Newflow

NÅNO

Liquid Flow Computer Application

Configuration & User Manual

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5	13-Nov-2023	Application Ref: 2v0r0	GPL	MOB	MPFJ
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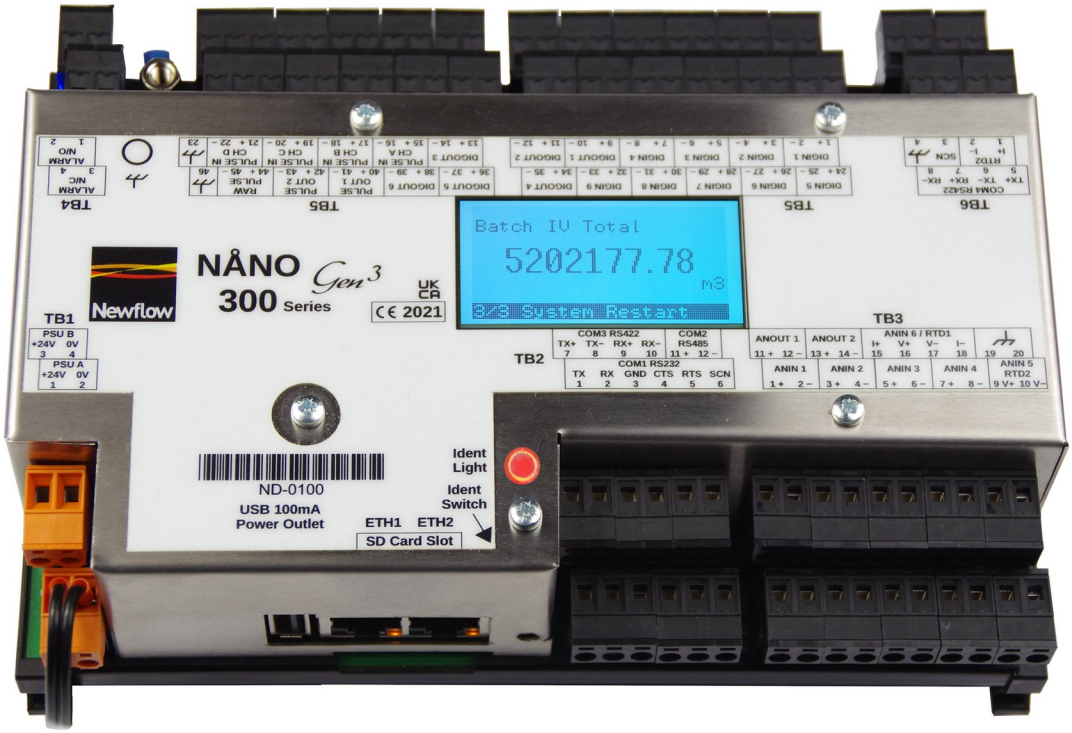
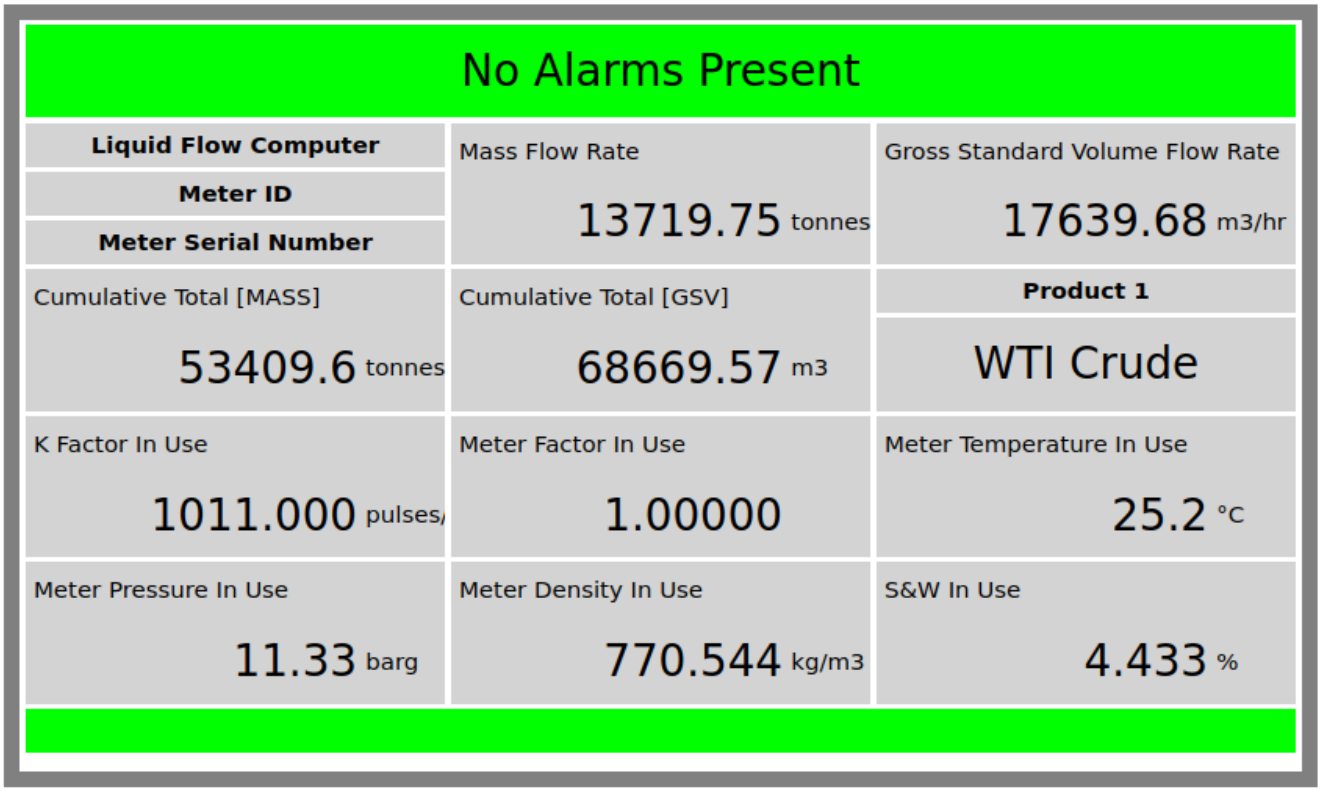
MMXXIII

Base Build



Build with Optional Lid Display


No Alarms Present
Liquid Flow Computer
Meter ID
Meter Serial Number
Mass Flow Rate
13719.75 tonnes
Gross Standard Volume Flow Rate
17639.68 m3/hr
Cumulative Total [MASS]
53409.6 tonnes
Cumulative Total [GSV]
68669.57 m3
Product 1
WTI Crude
K Factor In Use
1011.000 pulses/
Meter Factor In Use
1.00000
Meter Temperature In Use
25.2 °C
Meter Pressure In Use
11.33 barg
Meter Density In Use
770.544 kg/m3
S&W In Use
4.433 %

Operational Overview

This application is designed for use with Volumetric or Mass pulse based meters such as Turbine, PD, Ultrasonic or Coriolis meters.

Features

This application is expecting to receive liquid Volume or Mass flow pulses from a single meter.

- Can be integrated with the NÅNO Station Application.
- Volume correction for Crude & Refined Products, API MPMS Ch 11.1 2007 and 1980, Tables A & B, NGL with TP27/API 11.2.4 & TP15, and water.
- Multi-product, up to 12 individual product types with MF per product.
- Baseline & Proved meter factors management per product, MF curve per product or a Reynolds number corrected MF can be applied when used with an Endress+Hauser Promass 300 Coriolis meter. An override value can also be selected.
- Single 10 Point K-Factor linearization with override.
- Both Pulse Fidelity and Line Integrity options can be selected.
- Support for a Fast Loop or Header density meter, with separate T & P corrections.
- PID analog output based upon either the Main flow meter flow rate or to control the Fast Loop (slipstream or bypass) flow rate.
- Web Browser Mimic and optional Local Panel with configurable security for meter technician interface.
- Built in data logger and graphical trending display with download capability for spreadsheet analysis.
- Batch initiation via website, Modbus, XML comms, Local Panel display, digital input or calendar events.
- Support for Single or Dual samplers.
- Sophisticated alarm system with critical data logging and additional user configurable Alarms.
- Densitometer interface with a range of inputs. These can be analog, period mode (with Solatron calibration constants) or Digital Communications from a Coriolis meter.
- Snapshot report with instantaneous values and a selectable rolling average period for Density, Temperature & Pressure (for pycnometer verification).
- Powerful diagnostic capabilities.
- QR codes on manual batch operation (ended on the Local Panel or Site Panel Mimic on the Web Browser).
- NTP time synchronization.
- Low frequency cut off for meter input.
- Fully integrated with the Unified Prover Application.
- Modbus, XML and OPC-UA.
- Support for multiple printers, serial and networked, and reports can automatically uploaded to an FTP site, and the optional SD Card.
- Virtually unlimited Report Storage.
- User Configurable Alarms and Auxiliary Alarms.

- Browser based PC interface for programming. No special software needed.
- Metrology constants checksum for validation.
- Multiple User Level logins with a hardware enforced Metrology level.
- Hourly, Daily, Monthly, Batch, Proving and Meter Tech reports.

Table of Contents

1 Introduction

This application is one of a range designed specifically for fiscal measurement of Oil & NGLs utilizing pipelines. The list below however is not exhaustive:

► Liquid Flow Computer Application	Designed for use with Volumetric or Mass pulse based meters such as Turbine, PD, Ultrasonic and Coriolis meters
► Unified Prover Application	For use with all captive piston Provers as well as Bi-Directional Provers
► Master Meter Application	Designed for use with pulse based meters for Mass to Mass, Mass to Inferred Mass or Volume to Volume proving modes.
► LACT-Pro® Metering Application	Flow Meter based Truck Loading Applications and off-loading to day tanks with measurement of produced water
► LACT-Pro® Tank Application	Loading using gauging from Bullet & Cylindrical tanks
► LACT-Pro® Scales Application	Weighbridge tanker loading
► LACT-Pro® PI	For pipeline injection

In addition to this manual, a range of further documentation is available, which includes:

- NÅNO Installation Manual
- NÅNO XML Comms Manual
- Liquid Flow Computer Modbus Manual
- Master Meter Modbus Manual

1.1 Prover Integration

The NÅNO Liquid Flow Computer can operate in "Standalone" mode where the meter factors for each product are downloaded to the NÅNO from a DCS or HMI. These can either be downloaded as a single MF per product or, if the MF Curve option is selected, can be a MF curve per product. The prover could be a NÅNO Prover (using Small Volume Provers, Ball Provers or Master Meter Proving) or a 3rd party prover. In "standalone" mode, the Meter Factor management will be undertaken by the DCS or HMI package, and the NÅNO Liquid Flow Computer will accept what ever Meter Factors are downloaded to it.

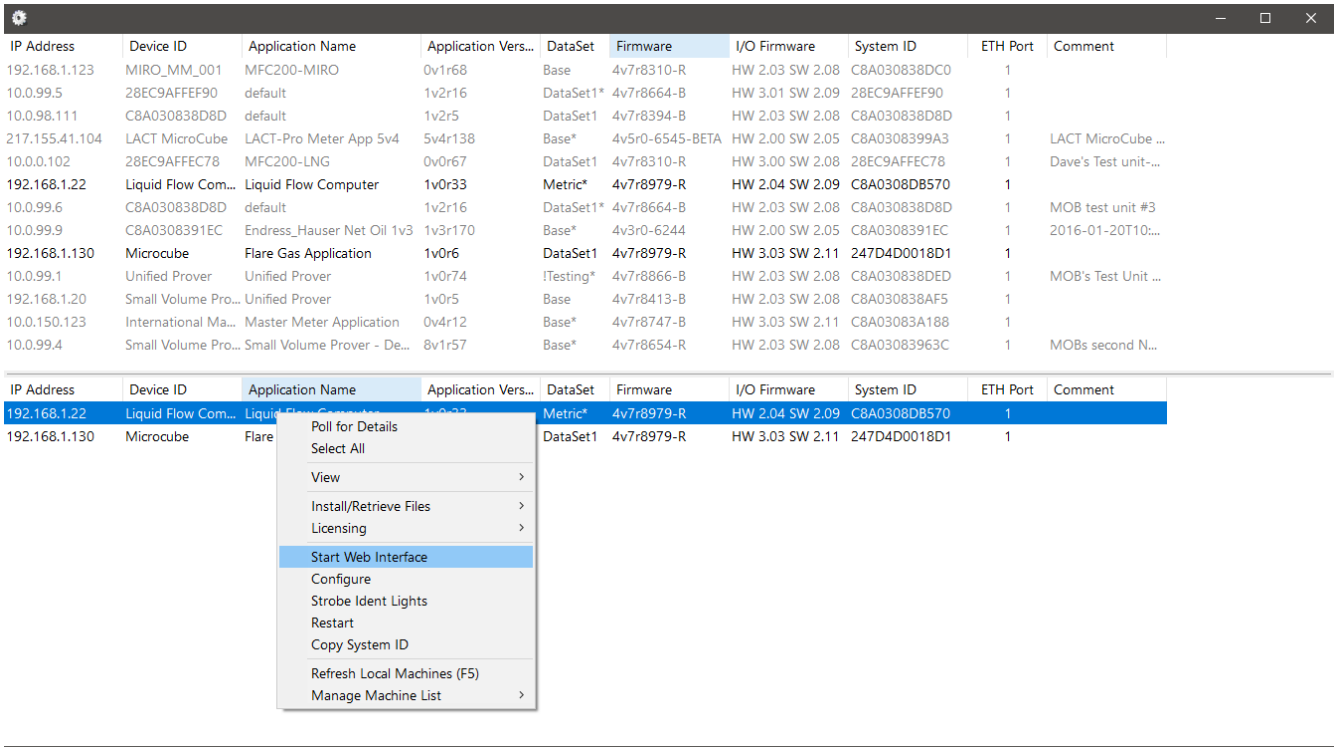
It can also operate in “System” mode where baseline meter factors are programmed into the Liquid Flow Computer application. However, when connected to a NÅNO Prover application, the product information and live process values are passed to the Prover application via a dedicated Ethernet comms link. The link also allows the prover to turn on the prover pulse bus on the relevant Liquid Flow Computer.

Finally once a prove is completed, as long as it was repeatable, the proved meter factor will then be passed back to the relevant Liquid Flow Computer to allow it to either automatically accept/reject that meter factor or to prompt the user to make that decision.

2 Loading the Application

If the required version of the Liquid Flow Computer Application is already loaded into the NÅNO and the IP address of the unit is known, then skip this section and proceed to Section 3 Configuration Overview.

Loading of applications, and a host of additional tasks, can be accomplished with the NÅNOConf program. Please refer to the NÅNOConf manual (NANOConf-UM) for further information.



3 Configuration Overview

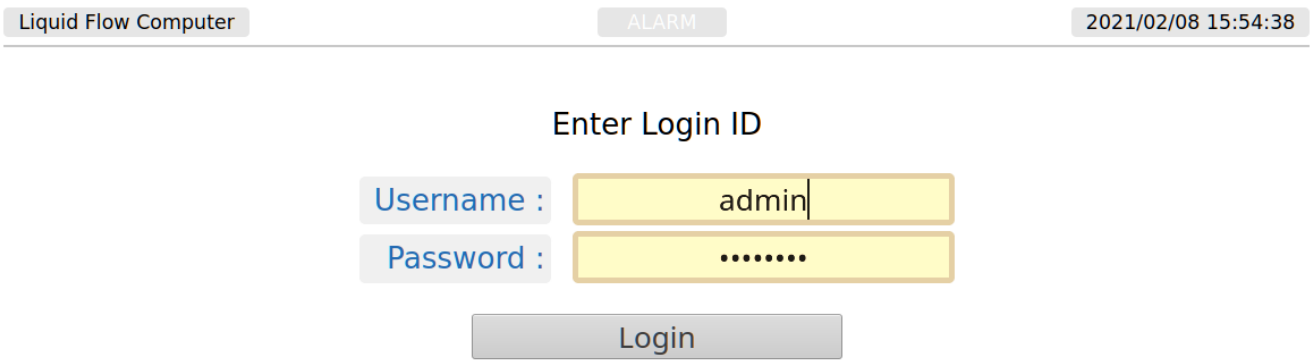
This section of the manual assumes that the Liquid Flow Computer application has been installed, and the IP address of the machine is known. This document explains how the application is configured to match the site.

There are a number of site specific options that need to be configured before the NÅNO will provide useful results. These options can be grouped as:

- Choose if an integrated NÅNO Prover is used, or if a DCS / HMI utilized.
- Initial Site report data, such as the Site Owner/Operator, Reference, Location and Device ID
- System Setup - these NÅNO specific items include Network Settings, Printers, Time & Date
- User Information - allows additional users & technician login details to be added / configured
- Configuring the measurement units to be used
- Matching the application to the site Piping and Instrumentation Diagram (P&ID)
- Setting the I/O assignments - these have rational default values, but may be changed to suit local wiring requirements, or for fault diagnostic purposes
- Product Configuration - setting up the parameters for up to 12 products
- Prover Integration
- Final Field Set-up and Analog Calibration, if applicable
- Back-up the configured application and print or download the constants log

The following configuration sequence is recommended, but not obligatory. The menu structure is dynamic, and as items are selected or deselected, associated information may appear or be hidden.

Once you had identified the physical NÅNO using the NÅNOConf deployment tool, you can right click on the unit you wish to set-up and select "Start Web Interface". Alternatively, take a note of the IP address, open a web browser (Firefox, Chrome or Safari are preferred), type the NÅNO's IP address into the browser's address bar and press ENTER.



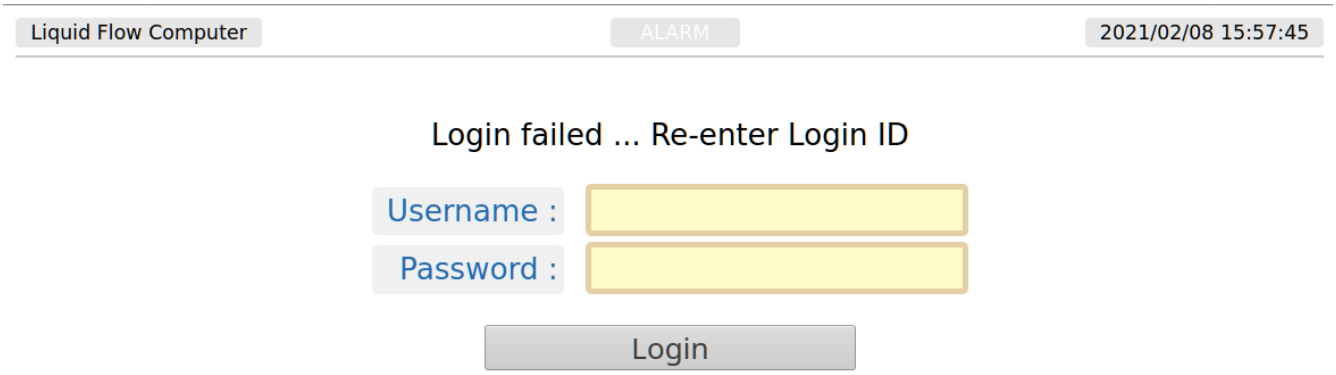
The default Login screen will be displayed, as shown above.

Unless someone has already configured the machine, and changed the login credentials, the user name will be **admin**, and the password will be **00000000** (that is the number zero repeated 8 times).

After typing the password, you can press the 

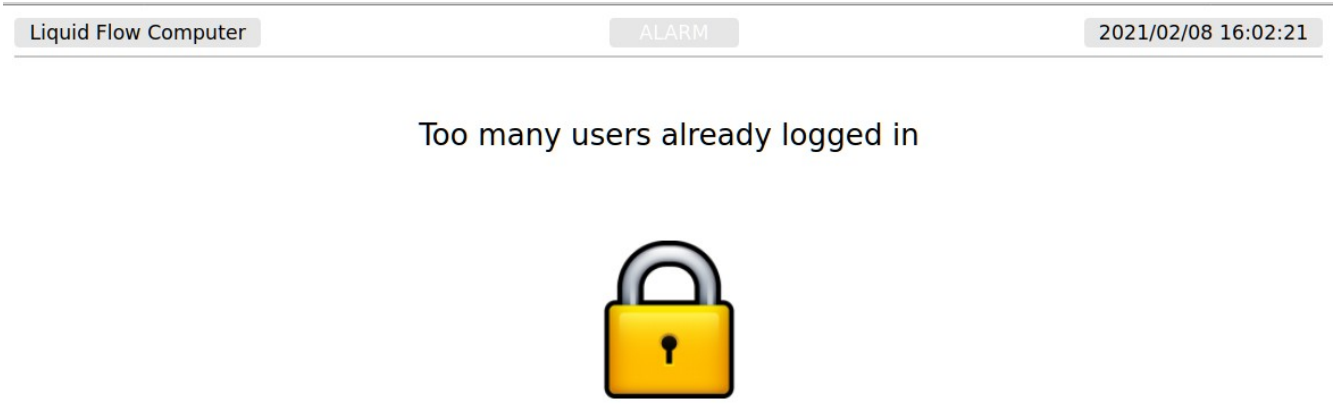
key on the keyboard, which works with most browsers or click the Login button, which will work for all browsers.

If the Password and/or Username have been changed from the default, then you will see this:



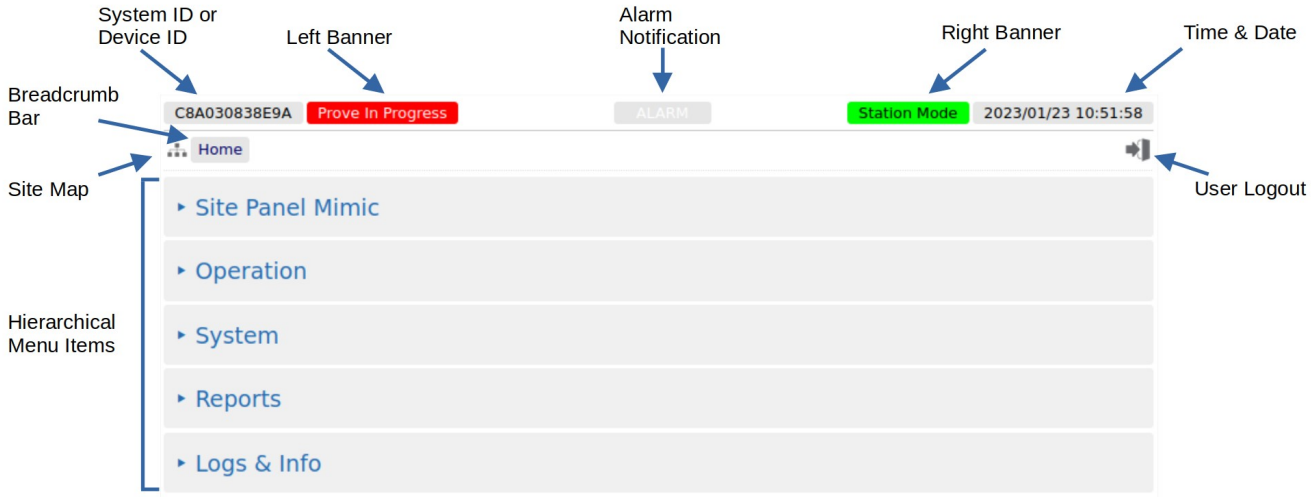
NOTE: If the Password & Username combination for the machine cannot be determined, there is no back-door method of logging into the NÅNO. The passwords cannot be recovered, but the machine can be reset to factory defaults but this will remove the application, and stored reports. The SD Card information is preserved.

NOTE: The maximum number of concurrent web browser connections is 4. If this is exceeded, a lock icon will be displayed and the message "Too many users already logged in" shown.

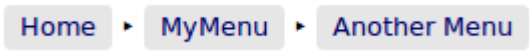


Assuming that the user limit has not been exceeded and you login correctly, then the home screen will be displayed.

NOTE: The home screen below is just an example screen used to highlight the various screen areas and icons. For any particular application, the System ID or Device ID will be different, as will the Hierarchical Menu Items. However the position and layout of the home screen will be similar.



System ID / Device ID	The System ID / Device ID is configured in the application. The Device ID is initially unset, so the System ID (the MAC Address) is shown to ensure each machine is unique, but can be changed by administrator level users in the Home ▸ System ▸ Initial Setup ▸ Site/Location Setup Menu.
Left Banner and Right Banner	These areas are used to give information to the user of modes or operation. In the example above, the left banner is showing that a prove is in progress and the right banner is showing that some settings and operational control is being performed by a NÅNO running the station application.
Alarm Notification	Clicking on this item will take you to the Alarms page. The color of the alarm indicator shows the current alarm status: Flashing red - there are unaccepted alarms. Solid red - there are only accepted but not cleared alarms. Grey - there are no alarms present.
Time / Date	This area of the screen displays the current machine time. Clicking on this item will jump to the Time / Date settings page (see Section 5.1 Time / Date).
Site Map	Clicking this icon takes you to a page showing all of the displays. The menu structure is dynamic and as items are selected or deselected, associated configuration information may appear or be hidden. This enables rapid navigation of the display tree, for users who are familiar with the layout of the data and sub menus. It is possible to get all menu entries in no more than two clicks, using the site-map feature.

Breadcrumb Bar	This navigation aid shows the hierarchical location of the current page:  Clicking on any of the breadcrumb items will jump to the relevant page.
User Logout	Clicking this icon immediately logs out the current user and returns you to the default login screen.
Sub Menu	A line on the menu with a leading triangle ▶ is the entry to the next sub menu. Clicking on a sub menu line will take you to the next level in the Hierarchical Menu. The browser "back" button will take you back up a level.
Data Point	The left hand side will show the name of the display point and the right hand side will show the current value of this data. **NOTE:** The home screen does not have any Data Points, only Sub Menus.
Gear Icon	A blue gear icon indicates that the value of the Display Point can be edited by the current user. If the gear icon is gray, this indicates that the display point can be edited, but the current user does not have the required user level. If no icon is show, the display point is read-only and shown for information only.

3.1 Conventions used in this manual

The browser can show a range of different screen types, such as menus, items names and associated value or status, dialog boxes for editing parameters, previews of reports, and other types of pages.

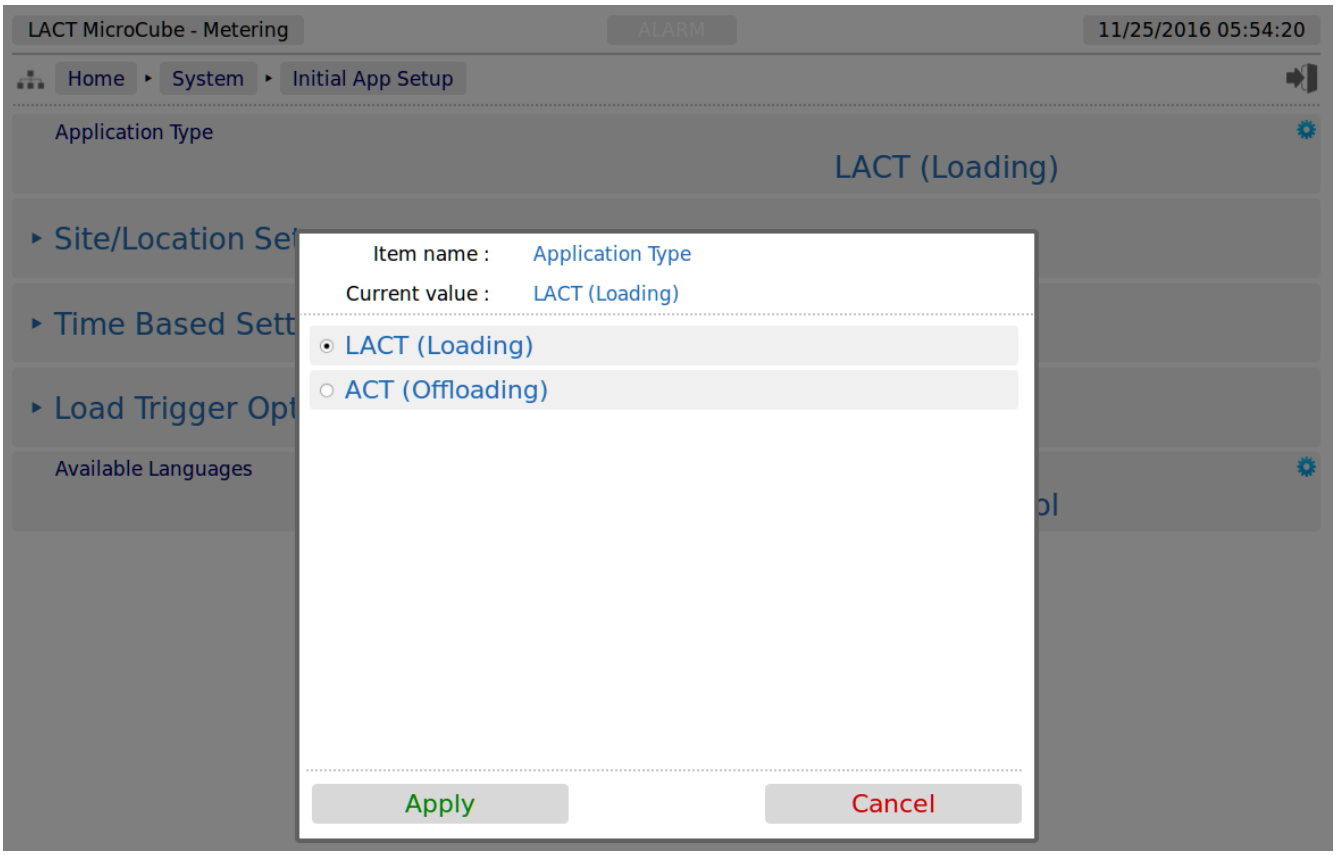
When a data point is being described in this manual, it will be shown in Bold Italics, as is ***Application Type*** in the next paragraph.

Menu locations will be shown as Home ▸ System ▸ Initial Setup in this manual.

Any line which has a gear icon at the end of the line, is an editable line.

Clicking anywhere on a line with the gear icon will open an edit dialog box. The original web page is now grayed out and the appropriate dialog box overlays the background.

The type of dialog depends upon the context. For example, If you navigate to Home ▸ System ▸ Initial Application Setup and click the top line ***Application Type*** will open a Radio Button dialog box, which only allows one choice from several options. This type of dialog box is shown below.



This radio button type dialog box only has two choices, click the line that matches your requirement and click on the ***Apply*** button, to make the selection, or ***Cancel*** to lose any change made.

There are a range of other dialog boxes, for example the Edit value dialog box shows the name of the item being edited (Item name) and it has a large data entry entry area. In the screenshot below, the value "Old Company Name" is being replaced with "New Corporation Name".

The user can now accept the new value by clicking the green ***Apply*** button, or reject the changes by clicking the red ***Cancel*** button, at which point the Edit value dialog box closes and the main screen is displayed as normal.

NOTE: If you have changed the Device ID, you will need to refresh the page view before the System ID/Device ID Name on the top Left Hand Side of the screen will be updated.

NOTE: The format of the data entered is checked, but not the validity of that data. In the case of the Device ID, the format is free and you can enter any numbers, characters or Unicode Symbols as you wish, up to the equivalent of 32 ASCII characters.

3.1.1 Editable data points with the wrong User Permissions

The Liquid Flow Computer application uses 3 different User Permissions, Technician, Admin and Metrology.

3.1.1.1 Technician

The Technician login level is used for the Digital I/O Debug facility and also the analog Bias values.

3.1.1.2 Admin (Administrator)

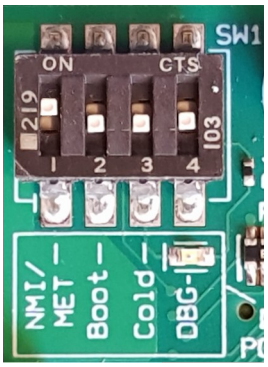
An Admin level user login is provided by default with a default password. Many organizations will require the default password to be changed but note that if the Admin Password is lost, there is NO backdoor into the machine, nor will you be able to backup or retrieve either the metering data or the configuration. See Section 5.4 User Info for more information on User configuration.

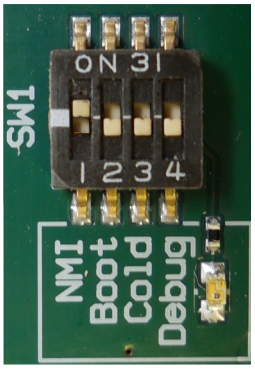
An administrator can change all data points that are not critical to the measurement integrity. These points are Alarm Levels, Location Names, Meter serial number and similar information. In addition and administrator is able to perform the routine tasks, such as ending a batch, changing the product type, requesting a prove (when a system Prover is configured) as well as retrieval of reports, alarms and log.

3.1.1.3 Metrology

A user running at the Metrology level (with the hardware enforcement switch bit 1 ON) is able to change both the Metrology sensitive data and any data points accessible to an Administrator.

Since an Administrator can create users with the Metrology level, at first sight it may appear that the Metrology level does not offer any additional security. This however is not true, because in addition to the login level, Switch 1 Bit 1 labelled as NMI (or MET) must be in the ON position (upwards) as shown in the photographs below.





Or

Once the application has been configured, a Metrology Officer is able to set SW1 Bit 1 to the OFF position (downwards in the images above). The enclosure lid can then be replaced and sealed. Logging in as Metrology with the switch off gives Admin level properties, and data points that needed Metrology level access will show a gray gear icon as shown in the screenshot below.

NOTE: If logged in at Metrology level but the NMI/MET switch (Switch 1 Bit 1) is in the OFF position (downwards) a warning will be shown in the right banner as shown below. If in Station Mode and the NMI/MET switch is OFF, the banner will alternate between the Station Mode status and Met. Switch OFF notification

4 Stage 1 of 5: Initial Application Setup

NOTE: The following configuration sequence is recommended, but not mandatory. The menu structure is dynamic, and as items are selected or deselected, associated information may appear or be hidden. The Initial Setup screen is sub-menu of the System screen.

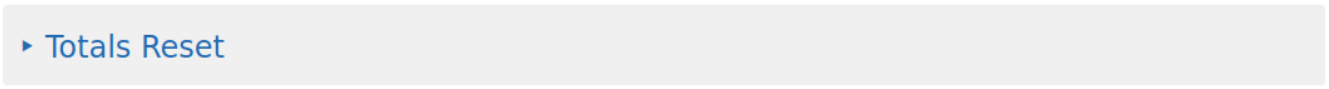
The default or home page that will be displayed in the browser is shown below:

Site Panel Mimic	This is a mimic of the Local Panel and can be used to support and train operators. In addition it will also mimic the Technician menus and any other Local Panel screens.
Operation	This is where the routine functions performed by an operators are grouped, such as changing product in-use and setting a batch end.
System	This is the entry point to the system configuration sub-menus.
Reports	This section will contain all of the reports produced by the Application.
Logs & Info	All the information supplementary to the reports will be found in the section.

To start the configuration, click the line containing the ▸ System sub menu. This will take you to the top of the System menu page Home ▸ System.

This menu is shown on the next page.

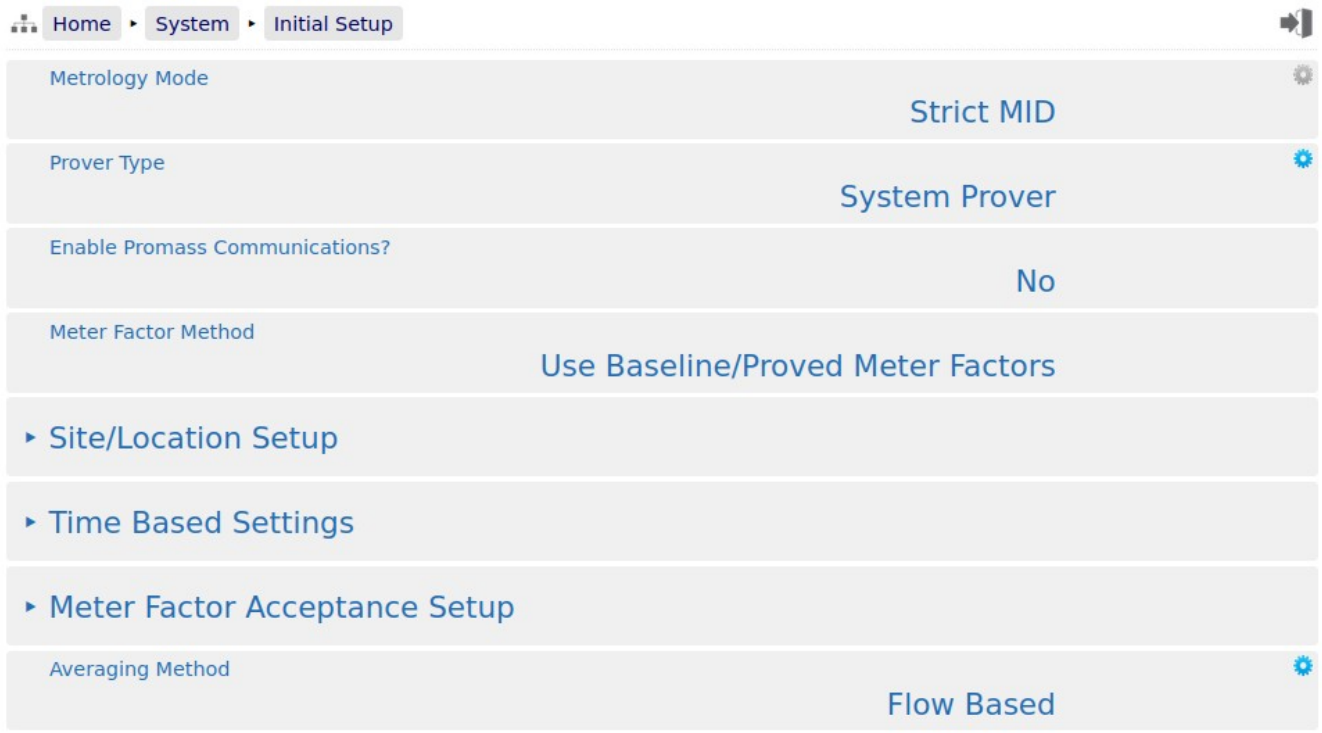
If ***Metrology Mode*** in Home ▸ System ▸ Initial Setup is set to ***API*** an additional menu entry (shown below) is added to allow the totalisers to be reset (additional security can be enabled for a reset to take place).



On this menu, click the top line, ▸ Initial Setup to start the configuration process.

4.1 Initial Flow Computer Setup

If set to System Prover;



If set to Standalone Prover;

Metrology Mode	There are two options, ***API*** or ***Strict MID***, selectable using the radio buttons. **API**: The application will meet the API requirements and have the following additional features available: - DCF/DMF input - Single point bias adjustment for Analog values - Field Calibration to allow loop calibration to be performed on site - An S&W Input - Ability to reset the Cumulative Totalisers **Strict MID**: The Application can be configured to be suitable for European MID compliance.	**M**
Prover Type	There are two options, ***Standalone Prover*** or ***System Prover***, selectable using radio buttons: **Standalone Prover**: With this option selected the application does not expect the presence of a prover computer. If proving is performed the meter data such as product type, product name, meter temperature and pressure, etc will need to be transferred to the prover by another means, such as manually entered at the prover or via a supervisory computer. Resulting data such as a new Meter Factor will also need to be manually entered in this application or passed via the supervisory computer. Checks on the validity of the new Meter Factor will need to be performed externally. **System Prover**: With this option selected, the application uses an inter-NÅNO communications link to pass all necessary meter data to the NÅNO prover application. Resulting data such as a new Meter Factor are passed back via the same link for processing in this application.	**A**
Enable Promass Communications ?	This is only selectable when the ***Prover Type*** is set to ***Standalone Prover***. When enabled various debug information is retrieved (and is available for transfer to a supervisory computer via the OPC-UA link). The data available is shown under Home ▸ System ▸ RTU Setup ▸ Comms ▸ Promass Data. The following variables can also be used in the application directly; **Mass Rate**: Used together with the calculated flow rate from the incoming pulses and electronically checked against each other for deviation and raise an alarm if necessary. **Flowing Density**: With this option selected the application allows for the density to be brought in via comms from the Coriolis meter and used in the flow calculations. **Reynolds Number**: With communications good, the Reynolds Number can be used with a % Error lookup table to show a calculated Meter Factor.	**A**

Meter Factor Method	With the ***Prover Type*** set to ***System Prover***, the only option of Meter Factor is **Use Baseline/Proved Meter Factor**. With the Prover Type set to ***Standalone Prover***, there are options of **Use Baseline/Proved Meter Factors**, **Use Meter Factor Curve** or **Use Reynolds Corrected Meter Factor**. The option of **Use Reynolds Corrected Meter Factor** is only available if the ***Enable Promass Communications?*** option is also set to **Yes**.  The choices are; **Use Baseline/Proved Meter Factors**: This uses a baseline value (typically 1.0) or, if proved previously, the Proved Meter Factor. There is a separate Meter Factor for each product. **Use Meter Factor Curve:** This uses an independent Meter Factor curve for each product on the meter. The curves can be entered and modified in Section 8.3 Product Data of the manual. **Use Reynolds Corrected Meter Factor**: This uses a fixed Meter Factor for the meter along with a % Error lookup table to calculate a live, calculated Meter Factor. This is product independent.	**A**
▸ ***Site/Location Setup***	This menu is described below in Section 4.2 Initial Application Setup, Site/Location Setup of the manual.	
▸ ***Time Based Settings***	This menu is described below in Section 4.3 Initial Application Setup, Time Based Settings of the manual.	
▸ ***Meter Factor Acceptance Setup***	If ***System Prover*** is selected, then the Flow Computer can be tightly integrated with the NÅNO Prover application. The system prover option allows proves to be launched from the Meter Run, and the acceptance criteria to be specified. The screenshot on the previous page has System Prover selected, so the Meter Factor Acceptance Setup menu is shown. See Section 4.4 Initial Application Setup, Meter Factor Acceptance Setup	
Averaging Method	The averaging blocks within the application can be set to; **Flow Based**: Depending on K Factor Type, this uses the incoming Volume or Mass flow to calculate the Flow Weighted Averages (FWA). **Time Based**: This uses the elapsed time, regardless of flow rate, to calculate the Flow Weighted Averages (FWA).	**A**

Now choose the Home ▸ System ▸ Initial Setup ▸ Site/Location Setup sub-menu to continue the configuration.

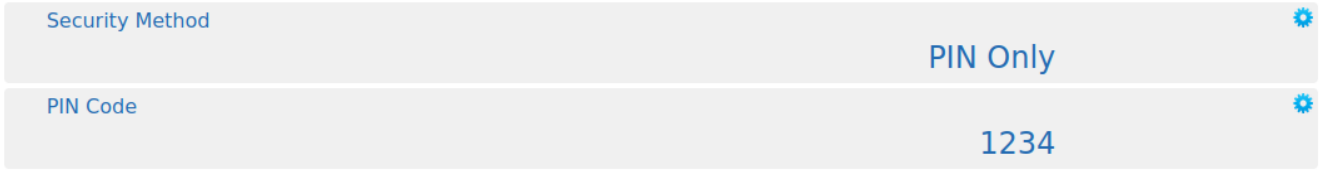
4.2 Initial Application Setup, Site/Location Setup

Site Owner/ Operator	This is an alphanumeric text field of up to 32 ASCII characters. Unicode characters can be used, but this will reduce the total number of characters supported. The Site Owner/Operator is printed on all reports.	**A**
Site Reference	This is an alphanumeric text field of up to 32 ASCII characters. Unicode characters can be used, but this will reduce the total number of characters supported. The Site Reference is printed on all reports.	**A**
Site Location	This is an alphanumeric text field of up to 32 ASCII characters. Unicode characters can be used, but this will reduce the total number of characters supported. The Site Location is printed on all reports.	**A**
Device ID	This is a text field, like the entries above, and appears on all reports but the Device ID is also shown on the top left of all web browser pages if configured. **NOTE:** If no Device ID name is set then the hardware unique System ID will be used instead.	**A**
Local Atmospheric Pressure	This data point allows the user to set the default Local Atmospheric Pressure, in absolute pressure units determined in the Measurement Units setup page.	**M**
▸ ***Security Setup***	This is a sub menu, described below in Section 4.2.1 Security Modes. The security setup is only applicable to the Local Panel display. The Web security is enforced through the User Info menus accessible here: Home ▸ System ▸ RTU Setup ▸ User info.	
▸ ***Optional Lid Display Setup***	This is a sub menu, described below in Section 4.2.2 Optional Lid Display Setup.	

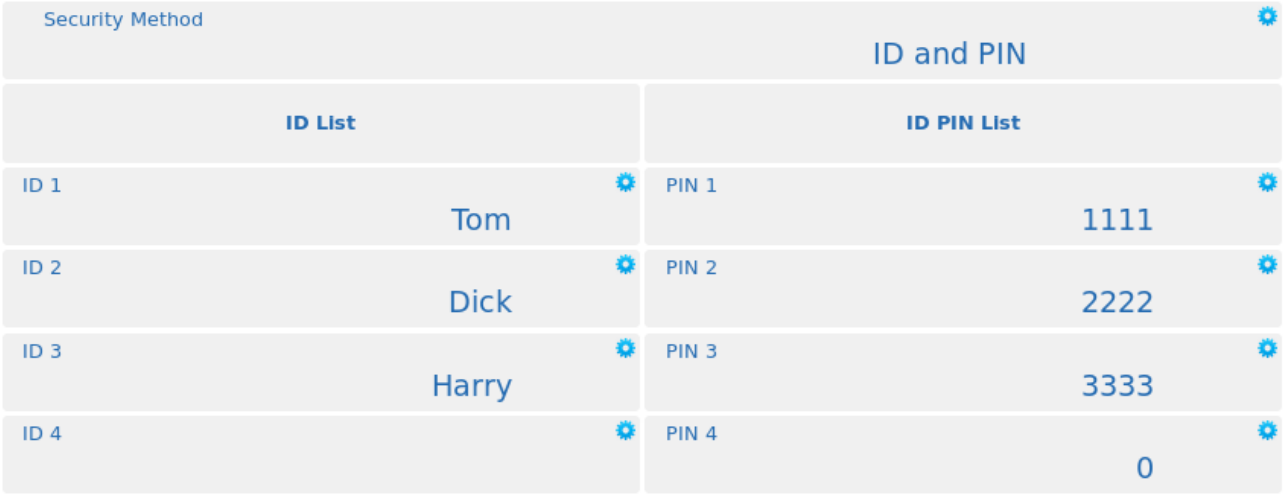
4.2.1 Security Modes

Security Mode	There are four choices for the security mode:		**A**
	None	There are no checks on the user of the Local Panel.	
	PIN Only	If this option is selected, before the user can operate the Liquid Flow Computer, they will have to enter the PIN, specified in the PIN Code value field, which will appear below.. The PIN Code can be any positive number between 1 and 999,999,999. The Pin Code value can also be downloaded via XML comms.	
	ID Only	If this option is selected, the operator must match one of the IDs on the ID List which appears below this option.	
	ID and PIN	If this option is selected, the user must first match one of the IDs in the ID List which appears below this option. Then second, supply the matching PIN Code associated with the ID from the ID PIN List.	

If ***Pin Only*** is selected, the menu will change to show:



If ***ID Only*** or ***ID and PIN*** is selected, the ID List and ID PIN List will be shown. The image below shows the first four of the 20 line items.



