Newflow

NÅNO

Unified Prover Application

Configuration & User Manual

Newflow Ltd
George House
Derwent Road
Malton, North Yorkshire
YO17 6YB, UK

Tel: +44 1653 310 000
Email: sales@newflow.co.uk

Document Information

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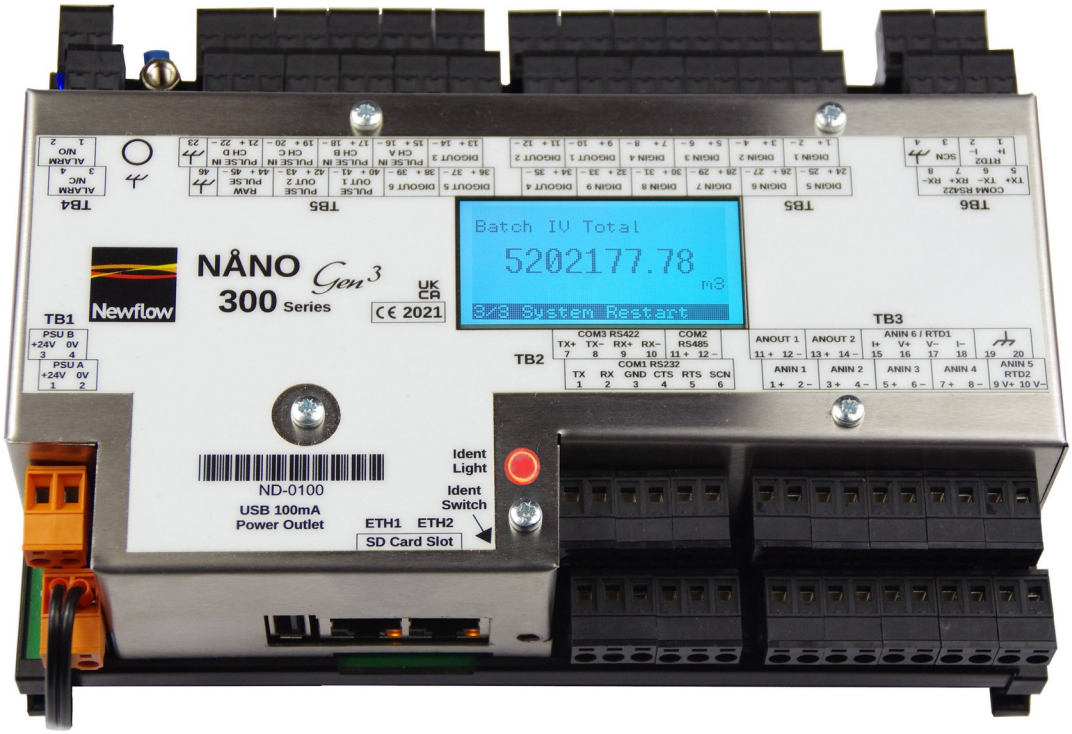
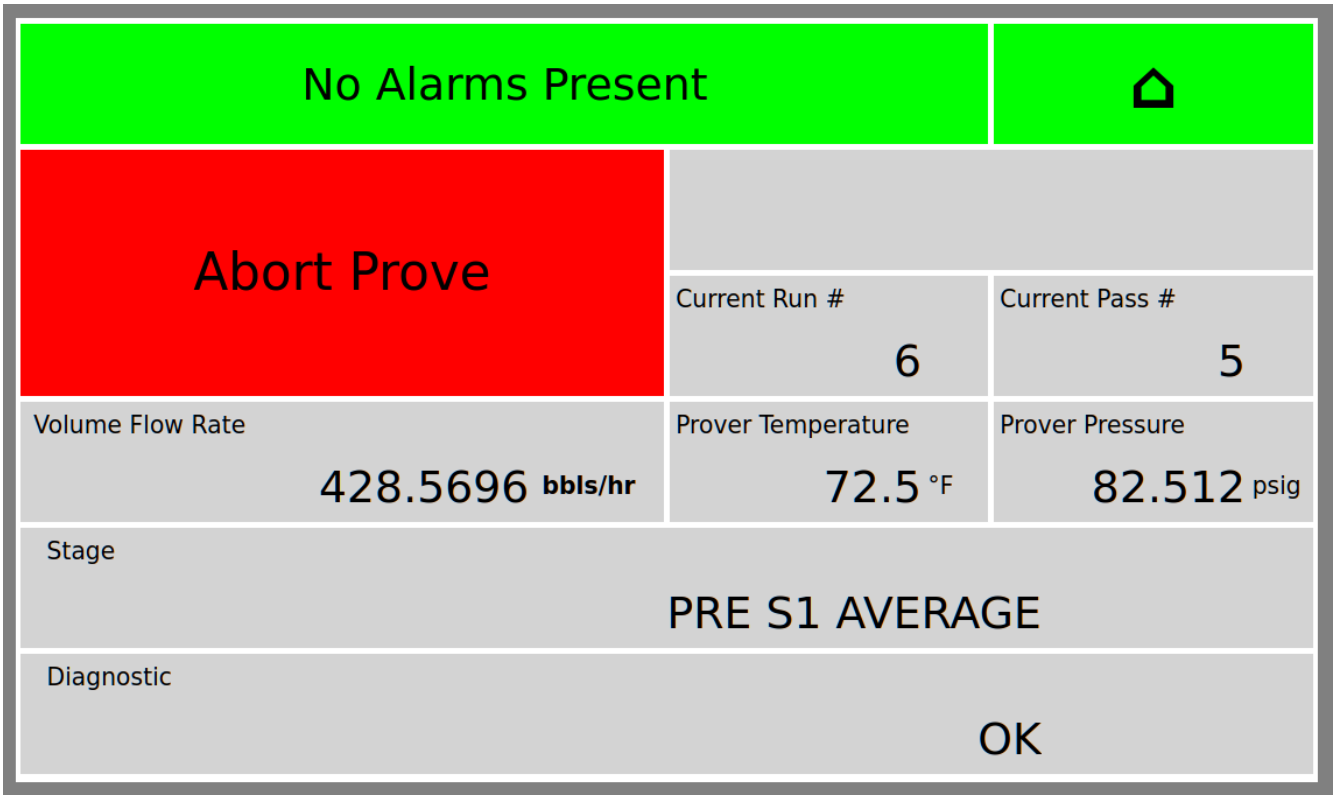
MMXXIV

