hydro-Hub user guide HD0864 for further details.

1 Configure the Hydro-Hub Fieldbus Address

Select Settings from the main menu.

Figure 25: Hydro-Hub Settings

Set the Fieldbus Address to match the Address previously configured in the PLC Profibus Slave. Click save.

Figure 26: Hydro-Hub Profibus Address

After the Fieldbus address has been changed the Hydro-Hub must be powered down and then restarted. If the PLC has been correctly configured, and the Profibus cable is connected, both lights on the Hydro-View Profibus module will be green.

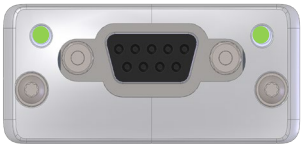


Figure 27: Hydro-Hub Profibus Module Correctly Configured (Connector Not Shown)

Chapter 5 I/O Data

The I/O data available using the Hydro-Hub Profibus module is detailed below.

Module Name	Input/ output	Data Type	Description	Data Range
Sensor Address	Output	Word	Node address of the Connected sensor	1 to16 16#0001 to 16#0010
Status Update Mode	Output	DWord	Configures the Update Mode to enable reading of the Averaging Status and/or the Digital Outputs for each connected sensor	16#0000_0000= None 16#0000_0001=Digital Outputs 16#0000_0002=Averaging Status 16#0000_0003=Both **Sensor Address must be set to 16#0000 for this request to work**
Trigger	Output	Word	Trigger word to initiate a sensor update command	The Hydro-Hub will initiate the communication with a sensor whenever the trigger value changes. (Positive Edge)
Activate Averaging	Output	Word	Activate the averaging in a single or multiple connected sensors	Each bit in the 16bit word will active the sensor with the corresponding node address (1-16) **Sensor Address must be set to 16#0000 for this request to work**
Filtered Unscaled F	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Filtered Unscaled Mode F”	
Filtered Unscaled V	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Filtered Unscaled Mode V”	
Filtered Unscaled E	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Filtered Unscaled Mode E”	
Filtered Moisture F	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Filtered Moisture Mode F”	

Filtered Moisture V	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Filtered Moisture Mode V”	
Filtered Moisture E	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Filtered Moisture Mode E”	
Unscaled Average F	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Average Unscaled Mode F”	
Unscaled Average V	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Average Unscaled Mode V”	
Unscaled Average E	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Average Unscaled Mode E”	
Moisture Average F	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Average Moisture Mode F”	
Moisture Average V	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Average Moisture Mode V”	
Moisture Average E	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Average Moisture Mode E”	
Electronic Temp	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Electronic Temperature”	
Resonator Temp	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Resonator Temperature”	

Material Temp	Input	DWord	Floating point Number 2 decimal place precision. Sensor output value “Material Temperature”	
Digital Outputs	Input	Word	Current status of the connected sensor(s) digital output	Each bit in the 16bit word will indicate the digital output status of the sensor with the corresponding node address (1-16)
Averaging Status	Input	Word	Averaging status of the connected sensors	Each bit in the 16bit word will indicate the averaging status of the sensor with the corresponding node address (1-16)
Update Status	Input	Word	Update Status value is incremented when the Hydro-Hub has completed a message transaction	Rolling increment from: 16#0001 to 16#00FF If an error has occurred the Update status will be set to: 16#0000
Available Sensors	Input	Word	Current sensors available on the network	Each bit in the 16bit word represents a sensor node address (1-16)
Search Status	Input	Word	Indicates if a search of the sensor network is in progress	0= No search in progress 1= Search in progress
Search Network	Output	Word	Start a search of the network	1= Start Search Increment the Trigger Word to initiate the search

Table 1: Hydro-Hub Profibus I/O

1 Example Transactions

To retrieve data from a sensor, a search network command must be completed. A search of the network is automatically started when the Hydro-View/Hydro-Hub is switched on. If a new sensor is added to the network a new search, using the Hydro-View/Hydro-Hub, must be performed. Alternatively, the network can be searched using the Search Network Profibus command.