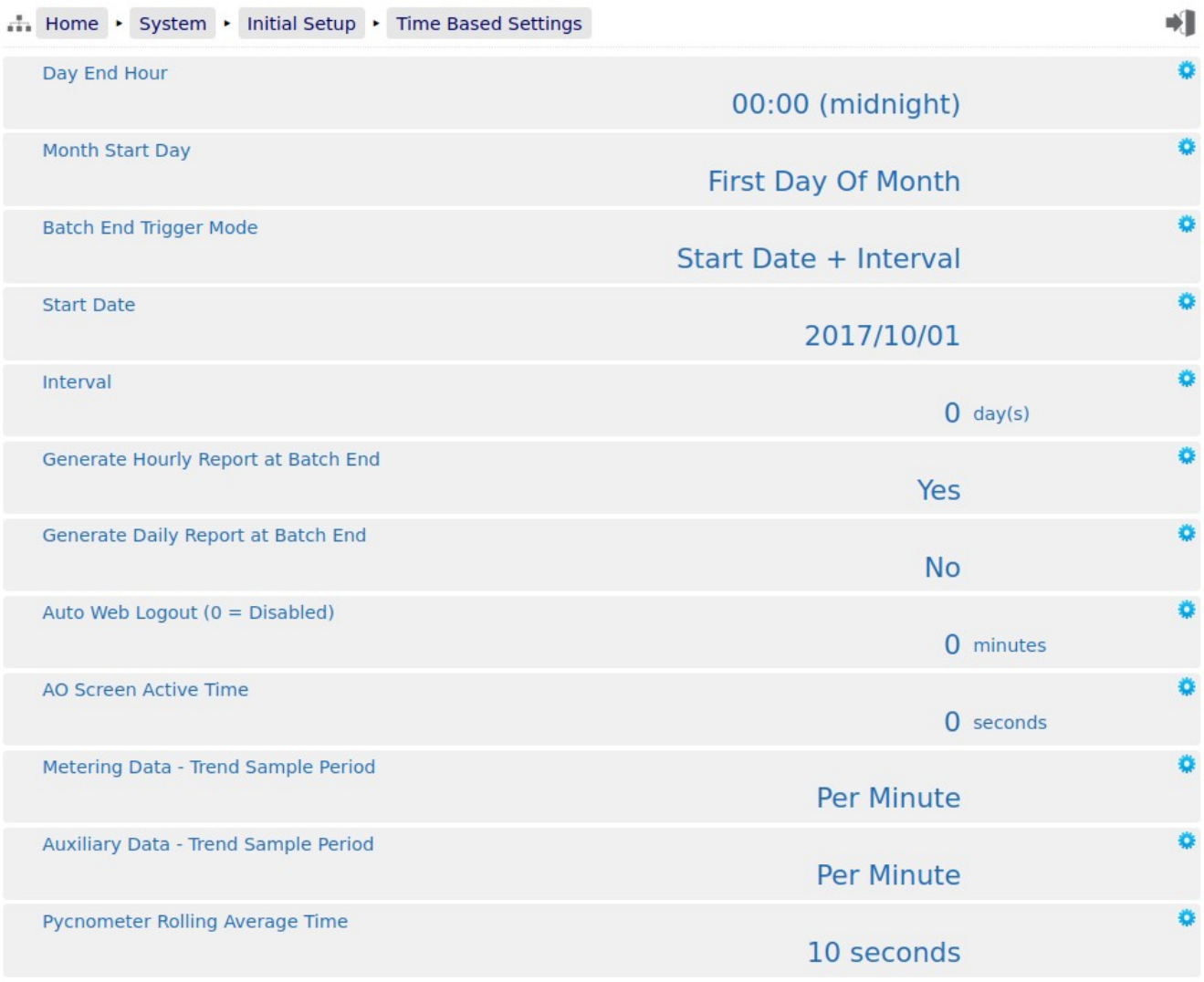
The Application can support up to 20 different IDs. The associated PIN can be any positive number between 1 and 999,999,999. The ID and the PIN can be downloaded to the application using XML Communications.

If ***ID Only*** is selected, the associated PIN values are ignored but will be shown in the setup screen.

4.2.2 Optional Lid Display Setup

Clicking on each entry allows it to be Enabled or Disabled from being shown on the lid display. The display automatically cycles round each entry every 10 seconds and is read only.

4.3 Initial Application Setup, Time Based Settings



Day End Hour	The accounting end of day time can be set to any whole hour of the day. The minutes and seconds are always set as zero. Clicking the line opens a table with radio buttons, showing the times in both 24 Hour / Military time and 12 Hour am/pm times. **NOTE:** If in Station Mode this value will be read-only and will be set by the NÅNO station application.	**A**
Month Start Day	There are two options: **First Day Of Month** or **Last Day Of Month**. **NOTE:** If in Station Mode this value will be read-only and will be set by the NÅNO station application.	**A**
Batch End Trigger Mode	There are four options: **First Day Of Month**: As the Month Start Day setting, allows the user to select auto Batch End at the Day End Hour on the first day of the month. **Last Day Of Month**: As the Month Start Day setting, allows the user to select auto Batch End at the Day End Hour on the last day of the month. **Start Date + Interval**: If this option is selected, two more menu items will appear, ***Start Date*** and ***Interval***, as described below. **No Date Trigger**: No auto Batch End is performed. **NOTE:** If in Station Mode this value will be read-only and will be set by the NÅNO station application.	**A**
Start Date	Only shown if the ***Batch End Trigger Mode*** is set to ***Start Date + Interval***. The date format is expected to be the same as set under Home ▸ System ▸ RTU Setup ▸ Time/Date. In this mode a batch report is generated at the Day End Hour on this date then at regular intervals set by the Interval setting below. **NOTE:** If in Station Mode this value will be read-only and will be set by the NÅNO station application.	**A**
Interval	Only shown if the ***Batch End Trigger Mode*** is set to ***Start Date + Interval***. In this mode, the Interval sets the number of days between Batch Ends being triggered. **NOTE:** If in Station Mode this value will be read-only and will be set by the NÅNO station application.	**A**
Generate Hourly Report at Batch End	There are two options for this field: **No**: An hourly report will NOT be generated immediately a Batch End is triggered. **Yes**: An hourly report will be generated immediately a Batch End is triggered. **NOTE:** If this option is set to Yes and several Batch Ends are triggered during an hour, you can have hourly reports which neither start nor stop on an hour boundary. **NOTE:** If in Station Mode this value will be read-only and will be set by the NÅNO station application.	**A**

Generate Daily Report at Batch End	There are two options for this field: **No**: A Daily report will NOT be generated immediately a Batch End is triggered. **Yes**: A Daily report will be generated immediately a Batch End is triggered. **NOTE:** If this option is selected and several Batch Ends are triggered during a day, you can have daily reports which neither start nor stop on a day boundary. **NOTE:** If in Station Mode this value will be read-only and will be set by the NÅNO station application.	**A**
Auto Web Logout (0 = Disabled)	By default, if you do not interact with the website for 10 minutes the user will be logged out and you will have to re-enter the User Name and Password. This auto-logout is a safety feature to ensure that if a user forgets to logout, it will be less likely that someone else can take control of the machine. On occasion, such as configuring a machine for the first time, the auto-logout feature can be an annoyance so you can either change the period by selecting a different number of minutes for the timeout or, if you enter zero, the timeout is disabled. **NOTE:** In this instance only a number can be typed into the Edit Value Dialog box. **NOTE:** It is recommended that a reasonable number is used once the machine is commissioned, to limit unauthorized access.	**A**
AO Screen Active Time	If set to zero, the AO screen is only shown when the associated Digital Input is active. This works perfectly for a toggle switch but if a push button is being used, it is inconvenient to hold the button in. This setting stretches the time for the period entered so, after a momentary push, the AO screen stays active for the entered time.	**A**
Metering Data - Trend Sample Period	This sets the interval between trend data points being recorded in zone ▸ Metering Data. The period can be set to 5, 15, 30 seconds, or once every minute, every 5, 15 or 30 Minutes. One minute is the default.	**A**
Auxiliary Data - Trend Sample Period	This sets the interval between trend data points being recorded in zone ▸ Auxiliary Data. The period can be set to 5, 15, 30 seconds, or once every minute, every 5, 15 or 30 Minutes. One minute is the default.	**A**
Pycnometer Rolling Average Time	This sets the length of the rolling average. It is used to smooth out the temperature, pressure and density values needed for performing a pycnometer verification. The values are only used on the Local Panel displays as detailed in Section 9 The Liquid Flow Computer Local Panel. The period can be set to 5, 10, 15, 20, 25 or 30 seconds. A sample is taken every 500ms.	**A**

This completes the ▸ **Time Based Settings**.

If in System Prover mode, proceed to Section 4.4 Initial Application Setup, Meter Factor Acceptance Setup

If in Standalone Prover mode, proceed to Section 5 Stage 2 of 5: RTU Setup

4.4 Initial Application Setup, Meter Factor Acceptance Setup

NOTE: This menu is only visible when ***Prover Type*** is set to ***System Prover***.

Auto Accept Meter Factor Mode	There are three options on the radio buttons for this selection: **Manually Accept/Reject MF** — After every prove requested from the Flow Computer has completed, a menu is presented to the operator showing the results, and asking if the new MF should be accepted or rejected. This is shown under Home ▸ Operation ▸ Prove Request. **Auto Accept MF if Reproducibility is OK** — The new MF will be compared to the previous proved MF, and if it deviates less than the ***Meter Factor Reproducibility Limit*** shown below, it will be automatically accepted. **Always Accept MF** — The new MF will be accepted regardless of the deviation from the Previous proved MF. **NOTE:** If in Station Mode this value will not be shown and will be controlled by the NÅNO station application. **NOTE:** If ***Reynolds Corrected Meter Factor*** has been chosen in Section 4.1 Initial Flow Computer Setup, this value should be set to ***Manually Accept/Reject MF*** and any adjustments to constants be applied manually.	**A**
Meter Factor Reproducibility Limit	Sets the maximum value, in percentage, of deviation between the current and previously proved MF that can be automatically accepted.	**A**
Meter Factor Reproducibility Alarm	This option has two values: Disabled or Enabled. If Enabled is selected and the new proved MF exceeds the Reproducibility factor, a '**Proved Meter Factor Outside Reproducibility Limits**' Alarm will be raised.	**A**

Force Batch End when Accepting a New Meter Factor	There are two values for this selection: ***No*** and ***Yes***. If ***Yes*** is selected then a Batch End will be triggered when a new MF is accepted. **NOTE:** If the application has Station Communications enabled and it is ***Up*** and ***Running/Enabled***, this option is hidden as it is then handled by the NÅNO station application.	**A**
Maximum Baseline Change Limit	Sets the maximum value, in percentage, of allowable deviation between the current MF and the MF defined for the selected product.	**A**
Baseline Change Limit Exceeded Alarm	If the Proved MF exceeds the allowable deviation as defined above in ***Maximum Baseline Change Limit*** this option allows the user to select what should happen. The two options are: **Event Log Only**: An entry will be made in the Application Event Log. **Alarm & Event Log**: An entry will be made in the Application Event Log and an alarm will also be raised.	**A**

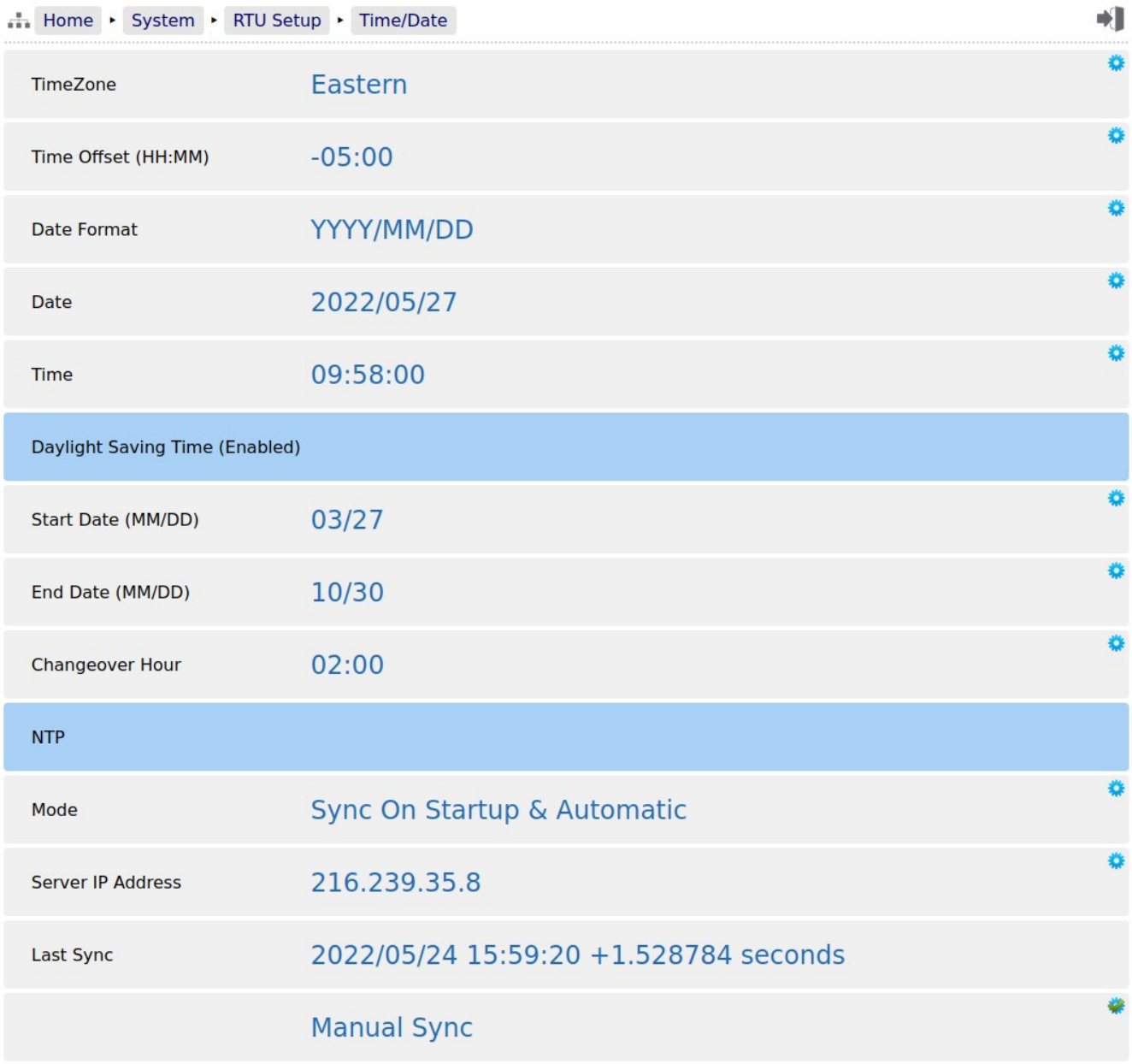
5 Stage 2 of 5: RTU Setup

The RTU setup configures the computer aspects of the NÅNO. The screenshot below shows the five sub-menus.

Clicking the ▸ **Time / Date** sub-menu will show the screen on the next page.

NOTE: Clicking on the time and date shown on the top-right of the browser screen is a shortcut to the Time / Date menu.

5.1 Time / Date



The NÅNO has a very high stability clock source which is used for a variety of measurement tasks, such as period measurement, as well as driving the internal time & date system. The internal clock will have an error of less than one second per day when running from a DC power source.

The time facilities in the NÅNO can be used in two ways.

5.1.1 The Local Time Method

The Administrator can decide to use a very simple time setting method. Ignore the ***TimeZone*** setting, and set the ***Time Offset (HH:MM)*** to 00:00. Note that the ***TimeZone*** value will now state UK.

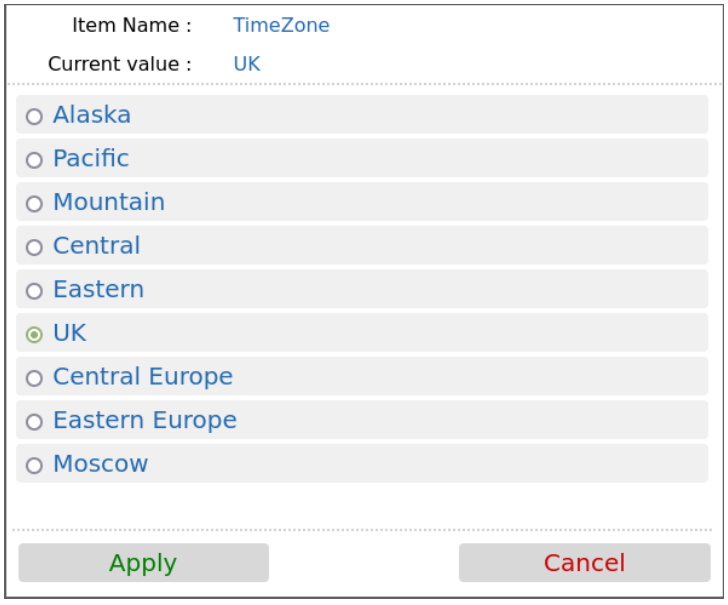
The Date and Time fields should then be set to the local time.

The Daylight Saving Time option may still be used if required. If not required, set the ***Start Date*** to be the same as the ***End Date*** and this feature will be disabled.

5.1.2 The NTP Time Method

Alternatively, to synchronize the NÅNO to the Internet time using the Network Time Protocol (NTP) you must input a time offset which represents your geographical timezone, as Internet time is always expressed in UTC (Coordinated Universal Time - see Section 15 Glossary). This is because the NTP server has no knowledge of where the client resides and local time is derived from adding or subtracting the local timezone time offset. The timezone offset can be input manually, for example, during the winter months in Houston, you would set the ***Time Offset (HH:MM)*** as -06:00 (subtract 6 hours from UTC time).

Similarly in Mumbai, India, you would set the ***Time Offset (HH:MM)*** as +05:30 (add 5 Hours and 30 minutes to UTC time). For convenience, the US timezones have been built in so in most of Texas, for example, click on ***TimeZone*** and select Central, and the ***Time Offset (HH:MM)*** value will be set to -06:00.



The following system settings are shown:

TimeZone	The dialog box above shows the options available: Alaskan zone is -9 Hours Pacific is -8 Hours Mountain is -7 Hours Central is -6 Hours Eastern is -5 Hours UK has no offset from UTC Central Europe is +1 Hour Eastern Europe is +2 Hours Moscow is +3 Hours Clicking an option pre-loads the ***Time Offset (HH:MM)*** item with the relevant timezone offset.
Time Offset (HH:MM)	This shows the current time offset (in hours:minutes). Clicking on the line will open the Time Offset dialog box which allows the user to input the time offset associated with the local timezone. The : (colon) character is used to separate hours and minutes. The minutes is optional hence if only whole hours are needed. For example, you can just enter -6 for US Central time during the winter.
Date Format	Shows the current date format. The three following formats are available and each shows an example of the date for Christmas Day for the year 2015: **YYYY/MM/DD** Example: 2015/12/25 **DD/MM/YYYY** Example: 25/12/2015 **MM/DD/YYYY** Example: 12/25/2015 Clicking on the line opens a selection box with the three options, clicking any of the lines selects the appropriate option and indicates the selection with the radio style button. As usual, select ***Apply*** or ***Cancel*** to exit the selection box.
Date	Shows the current date (using the format defined above). Clicking on the line containing the gear icon allows the user to enter a date, in the format specified above. The / (slash or forward-slash character) is used to separate the day, month and year.
Time	Shows the current local time in 24 hour military time format. Clicking on the line takes you to the Edit Value screen where the user can enter the time. **NOTE:** The : (colon) symbol must be used to separate the hours from the minutes and the minutes from the seconds.
Daylight Saving Time - This is the heading for the Daylight Savings options. This bar also indicates if Daylight Saving Time is in effect.	
Start Date (MM/DD)	This should be the date in the Spring when the hour is moved forward. Once the start date is reached, at either 1am or 2am (as set in the Changeover Hour), the NÅNO time will jump forward by one hour to 2am or 3am. **NOTE:** The format to enter this information is determined by the **Date Format** above, so could be in MM/DD or DD/MM format. The expected format will be displayed in the name. **NOTE:** It is not recommended that you load during this period as report times and averaged data may be confusing. However, no pulses will be lost and the accumulators and totals will be correct.

End Date (MM/DD)	This is the date in the Fall, when the hour moves back. At the changeover hour, the time will go back from say 2am to 1am and appear to repeat for an hour. When it reaches 2am for the second time, it will NOT jump back another hour. **NOTE:** The format to enter this information is determined by the **Date Format** above, so could be in MM/DD or DD/MM format. The expected format will be displayed in the name.
Changeover Hour	This can be either 1am or 2am, and determines the time of the day, on the selected date, that the time will spring forward by one hour or back by one hour in the Fall.
NTP - This is the heading for the NTP options	
Mode	Four NTP operating modes are available: **Disabled** — No NTP synchronization will be performed. **Automatic Sync** — At a pseudo-random time within the minute around 03:33 (local time), an NTP sync will be performed. **Sync On Startup** — An NTP sync will be performed when the unit is powered on or restarted. **Sync On Startup & Automatic** — An NTP sync will be performed when the unit is powered on or restarted and at a pseudo-random time within the minute around 03:33 (local time). Whenever an NTP sync is performed, if the time difference is less than 15 minutes and greater than 0.5 seconds, the machine time will be adjusted accordingly (with the Time Offset applied). Otherwise no action takes place. **NOTE:** Time changes are logged in the System Event Log.
Server IP Address	Specifies the IP address of the NTP Server to use. The IP address must be entered in IPv4 human readable quad-dotted format. There are large numbers of time servers, from government bodies and larger companies. A number of oil companies have their own time server. The NIST time server list can be found at http://tf.nist.gov/tf-cgi/servers.cgi For example: NIST, Boulder is 132.163.96.1 Google also has a series of time servers at 216.239.35.0, 216.239.35.4, 216.239.35.8 and 216.239.35.12
Last Sync	This field records the time & date of the last NTP synchronization, and the time offset between the computer and Network time.
NTP Manual Sync	Clicking the ***Manual Sync*** line will force the NTP server to request an immediate time update. The time will be applied directly. **NOTE:** No checking is provided on a manual sync, so it is the operator's responsibility to sanity check the result. We advise clicking the ***NTP Manual Sync*** a second time, checking that the Last Sync message shows a very small correction, and check that the ***Date*** and ***Time*** information looks correct.

This completes the ▸ **Time / Date settings**.

For the next phase, click RTU Setup on the breadcrumb bar to go back (or the browser back button) and select ▸ **Number Format**.

5.2 Number Format

Decimal Separator	Two options are available:	
	Point [.]	This will show the separator between the whole and fractional part of the number as a point. As an example 1234.567
	Comma [,]	This will show the separator between the whole and fractional part of the number as a comma. As an example 1234,567
Thousands Separator	Four options are available:	
	None	This will not show any separator between the thousands part of a number. As an example 1234567
	Comma [,]	This will show the separator between the thousands part of a number as a comma. As an example 1,234,567
	Point [.]	This will show the separator between the thousands part of the number as a point. As an example 1.234.567
	Space [ ]	This will show the separator between the thousands part of the number as a space. As an example 1 234 567

This completes the ▸ **Number Format settings**.

For the next phase, click RTU Setup on the breadcrumb bar to go back (or the browser back button) and select ▸ **Network**.

5.3 Network

The NÅNO has two 10/100 MHz Ethernet ports. These ports are connected to two independent network controllers. These can be connected to entirely separate networks (for highest reliability systems) or the same physical network. However, in either case, each controller must be configured so that they are on entirely separate subnets.

The Network page shows the current network settings for both network ports.

The settings can be changed only by administrator users. The operation of this page is slightly different to other pages, in that each line is NOT actioned as it changed. The user pre-loads a consistent set of information (IP address, Netmask & Gateway) and all the information gets applied together, when the ***Apply*** line is clicked.

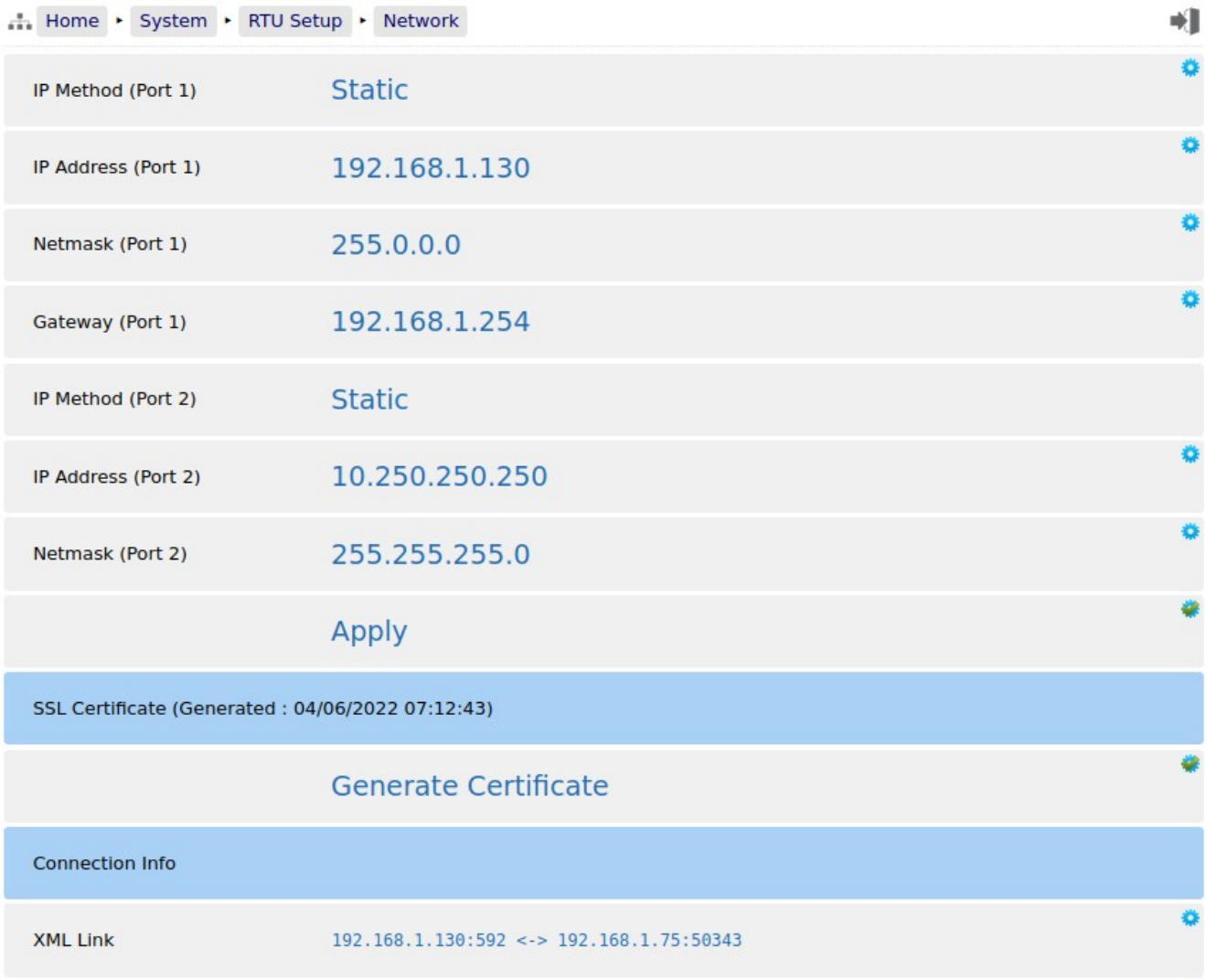
If you wish to cancel a setting before the ***Apply*** is clicked, simply change page by clicking on the breadcrumb bar.

Pre-loaded but not yet applied information is shown in RED text.

In addition to being able set up the Ethernet interfaces, this page has information on the connections made to the machine and allows a System Administrator to close links if required.

NOTE: When configuring the Ethernet IP addresses, the following MUST be carefully noted:

The IP address for each port must NOT be in the same subnet. Due to the fundamental design of the routing mechanism, Ethernet cannot work reliably if two separate controllers share the same subnet.

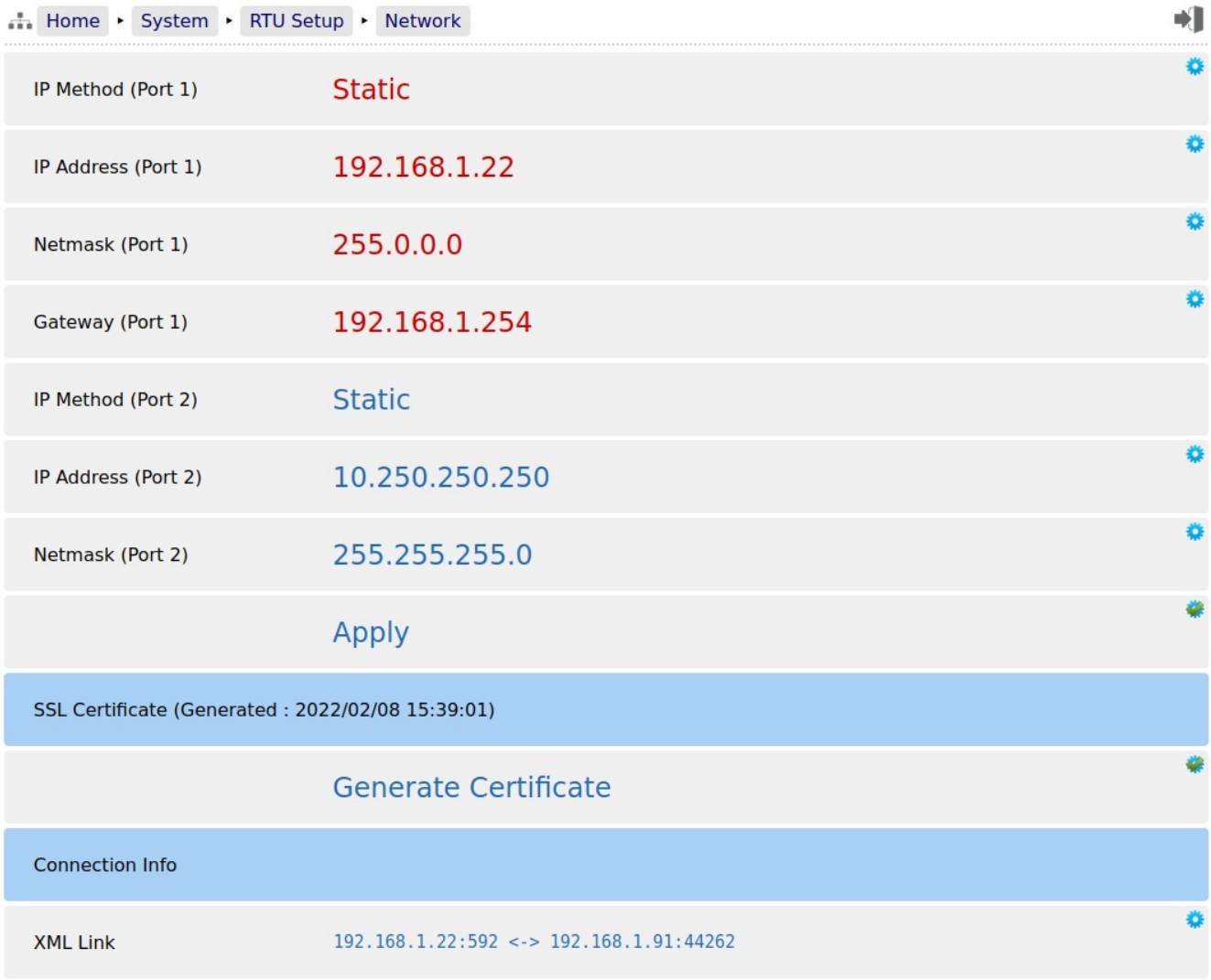


IP Method (Port 1)	This line indicates that either a ***Static*** (manually configured) address or a ***DHCP*** (automatic) address setting method has been selected for Ethernet Port 1 (ETH1). Clicking on the line containing the gear icon allows the administrator to select between the two options. **NOTE:** If ***DHCP*** is chosen as the IP Method, the current in-use IP address, Netmask and Gateway values are shown but grayed out as they are for information only.
IP Address (Port 1)	If ***DHCP*** has been selected, then this field will show, in gray text, the IP address that has been allocated to the unit by the DHCP server. If ***Static*** IP method has been selected then the line will contain the gear icon and, if the line clicked, the Edit Value dialog box will be opened so the manual IP address to be entered. The IP address must be entered in commonly used IPv4 quad-dotted decimal representation, as shown by the example screen on the previous page.

Netmask (Port 1)	If ***DHCP*** has been selected, then this field will show, in gray text, the Netmask that has been allocated to the unit by the DHCP server. If ***Static*** IP method has been selected then the line will contain the gear icon and can be changed by clicking the line and the Edit Value dialog box will be opened so the manual Netmask can be input. The Netmask must be entered in IPv4 quad-dotted decimal representation, like an IP address.
Gateway (Port 1)	If ***DHCP*** has been selected, then this field will show, in gray text, the gateway that has been allocated to the unit by the DHCP server. If ***Static*** IP method has been selected then the line will contain the gear icon and, if the icon is clicked, the Edit Value dialog box will be opened so the manual Gateway address can be set. The Gateway address must be entered in IPv4 quad-dotted decimal representation.
IP Method (Port 2)	Ethernet Port 2 (ETH2) does not allow DHCP to be used. This eliminates a potential problem where both ports are allocated addresses in the same subnet. The second port is always set to Static.
IP Address (Port 2)	Clicking this line allows the user to input the IP address for the second port.
Netmask (Port 2)	Clicking this line allows the user to input the Netmask for the second port.
Apply	Clicking Apply line will accept and action any of the changes highlighted in red on the Network page. Once the changes are accepted, the lines changed will revert to blue colored text.
SSL Certificate (Generated : xxxxxxxxxx yyyyyyyy)	
Generate Certificate	Clicking on this link will force the NÅNO to generate a new Self Certified SSL Certificate. Once generated, the NÅNO will automatically add the generated time and date into its subheading above, where ***xxxxxxxxxx*** is the system formatted date and ***yyyyyyyy*** is the system formatted time. The SSL Certificate is used by some communications links (for example the OPC-UA link).
Connection Info	
XML Link	In the previous screenshot the XML link information shows that 192.168.1.130 Port 592 (the NÅNO unit) is connected to a SCADA system with an IP address of 192.168.1.75 using port 50343. Up to 10 simultaneous XML links can be supported. Clicking on this line opens a "Close Connections?" dialog box. Selecting Confirm will close ALL the XML links.

The screen below shows an example Network setup screen that is modified. The items shown in red are changes and when the Apply line is clicked, Ethernet Port 1 will change to the settings currently highlighted in red.

At this point, the browser will no longer appear to function. The user will have to type the new address into the browser address bar, and login once again, to continue configuration.



This completes the ▸ **Network** settings.

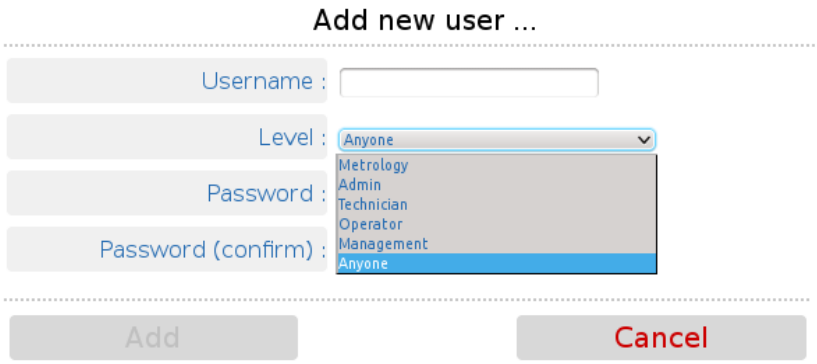
For the next phase, click RTU Setup on the breadcrumb bar to go back (or the browser back button) and select ▸ **User Info**.

5.4 User Info

The User Info page shows a list of currently configured users.

User details can be viewed by clicking on the relevant line containing the gear icon. Clicking on the admin line opens the Edit Value dialogue box, and you can change the name and password, but not the user level. Note that if you change the admin name to something else, you need to record the new name since you will need this name to log back into the machine.

The second line in the example above has the user details for a manually added ‘met’ user and the third line for a manually added 'tech' user. The fourth line in the example only shows if you are logged in at Admin or Metrology level and is called “Add new user ...”. Clicking on the text opens the Add new user dialog box, as shown on the right.

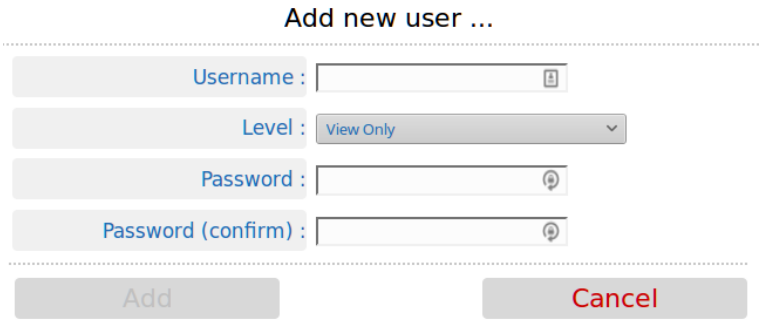


The following details can be changed:-

Username	Sets the username. All usernames must be unique.
Level	Sets the access level of the user, as follows: **Metrology** Used for sensitive data such as the units of measure, scaling values, etc. **Admin** Can change all parameters except those designated as Metrology or as Technician only. One user at Admin level is mandatory. **Technician** The technician can change the Field Calibration and the Digital I/O Diagnostics in this mode. **Operator** Not used in this application. **Management** Not used in this application. **Anyone** The display of all data on the website and the local panel
Password	To change the password, enter the new password into both password boxes.

Administrator users can edit any user's details or delete a user by selecting the line and clicking the red **Delete** button.

Non-administrator users can only edit their own username or password.



Adding a new user or clicking on an existing user opens the Edit user dialog box.

NOTE: At least one user MUST be set at Admin level and it is not possible to delete the last remaining Administrator account.

We recommend user names use the following characters only:

- Upper and Lower case letters (A..Z) and (a..z)
- Numbers (0..9)
- Hyphen (-)
- Full-stop (.)
- Space

NOTE: As stated previously, there is no back-door to the security. If you lose the Administrator password, it cannot be recovered and the only course of action is reset to factory default, which will clear all reports and data.

This completes the ▸ **User Info** settings.

For the next phase, click RTU Setup on the breadcrumb bar to go back (or the browser back button) and select ▸ **Comms**.

5.5 Communications Setup

The Comms menu is used to configure the printers and the mapping of the various reports to the printers available, setting the serial port for the Local Panel, as well as the communications to SCADA and Enterprise systems. An example menu is shown below however this may change as options are enabled or disabled.

5.5.1 Printers / SD Card / FTP

The application supports up to 3 physical printers, a virtual printer on the SD Card and remote "push" FTP printer. The FTP printer can push data in both Spreadsheet compatible TSV format in addition to text format, as a physical printer replacement.

TSV is Tab Separated Value format, which is identical to CSV, except it allows commas to be used in data.

One physical printer may be serial or networked (PostScript) and the other two physical printers may be network addressed PostScript printers. The screenshot overleaf shows a configured machine.

In the example, Printer 1 has the default name and Printers 2 & 3 have been renamed. Printer 2 has been named Management Office and Printer 3 named Oklahoma Accounts Dept.

Printer 1 has been configured to be a serial printer, using COM1 (the RS232 port) with 9600 baud. Printers 2 and 3 are configured as Networked printers. The relevant IP address has been added and the default TCP port of 9100 used.

The Printer / SD Card configuration page is a long page, so the screenshot of this menu has been split over two pages.

Print spool	Empty
Printer 1	
Name	Printer 1
Type	Serial (Codepage 437)
Serial Port	RS232 (COM1) - No handshaking
Baud Rate	9600
Printer 2	
Name	MGMT Office
Type	Network (Postscript)
Network Address	10.0.0.107
Network Port	9100
Zoom (%)	100
	Print Test Page
Printer 3	
Name	OK City Accounts
Type	Network (Postscript)
Network Address	10.0.0.11
Network Port	9100
Zoom (%)	100
	Print Test Page
SD Card	

and continued from page above:

SD Card	
Status	Installed (free 1.41 GiB, total 1.87 GiB)
Archive Alarms/Events	Weekly
Archive Historicals	Daily
FTP	
Server IP Address	66.220.9.50
Port	21
Username	mpfj
Password	********
Upload Directory	/mob/LP-Oil
Upload Format	Plain Text
	Send Test File

Print spool	This will show Empty if files generated have all been printed but will show the number of files in the printer spool, if the generated file(s) have not been printed. Clicking on the number of files, lists the possible printers and the number of items queued to be printed. Clicking on each printer then shows the details of each item, along with a Rubbish/Trash Bin icon at the right of each item. Clicking on this icon removes it from the list.
Printer 1	
Name	Clicking on the line opens the Edit dialog box, and default printer name can be changed.
Type	Printer 1 can be disabled by selecting ***None***, or set as a ***Serial*** or ***Networked*** (PostScript) printer. In this example, ***Serial*** has been selected. ***Serial Port*** and ***Baud Rate*** is only shown for Serial printing.
Serial Port	The Serial printer can be connected to Serial Port 1, 3 or 4. This setting is only shown if the ***Type*** above has been set to ***Serial***.
Baud Rate	This settings allows you to specify the baud rate for the Serial Port. The list of valid values is set by the application. This setting is only shown if the ***Type*** above has been set to ***Serial***.
Network Address	The IP address must be entered in IPv4 human readable quad-dotted format, as shown in the screenshot above. This setting is only shown if the ***Type*** above has been set to ***Network***.
Network Port	This is the TCP port number and depends upon the printer used. Port 9100 is the TCP port number reserved for Page Description Language Data Streams and is the most common. This setting is only shown if the ***Type*** above has been set to ***Network***.
Zoom (%)	Many postscript printers render data slightly differently so, to accommodate this possible variation, a percentage scaling factor can be applied. This is defaulted to 100% but a different scaling factor can be applied if the test print does not fill the paper correctly. This setting is only shown if the ***Type*** above has been set to ***Network***.
Print Test Page	Clicking this line with the Apply/Accept Icon forces an immediate test page to be printed. The test print is 64 lines by 80 characters, and is made up of a grid of asterisk (*) characters, with line number and column numbers. The zoom factor can be used to adjust for the printer page size. This setting is only shown if the ***Type*** above has been set to ***Network***.
Printer 2	
Name	Clicking on the line opens the Edit dialog box, and default printer name can be changed.
Type	This printer can only be set as a Networked (PostScript) printer or disabled. In this example, ***Network*** (Postscript) has been selected so the Network information and Zoom (%) options are displayed.
Network Address	The IP address must be entered in IPv4 human readable quad-dotted format, as shown in the screenshot above.
Network Port	This is the TCP port number and depends upon the printer used. Port 9100 is the TCP port number reserved for Page Description Language Data Streams and is the most common.

Zoom (%)	Many postscript printers render data slightly differently so, to accommodate this possible variation, a percentage scaling factor can be applied. This is defaulted to 100% but a different scaling factor can be applied if the test print does not fill the paper correctly.
Print Test Page	Clicking this line with the Apply/Accept Icon forces an immediate test page to be printed. The test print is 64 lines by 80 characters, and is made up of a grid of asterisk (*) characters, with line number and column numbers. The zoom factor can be used to adjust for the printer page size.
Printer 3	
	This section is setup as Printer 2 above.

The SD Card is a versatile extension to the on-board non-volatile memory, and can be used as a virtual printer, see Home ▸ System ▸ RTU Setup ▸ Comms ▸ Report/Printer Routing as well as being able to extend the Archive & Events and the Data Logging almost indefinitely.

SD Card	
Status	This will state No Card Inserted, if no SD Card is present or has been dismounted. When the NÅNO is turned off, SD Cards may be inserted or removed at any time. When power is applied, the NÅNO will automatically mount a card if available. When installed, the status line will show the free space and the total card size in GiB (GibiBytes) or MiB (MibiBytes). If a card needs to be removed from a running system, the status line should be clicked, the SD Card Install or Remove dialog box will then be presented. Ensure the Remove option is selected and press Apply. Once the Status has changed, you can take out the SD Card. To fit a card to a running machine, put the card into the card slot beneath the Ethernet ports, click the SD Card Status line, select Install and click Apply. The status line will now show the SD Card information.
Archive Alarms/Events	In addition to being able to use the SD Card as a 4th virtual printer, the Alarms and Events can also be "archived" to the SD Card at regular intervals. In essence, this means that all Alarms & Events over the lifetime of the machine could be stored within the NÅNO. The archive can be turned-off by selecting the Disabled option, or the time period between archives can be selected from ***Daily***, ***Weekly*** or ***Monthly***, depending upon how often information is generated. The file generated is a ZIP archive file containing six .TSV files containing the Alarm Log, Application Event Log, Metrology Event Log, Operator Event Log, Security Event log and the System Event log.
Archive Historicals	The Historical Data Logger collects data which can be viewed graphically in a browser by navigating to Home ▸ Logs & Info ▸ Trending, and selecting which data to view. The data from each data logging zone can be viewed or downloaded as a .TSV for viewing in a spreadsheet, but the archive module will generate the TSV for each logging zone and will ZIP these files and place them onto the SD Card. The time period between archives can be selected from ***Daily***, ***Weekly*** or ***Monthly***, depending upon how often information is generated.
FTP	
Server IP Address	The IP address of the remote FTP server must be entered in IPv4 human readable quad-dotted format, as shown in the screenshot above.
Port	This is the TCP port number, and depends upon the FTP server settings. Port 21 is the usual TCP port number reserved for the File Transfer Protocol (FTP).
Username	The username and password will be allocated by the FTP server administrator.
Password	See above.
Upload Directory	The upload directory can be a fixed path, for example /Site1123/Unit-AB12, and when a report is generated it is placed within this fixed directory path, using a "report name" + "datestamp" filename format so in the FTP server it appears as: `Hourly Report-05052017092716.tsv` Alternatively a very flexible, dynamic path method is available using a %TAG format. This method is exceedingly powerful but may require factory support to implement. If you need additional options, ask your distributor for MiniSpec18.

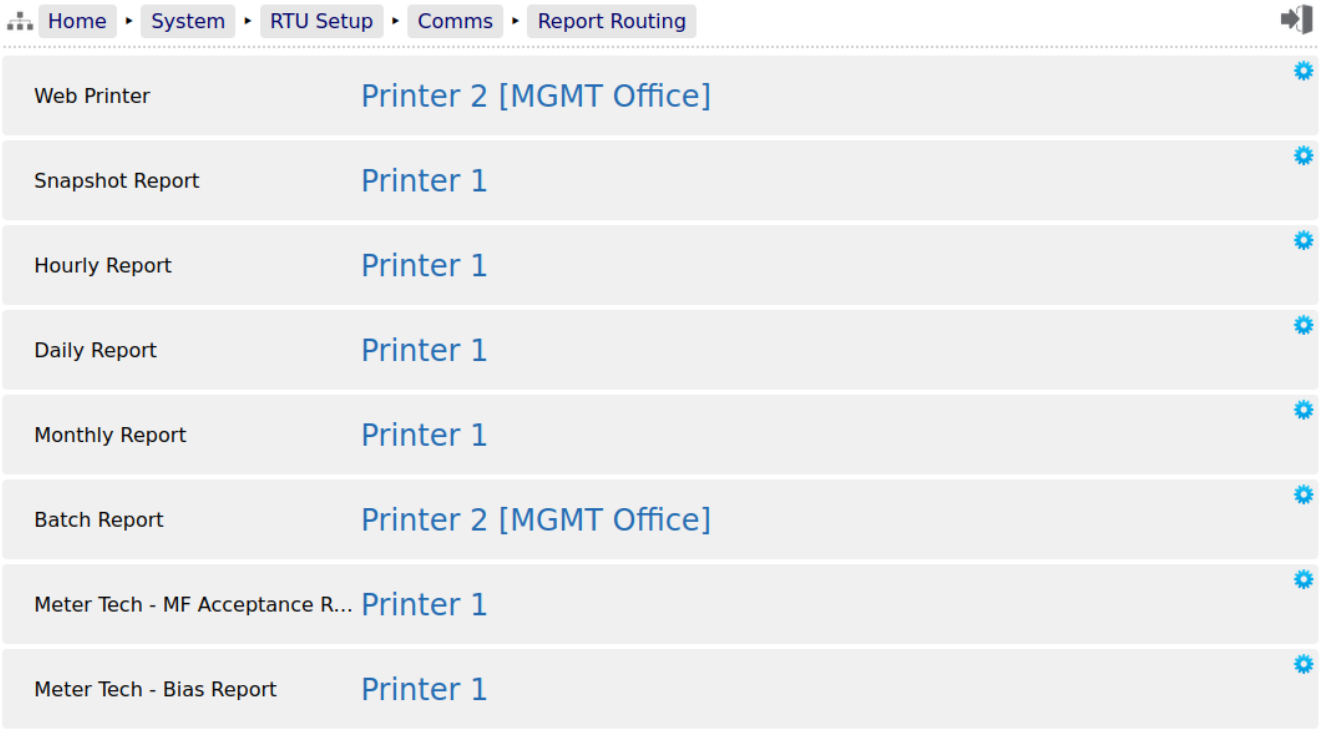
Upload Format	Clicking this line gives the choice of one of two options selected with a radio button. The two options are: **Plain Text** If this Option is selected all reports are transferred to the FTP server as text formatted documents. **TSV** If this Option is selected all reports are transferred to the FTP server as Tab Separated Values. There is a version of the BOL specially formatted for use as a TSV.
Send Test File	Clicking this line causes a test file to be transferred to the designated FTP server. A pop-up window shows the low level transaction information for debug purposes.

