MODBLOCK USER MANUAL

Version 5.0

Meiry Solutions
www.meirysolutions.com

Contents

Introduction

This document details how to install and commission your ModBlock digital solution.

ModBlock allows for simple interfacing of Hamilton ARC style probes into a DeltaV control system. All critical probe parameters are brought into the DeltaV system while utilizing few resources (DST and serial dataset).

ModBlock acts as a Modbus RTU data collector for dual Hamilton probes. As of this document version, pH and DO probes are supported, but in the near future, the full portfolio of Hamilton probes will be supported.

Although all Hamilton ARC probes support Modbus RTU, the data mapping is not easily managed by Emerson DeltaV Modbus RTU master implementation. The reason why is the Hamilton Modbus map is fragmented, and each register set mixes data of different type. DeltaV Modbus implementation requires a Modbus operation to act on a contiguous set of registers with a consistent type and direction. For example, a multiple register read requires that all registers be contiguous, of the same type (Integer or Floating Point), and direction (read or write). When a slave device has data that is fragmented, this can require many small register sets (data sets) and associated operations resulting in excessive resource usage (both DST and serial port hardware in the case of DeltaV) and segment performance issues.

ModBlock implements two features that alleviate any resource usage issues while still allowing full access to the entire probe data set. These features are:

1) Data aggregation – ModBlock reads data continuously from both probes, and arranges the data in a manner compatible with DeltaV requirements.
2) Data multiplexing – ModBlock does not demand a DeltaV register per probe parameter. Instead, lower priority data that is not used for control is slowly periodically collected in a per probe operation as opposed to each module or Modbus segment cycle.
3) ModBlock to Hamilton integration – Modblock implements much of the complex logic related to communications, probe operator level, and calibration without requiring direct involvement of the DeltaV system.

The end result of the above is continuous access to all critical probe parameters, and access to the full parameter set in debug mode (for troubleshooting) using total 2 DST consumption, or 3 DST when supporting a Hamilton InCyte cell density probe with scan data.

ModBlock has been designed foremost for ease of use, and as such, configuration of ModBlock and associated probes is largely plug and play.

In addition to supporting Hamilton ARC style probes, the ModBlock is available with a pressure sensor (Pendotech) input option.

ModBlock Operation Discussion

Every Hamilton probe possesses a myriad of operating parameters. The total parameter count for all the probe types is approximately 200 to 300. This huge number of parameters is not practical to continuously read each module scan, nor is this operationally beneficial.

The Hamilton Arc probe firmware allows for meeting stringent GMP requirements (e.g. 21 CFR part 11) in systems that do not necessarily natively meet such requirements. In the case where a DeltaV system is the primary plant control system, these features are not required to be implemented in the probe itself but are more conveniently managed by the system itself. The ModBlock device facilitates a Hamilton probe with DeltaV digital integration by allowing necessary functions to be implemented in the most appropriate system (Probe, ModBlock device or DeltaV) of the overall install.

The Hamilton Arc probe modbus parameters with a short description of how they are used with the ModBlock device is as follows:

1) Operator level and serial interface – Operator level is forced to specialist, allowing ModBlock access to highest level of parameter reads/writes, as parameter security is much more conveniently implemented in the DeltaV system. The serial interface is also forced to factory default, with ModBlock able to automatically detect a probe. In summary, none of these parameters are directly read/written by DeltaV, nor are they exposed to the operator.

2) Analog interface – As ModBlock depends completely on the digital interface, none of these parameters are directly read/written by DeltaV, nor are they exposed to the operator.

3) Primary measurements – Both the main process variable (e.g. pH or DO described as PMC1 in Hamilton literature) and the temperature (PMC6 in Hamilton literature) are continuously read as these are the critical measurements of interest.

4) Secondary measurements – None of these are directly read/written by deltaV, nor are they exposed by the operator. This was done to simplify the overall user experience.

5) Configuration – None of these are directly read/written by deltaV, nor are they exposed by the operator. This was done to simplify the overall user experience. Since these parameters can have an impact on the primary measurements, ModBlock requires the use of a factory reset probe. If a probe configuration has been modified, this state can be forced using an Arc Wii adapter with Arc Air software.

6) Calibration – The calibration functions (CP1, CP2, CP6 and calibration parameter updates for single use probes in Hamilton literature) are simplified by implementing these functions in ModBlock accessible via a command in the DeltaV system.

7) Status (including warnings and errors) – All warnings and errors are individually read by the DeltaV system and displayed to the user on the DeltaV detail display. Sensor status is also displayed.

8) Identification and information – The only 2 parameters of critical importance are the probe firmware version and the measuring point (similar to device tag). Only these are read by DeltaV

and displayed to the user. The measuring point is used by the ModBlock to identify the particular probe connected to a port.

9) System command (factory reset) – This resets the probe to its initial factory settings. Modblock requires the factory settings, and as such either a "factory fresh" probe or one having this command performed must be used.

In addition to the standard use of probe parameters by Modblock, an additional mode is implemented by the ModBlock called "Debug mode". When in this mode, only primary measurements are continuously collected to prevent process control upsets. A separate user interface is exposed where arbitrary modbus registers can be read and written to the probe. This mode is only meant to be used by a maintenance engineer for troubleshooting, and if a write has been performed, then a probe re-pairing is required to comply with 21 CFR part 11.

By implementing the above, all probe registers are able to brought into the DeltaV system without excessive DST usage.

ModBlock Components

The following parts are required for a working ModBlock system:

1. ModBlock Digital Device – Box with DCS and Probe ports
2. DCS cable – This cable plugs into DCS port (Cable M12 5 pin male end) to customer serial card (Flying lead end)
3. Probe cables – These cable plugs into probe ports 1 and 2 (cable M12 5 pin male end) to Hamilton probe (VP connector). To use both probe ports, 2 identical cables are required. The cable is universal for all supported Hamilton probes.
4. Magnetic commissioning key – This is simply a magnet used to initiate ModBlock device commissioning. Please refer to the ModBlock commissioning section for details.

DeltaV System Setup

DeltaV system setup consists of installing module faceplate and detail, associated charts and importing the fhx files including named set, composite template and control module class into the DeltaV database.

Graphics (Operate)

For each operator station, Pro and ProPlus computer, copy the MBK_FP.grf file to the DeltaV faceplate picture folder. This is typically either:

C:\DeltaV\DVData\Graphics-iFix\PIC\Faceplates

OR

D:\DeltaV\DVData\Graphics-iFix\PIC\Faceplates

AND copy the MBK_DT.grf file to the DeltaV detail picture folder. This is typically either:

C:\DeltaV\DVData\Graphics-iFix\PIC\Detail

OR

D:\DeltaV\DVData\Graphics-iFix\PIC\Detail

If you require viable cell density scan data, and copy the MBK_SCANDT.grf file to the DeltaV function block detail picture folder. This is typically either:

C:\DeltaV\DVData\Graphics-iFix\PIC\DetailFB

OR

D:\DeltaV\DVData\Graphics-iFix\PIC\DetailFB

Graphics (Live)

If your system is using DeltaV Live graphics, import the supplied MBK.zip archive file. This will import:

MBK_FP

MBK_DT

MBK_SCANDT

Contextual graphics.

Charts

Copy MBK_FP.phve to:

C:\DeltaV\DVData\Charts\lib

OR

D:\DeltaV\DVData\ Charts\lib

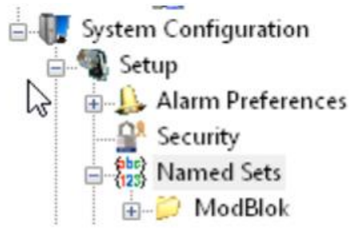
Named Set

From the ProPlus computer, import the asciiCharUpper.fhx file:

1) In DeltaV explorer, select File Menu -> Import -> Standard DeltaV Format
2) In file open dialog, select asciiCharUpper.fhx

After doing the above steps, the import should be successful. If there are errors, please contact Meiry Solutions for assistance.

The result of this will be a ModBlock folder under DeltaV Setup Named Sets:



Inside this folder will be a single Named Set asciiCharUpper:

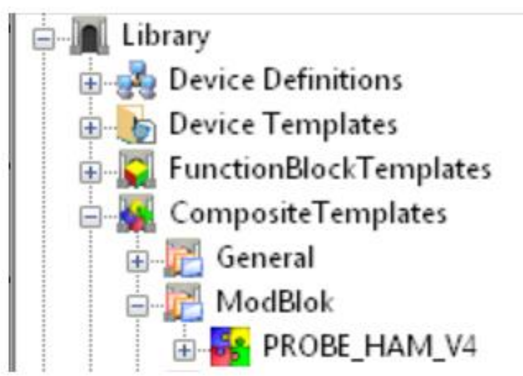
Composite Templates and Control Module Class

From the ProPlus computer, import the MBLK2_V1.fhx file:

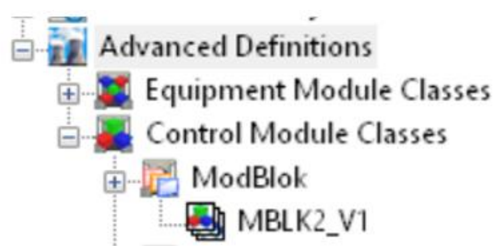
1) In DeltaV explorer, select File Menu -> Import -> Standard DeltaV Format
2) In file open dialog, select MBLK2_V1.fhx

After doing the above steps, the import should be successful. If there are errors, please contact Meiry Solutions for assistance.

The result of this will be a ModBlock folder under the DeltaV Library CompositeTemplates containing a composite block named PROBE_HAM_V4



and a ModBlock folder under the DeltaV Library Control Module Classes containing a module class MBLK2_V1.



If you require viable cell density, then the fhx file will be MBLK2_V1_1S, and the resulting composite templates ModBlock folder will have 3 composite blocks:

The DeltaV Library Control Module Classes will contain a module class MBLK2_V1_1S

DeltaV System Configuration

DeltaV system configuration consists of adding a serial device (the ModBlock device), configuring the device register set, creating a ModBlock device DeltaV control module, and editing the control module parameters setting external references to device registers and updating scaling.

Serial Card/Port configuration

In general, a ModBlock device will co-exist with other devices on the RS-485 bus. In DeltaV explorer, expand the appropriate serial card and port. Under this port, add a new device, choosing an unused address. Note that port settings such as baud rate, number of stop bits, and parity do not need to be changed. The ModBlock device can communicate with any valid Modbus RTU setting.

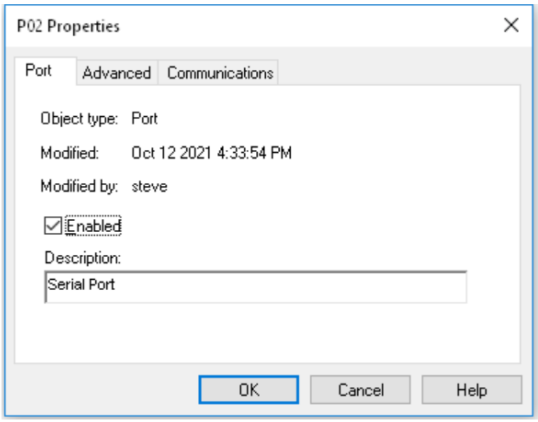
For the particular serial card, configure the port if required.

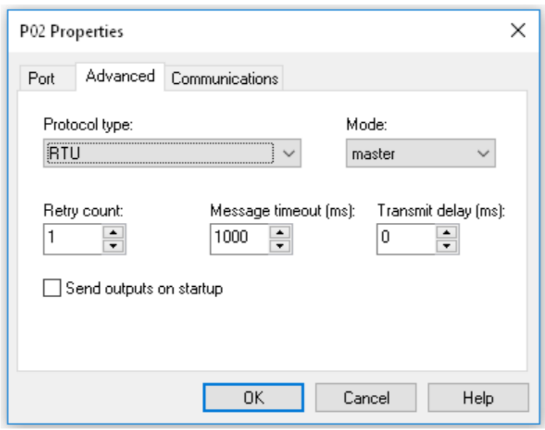
NOTE: ModBlock comes default with the below settings. It is recommended that if possible to configure the DeltaV serial device with these settings. Otherwise, any Modbus RTU compatible settings may be selected, however this will necessitate a ModBlock commissioning procedure to be performed.

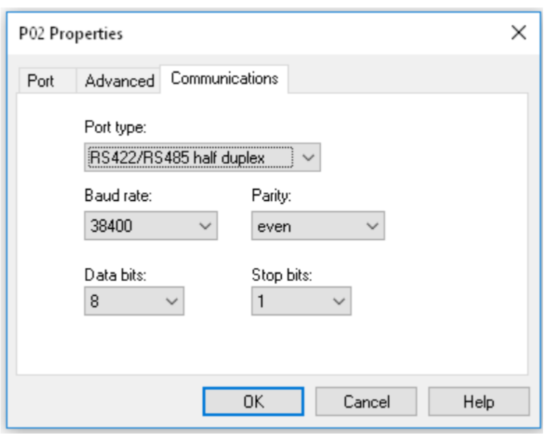
Default settings are:

Baud Rate: 38,400
Parity: Even
Data Bits: 8
Stop bits: 1
Address: 16

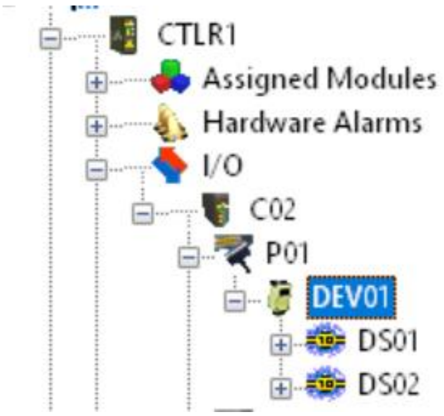
Right click on the serial card, and select properties. If default settings are selected, these will look like:


P02 Properties
Port
Advanced
Communications
Object type: Port
Modified: Oct 12 2021 4:33:54 PM
Modified by: steve
Enabled
Description:
Serial Port
OK
Cancel
Help

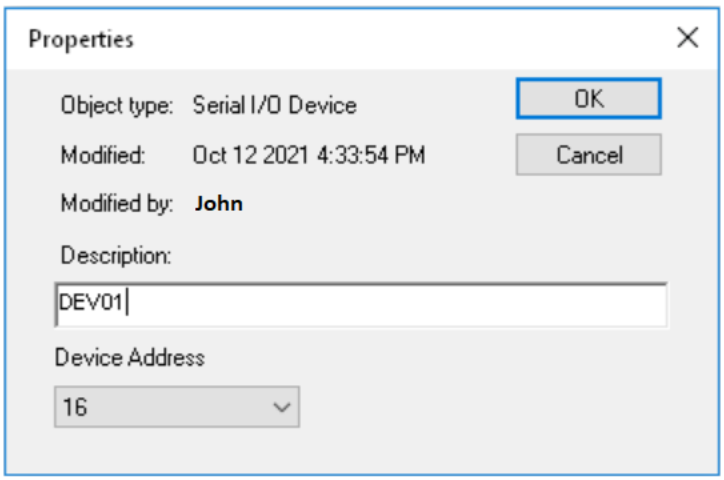

P02 Properties
Port
Advanced
Communications
Protocol type:
RTU
Mode:
master
Retry count:
1
Message timeout (ms):
1000
Transmit delay (ms):
0
Send outputs on startup
OK
Cancel
Help


P02 Properties
Port
Advanced
Communications
Port type:
RS422/RS485 half duplex
Baud rate:
38400
Parity:
even
Data bits:
8
Stop bits:
1
OK
Cancel
Help

For the particular serial card and port combination, add a new device:

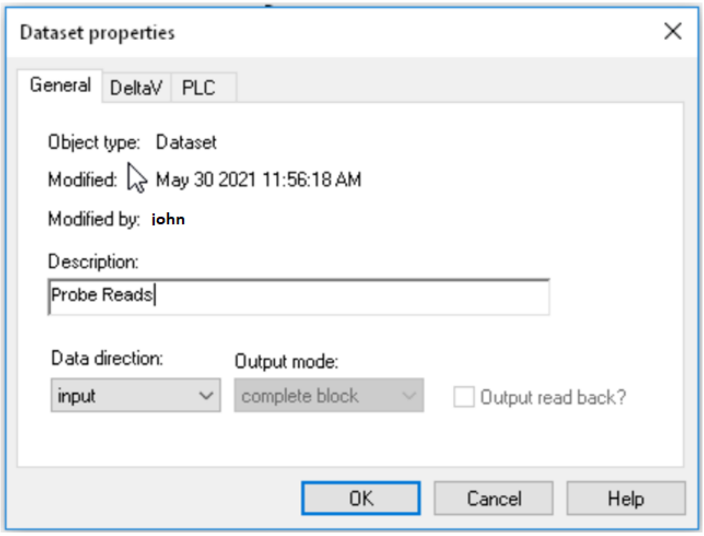


Configure the device as appropriate, remember to set address to 16 if default settings are to be used. In general, ModBlock will not be the only device, therefore pick a free device address:

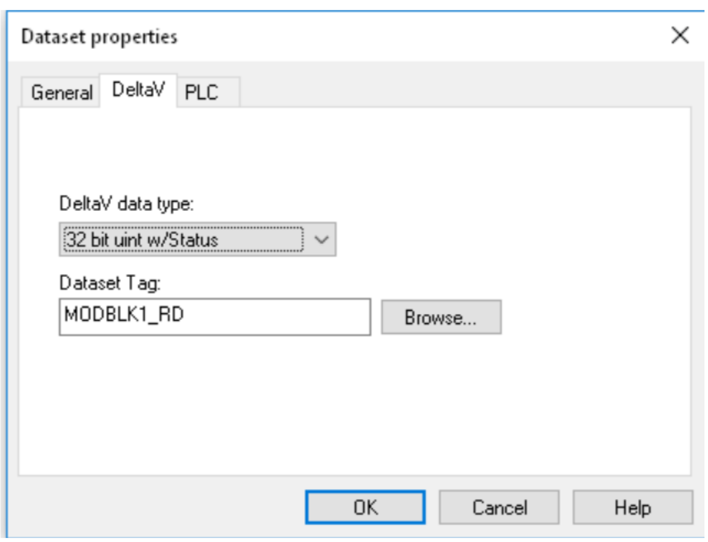


Read Register Set configuration

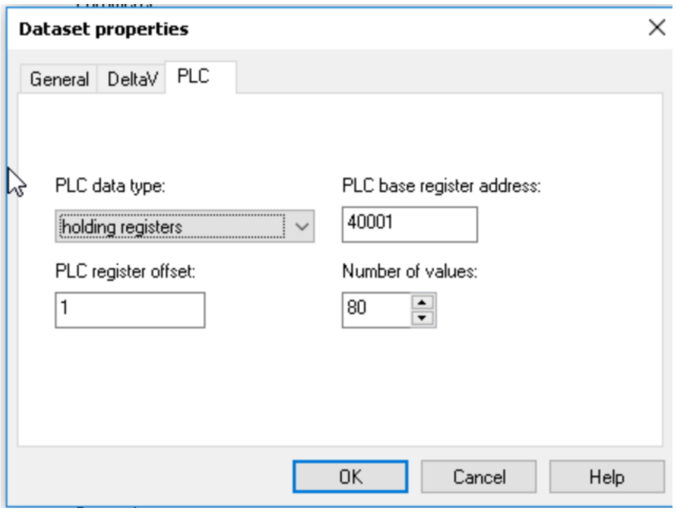
Add a new register set. Set the General properties as follows:



Set the DeltaV properties similar to below. You must set the data type as below, however the dataset tag can be user defined. Where a system has multiple ModBlock devices, a suitable naming convention should be used.