1.1 Sensor Live Values

To retrieve the current live values from a sensor the “Sensor Address” value must be set to match the sensor node address. The command is activated by incrementing the “Tigger” word. The “Update Status” value will be incremented by 1 on completion of the request.

1.2 Current Digital output status

To retrieve the current digital output status the “Sensor Address” output must be set to 0. The “Status Update Mode” is set to 16#0000_0001 and the “Trigger” bit is incremented. Each bit of

the 16bit “Digital Outputs” input is set to represent a sensor on the network based on the node address. The “Update Status” value will be incremented by 1 on completion of the request.

The following message indicates that the digital outputs on sensors 3, 12 and 16 are active.

1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0

1.3 Current Averaging Status

To retrieve the current “Averaging Status” of the sensors on the network the “Sensor Address” output must be set to 16#0000. The “Status Update Mode” is set to 16#0000_0002 and the “Trigger” bit is incremented. Each bit of the 16bit “Averaging Status” is set to represent a sensor on the network based on the node address. The “Update Status” value will be incremented by 1 on completion of the request.

The following message indicates that sensors 1, 2, 3 and 8 are currently averaging.

0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1

1.4 Activate Averaging

To command a sensor to start averaging the “Sensor Address” output must be set to 16#0000. The averaging for a sensor is configured by setting the appropriate bit in the 16bit “Activate Averaging” output. The “Trigger” bit is then incremented. The “Update Status” value will be incremented by 1 on completion of the request. The “Active Averaging” message is sent every time the “Trigger” is incremented and the sensor address is set to 0.

The following message will start averaging a sensor with a node address of 1.

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

To stop averaging the previously active bit is set to 0 and the “Trigger” bit incremented.

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1.5 Search Network

To initiate a search of the sensor network, set “Search Network” to 1 and increment the “Trigger” word. During the search cycle the “Search Status” word will be set to 1. Once the search has completed the “Search Status” word will return to 0.

The available sensors on the network are indicated by the “Available Sensors” word. Each bit in the “Available Sensors” word is set if a sensor is available. Each bit represents a sensor node address (1-16). The LSB represents address 1.

The following message shows there are 5 sensors on the network. The available sensors have node address’: 1, 5, 9, 10 and 16.

1	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1

This section will demonstrate the retrieval of data from a sensor. For these examples a watch table will be used to force the PLC values to replicate a user programme.

Connect the Hydro-Hub to the PLC using a suitable Profibus cable and connector. Ensure both light on the Hydro-Hub Profibus Module are green and not flashing. If the lights are flashing, ensure the PLC has been correctly configured and the Profibus address in the PLC matches the Hydro-Hub Fieldbus address.

1 Configure the I/O Tags in the PLC

To configure the tags in the PLC expand PLC Tags from the project tree view and select “Show all Tags”.

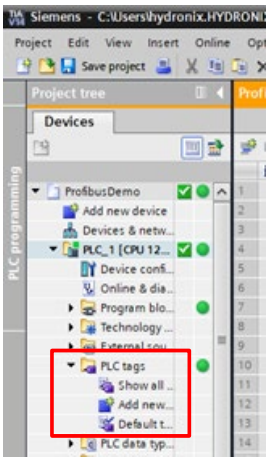


Figure 28: PLC Project Tree View

In the Tags section, add each of the Hydro-Hub Profibus Slave modules to the tags list and assign them to the address allocated by the PLC. Ensure they are of the correct data type.