This completes the ▸ **Printer / SD Card / FTP** settings.

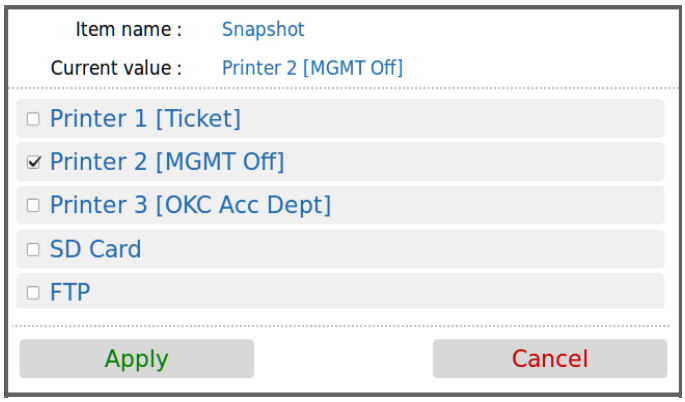
For the next phase, click ▸ **Comms** on the breadcrumb bar to go back (or the browser back button) and select ▸ **Report Routing**.

5.5.2 Report Routing

The application is configured to have reports. Each report can be sent to any or all of the printers as required.



Clicking each line opens up the relevant selection dialog. For example:



Clicking on the check boxes causes the report when generated to be directed to the selected printer. Reports can be directed to any or all printers. If no printers are selected, the report will not be printed but will still be generated and stored in the reports archive.

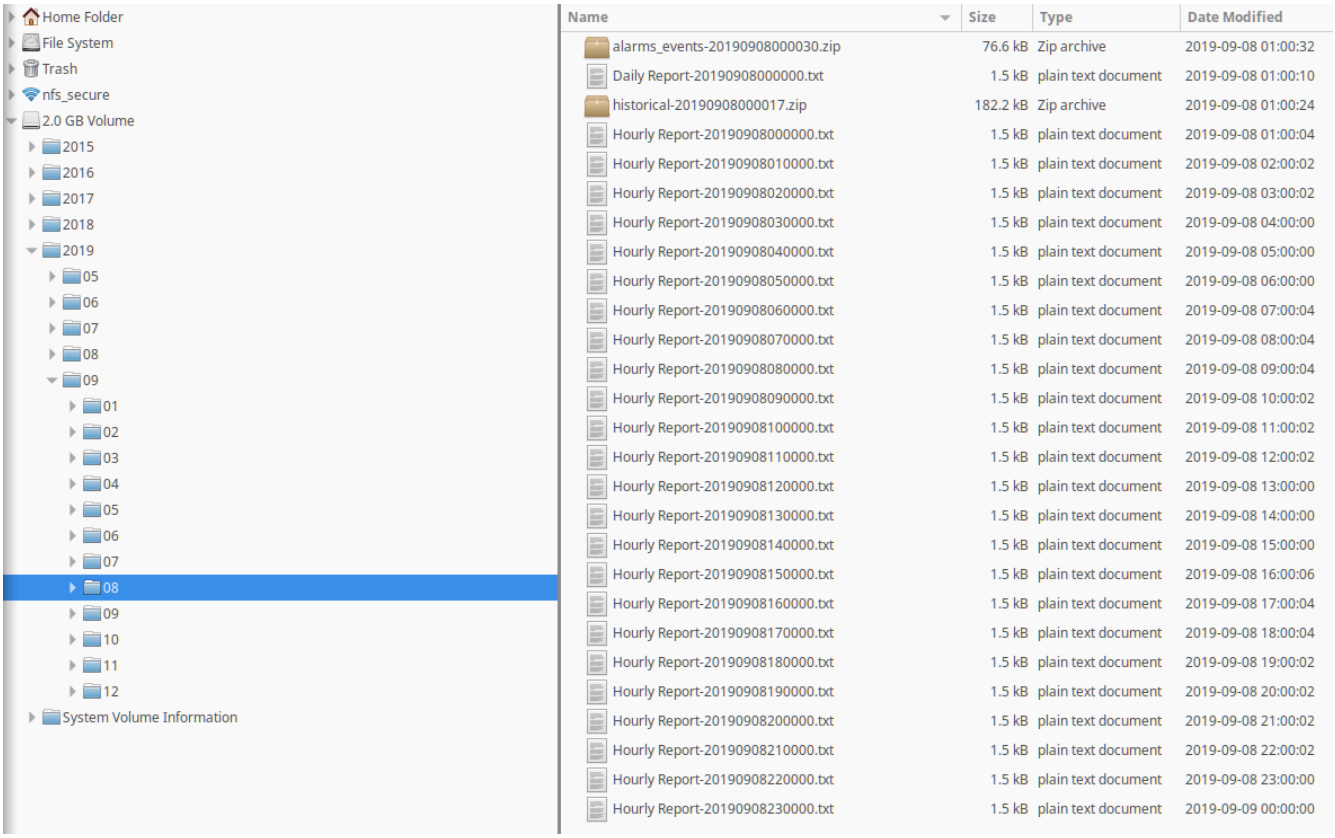
5.5.2.1 Reports Archive

The reports are stored in high reliability and predicable NOR Flash using a robust, check-summed linear file system. The use of NAND type flash (as used in USB memory sticks) is not suitable for industrial applications when a guaranteed lifetime and number of write cycles is needed.

The report archive area consists of 16 zones. The first six zones can store a minimum of 1500 reports and the other 10 zones can store a minimum of 250 reports.

5.5.2.2 SD Card Storage

The removable SD Card is a useful resource allowing virtually unlimited storage of the historical trending information and, since it is removable, the information can be quickly retrieved by a PC or Laptop. Below is a screenshot showing the structure and one day's content.



Unlike the Internal Storage/Archive, SD Cards utilize NAND flash and the number of writes is not predicable, nor is any warning given of failure. Therefore, for the best results, we recommend SD Cards are replaced every three years.

This completes the ▸ **Report Routing** settings.

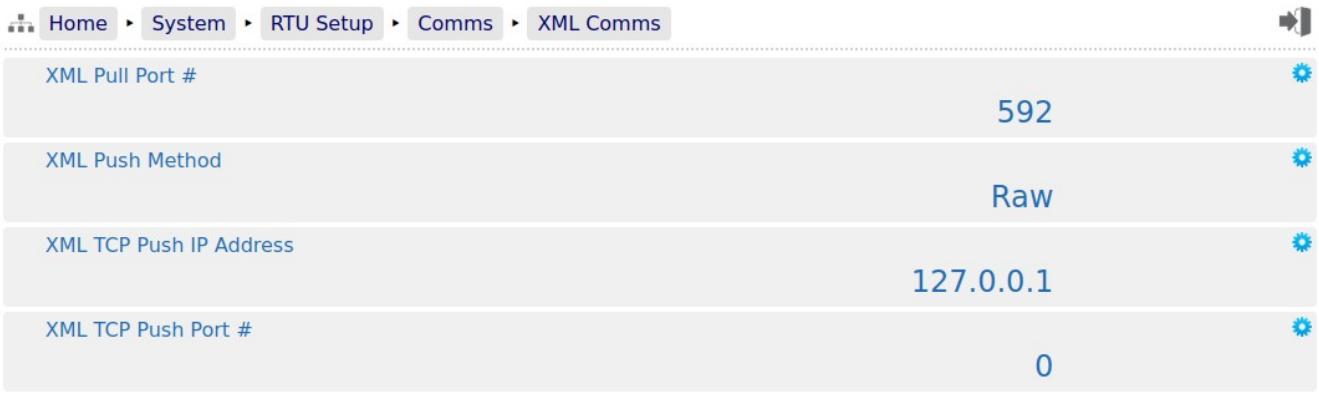
For the next phase, click ▸ **Comms** on the breadcrumb bar to go back (or the browser back button) and select ▸ **XML Comms**.

5.5.3 XML Comms

All data within the NÅNO can be accessed using the XML communications method.

The NÅNO can be polled periodically for new information but, to save bandwidth and data usages charges, there is also an XML push notification. The push notification informs that an alarm has changed state or a report generated, the machine could then be polled to retrieve the required information. This allows remote systems to be informed of new reports or alarms without having to constantly poll the unit.

The full potential of the XML communications can be found in the accompanying NÅNO XML Comms Manual, available from your distributor. In addition, there is a Windows based demonstration program available for test purposes.



The following details can be changed:-

XML Pull Port #	In XML Pull mode, the NÅNO acts as a slave device and waits for a remote server to initiate the XML requests. The TCP port number can be set to any number between 0 and 65535 but care must be taken in choosing the port number. We recommend the port number is left as 592, unless there is a good reason for changing it.
XML Push Method	This is where the NÅNO acts as a master device and, upon some internal trigger (new report or a change to Alarm status), sends a “status” packet to a remote server. Two “push” connection modes are possible: **Raw** the target sends the status packet as raw XML data to the server. **HTTP** the target uses an HTTP POST request to send the status packet to `http://<server>/notify`.
XML TCP Push IP Address	This is the IP address of the remote server which will receive the push notifications from the NÅNO.
XML TCP Push Port #	This is the TCP port number of the remote server which will receive the push notifications from the NÅNO. Setting the port number to zero will disable the Push notification.

This completes the ▸ **XML Comms** settings.

For the next phase, click ▸ **Comms** on the breadcrumb bar to go back (or the browser back button) and select ▸ **Modbus/TCP Slave**.

5.5.4 Modbus/TCP Slave

Modbus/TCP communications can be used to retrieve data from the NÅNO.

Relevant Datapoints within the NÅNO can be accessed using this method however our preferred method of retrieving data is to use the OPC-UA communications link as that also gives access to the reports and current alarm states (including the ability to accept alarms remotely while maintaining the alarm logs).

Modbus/TCP Port #	This is the TCP port number that the Modbus Master device must use to talk to the Modbus Map. The default port number is 502 for the Modbus map. To disable the Modbus Map, set the port number to zero.
Modbus/TCP Slave Address	This is usually set to 1 but can be changed to match the requirements of the Master, as required.

NOTE: The Modbus data points available are available on request.

This completes the ▸ **Modbus/TCP Slave** settings.

For the next phase, click ▸ **Comms** on the breadcrumb bar to go back (or the browser back button) and select ▸ **OPC-UA**.

5.5.5 OPC-UA

OPC-UA communications is the preferred method of retrieving data from the NÅNO.

Relevant Datapoints, Reports and Alarms within the NÅNO can be accessed using the OPC-UA communications method.

The following details can be changed:-

OPC-UA Port	The port number is normally set to 4840 however is changeable if required by the client.
ControlWeb Compatibility Mode	Although the OPC-UA interface is defined, we have found that some implementations differ from the standard. Due to differences found with the ControlWeb PC Application, we added this compatibility mode switch to allow ControlWeb to interface and interact with the NÅNO correctly.

This completes the ▸ **OPC-UA** settings.

For the next phase, click ▸ **Comms** on the breadcrumb bar to go back (or the browser back button) and select ▸ **Local Panel**.

5.5.6 Local Panel

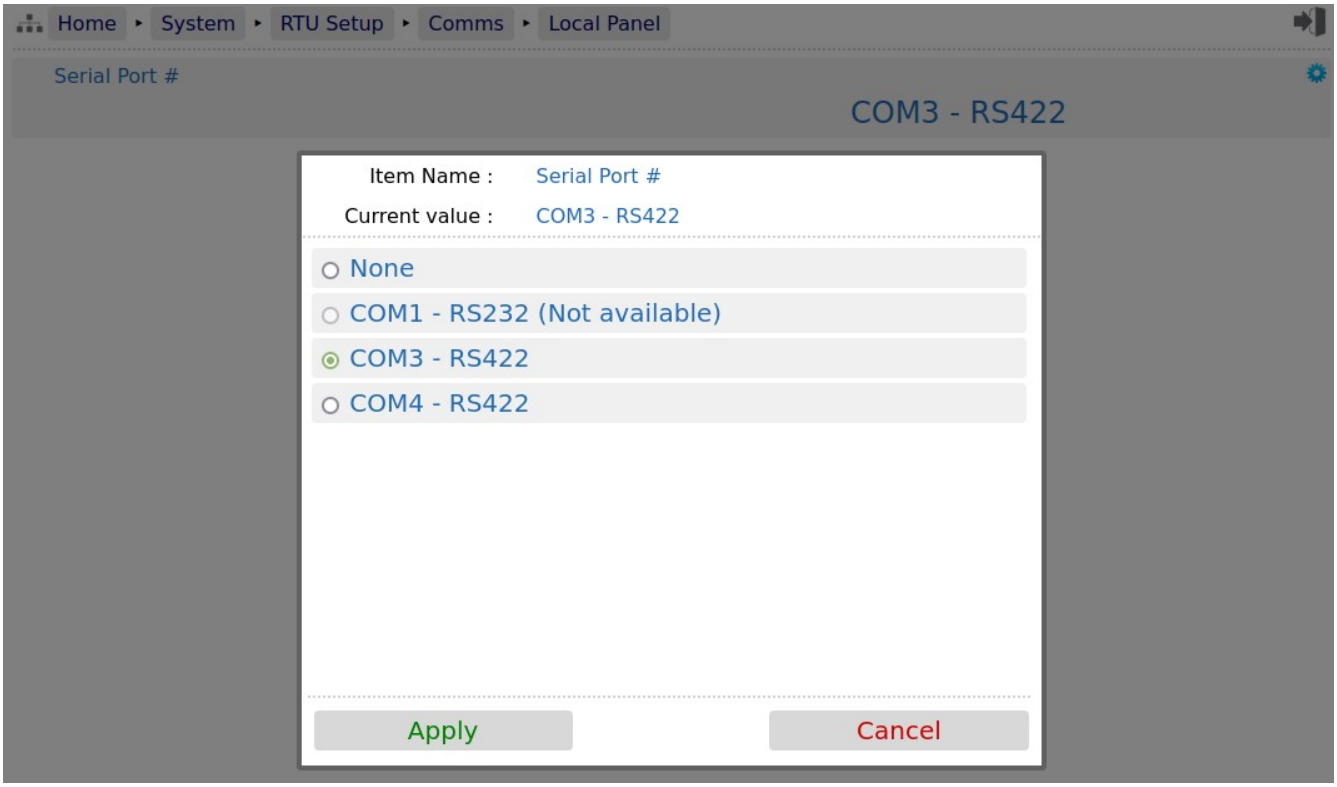
The NÅNO can be used "headless" using a web browser for configuration and operation. Alternatively a Local Panel display can be used when a dedicated display is required.

The optional Local Panel display can be connected to one of the full-duplex serial ports (COM1, COM3 or COM4). COM2 is unsuitable for the Local Panel because it is half duplex RS485 only.

NOTE: COM4 is only available on Gen3 Hardware.

NOTE: The Local Panel is designed as a user interface for information purposes therefore is not designed to replace or mimic the website interface.

The radio button only allows the selection of one port at a time or None (if no Local Panel is required). If the radio button is grayed out, this indicates that the serial port has already been allocated to another service. In the example shown, a serial printer is in use on COM1.



This completes the ▸ **Local Panel** settings.

Depending on options configured, the next phase is variable;

- If the ***Prover Type*** is set to System Prover under Home ▸ System ▸ Initial Setup, click ▸ **Comms** on the breadcrumb bar to go back (or the browser back button) and select ▸ **Prover Link**. Then go to Section 5.5.7 Prover Link.
- If the ***Prover Type*** is set to Standalone Prover under Home ▸ System ▸ Initial Setup, and ***Enable Promass Communications?*** is set to Yes, click ▸ **Comms** on the breadcrumb bar to go back (or the browser back button) and select ▸ **Promass Comms Link**. Then go to Section 5.5.8 Promass Comms Link
- Otherwise, for the next phase, check if there is a station link configured by clicking ▸ **Comms** on the breadcrumb bar to go back (or the browser back button) and select ▸ **Station Link**. Then go to Section 5.5.10 Station Link

5.5.7 Prover Link

If the prover and meter runs are using the NÅNO, then to reduce load on the communications between the Supervisory/HMI system, this link is added by default. To use this feature set the ***Prover Type*** in Home ▸ System ▸ Initial Setup to System Prover. The following options are then enabled.

Meter Number	A maximum of twelve meters can be connected using this link. Clicking on this option allows you to select which meter this unit represents. **NOTE:** The combination of this, the Prover Link ID and the Prover Channel ID below must be unique in the system.	**A**
Prover Link ID (Valid Entries 0-9999, 0 = Disabled)	As multiple flow systems may share the same network, the ability to separate Meter 1 on System 'X' from say, Meter 1 on System 'Y' is critical. This Prover Link ID allows each NÅNO to be uniquely identified on a network. This is used together with the Prover Channel ID to ensure that each communications link is also unique (see below). Enter a unique value here, between 1 and 9999 (0 disables the link), then simply make sure that the Link ID and Channel ID on all the other relevant units is set to the same value. In the example shown, the Prover Link ID is set to 1 and the Channel ID is set to Channel 1. These are used together with the Meter Number above to uniquely reference an individual unit and a particular communications link on the network.	**A**
Prover Channel ID	Along with the Prover Link ID each NÅNO is uniquely identified on a network for a particular communications link. Enter a unique channel here, between Channel 1 and Channel 5, then simply make sure that the Link ID and Channel ID on all the other relevant units is set to the same value. In the example shown, the Prover Link ID is set to 1 and the Channel ID is set to Channel 1. These are used together with the Meter Number above to uniquely reference an individual unit and a particular communications link on the network.	**A**

Link Status	This shows the status of the link to the NÅNO running the prover application: **Down**: This shows that a data connection is not made to the NÅNO running the prover application. **Up:** This shows that a data connection is currently available to the NÅNO running the prover application. This does not mean that data is being passed between the Meter Run and Prover however, as the passing of data is controlled by the prover end of the link.	-
Comms Status	This shows if the link to the NÅNO running the prover application is Enabled or Disabled. As the passing of data is controlled by the prover end of the link, if this is incorrect it will require updating of the setting on the prover NÅNO application.	-
Prover Counts	This is an internal counter in the NÅNO running the prover application that is used to monitor if the link is updating and is shown here for diagnostic purposes.	-

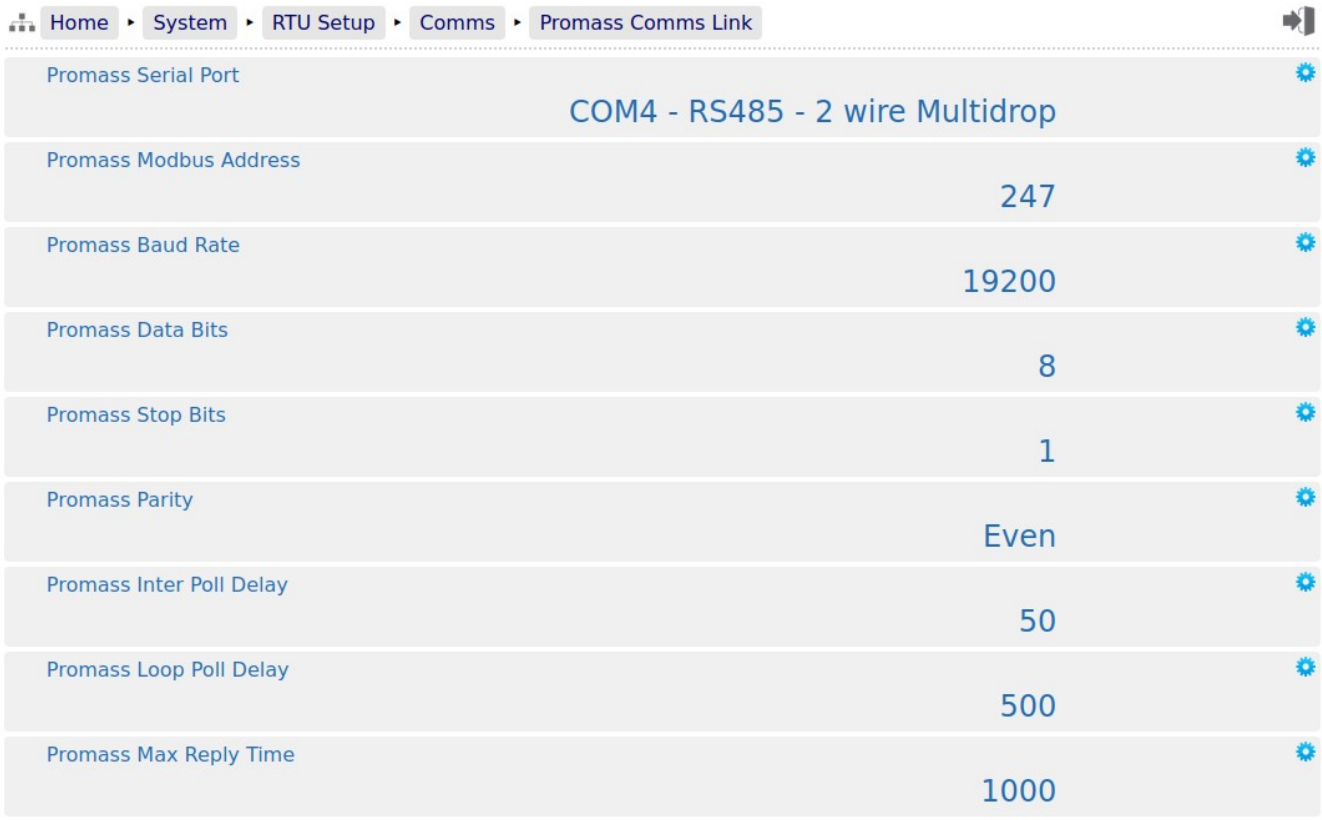
This completes the ▸ **Prover Link** settings.

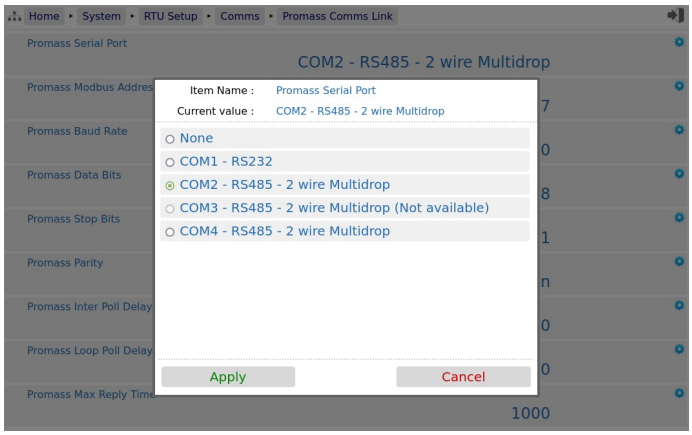
For the next phase, check if there is a station link configured by clicking ▸ **Comms** on the breadcrumb bar to go back (or the browser back button) and select ▸ **Station Link**. Then go to Section 5.5.10 Station Link.

5.5.8 Promass Comms Link

If an Endress+Hauser Promass Coriolis meter is used as the primary measurement, communications can also be used to retrieve more information. The extra data is shown in Section 5.5.9 Promass Data.

This menu is used to configure the communications to allow the data to be retrieved and used.



Promass Serial Port	Select the Serial Port to be used to communicate to the Promass Coriolis meter.  As with other communications links, the radio button only allows the selection of one port at a time or None (if no serial port is required). If the radio button is grayed out, this indicates that the serial port has already been allocated to another service. In the example shown, a local panel is in use on COM3. **NOTE:** COM4 is only available on Gen3 Hardware.	**A**
Promass Modbus Address	This is usually set to 1 or 247 but can be changed to match the requirements of the installation, as required.	**A**
Promass Baud Rate	This setting allows you to specify the baud rate for the Serial Port. The list of valid values is 1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200.	**A**
Promass Data Bits	This setting allows you to specify the number of data bits for the Serial Port. The list of valid values is 4, 5, 6, 7 or 8.	**A**
Promass Stop Bits	This setting allows you to specify the number of stop bits for the Serial Port. The list of valid values is 1 or 2.	**A**
Promass Parity	This setting allows you to specify the parity for the Serial Port. The list of valid values is None, Odd or Even.	**A**
Promass Inter Poll Delay	This setting allows you to specify the delay that is left between each poll for data from the Promass Coriolis meter. This time is set in milliseconds.	**A**
Promass Loop Delay	This setting allows you to specify the delay that is left after the last poll in the sequence before the next poll sequence is started from the Promass Coriolis meter. This time is set in milliseconds.	**A**
Promass Max Reply Time	This setting allows you to specify the maximum time that is allowed for the Promass Coriolis meter to reply to a request. This time is set in milliseconds.	**A**

This completes the ▸ **Promass Comms Link** settings.

For the next phase, click ▸ **Comms** on the breadcrumb bar to go back (or the browser back button) and select ▸ **Promass Data**. Then go to Section 5.5.9 Promass Data.

5.5.9 Promass Data

This display is shown for information purposes only. The Mass Rate, Flowing Density and Reynolds Number can be used in the application and are described in the relevant section.

All the data can be retrieved by the supervisory/HMI using the OPC-UA communications link.

Each line will not be described here as they are a direct copy of the data from the Endress+Hauser Promass Coriolis meter.

This completes the ▸ **Promass Data**. settings.

For the next phase, check if there is a station link configured by clicking ▸ **Comms** on the breadcrumb bar to go back (or the browser back button) and select ▸ **Station Link**. Then go to Section 5.5.10 Station Link.

5.5.10 Station Link

If the meter run is using the NÅNO and it is also connected to a NÅNO Station machine, then to reduce load on the communications between the Supervisory/HMI system, this link can be enabled. This allows some settings to be controlled by a Station unit along with a view of instantaneous station rates, totals and Station reports.

By default the link is Disabled and the display below will be shown;

If however the mode is changed to Enabled, settings are revealed. These are described below;

Link Control	This allows the link to a station NÅNO to be enabled or disabled: **Disabled**: This masks all the other settings on this page and also disables the possiblity of the 'Station Link Comms Fail' alarm. **Enabled**: Makes the options below visible and allows an alarm to be raised by the Meter Run if it is unable to communicate with the Station NÅNO.	**A**
Meter Number	A maximum of six meters can be connected using this link. Clicking on this option allows you to select which meter this unit represents. **NOTE:** The combination of this, the Station Link ID and the Station Channel ID below must be unique in the system.	**A**
Station Link ID (Valid Entries 0-9999, 0 = Disabled)	As multiple flow systems may share the same network, the ability to separate Meter 1 on System 'X' from say, Meter 1 on System 'Y' is critical. This Station Link ID allows each NÅNO to be uniquely identified on a network. This is used together with the Station Channel ID to ensure that each communications link is also unique (see below). Enter a unique value here, between 1 and 9999 (0 disables the link), then simply make sure that the Station Link ID and Station Channel ID on all the other relevant units is set to the same value. In the example shown, the Station Link ID is set to 1 and the Station Channel ID is set to Channel 2. These are used together with the Meter Number above to uniquely reference an individual unit and a particular communications link on the network.	**A**
Station Channel ID	See description above for Station Link ID. **NOTE:** Ensure that the Station Channel ID is unique for a particular communication link.	**A**
Station Link Status	This shows the status of the link to the NÅNO running the station application: **FAILED:** This shows that a data connection is not made to the NÅNO running the station application. This may be due to settings above being incorrect, a fault or the link being disabled. **CONNECTED_ BUT_NO_COMMS:** This shows that a communications connection is currently available to the NÅNO running the station application, however that data is not being passed. It is likely that this is due to the connection being disabled at the station application (as it is in control of the communications link). **CONNECTED_ WITH_COMMS_ OK:** This shows that a communications connection is currently available to the NÅNO running the station application and that data is being passed. This is the normal, correct running of the link.	**-**

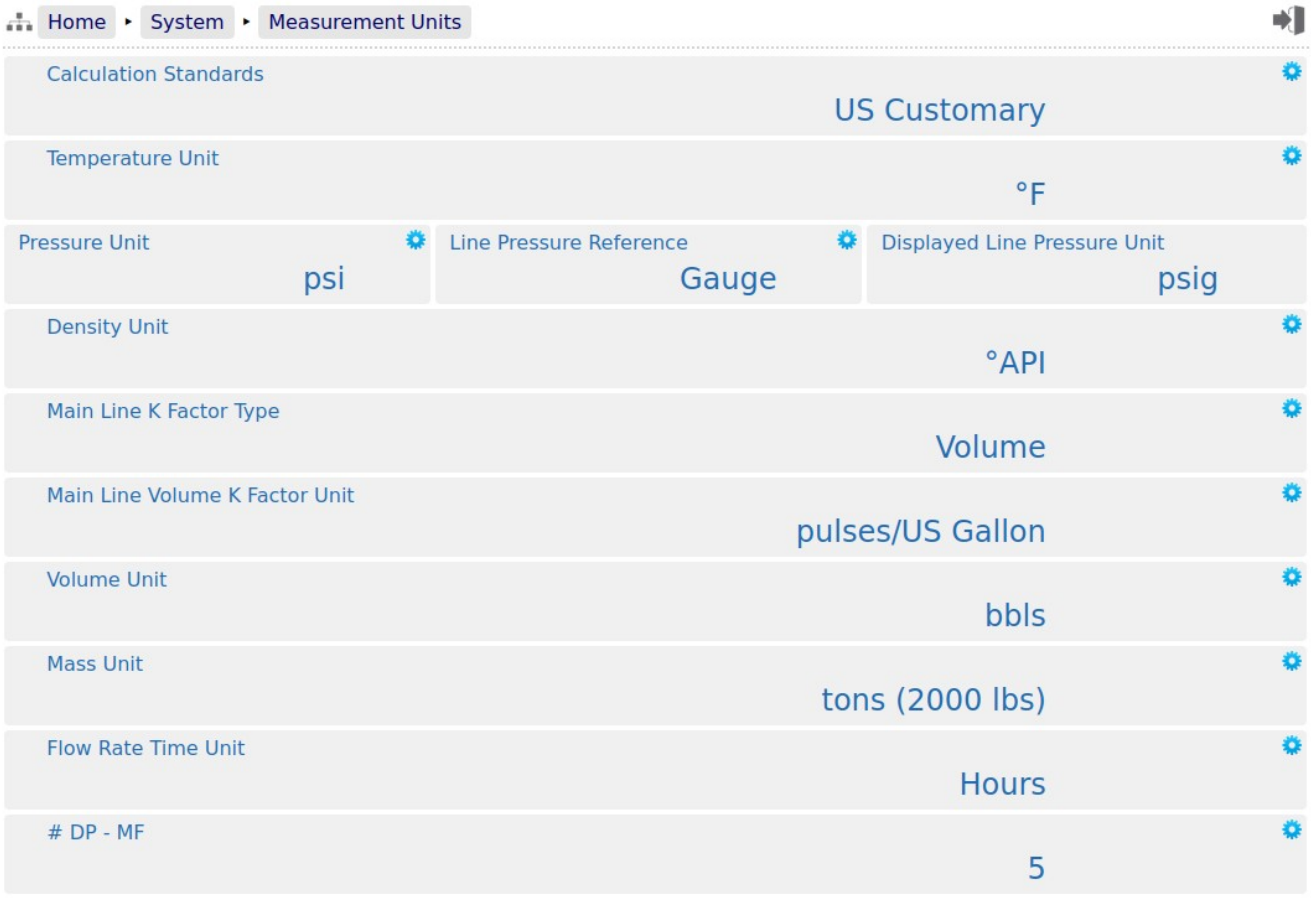
Comms Status	This shows if the link to the NÅNO running the station application is running correctly. This shows the status of the link to the NÅNO running the station application: **Failed**: This shows that the communications link is not functioning correctly, this could be due to incompatible settings for the Meter Number, Station Link ID and Station Channel ID or the link being disabled (from either the meter run or station end). **Running**: This shows that the communications link is functioning correctly, the settings are compatible with the station application, the link is enabled and data is flowing as expected between the meter run and the station application.	-
Station Heartbeat	This is an internal counter in the NÅNO running the station application that is used to monitor if the link is updating and is shown here for diagnostic purposes.	-

This completes the ▸ **Station Link** settings.

For the next phase, click ▸ **System** on the breadcrumb bar to go back (or the browser back button) and select ▸ **Measurement Units**. Then go to Section 6 Stage 3 of 5: Configuring the Measurement Units

6 Stage 3 of 5: Configuring the Measurement Units

The units available in the Liquid Flow Computer Application are highly configurable. The screenshot below shows the unit selection screen:



Calculation Standards	There are two choices, US Customary and Metric. If using 60°F as the temperature base, select US Customary and °F as the Temperature Unit (shown below) otherwise select Metric.	**M**
Temperature Unit	Select degree Centigrade (°C) or degrees Fahrenheit (°F).	**M**
Pressure Unit	There are three options: psi, bar or kPa on radio buttons. Select the appropriate one.	**M**
Line Pressure Reference	This selection determines if the measured (line) pressures are in Absolute pressure or Gauge pressure. **NOTE:** The atmospheric pressure at the location in use is set here: Home ▸ System ▸ Initial Setup ▸ Site/Location Setup.	**M**
Displayed Line Pressure Unit	This shows how the unit will be displayed on the website, local panel and printed reports. If the Pressure Unit was set to psi and the Line Pressure Reference Selection is Gauge, then psig will be used and displayed.	**-**
Density Unit	There are 6 choices of Density Unit and the selected unit is used throughout the Application: in reports, on displays and as an input parameter. The choices are: kg/m3, SG(RD) °API, lbs/US gallon, lbs/barrel or g/cc .	**M**
Main Line K Factor Type	This configures the application to run in Volume mode giving an inferred mass result based upon density or in Mass mode with an inferred volume. The setting will also determine which of the two lines below is displayed.	**M**
Main Line Volume K Factor Unit	If Volume K Factor has been selected, the options will be pulses/litre, pulses/m3, pulses/bbl or pulses/US Gallon.	**M**
Main Line Mass K Factor Unit	If Mass K Factor has been selected, the options will be pulses/kg, pulses/tonne (1000 kg), pulses/ton (US Short Ton), pulses/lb or pulses/1000 lbs.	**M**
Volume Unit	The Volume Unit selection determines the volume used on reports, displays and communications and does not have to align with the K Factor unit selected. This can be Litres, Cubic Meters (m3), US Gallons or US Oil Barrels (bbls).	**M**
Mass Unit	The Mass Unit selection determines the mass unit used on reports, display and communications and does not have to align with the K Factor unit selected. The choice of mass units is kg, tonnes (1000kg), US Short tons (2000lbs) or 1000 lbs.	**M**
Flow Rate Time Unit	This can be set to Seconds (s), Minutes (min), Hours (hr) or Days (d).	**M**
# DP - MF	To match international standards values of 4 or 5 are valid numbers.	**M**

This completes the ▸ **Measurement Units** settings.

For the next phase, click ▸ **System** on the breadcrumb bar to go back (or the browser back button) and select ▸ **I/O**.

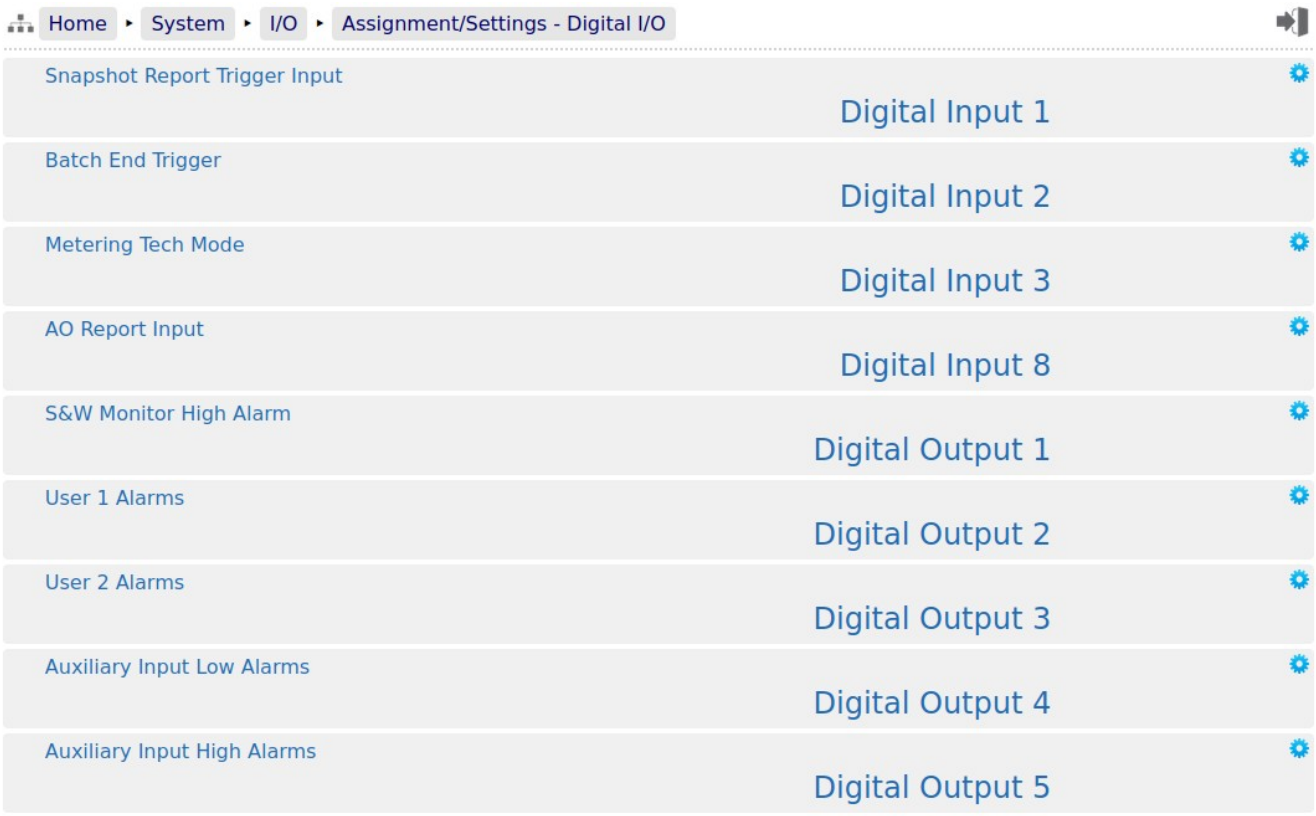
7 Stage 4 of 5: Matching the I/O to the P&ID

There are nine sub-menus accessible from this screen. They are used to configure the various types of field I/O provided by the NÅNO.

Most are grouped by I/O type, for example the Digital I/O or Analog Outputs. The ***Assignment/Settings - Process Inputs*** is the exception to this as most of the process inputs are Analog Inputs but as measured density can be either a scaled Analog input or a Frequency (period) input, it is grouped together for ease. The flow meter Pulse Input Routing option is also selected from this menu.

Field Calibration is only available if the ***Metrology Mode*** is set to API under Home ▸ System ▸ Initial Setup.

7.1 Assignment/Settings – Digital I/O



NOTE: Applications do not check for exclusive assignment of any I/O points. It is recommended to record any changes to the I/O using the I/O schedule drawings available in Section 16 I/O Schedules.

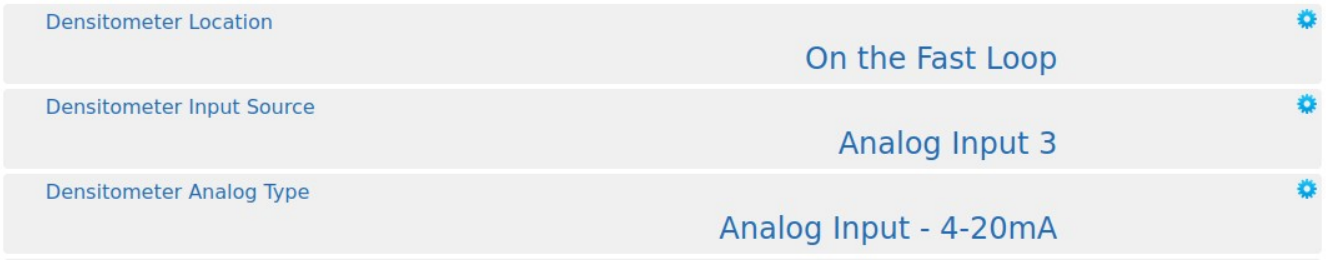
Snapshot Report Trigger Input	Driving the selected Digital Input will cause the application to snapshot the live data (see Home ▸ Logs & Info ▸ Snapshot/Live Data) and print it to the printer designated in Home ▸ System ▸ RTU Setup ▸ Comms ▸ Report Routing.	**A**
Batch End Trigger	Driving the selected Digital Input will cause the current batch to end and immediately start the next batch running. This action can also be triggered from the Local Panel (when the Metering Technician screen has been activated), by a pre-programmed calendar event or remotely via comms.	**A**
Metering Tech Mode	A switch should be connected to this input to enable the Local Panel to be swapped from "Flow Information" mode to "Metering Tech" mode. This allows a metering technician to change some of the metering parameters following a meter prove. The switch should be secured so that tampering can be detected. Changing the Local Panel to Metering Tech mode logs the technician name & password, assuming that security has been enabled. When exiting Metering Tech mode, if the Bias values have been changed or if the MF has been accepted by this route a report will be printed to log this information.	**A**

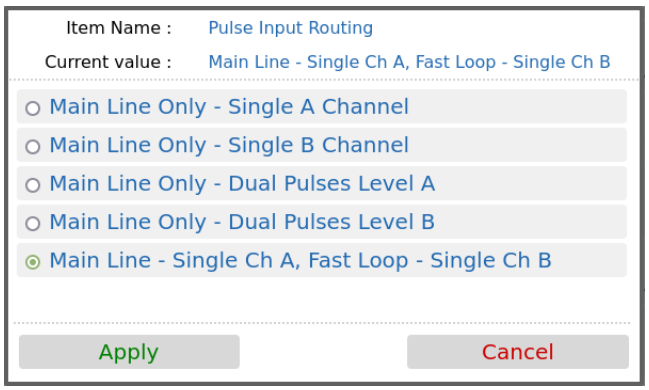
AO Report Input	This digital input is intended to be wired to a switch. When the BLM Authorized Officer wishes to inspect certain critical data on the Flow Computer, this is easily accomplished by setting this switch to on. The Flow Information screen or Metering Technician menus will be temporarily hidden and the AO report displayed on the Local Panel. The length of time that the AO report will be displayed for is set under Home ▸ System ▸ Initial Setup ▸ Time Based Settings.	**A**
S&W Monitor High Alarm	If an S&W Monitor High (Bad Oil) signal is needed, it can be assigned to a Digital Output or suppressed altogether by selecting Not Routed. Alternatively the Output can be left unconnected if not required.	**A**
User 1 Alarms	If any User 1 High alarms are exceeded or the value is lower than the User 1 Low alarms, this Digital Output will become active.	**A**
User 2 Alarms	As for User 1 Alarms, but for the second user alarm group, User 2 Alarms.	**A**
Auxiliary Input Low Alarms	This operates as per the User Alarms but can only be configured to monitor the Auxiliary Inputs. This will be triggered when an auxiliary input goes below the Low Alarm Limit.	**A**
Auxiliary Input High Alarms	This operates as per the user alarms but can only be configured to monitor the Auxiliary Inputs. This will be triggered when an auxiliary input goes above the High Alarm Limit.	**A**

7.2 I/O Assignments – Process Inputs

NOTE: Applications do not check for exclusive assignment of any I/O points. It is recommended to record any changes to the I/O using the I/O schedule drawings available in Section 16 I/O Schedules.