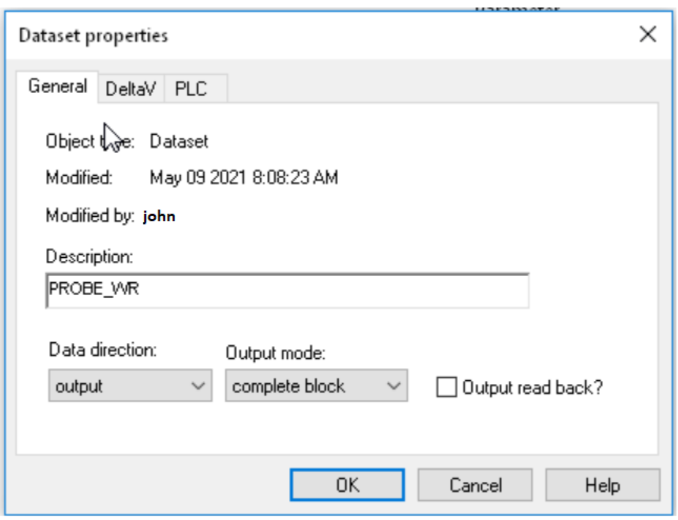


Set the PLC properties as below:

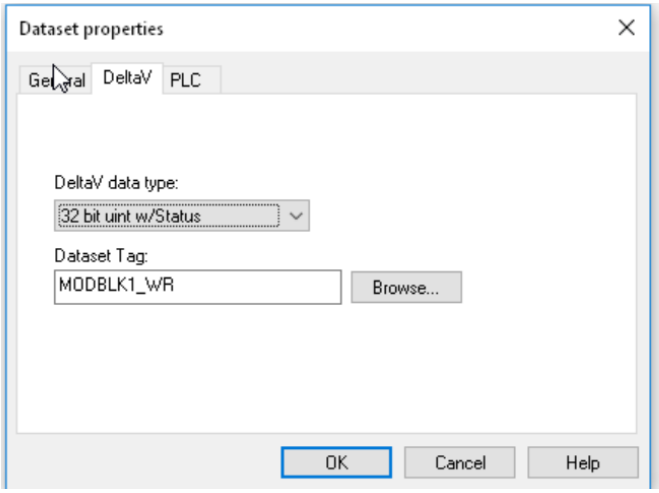


Write Register Set configuration

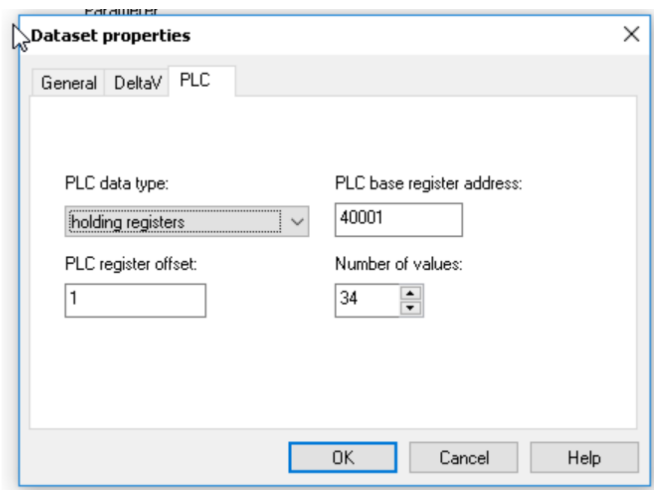
Add a new register set. Set the General properties as follows:



Set the DeltaV properties similar to below. You must set the data type as below, however the dataset tag can be user defined. Where a system has multiple ModBlock devices, a suitable naming convention should be used.

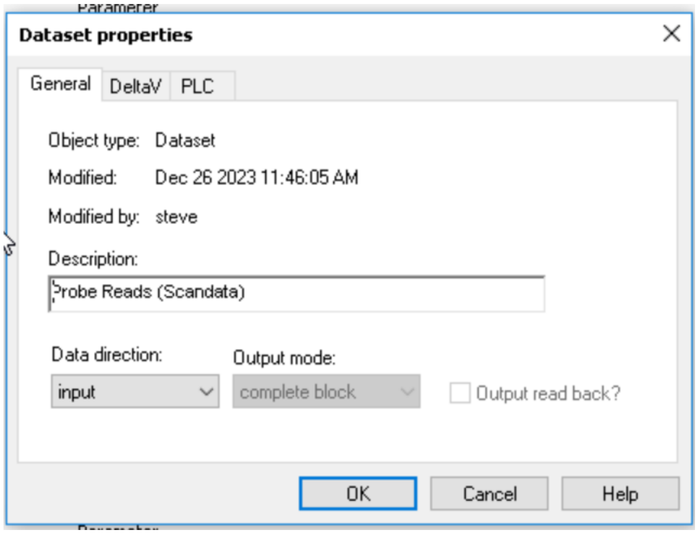


Set the PLC properties as below:

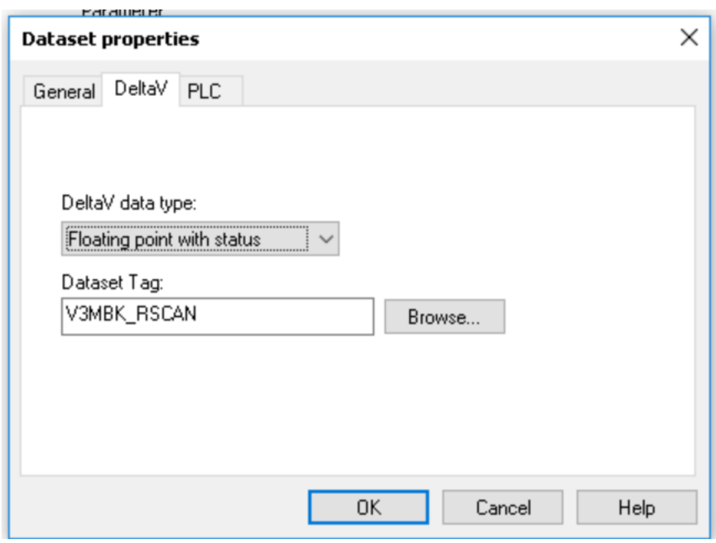


For viable cell density only, if scan data option is purchased, then a 3rd read dataset must be configured which is dedicated to scan data.

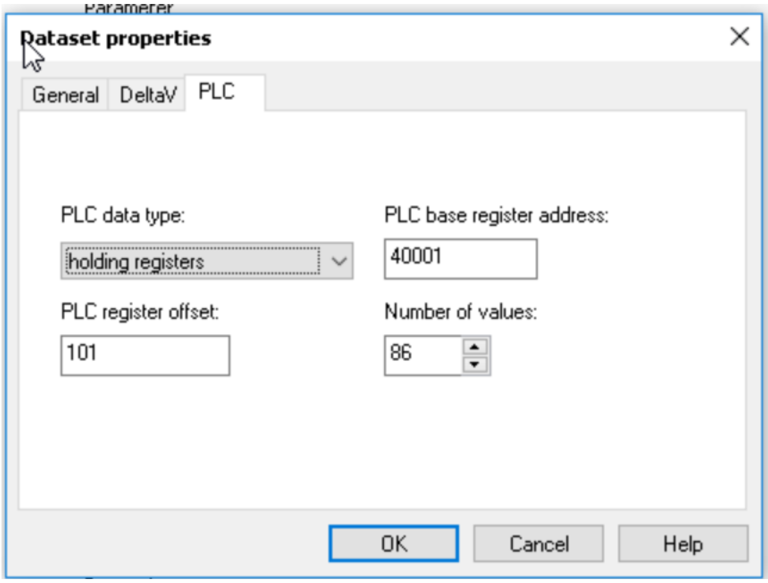
Add a new register set. Set the General properties as follows:



Set the DeltaV properties similar to below. You must set the data type as below, however the dataset tag can be user defined. Where a system has multiple ModBlock devices, a suitable naming convention should be used.



Set the PLC properties as below:

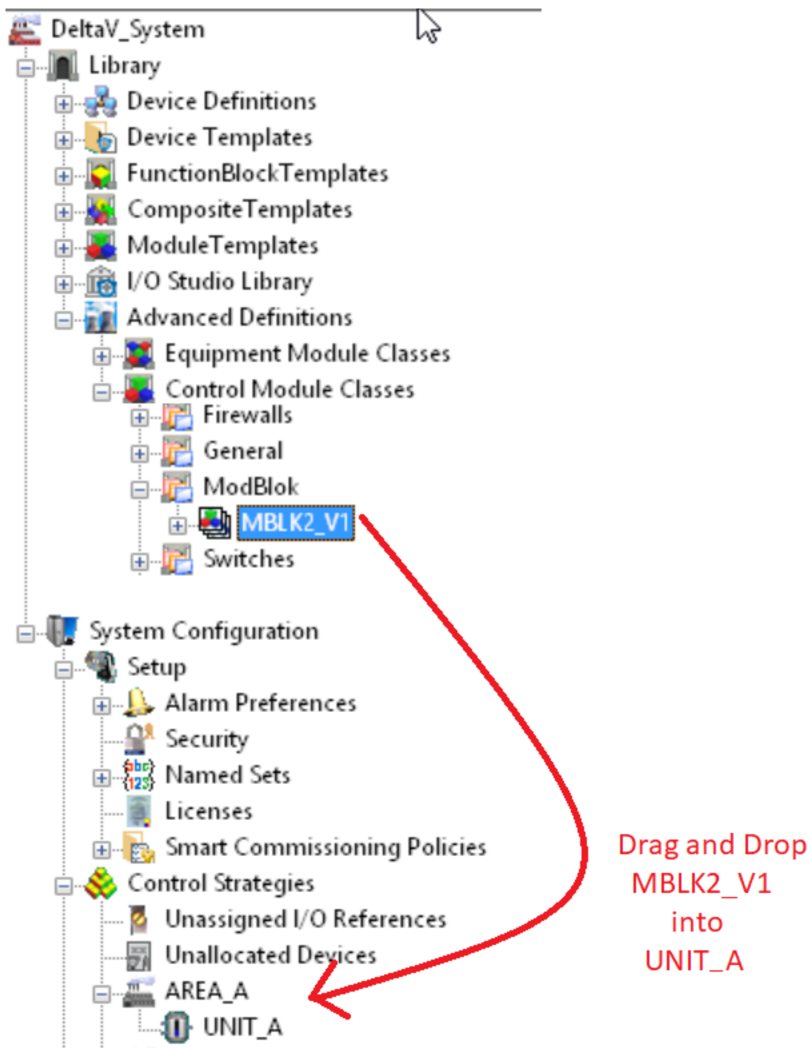


DeltaV Module Creation and Configuration

To access probe parameters, it is necessary to create a DeltaV control module. Only one module per ModBlock device is required, and the module can be considered a "Probe set" I/O module.

1) In DeltaV explorer, navigate to the Area/Unit where the ModBlock control module logically belongs. Drag MBLK2_V1 module class, and drop to the Area/Unit Destination.

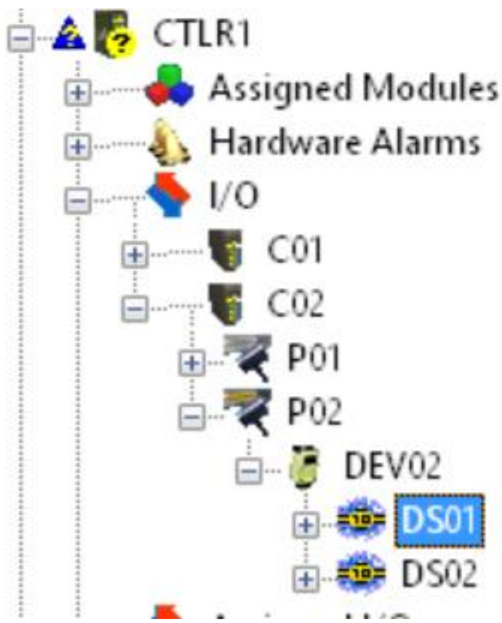
   For example, to create a module instance in AREA_A/UNIT_A:



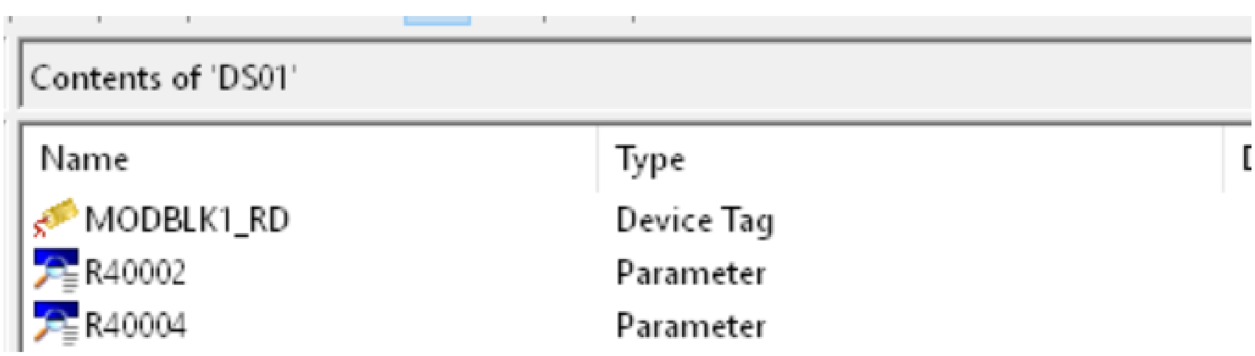
2) Name the module as appropriate.

3) populate the external references to refer to the serial device registers. Please note that the correct dataset tag must be used

Recall that during serial port configuration, that a both a read and write dataset were given a dataset tag. For the example device/dataset below:



Device Tag can be seen in the right-hand window pane:

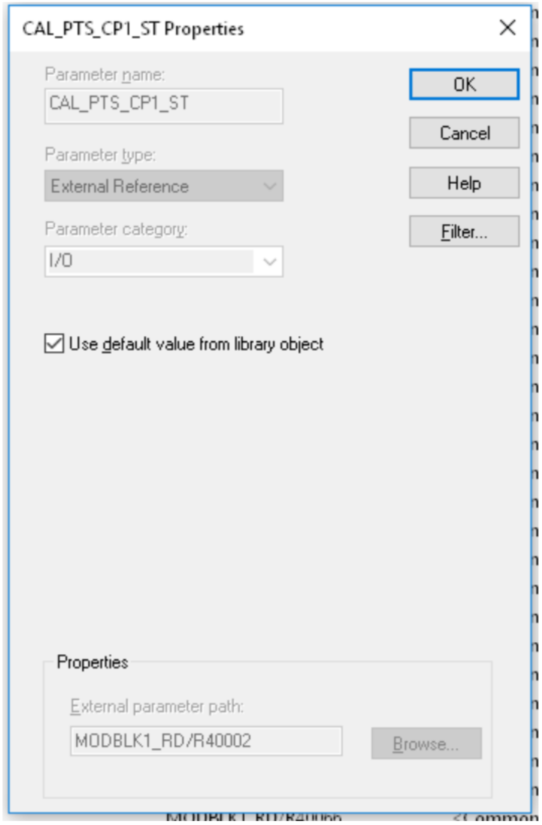


Which in this case is MODBLK1_RD. Similarly for DS02, the Device Tag is MODBLK1_WR

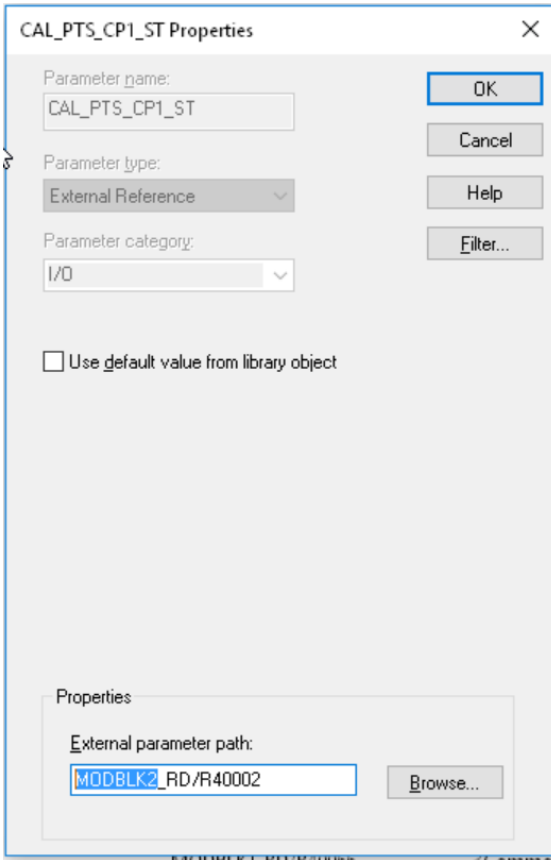
Click on the module instance (MODBLK1 in previous step), and rename the dataset portion of the path for all register value.