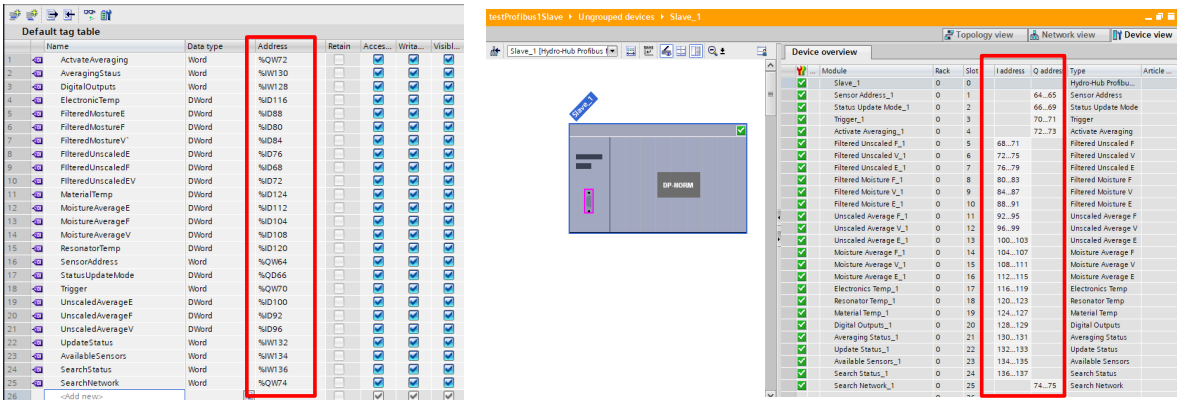


Figure 29: PLC Tags (L), Profibus Slave I/O (R)

Add a watch table to the project. Expand Watch and Force Tables from the project tree view. Select “Add New Watch Table”.

In the watch table add every I/O for the Hydro-Hub Profibus Module by entering the Address of the tag previously configured in the default tag table.

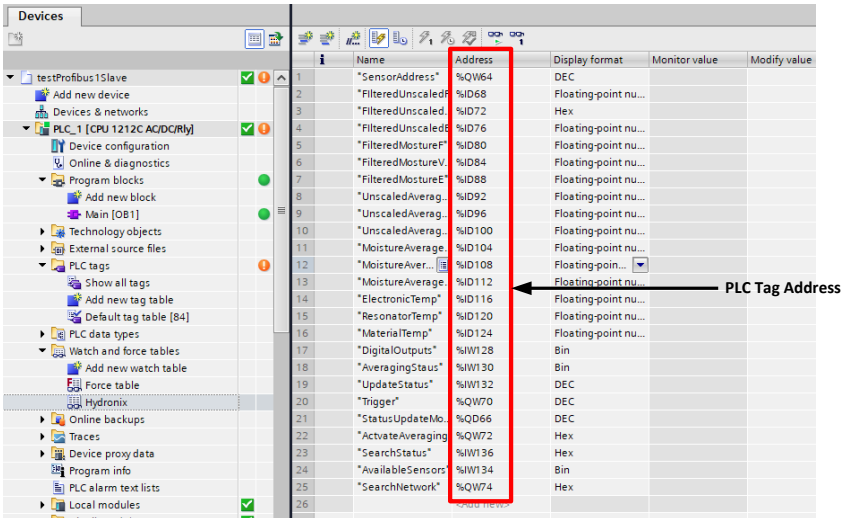


Figure 30: Watch Table

Compile and download the changes to the PLC.

The values displayed in the watch table can be converted to be displayed as Hex, Floating point, Binary or Decimal as required.

2 Testing the Connection

To test the communication with the Hydro-Hub Profibus module ensure a sensor is connected to the Hydro-Hub. Once the sensor is connected confirm the node address using the Sensor search facility in the Hydro-Hub software.

Click Monitor all from the task bar above the watch table. The screen will now go live

Figure 31: Watch Table Monitor All

2.1 Get Live Sensor Values

Set the Sensor Address tag value in the watch table so it matches the sensor node address. Now set the Trigger I/O so the number is high or lower than the current displayed value.