If the density is assigned to an analog input, that section will change as shown below, to allow entry of the Analog Type:



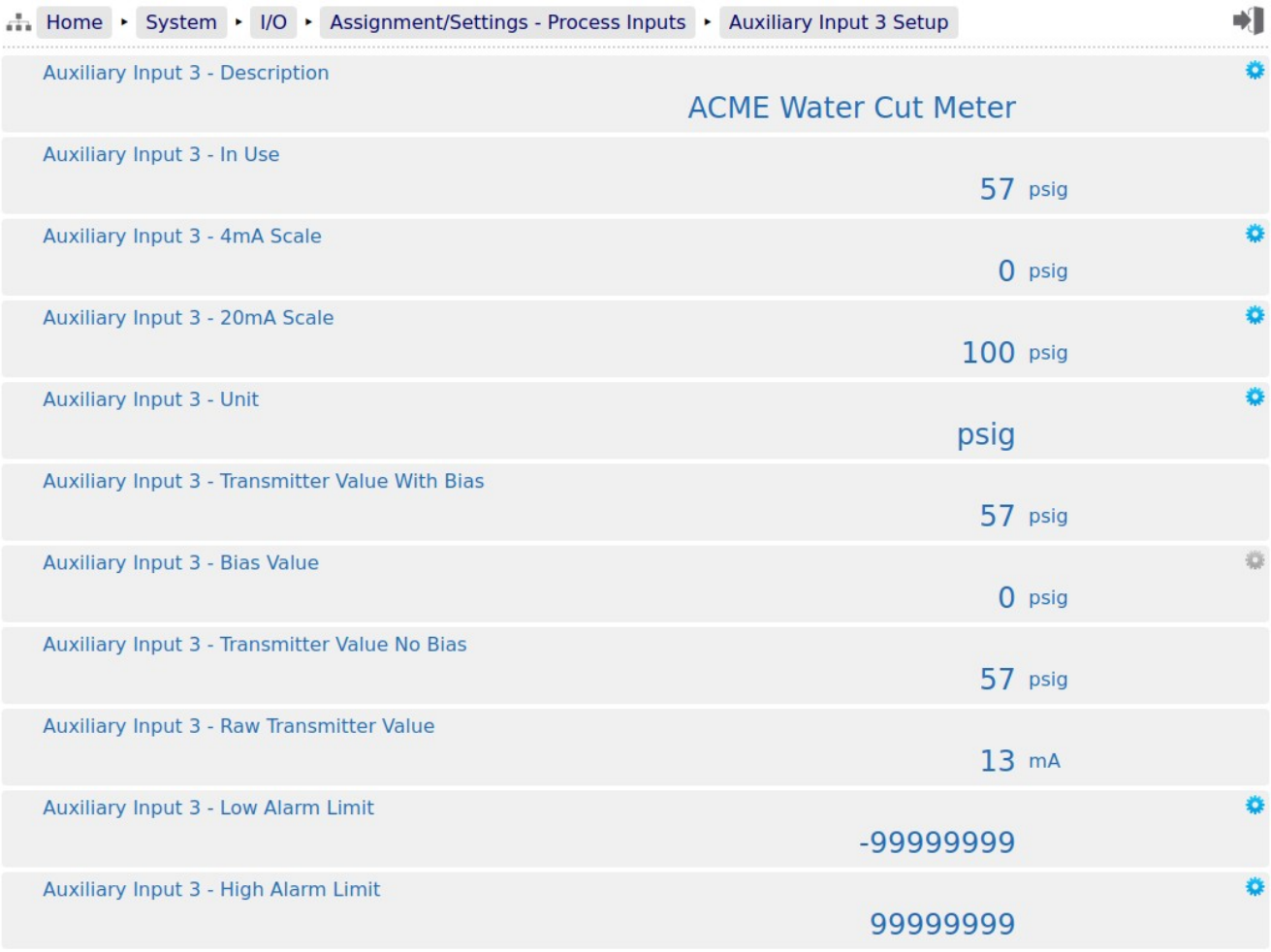
Pulse Input Routing	The application has two Meter Pulse Inputs. They can be used as a pair to give API MPMS Ch5.5 Fidelity & Security to Level A or B, or as a pair of single pulse inputs.  If there is no Fast Loop, the Main line can be a single pulse input on channel A or B, or a dual pulse input with either Level A or Level B security. If however, PID control of the Fast Loop is required, select the 'Main Line - Single Ch A, Fast Loop - Single Ch B' option. This enables a second meter to be connected, a PID control loop can be assigned to the flow rate of this second meter.	**M**
Meter Temperature Source	The application can use a live meter temperature with an optional Default (fail-over) value (in the case of a transmitter failure) or a user entered Override value. In this example, the unit is configured assuming that the temperature is being measured using a 4-wire RTD. Analog Input 6 has been assigned as the source of the Temperature information. Clicking this line allows the user to assign different Analog Inputs or to Disable the Meter Temperature Source, if an alternative method is being used.	**M**

Meter Temperature Type	Once the appropriate Meter Temperature Source has been chosen, the Type of Temperature needs to be selected. A 4-20mA transmitter or 1-5 Volt device can be used with any of the Analog Inputs, and Analog 5 & 6 also allow a 4-wire RTD to be directly connected. If a Meter Temperature Source has been selected as 4-20mA then the Meter Temperature parameters will also need to be set. See Section 8.1.6 Meter Temperature. On the screenshot above Analog Input 6 has been configured for a 4-wire RTD.	**M**
Meter Pressure Source	The application can use either a live meter pressure with an optional default (fail-over) value (in the case of a transmitter failure) or a user entered Override value. In this example a live meter pressure is configured on Analog Input 1 to measure this value. Clicking this line allows the assignment to be changed to another Analog Input channel or Disabled if a measured value is not used. If a Meter Pressure Source has been selected, the Meter Pressure parameters will also need to be set. See Section 8.1.7 Meter Pressure.	**M**
Meter Pressure Type	The Meter Pressure Transmitter can be a 4-20mA device or a 1-5 Volt unit.	**M**
Monitor S&W Source	The application can use a live Sediment and Water reading, with an optional fail-over value in the case of an instrument failure or a user entered Override value. **NOTE:** This option is only available if ***Metrology Mode*** is set to **API** in Section 4.2 Initial Application Setup, Site/Location Setup. By clicking this line the assignment can be changed to another Analog Input channel or Disabled if a measured value is not used. If a Measured S&W has been selected, the Measured S&W parameters will also need to be set. See Section 8.1.9 Monitor S&W.	**A**
Monitor S&W Type	The Monitor S&W Transmitter can be a 4-20mA device or a 1-5 Volt unit.	**A**
Densitometer Location	There are 3 options available: **No Densitometer Fitted** — If this option is selected, the Base Density for each product must be entered in the Product "N" Data menu, where "N" is the product number. See Section 8.3.4 Product "N" Data. **On the Meter Run:** — If this option has been selected, the Densitometer Input Source (next item down) must be configured to match the Density Meter type and I/O connection. To configure, navigate to Home ▸ System ▸ Process Setup ▸ Main Line ▸ Densitometer. **On the Fast Loop:** — If this option has been selected, the set up is the same as for the Main Line, except the process setup is here: Home ▸ System ▸ Process Setup ▸ Fast Loop ▸ Densitometer. For more information see Section 8.1.8 Main Line Densitometer.	**M**

Densitometer Input Source	The Densitometer output can be a scaled Analog output, a pulse type output or digital communications. Select the relevant input option: **Analog Input:** If this option is selected, select which Analog Input the densitometer is connected to. **Period Input:** If this option has been selected, select which Period Input the densitometer is connected to. **Coriolis Comms:** If this option has been selected, this relies on the Promass Comms Link being enabled and working. Modbus register 2013 is used. **NOTE:** The Coriolis meter density must be in the same units as the Flow Computer density.	**M**
Fast Loop Temperature Source	Clicking this line allows the user to assign different Analog Inputs, or to Disable the Fast Loop Temperature Source. The application can use a live fast loop temperature with an optional Default (fail-over) value (in the case of a transmitter failure) or a user entered Override value. In this example, the unit is configured assuming that the temperature is being measured using an analog transmitter on Analog Input 4.	**M**
Fast Loop Temperature Type	Once the appropriate Fast Loop Temperature Source has been chosen, the Type of Temperature needs to be selected. A 4-20mA transmitter, or 1-5 Volt device can be used with any of the Analog Inputs, and Analog 5 & 6 also allow a 4-wire RTD to be directly connected. If a Fast Loop Temperature Source has been selected as 4-20mA or 1-5V, the Fast Loop Temperature parameters will also need to be set. See Section 8.2.3 Fast Loop Temperature.	**M**
Fast Loop Pressure Source	Clicking this line allows the user to assign different Analog Inputs, or to Disable the Fast Loop Pressure Source. The application can use a live fast loop pressure with an optional Default (fail-over) value (in the case of a transmitter failure) or a user entered Override value. In this example, the unit is configured assuming that the live pressure reading is Disabled.	**M**
Fast Loop Pressure type	The Fast Loop Pressure Transmitter can be a 4-20mA device or a 1-5 Volt unit. Once the appropriate Fast Loop Pressure Source has been chosen, the Type of Pressure needs to be selected. A 4-20mA transmitter, or 1-5 Volt device can be used with any of the Analog Inputs. If a Fast Loop Pressure Source has been selected, the Fast Loop Pressure parameters will also need to be set. See Section 8.2.4 Fast Loop Pressure.	**M**

Auxiliary Input 1 Source	An Auxiliary Input is an Analog Input that is not used directly by the application but allows unused Analog Inputs to be used as a data logger, or already allocated Analog Inputs to be scaled differently. Auxiliary Input data can be scaled to engineering units and logged in the historical data archive, charted and displayed on a web browser, using the in-built trending feature. Live and historical data can be retrieved over the XML data link. Live data is also available via OPC-UA and Modbus. Each Auxiliary input source can be set to any of the Analog Inputs or Disabled, which is the default selection. It is the responsibility of the administrator to check the assignment of the Field I/O inputs and outputs. In this example Auxiliary Input 1 Source is disabled. **NOTE:** All Auxiliary Inputs are fixed as 4-20mA transmitters. No option is provided to select a 1-5 Volt device.	**A**
▸ ***Auxiliary Input 1 Setup***	To configure an Auxiliary Input see Section 7.2.1 Auxiliary Input Setup Menu below.	**-**
Auxiliary Input 2 Source	As Auxiliary Input 1 above.	**A**
▸ ***Auxiliary Input 2 Setup***	As Auxiliary Input 1 above.	**-**
Auxiliary Input 3 Source	As Auxiliary Input 1 above. In this example, Auxiliary Input 3 is configured to Analog Input 3.	**A**
▸ ***Auxiliary Input 3 Setup***	As Auxiliary Input 1 above, however as Auxiliary Input 3 is configured, see Section 7.2.1 Auxiliary Input Setup Menu for how to set this up.	**-**
Auxiliary Input 4 Source	As Auxiliary Input 1 above.	**A**
▸ ***Auxiliary Input 4 Setup***	As Auxiliary Input 1 above.	**-**
Auxiliary Input 5 Source	As Auxiliary Input 1 above.	**A**
▸ ***Auxiliary Input 5 Setup***	As Auxiliary Input 1 above.	**-**

7.2.1 Auxiliary Input Setup Menu



In the descriptions below, ‘X’ represents the loop, so in this example it would be ‘3’.

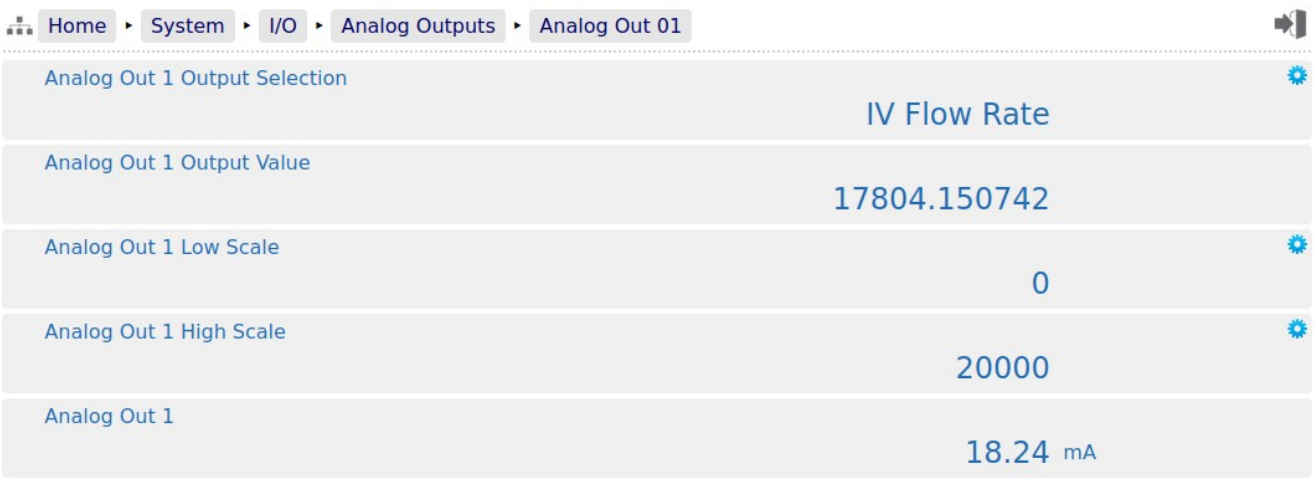
Auxiliary Input "X" - Description	This field allows the Auxiliary Input to be named. The name is then visible on the Home ▸ System ▸ I/O ▸ I/O Diagnostics report page.	**A**
Auxiliary Input "X" - In Use	This field shows the scaled engineering result that is made available to the trending system and can be retrieved via XML and Modbus communications. This is for information only and cannot be changed.	**-**
Auxiliary Input "X" - 4mA Scale	This field sets the 4mA scaling value. It is recommended to set the Engineering Units (shown below) first, then set the scaling.	**A**
Auxiliary Input "X" - 20mA Scale	This field sets the 20mA scaling value. It is recommended to set the Engineering Units (shown below) first, then set the scaling.	**A**
Auxiliary Input "X" - Unit	Clicking the line brings up a selection dialog box. Select one of the 5 different units available. The options are °F, %, psig, g/cc or °API. The default is %.	**A**
Auxiliary Input "X" Transmitter Value with Bias	This is the sum of the ***Transmitter Value No Bias*** and the associated ***Bias Value***. This is for information only and cannot be changed.	**-**
Auxiliary Input "X"Bias Value	This is the Bias or Offset value that is being applied to the measured value. This value can be viewed by anyone. If logged in at Technician level however, it can also be edited. It can also be set by the Technician Menu using the Local Panel. **NOTE:** If logged in at Admin level, this is a read-only status display.	**TO**
Auxiliary Input "X" Transmitter Value no Bias	This point displays the live measured engineering value with the units and scaling factors applied. This item cannot be edited.	**-**
Auxiliary Input "X" – Raw Transmitter Value	This field shows the equivalent current for the associated Analog Input channel. This is for information only and cannot be changed.	**-**
Auxiliary Input "X" – Low Alarm Limit	This point shows the currently configured Low Alarm limit. If the ***Auxiliary Input “X” In Use*** goes below the configured value, the Auxiliary Input “X” - Low Alarm will be raised. Clicking the line opens the Edit Value dialog box, allowing the user to choose a different value. If an impossibly low default value is used, no Low Alarm will ever be raised.	**A**
Auxiliary Input "X" – High Alarm Limit	This point shows the currently configured High Alarm limit. If the ***Auxiliary Input “X” In Use*** goes above the configured value, the Auxiliary Input “X” - High Alarm will be raised. Clicking the line opens the Edit Value dialog box, allowing the user to choose a different value. If an impossibly high default value is used, no High Alarm will ever be raised.	**A**

That is the end of the Process Inputs setup.

7.3 Configuring Analog Outputs

The NÅNO has two independent Analog outputs. The example below shows the settings for Analog Out 1 however the same options are available for Analog Out 2. As such, Analog Out 2 screenshot and description will not be shown or described here.

NOTE: The Analog Outputs are always driven. You can change what they are driven by but cannot disable them. If Analog Outputs are not required do not connect anything to the Analog Output terminals.



Analog Out 1 Output Selection	Clicking the Analog Out 1 Output Selection line will open the selection dialog box, and any one of the eight options listed can be selected. The options are: Meter Pressure, Meter Temperature, Meter Density, Indicated Volume Flow Rate, Mass Flow Rate, Gross Observed Volume Flow Rate, S&W or PID Controller output. **Note:** Some outputs are not available depending on application setup. These will be selectable however the values will always be 0. An example of this is IV Flow Rate – this is not available if the K Factor is in mass units.	**A**
Analog Out 1 Output Value	This is the value to be output based on the selection above. This item cannot be edited.	**-**
Analog Out 1 4mA Scale	This is the value of the selected output variable required drive the output to 4mA.	**A**
Analog Out 1 20mA Scale	This is the value of the selected output variable required to drive the output to 20mA.	**A**
Analog Out 1	Based on the Output Value and Scaling Values above, this is the calculated mA value to be output. **Note:** If the Output Value is outside the Scaling Values, the calculated mA value will be extrapolated. It is possible that the calculated value, although calculated is not achievable by the hardware.	

Example:

Assume that in the Units Setting page, the Volume Unit has been chosen as bbls and the Flow Rate Time Unit as Hours (hr). Also assume that the ***Analog Out 1 Output Selection*** is Indicated Flow Rate and ***Analog Out 1 4mA Scale*** is set to 0 and the ***Analog Out 1 20mA Scale*** is set to 10,000.

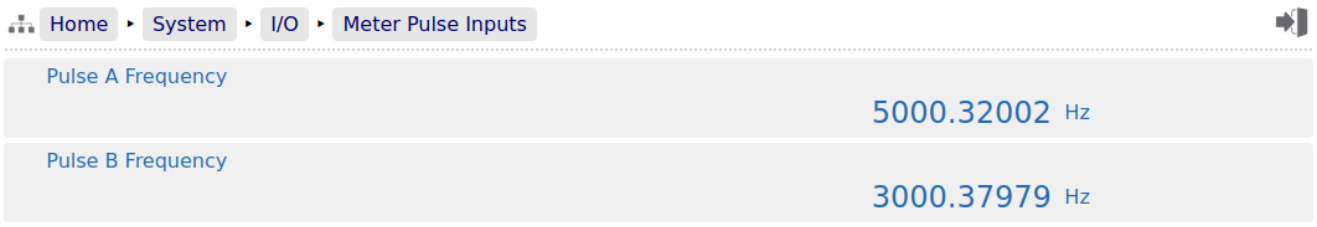
Example Results:

Less than 3.5mA indicates a fault. This could be negative flow, a wiring fault or the controller is off.
4.0mA represents No Flow.
6.0mA represents flow rate of 1,250 bbls/hour.
8.0mA represents flow rate of 2,500 bbls/hour.
12.0mA represents flow rate of 5,000 bbls/hour.
16.0mA represents flow rate of 7,500 bbls/hour.
20.0mA represents flow rate of 10,000 bbls/hour.
Over 20.0mA indicates a flow rate in excess of 10,000 bbls/hour.

7.4 Meter Pulse Inputs

Depending on the ***Pulse Input Routing*** setting in Section 7.2 I/O Assignments – Process Inputs depends on whether to look in Section 7.4.1 Single Pulse Mode or Section 7.4.2 Dual Pulse Mode.

7.4.1 Single Pulse Mode

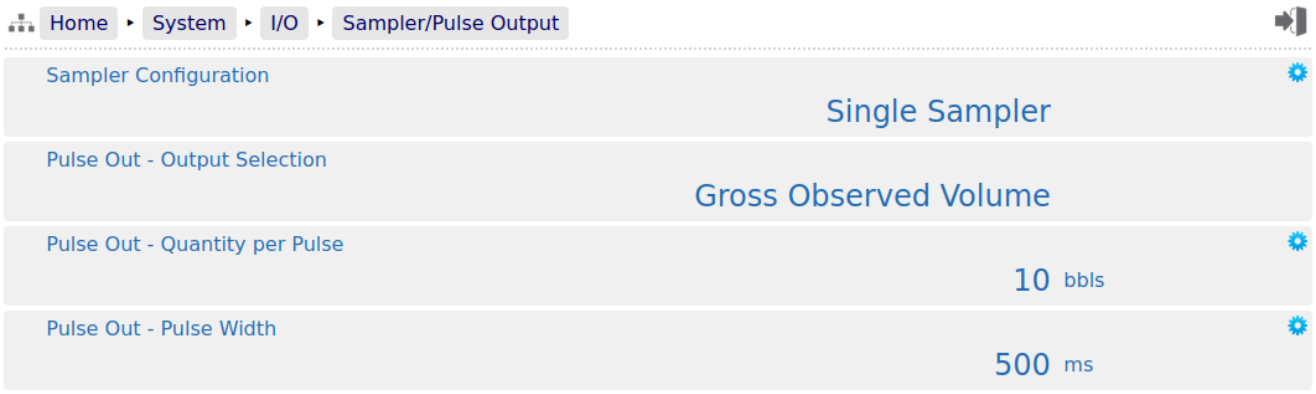


Pulse A Frequency	This is not configurable but indicates the frequency on the A channel.	-
Pulse B Frequency	This is not configurable but indicates the frequency on the B channel.	-

7.4.2 Dual Pulse Mode

Raw Good Pulse Frequency	This is not configurable but indicates the frequency of the good pulses calculated from the Main Line flow meter.	**-**
Raw Bad Pulse Frequency	This is not configurable but indicates the frequency of the bad pulses calculated from the Main Line flow meter.	**-**

7.5 Sampler/Pulse Output



Sampler Configuration	There are two options: **Single Sampler:** Both Pulse Outputs will be driven at the same time so either output can be used to drive the single sampler. **Dual Sampler:** The Pulse Output used is alternated each batch. The batch report states which sampler output was driven for that batch.	**A**
Pulse Out - Output Selection	The Pulse Outputs are always driven from the Gross Observed Volume totalization. This is for indication only and is not changeable.	**-**
Pulse Out - Quantity per Pulse	Assuming that the volume unit has been set to barrels, then the default is '1' which equates to 1bbl/pulse. Clicking on the line opens the Edit Value box and a new value can be input. If 10 is input, the controller will generate one Pulse for every ten barrels loaded. If faster sampling was needed, for example, two sample pulses for each barrel, then 0.5 should be entered as the Quantity per Pulse.	**A**

Pulse Out - Pulse Width	This sets the minimum width of the pulse, both the On and Off periods, and thus the maximum repetition rate. The width of the pulse should be set to match the requirements of the sampler grab solenoid. By default, the output will be low until a whole barrel has been loaded. As an example if this is set to 1000ms, the output will go high and stay high for one second (1000 ms). It will then go low again and stay low until the next multiple of the ***Pulse Out - Quantity per Pulse*** volume has been loaded. With the ***Pulse Out - Pulse Width*** set to 1000ms, the pulses will never be sent out any faster than once every two seconds, regardless of the flow rate.	**A**

Example Number	bbls/Hour	bbls/Minute	bbls/Pulse	Pulse Width (ms)	On Time (Seconds)	Off Time (Seconds)
1	50	0.83	1	1000	1	71
2	100	1.67	1	1000	1	35
3	240	4	1	1000	1	14
4	480	8	1	1000	1	6.5
5	1000	16.67	1	1000	1	2.6
6	1200	20	1	1000	1	2
7	1500	25	5	1000	1	11
8	60	1	0.1	2000	2	4

In the examples 1 to 6 above, the Quantity per Pulse (bbls/Pulse) has been left as 1 and the Pulse Out Pulse width has also been left as 1000ms. As the flow rate increases, the time between sample pulses decreases. The sample system minimum time between pulse must be considered. If, for example, the minimum time between pulses is 5 seconds then you would be limited to 600bbls/Hour at 1 barrel per pulse. Line numbers 5 and 6, with a flow rate above 600bbls/Hour, show the off times as on 2.6 seconds and 2 seconds respectively so would not be compatible with this theoretical sample system.

If you needed to use higher flow rates, the number of pulse produced must be reduced.

Line number 7 shows the Quantity per Pulse (bbls/Pulse) has been set to 5 so only one pulse is produced for every 5 barrels measured and, even at 1500 bbls/hour, there would be 11 seconds off-time between pulses and so would be compatible with our theoretical sample system.

7.6 Period Inputs

This menu is for information only, and nothing can be changed.

The two lines show the period of Period In 1 & 2 in microseconds.

7.7 Field Calibration

The NÅNO has very stable, high resolution Analog Input and RTD measurement circuitry which is factory calibrated to a high standard. This will give excellent measurement results without additional user input.

However real-world issues, such as transmitter error, or physical problems, such as a sub-standard design of thermowell, or incorrect placement of a transmitter can lead to the measured value being different to the reality. There are two ways to solve this problem.

The simplest is to apply a one-point bias, or offset adjustment, and this is easily achieved in Technician Mode using the Local Panel. A bias adjustment however may only be reasonable when the operating point does not change too much. If, for example, the bias function is used to adjust a temperature reading, this Bias Adjustment should be checked between Summer and Winter as a minimum.

In addition to the bias or offset for a Process Variable, the Application features a site calibration mode to enable loop calibration of each Analog Input.

This can eliminate certain transmitter errors, such as offset errors and span/gain errors. Loop calibration cannot eliminate problems of non-linearity, although good operating practice can indicate these type of transmitter problems.

The process for calibrating an Analog input is straightforward but remember the user MUST be logged in at Technician Level.

Example:

In this example the pressure input, configured to use Analog Input 1, is to be loop calibrated.

Before the Calibration process can commence, the operator must know the range the transmitter will operate over and the scaling values.

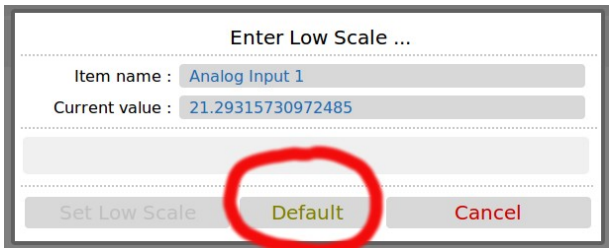
To start the calibration process, navigate to Home ▸ System ▸ I/O ▸ Field Calibration as shown below. This page shows all 6 Analog Inputs. In this example, we are calibrating the loop for 0 to 250 PSI.

NOTE: Unless logged in at Technician level, the edit icons will be shown in gray and the Analog Inputs cannot be edited.

You can see that ***Analog Input 2*** through to ***Analog Input 6*** show (Default) at the beginning of the line. This shows that these inputs are using the factory calibration values. ***Analog Input 1*** however does not show (Default) hence Analog Input 1 is running with replacement values.

Step 1

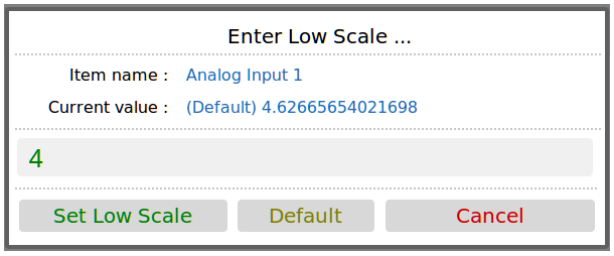
The replacement values must be cleared and set back to default. Click the line associated with the relevant input which will open the Enter Low Scale dialog box. Then click the button named Default. You will be asked to Reset Scale to Default and click the Confirm button.



You will be taken back to the previous screen but now ***Analog Input 1*** will show (Default) in front of the live reading and you are ready to proceed.

Step 2

Once again click the line associated with the input. This will open the Enter Low Scale dialog box again.



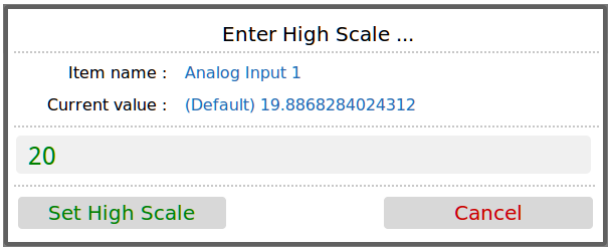
Vent the pressure as seen by the Pressure Transmitter to atmosphere and the reading shown as the "current value" in the Enter Low Scale dialog box should be around 4mA. If it is drastically different, the cause should be investigated. Once the pressure has normalized to atmospheric, type 4 into the data entry box and click the Set Low Scale Button.

This has pre-loaded 4.0mA into the low scale field. It is not yet being used and will not become active unless confirmed at the end of the process.

The dialog box now prompts you to enter the High Scale value.

Step 3

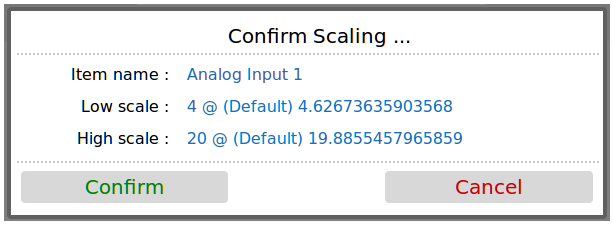
Now load the dead weight tester until pressure is at the full scale value of 250 PSI in this example.



The live reading should be display numbers around 20mA. Now type 20 into the Enter High Scale dialog box and click the Set High Scale button to set the value.

Step 4

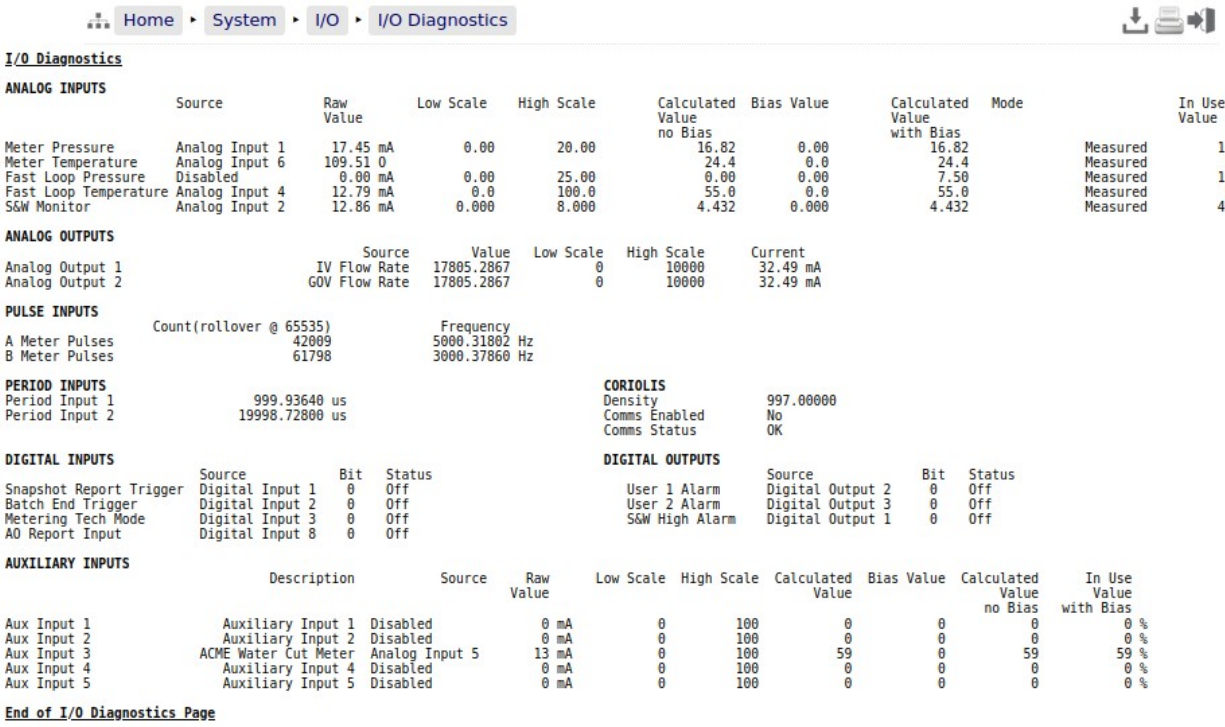
The dialog box now changes to "confirm scaling" as shown. The confirm scaling dialog box shows both the low scale and high scale before and after values. If these values appear to be reasonable then pressing the confirm button will accept the field calibration replacement values.



If, subsequently, a problem is found with the field calibration replacement values, the default values can be restored by clicking the relevant line and selecting the ***Default*** button (as per Step 1 above).

NOTE: Calibration replacement values are stored in the Metrology Event Log. The replacement values are also stored in non volatile memory and retained following a power cycle, update of the Application and update of the firmware.

7.8 I/O Diagnostics



Home ▸ System ▸ I/O ▸ I/O Diagnostics

I/O Diagnostics

ANALOG INPUTS

	Source	Raw Value	Low Scale	High Scale	Calculated Value no Bias	Bias Value	Calculated Value with Bias	Mode	In Use Value
Meter Pressure	Analog Input 1	17.45 mA	0.00	20.00	16.82	0.00	16.82	Measured	16.82 barg
Meter Temperature	Analog Input 6	109.51 O			24.4	0.0	24.4	Measured	24.4 °C
Fast Loop Pressure	Disabled	0.00 mA	0.00	25.00	0.00	0.00	7.50	Measured	16.82 barg
Fast Loop Temperature	Analog Input 4	12.79 mA	0.0	100.0	55.0	0.0	55.0	Measured	55.0 °C
S&W Monitor	Analog Input 2	12.86 mA	0.000	8.000	4.432	0.000	4.432	Measured	4.432 %

ANALOG OUTPUTS

	Source	Value	Low Scale	High Scale	Current
Analog Output 1	IV Flow Rate	17805.2867	0	10000	32.49 mA
Analog Output 2	GOV Flow Rate	17805.2867	0	10000	32.49 mA

PULSE INPUTS

	Count(rollover @ 65535)	Frequency
A Meter Pulses	42009	5000.31802 Hz
B Meter Pulses	61798	3000.37860 Hz

PERIOD INPUTS

Period Input 1	999.93640 us
Period Input 2	19998.72800 us

CORIOLIS

Density	997.00000
Comms Enabled	No
Comms Status	OK

DIGITAL INPUTS

	Source	Bit	Status
Snapshot Report Trigger	Digital Input 1	0	Off
Batch End Trigger	Digital Input 2	0	Off
Metering Tech Mode	Digital Input 3	0	Off
AO Report Input	Digital Input 8	0	Off

DIGITAL OUTPUTS

	Source	Bit	Status
User 1 Alarm	Digital Output 2	0	Off
User 2 Alarm	Digital Output 3	0	Off
S&W High Alarm	Digital Output 1	0	Off

AUXILIARY INPUTS

	Description	Source	Raw Value	Low Scale	High Scale	Calculated Value	Bias Value	Calculated Value no Bias	In Use Value with Bias
Aux Input 1	Auxiliary Input 1	Disabled	0 mA	0	100	0	0	0	0 %
Aux Input 2	Auxiliary Input 2	Disabled	0 mA	0	100	0	0	0	0 %
Aux Input 3	ACME Water Cut Meter	Analog Input 5	13 mA	0	100	59	0	59	59 %
Aux Input 4	Auxiliary Input 4	Disabled	0 mA	0	100	0	0	0	0 %
Aux Input 5	Auxiliary Input 5	Disabled	0 mA	0	100	0	0	0	0 %

End of I/O Diagnostics Page

The data shown on this page is live and will be updated every heartbeat. However the web page only updates approximately every second, depending upon bandwidth and connection type.

On this page, two additional screen icons are shown:

The Download Icon indicates that the data on the screen can be downloaded to the PC currently viewing the NÅNO web page. After clicking on this icon, your browser may ask the user what action should be performed with this file. Normally these options are to Save or View the data.

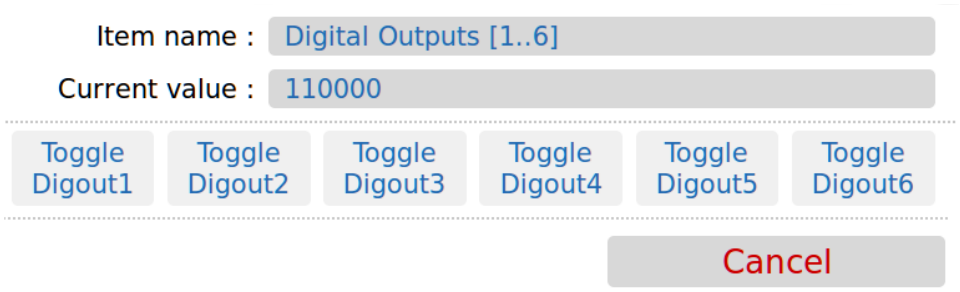
The Print icon indicates that the data on the screen can be printed, via the web printer configured on via Home ▸ System ▸ RTU Setup ▸ Comms ▸ Report Routing.

NOTE: To print to the PC running the browser, use the browser's specific printing method or type Ctrl+P on most browsers on most operating systems.

7.9 Digital I/O Debug

When logged in at Administrator level, this menu is a read-only information page and the gear icon on the Digital Output [1..6] line will be showed grayed-out.

The screenshot below shows the display when logged in at Technician level.

Digital Inputs [1..9]	This shows the current status of the Digital Inputs in a very compact manner. A "0" represents the OFF state and a "1" represents the ON state. The left most digit is Digital Input 1.	-
Digital Outputs [1..6]	There are two aspects to the Digital outputs, a display and an override. The display shows the current status of the Digital Outputs in a very compact manner. A "0" represents the OFF state and a "1" represents the ON state. The left most digit is Digital Output 1. If you click on the line, the following dialog box will be opened:  **CAUTION:** Careless use of this feature may cause operational problems, such as inadvertently changing the state of a permissive output, and so this feature should be used with caution. **Do NOT use or disclose Technician Level passwords without careful consideration** The current state of the Digital Outputs are shown in the Current value field. In the example above Digout1 and Digout2 are "ON" and the rest are "OFF". If you click on the Toggle Digout for any of the output channels, the output state will be inverted each time you click and the Current value field will be updated. In the above example, clicking on Toggle Digout6 would result in Digout 6 changing from "OFF" to "ON", and the current value would then be 110001. Pressing Cancel will restore the previous values.	**TO**

8 Stage 5 of 5: Process Setup

The Main Line and Product Data menus are always visible, but the Fast Loop menu is only shown here when the Pulse Input Routing has selected Fast Loop, see Section 7.2 I/O Assignments – Process Inputs

Selecting the Main Line option will display the menu shown below.

8.1 Main Line

Selecting the Flow Meter option will display the menu shown on the next page.

8.1.1 Flow Meter

This menu sets most of the parameters associated with the Flow Meter, except for the Meter Factor. Since the Flow Computer can handle up to 12 products, individual Meter Factors per product are required so the Meter Factor handling is explained in Section 8.3 Product Data.

Proving Pulse Bus	When used with the Prover Application, the Proving Pulse Bus (also know as the Raw Pulse Bus) is controlled by the Prover but for test or standalone systems, the Bus can be controlled from here. **Disabled:** This setting 'tri-states' the output, effectively disconnecting it from the wiring so that it has no influence when other devices are driving the signal levels. **Enabled:** Enabling the output, connects the internal circuitry to the wiring and drives a copy of the pulses coming from the Main Line meter onto this bus.	**A**
Low Flow Cut-Off Mode	There are three possible selections on the radio buttons: ***Meter Locked In***, ***Coriolis Zero Offset*** or ***Low Flow Detection***. These modes are explained in detail below but if none are required, set the Low Flow Threshold Frequency to 0 Hz.	**M**
Low Flow Threshold Frequency	The selected Low Flow Cut-Off mode is applied below this threshold. Set at 0 Hz to disable.	**M**

Low Flow Cut off modes

Short Description	**Action when Pulse Frequency is less than the Low Flow Threshold**			
	Flow Rate	**Flow Totals**	**Process Alarms**	**Event Log**
Meter Locked In	Forced to Zero	Continue to Count	Suppressed	None
Coriolis Zero Offset	Forced to Zero	No Increments added	Suppressed	None
Low Flow Detection	Forced to Zero	No Increments added	Unchanged	Event logged when entering or leaving Low Flow

Continuing the Flow Meter Setup, the following three entries are only visible if the Pulse Input Routing in Section 7.2 I/O Assignments – Process Inputs is set to either Main Line Only – Dual Pulses Level A or Main Line Only – Dual Pulses Level B.

Dual Pulse Checking Threshold Frequency	Below this frequency any pulses arriving into the NÅNO that are out of sequence (signifying that there may be an issue with the pickup part of the meter) are ignored. This is due to variation in sensitivity of the circuitry at very low speeds.	**M**
Maximum Bad Pulse Count	Once above the ***Dual Pulse Checking Threshold Frequency***, any pulses arriving out of sequence will be logged as a bad pulse. Once this maximum count is exceeded, an alarm is generated by the system to alert the user to investigate the issue.	**A**

Minimum Consecutive Good Pulses	During normal operation occasional bad pulses may be recorded. Over time these would accumulate and flag a 'false' alarm. To prevent these from occurring the application checks for the number of consecutive good pulses it receives and once this minimum count is exceeded, the live bad pulse count is reset to zero. The typical value for this field is 200,000. In this example, if a bad pulse is seen when the recorded number of consecutive good pulses is at 199,999 then a further 200,000 consecutive good pulses would be required to reset the bad pulse counts recorded.	**A**

Continuing the Flow Meter Setup.

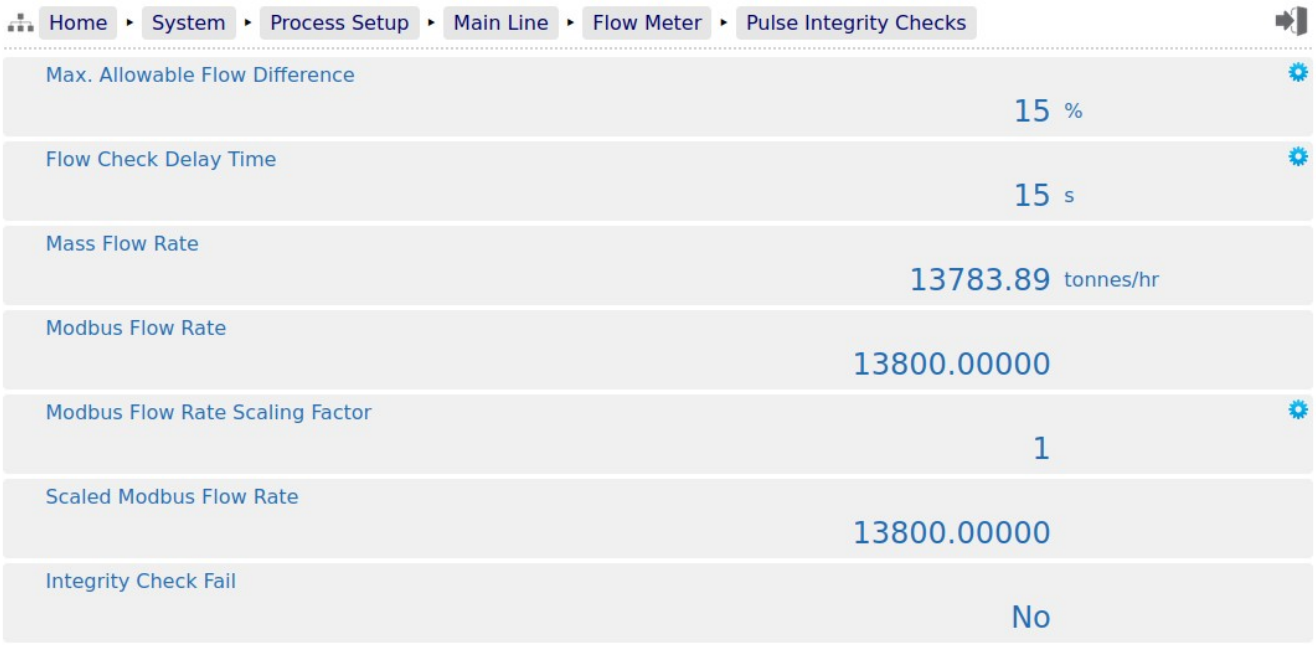
K Factor In Use	This line is for information only and shows the currently used K Factor.	**-**
Use Override K Factor?	If a single K Factor is required then select the Yes option and put the required K Factor in to the K Factor Override Value, shown below. If a K Factor curve is required, select NO and the value calculated from the Pulse Frequency and the K Factor curve will be used. This value will be shown in the K Factor In Use field above.	**M**
K Factor Override Value	Enter the required K Factor value when K Factor Curve is not in use.	**M**
▸ K Factor Curve	See Section 8.1.2 K Factor Curve.	**-**
Use MF in GSV Calculation?	There are two choices: **No:** This provides for some legacy systems that exclude the Meter Factor from the GSV calculations. **Yes:** This is the default and includes MF in the GSV calculations.	**M**
Meter ID	This is free text for information. It is shown on the relevant reports and can be written or read-back via communications.	**A**
Meter Serial Number	As per ***Meter ID***.	**A**
Meter Manufacturer	As per ***Meter ID***.	**A**
Meter Model	As per ***Meter ID***.	**A**
Meter Size	As per ***Meter ID***.	**A**
▸ Pulse Integrity Checks	This option is only visible if the communications to the Promass Coriolis meter is enabled in Section 4.2 Initial Application Setup, Site/Location Setup and is described in Section 8.1.3 Pulse Integrity Checks.	**A**

8.1.2 K Factor Curve

Linearized K Factor	This line shows the calculated K Factor and is the result of the K Factor Curve calculation. If "No" has been selected for the ***Use Override K Factor*** option on the previous page, the K Factor In Use will be this Linearized K Factor. If the Meter Pulse Frequency is at or below the Index 1 frequency, Index 1 K Factor Value will be applied. If the Meter Pulse Frequency is between Index 1 and Index 2 frequency, the K Factor Value will be a linear interpolation between the Index 1 and the Index 2 K Factor Values. The same applies for all pairs of entries, unless the next K Factor Frequency is shown as a zero. If the Meter Pulse Frequency is at or above the Index 10 frequency, or above the last frequency before a zero entry, the last valid K Factor Value will be applied.	-

Meter Frequency (after Cut-Off Checking)	This is for information only and shows the live incoming frequency after checking has taken place.	**-**
K Factor Frequency/K Factor Value ***Index 1...10***	For Index 1 to 10, enter the frequency and associated K Factor Value for as many points that are in use and if there are unused Index entries put 0 (zero) into the Frequency column for all the unused entries. The minimum number of index entries is two. If a curve is not required, enter a ***K Factor Override Value*** and select Yes for ***Use Override K Factor*** in Section 8.1.1 Flow Meter above. **NOTE:** The Frequencies in the K Factor Frequency column must be higher than the value for the previous Index(except to terminate the table), and the K Factor must be non zero.	**M**

8.1.3 Pulse Integrity Checks



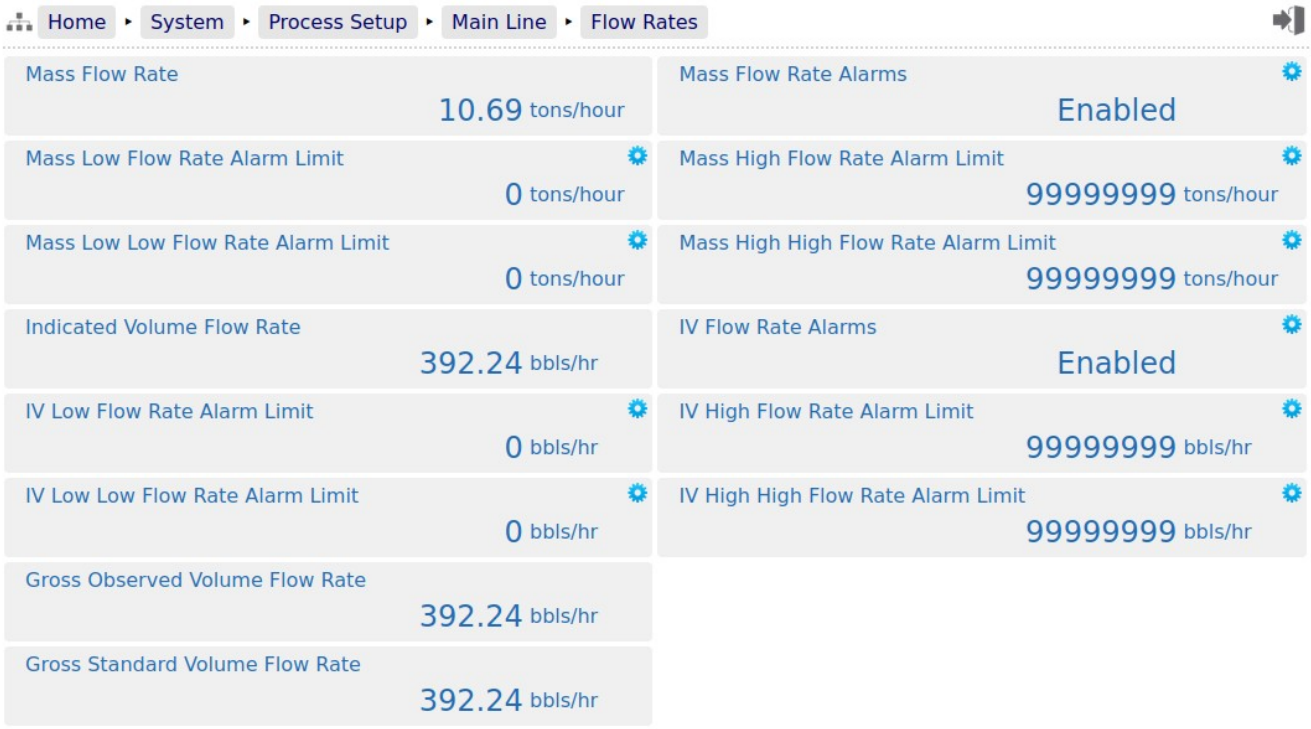
This option is only visible if the communications to the Promass Coriolis meter is enabled in Section 4.2 Initial Application Setup, Site/Location Setup.

Max. Allowable Flow Difference	This is the maximum percentage difference allowed between the flow rate generated from the pulse inputs and the flow rate received across modbus from the Coriolis meter.	**A**
Flow Check Delay Time	If the flow rates deviate by more than the ***Max. Allowable Flow Difference***, they must deviate for greater than this time before an alarm is raised. If the flow deviation drops below the ***Max. Allowable Flow Difference*** at any point the elapsed time is reset.	**A**
Mass Flow Rate	This is the flow rate calculated from the incoming pulses, the In Use K Factor and if the pulses are volume based, density. The ***Flow Rate Time Unit*** defined in Section 6 Stage 3 of 5: Configuring the Measurement Units is also used.	**-**
Modbus Flow Rate	This is the flow rate received from the Coriolis modbus link.	**-**
Modbus Flow Rate Scaling Factor	This allows a simple scaling factor to be applied to the incoming ***Modbus Flow Rate***. This could be used to account for a different time unit. As an example if the flow rate in the NÅNO was calculated in tonnes/hr whereas the flow rate received from the Coriolis meter was in tonnes/s, then a Scaling Factor of 3600 could be entered.	**A**
Scaled Modbus Flow Rate	This is the resulting flow rate after applying the ***Modbus Flow Rate Scaling Factor***. It is this flow rate that is compared to the ***Mass Flow Rate*** above.	**-**
Integrity Check Fail	This is an indication only status of whether the current flow rates are inside or outside the deviation limits set above. It is the live status therefore the flow rates may not have exceeded the ***Max. Allowable Flow Difference*** for sufficient time to have triggered the alarm.	**-**

8.1.4 Flow Rates

This menu shows the current flow rates in terms of Mass, Indicated Volume (IV), Gross Observed Volume (GOV) and Gross Standard Volume (GSV).