CAL_PTS_CP1_ST	Parameter Shortcut	MODBLK1_RD/R40002	<Common Config>
CP1_CP6_STAT	Parameter Shortcut	MODBLK1_RD/R40004	<Common Config>
PHI0_OFF	Parameter Shortcut	MODBLK1_RD/R40006	<Common Config>
CSV_SLOPE	Parameter Shortcut	MODBLK1_RD/R40008	<Common Config>
REF_TEMP	Parameter Shortcut	MODBLK1_RD/R40010	<Common Config>
FW_VER1	Parameter Shortcut	MODBLK1_RD/R40012	<Common Config>
FW_VER2	Parameter Shortcut	MODBLK1_RD/R40014	<Common Config>
FW_VER3	Parameter Shortcut	MODBLK1_RD/R40016	<Common Config>
FW_VER4	Parameter Shortcut	MODBLK1_RD/R40018	<Common Config>
MEAS_POINT1	Parameter Shortcut	MODBLK1_RD/R40020	<Common Config>
MEAS_POINT2	Parameter Shortcut	MODBLK1_RD/R40022	<Common Config>
MEAS_POINT3	Parameter Shortcut	MODBLK1_RD/R40024	<Common Config>
MEAS_POINT4	Parameter Shortcut	MODBLK1_RD/R40026	<Common Config>
SENSOR_QUAL	Parameter Shortcut	MODBLK1_RD/R40028	<Common Config>
WARN_MEAS	Parameter Shortcut	MODBLK1_RD/R40030	<Common Config>
WARN_CAL	Parameter Shortcut	MODBLK1_RD/R40032	<Common Config>
WARN_HW	Parameter Shortcut	MODBLK1_RD/R40034	<Common Config>
ERROR_MEAS	Parameter Shortcut	MODBLK1_RD/R40036	<Common Config>
ERROR_CAL	Parameter Shortcut	MODBLK1_RD/R40038	<Common Config>
ERROR_HW	Parameter Shortcut	MODBLK1_RD/R40040	<Common Config>
MBLOCK_STAT	Parameter Shortcut	MODBLK1_RD/R40042	<Common Config>
WD_FB	Parameter Shortcut	MODBLK1_RD/R40044	<Common Config>
PRESSURE	Parameter Shortcut	MODBLK1_RD/R40046	<Common Config>
PROBE_RD_PTR_FB	Parameter Shortcut	MODBLK1_RD/R40048	<Common Config>
PROBE_CMD_STAT	Parameter Shortcut	MODBLK1_RD/R40050	<Common Config>
PR1_PMC1_PV	Parameter Shortcut	MODBLK1_RD/R40052	<Common Config>
PR1_PMC6_PV	Parameter Shortcut	MODBLK1_RD/R40054	<Common Config>
PR1_PMC_STAT	Parameter Shortcut	MODBLK1_RD/R40056	<Common Config>
PR1_PROBE_STATE	Parameter Shortcut	MODBLK1_RD/R40058	<Common Config>
PR2_PMC1_PV	Parameter Shortcut	MODBLK1_RD/R40060	<Common Config>
PR2_PMC6_PV	Parameter Shortcut	MODBLK1_RD/R40062	<Common Config>
PR2_PMC_STAT	Parameter Shortcut	MODBLK1_RD/R40064	<Common Config>
PR2_PROBE_STATE	Parameter Shortcut	MODBLK1_RD/R40066	<Common Config>
MBLOCK_CMD	Parameter Shortcut	MODBLK1_WR/R40002	<Common Config>
PRESS_CMD	Parameter Shortcut	MODBLK1_WR/R40004	<Common Config>
WD_WR	Parameter Shortcut	MODBLK1_WR/R40006	<Common Config>
PROBE_RD_PTR	Parameter Shortcut	MODBLK1_WR/R40008	<Common Config>
PROBE_CMD	Parameter Shortcut	MODBLK1_WR/R40010	<Common Config>
PROBE_CMD_DAT1	Parameter Shortcut	MODBLK1_WR/R40012	<Common Config>
PROBE_CMD_DAT2	Parameter Shortcut	MODBLK1_WR/R40014	<Common Config>
PROBE_CMD_DAT3	Parameter Shortcut	MODBLK1_WR/R40016	<Common Config>
PROBE_CMD_DAT4	Parameter Shortcut	MODBLK1_WR/R40018	<Common Config>
PROBE_CMD_DAT5	Parameter Shortcut	MODBLK1_WR/R40020	<Common Config>

For the above, for example if a second ModBlock device was added and the same naming convention was applied, the Device Tags would be MODBLK2_RD and MODBLK2_WR for DS01 and DS02. Then for each of the above, the parameter reference path should be edited such that MODBLK1 becomes MODBLK2. To do this, double click on the parameter in the righ-hand pane:



Uncheck the Use default value from library object checkbox, and edit the External parameter path, changing MODBLK1 to MODBLK2:



And click OK. Do this for all register values ensuring the register portion (e.g. R40002 in the above) remains unchanged.

4) Set the probe type:

Parameter PR1_TYP sets probe 1 type

Parameter PR2_TYP sets probe 2 type

Set above parameters to integer value as indicated below:

pH single use : 1
pH reusable : 2
DO single use : 7
DO reusable : 8

CO2 : 13
Cell Density (without scan) : 18
Cell Density (with scan) : 19

5) Set the scaling parameters as required. This step is only required if the user control system is preconfigured to require a specific range of input.

   The following parameters can be scaled:

   PRESS_VAL – Pendotech pressure in psig
   PROBE1/PMC1_PV – Probe 1 Process Variable (PMC1) in factory default units
   PROBE1/PMC2_PV – Probe 1 Second Process Variable (PMC2) in factory default units
   PROBE1/PMC6_PV – Probe 1 Temperature (PMC6) in factory default units
   PROBE2/PMC1_PV – Probe 2 Process Variable (PMC1) in factory default units
   PROBE2/PMC2_PV – Probe 2 Second Process Variable (PMC1) in factory default units
   PROBE2/PMC6_PV – Probe 2 Temperature (PMC6) in factory default units

   To make use of pressure scaling, edit the following parameters:

PRESS_SCI	Parameter Shortcut	0.0 to 100.0
PRESS_SCO	Parameter Shortcut	0.0 to 100.0
PRESS_STV	Parameter Shortcut	4000

   Where PRESS_SCI is the input scaling, PRESS_SCO is the output scaling, and PRESS_STV is the output value when a bad status is present. This is used commonly where the value is scaled to a 15 bit analog input (i.e. 0 – 32,767 = 0 – 20mA) and where a bad status can be detected as less than 4mA (i.e. less than 6,553).

   Where scaling is used, the output value is in parameter PRESS_PVSC

   Similar to Pressure, where PMC1/PMC2/PMC6 scaling is required, the following parameters apply:

   Probe 1:

PROBE1$PMC6_STV	Parameter Shortcut	4000
PROBE1$PMC6_SCO	Parameter Shortcut	0.0 to 100.0
PROBE1$PMC6_SCI	Parameter Shortcut	0.0 to 100.0
PROBE1$PMC2_STV	Parameter Shortcut	4000
PROBE1$PMC2_SCO	Parameter Shortcut	0.0 to 100.0
PROBE1$PMC2_SCI	Parameter Shortcut	0.0 to 100.0
PROBE1$PMC1_STV	Parameter Shortcut	4000
PROBE1$PMC1_SCO	Parameter Shortcut	0.0 to 100.0
PROBE1$PMC1_SCI	Parameter Shortcut	0.0 to 100.0

Probe 2:

PROBE2$PMC6_STV	Parameter Shortcut	4000
PROBE2$PMC6_SCO	Parameter Shortcut	0.0 to 100.0
PROBE2$PMC6_SCI	Parameter Shortcut	0.0 to 100.0
PROBE2$PMC2_STV	Parameter Shortcut	4000
PROBE2$PMC2_SCO	Parameter Shortcut	0.0 to 100.0
PROBE2$PMC2_SCI	Parameter Shortcut	0.0 to 100.0
PROBE2$PMC1_STV	Parameter Shortcut	4000
PROBE2$PMC1_SCO	Parameter Shortcut	0.0 to 100.0
PROBE2$PMC1_SCI	Parameter Shortcut	0.0 to 100.0

Where SCI is scaled input, SCO is scaled output, and STV is output when a bad status is present.

Following Parameters contain the scaled outputs:

PROBE1/PMC1_PVSC – Probe 1 Process Variable (PMC1) scaled output
PROBE1/PMC2_PVSC – Probe 1 Second Process Variable (PMC2) scaled output

PROBE1/PMC6_PVSC – Probe 1 Temperature (PMC6) scaled output
PROBE2/PMC1_PVSC – Probe 2 Process Variable (PMC1) scaled output
PROBE2/PMC2_PVSC – Probe 2 Second Process Variable (PMC2) scaled output
PROBE2/PMC6_PVSC – Probe 2 Temperature (PMC6) scaled output

6) Give each Hamilton probe a user description by editing the following parameters. This is simply a text field which will show up on the faceplate graphic:

PROBE1$PROBE_TYPE	Parameter Shortcut	Single Use pH
PROBE2$PROBE_TYPE	Parameter Shortcut	Single Use DO

7) Assign the module to the appropriate controller and download.

For viable cell density

ModBlock DeltaV Parameter Integration

If scaled outputs are required, refer to the previous section for configuration. In this case, the pertinent values are:

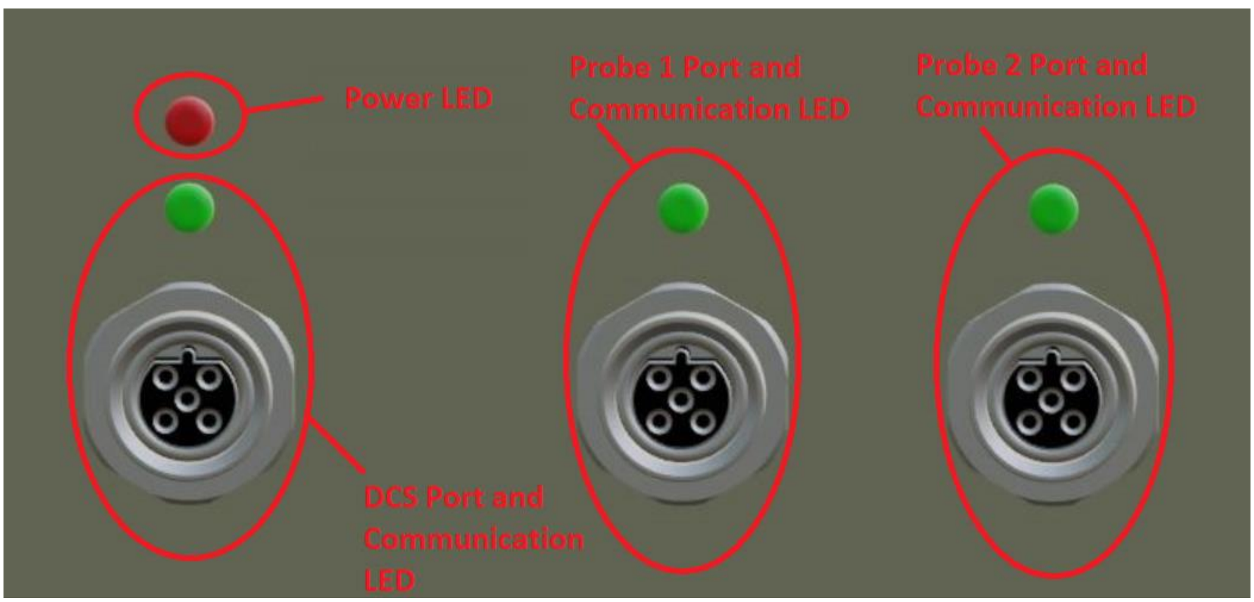
PRESS_PVSC – Pendotech Pressure scaled output
PROBE1/PMC1_PVSC – Probe 1 Process Variable (PMC1) scaled output
PROBE1/PMC6_PVSC – Probe 1 Temperature (PMC6) scaled output
PROBE2/PMC1_PVSC – Probe 2 Process Variable (PMC1) scaled output
PROBE2/PMC6_PVSC – Probe 2 Temperature (PMC6) scaled output

Otherwise, the non-scaled values are:

PRESS_PV – Pendotech Pressure
PROBE1/PMC1_PV – Probe 1 Process Variable (PMC1)
PROBE1/PMC6_PV – Probe 1 Temperature (PMC6)
PROBE2/PMC1_PV – Probe 2 Process Variable (PMC1)
PROBE2/PMC6_PV – Probe 2 Temperature (PMC6)

ModBlock Installation

Port and LED Indicator Overview – Front Face



As the above shows, A single Red LED indicates device power (24V DC)

The ModBlock device has 3 separate serial ports. The first is for the DeltaV DCS, and is the left most port.

The other ports to the right of the DeltaV DCS port are Probe 1 and Probe 2 respectively.

Each port (DCS, Probe 1, and Probe 2) has a green communications LED. This LED is lit when the associated port has good communications. When DCS and box are communicating, the green LED above the DCS port is lit. Likewise, when the box and Probe is communicating, the green LED above that port is lit.

During normal operation with 2 probes, all LEDs are lit.

Port Overview – Right Face

On the right had side, if ordered with pressure sensor option, the port for the pressure sensor is available. Currently, the ModBlock with pressure measurement supports Pendotech single use pressure sensors.

Master (DCS) Port Cable

The Master (DCS) port cable connects the ModBlock device to the DCS system. This cable has a Male 5 pin M12 connector on one end, and flying leads on the other end. The male 5 pin M12 connector plugs into the ModBlock left hand port. Plug this connector to left hand DCS port, and tighten threaded fitting via knurled portion of the connector.

The flying lead end is for connection to customer RS-485 bus. The following table shows wire colors and functions for customer termination:

Cable Type 1 Cable Type 2

Blue/White	Black/white stripe	24V DC Gnd	M12 Pin 1
Blue	Black	24V DC Positive	M12 Pin 2
Brown	White	RS-485 (A)	M12 Pin 3
Brown/White	White/black stripe	RS-485 (B)	M12 Pin 4
Bare	bare	Safety Ground	M12 Pin 5

How the above wires are terminated depends on customer control system layout.

Probe Port Cables

The probe port cable connects the Hamilton probe to the ModBlock device. The cable has a male 5 pin M12 connector on one end, and a VP connector on the other.

Plug the M12 connector into the appropriate probe port (Probe 1 or Probe 2 port), and tighten threaded fitting via knurled portion of the connector.

Plug your probe into the VP connector side of the cable, and tighten threaded fitting via knurled portion of the connector.

Please note that each probe port is “Agnostic” with respect to the probe type. Provided the probe is a supported Hamilton probe, the ModBlock device will automatically be able to determine the type and read the appropriate parameters. Also, please note that the probe cable is “universal” for all supported probe types.

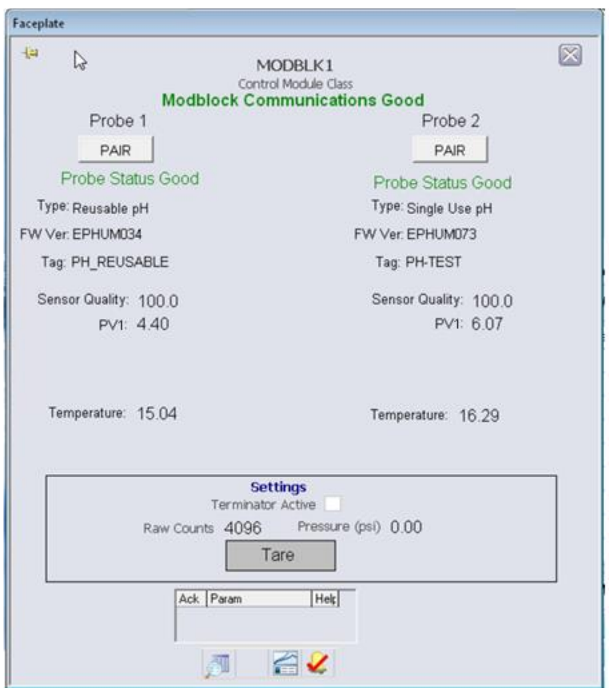
Pressure Port Cables

If the pressure sensor option is ordered, a pressure port cable is required. This has a M12 connector on one side which plugs into the ModBlock device, and a Pendotech 4 pin connector on the other end which the single use sensor is plugged into.

Graphic Overview - Faceplate

The ModBlock graphics consist of a DeltaV control Module faceplate, and embedded VBA forms associated with this faceplate graphic.

Below is a screenshot of the faceplate graphic.



The faceplate graphic gives an overall view of the ModBlock device and connected probes. It if from here that all probe parameters can be viewed, written, and where probe calibration is performed.

The included faceplate and detail graphic function is targeted for probe installation, setup, diagnostics, and maintenance (e.g. calibration) than it is for operations. For operations, user should continue using their standard graphics and control modules. The Meiry provided modules and graphics should be considered as interfaces to the probe, but not as operational graphics/controllers. In this way, the same look and feel are maintained.

ModBlock Device Status

The ModBlock Device status is shown in the top middle of the graphic.