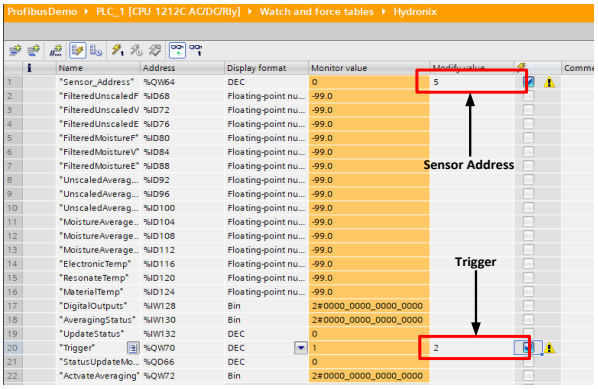


Figure 32: Get Live Sensor Values

Click Modify all Selected Values in the task bar

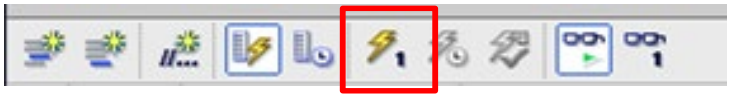
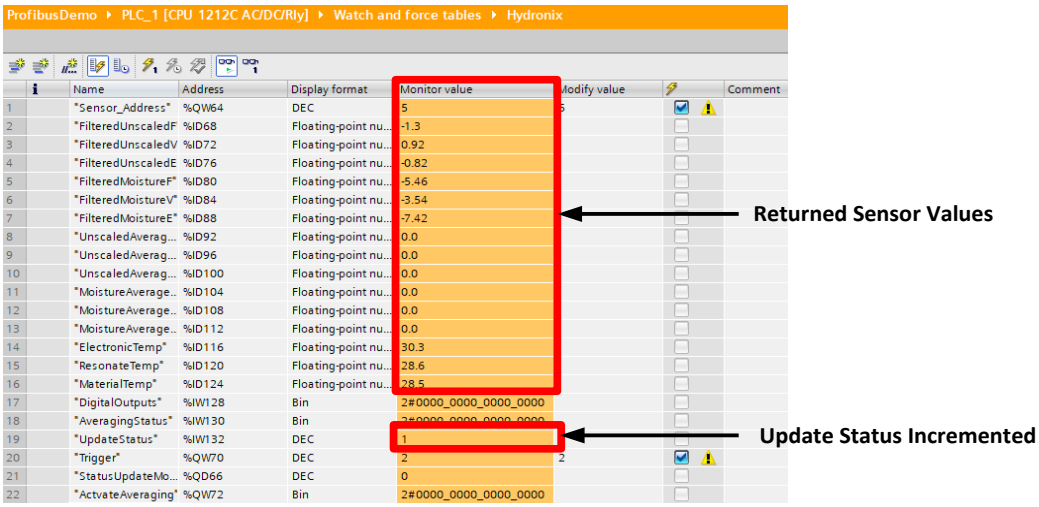


Figure 33: Get Live Sensor Values Modify All

The selected values will now be updated to the PLC.

If the message has been sent correctly the sensor values will update and the Update Status value will increment by 1.