NOTE: The Indicated Volume (IV) flow rate will show a value of zero if the K Factor is mass based.



For the Mass and IV, there is an optional alarm setting that can be configured. In the example shown above, both the Mass Flow Rate Alarms and IV Flow Rate Alarms are shown as Enabled.

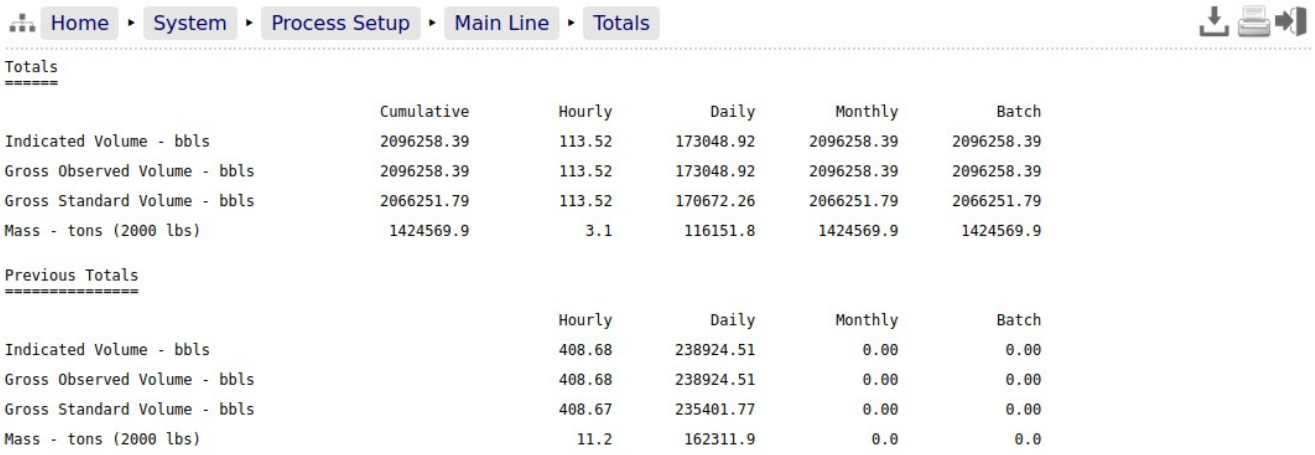
When the alarms are enabled four additional menu entries appear: Low Low Flow Rate Alarm Limit, Low Flow Rate Alarm Limit, High Flow Rate Alarm Limit and High High Flow Rate Alarm Limit. By default the Low and Low Low alarms are set to zero and the High and High High alarms to 99999999, so no alarm will be raised until they are configured with realistic values.

8.1.5 Totals

This menu is an example of a live report lists the four different totalizers: IV, GOV, GSV and Mass.

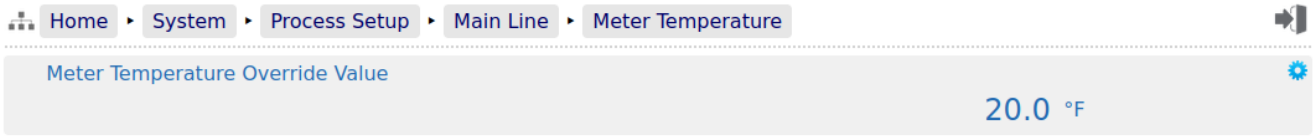
For each totalizer, it shows the Cumulative, Current Hourly, Current Daily, Current Monthly and Current Batch totals and below it, the Previous Hourly, Previous Daily, Previous Monthly and Previous Batch totals.

NOTE: If the K Factor is mass based, the Indicated Volume lines will not be shown.



8.1.6 Meter Temperature

If the Meter Temperature Source has been set as Disabled in Home ▸ System ▸ I/O ▸ Assignment/Settings - Process Inputs (see Section 7.2 I/O Assignments – Process Inputs) then only the Meter Temperature Override Value will be shown, as in the screenshot below.



If the system has a measured meter temperature configured, the Meter Temperature menu will be similar to that shown below. In this example the input is configured to be an analog input.

Home ▸ System ▸ Process Setup ▸ Main Line ▸ Meter Temperature

Meter Temperature In Use	17.0 °C
Meter Temperature 4mA Scale Value	0.0 °C
Meter Temperature 20mA Scale Value	100.0 °C
Meter Temperature Operating Status	Default due to Failure
Meter Temperature Automatically Recover to Measured	Yes
Meter Temperature Override Value	20.0 °C
Meter Temperature Default Value	17.0 °C
Meter Temperature Transmitter Value with Bias	-22.0 °C
Meter Temperature Bias Value	0.0 /°C
Meter Temperature Transmitter Value no Bias	-22.0 °C
Meter Temperature - Raw Transmitter Value	0.48 mA
Meter Temperature Low Alarm Limit	-99999999.0 °C
Meter Temperature High Alarm Limit	99999999.0 °C
Meter Temperature User 1 Low Alarm Limit	-99999999.0 °C
Meter Temperature User 1 High Alarm Limit	99999999.0 °C
Meter Temperature User 2 Low Alarm Limit	-99999999.0 °C
Meter Temperature User 2 High Alarm Limit	99999999.0 °C
Low Input Fail Point	3.5 mA
High Input Fail Point	20.5 mA

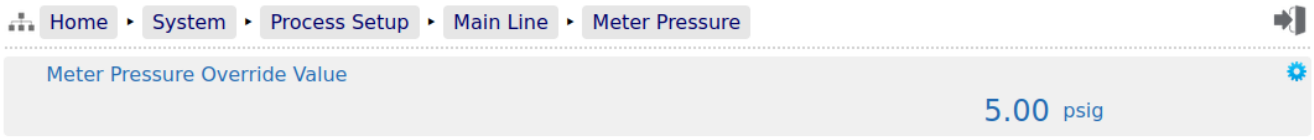
Meter Temperature In Use	This display point shows the temperature being used in the calculations, FWA & reports. This may be a live value, a manual override value or a (fail-over) default.	**-**
Meter Temperature 4mA Scale Value	This point indicates the temperature represented by 4mA. Clicking this line opens the dialog box allowing a different temperature to be input. **NOTE:** If the ***Meter Temperature Type*** was set as RTD, the point will not appear since the RTD gives a non scalable reading.	**M**
Meter Temperature 20mA Scale Value	This point indicates the temperature represented by 20mA. Clicking the line opens the dialog box allowing a different temperature to be input. **NOTE:** If the ***Meter Temperature Type*** was set as RTD, the point will not appear since the RTD gives a non scalable reading.	**M**
Meter Temperature Operating Status	This point indicates the current operating mode. Clicking the line opens the dialog box allowing the user to select which of the 3 modes to select: **Always Measured:** Uses the calculated value from the measured input regardless of it being within acceptable limits or not. **Always Override:** Uses the Override value at all times. **Use Default on Failure:** Uses the calculated value from the measured input unless it is either lower than the ***Low Input Fail Point*** or higher than the ***High Input Fail Point***, in which case it would use the ***Meter Temperature Default Value*.**	**M**
Meter Temperature Automatically Recover to Measured	If the ***Meter Temperature Operating Status*** is set to ***Use Default on Failure*** and this option is set to ***Yes***, then if the input fails (and therefore goes into the ***Default due to Failure*** mode), once the measured value recovers to being between the low and high Input Fail Points, the measured value will be used instead of the fail-over default value. If No has been selected, then the fail-over default value will continue to be used even when a valid reading is available. See below for the operation in this case.	**M**
Meter Temperature Manually Recover to Measured	If the ***Meter Temperature Operating Status*** is set to ***Use Default on Failure,*** and the ***Meter Temperature Automatically Recover to Measured*** option (above) is set to ***No***, then if the input fails, then subsequently recovers (to between the low and high Input Fail Points), the fail-over default value will continue to be used until a user presses the “Recover” button on this line. If the input is still in a failed state, this line will not be shown. Likewise this line is not shown if it is not a valid option.	**A**
Meter Temperature Override Value	This is the value used when the ***Meter Temperature Operating Status*** has been set to Always Override. If no transmitter has been assigned to the Meter Temperature, this override value is always used.	**M**
Meter Temperature Default Value	This is the value used when the ***Meter Temperature Operating Status*** has been set to Use Default on Failure, and the measured value is NOT between the low and high Input Fail Points.	**M**
Meter Temperature Transmitter Value with Bias	This is the sum of the ***Meter Temperature Transmitter Value no Bias*** and the ***Meter Temperature Bias Value***.	**-**

Meter Temperature Bias Value	This is the Bias or Offset value that is being applied to the measured value. If logged in at Technician level, this value can be viewed and edited. It can also be set by the Technician Menu using the Local Panel. If logged in at Admin level, this is a read-only status display.	**TO**
Meter Temperature Transmitter Value no Bias	This point displays the live measured temperature value. This item is for information only and cannot be edited.	**-**
Meter Temperature - Raw Transmitter Value	This shows the instantaneous current flow from the 4-20mA Transmitter. If an RTD is being used, the instantaneous resistance value is displayed.	**-**
Meter Temperature Low Alarm Limit	This point shows the currently configured Low Alarm limit. If the ***Meter Temperature In Use*** goes below the configured value, the Low Temperature Alarm will be raised. Clicking the line opens the Edit Value dialog box, allowing the user to choose a different value. If an impossibly low default value is used, no Low Temperature Alarm will ever be raised.	**A**
Meter Temperature High Alarm Limit	This point shows the currently configured High Alarm limit. If the ***Meter Temperature In Use*** goes above the configured value then the High Temperature Alarm will be raised. Clicking the line opens the Edit Value dialog box, allowing the user to choose a different value. If an impossibly high default value is used, no High Temperature Alarm will ever be raised.	**A**
Meter Temperature User 1 Low Alarm Limit	If the ***Meter Temperature In Use*** goes below the User 1 Low Alarm Limit, the User 1 Low Alarm will be set.	**A**
Meter Temperature User 1 High Alarm Limit	If the ***Meter Temperature In Use*** goes above the User 1 High Alarm Limit, the User 1 High Alarm will be set.	**A**
Meter Temperature User 2 Low Alarm Limit	If the ***Meter Temperature In Use*** goes below the User 2 Low Alarm Limit the User 2 Low Alarm will be set.	**A**
Meter Temperature User 2 High Alarm Limit	If the ***Meter Temperature In Use*** goes above the User 2 High Alarm Limit the User 2 High Alarm will be set.	**A**
Low Input Fail Point	If the ***Meter Temperature - Raw Transmitter Value*** goes below this point and the ***Meter Temperature Operating Status*** is set to Use Default on Failure then the ***Meter Temperature In Use*** will be the fail-over ***Meter Temperature Default Value***. In 4-20mA mode this value will be 3.5mA by default. If the Meter Temperature Type was set as RTD then this will be 60 Ohms, as standard. Clicking the line opens the Edit Value dialog box, allowing the user to input a different value.	**A**

High Input Fail Point	If the ***Meter Temperature - Raw Transmitter Value*** goes above the ***High Input Fail Point*** and the ***Meter Temperature Operating Status*** is set to Use Default on Failure, then the ***Meter Temperature In Use*** will be the fail-over ***Meter Temperature Default Value***. In 4-20 mA mode this value will be 20.5mA by default. If the Measured Temperature Type was set as RTD, then this will be 180 Ohms as standard. Clicking the line opens the Edit Value dialog box, allowing the user to input a different value.	**A**

8.1.7 Meter Pressure

If the Meter Pressure Source has been set as Disabled in Home ▸ System ▸ I/O ▸ Assignment/Settings - Process Inputs (see Section 7.2 I/O Assignments – Process Inputs) then only the Meter Pressure Override Value will be shown, as in the screenshot below.



If the system has a measured meter pressure configured, the Meter Pressure menu will be similar to that shown below.

Display points associated with the Measured Meter Pressure are shown below.

Home ▸ System ▸ Process Setup ▸ Main Line ▸ Meter Pressure

Meter Pressure In Use	7.50 barg
Meter Pressure 4mA Scale Value	0.00 barg
Meter Pressure 20mA Scale Value	20.00 barg
Meter Pressure Operating Status	Default due to Failure
Meter Pressure Automatically Recover to Measured	No
Meter Pressure Manually Recover to Measured	Recover
Meter Pressure Override Value	5.00 barg
Meter Pressure Default Value	7.50 barg
Meter Pressure Transmitter Value with Bias	9.86 barg
Meter Pressure Bias Value	0.00 barg
Meter Pressure Transmitter Value no Bias	9.86 barg
Meter Pressure - Raw Transmitter Value	11.89 mA
Meter Pressure Low Alarm Limit	-99999999.00 barg
Meter Pressure High Alarm Limit	99999999.00 barg
Meter Pressure User 1 Low Alarm Limit	-99999999.00 barg
Meter Pressure User 1 High Alarm Limit	99999999.00 barg
Meter Pressure User 2 Low Alarm Limit	-99999999.00 barg
Meter Pressure User 2 High Alarm Limit	99999999.00 barg
Low Input Fail Point	3.5 mA
High Input Fail Point	20.5 mA

Meter Pressure In Use	This display point shows the pressure being used in the calculations, FWA & reports. This may be a live value, a manual override value or a (fail-over) default.	**-**
Meter Pressure 4mA Scale Value	This point indicates the pressure represented by 4mA. Clicking this line opens the dialog box allowing a different pressure to be input.	**M**
Meter Pressure 20mA Scale Value	This point indicates the Pressure represented by 20mA. Clicking the line opens the dialog box allowing a different Pressure to be input.	**M**
Meter Pressure Operating Status	This point indicates the current operating mode. Clicking the line opens the dialog box allowing the user to select which of the 3 modes to select: **Always Measured:** Uses the calculated value from the measured input regardless of it being within acceptable limits or not. **Always Override:** Uses the Override value at all times. **Use Default on Failure:** Uses the calculated value from the measured input unless it is either lower than the ***Low Input Fail Point*** or higher than the ***High Input Fail Point***, in which case it would use the ***Meter Pressure Default Value*****.**	**M**
Meter Pressure Automatically Recover to Measured	If the ***Meter Pressure Operating Status*** is set to ***Use Default on Failure*** and this option is set to ***Yes***, then if the input fails (and therefore goes into the ***Default due to Failure*** mode), once the measured value recovers to being between the low and high Input Fail Points, the measured value will be used instead of the fail-over default value. If No has been selected, then the fail-over default value will continue to be used even when a valid reading is available. See below for the operation in this case.	**M**
Meter Pressure Manually Recover to Measured	If the ***Meter Pressure Operating Status*** is set to ***Use Default on Failure,*** and the ***Meter Pressure Automatically Recover to Measured*** option (above) is set to ***No***, then if the input fails, then subsequently recovers (to between the low and high Input Fail Points), the fail-over default value will continue to be used until a user presses the “Recover” button on this line. If the input is still in a failed state, this line will not be shown. Likewise this line is not shown if it is not a valid option.	**A**
Meter Pressure Override Value	This is the value used when the ***Meter Pressure Operating Status*** has been set to Always Override. If no transmitter has been assigned to the Meter Pressure, this override value is always used.	**M**
Meter Pressure Default Value	This is the value used when the ***Meter Pressure Operating Status*** has been set to Use Default on Failure, and the measured value is NOT between the low and high Input Fail Points.	**M**
Meter Pressure Transmitter Value with Bias	This is the sum of the ***Meter Pressure Transmitter Value no Bias*** and the ***Meter Pressure Bias Value***.	**-**
Meter Pressure Bias Value	This is the Bias or Offset value that is being applied to the measured value. If logged in at Technician level, this value can be viewed and edited. It can also be set by the Technician Menu using the Local Panel. If logged in at Admin level, this is a read-only status display.	**TO**

Meter Pressure Transmitter Value no Bias	This point displays the live measured pressure value. This item is for information only and cannot be edited.	**-**
Meter Pressure - Raw Transmitter Value	This shows the instantaneous current flow from the 4-20mA Transmitter.	**-**
Meter Pressure Low Alarm Limit	This point shows the currently configured Low Alarm limit. If the ***Meter Pressure In Use*** goes below the configured value, the Low Pressure Alarm will be raised. Clicking the line opens the Edit Value dialog box, allowing the user to choose a different value. If an impossibly low default value is used, no Low Pressure Alarm will ever be raised.	**A**
Meter Pressure High Alarm Limit	This point shows the currently configured High Alarm limit. If the ***Meter Pressure In Use*** goes above the configured value then the High Pressure Alarm will be raised. Clicking the line opens the Edit Value dialog box, allowing the user to choose a different value. If an impossibly high default value is used, no High Pressure Alarm will ever be raised.	**A**
Meter Pressure User 1 Low Alarm Limit	If the ***Meter Pressure In Use*** goes below the User 1 Low Alarm Limit, the User 1 Low Alarm will be set.	**A**
Meter Pressure User 1 High Alarm Limit	If the ***Meter Pressure In Use*** goes above the User 1 High Alarm Limit, the User 1 High Alarm will be set.	**A**
Meter Pressure User 2 Low Alarm Limit	If the ***Meter Pressure In Use*** goes below the User 2 Low Alarm Limit the User 2 Low Alarm will be set.	**A**
Meter Pressure User 2 High Alarm Limit	If the ***Meter Pressure In Use*** goes above the User 2 High Alarm Limit the User 2 High Alarm will be set.	**A**
Low Input Fail Point	If the ***Meter Pressure - Raw Transmitter Value*** goes below this point and the ***Meter Pressure Operating Status*** is set to Use Default on Failure then the ***Meter Pressure In Use*** will be the fail-over ***Meter Pressure Default Value***. This value will be 3.5mA by default. Clicking the line opens the Edit Value dialog box, allowing the user to input a different value.	**A**
High Input Fail Point	If the ***Meter Pressure - Raw Transmitter Value*** goes above the ***High Input Fail Point*** and the ***Meter Pressure Operating Status*** is set to Use Default on Failure, then the ***Meter Pressure In Use*** will be the fail-over ***Meter Pressure Default Value***. This value will be 20.5mA by default. Clicking the line opens the Edit Value dialog box, allowing the user to input a different value.	**A**

8.1.8 Main Line Densitometer

This menu item is only in the Main Line menu structure if the Densitometer Location in Home ▸ System ▸ I/O ▸ Assignment/Settings - Process Inputs is set to ***On The Meter Run***.
(see Section 7.2 I/O Assignments – Process Inputs)

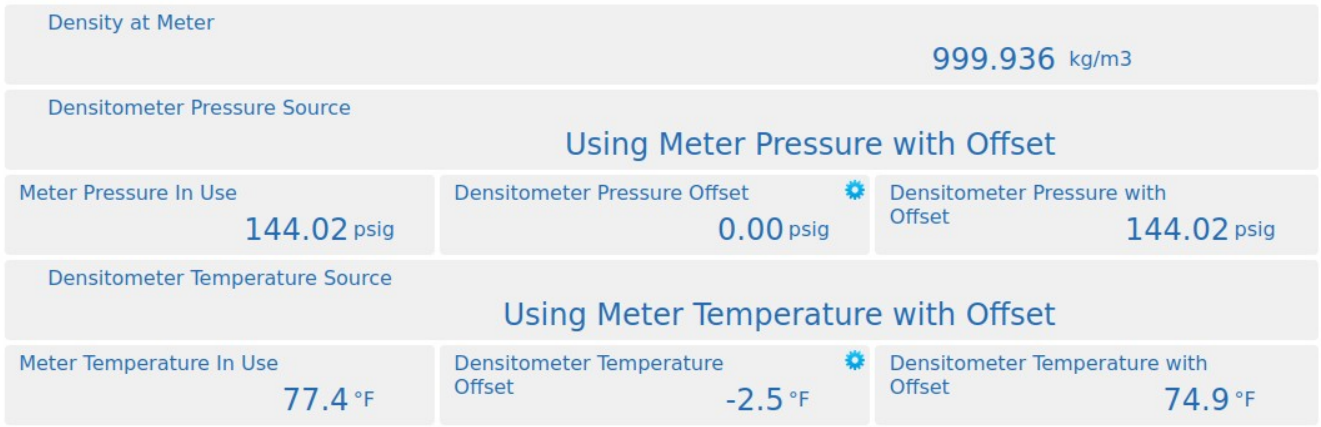
The density setting menu is a large menu, so has been shown in three sections.

8.1.8.1 The Top "Third" of the Menu

The screenshot below shows the top 5 lines of the Density menu, when the Fast Loop Temperature and Fast Loop pressure are both disabled. The menu for enabling or disabling these inputs can be found at Home ▸ System ▸ I/O Assignment/Settings - Process Inputs.

See Section 7.2 I/O Assignments – Process Inputs.

NOTE: If the Densitometer Location has been selected as On the Meter Run then the Fast Loop Temperature and Fast Loop pressure should both be disabled, and no pressure or temperature offset should be used. The offsets should be set to zero.



Density at Meter	The value shown in this field is the output of the Densitometer calculation compensated for the effects of temperature and pressure on the density meter body (Solatron calculation) and multiplied by the DCF/DMF value.	-
Densitometer Pressure Source	In this example, the Fast Loop Pressure is disabled so the source is shown as the Meter Pressure with Offset. See Section 8.1.8.2 Densitometer Correction Source Information, Priority below for explanation of the Densitometer Correction.	-
Meter Pressure In Use	This field shows the current Meter Pressure In Use. This is for information only.	-
Densitometer Pressure Offset	If due to the physical installation, the Densitometer runs at a slightly different pressure which tracks the Meter Pressure, then an offset can be applied here. When the Densitometer is configured as being on the Main Line then applying an offset here makes no sense. The offset should be set to zero.	**A**

Densitometer Pressure with Offset	This field shows the current Meter Pressure with the offset applied. This is for information only.	**-**
Densitometer Temperature Source	In this example, the Fast Loop Temperature is disabled so the source is shown as the Meter Temperature with Offset. See Section 8.1.8.2 Densitometer Correction Source Information, Priority below.	**-**
Meter Temperature In Use	This field shows the current Meter Temperature In Use. This is for information only.	**-**
Densitometer Temperature Offset	If due to the physical installation, the Densitometer runs at a slightly different temperature which tracks the Meter Temperature, then an offset can be applied here. When the Densitometer is configured as being on the Main Line then applying an offset here makes no sense. The offset should be set to zero.	**A**
Densitometer Temperature with Offset	This field shows the densitometer temperature after applying the offset from the Meter Temperature.	**-**

8.1.8.2 Densitometer Correction Source Information, Priority

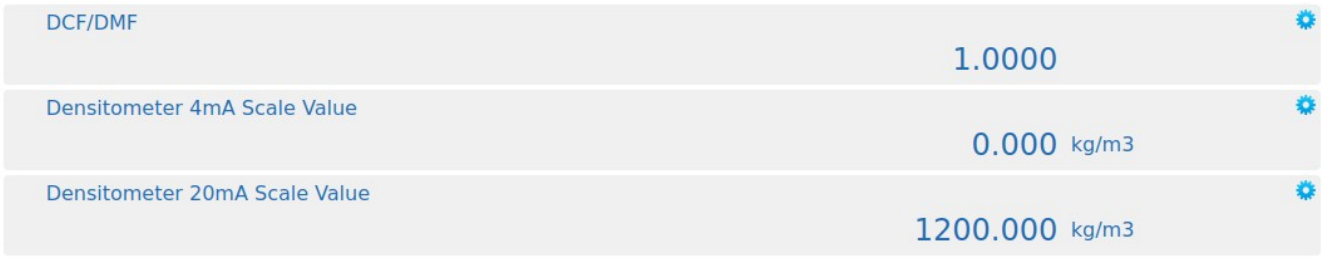
When a live Periodic (frequency mode) Densitometer input is used, the temperature and pressure at the Densitometer is needed to obtain the highest accuracy.

The source of these Densitometer correction values are prioritized in the following order.

NOTE: In the explanation below, Densitometer Pressure works in exactly the same way as the Densitometer Temperature.

1. The Densitometer Temperature (or Pressure) will be the Fast Loop values, unless the Fast Loop Temperature (or Pressure) Source is disabled.
2. The Densitometer Temperature (or Pressure) will be the Main Line Meter Temperature (or Pressure) with Offset. The offset can of course be zero if there is negligible temperature (or Pressure) difference between the density meter and the flow meter.
3. If there is also no Main Line (Flow) Meter Temperature (or Pressure) configured, the Densitometer Temperature (or Pressure) will be the Main Line Meter Temperature (or Pressure) override value with Offset.

8.1.8.3 The "Middle" section of the Densitometer menu



DCF/DMF	The DCF/DMF value is usually derived from a Pycnometer reading and is used to correct for measurement errors in the Density meter. If the Metrology Mode in Section 4.2 Initial Application Setup, Site/Location Setup is set to ***Strict MID*** this entry will not be shown and no correction will be made.	**A**
Density 4mA Scale Value	This point indicates the density represented by 4mA. Clicking this line opens the dialog box allowing a different scaling value to be input. **NOTE**: This line is only displayed if the Density source is an analog.	**M**
Density 20mA Scale Value	This point indicates the density represented by 20mA. Clicking the line opens the dialog box allowing a different scaling value to be input. **NOTE**: This line is only displayed if the Density source is an analog.	**M**

Densitometer Operating Status	This point indicates the current operating mode. Clicking the line opens the dialog box allowing the user to select which of the 3 modes to select:		**M**
	Always Measured	Uses the calculated value from the measured input regardless of it being within acceptable limits or not.	
	Always Override	Uses the Override value at all times.	
	Use Default on Failure	Uses the calculated value from the measured input unless it is seen as being failed.	
	Depending on the type of input, the failed state is defined, see below;		
	In Analog Mode:	The input is deemed as failed if the measured input is either lower than the ***Low Input Fail Point*** or higher than the ***High Input Fail Point***.	
	In Periodic (Frequency) Mode:	The input is deemed as failed if the calculated density falls below the ***Clamp Low Value*** or goes above the ***Clamp High Value***.	

Densitometer Automatically Recover to Measured	If the ***Densitometer Operating Status*** is set to ***Use Default on Failure*** and this option is set to ***Yes***, then if the input fails (and therefore goes into the ***Default due to Failure*** mode), once the measured value recovers to being between the relevant limits, the measured value will be used instead of the fail-over default value. If No has been selected, then the fail-over default value will continue to be used even when a valid reading is available. See below for the operation in this case. **NOTE:** This menu item is only visible if an analog or period Densitometer is in use.	**M**
Densitometer Manually Recover to Measured	If the ***Densitometer Operating Status*** is set to ***Use Default on Failure,*** and the ***Densitometer Automatically Recover to Measured*** option (above) is set to ***No***, then if the input fails, then subsequently recovers (to between the relevant limits), the fail-over default value will continue to be used until a user presses the “Recover” button on this line. If the input is still in a failed state, this line will not be shown. Likewise this line is not shown if it is not a valid option.	**A**
Densitometer Override Value	This is the value used when ***Densitometer Operating Status*** has been set to Always Override.	**M**
Densitometer Default Value	This is the value used when the ***Densitometer Operating Status*** has been set to Use Default on Failure, and the measured value is NOT between the relevant limits.	**M**
Densitometer - Raw Transmitter Value	In period mode, this field will show the period of the selected input in microseconds. If Density Source is selected as an Analog Input it will show the equivalent current scaled 4-20mA.	**-**
Measured Density Low Alarm Limit	If the ***Density at Meter*** goes below the configured value, the Measured Density Low Alarm will be raised. Clicking the line opens the Edit Value dialog box, allowing the user to choose a different value. If an impossibly low default value is used, no Measured Density Low Alarm will ever be raised.	**A**
Measured Density High Alarm Limit	If the ***Density at Meter*** goes above the configured value, the Measured Density High Alarm will be raised. Clicking the line opens the Edit Value dialog box, allowing the use to choose a different value. If an impossibly high default value is used, no Measured Density High Alarm will ever be raised.	**A**
Measured Density User 1 Low Alarm Limit	If the ***Density at Meter*** goes below the User 1 Low Alarm Limit, the User 1 Alarm will be set.	**A**
Measured Density User 1 High Alarm Limit	If the ***Density at Meter*** goes above the User 1 High Alarm Limit, the User 1 Alarm will be set.	**A**
Measured Density User 2 Low Alarm Limit	If the ***Density at Meter*** goes below the User 2 Low Alarm Limit, the User 2 Alarm will be set.	**A**
Measured Density User 2 High Alarm Limit	If the ***Density at Meter*** goes above the User 2 High Alarm Limit, the User 2 Alarm will be set.	**A**
Low Input Fail Point	This is set to 3.5mA by default, by can be changed by clicking on the line. **NOTE:** This line is only displayed if the Density Input Source is an analog.	**A**
High Input Fail Point	This is set to 20.5mA by default, by can be changed by clicking on the line. **NOTE:** This line is only displayed if the Density Input Source is an analog.	**A**

Clamp Low Value	This is the lowest Density value that will be passed forward when Period mode has been selected as the Density Source. **NOTE:** This line is only displayed if the Density Input Source is set to Period.	**A**
Clamp High Value	This is the highest Density value that will be passed forward when Period mode has been selected as the Density Source. **NOTE:** This line is only displayed if the Density Input Source is set to Period.	**A**
Coriolis Density Low Fail Value	This is the lowest Density value that will be passed forward when Coriolis comms has been selected as the Density Source. **NOTE:** This line is only displayed if the Density Input Source is set to Coriolis Comms.	**A**
Coriolis Density High Fail Value	This is the highest Density value that will be passed forward when Coriolis comms has been selected as the Density Source. **NOTE:** This line is only displayed if the Density Input Source is set to Coriolis Comms.	**A**

8.1.8.4 The Lower "Third" - Densitometer Coefficient Configuration

Current Process Units are:-

Temperature Unit	Pressure Unit	Density Unit
°F	psi	kg/m3

Densitometer Constants

K0	0
K1	1
K2	0
K18	0
K19	0
K20A	0
K20B	0
K21A	0
K21B	0

NOTE: The bottom "third" of the menu is only visible when the Densitometer Source is selected as Periodic.

Temperature Unit	This is for information only, to highlight the chosen temperature unit. This is to remind the user which Densitometer constants should be entered. **NOTE:** No checking is made in the application between the constants entered and the units the NÅNO is configured in.	**-**
Pressure Unit	This is for information only, to highlight the chosen pressure unit. This is to remind the user which Densitometer constants should be entered. **NOTE:** No checking is made in the application between the constants entered and the units the NÅNO is configured in.	**-**
Density Unit	This is for information only, to highlight the chosen density unit. This is to remind the user which Densitometer constants should be entered. **NOTE:** No checking is made in the application between the constants entered and the units the NÅNO is configured in.	**-**
K0, K1, K2	These are the Solatron calibration constants. Frequently more than one set of K0, K1 & K2 are provided for different ranges of density.	**M**
K18, K19	These are the temperature coefficient used to compensate for the effects of temperature on the Densitometer body.	**M**
K20A, K20B, K21A, K21B	These are the pressure coefficient used to compensate for the effects of pressure on the Densitometer body.	**M**

8.1.9 Monitor S&W

This option is only shown when the ***Metrology Mode*** is set to **API**. See Section 4.2 Initial Application Setup, Site/Location Setup and Section 7.2 I/O Assignments – Process Inputs I/O Assignments – Process Inputs for more information.

If the system allows and a Monitor S&W has been configured, then the settings menu will show an item for Monitor S&W.

S&W In Use	This display point shows the S&W value used in the calculations, FWA & reports. This may be a live value, a manual override value or a (fail-over) default.	**-**
S&W 4mA Scale Value	This point indicates the S&W represented by 4mA. Clicking the line opens the dialog box allowing a different scaling value to be input.	**A**
S&W 20mA Scale Value	This point indicates the S&W represented by 20mA. Clicking the line opens the dialog box allowing a different scaling value to be input.	**A**
S&W Operating Status	This point indicates the current operating mode. Clicking the line opens the dialog box allowing the user to select which of the 3 modes to select: **Always Measured:** Uses the calculated value from the measured input regardless of it being within acceptable limits or not. **Always Override:** Uses the Override value at all times. **Use Default on Failure:** Uses the calculated value from the measured input unless it is either lower than the ***Low Input Fail Point*** or higher than the ***High Input Fail Point***, in which case it would use the ***S&W Default Value*****.**	**A**
S&W Automatically Recover to Measured	If the ***S&W Operating Status*** is set to ***Use Default on Failure*** and this option is set to ***Yes***, then if the input fails (and therefore goes into the ***Default due to Failure*** mode), once the measured value recovers to being between the low and high Input Fail Points, the measured value will be used instead of the fail-over default value. If No has been selected, then the fail-over default value will continue to be used even when a valid reading is available. See below for the operation in this case.	**A**
S&W Manually Recover to Measured	If the ***S&W Operating Status*** is set to ***Use Default on Failure,*** and the ***S&W Automatically Recover to Measured*** option (above) is set to ***No***, then if the input fails, then subsequently recovers (to between the low and high Input Fail Points), the fail-over default value will continue to be used until a user presses the “Recover” button on this line. If the input is still in a failed state, this line will not be shown. Likewise this line is not shown if it is not a valid option.	**A**
S&W Override Value	This is the value used when ***S&W Operating Status*** has been set to Always Override.	**A**
S&W Default Value	This is the value used when the ***S&W Operating Status*** has been set to Use Default on Failure, and the measured value is NOT between the low and high Input Fail Points.	**A**
S&W Transmitter Value with Bias	This is the sum of the ***S&W Transmitter Value no Bias*** and the ***S&W Bias Value***.	**-**
S&W Bias Value	This is the Bias or Offset value that is being applied to the measured value. If logged in at Technician level, this value can be viewed and edited. It can also be set by the Technician Menu using the Local Panel. If logged in at Admin level, this is a read-only status display.	**TO**
S&W Transmitter Value (No Bias)	This point displays the live measured S&W value. This item is for information only and cannot be edited.	**-**

S&W - Raw Transmitter Value	This shows the instantaneous current flow from the 4-20mA transmitter.	**-**
S&W High Alarm Limit	This point shows the currently configured High Alarm limit. If the measured S&W goes above the configured value then the High S&W Alarm will be raised. Click line to open the Edit Value dialog box. The default value for this is set to 5%. If an impossibly high value is used, no S&W High Alarm will ever be raised	**A**
S&W User 1 High Alarm Limit	If the ***S&W In Use*** goes above the User 1 High Alarm Limit, the User 1 Alarm will be set.	**A**
S&W User 2 High Alarm Limit	If the ***S&W In Use*** goes above the User 2 High Alarm Limit, the User 2 Alarm will be set.	**A**
Low Input Fail Point	If the ***S&W - Raw Transmitter Value*** goes below the Low Input Fail Point and the ***S&W Operating Status*** is set to Use Default on Failure then the ***S&W In Use*** will be the fail-over ***S&W Default Value***. As standard this value will be 3.5mA. Click line to open the Edit Value dialog box.	**A**
High Input Fail Point	If the ***S&W - Raw Transmitter Value*** goes above the High Input Fail Point and the ***S&W Operating Status*** is set to Use Default on Failure then the ***S&W In Use*** will be the fail-over ***S&W Default Value***. The High Input Fail Point default value is 20.5mA. Click line to open the Edit Value dialog box.	**A**

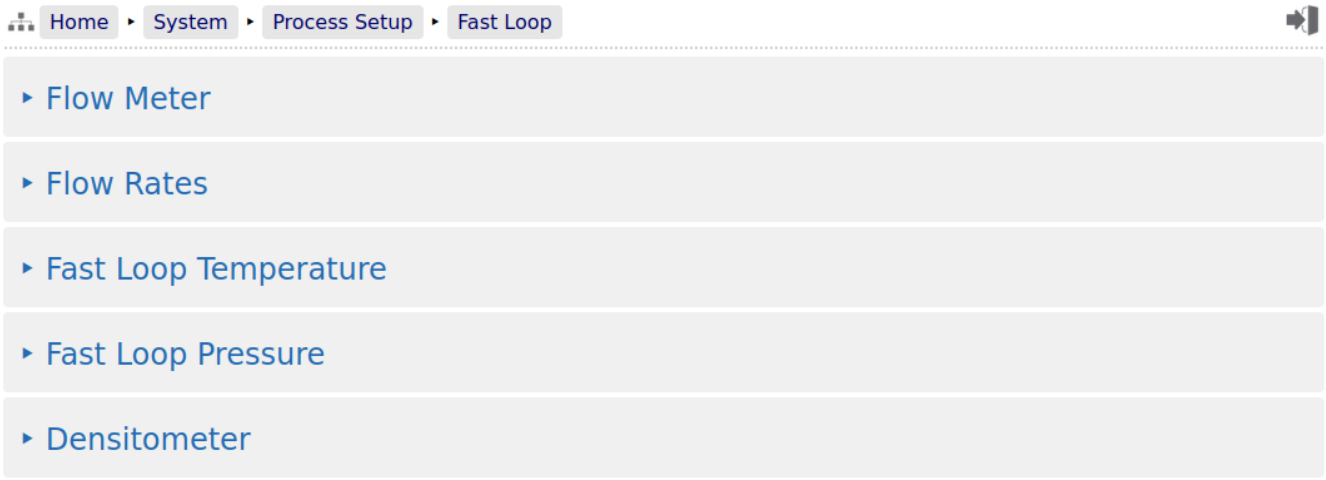
The ***S&W Monitor High Output*** can also drive a Digital Output signal for monitoring purposes. See Section 7.1 Assignment/Settings – Digital I/O.

8.2 Fast Loop

This is also known as the slipstream.

There are 4 or 5 entries in this menu, depending upon where the density is being derived from.

In the screenshot below, the Density Meter is shown as on the fast loop, in which case it would not be shown on the Main Line menus.



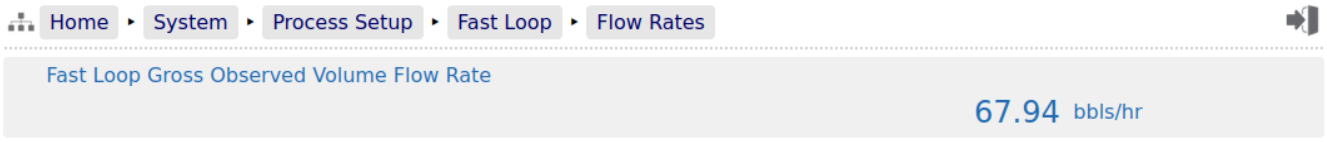
8.2.1 Fast Loop Flow Meter

The Fast Loop Flow Meter is much simpler than the Main Line Flow Meter, as its only purpose is for flow control of the fast loop.

The K Factor is volume only but can be in different units to the Main Line meter.

There is no option for a K Factor curve, only a single point K Factor that is applied over the full frequency range and a single Meter Factor.

8.2.2 Fast Loop Flow Rates



This menu only shows the Fast Loop Gross Observed Volume Flow Rate. No alarms or other settings are available for this.

8.2.3 Fast Loop Temperature

This is the same setup menus as for the Main Line, see Section 8.1.6 Meter Temperature.

8.2.4 Fast Loop Pressure

This is the same setup menus as for the Main Line, see Section 8.1.7 Meter Pressure.

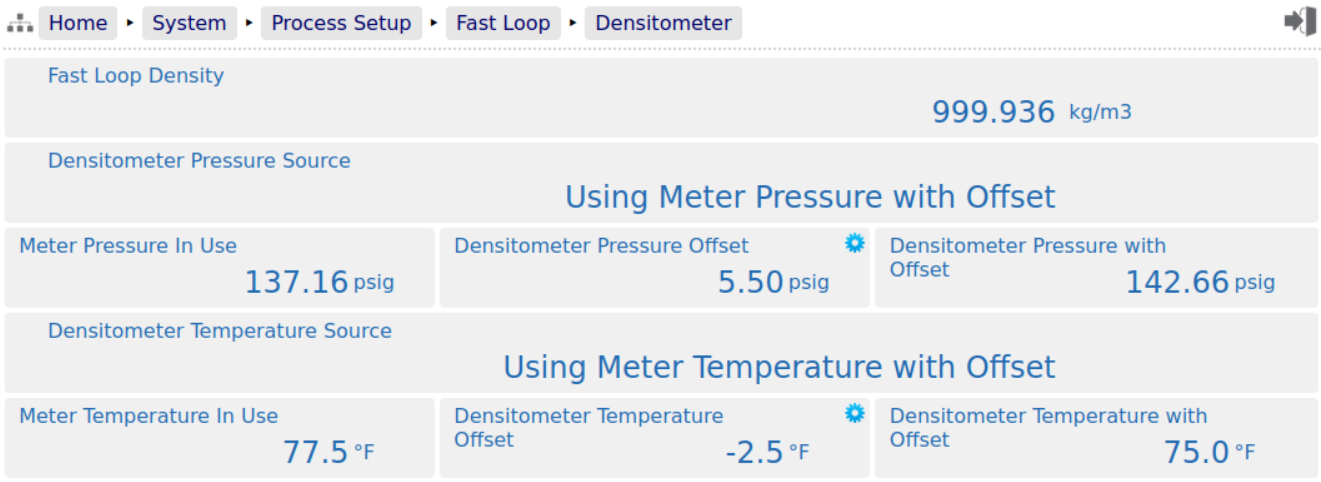
8.2.5 Fast Loop Densitometer

The Fast Loop Densitometer menu looks similar to the Main Line Densitometer menu, however there is a significant operational difference.

The live density value derived from the Fast Loop is almost certainly at a different temperature and pressure from the Main Line (otherwise the Liquid Flow Computer would have been configured to use Main Line Density). Therefore an addition Liquid Volume Correction is performed to convert the live Fast Loop density to reference conditions, and the reference density is then used by the Main Line metering calculations.

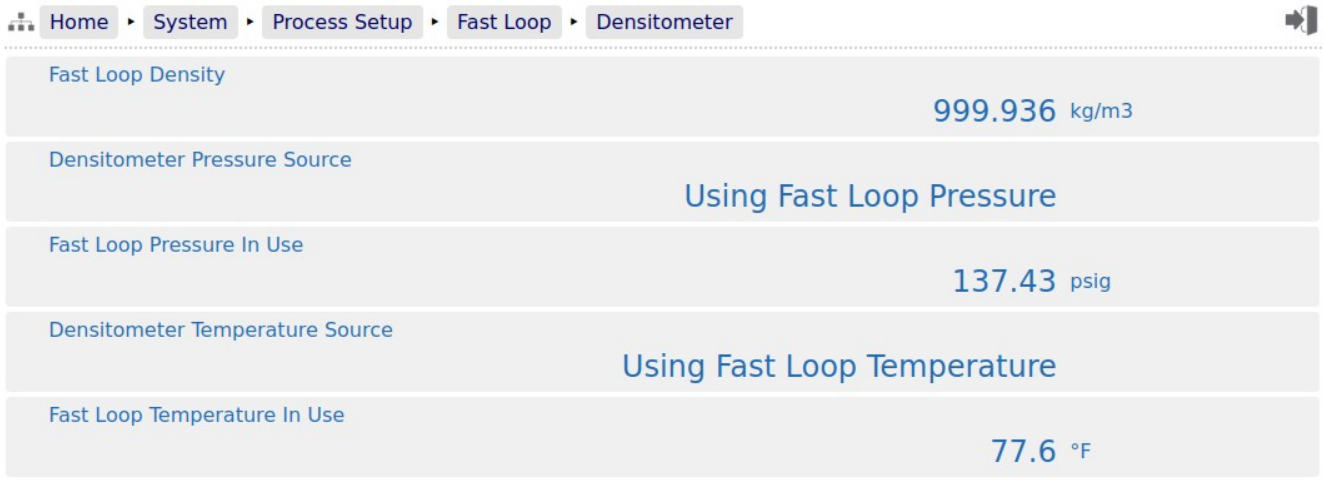
If the Fast Loop operating conditions are fairly stable and track the Main Line conditions, it may be valid to use the meter conditions with fixed offsets, as shown in the screenshot below.

In this example, the Fast Loop pressure is shown as 5.5 psig more than the Main Line Pressure and the temperature is 2.5°F less.



If however Fast Loop Temperature and Pressure transmitters are available then they should be enabled using the menu Home ▸ System ▸ I/O Assignment/Settings - Process Inputs.

The Densitometer Pressure and Temperature sources will then be shown as Using Fast Loop as shown in the screenshot below.



Fast Loop Density	The value shown in this field is the output of the density meter calculation compensated for the effects of temperature and pressure on the density meter body (Solatron calculation) and multiplied by the DCF/DMF value.	**-**
Densitometer Pressure Source	In this example, the Fast Loop Pressure has been selected.	**-**
Fast Loop Pressure In Use	This field shows the current Fast Loop Pressure In Use. This is for information only.	**-**
Densitometer Temperature Source	In this example, the Fast Loop Temperature has been selected.	**-**
Fast Loop Temperature In Use	This field shows the current Fast Loop Temperature In Use. This is for information only.	**-**

The rest of the Densitometer setup is exactly the same as for the Main Line meter, see:

Section 8.1.8.3 The "Middle" section of the Densitometer menu

Section 8.1.8.4 The Lower "Third" - Densitometer Coefficient Configuration

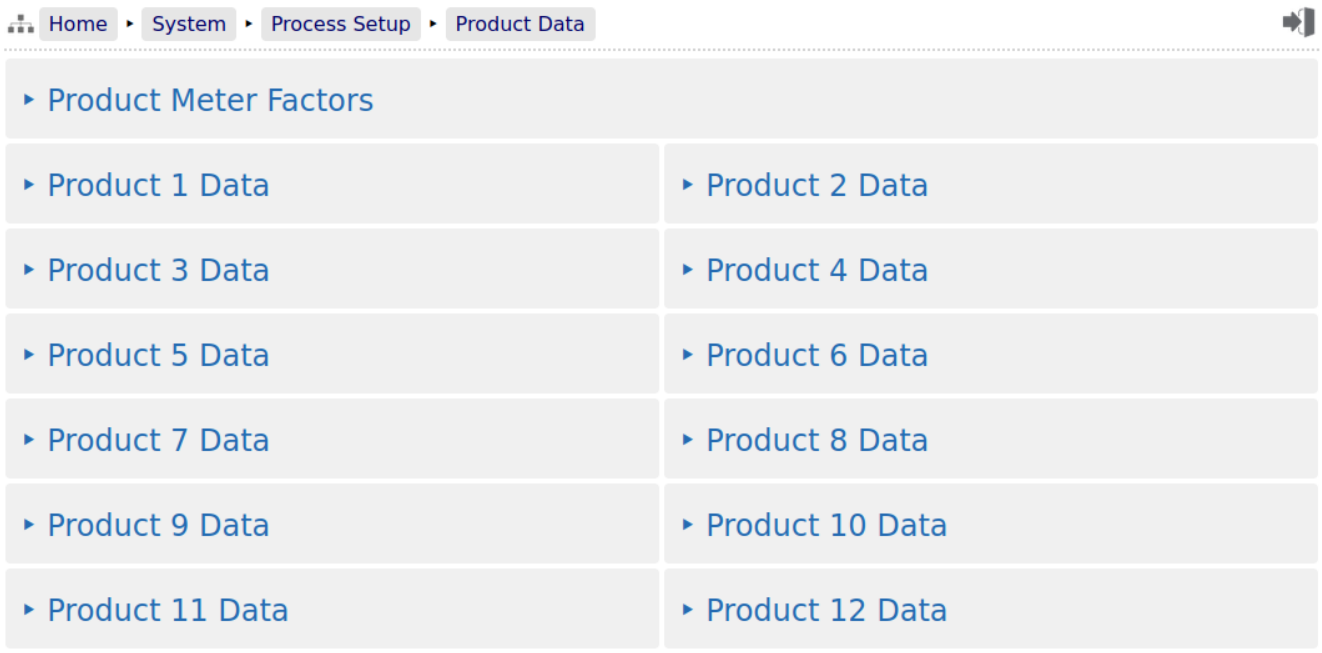
8.3 Product Data

Depending on the Prover Type selected, Meter Factor Method and if the Promass Communications is Enabled in Section 4.1 Initial Flow Computer Setup, the Meter Factors are set up differently. There are three possibilities.