When the ModBlock device is initially connected to the DeltaV control system serial bus, it is likely that the communication settings are different between the ModBlock device and the DeltaV serial bus. In this case, the ModBlock status indicator will show Bad.

It is the act of commissioning the ModBlock device which sets the ModBlock device communication settings to match those configured.

ModBlock Commission

When the ModBlock device DCS port communication settings do not match those as configured in the DeltaV DCS, the device cannot communicate and the status will be Bad as shown above. When the ModBlock device is commissioned, these communication settings are set to match those configured in the DeltaV DCS.

NOTE: This step is only necessary if the current ModBlock communication parameters do not match those configured in the DeltaV.

The default communication parameters are as follows when a serial number ends with an even number:

Baud Rate: 38,400
Parity: Even
Data Bits: 8
Stop bits: 1
Address: 16

The default communication parameters are as follows when a serial number ends with an odd number:

Baud Rate: 38,400
Parity: Even
Data Bits: 8
Stop bits: 1

Address: 17

Only when communications status is bad will the Commission Box button be visible as below

To prevent the ModBlock device from inadvertently entering the commissioning state, the commissioning procedure is a three-step process:

1) The ModBlock device is unlocked via the included magnetic key. Place the magnetic key on the top center of the box.
2) Press the Commission Box button on the graphic

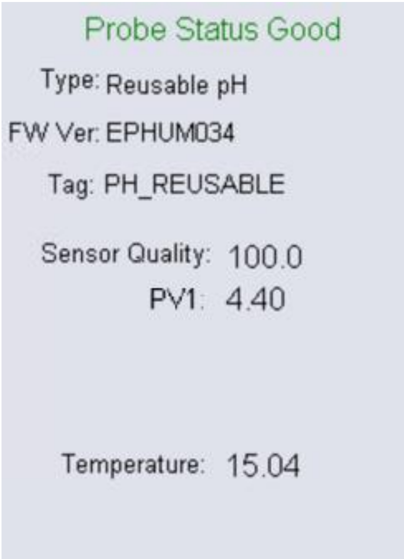
After step 2 is completed, the DeltaV module will send a “signature” which the ModBlock device uses to self configure.

3) Remove the DCS cable to power down the box. Wait 5 seconds, then reinstall the DCS cable.

During commissioning, a 5-minute timer is started. If this timer expires, the commissioning process has failed, and will be aborted.

On successful commissioning, the status will be good and the commission box button will be invisible. The valid Modbus RTU configuration is stored in non-volatile memory such that on power loss, re-commissioning will not be required.

Probe Status and Values



For each probe, the Probe status is indicated. When good a green “Probe Status Good” is visible. The following Probe errors in red are visible under the following conditions:

1) “Probe Not Communicating” when the ModBlock device loses communication with the probe
2) “Probe Not Paired” when good communication with the probe but either the tag (measuring point) or probe firmware does not match with expected
3) “Probe Not Supervisor Mode” when good communication with the probe but the probe operating mode is not Supervisor level

The Probe type is displayed under the probe status, and is a user defined text field set at module configuration time.

FW Ver field indicated the probe firmware version. This firmware version effectively indicates the probe type. For example, EPHUM034 indicates a EasyFerm reusable pH probe.

Tag field indicates the measuring point, and is assigned by the user during the probe pairing routine

Sensor Quality field indicates the health of the sensor. This is a calculated field whereby the lesser value of Cap Quality and Sensor Quality is selected. Where one of these values is not present in the probe, that value is ignored.

PV field is the PMC1 value directly read from the probe.

Associated with the PMC1 value are out of range, Calibration status, warning and error alarm indicators

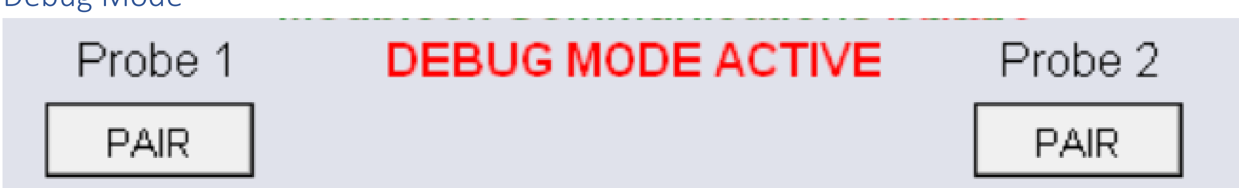
Each of these red text values are visible when that condition is active.

Temperature field is the PMC6 value directly read from the probe.

Associated with the PMC6 value are out of range, Calibration status, warning and error alarm indicators

Each of these red text values are visible when that condition is active.

Debug Mode



When Debug mode is active, a red "DEBUG MODE ACTIVE" is visible.

Debug mode should only be used by a maintenance engineer for troubleshooting purposes. The user interface for this mode is contained in the detail display.

Probe Pairing

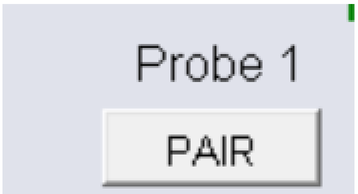
ModBlock will continuously attempt to communicate to both probes connected to ports 1 and 2. If the probe measuring point (Tag) and the firmware does not those settings in ModBlock non-volatile memory, the probe is said to be unpaired.

ModBlock requires factory setting probes to establish communication. Once probe communication is established, the PAIR button will be visible.

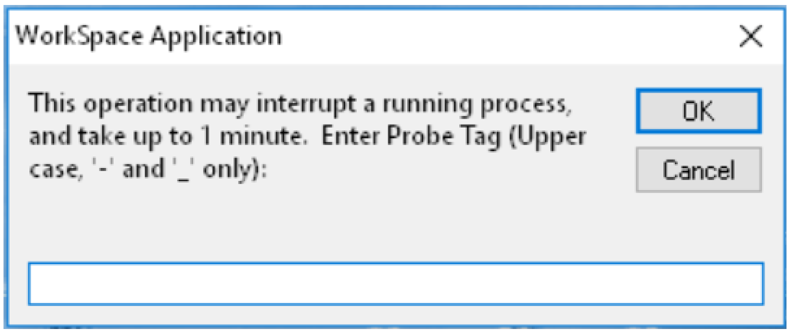
The act of pairing accomplishes the following:

As part of the pairing process, the user is prompted to give the probe a tag. This tag is meant to uniquely identify that probe with the ModBlock port. If a different probe is connected to that port, DeltaV will then indicate via the status that a probe pairing is required.

To initiate a Pairing, ensure that probe is communicating. Press the PAIR button



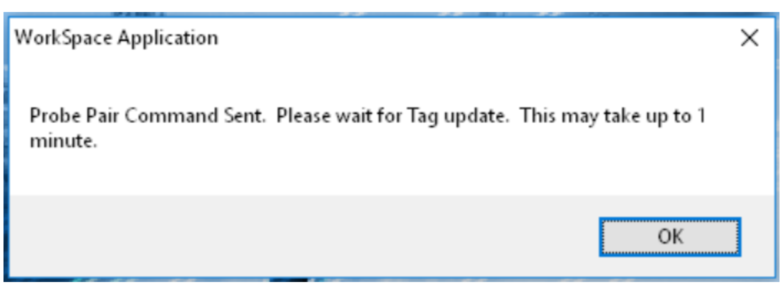
After doing so, a message box will be shown



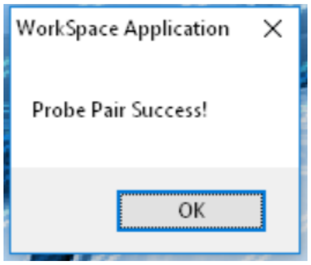
Enter in a tag, for example AE-123 and press the OK button

A message to wait will be visible on the faceplate.

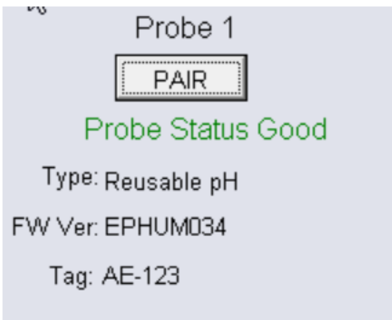
It can take up to 30 seconds to send the command after which a message box will indicate that a tag update is in progress.



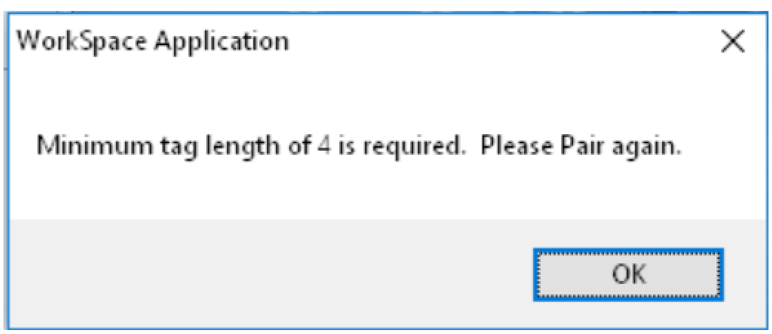
Press the OK button. After some time (up to a minute) a textbox indicating success will appear



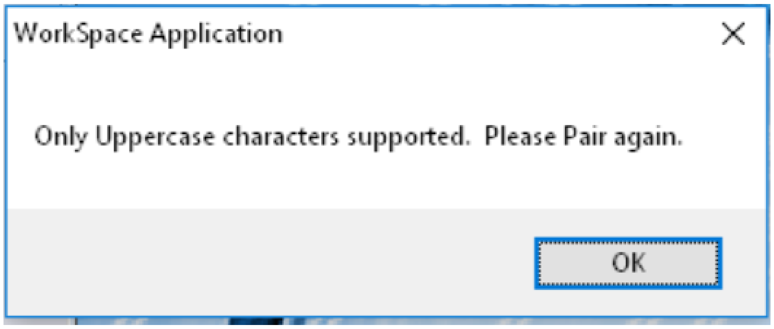
Press the OK button to dismiss the message box. Observe the updated Tag field on the faceplate



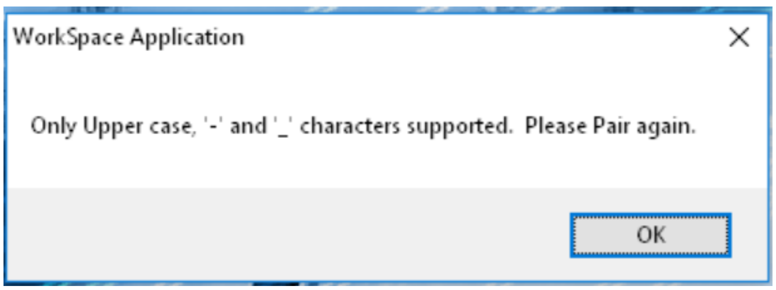
If the user does not enter in a minimum 4 character tag, an error message is displayed and pairing is aborted.



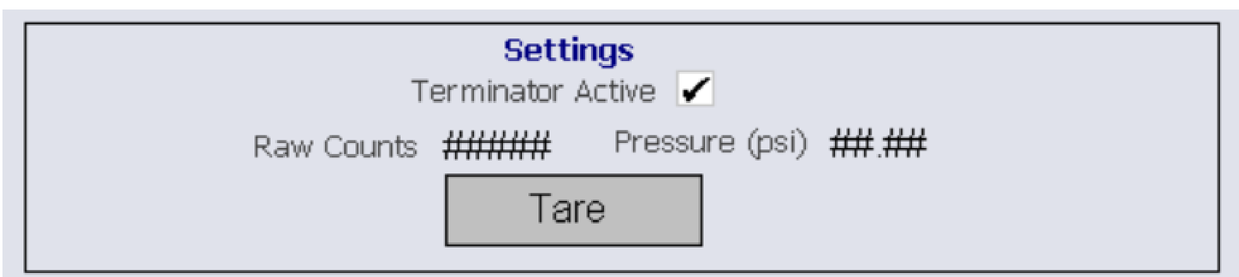
If the user does not enter all uppercase character tag, an error message is displayed and pairing is aborted.



If unsupported characters are present in the tag, an error message is displayed and pairing is aborted.



Pressure and Terminator



If ModBlock is situated at the end of the serial segment, a termination resistor may be required. For most installations, the terminator does not need to be changed by the user. It is set once only during the initial installation.

Where the user needs the ability to switch in and out the terminator, the graphics code behind the checkbox must be uncommented. In this case, please contact Meiry Solutions for this update.

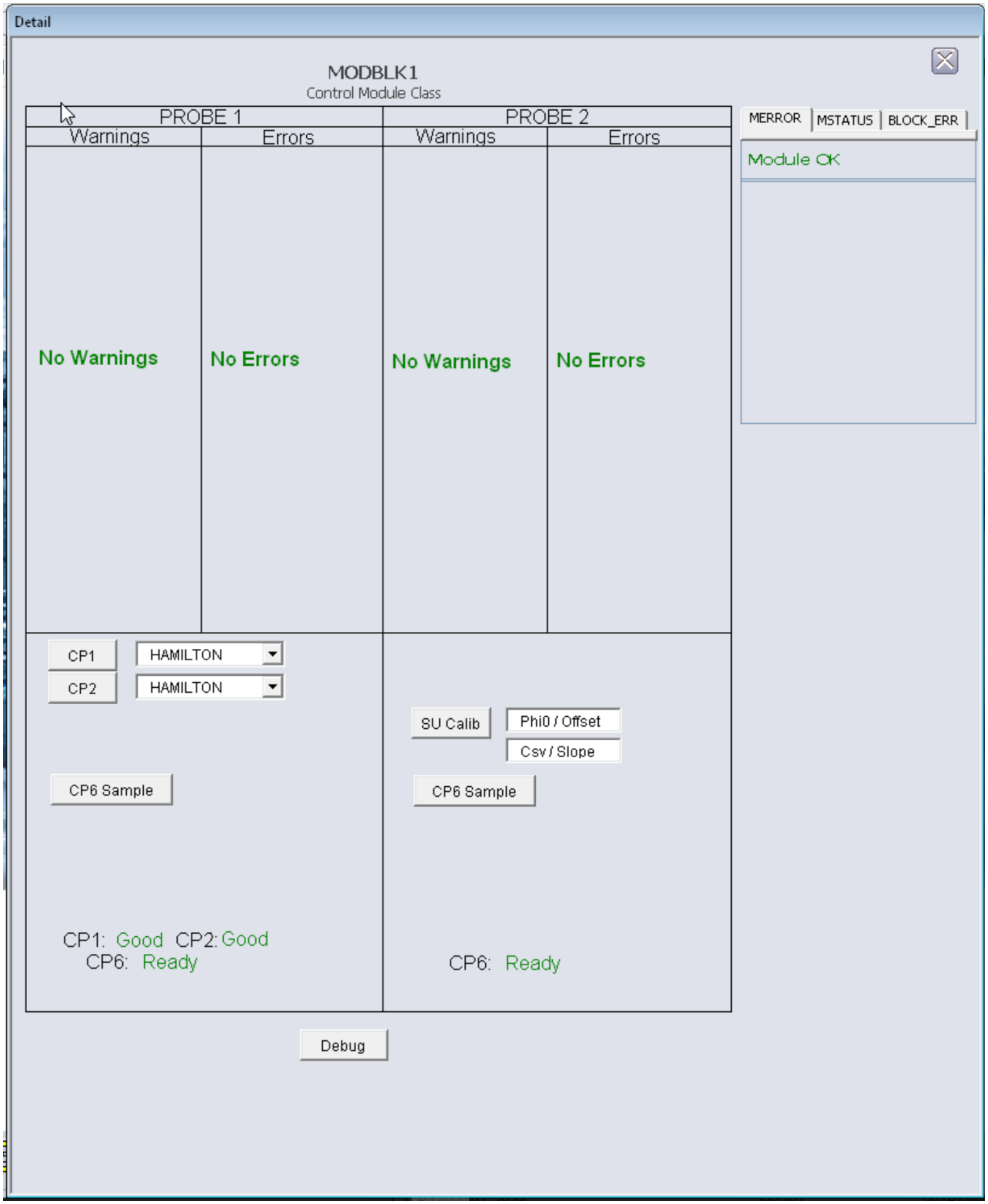
Pressure raw counts are the A/D converter digital value. The raw counts for the pressure sensor is shown in the Raw Counts field. Zero pressure is centered as 4096, with full scale of +/- 10 psi offset by 1024 counts plus or minus. -10 psi is given by 3072 and 10 psi is given by 5120.

Pressure (psi) is pressure in psi units.

On the installation of each new Pendotech single use sensor, and Tare to zero the reading to ambient conditions is required. The Tare button accomplishes this.

Graphic Overview - Detail

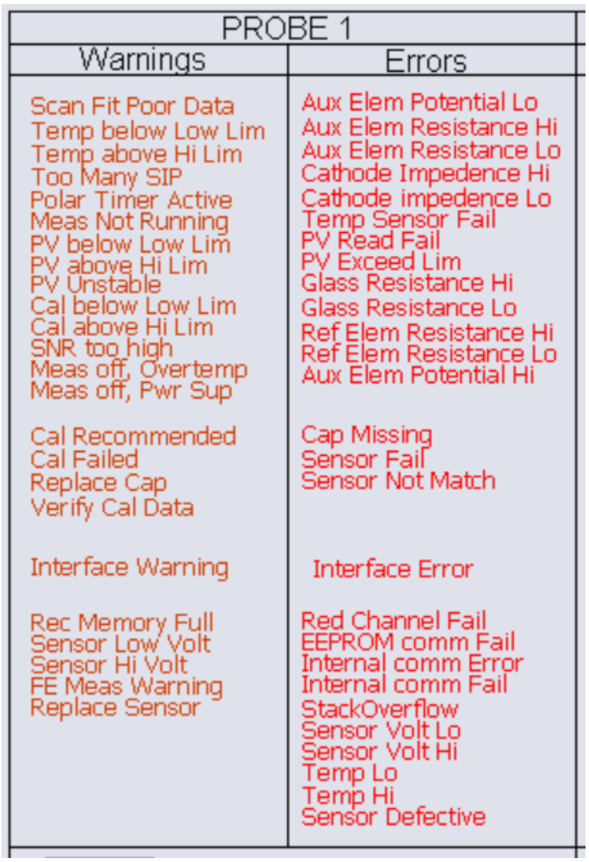
When the open faceplate button is clicked, the detail is shown:



Probe Errors and Warnings

When no warnings are active, a green “No Warnings” is visible. Similarly, when no errors are active, a green “No Errors” is visible.