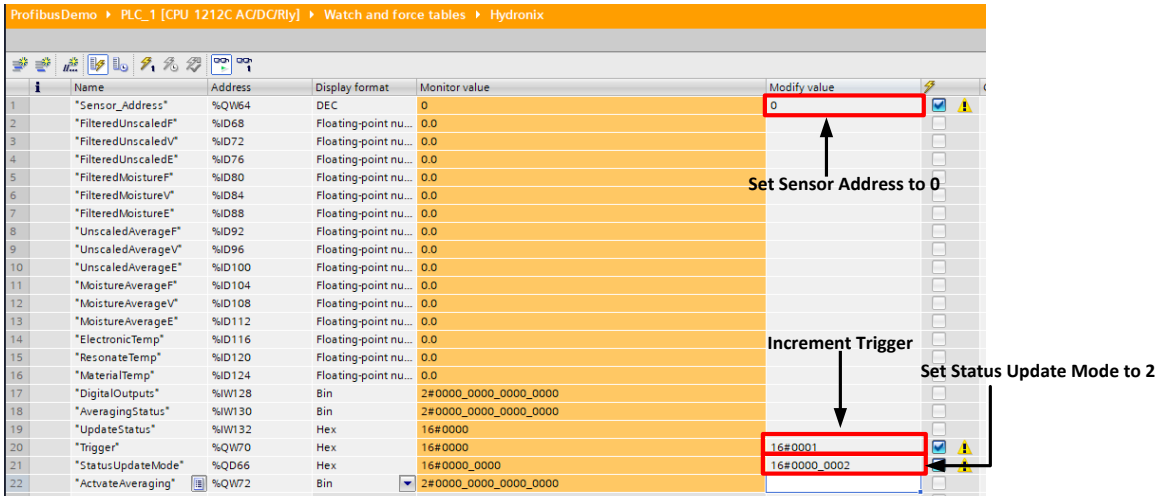


	Name	Address	Display format	Monitor value	Modify value	Comment
1	"Sensor_Address"	%QW64	DEC	5	5	
2	"FilteredUnscaledF	%ID68	Floating-point nu...	-1.3		
3	"FilteredUnscaledV	%ID72	Floating-point nu...	0.92		
4	"FilteredUnscaledE	%ID76	Floating-point nu...	-0.82		
5	"FilteredMoistureF"	%ID80	Floating-point nu...	-5.46		
6	"FilteredMoistureV"	%ID84	Floating-point nu...	-3.54		
7	"FilteredMoistureE"	%ID88	Floating-point nu...	-7.42		
8	"UnscaledAverag...	%ID92	Floating-point nu...	0.0		
9	"UnscaledAverag...	%ID96	Floating-point nu...	0.0		
10	"UnscaledAverag...	%ID100	Floating-point nu...	0.0		
11	"MoistureAverage..	%ID104	Floating-point nu...	0.0		
12	"MoistureAverage..	%ID108	Floating-point nu...	0.0		
13	"MoistureAverage..	%ID112	Floating-point nu...	0.0		
14	"ElectronicTemp"	%ID116	Floating-point nu...	30.3		
15	"ResonateTemp"	%ID120	Floating-point nu...	28.6		
16	"MaterialTemp"	%ID124	Floating-point nu...	28.5		
17	"DigitalOutputs"	%IW128	Bin	2#0000_0000_0000_0000		
18	"AveragingStatus"	%IW130	Bin	2#0000_0000_0000_0000		
19	"UpdateStatus"	%IW132	DEC	1		
20	"Trigger"	%QW70	DEC	2	2	
21	"StatusUpdateMo...	%QD66	DEC	0		
22	"ActvateAveraging"	%QW72	Bin	2#0000_0000_0000_0000		

Figure 34: Returned Values

2.2 Get Averaging Status

Set the Sensor Address tag value in the watch table to 0. Set the Status Update Mode to 2 and increment the Trigger value.



	Name	Address	Display format	Monitor value	Modify value
1	"Sensor_Address"	%QW64	DEC	0	0
2	"FilteredUnscaledF"	%ID68	Floating-point nu...	0.0	
3	"FilteredUnscaledV"	%ID72	Floating-point nu...	0.0	
4	"FilteredUnscaledE"	%ID76	Floating-point nu...	0.0	
5	"FilteredMoistureF"	%ID80	Floating-point nu...	0.0	
6	"FilteredMoistureV"	%ID84	Floating-point nu...	0.0	
7	"FilteredMoistureE"	%ID88	Floating-point nu...	0.0	
8	"UnscaledAverageF"	%ID92	Floating-point nu...	0.0	
9	"UnscaledAverageV"	%ID96	Floating-point nu...	0.0	
10	"UnscaledAverageE"	%ID100	Floating-point nu...	0.0	
11	"MoistureAverageF"	%ID104	Floating-point nu...	0.0	
12	"MoistureAverageV"	%ID108	Floating-point nu...	0.0	
13	"MoistureAverageE"	%ID112	Floating-point nu...	0.0	
14	"ElectronicTemp"	%ID116	Floating-point nu...	0.0	
15	"ResonateTemp"	%ID120	Floating-point nu...	0.0	
16	"MaterialTemp"	%ID124	Floating-point nu...	0.0	
17	"DigitalOutputs"	%IW128	Bin	2#0000_0000_0000_0000	
18	"AveragingStatus"	%IW130	Bin	2#0000_0000_0000_0000	
19	"UpdateStatus"	%IW132	Hex	16#0000	
20	"Trigger"	%QW70	Hex	16#0000	16#0001
21	"StatusUpdateMode"	%QD66	Hex	16#0000_0000	16#0000_0002
22	"ActvateAveraging"	%QW72	Bin	2#0000_0000_0000_0000	