Base Build



Build with Optional Lid Display


No Alarms Present
Abort Prove
Current Run #
6
Current Pass #
5
Volume Flow Rate
428.5696 bbls/hr
Prover Temperature
72.5 °F
Prover Pressure
82.512 psig
Stage
PRE S1 AVERAGE
Diagnostic
OK

Operational Overview

This application is designed for both Small Volume (captive piston) or Bi-Directional Ball provers.

This standalone prover requires meter data to be entered either manually or via the OPC-UA interface. Prove cycles can be started by using either the web interface or Local Display panel. The Unified Prover App drives the prover directly and will generate reports, which are stored locally. These can be printed to a networked printer, sent via FTP or retrieved using OPC-UA communications.

Features

- Small Volume provers with mechanical retract or Hydraulic balance retract are accommodated.
- BiDi prover 4-way valve control and monitoring provided.
- USC or Metric measurement units can be selected allowing API MPMS 11.1 or API MPMS Ch11.2.4, 2019 (GPA TP27, 2007 together with API Ch11.2.2 (0.35 to 0.637 SG) and an option with a wider density range) to utilize the US Customary Calculation to a 60°F base, or in Metric mode, a 15°C or 20°C base. An option to prove with water is also available.
- Vapor Pressure corrections can be applied, using either TP15 or an operator entered Pe.
- Prove cycles can be initiated from a Supervisory System, using a web browser or using the Local Panel display.
- Volume or Mass based proving can be performed with a Unified Prover and Volume proving with a ball prover.
- Average Data Method, Average Meter Factor Method or Uncertainly based acceptance criteria can be selected.
- OPC-UA and XML communication links are provided for a Supervisory system.
- In Mass mode, Coriolis meter pressure corrections for density pressure value can be sent via Modbus Communications.
- Optional Stability Checks can be selected.
- Ability to view live pass by pass and run by run proving data provided.
- Powerful diagnostic capabilities built in as standard.
- Data logger functionality built-in to provide information for further analysis.