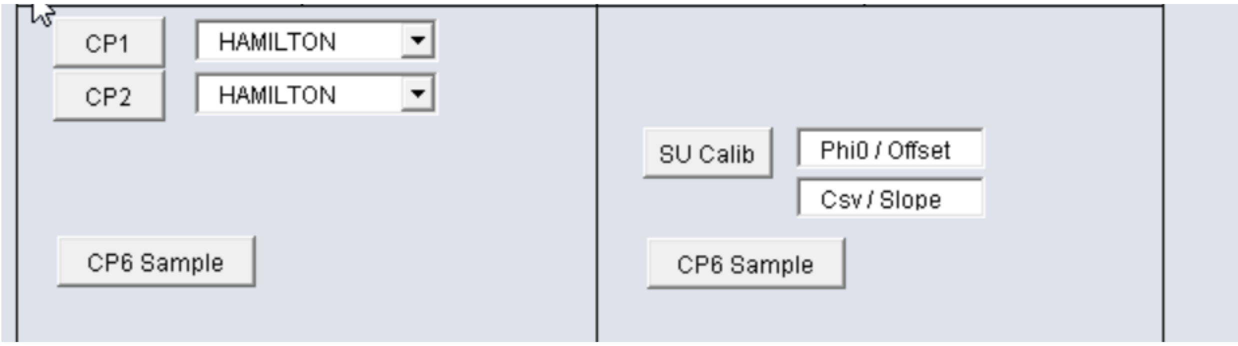
When a warning is active, that particular warning is visible in Orange. When an error is active, that particular error is visible in red.



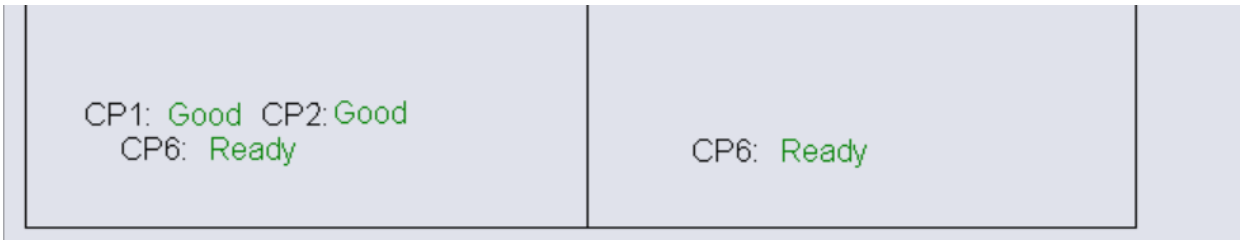
Because ModBlock does not use any of the analog interfaces, all applicable warnings are combined in a common “Interface Warning” and all applicable errors are combined in a common “Interface Error” indicator.

Calibration Access and Status

Calibration is accomplished via the CP1, CP2, CP6 and SU Calib buttons and fields



Indication of Calibration status is directly below these user interface elements

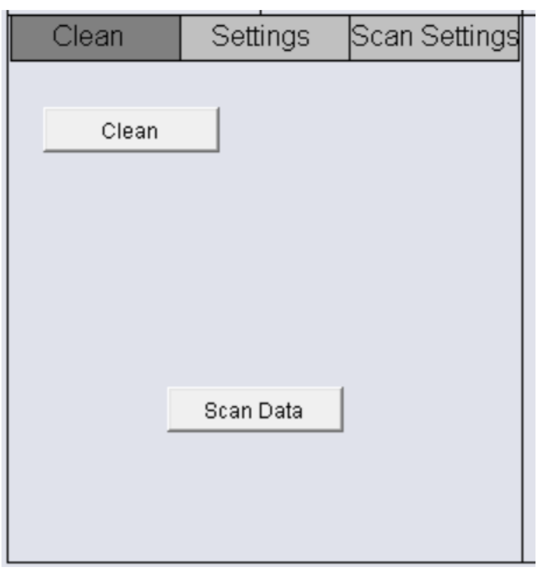


In general, the displayed user interface elements depends on the type of probe. Only those operations (e.g. CP1, CP2, CP6 or direct entry of calibration constants) that the probe supports are exposed to the user. In this way, the full range of calibration operations is available in the most user friendly manner possible.

A thorough discussion of calibration is presented in the next section, as this is an important function to any running operation.

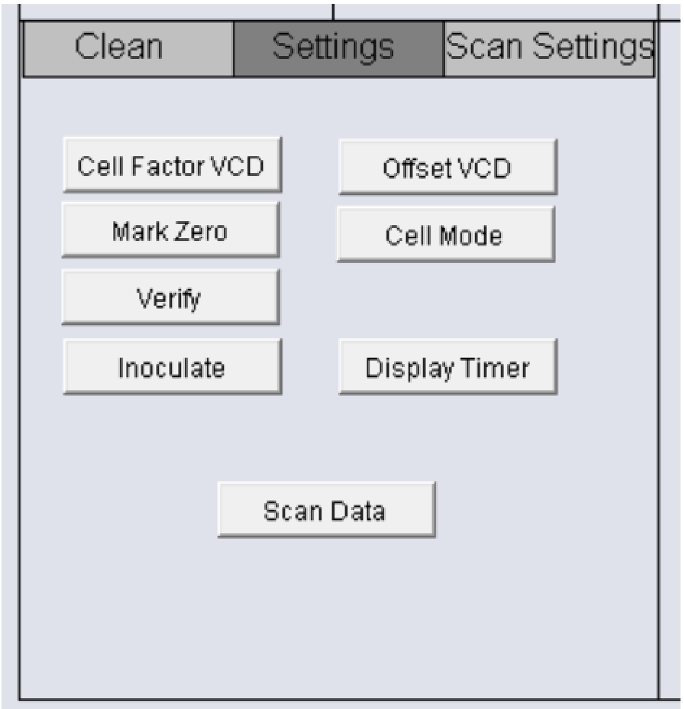
InCyte Viable Cell Probe Control

Probe control is via 3 tabs as shown below. They are Clean, Settings, and Scan Settings

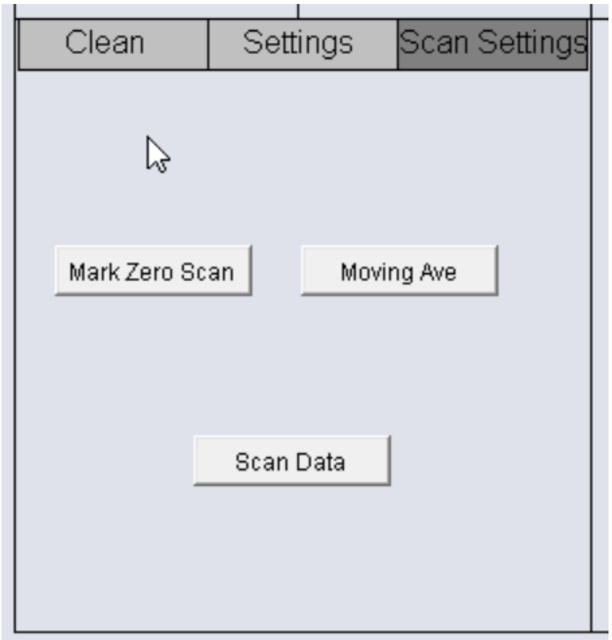


Clean allows manual cleaning of probe. It is not recommended to do this during a production run, as the clean procedure negatively affects measurement for approximately 30 minutes.

The Settings Tab contains those operations related to PMC1, viable cell density measurement:



The Scan settings Tab contains those operations related to generation of the scan data:

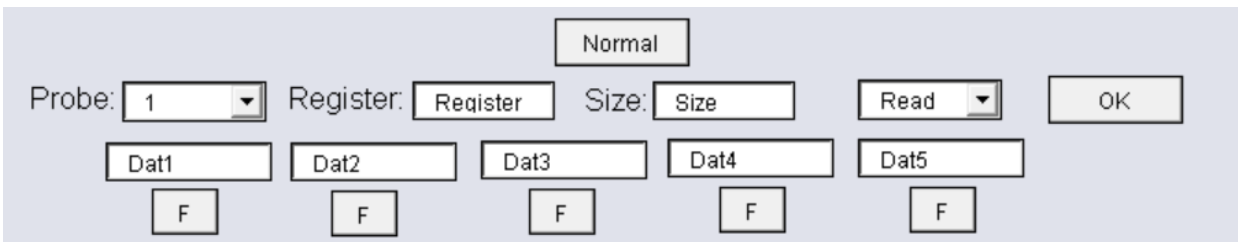


Debug Mode

Debug mode should only be used by a qualified maintenance engineer in conjunction with the appropriate Hamilton probe Modbus programmer's manual. Debug mode is only to be used as a troubleshooting aid and requires deep knowledge of the probe operation and the Hamilton ARC firmware in particular.

Pressing the Debug button

Will unhide a Normal button and the Debug mode will be active with user interface visible



Fields are as follows:

1) Probe – Selects the probe to send a debug command
2) Register – User types the register number
3) Size – User types in the quantity of **32 bit** registers (or datum number) to be read or written. This size field is **Directly** used in the RTU Modbus request, and **Must** match that in the Hamilton Modbus Programmer's manual. Note that this value is exactly half of what is shown in the Modbus Programmer's manual because the value in the manual is the number of 16 bit registers, and 2 registers are required for each datum.
4) Read/Write combo box – User selects read or write operation
5) Dat1 through Dat5 text boxes – User enters in values to be written in these text boxes. Results of a read are displayed in these text boxes **ALWAYS as raw 32 bit values on the initial read**.
6) Ok Button sends read or write command to probe
7) F buttons convert a raw 32 bit integer value to IEEE-754 floating point value. When a value is converted, the 'F' changes to 'I' allowing conversion between integer and floating point without a calculator.

To illustrate operation, consider register 5448 – Calibration Coefficients for Probe 2 having firmware EPHUM073 which is a SU pH probe.

Press the Debug button. The following will occur:

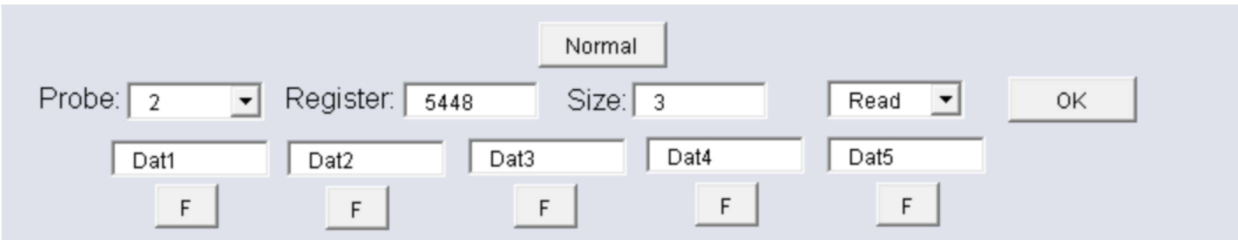
1) On the faceplate the red "DEBUG MODE ACTIVE" indication is visible
2) Both Pair buttons disappear on the faceplate
3) All probe calibration elements disappear from the detail
4) The debug user interface is visible on the detail

From the Modbus programmer's manual:

Start register	Number of registers	Reg1 / Reg2 (Float)	Reg3 / Reg4 (Float)	Reg5 / Reg6 (Float)	Modbus function code	Read access	Write access
5448	6	Offset at pH 7 [mV]	Slope (25 °C) [mV/pH]	Reference temperature [K]	3, 4	U/A/S	A/S

Figure 2.7.8.1: Definition of register 5448.

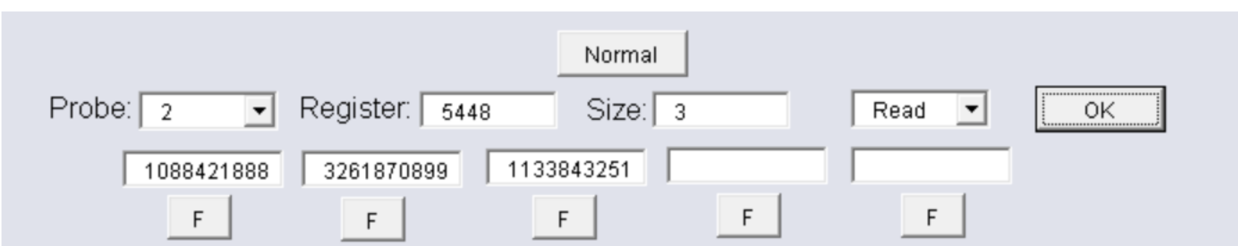
To read the current values, set Probe, Register fields and ensure that combo box selection is Read



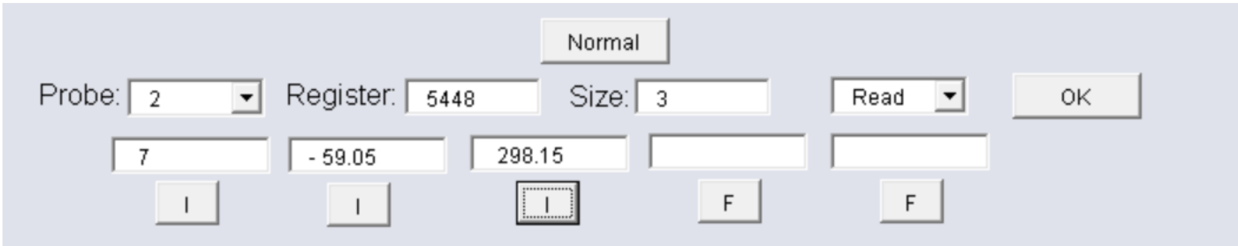
Click the OK button

Observe the Wait message displayed on the detail

After some time, the message disappears and the 3 data values are displayed. These are the raw 32 bit values



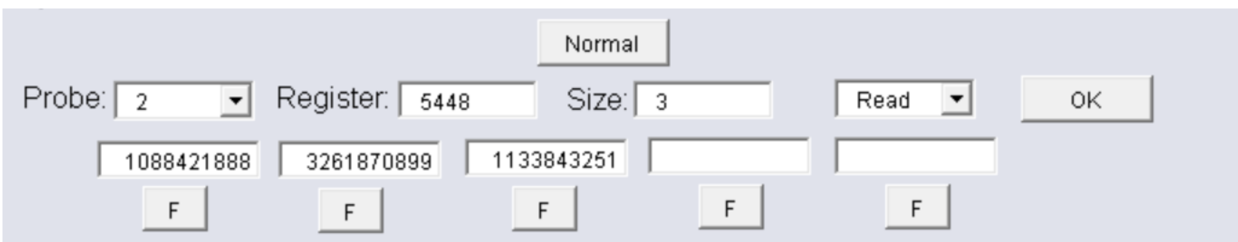
To convert the 3 values into floating point representation (as documented in the Modbus programmer's manual), click the first 3 "F" buttons



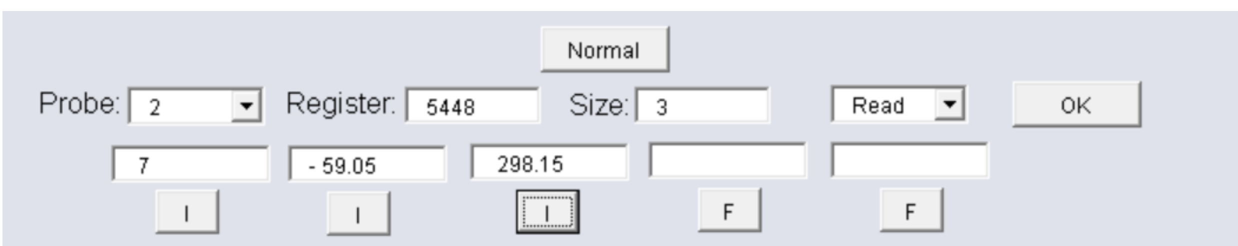
Notice:

1) All values are reasonable floating point values. Offset is 7 mV, slope is -59.05 mV/pH, and temperature is 298.15 K (25 degrees C).
2) Each of the buttons changed from "F" to "I"

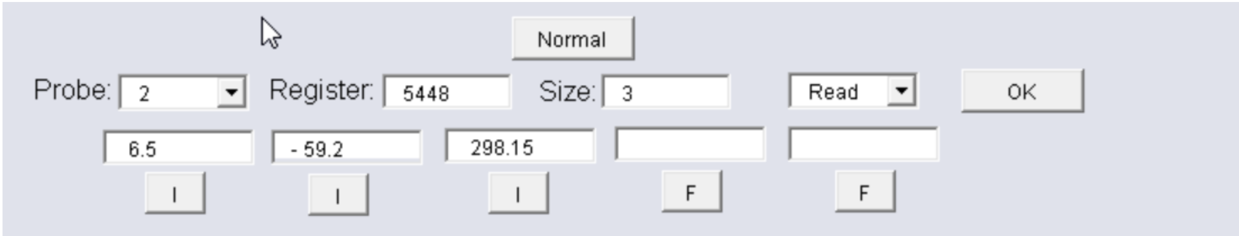
To convert the 3 values back into integer representation, click the first 3 "I" buttons