Figure 35: Get Averaging Status

Click Modify all Selected Values in the task bar

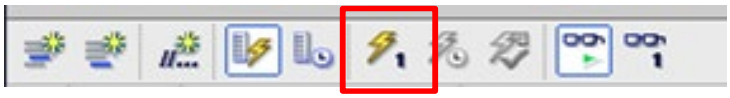
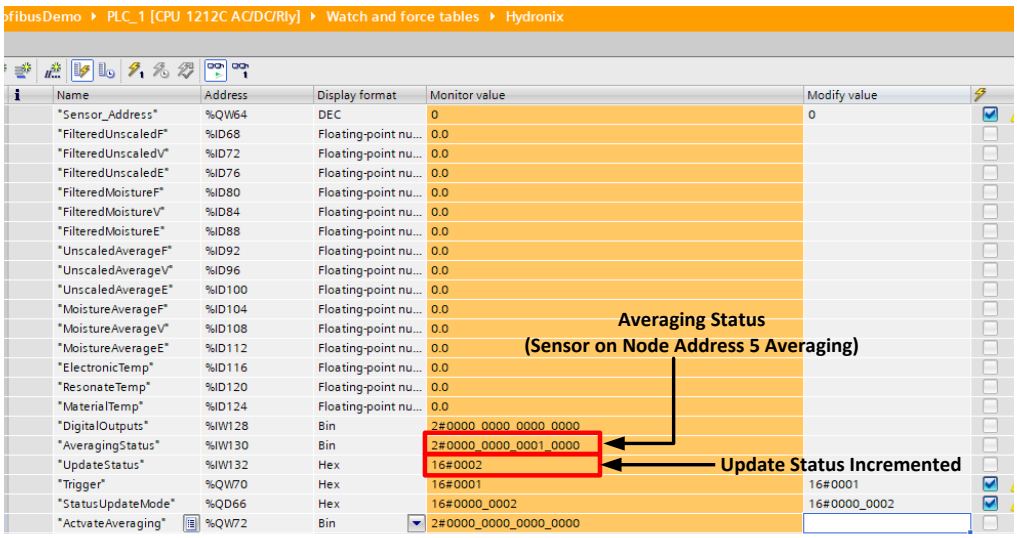


Figure 36: Get Averaging Status Modify All

The selected values will now be updated to the PLC.

If the message has been sent correctly the Averaging Status values will be update and the Update Status value will increment by 1. In the image below a sensor with the node address of 5 is averaging.



	Name	Address	Display format	Monitor value	Modify value	
	"Sensor_Address"	%QW64	DEC	0	0	☑
	"FilteredUnscaledF"	%ID68	Floating-point nu...	0.0		☐
	"FilteredUnscaledV"	%ID72	Floating-point nu...	0.0		☐
	"FilteredUnscaledE"	%ID76	Floating-point nu...	0.0		☐
	"FilteredMoistureF"	%ID80	Floating-point nu...	0.0		☐
	"FilteredMoistureV"	%ID84	Floating-point nu...	0.0		☐
	"FilteredMoistureE"	%ID88	Floating-point nu...	0.0		☐
	"UnscaledAverageF"	%ID92	Floating-point nu...	0.0		☐
	"UnscaledAverageV"	%ID96	Floating-point nu...	0.0		☐
	"UnscaledAverageE"	%ID100	Floating-point nu...	0.0		☐
	"MoistureAverageF"	%ID104	Floating-point nu...	0.0		☐
	"MoistureAverageV"	%ID108	Floating-point nu...	0.0		☐
	"MoistureAverageE"	%ID112	Floating-point nu...	0.0		☐
	"ElectronicTemp"	%ID116	Floating-point nu...	0.0		☐
	"ResonateTemp"	%ID120	Floating-point nu...	0.0		☐
	"MaterialTemp"	%ID124	Floating-point nu...	0.0		☐
	"DigitalOutputs"	%IW128	Bin	2#0000_0000_0000_0000		☐
	"AveragingStatus"	%IW130	Bin	2#0000_0000_0001_0000		☐
	"UpdateStatus"	%IW132	Hex	16#0002		☐
	"Trigger"	%QW70	Hex	16#0001	16#0001	☑
	"StatusUpdateMode"	%QD66	Hex	16#0000_0002	16#0000_0002	☑
	"ActvateAveraging"	%QW72	Bin	2#0000_0000_0000_0000		☐