If the Prover Type is set to System Prover no option is given, the Meter Factor Method will always be ***Use Baseline/Proved Meter Factor***.

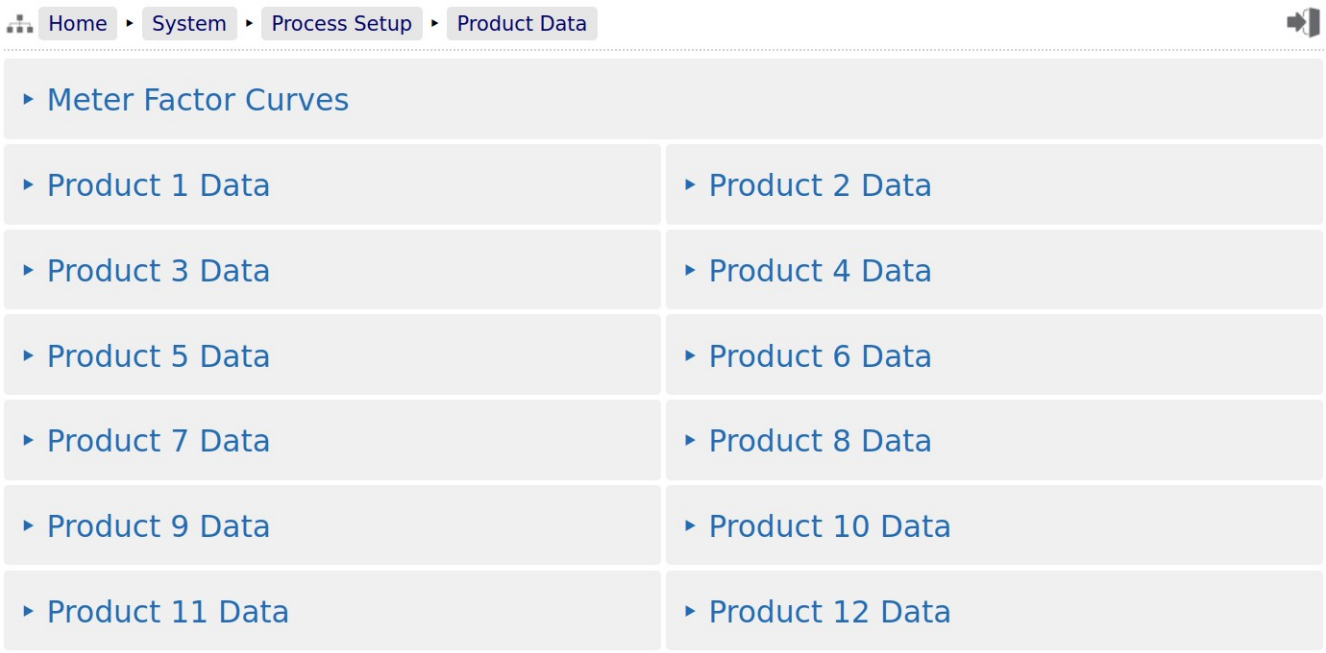
If the Prover Type is set to Standalone Prover, options are given for ***Use Baseline/Proved Meter Factor***, ***Use Meter Factor Curve*** and if Enable Promass Communications? is set to Yes, ***Use Reynolds Corrected Meter Factor***.

If ***Use Baseline/Proved Meter Factor*** is selected, the menu will be as below;



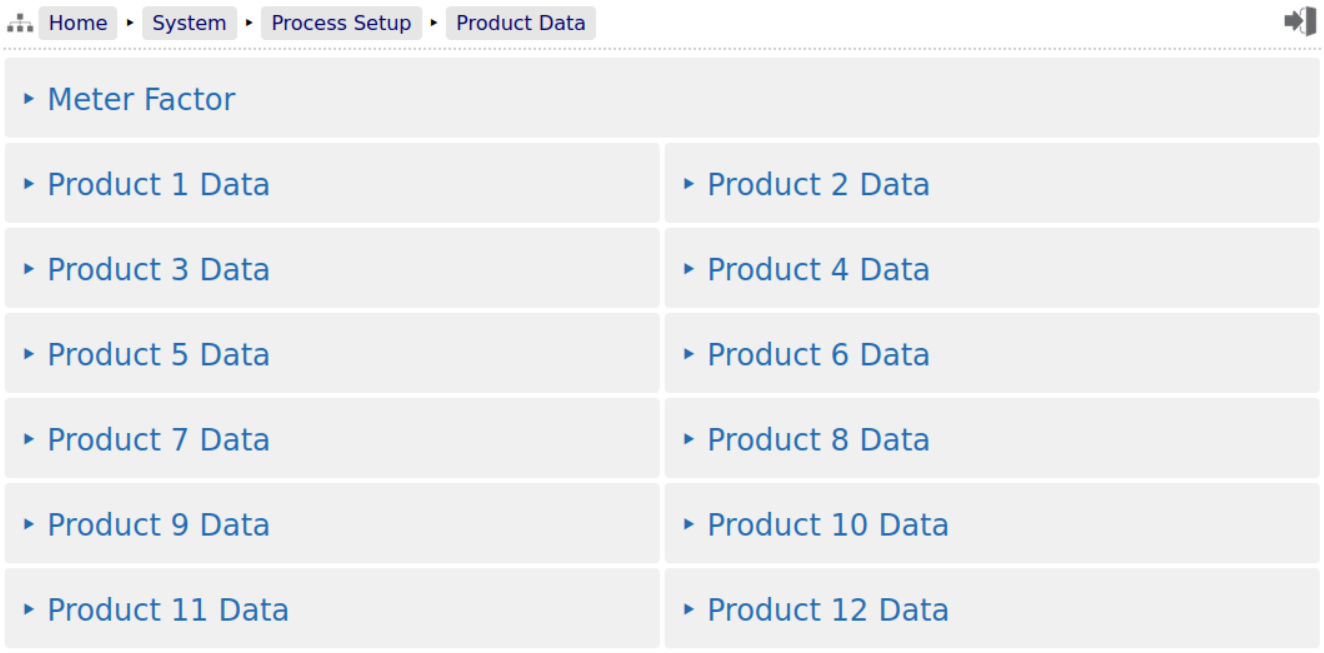
This is described below under Section 8.3.1 Product Meter Factors (Use Baseline/Proved Meter Factor).

If the ***Meter Factor Method*** is set to ***Use Meter Factor Curve*** the menu will look as per the screenshot below;



This is described below under Section 8.3.2 Meter Factors (Use Meter Factor Curves).

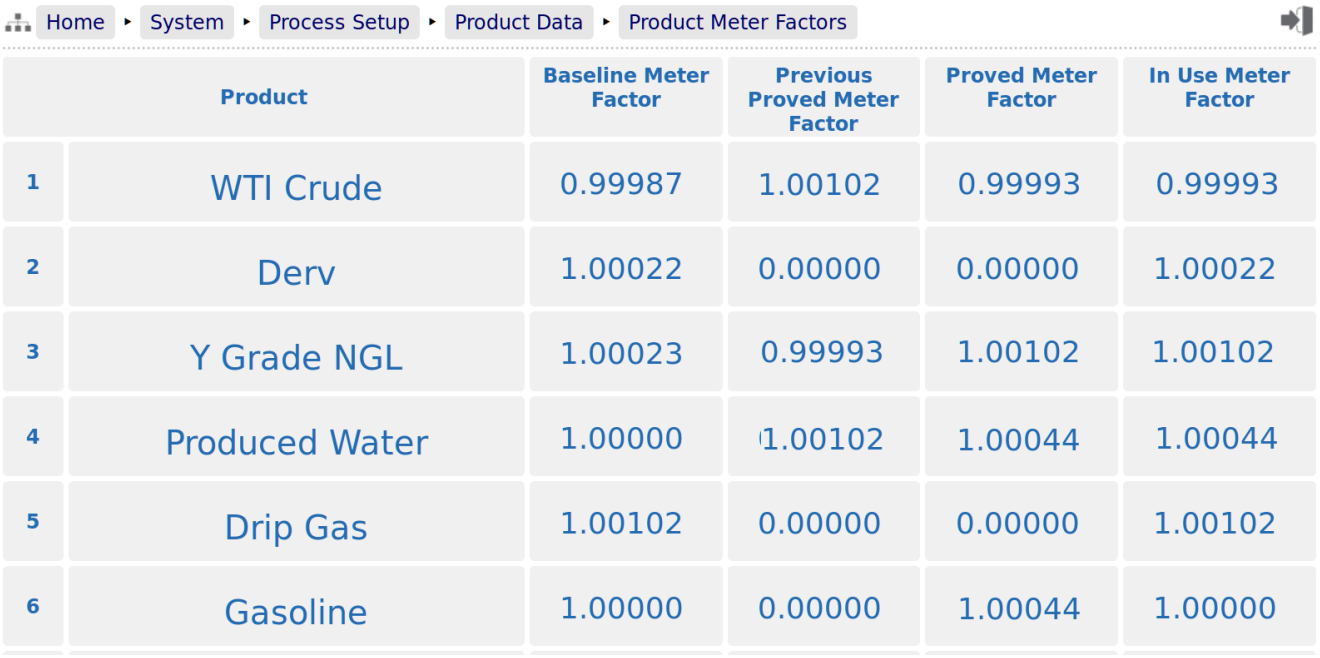
Finally, if the ***Meter Factor Method*** is set to ***Use Reynolds Corrected Meter Factor*** the menu will look as per the screenshot below;



This is described below under Section 8.3.3 Meter Factors (Use Reynolds Corrected Meter Factor).

8.3.1 Product Meter Factors (Use Baseline/Proved Meter Factor)

The screenshot below shows an example of an in use Product Meter Factor Table.



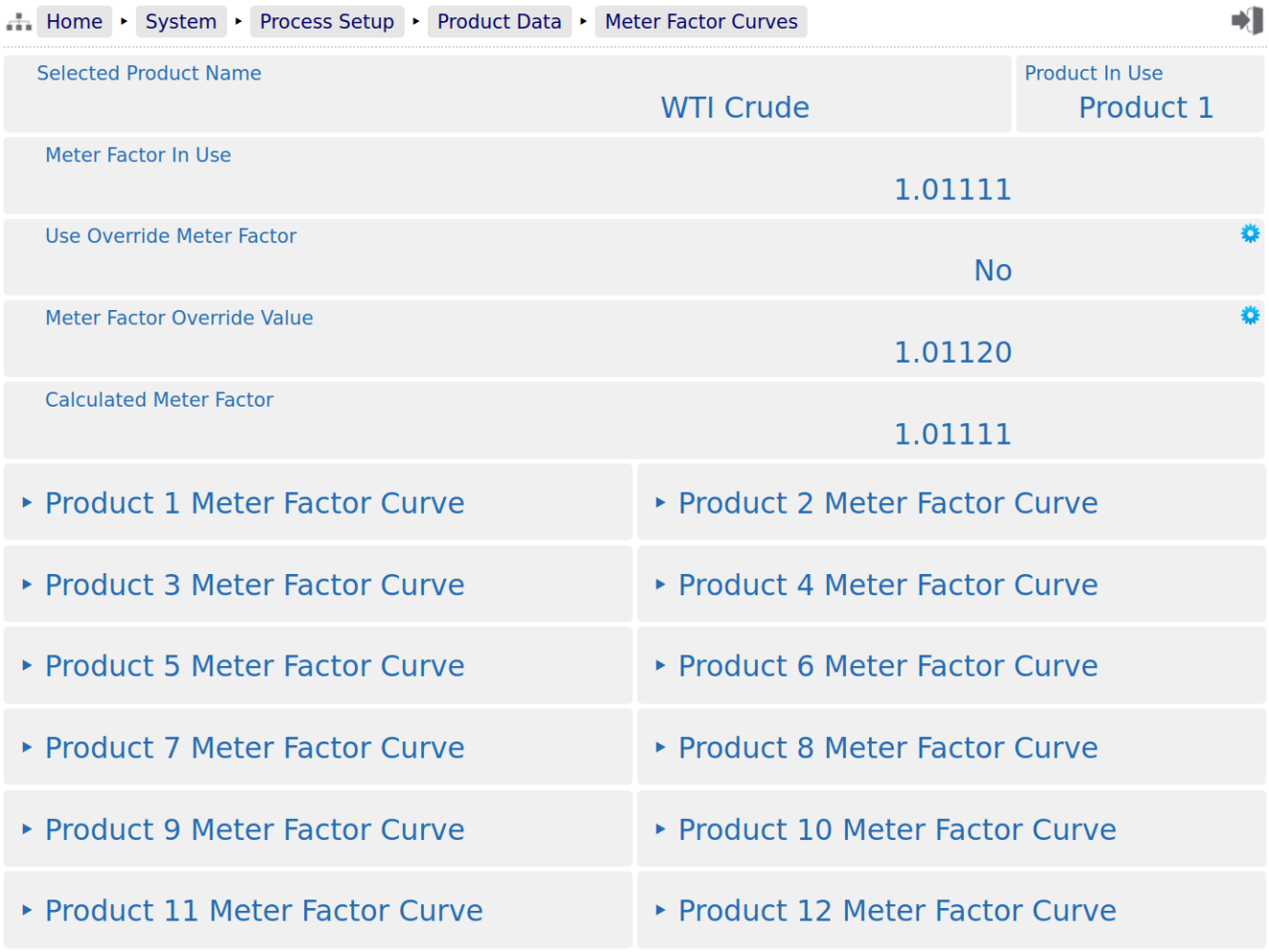
	Product	Baseline Meter Factor	Previous Proved Meter Factor	Proved Meter Factor	In Use Meter Factor
1	WTI Crude	0.99987	1.00102	0.99993	0.99993
2	Derv	1.00022	0.00000	0.00000	1.00022
3	Y Grade NGL	1.00023	0.99993	1.00102	1.00102
4	Produced Water	1.00000	1.00102	1.00044	1.00044
5	Drip Gas	1.00102	0.00000	0.00000	1.00102
6	Gasoline	1.00000	0.00000	1.00044	1.00000

This page provides information only.

Product	The Product number along with associated name is entered in each of the product data pages as described below in Section 8.3.4 Product "N" Data	-
Baseline Meter Factor	This is entered in each of the product data pages as described below in Section 8.3.4 Product "N" Data	-
Previous Proved Meter Factor	If the meter has been proved on the associated product before, this will show the Meter Factor that was obtained. If not, a value of zero will be seen.	-
Proved Meter Factor	If the meter has been proved on the associated product, this will show the latest Meter Factor that was obtained. If not, a value of zero will be seen.	-
In Use Meter Factor	This will show the Proved Meter Factor, if it has been accepted, otherwise if the Proved Meter Factor was rejected or no prove has been performed on this meter on the associated product, the Baseline Meter Factor.	

8.3.2 Meter Factors (Use Meter Factor Curves)

The screenshot below shows the set up screen along with further menus for the individual product curves.



Selected Product Name	This is provided for information only on the current product Meter Factor curve being used. Selection of the product is performed under Section 10.3 Product in Use	-
Product In Use	This is provided for information only on the current product Meter Factor curve being used. Selection of the product is performed under Section 10.3 Product in Use	-
Meter Factor In Use	This will show either the Override Meter Factor or the Meter Factor calculated from the selected product Meter Factor curve data, depending on the ***Use Override Meter Factor*** selection.	-

Use Override Meter Factor	This point selects the current operating mode. Clicking the line opens the dialog box allowing the user to select which mode to work in. **No:** Uses the calculated value from the selected product Meter Factor curve regardless of what the value is. **Yes:** Uses the Override value at all times.	**A**
Meter Factor Override Value	This is a fixed override value for the Meter Factor that would be used if the ***Use Override Meter Factor*** option above is set to **Yes**.	**A**
Calculated Meter Factor	This is the calculated Meter Factor value (from the selected Meter Factor curvethat would be used if the ***Use Override Meter Factor*** option above is set to **No**.	
Product 'N' Meter Factor Curve	These menus are used to enter the Meter Factor curves for each specific product. They are described below in Section 8.3.2.1 Product 'N' Meter Factor Curve	

8.3.2.1 Product 'N' Meter Factor Curve

The screenshot below shows an example Product Meter Factor Curve setup page (the example shown is for Product 1 when using a Volume K Factor).

Calculated MF	This is the calculated MF using the live Flow Rate and the Meter Factor entries in the ***Index 1...10 entries*** below.	-
Indicated Volume Flow Rate/Indicated Mass Flow Rate	Depending on the K Factor units selected in Section 6 Stage 3 of 5: Configuring the Measurement Units, this will show the indicated flow rate. In Mass mode, this will be the Indicated Mass and in Volume mode, Indicated Volume.	-
Index 1...10	This is the lookup table of the associated flow rate and relevant Meter Factor for that point over a range of 10 points. As in the example screenshot above, any unused entries should have a value of zero entered into the flow rate and Meter Factor fields.	**A**

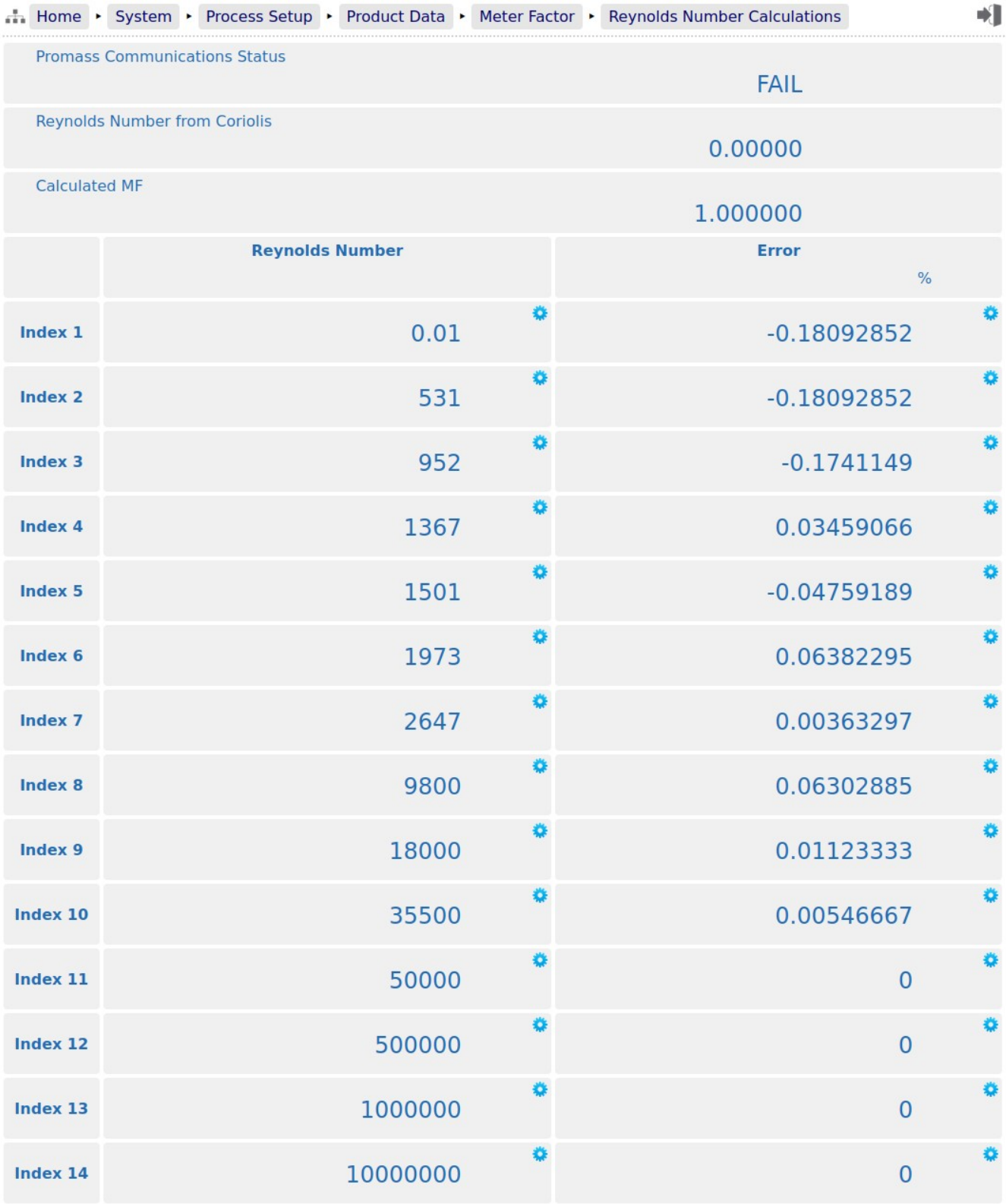
8.3.3 Meter Factors (Use Reynolds Corrected Meter Factor)

The screenshot below shows the Meter Factor setup page.

Meter Factor In Use	This shows the Meter Factor that will be used in the flow calculations and displays in the application.	-
Meter Factor Mode Status	This point indicates the current operating mode. Clicking the line opens the dialog box allowing the user to select which of the 3 modes. **Always Calculated:** Uses the calculated value from the Reynolds Number Calculations regardless of what the value is. **Always Override:** Uses the Override value at all times. **Use Override on Comms Failure:** Uses the calculated value from the Reynolds Number Calculations unless the communications to the Coriolis meter has failed, in which case it would use the ***Override MF*** value.	**A**
Override MF	This is a fixed override value for the Meter Factor that would be used if the ***Meter Factor Mode Status*** is set to **Always Override** or is set to **Use Override on Comms Failure** and the communications link has failed.	**A**
Calculated MF	This is the calculated value for the Meter Factor using the Reynolds Number calculation values below. This will be used if the ***Meter Factor Mode Status*** is set to **Always Calculated** or is set to **Use Override on Comms Failure** and the communications link is good.	-
▸ ***Reynolds Number Calculations***	This menu is used to enter the correction tables for use in the Reynolds Number calculations and also provides information on the link for debug purposes. It is described below in Section 8.3.3.1 Reynolds Number Calculations	

8.3.3.1 Reynolds Number Calculations

The screenshot below shows the Reynolds Number Calculations setup page.



Promass Communications Status	This shows the status of the modbus communications link to the Promass Coriolis meter. This will show either OK (when the link to the Coriolis is good) or FAIL if the link is down.	**-**
Reynolds Number from Coriolis	This shows the Reynolds Number received on the modbus communications link to the Promass Coriolis meter. This will show a value of zero if the link is down.	**-**
Calculated MF	This is the calculated MF using the live Reynolds Number and the Error entries in the ***Index 1...14 entries*** below.	**-**
Index 1...14	This is the lookup table of Reynolds Number and percentage Error over a range of 14 points. As in the example screenshot above, any unused entries should have a value of zero entered into the Error % field.	**A**

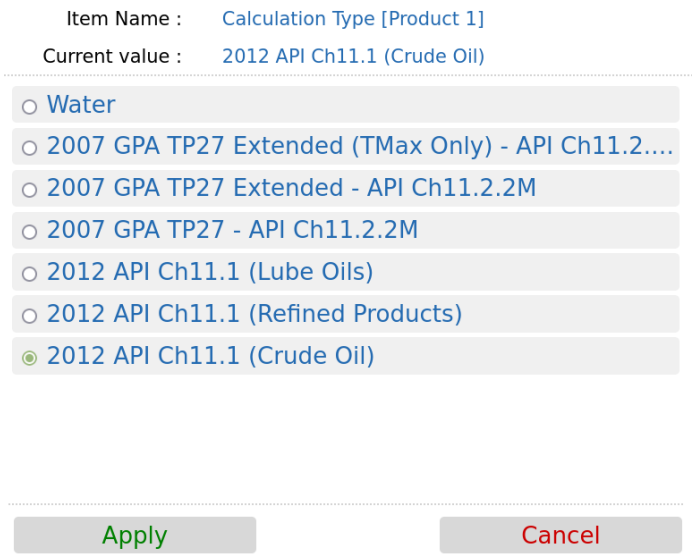
8.3.4 Product "N" Data

The Liquid Flow Computer supports up to 12 different products, and there is a Product Data page for each one.

The top seven lines are identical regardless of selecting ***Use Baseline/Proved Meter Factor***, ***Use Meter Factor Curve*** or ***Use Reynolds Corrected Meter Factor*** as the Meter Factor Method.

This is preset to ***Use Baseline/Proved Meter Factor*** and not changeable when the ***Prover Type*** is set to ***System Prover*** or is selectable when set to ***Standalone Prover***. See Section 4.2 Initial Application Setup, Site/Location Setup for further information.

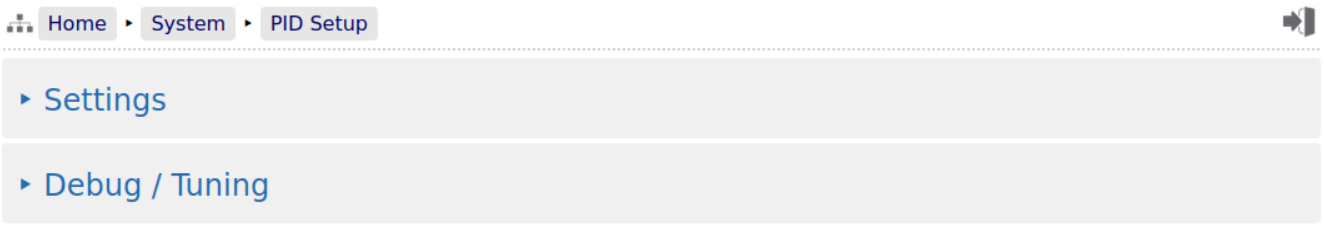
Below are the top seven lines for the Product 1 Data page as an example.

Product "N" Name	This item allows a name to be applied to each product. This name will appear on the relevant reports.	**A**
Calculation Type	There are seven options, as shown:  Depending whether the ***Calculations Standards*** are set to ***Metric*** or ***US Customary*** will change whether Metric or US Customary based calculation options are shown here. The Calculation Standards choice is made under Home ▸ System ▸ Measurement Units. See Section 6 Stage 3 of 5: Configuring the Measurement Units for more information.	**M**
Rounding Control	There are two choices here. If none is selected, then the calculations will be run to full (64bit Floating Point) precision where possible, otherwise the rounding will be performed in accordance with the calculation standard.	**M**
Vapor Pressure Calculation Mode	There are three options in the menu. If ***Use Product Table Vapor Pressure*** is selected, the value in the field below will always be applied. If Calculate Vapour Pressure is selected then TP15 will run in strict accordance with the density and temperature ranges in the specification. If the "Extended Limits" option is selected, the density & temperature ranges of TP15 are extended.	**M**
Vapor Pressure (Pe)	The Pe override value for each particular product is entered here.	**M**
Pe Unit	This entry determines if the Vapor Pressure Override is specified as a gauge or absolute pressure. The unit will be the same as the system wide pressure unit however this allows the user to select between Absolute or Gauge values.	**M**
Reference Density	If a live density value is not available from a Densitometer or Coriolis meter, the reference (base) density value should be entered here for each product. It is advisable to enter a value here regardless, just in case a transmitter fails when in service.	**M**
Reference Temperature	This is the reference temperature at which the density entered above refers.	**-/M**

The bottom three lines are only shown if the ***Meter Factor Method*** is set to ***Use Baseline/Proved Meter Factors***. See Section 4.1 Initial Flow Computer Setup.

Meter Factor Mode	There are two choices. If ***Use Base Line Meter Factor*** is selected, the meter factor shown in the field below will always be used. If the ***Use Proved Meter Factor*** option is selected, the last accepted meter factor from the Prover will be used.	**A**
Base Line Meter Factor	Enter the Baseline (or initial) Meter Factor.	**A**
Proved Meter Factor	This field shows the last Meter Factor accepted from the Prover. If a prove has not been performed, this value will show as zero. If the Meter Factor Mode (2 rows above) has been set to Use Proved Meter Factor, but the value is zero, the baseline value will be used until a successful prove has occurred.	**-**
Previous Proved Meter Factor	This field shows the previous Meter Factor accepted from the Prover.	**-**

8.4 PID Setup

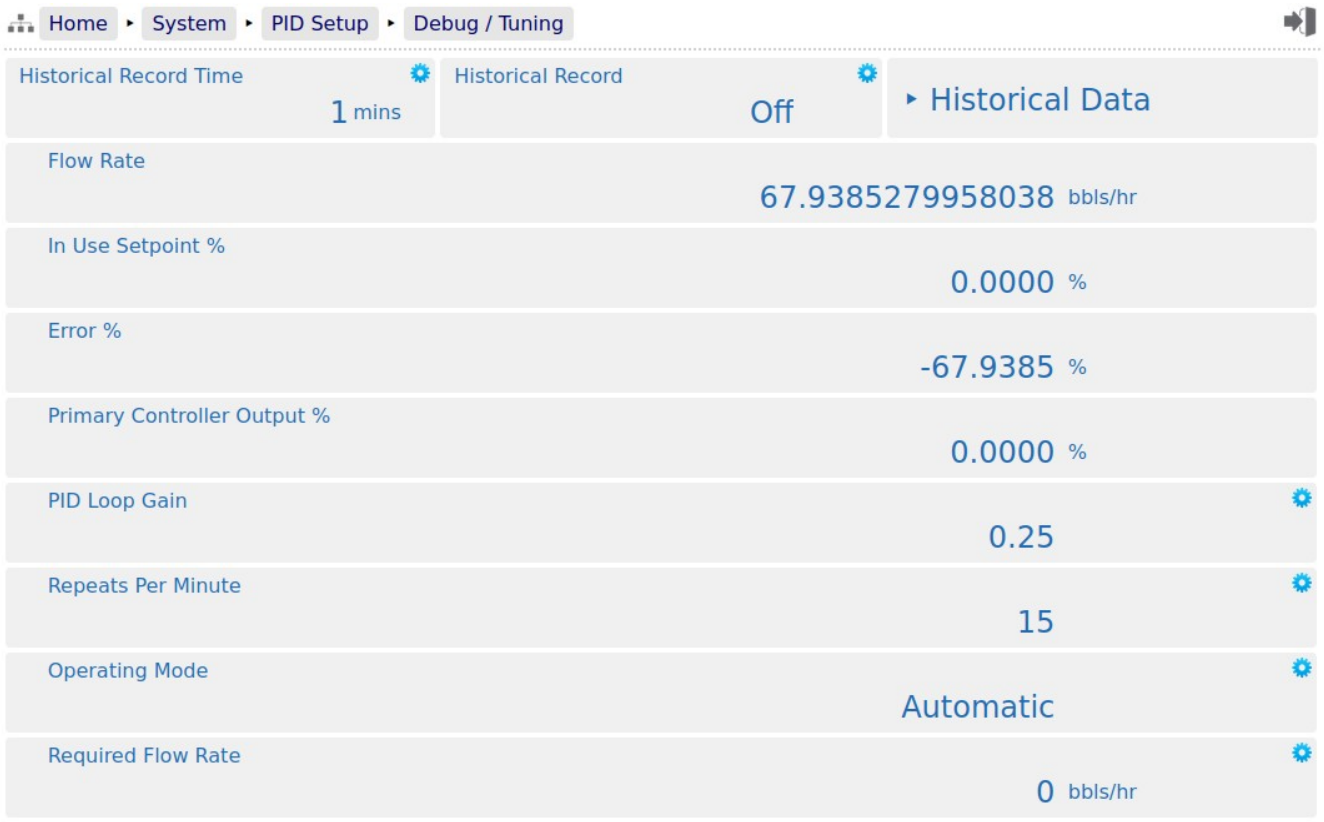


8.4.1 Settings

The settings menu is where all the PID configuration parameters are shown and can be adjusted to match the operational requirements.

For a full description of these data points refer to MiniSpec 14 Manual, available on request from the factory.

8.4.2 Debug / Tuning



This menu has the operational functions (Automatic or Manual), shows the Process Variable to be controlled (Flow Rate) Controller Output value and the controller error percentage as well as duplicating some of the settings, which may need changing whilst the control loop is being tuned.

8.4.3 PID Historical Data

To aid tuning the PID controller loop, the Historical Data storage can be used to record every cycle performed by the controller. As the NÅNO is designed for a 25 year lifespan, full speed writes to the historical storage cannot be performed continuously as this would shorten the lifespan, so the operator can chose how many minutes of data are to be recorded.

Then clicking on Historical Record and selecting On, will start the recording process, and a yellow Recording Active banner will be displayed.

Clicking on the Historical Data link takes you to the following menu:

Home ▸ System ▸ PID Setup ▸ Debug / Tuning ▸ Historical Data ▸ PID Loop Debug

The data can now be downloaded for detailed examination. Note the PID loop runs several times per second. The time-stamp in only in whole seconds but the downloaded data is in time order.

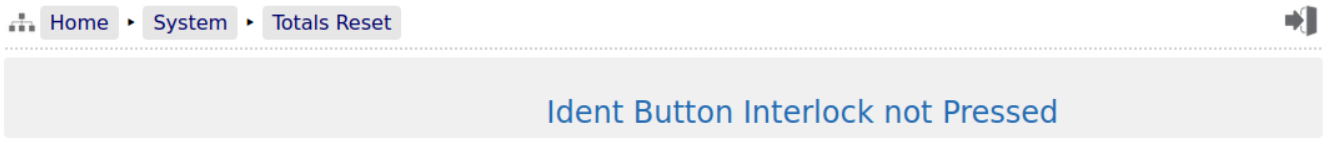
NOTE: Ensure Records are kept under an hour to ensure data is not overwritten.

8.5 Totals Reset

This option is only available if the ***Metrology Mode*** is set to ***API***. If set to ***Strict MID***, the menu is hidden as the totals can not be reset from the running application. See Section 4.1 Initial Flow Computer Setup

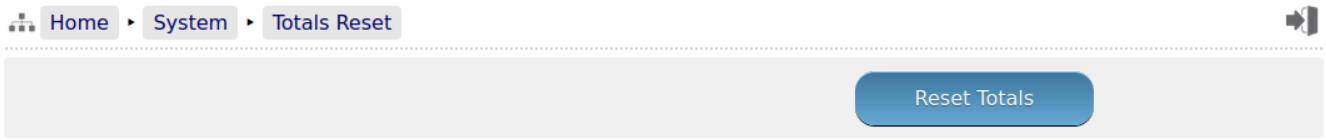
During testing or when a unit is redeployed, it can be useful to reset the totals. However it is imperative to ensure that it isn't possible to accidentally or deliberately reset the totals remotely.

To ensure the totals cannot be reset without physical access to the NÅNO, the IDENT button is used as an interlock. Navigating to the Home ▸ System ▸ Totals Reset page will show the following:

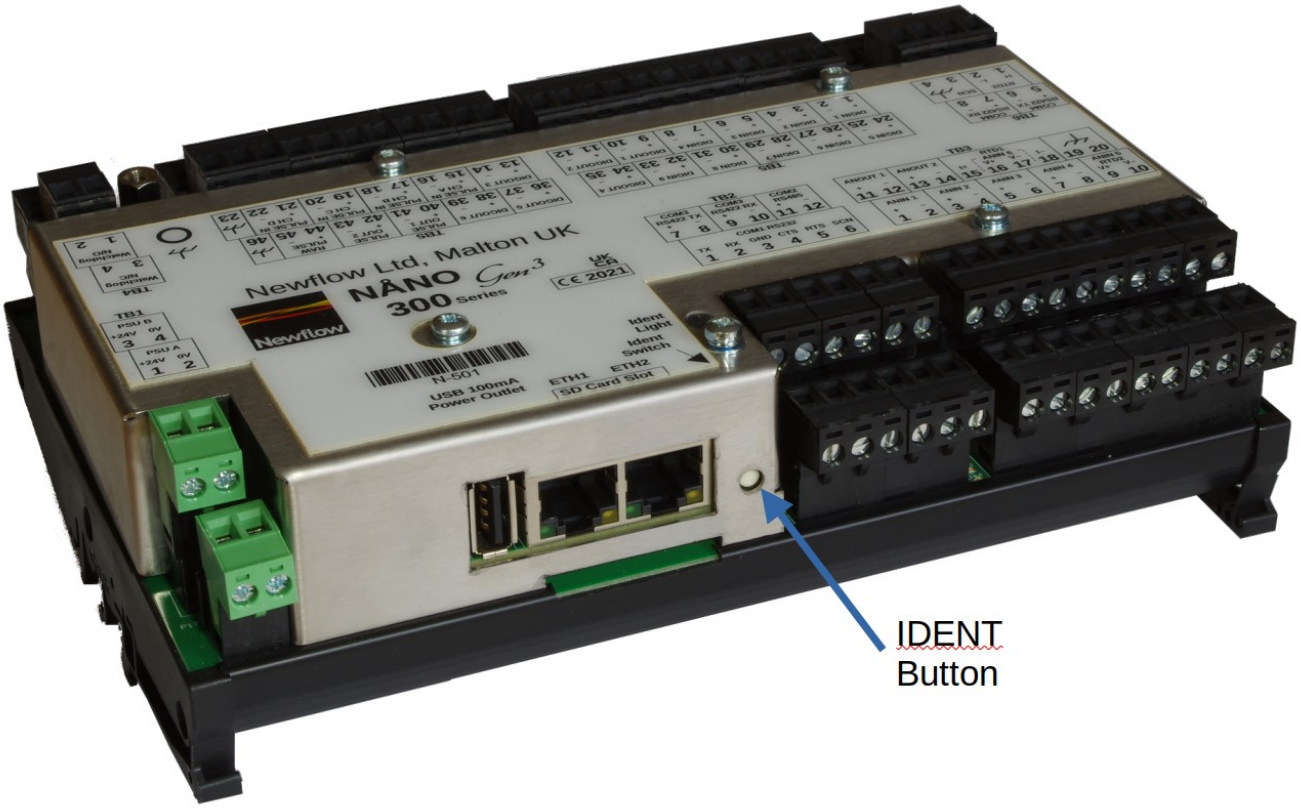


If you want to reset the totals of a packaged NÅNO, the IDENT button MUST be held down for several seconds before navigating to the Home ▸ System ▸ Totals Reset page. The page will now display the Reset Totals button and clicking the button will reset the totals. As soon as the IDENT button is not held down the "Interlock not Pressed" message will be shown again.

NOTE: The Non-Resettable Totals will NOT be reset by this action.



The IDENT button is located here;



This ends the setup of the Liquid Flow Computer application

NOTE1: Now would be a good time to back up your changes. With the NÅNOConf tool, Application configurations can be uploaded to the PC for back-up purposes and for cloning more NÅNOs. Additionally, printing a constants log will generate a list of configured data points.

NOTE2: When commissioning the unit, enter the Technician Menu mode using the Local Panel and select "**Batch End**".

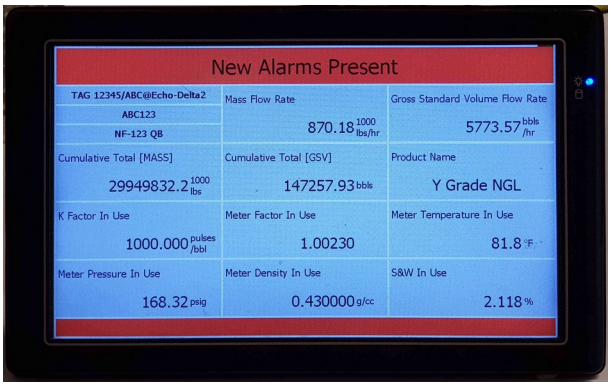
NOTE3: The following information details the Reports generated by the NÅNO, the Logs and trending data provided as well as the diagnostic information available in the NÅNO.

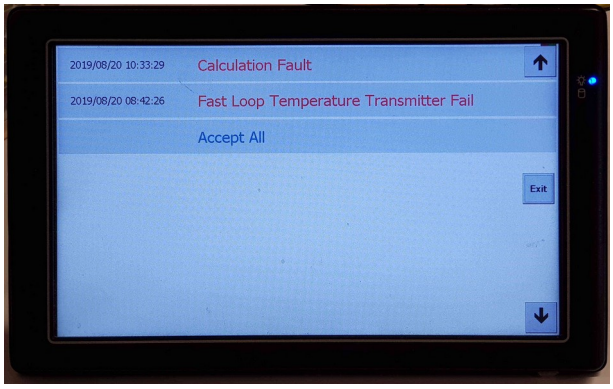
9 The Liquid Flow Computer Local Panel

The NÅNO can be equipped with a Local Panel for operation and maintenance purposes. The Local Panel is not intended for configuring the Flow Computer. This is done via the web interface or by down loading a pre-configured image using NÅNOConf.

ConstED can be used to assist in pre-configuration of the application.

If neither the AO Report Digital Input nor the Metering Tech Mode Digital Input is active, the default Liquid Flow Computer Local Panel screen will be displayed, as shown below:





The top left of the Local Panel has three fields without accompanying descriptions.

The top field is the Device ID.

The second line down is the Main Line Flow Meter ID.

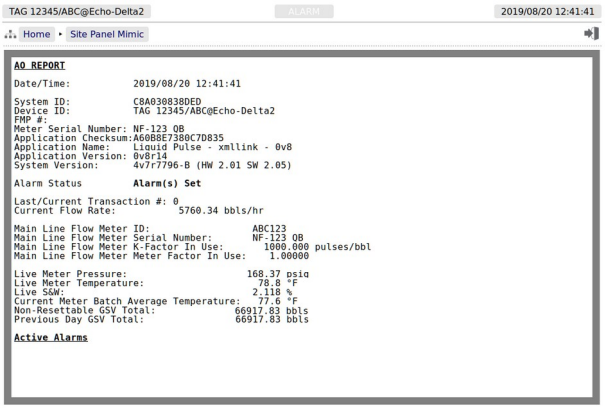
The third line is the Main Line Flow Meter Serial Number.

The rest of the display is self explanatory.

On the Web Interface, the Home ▸ Site Panel Mimic will show the same display.

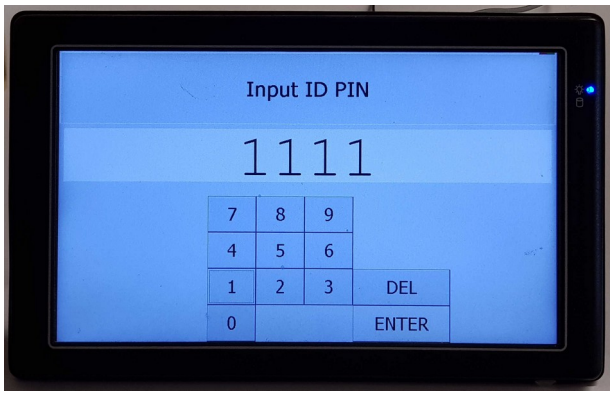
NOTE: The left hand screen shows that new alarms are present, and clicking on the top red alarm banner open another window which shows the technician the alarms, and allows them to be accepted.

If the AO Report Digital Input is active, then the Local Panel will display the AO report as shown below:



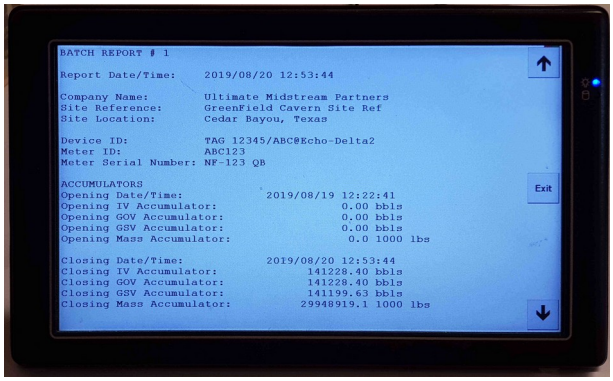
If the Metering Tech Mode Digital Input is made active, the technician will need to log in unless the security Method was set to None in this menu: Home ▸ System ▸ Initial Setup ▸ Site/Location Setup ▸ Security Setup.

The left hand screenshot below show the security ID entry. Note the keypad is a full alpha-numeric keyboard to allow the name to be entered but the associated PIN is numeric only, so only a number pad is displayed.

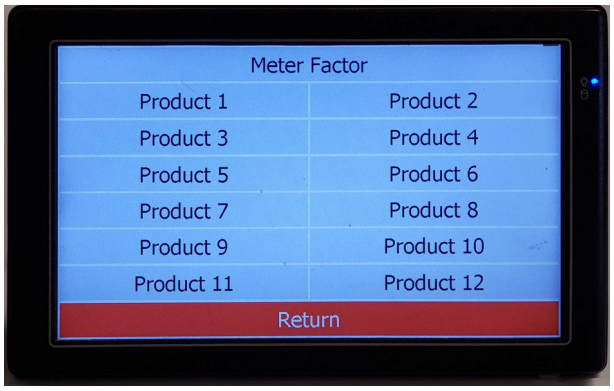


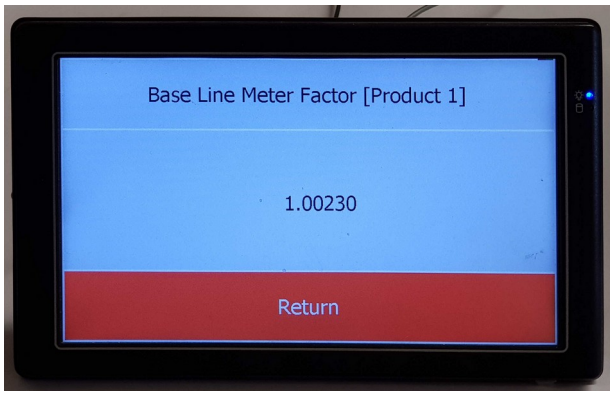
Once the Technician has logged in, four choices are shown, below left. If End Batch is clicked, the image below right shows the result of ending the batch from the Local Panel.

If when looking at the Batch Report, the View Summary box is clicked, a preview of the batch reports is shown, as on the right hand side.

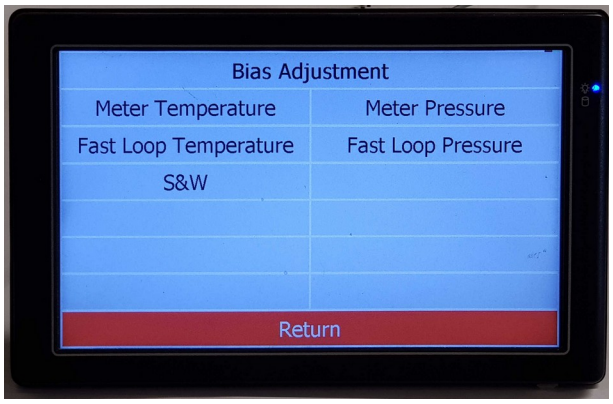


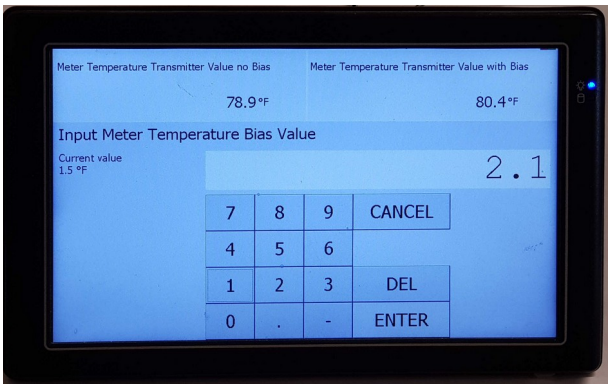
If the Enter New Meter Factor option is chosen, then the operators is asked which Product Meter Factor is to be changed, and the image below right shows the entry for Product 1:





If the Bias Adjustment option is chosen then the Technician will be asked which input variable is to be adjusted, and the image on the right shows the screen for the Meter Temperature Bias adjustment.