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

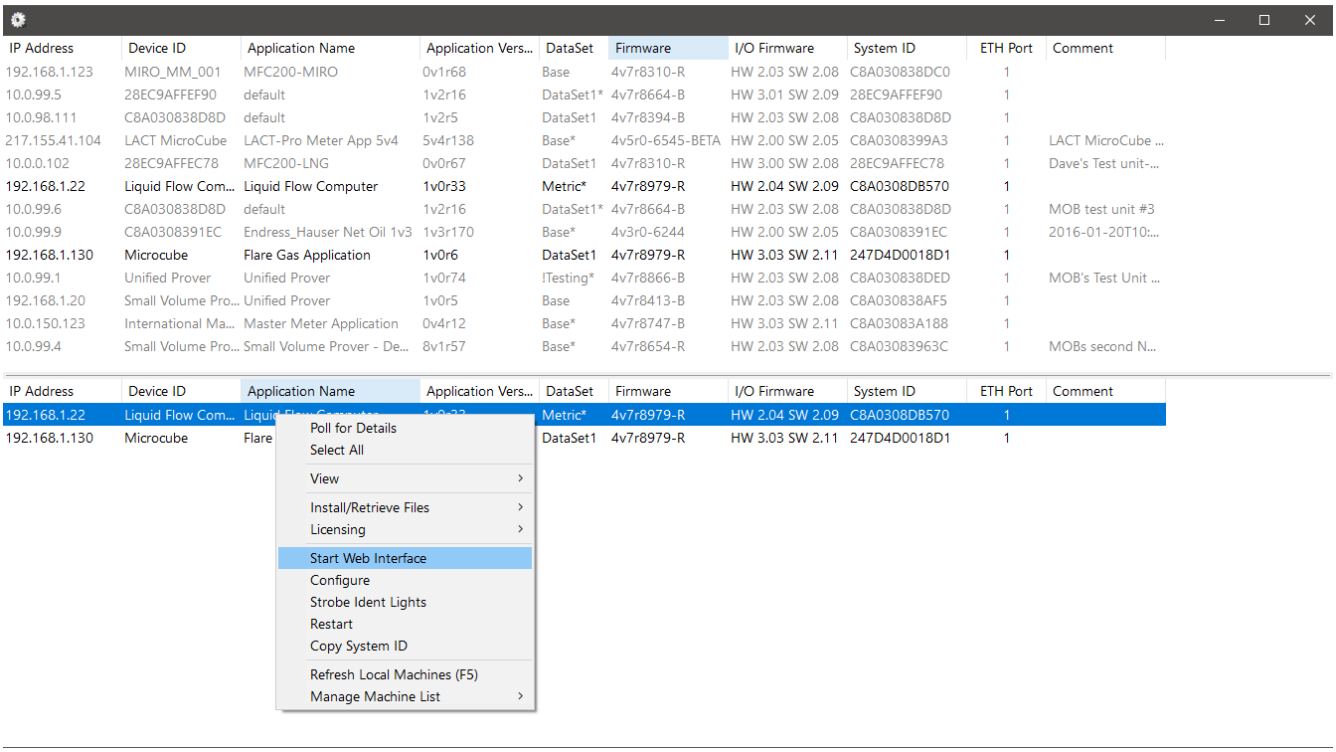
In addition to this manual, a range of further documentation is available, which includes:

- NÅNOConf Application Deployment Tool, NANOConf-UM
- Installation Manual
- NÅNO XML Comms Manual Rev20

2 Loading the Application

If the required version of the Unified Prover 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

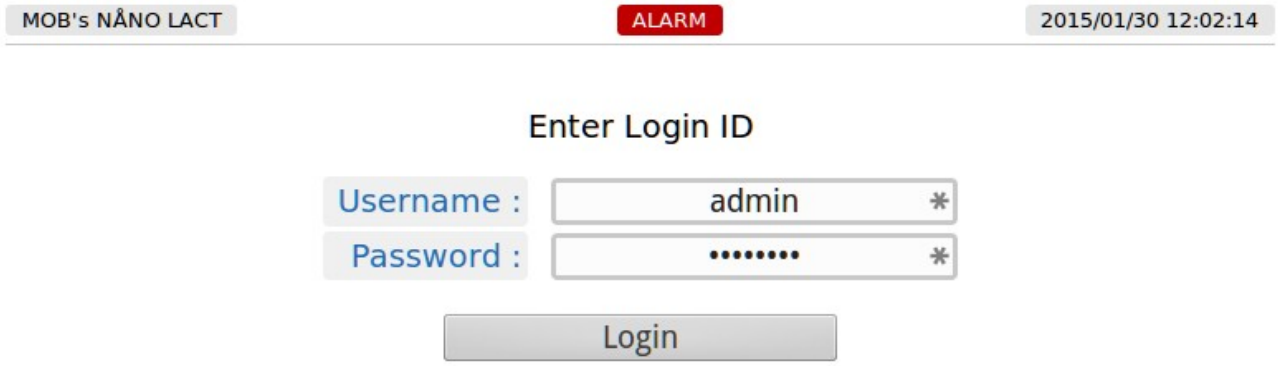
This section of the manual assumes that the Unified Prover application has been installed, and the IP address of the machine is known. This document explains how the application is configured to match the site.