Figure 37: Averaging Status

2.3 Activate Averaging

Set the Sensor Address tag value in the watch table to 0. Set the Status Update Mode to 0 and set the appropriate bit in the Activate Averaging tag to active averaging on a sensor on the Hydro-Hub network.

In this example a sensor on node address 10 will be set to start averaging.

0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Increment the Trigger value.

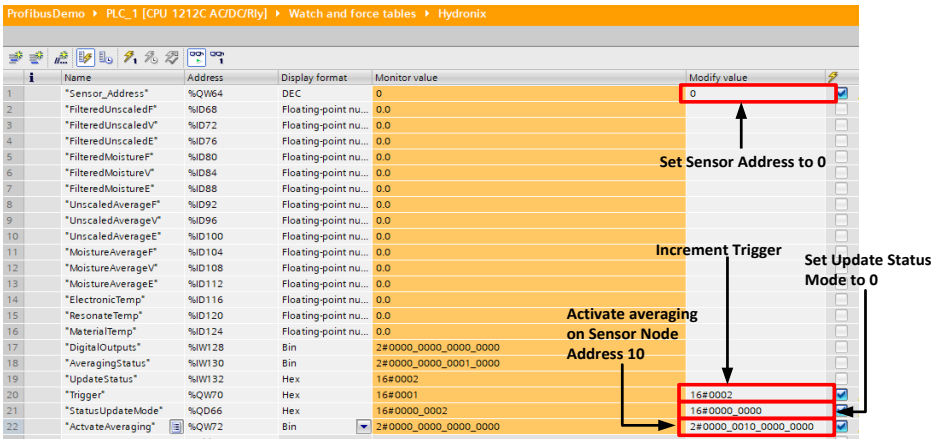


Figure 38: Activate Averaging

Click Modify all Selected Values in the task bar

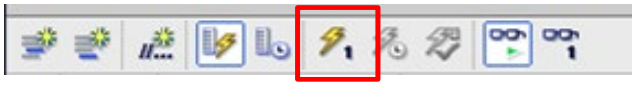


Figure 39: Activate Averaging Modify All

The selected values will now be updated to the PLC.

If the message has been sent correctly the sensor will start averaging and the Update Status value will increment by 1. To confirm the averaging status perform a Get Averaging Status request.

2.4 Search Sensor Network

Set “Search Sensor” word in the watch table to 1, then increment the “Trigger” word.