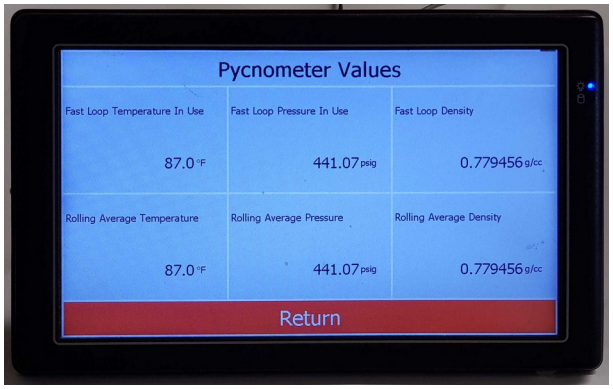




If the Pycnometer Values option is chosen, then the screen shown on the right is displayed.

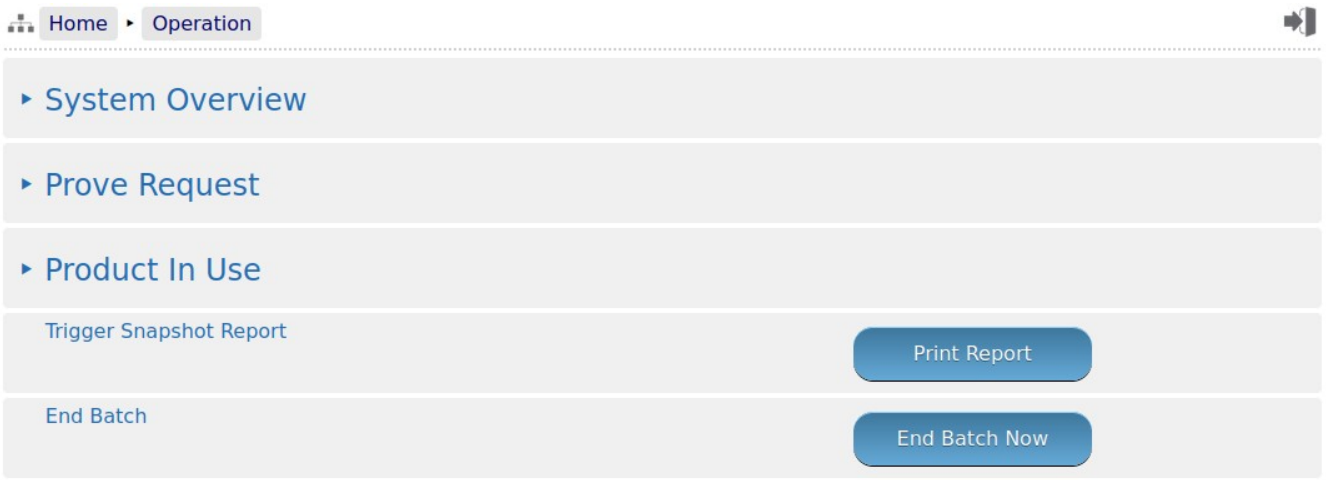
This screen shows the instantaneous (live) values for the Densitometer Density Output and the associated Temperature and Pressure on the top line.

The line below shows the same values with a rolling average. The rolling average time is set in the Home ▸ System ▸ Initial Setup ▸ Time Based Settings menu.



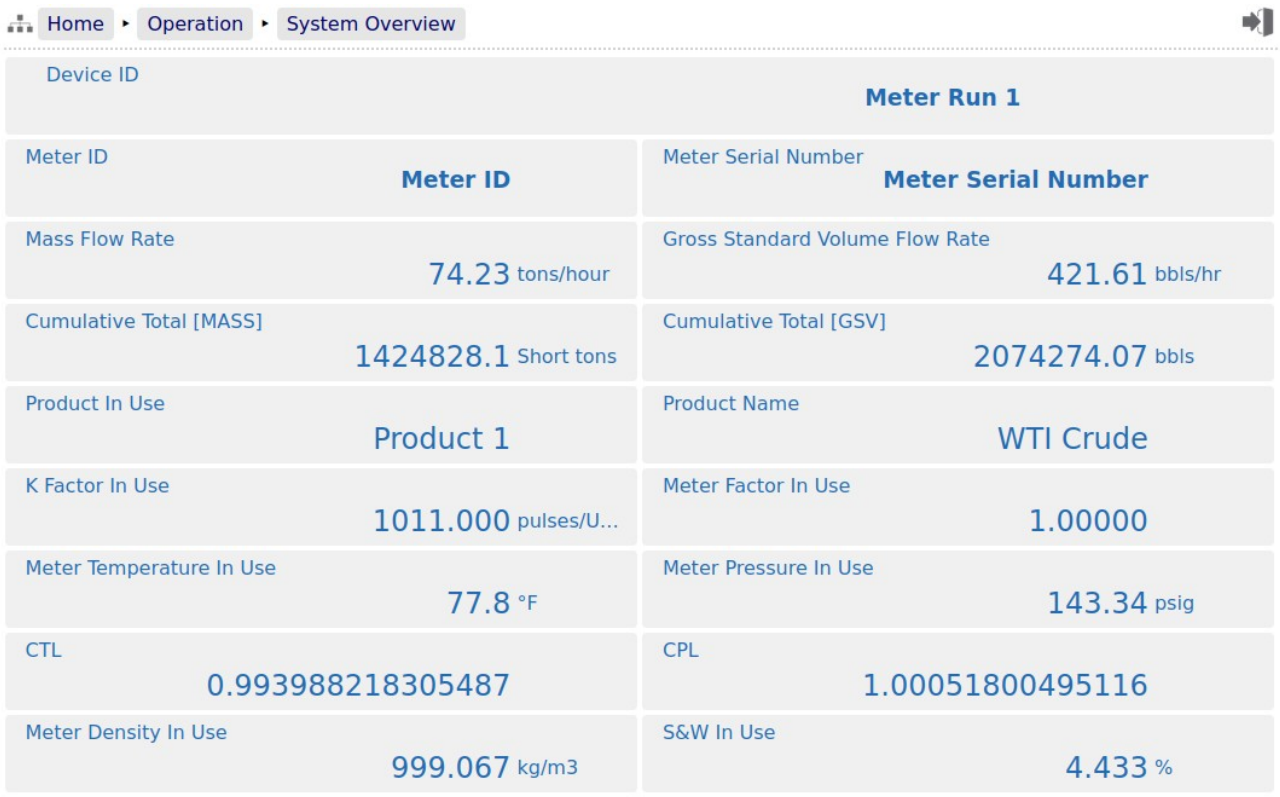
10 Operating the Liquid Flow Computer

From the home screen, clicking Operation takes you to a menu where many of the operation changes (rather than setup configuration changes) are made.



NOTE: If in Station Mode the ***End Batch*** option will not be shown and will be controlled by the NÅNO station application.

10.1 System Overview



This display shows similar information to the default Local Panel menu, but unlike the Local Panel mimic, it will not change when in use by a Technician.

10.2 Prove Request

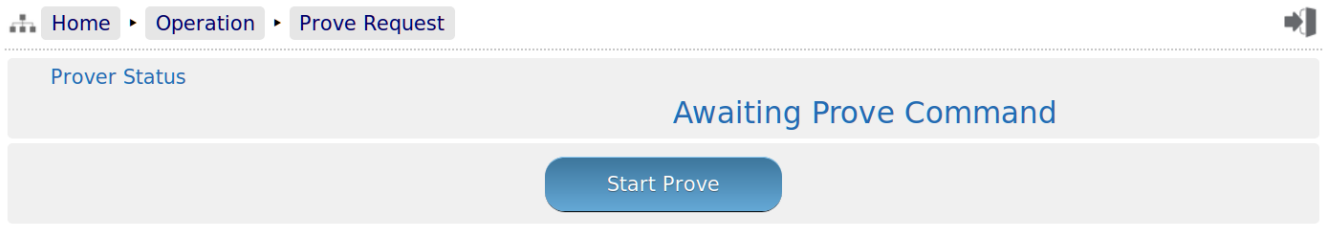
This option is only shown when the Prover Type is set to System Prover, see Section 4.1 Initial Flow Computer Setup.

If the Prove Request menu does NOT show the Start Prove button, then the Flow Computer has not found a System Prover. This is normally due to a mismatch in the Meter - Prover XML Link ID, or else the System Prover is not running. The screenshot below show the Menu when the Start Prove button is missing. The Meter - Prover XML Link ID is configured here:

Home ▸ System ▸ RTU Setup ▸ Comms ▸ Meter - Prover XML Link

and see Section 5.5.7 Prover Link for more information.

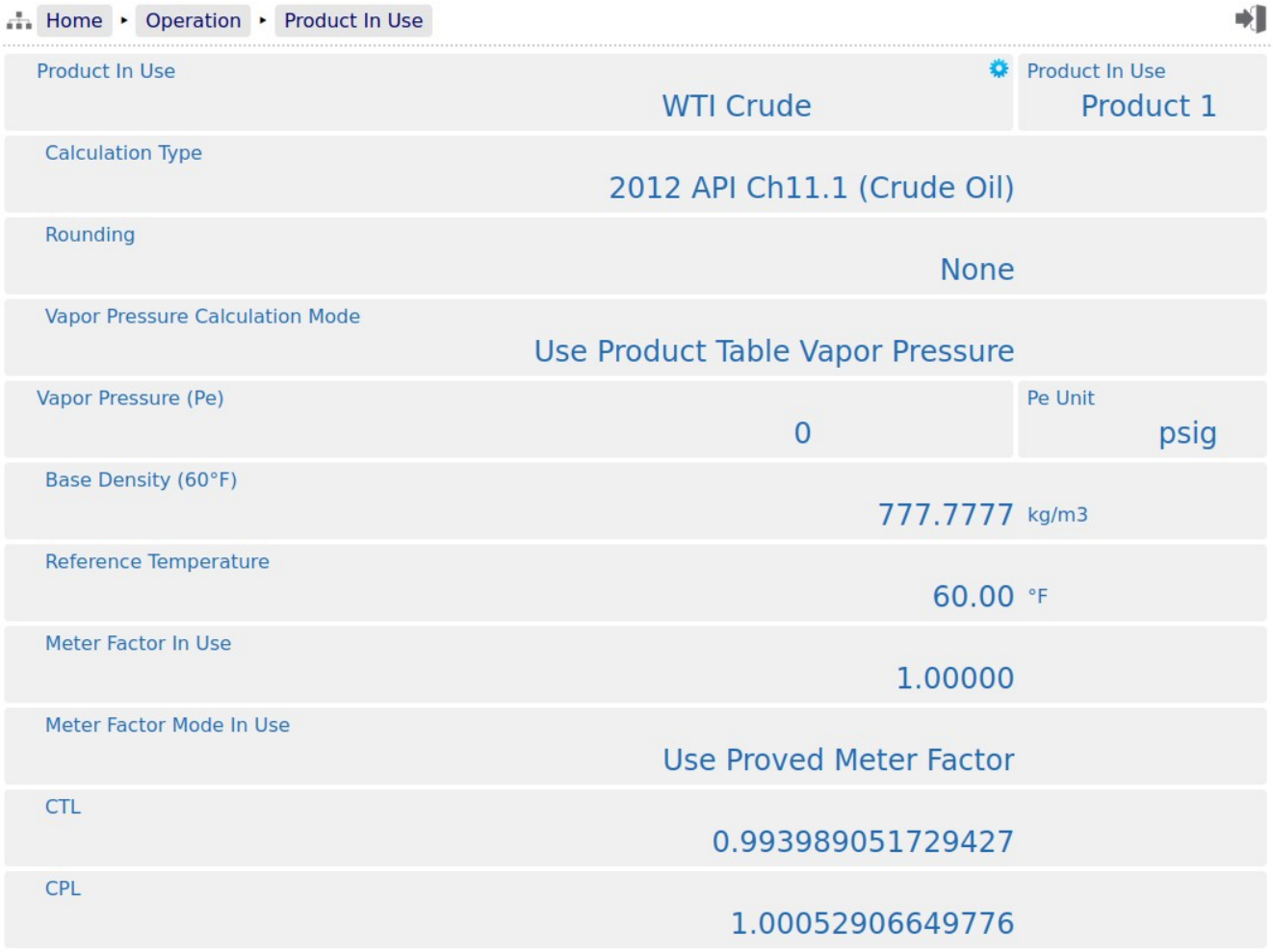
Once the Liquid Flow Computer application has found the System prover, the Start Prover Button will be displayed, as shown in the screenshot below.



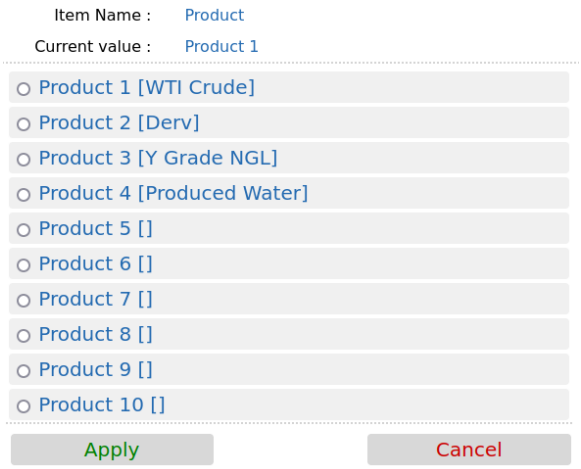
Clicking the Start Prover Button will initiate a prove cycle. The prove cycle can be aborted at any time by clicking the button, now renamed as Abort Prove.

NOTE: Any other Flow Computers sharing the same Meter -Prover Link ID value will also show the Prove In Progress banner. A typical unit's screenshot is shown below;

10.3 Product in Use



There is only one changeable data point on this menu, and that is the Product in use. The rest of the menu is for information only. Selecting Product In Use brings up the dialog box shown below.

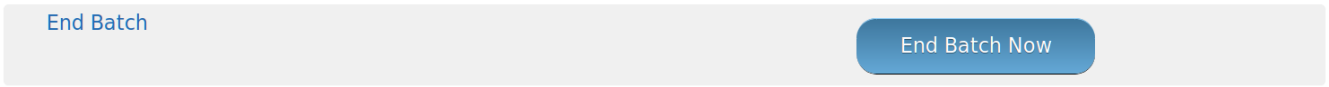


10.4 Trigger Snapshot Report

Pressing the Print Report button will generate a Snapshot report, and this may be printed depending upon the Report Routing settings in Home ▸ System ▸ RTU Setup ▸ Comms ▸ Report Routing.

See Section 5.5.2 Report Routing.

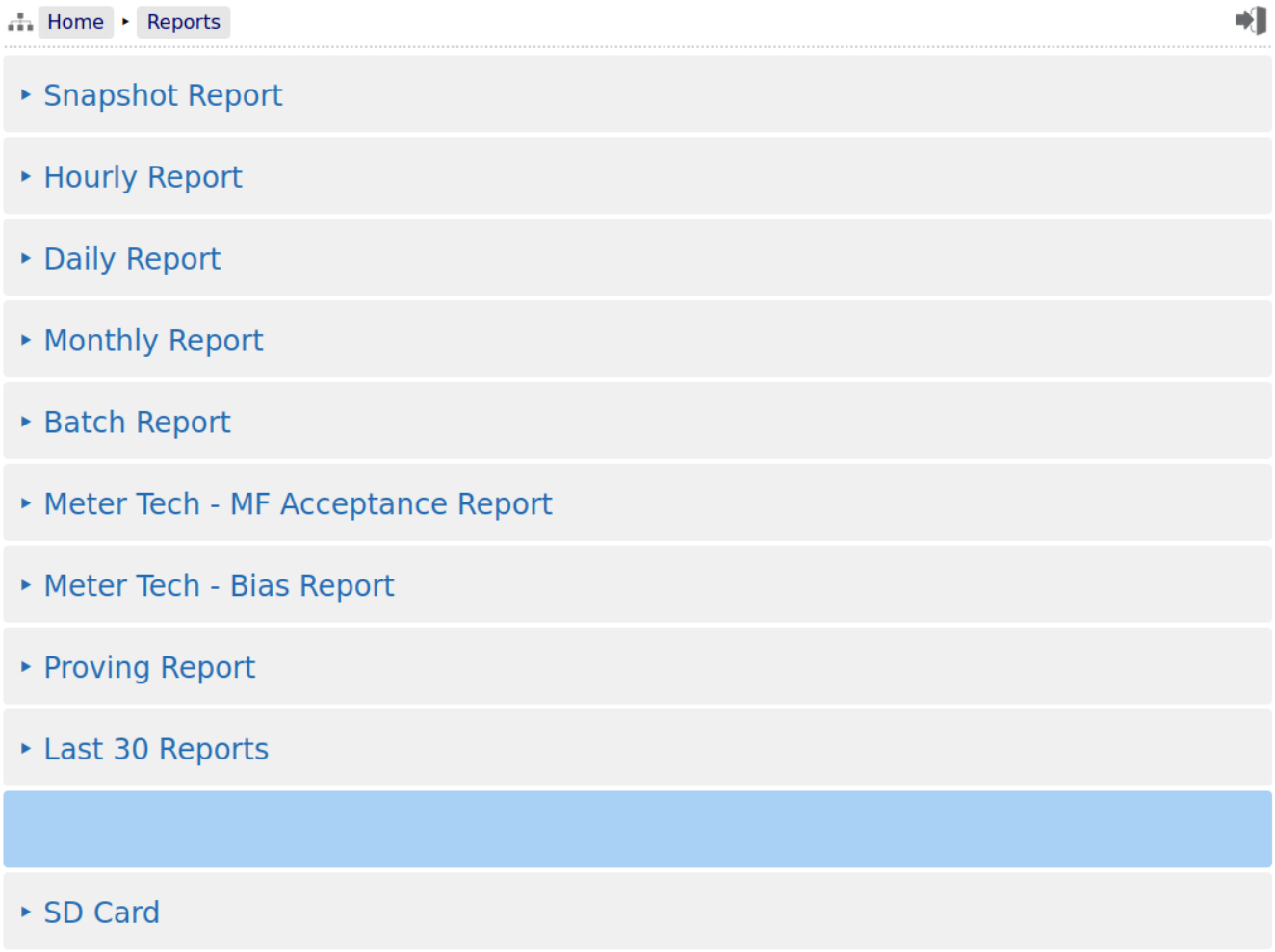
10.5 End Batch



Clicking on the End Batch Now button will end the current batch and immediately start the next one, and the reports will be generated.

11 Reports

The purpose of the Liquid Flow Computer application is to record all the relevant flow data, and produce a set of reports for agreement between the buyer & seller of all transactions.



11.1 Liquid Flow Computer Report Types

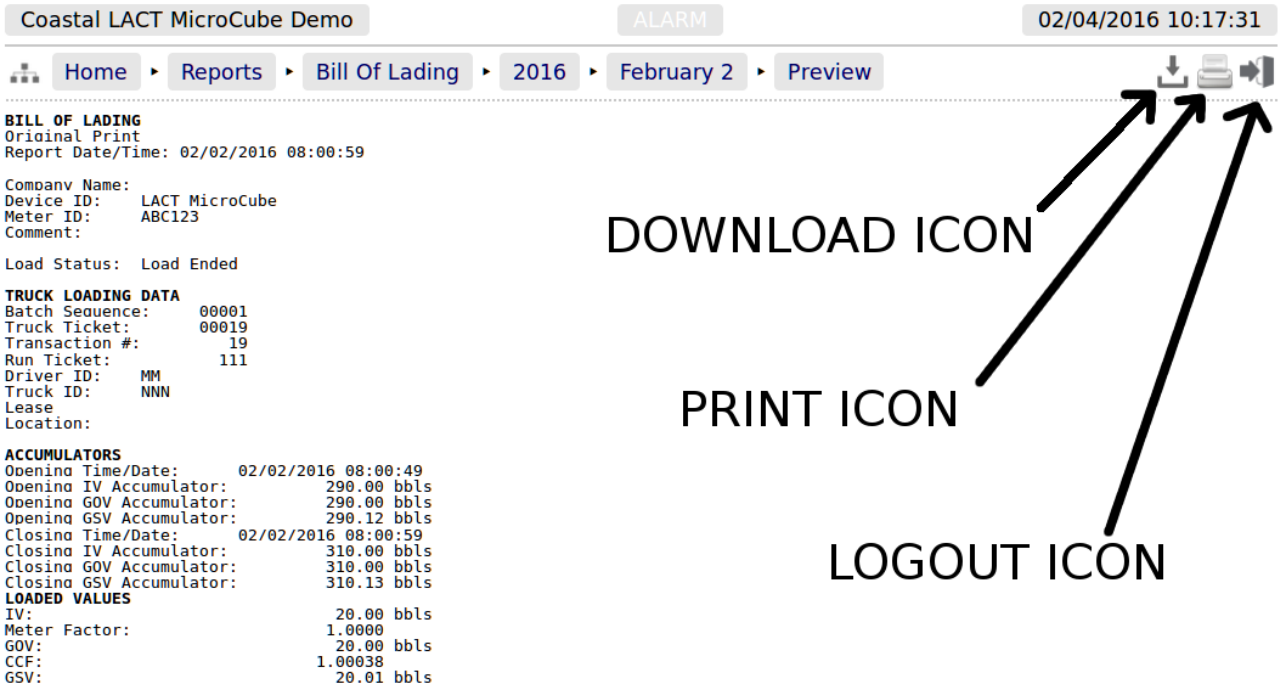
Snapshot	If a snapshot report has been generated it will be stored here, by time and date. **NOTE:** Only the last generated report is shown and the snapshot report is NOT stored in non-volatile memory so will be cleared on a restart or power cycle.
Hourly Report	As a minimum, an Hourly Report will be generated at the end of every hour. This will be stored in secure, non-volatile memory and may be printed automatically, The automatic printing will depend on the printer settings and printer routing (see Home ▸ System ▸ RTU Setup ▸ Comms ▸ Report Routing). When the Application is started for the very first time, an Hourly Report will be generated, with the initial data. In addition, if in Home ▸ System ▸ Initial Setup ▸ Time Based Settings the ***Generate Hourly Report at Batch End*** option has been set to "Yes", then another Hourly Report will be generated when a batch is ended. **NOTE:** If this option is selected and several Batch Ends are triggered during an hour, you can have Hourly Reports which neither start nor stop on an hour boundary. The Hourly Report is stored in Zone 4, which holds a minimum of 1500 reports, giving over 62 days of Hourly Reports, unless Batch Ends are also triggering Hourly Reports.
Daily Report	Every day at the Day End Hour time (see Home ▸ System ▸ Initial Setup ▸ Time Based Settings) a Daily Report will be generated. This will be stored in secure, non-volatile memory, and may be printed automatically. The automatic printing will depend on the printer settings and printer routing (see Home ▸ System ▸ RTU Setup ▸ Comms ▸ Report Routing). When the Application is started for the very first time, a Daily Report will be generated, with the initial data. In addition, if in Home ▸ System ▸ Initial Setup ▸ Time Based Settings the ***Generate Daily Report at Batch End*** option has been set to "Yes", then another Daily Report will be generated when a batch is ended. **NOTE:** If this option is selected and several Batch Ends are triggered during a single day, you can have Daily Reports which neither start nor stop on an day boundary. The Daily Report is stored in Zone 3, which holds a minimum of 1500 reports, giving over 4 years of daily reports, unless Batch Ends are also triggering Daily Reports.
Monthly Report	On either the first day of each calendar month or the last day of the calendar month at the Day End Hour Time (see Home ▸ System ▸ Initial Setup ▸ Time Based Settings) a Monthly Report will be generated. This will be stored in secure, non-volatile memory and may be printed, as above. When the Application is started for the very first time, a Monthly Report will be generated, with the initial data. The Monthly Report is stored in Zone 7, which holds a minimum of 250 reports, giving over 20 years of Monthly Reports.
Batch Report	At the end of a batch, a Batch Report will be generated. This will be stored in secure, non-volatile memory and may be printed. The Batch Report is stored in Zone 1, which holds a minimum of 1,500 reports.

Metering Tech (Baseline MF Report)	When in Meter Technician Mode and the Change Baseline MF option is selected, an "As Found" report is generated. The Technician can then change as many of the product baseline Meter Factors as required and, when Meter Technician mode is exited, the "As Left" report is generated. The Metering Tech - Baseline MF Report is stored in Zone 8, which holds a minimum of 250 reports.
Metering Tech (Bias Report)	This report records the As Left Bias (Offset) values applied to the analog measured values. The Metering Tech - Bias Report is stored in Zone 8, which holds a minimum of 250 reports.
Proving Report	The Proved MF Report shows the data pulled back from the System Prover as well as if the proved MF met the accelerated criteria. The Proving Report is stored in Zone 9, which holds a minimum of 250 reports.
Last 30 Reports	This shows the last 30 of all types of report generated in time & date order. A screenshot of the top five entries of the Last 30 Reports is shown below.
SD Card	The SD Card menu is a hierarchical viewer in date order. First select the year, then the month, and finally the day, and all files created on that day will be visible.

11.2 Last 30 Reports

By clicking on any of the reports listed, a preview of the report will be shown. When looking at any report preview page, the report can also be downloaded directly to the PC by clicking on the File Download icon. The preview below shows the first few lines of the Bill of Lading ticket for clarity and the arrow indicate the purpose of the additional icons on the breadcrumb navigation bar.

The example report below is from the LACT-Pro® app, but the report layouts are all consistent.



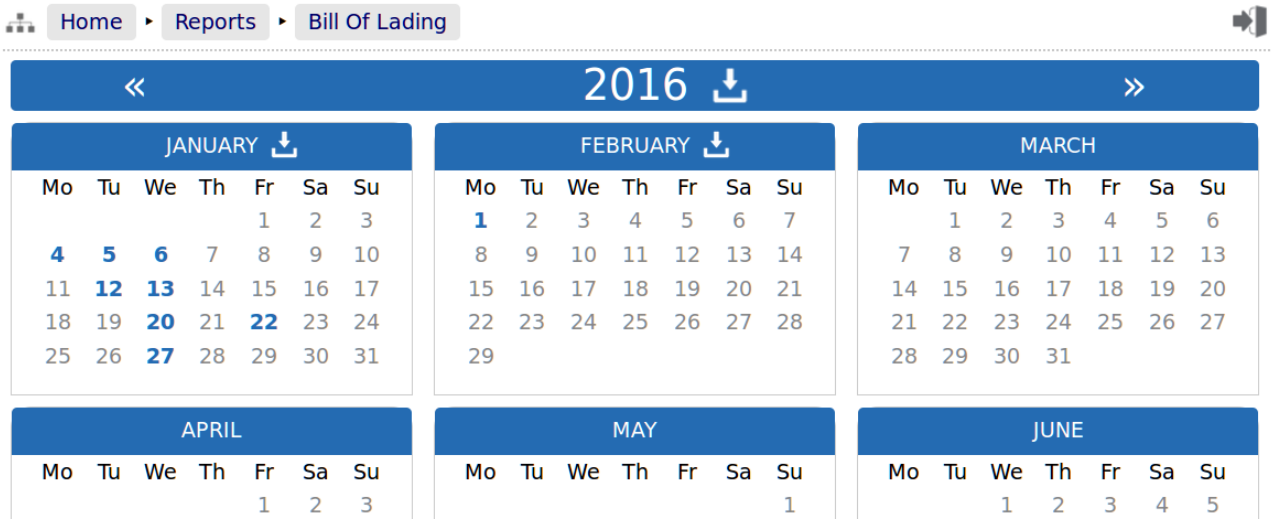
Reports will be downloaded to the PC as plain text files, but the text attributes will be shown in the downloaded text, for example <b> for bold and <u> for underline.

Clicking the Print icon will cause the file to be printed to the whichever printer has been designated as the web printer during the setup phase.

Alternatively, the screen can be printed from the browser, using the usual method. Frequently Ctrl-P allows printing from a browser.

11.3 Reports Calendar View

Clicking on the reports listed in Home ▸ Reports (except for the Snapshot Report and the Last 30 Reports) will show a year calendar for the current year for the current selected report. The screenshot below shows just the top of the screen.



The « and » arrow icons on the Year header move the currently displayed calendar year backwards or forwards. If there are any downloadable files associated with the selected calendar year, then the Download icon will be displayed in the Year header. Clicking this icon will download all the files for that year as a single .zip archive file.

NOTE: This could be a very large file.

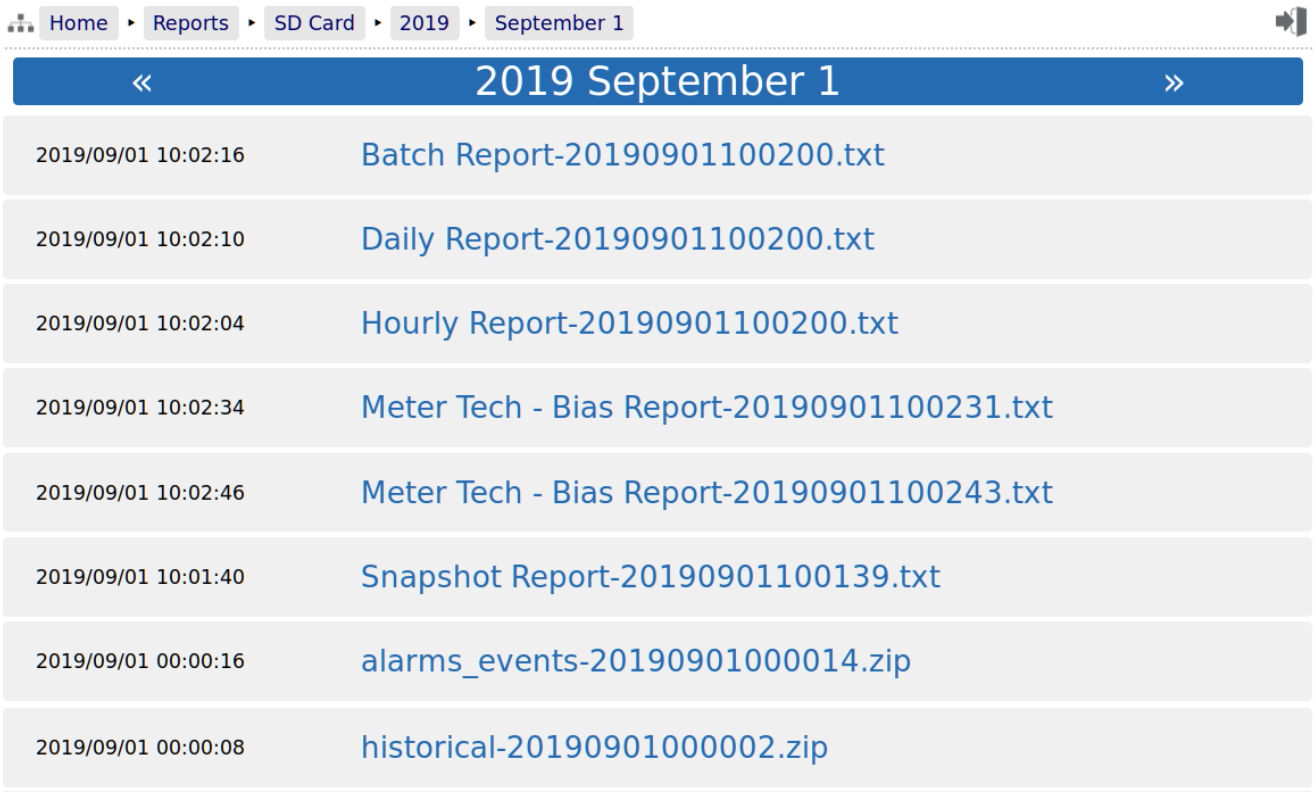
Each year is split into months and, by default, each day of the month is shown in a light gray typeface. If there are any reports associated with the day, then the day will be shown in a bold blue typeface. If there are any reports in the month, then the download icon will be shown in Month header. Clicking the Month download icon will download all the reports for that month as a single .zip archive file.

Clicking on any day shown in a bold blue typeface, will open the daily view screen, which will show all reports associated with that day. All reports are shown with their date and time of creation. Clicking the associated line will open a report preview. The breadcrumb bar will show the download icon which allows the single report currently previewed to be downloaded.

The Day header also has « and » arrow icons which will allows the user to move backwards or forwards a day for each click. If there are no reports for the selected day, the screen will show ***No items present***.

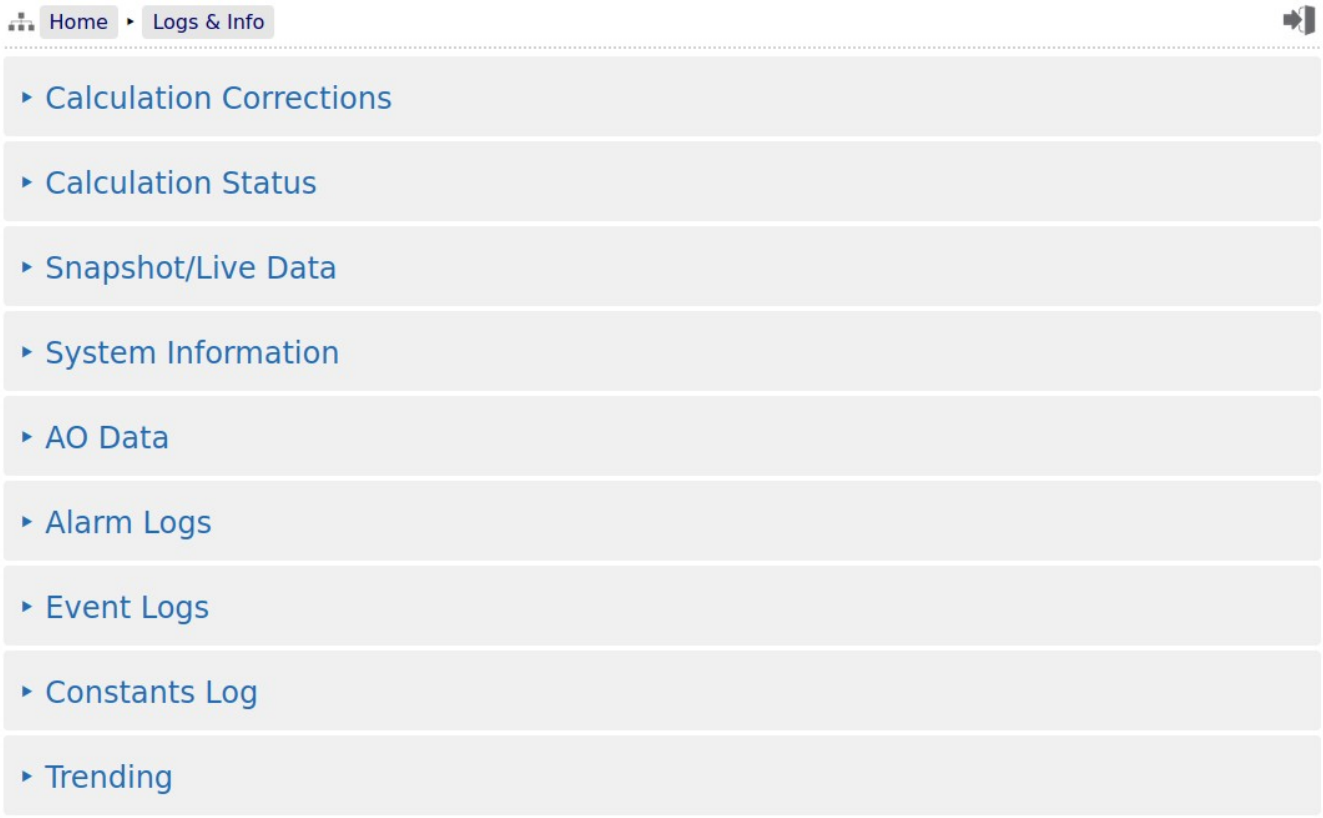
11.4 SD Card

Clicking the ***SD Card*** sub-menu item opens a year calendar view, as for the other reports listed above. The difference is that the SD Card view will show multiple file types, so the file name is displayed as well as the date & time information, much as the ***Last 30 Reports*** view shows. In addition, it will also show the archived historical (trend) data and the alarms & events archives, as shown below:



12 Logs and Info

The Logs & Info menu gives the user access to all the accessible data, except for the reports (which are described in Section 11 Reports).

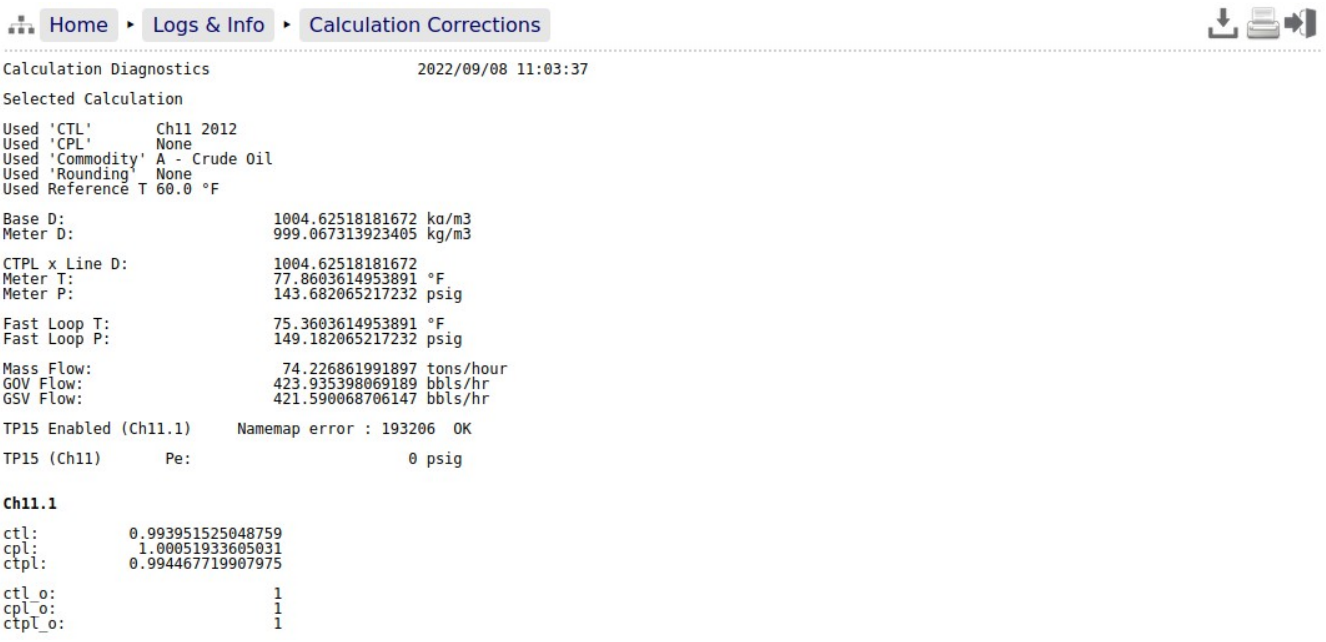


Calculation Corrections	This is a live report that shows the Liquid Volume Correction (LVC) calculation in use, as well as the density and correction factor in use.
Calculation Status	This display shows the status of the LVC calculations running in the Liquid Flow Computer application.
Snapshot Live Data	This is the live report showing the accumulators, flow rates, process conditions and fluid properties. The Snapshot report is a frozen version of this live report.
System Information	Low level information regarding the hardware and software in use, as explained in Section 12.4 System Information.
AO Data	This menu shows the data compiled for the BLM's Authorized Officer.
Alarm Logs	The comprehensive Alarm Logs are explained in Section 12.6 Alarm Logs.
Events Logs	There are 5 categories of events, detailed in Section 12.7 Event Logs.
Constants Log	The constant log is detailed in Section 12.8 Constants Log.
Trending	The Liquid Flow Computer application has an in-built data logger, which runs independently from the NÅNO and flow measurement. The historical data from the logger can be downloaded for analysis, or the trends can be viewed graphically via the embedded web-server. See Section 12.9 Trending for more details.

The Liquid Flow Computer application supports 3 different log files types: Alarms, Events (split into 5 sub-categories) and Constants.

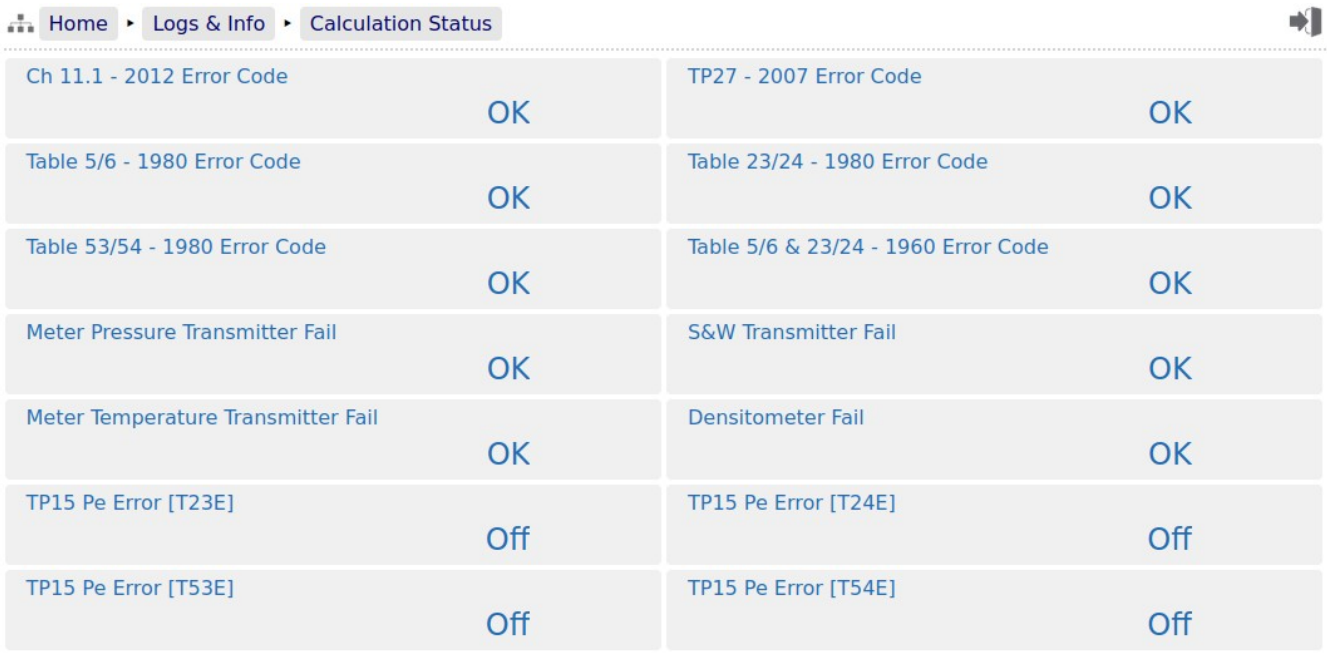
In addition the Liquid Flow Computer has a powerful historical storage and graphical representation facility for trending data, and can show the most significant information in the machine in real time, from the Home ▸ Logs & Trends ▸ Live Data pages.

12.1 Calculation Corrections



This display shows the process conditions in use, and the resulting calculation results from the LVC.

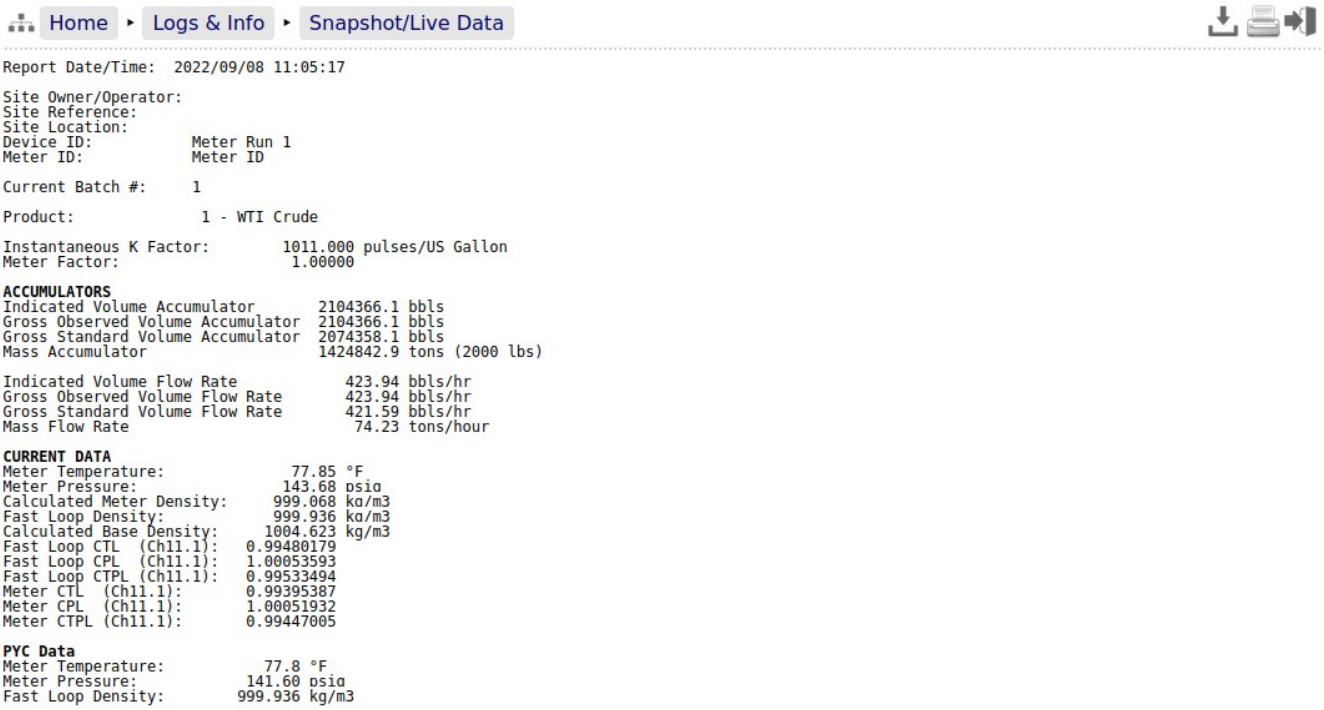
12.2 Calculation Status



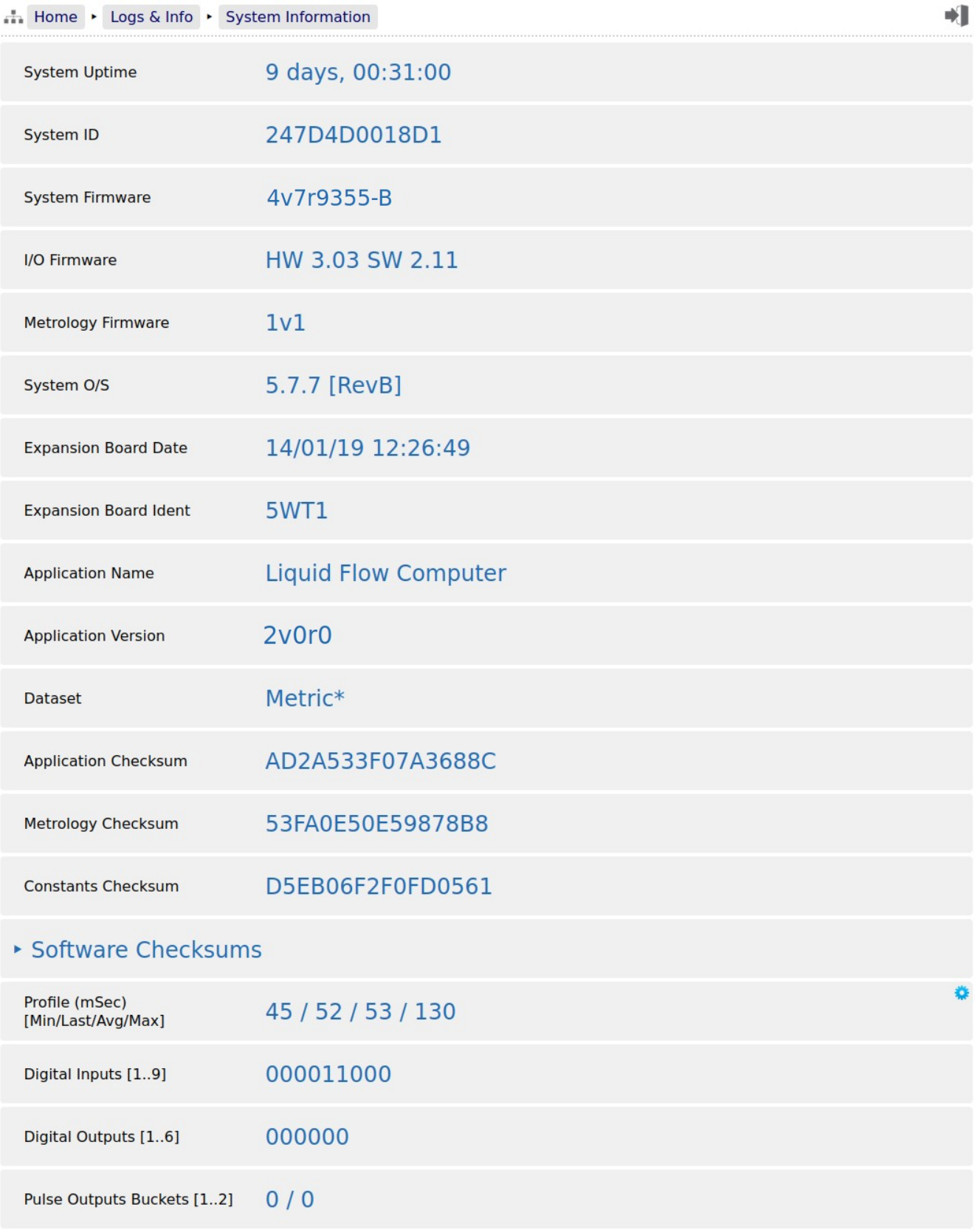
If there are process or fluid properties outside of the LVC calculation standards selected, the relevant error codes will be displayed on this menu.