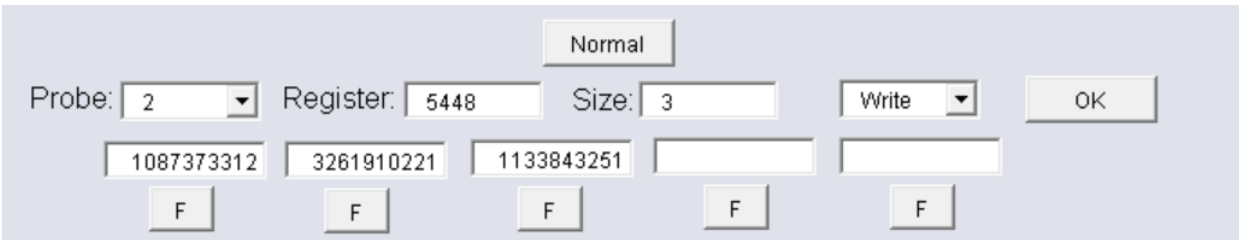
To affect a write, first convert back to floating point values



Then make any updates as appropriate. For example, to change offset to 6.5 mV and slope to -59.2 mV/pH edit the data values

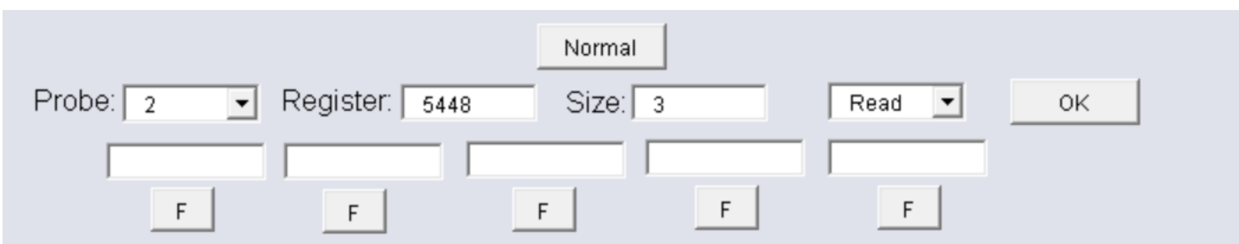


Then convert back to integer values, and set the combo box selection to write

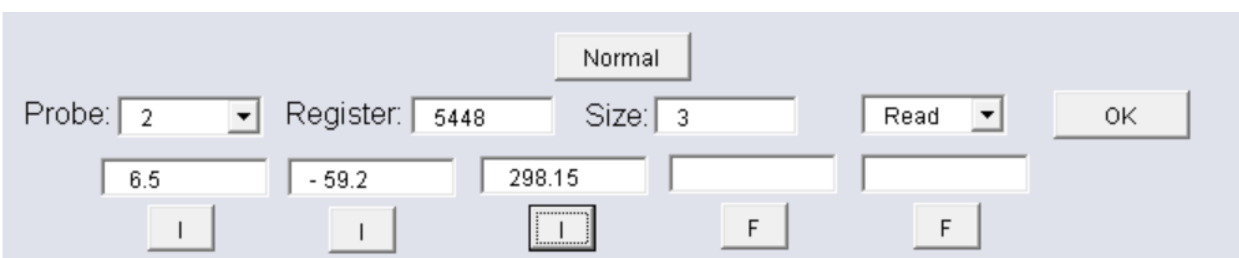


Click the OK button, and the values are written.

To confirm the writes, manually clear all the data values, and select Read from the combo box



Press OK, and convert the first 3 values to floating point



Notice that all updates were made.

Probe Calibration

Calibration Overview

Probe calibration is typically performed at the start of any production run, and can optionally be performed while in service. The calibration itself is meant to bring the probe measurement back into published specifications.

Calibration Types

Standard Calibration

A standard calibration is typically performed before a production run. This generally entails performing a 2-point calibration for reusable probes.

In the Hamilton manual, these are known as CP1 and CP2 and together form a 2-point calibration.

Calibration Constant Entry

Calibration constant entry applies to single use probes. Rather than doing a 2 point calibration, the appropriate constants are indicated on a tag at time of manufacture.

For the single use pH, these 2 constants are offset (mV at neutral pH) and slope (mV/pH). For single use DO probe, these 2 constants are phi0 (phase at zero) and Stern Volmer constant.

An example of such a tag

6.2 Calibration

The SU ODO Cap has been pre-calibrated at 100% and 0% saturation at 25 °C; hence calibration prior to the process is not necessary. The calibration values for Phase 0 and Stern-Volmer coefficient (SV-Coefficent) can be found on the label attached to the SU ODO Cap.

Figure 15: Example sensor label with calibration data

Product Calibration

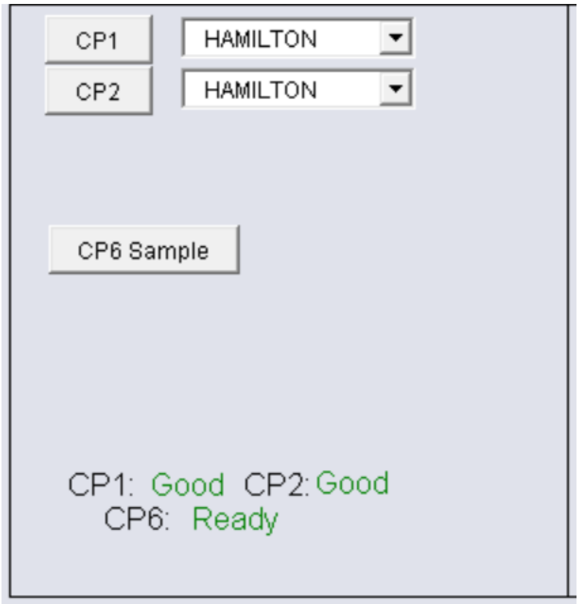
A Product calibration is optionally performed during a production run. An initial measurement is taken by the probe, and at the same time, a sample is analyzed in the lab. When the lab value is known, this is entered by the operator, and the probe automatically adjusts calibration constants to current product conditions.

In the Hamilton manual, this calibration is know as CP6 and is equivalent to a single point calibration.

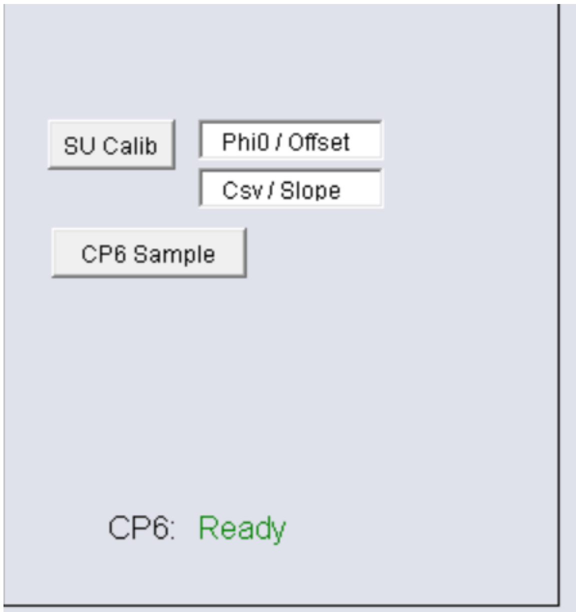
Determination of available calibration points

Modblock reads the appropriate probe registers to determine the availability of calibration points. The DeltaV module and graphics then displays both the applicable controls and statuses.

For example, a reusable probe generally has standard calibration (CP1/CP2) and CP6



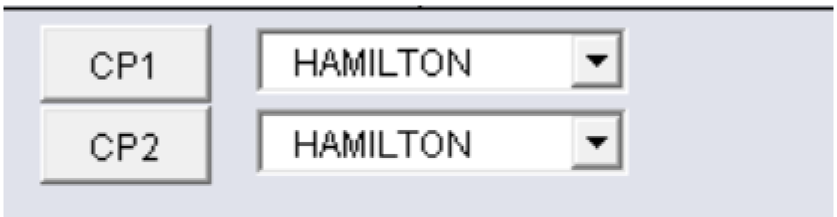
Whereas a single use probe generally has only calibration constant entry and CP6



In each of these cases, the graphics will display only the calibration points supported by the connected probe.

Standard Calibration

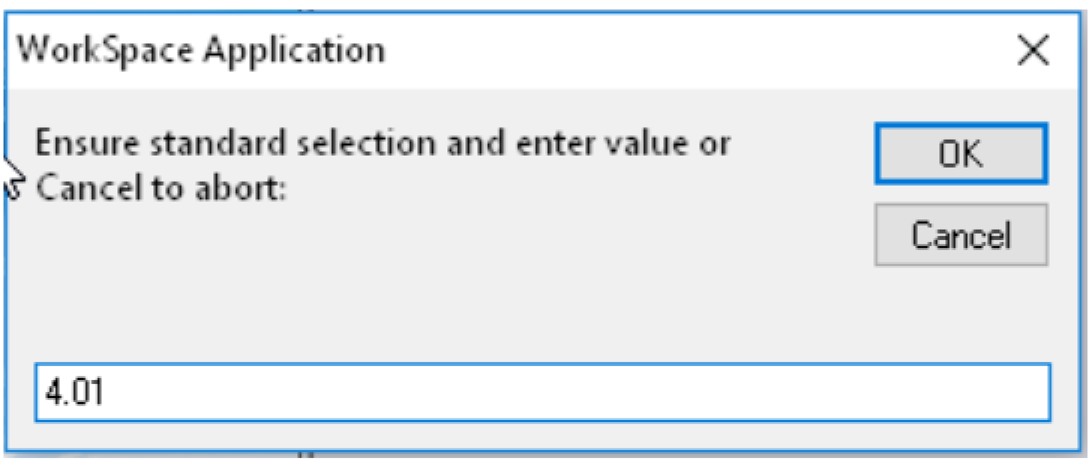
EasyFerm pH reusable probe



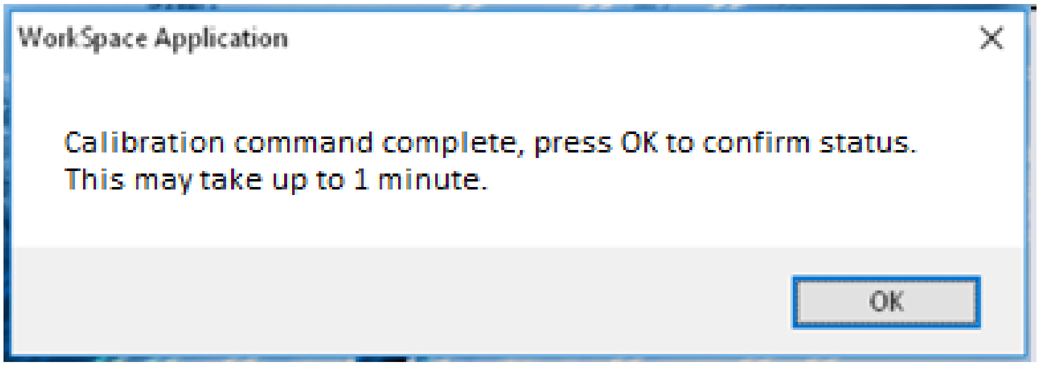
The reusable pH probe differs from the reusable DO probe in that each calibration point (CP1 and CP2) requires the user to select a calibration set.

Modblock enables all calibration sets, and for each standard enables manual entry and disables automatic detection of calibration standard. This was done to simplify the user interface and to limit the number of graphics and operations.

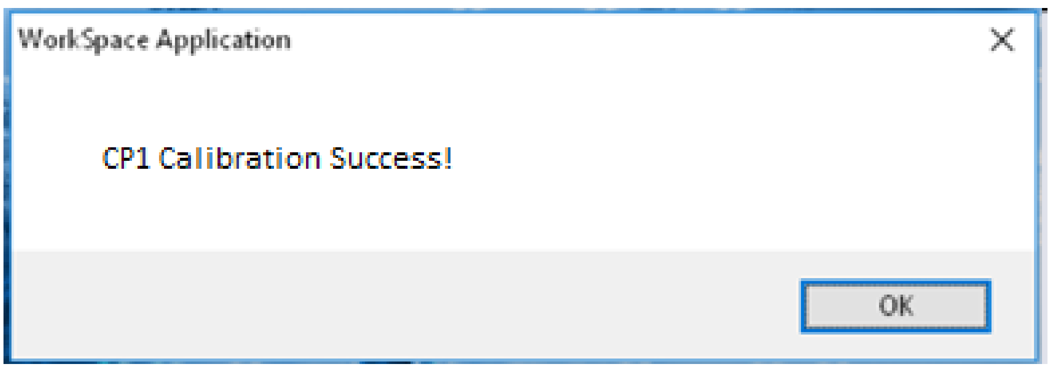
To affect a CP1, user selects the appropriate calibration set from the combo box beside the CP1 button. Then click the CP1 button.



Manually enter the calibration value, and click the OK button.



Click the OK button

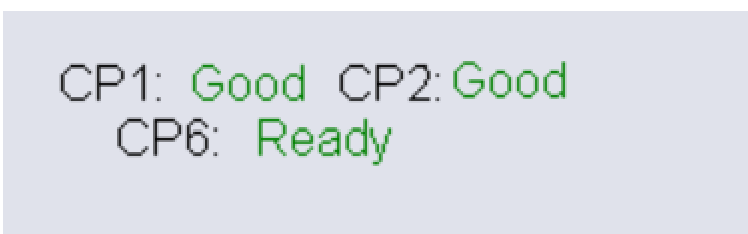


Click the OK button to dismiss

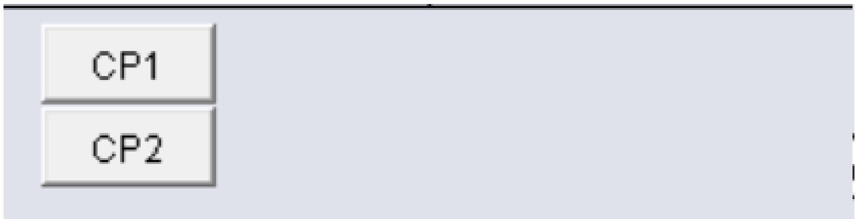
At any time, if a calibration is not successful, a message box will indicate the error message.

To affect a CP2, the procedure is similar to CP1. User selects the appropriate calibration set from the combo box beside the CP2 button. Then click the CP2 button and manually enter the calibration value.

After the calibration routines have executed, confirm all calibration point statuses are good

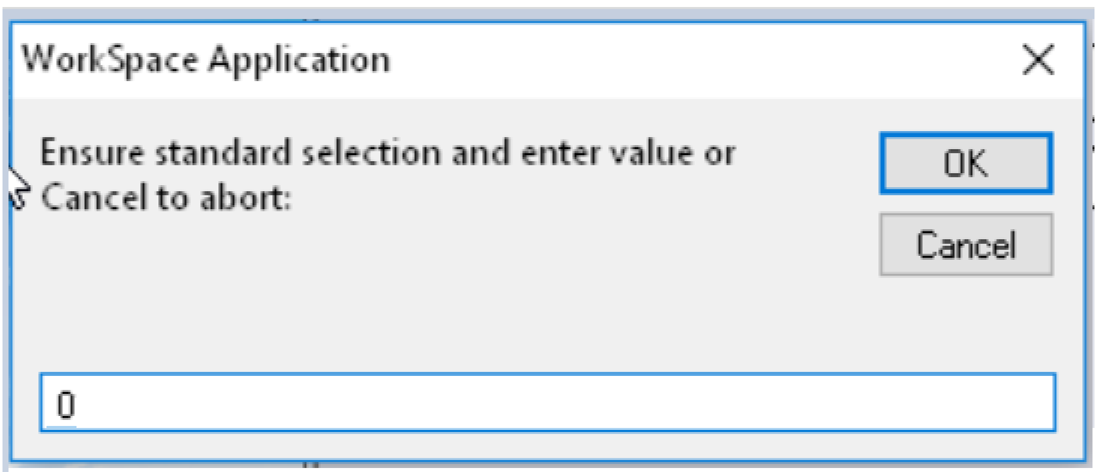


VisiFerm DO reusable probe

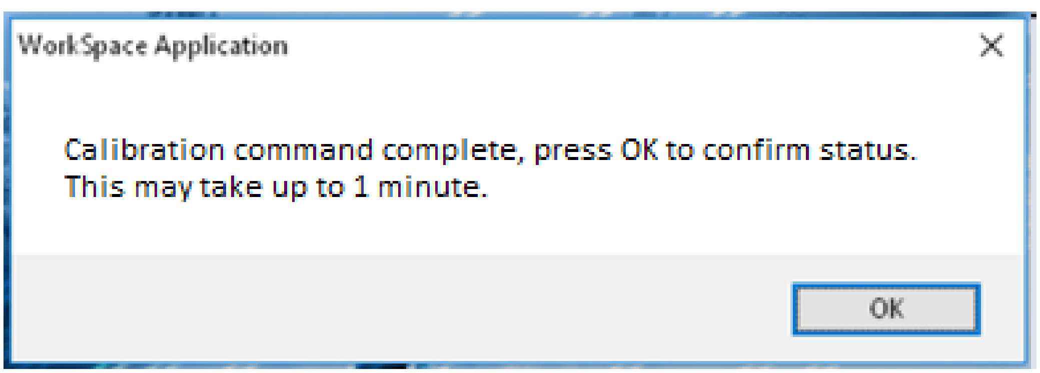


CP1 and CP2 calibration for Visiferm DO reusable probe is similar to the EasyFerm pH reusable probe with the exception that there is no calibration standard set. DeltaV graphics contains logic such that the calibration standard is hidden.