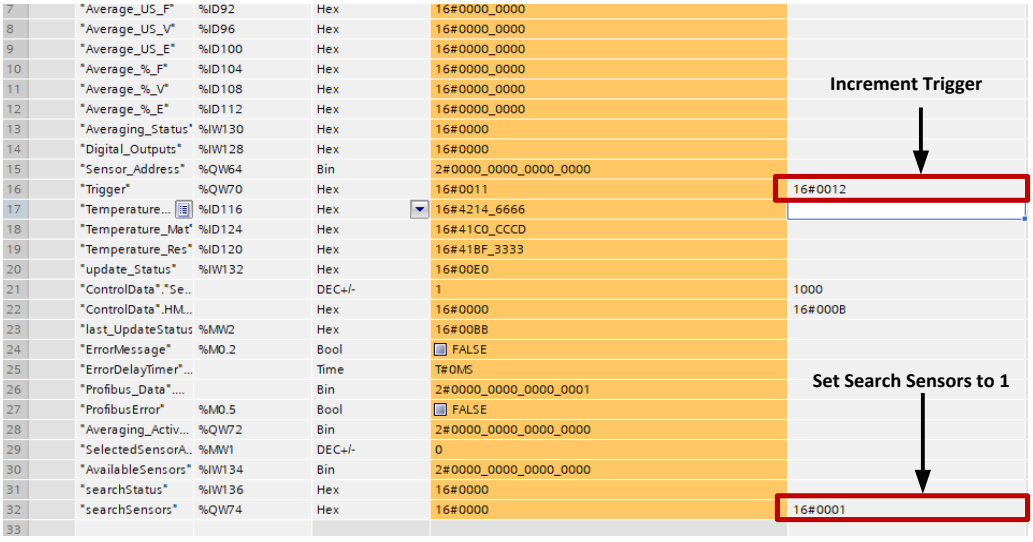


Figure 40: Start Sensor Search

Once the Search Sensor command has commenced the Search Status word will be set to 1.

15	"Sensor_Address"	%QW64	Bin	2#0000_0000_0000_0000
16	"Trigger"	%QW70	Hex	16#0012
17	"Temperature_Elec	%ID116	Hex	16#4214_6666
18	"Temperature_Mat"	%ID124	Hex	16#41C0_CCCD
19	"Temperature_Res"	%ID120	Hex	16#41BF_3333
20	"update_Status"	%IW132	Hex	16#00E2
21	"ControlData"."Se..		DEC+/-	1
22	"ControlData".HM...		Hex	16#0000
23	"last_UpdateStatus	%MW2	Hex	16#00BB
24	"ErrorMessage"	%M0.2	Bool	FALSE
25	"ErrorDelayTimer"...		Time	T#0MS
26	"Profibus_Data"....		Bin	2#0000_0000_0000_0001
27	"ProfibusError"	%M0.5	Bool	FALSE
28	"Averaging_Activ...	%QW72	Bin	2#0000_0000_0000_0000
29	"SelectedSensorA..	%MW1	DEC+/-	0
30	"AvailableSensors"	%IW134	Bin	2#0000_0000_0000_0000
31	"searchStatus"	%IW136	Hex	16#0001
32	"searchSensors"	%QW74	Hex	16#0000

Figure 41: Sensor Search Commenced

On completion of the search, the Sensor Status word will return to 0. The Available Sensors word is updated to indicate the node address of each sensor on the network. In this example 1 sensor on node address 5 has been detected.

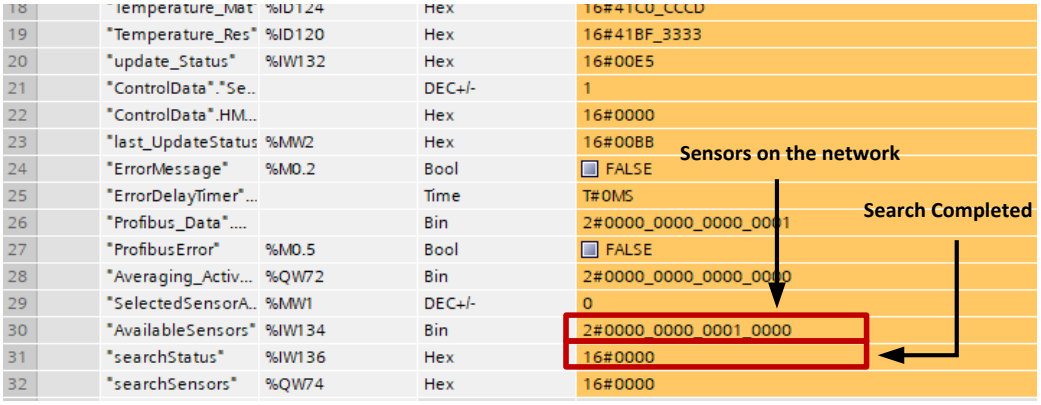


Figure 42: Sensors on the Network

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
HD0864	Hydro-View / Hydro-Hub User Guide

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