12.3 Snapshot/Live Data

The screenshot below shows the live data available in the Liquid Flow Computer application.



12.4 System Information



System Uptime	This shows how long the unit has been running since the last restart.
System ID	The System ID is a unique hardware number for every device.
System Firmware	This is the runtime firmware version and represents the firmware held in the CPU card.
I/O Firmware	This information refers to the Logic design and the CPU firmware within the I/O Processor.
Metrology Firmware	This is the firmware version of any Metrology specific functionality in the System Firmware.
System O/S	This shows the version of the Linux Operating System in use.
Expansion Board Date	This is the date the expansion board was calibrated. The expansion board type fitted to the NÅNO is the 6+2 Channel Analog I/O board.
Expansion Board Ident	This factory information contains the expansion board serial number and calibration information.
Application Name	This is the name of the application current running.
Application Version	This is the version number of the application current running.
Dataset	This shows which Dataset was selected when the application was downloaded by NÅNOConf. The dataset contains a consistent set of constants, so a pipe diameter may be defaulted to 12 inches in USC but 300mm in Metric for example.
Application Checksum	This is the checksum value of the application current running, including the cold start constants.
Metrology Checksum	Any code or constants designated as a Metrology field will be included in this checksum but data such as a Tag Name, or a site address field would not be.
Constants Checksum	This is the checksum of all constants, both Metrology and other constants that can be changed by an Administrator or Technician level user.
Software Checksums - see Section 12.4.1 Software Checksums below.	
Profile (mSec) [Min/Last/Avg/Maximum]	These four numbers indicate the performance of the C||Cure runtime engine. Clicking the line opens a dialog that allows the maximum recorded profile information to be reset.
Digital Inputs [1..9]	This shows the current status of the Digital Inputs in a very compact manner. A "0" represents the OFF state and a "1" represents the ON state. The left most digit is Digital Input 1.
Digital Outputs [1..6]	This shows the current status of the Digital Outputs in a very compact manner. A "0" represents the OFF state and a "1" represents the ON state. The left most digit is Digital Output 1.
Pulse Outputs Buckets [1..2]	This is a status only display and shows the number of pulses generated by the application that are still waiting to be output. The value to the left of the "/" is associated with Pulse Output 1 and the value on the right is associated with Pulse Output 2. In normal operation, these should show 0 or occasionally 1, but any other value indicates a mismatch in the Sampler Pulse setup, and pulse are being generated faster than they can be delivered.

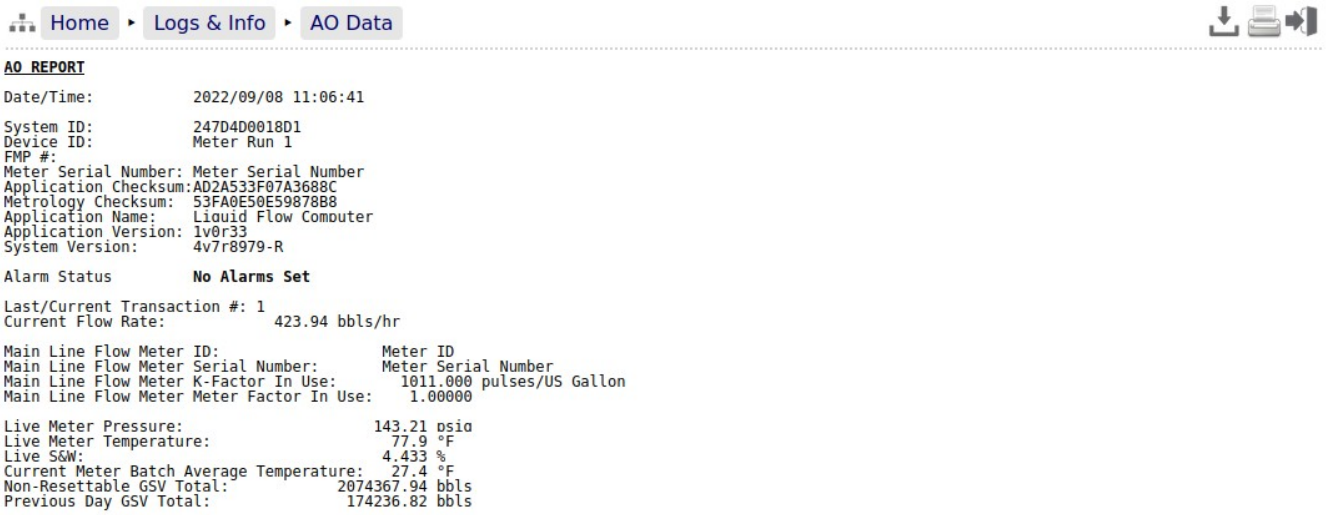
12.4.1 Software Checksums

For any calculation block defined as a Metrology block, a high integrity hash code is generated as a checksum for the software, and this can be compared to the checksum on third-party metrological approval certificates.

The screenshot shows an example of the information for the Liquid Flow Computer application.

12.5 AO Data

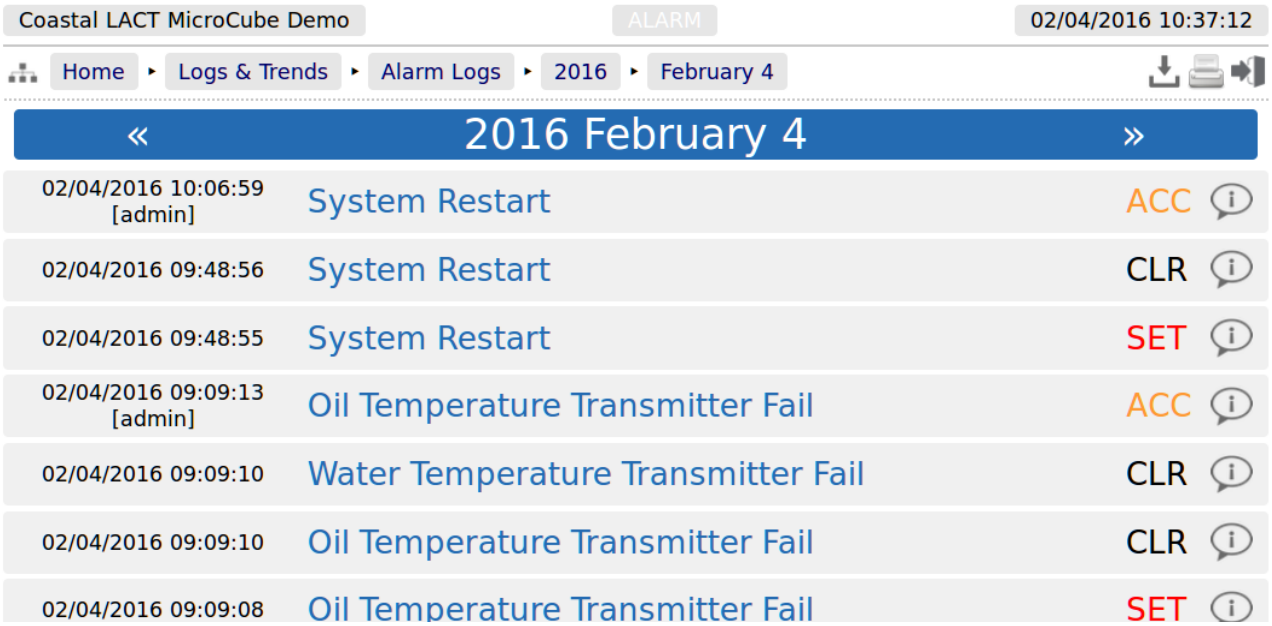
Below is a screenshot of the BLM Authorized Officer screen, which is also duplicated on the Local Panel when the AO screen is requested.



12.6 Alarm Logs

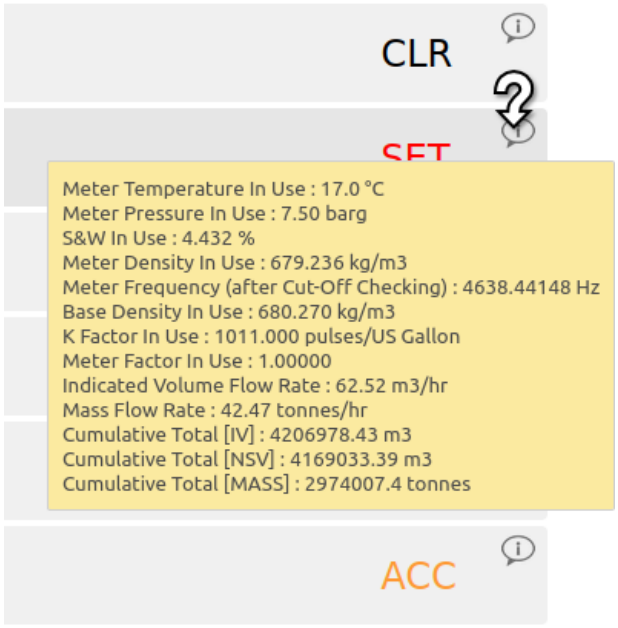
Clicking on Alarm Logs will show calendar view for the Alarm logs. The calendar view operates in the same manner as the Reports Calendar view, see Section 11.3 Reports Calendar View for more details. Drilling down to each day shows all of the Alarms stored in sequential time order. The NÅNO stores 1000 Alarms and they can all be downloaded from the website or via XML communications.

Each Alarm is time and date stamped, has a description of the Alarm, states if the Alarm is being set, accepted or cleared. See example below;



At the end of the line is an information bubble, known as the Additional Log Values (ALVs).

Hovering the mouse pointer over the information bubble results in a small pop-up window that shows the additional values configured in the application, at the time the Alarm was recorded. See example below;



If the entire Alarm history is needed, it can be retrieved using the XML communications for routine and regular use, but for immediate access, the data can be downloaded from the NÅNO website, simply by clicking on the Download Icon, at the top of the screen. The data will be downloaded as a single file in Tab Separated Variable (.TSV) format and can be opened and manipulated in LibreOffice, Excel or other spreadsheet programs.

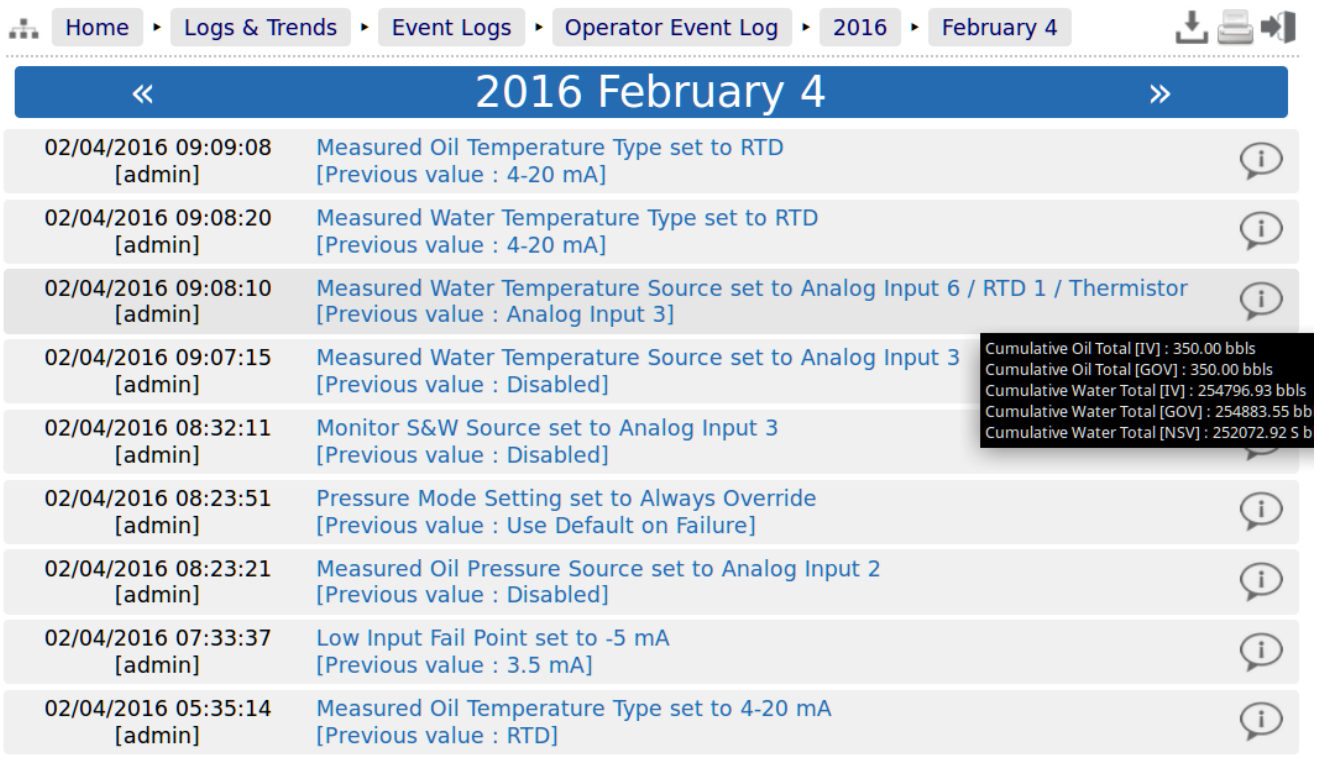
12.7 Event Logs

There are 5 categories of events. The Operator Event Log stores 2500 events, and all the others store 1000 events each (6500 events in total). Each event also has the ALVs logged, to aid forensic analysis.

System Event Log	Events that change the Time / Date settings, Network Settings, User Information, SD Card state, Power Cycles and Communications (including Printers, XML and Modbus ports, Local Panel) as well as remote events using the NÅNOConf configuration tool.
Operator Event Log	This log records all the input from the Local Panel, from the user or the Metering Technician, as well as changes to the Application settings made from the website.
Metrology Event Log	Any item changed that is declared as a Metrology point is logged here. Field calibration events are stored in this log.
Security Event Log	This log is used to record who logged in and out, the type of login, web or XML and the IP address of the user.
Application Event Log	In the Liquid Flow Computer application, this log is used to record if there have been too many login attempts, if the meter factor has exceeded the baseline change limit or if there has been a sampler error.
Combined Event Log	This shows the last 32 events of any type in reverse time order.

As an example, clicking on System Event Log will show all events for the selected day, in sequential time order. The screenshot below is part of the log.

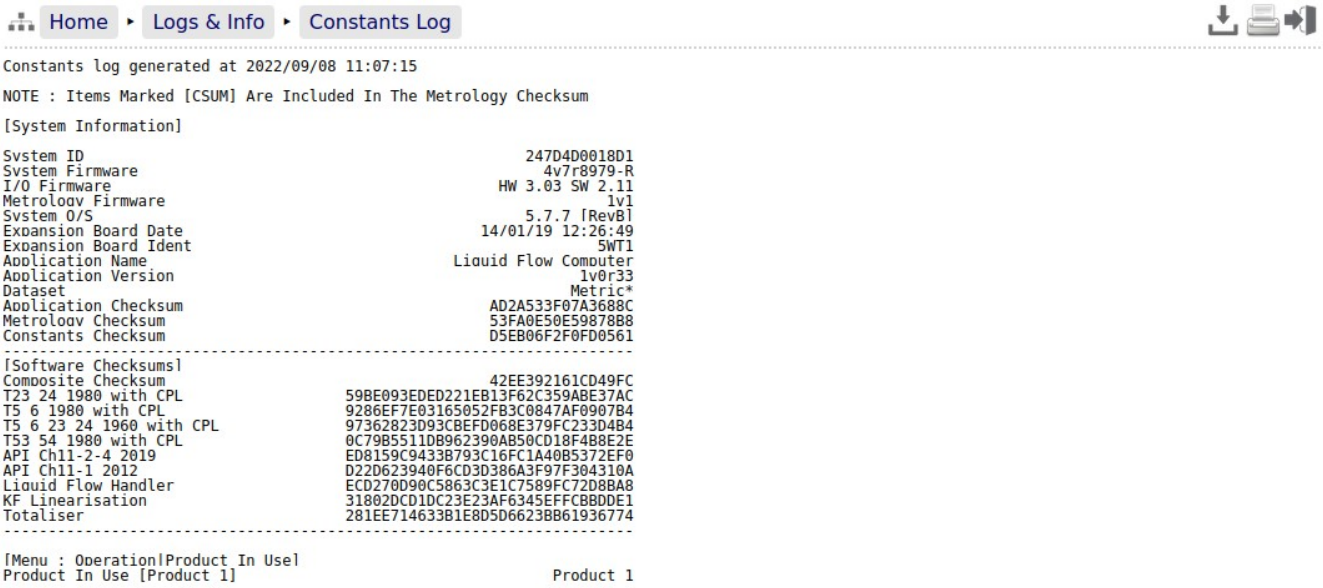
NOTE: An example of the ALVs is shown in the smaller white text within the black box.



The Event log is similar to the Alarm log, in that only a single day's events are displayed at a time on the website, but all the data can be collected using the XML communications, or downloaded from the website as a Tab Separated Variable document.

The Event Log fields are slightly different. The 1st Column shows the time the event was logged and the source of the event. The second column is a description of the event. The last column shows the ALVs information bubble, containing the additional values configured in the application.

12.8 Constants Log



Clicking on the Constants Log generates a log file with all the editable data points. This file can be printed or downloaded via XML or from the website.

NOTE: An example ‘header’ is shown since it would take several pages to display all data generated. This is purely an example and may not correlate to the running application

12.9 Trending

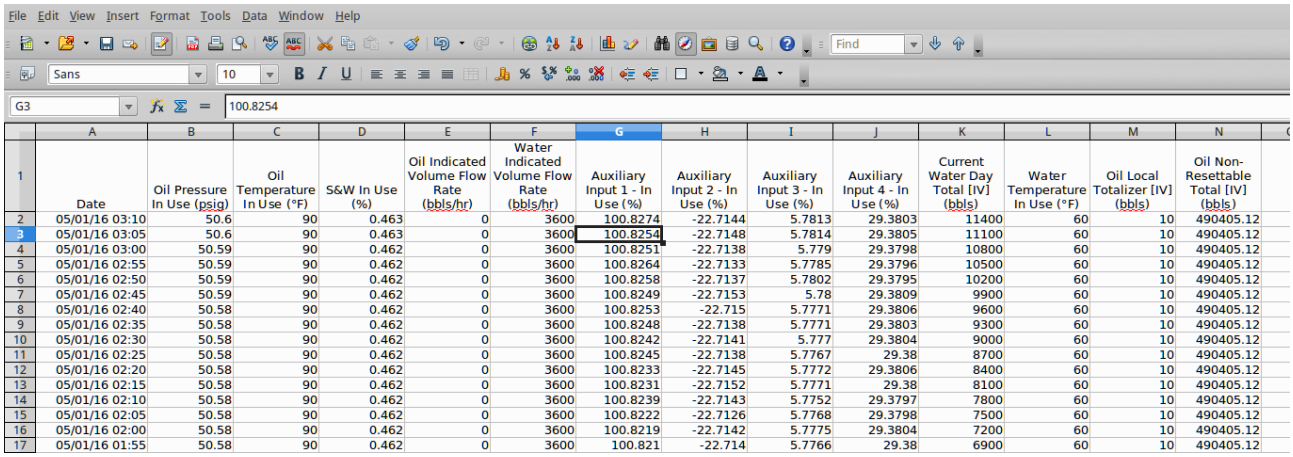
The NÅNO has a powerful data logging facility combined with an easy to use web-based visualization tool which gives unrivaled trending information.

There are three separate historical data zones, each of which can store 20,000 records. Each record is comprised of up to 13 data points and the time-stamp for when the selected data points were snapshot by the trigger. Each historical data zone can have a separate trigger, and the collection of data points in each zone can be different.

The Liquid Flow Computer Application utilizes all three zones. One is used for Metering Data, the second for Auxiliary Data and the third is used for debugging the PID Loop.

All 13 data slots are used in this application. The screenshot below shows the contents of each slot. Clicking on a particular line will generate a chart showing just the data points in that particular slot, and the last line, ***All active slots***, will show a chart with all 13 slots overlaid.

NOTE: As well as being able to display the Historical Data in a zoom-able chart, the Historical Data can be downloaded and saved on a PC and displayed in a spreadsheet. To accomplished this, simply click on the download icon.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Date	Oil Pressure In Use (psig)	Oil Temperature In Use (°F)	S&W In Use (%)	Oil Indicated Volume Flow Rate (bbls/hr)	Water Indicated Volume Flow Rate (bbls/hr)	Auxiliary Input 1 - In Use (%)	Auxiliary Input 2 - In Use (%)	Auxiliary Input 3 - In Use (%)	Auxiliary Input 4 - In Use (%)	Current Water Day Total [IV] (bbls)	Water Temperature In Use (°F)	Oil Local Totalizer [IV] (bbls)	Oil Non-Resettable Total [IV] (bbls)
2	05/01/16 03:10	50.6	90	0.463	0	3600	100.8274	-22.7144	5.7813	29.3803	11400	60	10	490405.12
3	05/01/16 03:05	50.6	90	0.463	0	3600	100.8254	-22.7148	5.7814	29.3805	11100	60	10	490405.12
4	05/01/16 03:00	50.59	90	0.462	0	3600	100.8251	-22.7138	5.779	29.3798	10800	60	10	490405.12
5	05/01/16 02:55	50.59	90	0.462	0	3600	100.8264	-22.7133	5.7785	29.3796	10500	60	10	490405.12
6	05/01/16 02:50	50.59	90	0.462	0	3600	100.8258	-22.7137	5.7802	29.3795	10200	60	10	490405.12
7	05/01/16 02:45	50.59	90	0.462	0	3600	100.8249	-22.7153	5.78	29.3809	9900	60	10	490405.12
8	05/01/16 02:40	50.58	90	0.462	0	3600	100.8253	-22.715	5.7771	29.3806	9600	60	10	490405.12
9	05/01/16 02:35	50.58	90	0.462	0	3600	100.8248	-22.7138	5.7771	29.3803	9300	60	10	490405.12
10	05/01/16 02:30	50.58	90	0.462	0	3600	100.8242	-22.7141	5.777	29.3804	9000	60	10	490405.12
11	05/01/16 02:25	50.58	90	0.462	0	3600	100.8245	-22.7138	5.7767	29.38	8700	60	10	490405.12
12	05/01/16 02:20	50.58	90	0.462	0	3600	100.8233	-22.7145	5.7772	29.3806	8400	60	10	490405.12
13	05/01/16 02:15	50.58	90	0.462	0	3600	100.8231	-22.7152	5.7771	29.38	8100	60	10	490405.12
14	05/01/16 02:10	50.58	90	0.462	0	3600	100.8239	-22.7143	5.7752	29.3797	7800	60	10	490405.12
15	05/01/16 02:05	50.58	90	0.462	0	3600	100.8222	-22.7126	5.7768	29.3798	7500	60	10	490405.12
16	05/01/16 02:00	50.58	90	0.462	0	3600	100.8219	-22.7142	5.7775	29.3804	7200	60	10	490405.12
17	05/01/16 01:55	50.58	90	0.462	0	3600	100.821	-22.714	5.7766	29.38	6900	60	10	490405.12

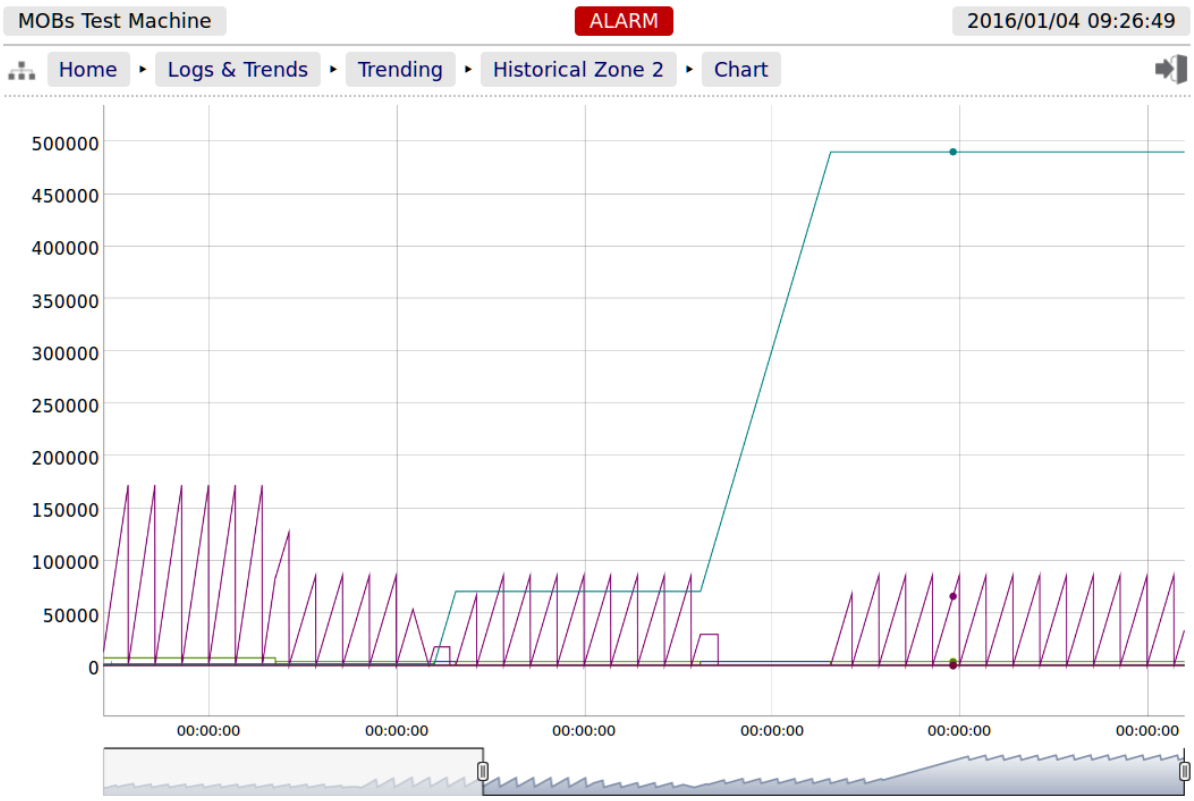
The example above only shows 16 of the possible 20,000 records.

If ***All active slots*** was selected then a chart showing a composite of all the data points is generated, in a time line (x-axis) against a single y-axis which indicates the value. In the example shown below, the chart is dominated by two data slots with large values.

Under the **Show Series** title, there is a list of each data slot with an associated tick box. If the larger value item, in this example "Oil Non-Resettable Total [IV] (bbls)", checkbox is clicked to toggle the tick to "off", then this slot will no longer be displayed and the display will re-scale.

You can also scale the time line by using the slider bars between the graph and the list of slots in use. The example below has the left-hand slider moved inwards by about a third.

If the cursor is placed over the graph, a dot will appear on each slot at the same instance in time and a readout of the value for each slot and the time the record was made is shown. In the example below, the cursor is highlighting 26/12/2015 at 18:20:00 and the **Oil Pressure In Use (psig)** is showing 51.



Show Series:

- ☑ Oil Pressure In Use (psig)
- ☑ Oil Temperature In Use (°F)
- ☑ S&W In Use (%)
- ☑ Oil Indicated Volume Flow Rate (bbls/hr)
- ☑ Water Indicated Volume Flow Rate (bbls/hr)
- ☑ Auxiliary Input 1 - In Use (%)
- ☑ Auxiliary Input 2 - In Use (%)
- ☑ Auxiliary Input 3 - In Use (%)
- ☑ Auxiliary Input 4 - In Use (%)
- ☑ Current Water Day Total [IV] (bbls)
- ☑ Water Temperature In Use (°F)
- ☑ Oil Local Totalizer [IV] (bbls)
- ☑ Oil Non-Resettable Total [IV] (bbls)

26/12/2015, 18:20:00:

Oil Pressure In Use (psig): 51
Oil Temperature In Use (°F): 90
S&W In Use (%): 0.471
Oil Indicated Volume Flow Rate (bbls/hr): 0
Water Indicated Volume Flow Rate (bbls/hr): 3600
Auxiliary Input 1 - In Use (%): 100.723
Auxiliary Input 2 - In Use (%): -22.7127
Auxiliary Input 3 - In Use (%): 5.8891
Auxiliary Input 4 - In Use (%): 29.3789
Current Water Day Total [IV] (bbls): 66000.04
Water Temperature In Use (°F): 60
Oil Local Totalizer [IV] (bbls): 10
Oil Non-Resettable Total [IV] (bbls): 490395.12

13 Diagnostic Information

The Liquid Flow Computer Application has been designed for ease of use as well as simplifying installation & commissioning and gives a remarkable amount of information to help diagnose process problems. There are five main areas of information:

Live Data and Snapshots of live data	Home ▸ Logs & Info ▸ Snapshot/Live Data The Live Data gives a page of live information of the application data, allowing an engineer to instantly see the effects of any changes made to the system. The Live Snapshot Data can be printed or downloaded with a one button click. If the Snapshot Report Trigger Input (defaulted to Digital Input 4) is briefly turned on, the live data will be snapshot and directed to the assigned printer. See Section 12.3 Snapshot/Live Data for more details.
System Information	Home ▸ Logs & Info ▸ System Information This shows the System Information for the NÅNO. See Section 12.4 System Information for more details.
Totals	Home ▸ System ▸ Process Setup ▸ Main Line ▸ Totals Hourly, Daily, Monthly, Cumulative and Batch Totals can be viewed live, sorted by type of total. See Section 8.1.5 Totals for more details.
Calculation Diagnostics	Home ▸ Logs & Info ▸ Calculation Corrections This page shows the live correction factors from the Liquid Volume Correction calculation running in the Flow Computer application. See Section 12.1 Calculation Corrections for more details.
Calculation Status	Home ▸ Logs & Trends ▸ Calculation Status This page indicates if any calculations have input parameters outside of the values determined in the calculation standard. See Section 12.2 Calculation Status for more details.

14 Liquid Volume Correction Calculations

The Liquid Flow Computer Application has a water calculation, based on API MPMS Ch11.4.1 and a range of hydrocarbon calculations. However only the later calculations are made accessible on the general release version of the application:

- API Ch11.1, 2007 for commodities Crude and Refined for both USC with a 60°F reference temperature and Metric Units at 15°C or 20°C reference temperatures.
- TP15 or an entered Vapor Pressure (Pe) can be used with API Ch11.1 for higher density NGLs.
- GPA TP27, 2007 together with API Ch11.2.2 (0.35 to 0.637 SG) and an option with a wider density range. They are available for both USC and Metric units. Again TP15 or an entered Vapor Pressure (Pe) can be selected.
- The API rounding can be disabled for higher resolution calculations.
- Density can be entered in various - as a reference density, taken either from a Densitometer on a fast loop, from a Densitometer on the Main Line, or from a Coriolis Meter on the Main Line.
- Although not in the standard release of the Liquid Flow Computer application, other calculations are also available, such as, API Ch11.1 1980 and 1960 tables

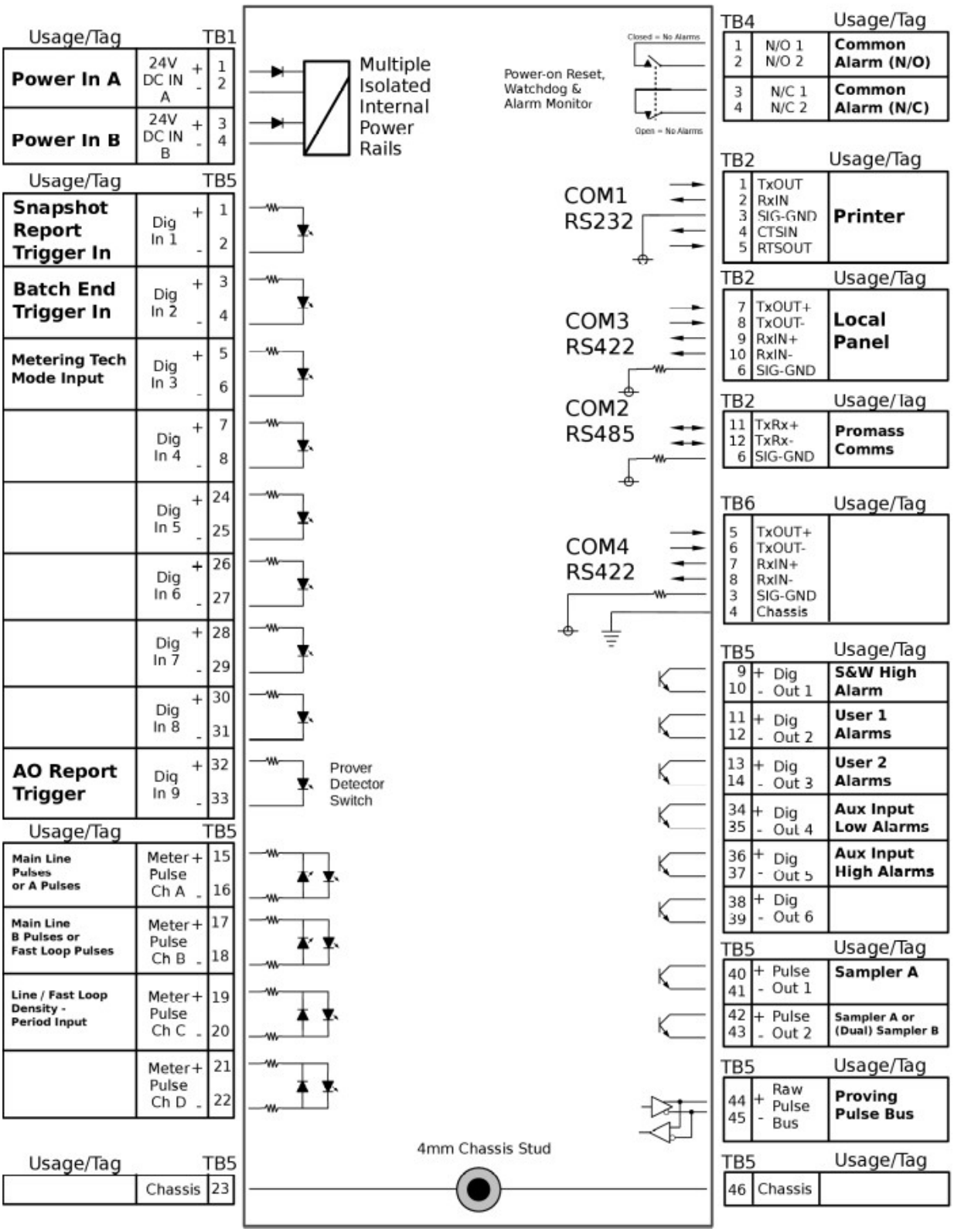
15 Glossary

Icon	Description
	If a line contains the blue "gear" icon, this indicates that the line can be edited. Click the line to open the edit dialog.
	If a line contains a gray colored "gear" icon, this indicates that the line has editable data, but the current user does NOT have the necessary user level privileges.
	Sitemap Icon. Clicking this icon opens the sitemap allowing rapid navigation around the website.
	Logout Icon. Clicking this icon will logout the current user of the session, and takes you back to the login screen.
	Download Icon. This icon is visible when information is available for downloading from the NÅNO. Clicking this icon allows the information to be viewed or downloaded depending upon browser preferences.
	Print Icon. Clicking this item causes the current viewed screen to be printed to the designated Web printer.
	Accept/Apply Icon. This is used when several pieces of information are preset and then actioned as a group, for example setting networking parameters.
	Rubbish/Trash Bin Icon. Clicking on this icon removes the associated item. This is an instant action and does not ask for confirmation.

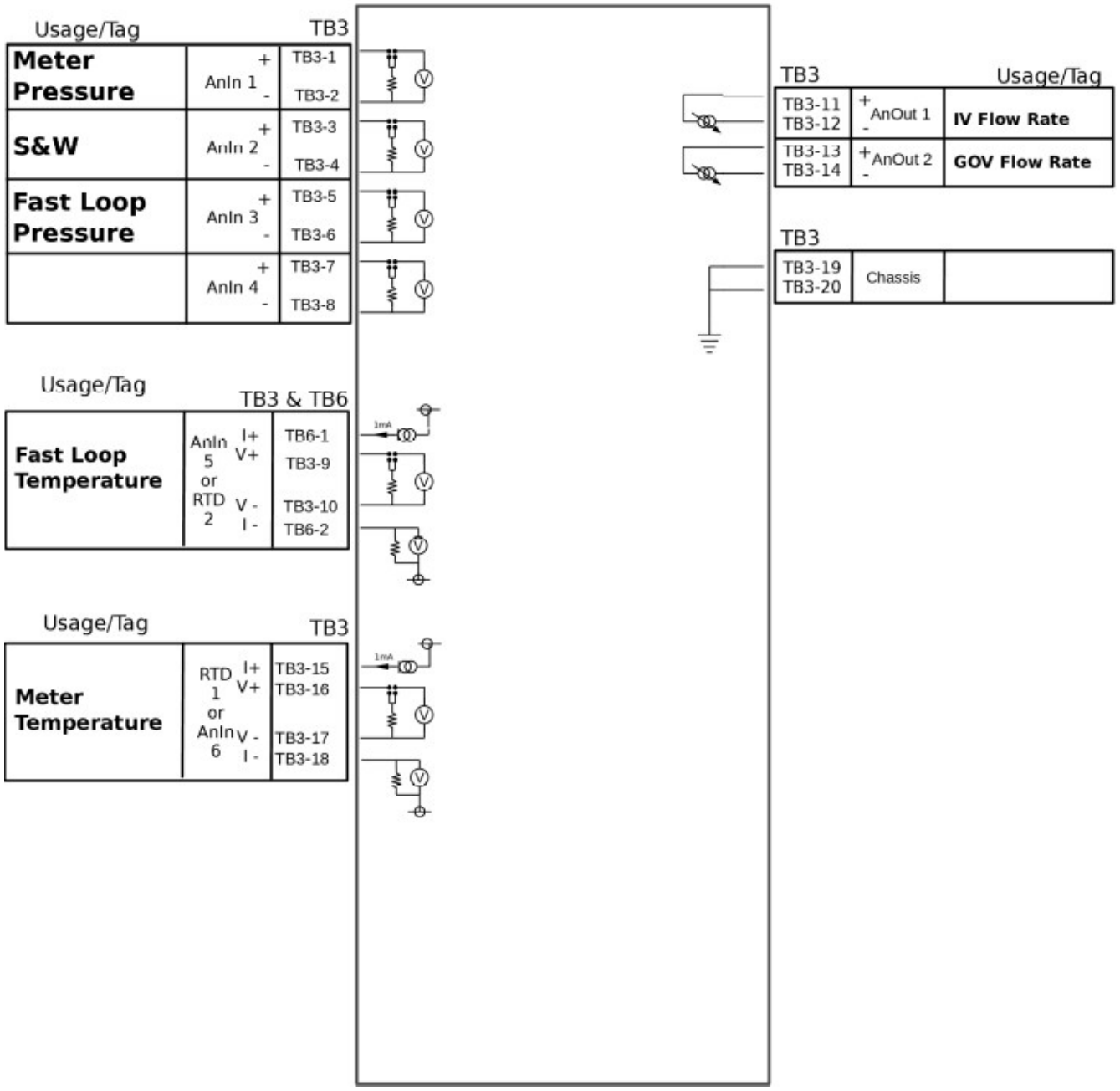
Term	Description
ADC	Analog to Digital Converter
ALVs	Additional Log Values - data that is snapshot when an Alarm or Event occurs.
AO	BLM Authorized Officer
APP	A configuration file for the MicroCube where all hard coded calculation routing has been finalized. Field settings may or may not have been entered.
BLM	Bureau of Land Management
CONSTANTS	Numbers which are only infrequently changed.

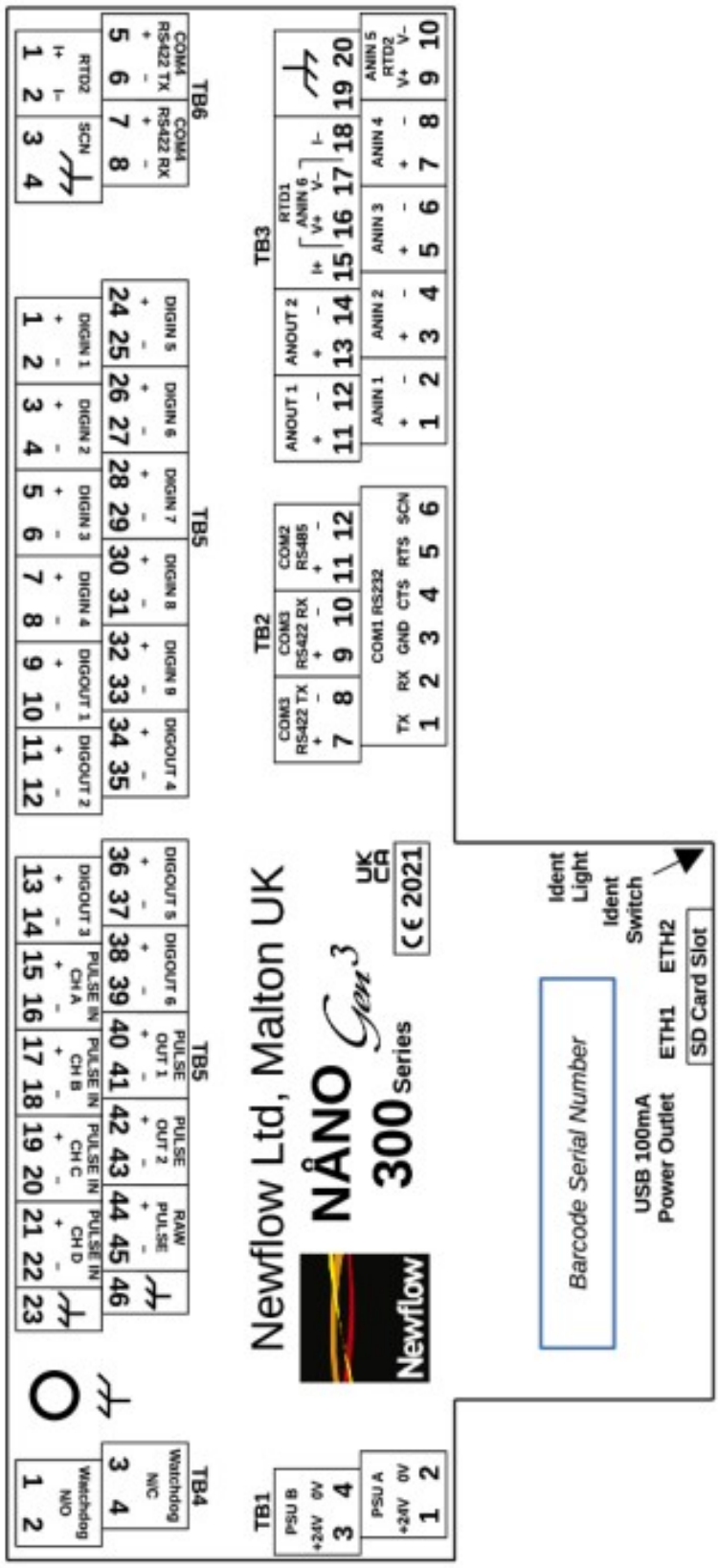
ConstED	An off-line configuration program for MicroCube applications.
CPU	Central Processor Unit
CSV	Comma Separated Variables (a spreadsheet format)
DCS	Distributed Control System
DEFAULT VALUE	A fallback value that the input 'defaults' to if measurement is not possible due to the input from the transmitter being determined BAD.
FIELD SETTINGS	Constants, Limits, Scalings for a specific Meter Run. This does not relate to specific calculations as these will be defined in the Application.
FWA	Flow Weighted Average
HMI	Human Machine Interface
LACT	Lease Automated Custody Transfer
LVC	Liquid Volume Correction
mA	milliAmp
METER RUN	The pipework and associated instrumentation for a single device to measure flow. Typically a turbine meter, orifice meter, Coriolis meter, ultrasonic meter, etc.
OVERRIDE VALUE	A fixed manual entry to 'override' any transmitter values.
PLC	Programmable Logic Controller
PROVER	The pipework and associated instrumentation for a single device to verify the data produced by a meter run flow device. Typically a Ball or Piston type Prover.
RTD	Resistance Temperature Detector
RX	Received information
SECURITY CODE	Security Codes are used to limit access by operators to parameters retained in NON VOLATILE memory.
STATION	Possibly pipework and associated instrumentation or just an application to collate data (and possibly disseminate header data) from a number of meter runs (and possibly a Prover) into a single source for display and/or passing to a Supervisory Computer.
TAGNAME	Alphanumeric string used to represent an item held within the computer database.
TSV	Tab Separated Variables (a variant of CSV)
TX	Transmitted information
VARIABLES	Changeable values

Digital & Serial



Analog Expansion




Newflow Ltd, Malton UK
NÅNO Gen3
300 Series
UK CA
CE 2021
Newflow
TB1
PSU B +24V 0V 3 4
PSU A +24V 0V 1 2
TB4
Watchdog N/O 1 2
Watchdog N/C 3 4
TB5
DIGIN 1 1 2
DIGIN 2 3 4
DIGIN 3 5 6
DIGIN 4 7 8
DIGOUT 1 9 10
DIGOUT 2 11 12
DIGIN 5 24 25
DIGIN 6 26 27
DIGIN 7 28 29
DIGIN 8 30 31
DIGIN 9 32 33
DIGOUT 4 34 35
DIGOUT 3 13 14
PULSE IN CH A 15 16
PULSE IN CH B 17 18
PULSE IN CH C 19 20
PULSE IN CH D 21 22 23
DIGOUT 5 36 37
DIGOUT 6 38 39
PULSE OUT 1 40 41
PULSE OUT 2 42 43
RAW PULSE 44 45 46
TB6
RTD2 I+ I- 1 2
SCN 3 4
COM4 RS422 RX + - 7 8
COM4 RS422 TX + - 5 6
TB2
COM1 RS232 TX RX GND CTS RTS SCN 1 2 3 4 5 6
COM2 RS485 + - 11 12
COM3 RS422 RX + - 9 10
COM3 RS422 TX + - 7 8
TB3
ANIN 1 + - 1 2
ANIN 2 + - 3 4
ANOUT 2 + - 13 14
ANOUT 1 + - 11 12
RTD1 I+ ANIN 6 V+ V- I- 15 16 17 18
ANIN 3 + - 5 6
ANIN 4 + - 7 8
ANIN 5 RTD2 V+ V- 9 10
19 20
Barcode Serial Number
USB 100mA Power Outlet
ETH1
ETH2
Ident Light
Ident Switch
SD Card Slot