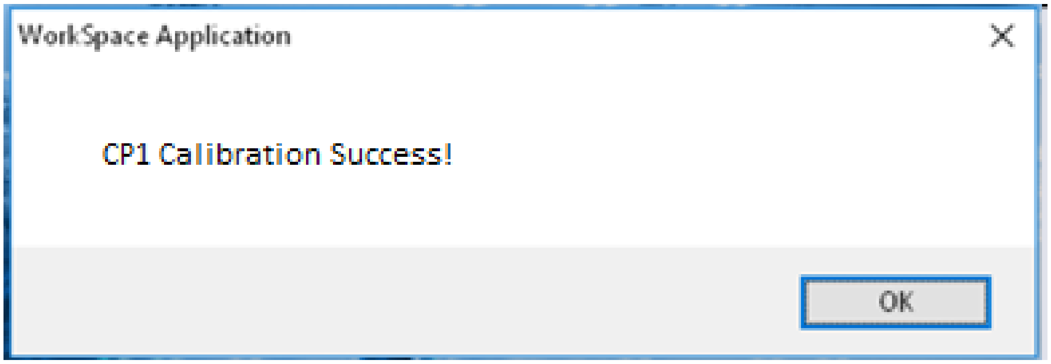
To affect a CP1, user selects the appropriate calibration set from the combo box beside the CP1 button. Then click the CP1 button.



Manually enter the calibration value, and click the OK button.



Click the OK button

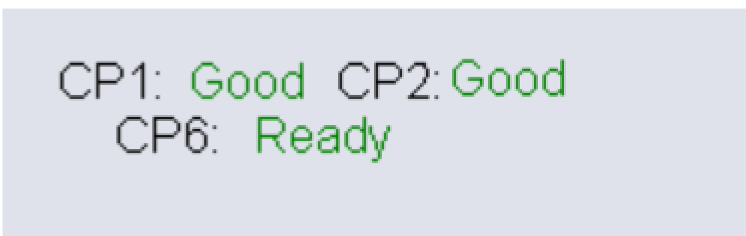


Click the OK button to dismiss.

At any time, if a calibration is not successful, a message box will indicate the error message.

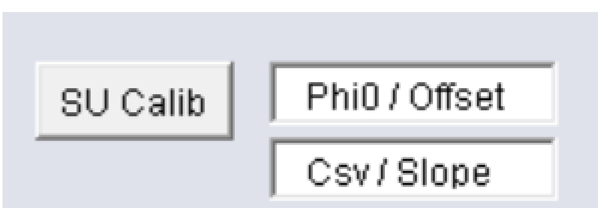
To affect a CP2, the procedure is similar to CP1. User clicks the CP2 button and manually enter the calibration value.

After the calibration routines have executed, confirm all calibration point statuses are good

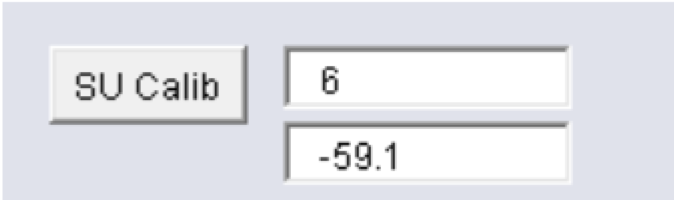


Calibration Constant Entry

To enter new calibration constants, determine the values from the single use sensor tag

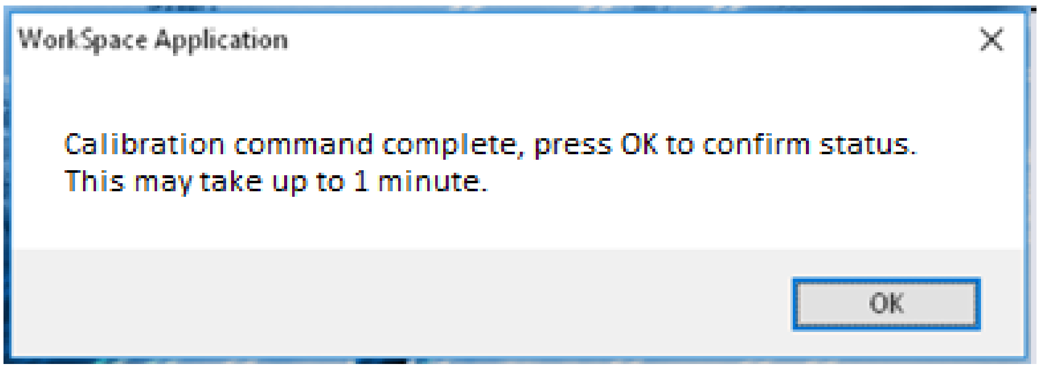


Enter in the appropriate values into the fields. For example, for OneFerm SU sensor, if the offset is 6 mV and the slope is -59.1 mV/pH then enter as below:

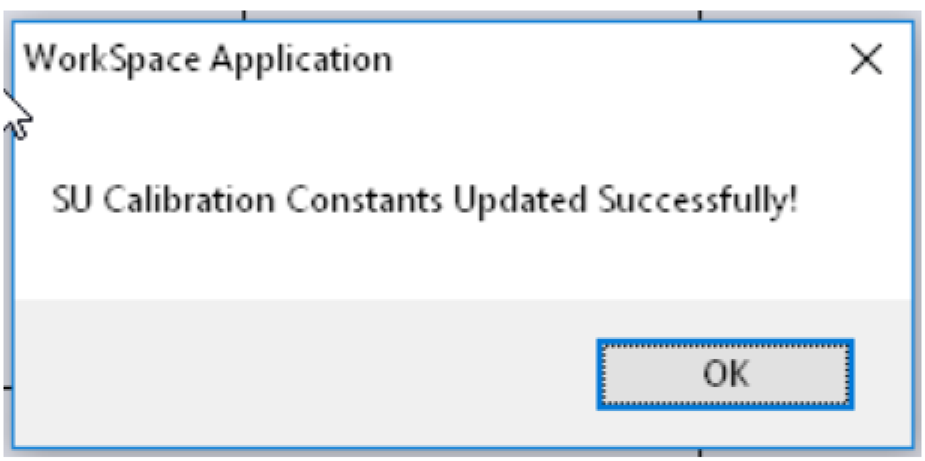


Click the SU Calib button.

After some time, a message indicating the command is complete is visible



Click the OK button. After a delay, a message box indicating success is visible.

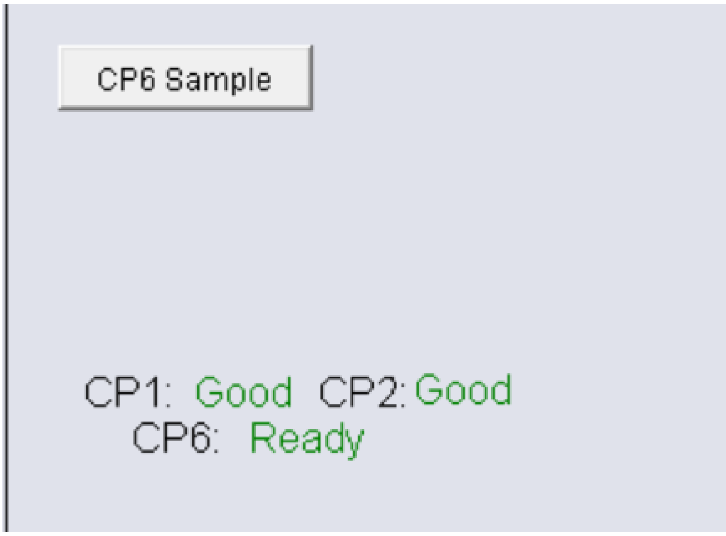


Click the OK button to dismiss.

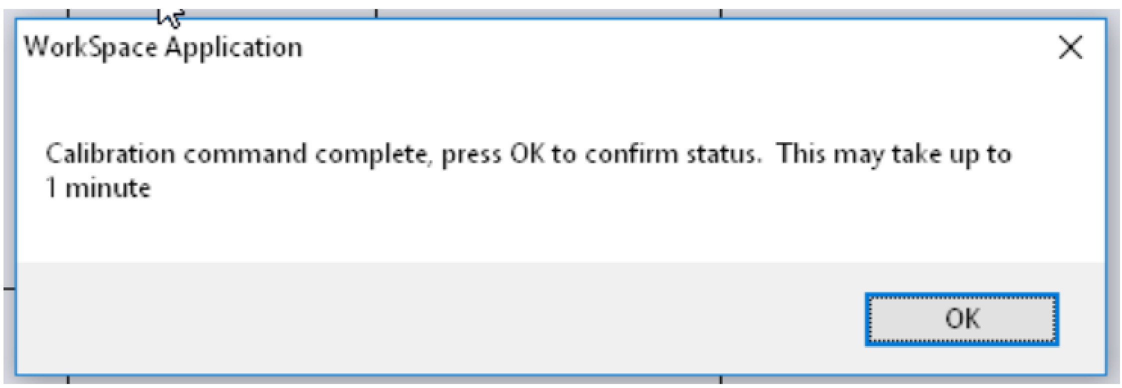
Product Calibration

A product calibration (CP6) is generally done performed during a running process to take into account changes in the ambient conditions, or to correct drift in a measurement. This is implemented as a single point calibration whereby a lab measurement is used to correct any errors.

To affect a product calibration, ensure that CP6 is Ready status, and click the CP6 Sample button. At the same time, take a sample for lab analysis

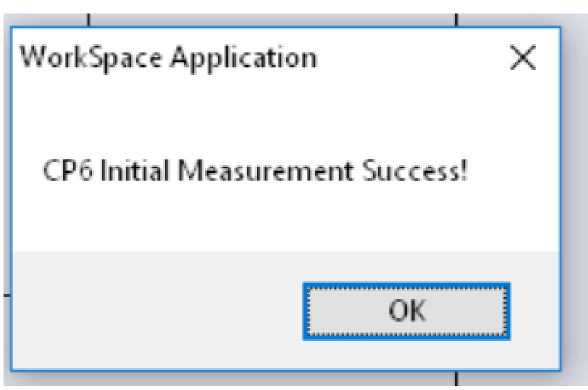


After a delay, a message indicating the calibration command is complete is visible

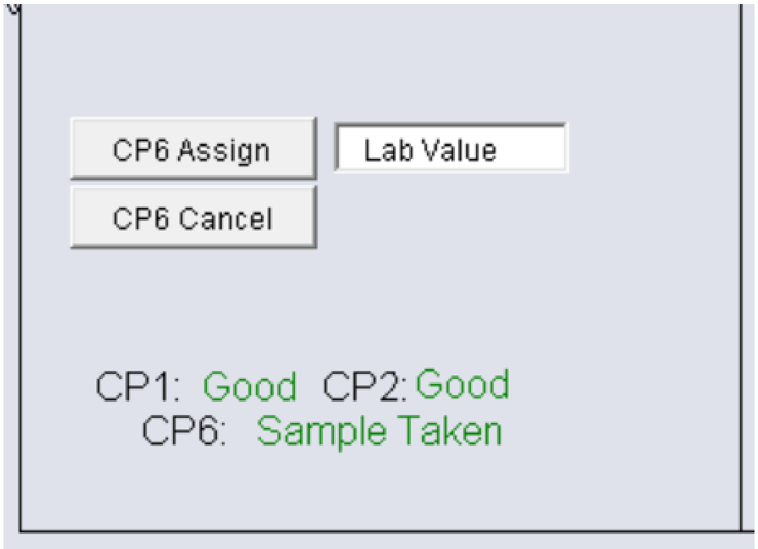


Click the OK button.

After a delay, a message box indicating success is visible

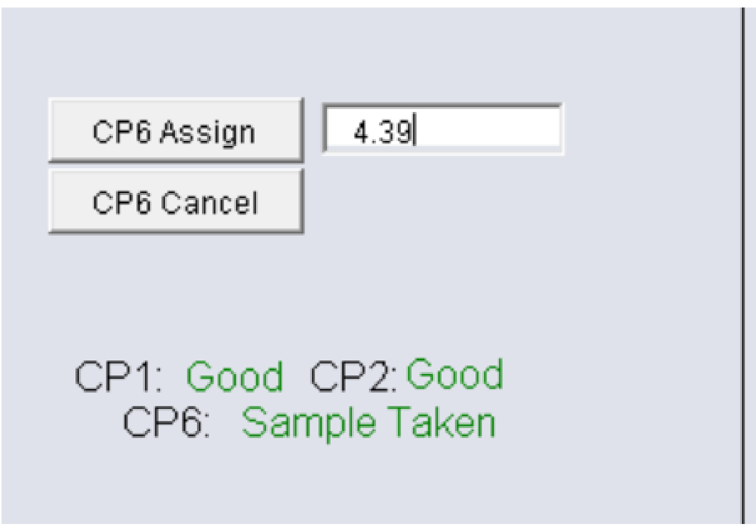


Click the OK button and observe CP6 status is Sample Taken

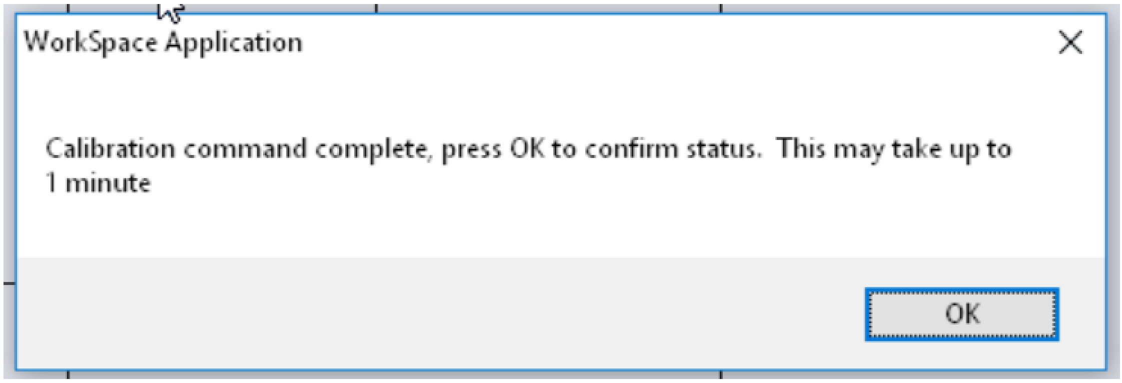


Analyze the sample in the lab.

In the Lab Value text box, enter the value as measured by the lab and click the CP6 Assign button

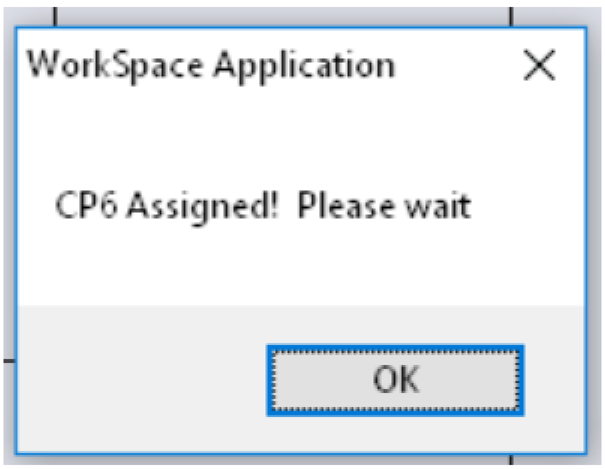


A message indicating calibration command is complete is visible

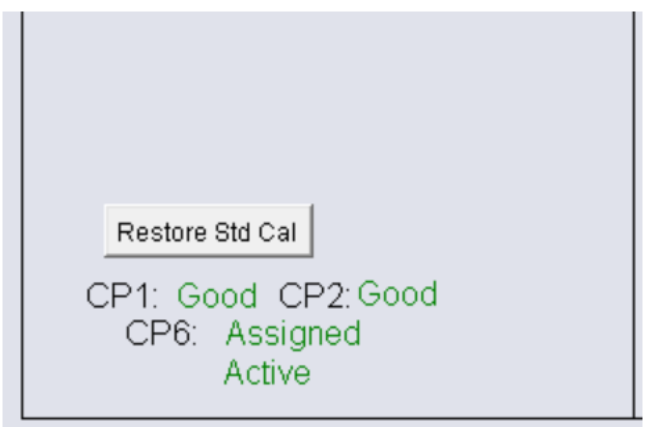


Click the OK button

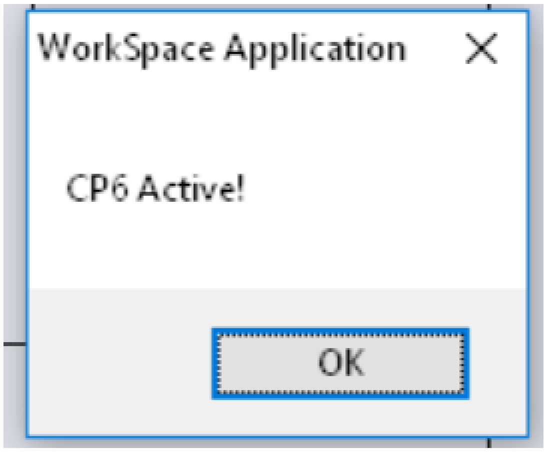
After a delay, a message box indicating success is visible



Click the OK button to dismiss, and observe that CP6 has 2 statuses associated with it. It is Assigned and it is Active



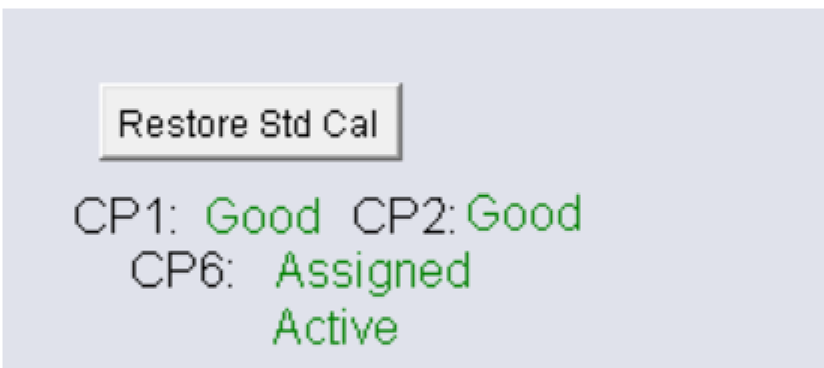
A second message box indicates that CP6 is active



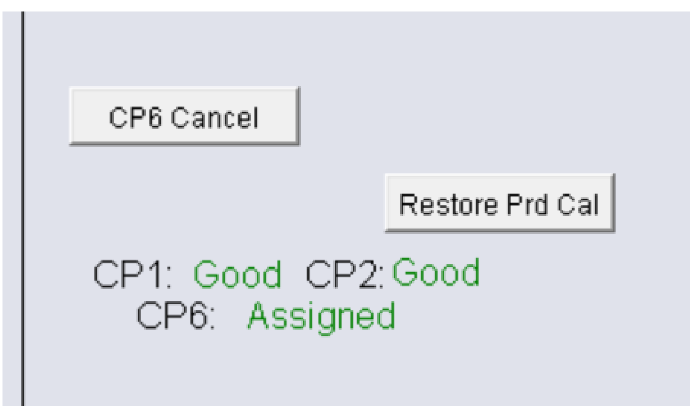
Click the OK button to dismiss

Restore Standard Calibration

To restore a previous standard calibration while running a product calibration, click the Restore Std Cal button



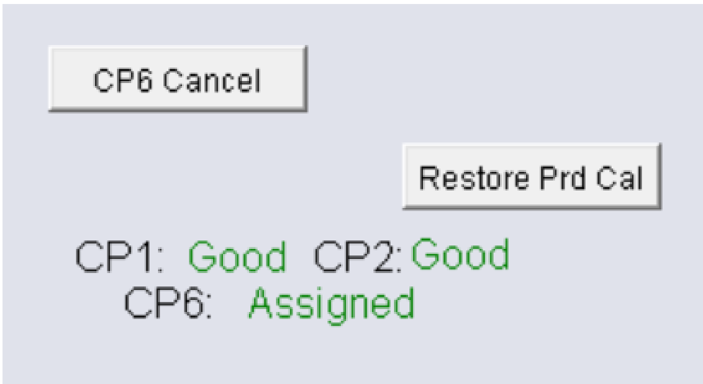
After some time, the status of CP6 will be Assigned but Active will not be visible. A Restore Prod Cal button will be visible



At this point, there is a valid product calibration available, however the probe is running on the previous standard calibration

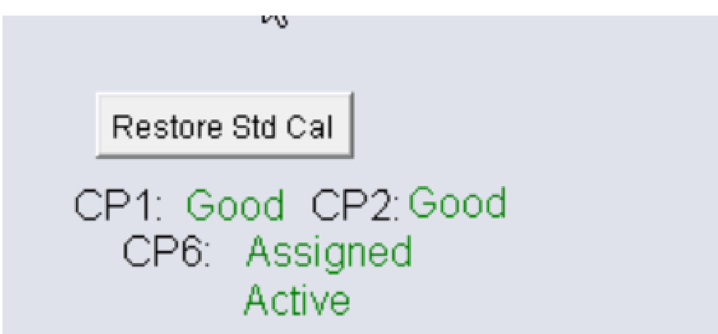
Restore Product Calibration

If a valid Product calibration is available, CP6 Status will be Assigned but Active will not be visible. Also a Restore Prd Cal button will be visible



To restore the Product Calibration, click the Restore Prd Cal button.

After a delay the Product calibration CP6 will be Assigned and Active



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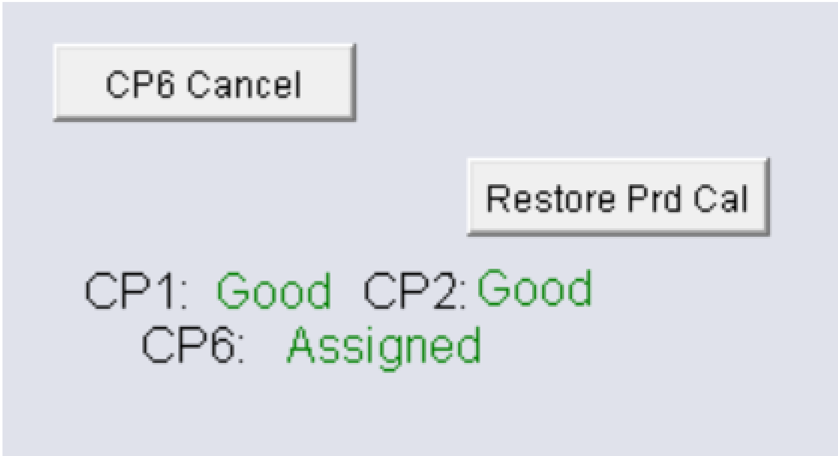
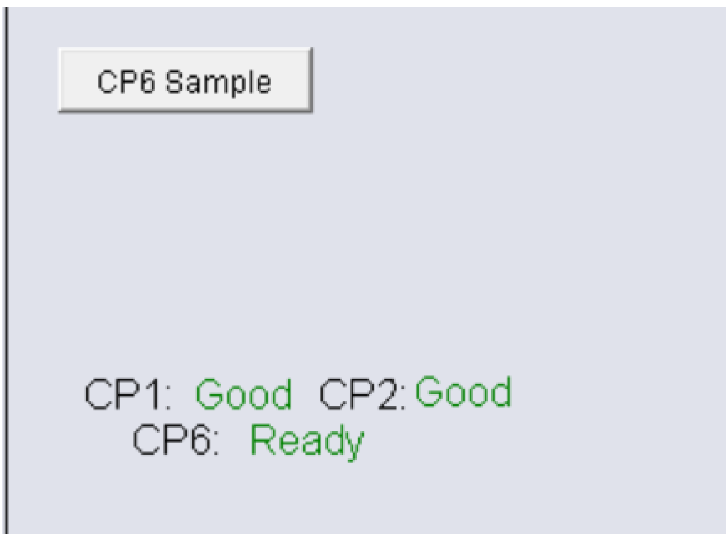
Cancel Product Calibration

To remove or cancel a product calibration that is in progress, use the CP6 Cancel button. Note that this button will only be visible when NOT running a product calibration. For example, if a standard calibration is running, but a product calibration is available, CP6 status will be Assigned but not Active



To cancel the product calibration, click the CP6 Cancel button



The CP6 will no longer be assigned.

Alarms

The following alarms are provided for:

1) MBLK_COMMS – Bad Modblk communications.
2) PRESSURE_PVBAD – Bad reading on the pressure sensor input. Indicates problem with pressure sensor element, or pressure sensor unplugged.
3) PROBE1_PVBAD – Bad reading for probe 1. This is a common alarm and could indicate bad communications, or internal status. To determine specific issue, user should open faceplate and detail to determine if the issue is communications, calibration, or probe measurement specific.
4) PROBE2_PVBAD – Bad reading for probe 2. This is a common alarm and could indicate bad communications, or internal status. To determine specific issue, user should open faceplate and detail to determine if the issue is communications, calibration, or probe measurement specific.

21 CFR Part 11 Compliance

The DeltaV module and graphics contain logic to ensure compliance with 21 CFR Part 11.

For most operations, critical operations are logged via the standard DeltaV Event Chronicle, using the module STATUS alarm.

Where an operation succeeds, the alarm priority is set to LOG, which is not captured by the operator facing graphics (i.e. no alarm will be visible on the faceplate).

Where an operation fails or causes a condition where the current probe reading is not confirmed valid, then the alarm priority is set to WARNING which is transiently displayed on the faceplate

Probe Pairing

A probe pair is performed using the pair button on the faceplate. Log messages after a successful pairing are then stored and can be viewed at a later date.

		Date/Time*	Event Type	Area	Node	Unit	Module*	Parameter	State	Level	Desc1	Desc2
1		5/13/2023 1:55:40.328 PM	EVENT	AREA_A	CTLR1	UNIT_A	MODBLK1	STATUS	INACT/ACK		ALARM	
2		5/13/2023 1:55:30.328 PM	EVENT	AREA_A	CTLR1	UNIT_A	MODBLK1	STATUS	ACT/ACK		ALARM	Probe 1 Paired, Tag:123-AE-456
3		5/13/2023 1:55:30.009 PM	CHANGE	AREA_A	WIN-5ES	UNIT_A	MODBLK1	RECORD_FLAG.CV			HENRY	NEW VALUE = 1, OLD VALUE = 0
4		5/13/2023 1:55:28.722 PM	CHANGE	AREA_A	WIN-5ES	UNIT_A	MODBLK1	RECORD_MSG.CV			HENRY	NEW VALUE = Probe 1 Paired, Tag:123-AE-456, OLD VALUE =

For the above example, the LOG message “Probe 1 Paired, Tag: 123-AE-456”

A failure of probe pairing will result in a transient alarm and message

		Date/Time*	Event Type	Area	Node	Unit	Module*	Parameter	State	Level	Desc1	Desc2
1		5/13/2023 1:14:18.359 PM	EVENT	AREA_A	CTLR1	UNIT_A	MODBLK1	STATUS	INACT/ACK		ALARM	
2		5/13/2023 1:14:08.359 PM	ALARM	AREA_A	CTLR1	UNIT_A	MODBLK1	STATUS	ACT/UNACK	11-WARNING	ALARM	Probe 1 Pairing failed, please retry
3		5/13/2023 1:14:08.009 PM	CHANGE	AREA_A	WIN-5ES	UNIT_A	MODBLK1	RECORD_FLAG.CV			HENRY	NEW VALUE = 1, OLD VALUE = 0
4		5/13/2023 1:14:07.355 PM	ALARM	AREA_A	CTLR1	UNIT_A	MODBLK1	STATUS	INACT/ACK	11-WARNING	ALARM	Probe 1 Pairing failed, please retry

For the above example, the WARNING message “Probe 1 Pairing failed, please retry” is shown in the event vie

Debug Mode Entry/Exit

On entry to Debug mode, a LOG message will be stored in the event chronicle:

		Date/Time*	Event Type	Area	Node	Unit	Module*	Parameter	State	Level	Desc1	Desc2
1		5/13/2023 2:08:08.320 PM	EVENT	AREA_A	CTLR1	UNIT_A	MODBLK1	STATUS	INACT/ACK		ALARM	
2		5/13/2023 2:07:58.320 PM	EVENT	AREA_A	CTLR1	UNIT_A	MODBLK1	STATUS	ACT/ACK		ALARM	Modblock now in Debug Mode
3		5/13/2023 2:07:58.007 PM	CHANGE	AREA_A	WIN-5ES	UNIT_A	MODBLK1	RECORD_FLAG.CV			HENRY	NEW VALUE = 1, OLD VALUE = 0
4		5/13/2023 2:07:56.008 PM	CHANGE	AREA_A	WIN-5ES	UNIT_A	MODBLK1	RECORD_MSG.CV			HENRY	NEW VALUE = Modblock now in Debug Mode, OLD VALUE =

The above message indicated “Modblock now in Debug Mode”

On leaving Debug mode, a LOG message will be stored in the event chronicle:

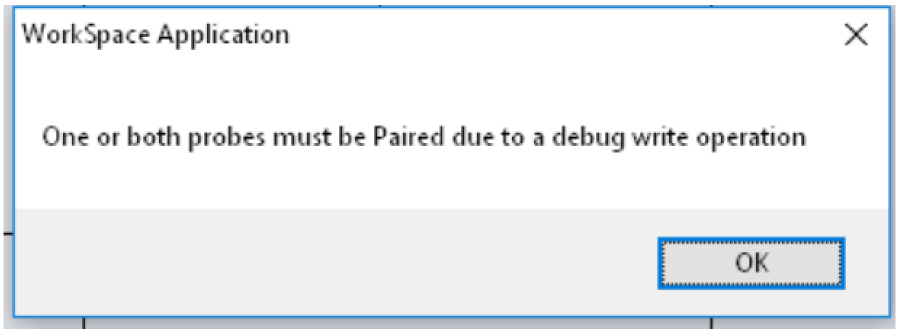
		Date/Time*	Event Type	Area	Node	Unit	Module*	Parameter	State	Level	Desc1	Desc2
1		5/13/2023 2:11:28.318 PM	EVENT	AREA_A	CTLR1	UNIT_A	MODBLK1	STATUS	INACT/ACK		ALARM	
2		5/13/2023 2:11:18.321 PM	EVENT	AREA_A	CTLR1	UNIT_A	MODBLK1	STATUS	ACT/ACK		ALARM	Modblock now in Normal Mode
3		5/13/2023 2:11:18.010 PM	CHANGE	AREA_A	WIN-5ES	UNIT_A	MODBLK1	RECORD_FLAG.CV			HENRY	NEW VALUE = 1, OLD VALUE = 0
4		5/13/2023 2:11:16.010 PM	CHANGE	AREA_A	WIN-5ES	UNIT_A	MODBLK1	RECORD_MSG.CV			HENRY	NEW VALUE = Modblock now in Normal Mode, OLD VALUE =

The above LOG message indicates “Modblock now in Normal Mode”

Debug Mode Write

If the debug interface was used to write a probe parameter, then the system will require a probe pair operation. The reason why is that is it impractical to track every possible register write, and some register writes will cause primary measurement values to change. For example if units or calibration constants are changed, these can greatly affect the probe reading.

On exiting Debug Mode (by pressing the Normal button) after any probe write, a message box will be displayed:



In addition, an alarm message will be displayed.

		Date/Time	Event Type	Area	Node	Unit	Module	Parameter	State	Level	Desc1	Desc2
1		5/13/2023 2:21:15.312 PM	EVENT	AREA_A	CTLR1	UNIT_A	MODBLK1	STATUS	INACT/ACK		ALARM	
2		5/13/2023 2:21:05.315 PM	ALARM	AREA_A	CTLR1	UNIT_A	MODBLK1	STATUS	ACT/UNAC	11-WARNING	ALARM	PROBE 1 pair required.
3		5/13/2023 2:21:05.008 PM	CHANGE	AREA_A	WIN-5ES	UNIT_A	MODBLK1	RECORD_FLAG.CV			HENRY	NEW VALUE = 1, OLD VALUE = 0
4		5/13/2023 2:21:03.312 PM	ALARM	AREA_A	CTLR1	UNIT_A	MODBLK1	STATUS	INACT/ACK	11-WARNING	ALARM	PROBE 1 pair required.
5		5/13/2023 2:21:03.014 PM	CHANGE	AREA_A	WIN-5ES	UNIT_A	MODBLK1	RECORD_MSG.CV			HENRY	NEW VALUE = PROBE 1 pair required. , OLD VALUE =

For the above example, the WARNING message “PROBE 1 pair required” is visible

Calibration Constant Entry

		Date/Time	Event Type	Cate	A	N	U	Module	Mo	Parameter	State	Level	Desc1	Desc2
1		5/13/2023 10:25:23.998 PM	EVENT	PRO	A	C	U	MODBLK1	Co	STATUS	INACT/A		ALARM	
2		5/13/2023 10:25:13.998 PM	EVENT	PRO	A	C	U	MODBLK1	Co	STATUS	ACT/ACK		ALARM	Probe 2 Calibration successful at (Phi0/Offset, SternVolmer/Slope): 6.8, -59.04

A LOG message indicating the calibration constants and their values is logged

If the calibration constant entry fails, a WARNING message is logged.

CP1/CP2

		Date/Time	Event Type	Cate	A	N	U	Module	Mo	Parameter	State	Level	Desc1	Desc2
1		5/13/2023 10:25:23.998 PM	EVENT	PRO	A	C	U	MODBLK1	Co	STATUS	INACT/A		ALARM	
2		5/13/2023 10:25:13.998 PM	EVENT	PRO	A	C	U	MODBLK1	Co	STATUS	ACT/ACK		ALARM	Probe 1 CP1 Calibration at: 4

For CP1 or CP2, a LOG message indicating the calibration point (CP1 or CP2) is shown in addition to the calibration value.

CP6

Each CP6 command (Sample, Assign, or Cancel) is logged. For example, a LOG message indicating a sampling:

		Date/Time	Event Type	Cate	A	N	U	Module	Mo	Parameter	State	Level	Desc1	Desc2
1		5/13/2023 10:25:23.998 PM	EVENT	PRO	A	C	U	MODBLK1	Co	STATUS	INACT/A		ALARM	
2		5/13/2023 10:25:13.998 PM	EVENT	PRO	A	C	U	MODBLK1	Co	STATUS	ACT/ACK		ALARM	Probe 1 CP6 Sample Taken

For an assignment, the lab measured value is indicated:

		Date/Time	Event Type	Cate	A	N	U	Module	Mo	Parameter	State	Level	Desc1	
1		5/13/2023 10:25:23.998 PM	EVENT	PRO	A	C	U	MODBLK1	Co	STATUS	INACT/A		ALARM	
2		5/13/2023 10:25:13.998 PM	EVENT	PRO	A	C	U	MODBLK1	Co	STATUS	ACT/ACK		ALARM	Probe 1 CP6 Assigned at: 4.1

If the CP6 command fails, a WARNING message is logged

Restore Product Calibration/Restore Standard Calibration

Both the calibration restore commands are logged. For example, a LOG message indicating a Restore Product Calibration

		Date/Time	Event Type	Cate	A	N	U	Module	Mo	Parameter	State	Level	Desc1	
1		5/13/2023 10:25:23.998 PM	EVENT	PRO	A	C	U	MODBLK1	Co	STATUS	INACT/A		ALARM	
2		5/13/2023 10:25:13.998 PM	EVENT	PRO	A	C	U	MODBLK1	Co	STATUS	ACT/ACK		ALARM	Probe 1 Restored Product Calibration

Similarly for restore Standard Calibration:

		Date/Time	Event Type	Cate	A	N	U	Module	Mo	Parameter	State	Level	Desc1	
1		5/13/2023 10:25:23.998 PM	EVENT	PRO	A	C	U	MODBLK1	Co	STATUS	INACT/A		ALARM	
2		5/13/2023 10:25:13.998 PM	EVENT	PRO	A	C	U	MODBLK1	Co	STATUS	ACT/ACK		ALARM	Probe 1 Restored Standard Calibration

If the command fails, a WARNING message is logged

Tare

The DeltaV Module Parameter PCMD_TARE change event indicates a tare occured