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

- Initial Site report data, such as the Prover Owner/Operator, Location and Device ID
- System Setup - these controller 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
- Setting the Unified Prover physical parameters, such as sizing & material properties
- Configuring the number of passes and the repeatability limit
- Backing up the configuration

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 controller's IP address into the browser's address bar and press ENTER.



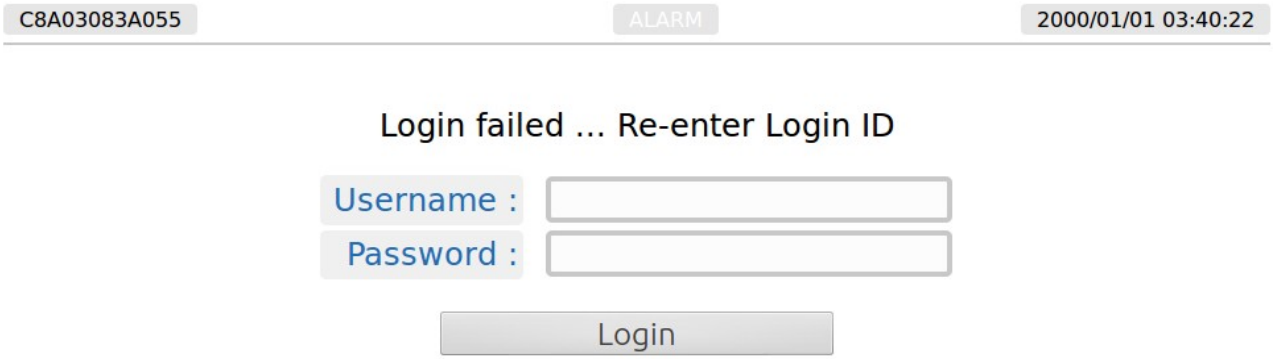
The default Login screen will be displayed, as shown above.

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 

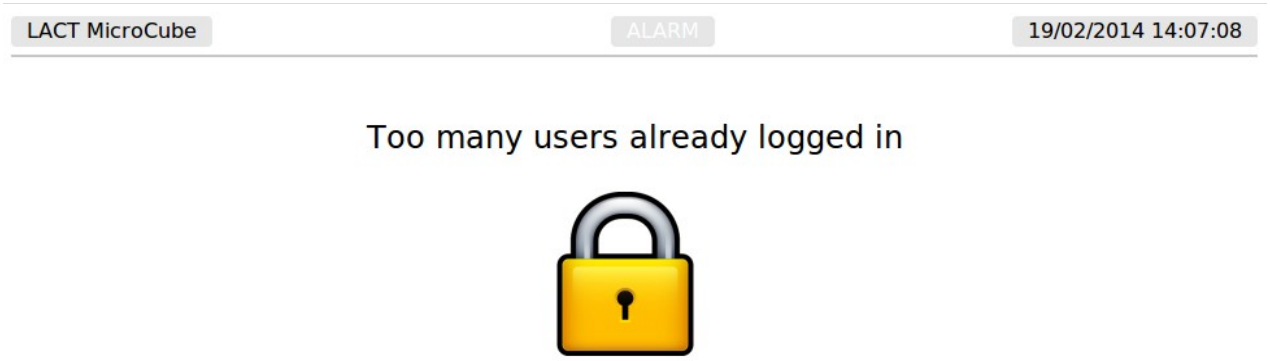
key on the keyboard (works with most browsers) or click the Login button, which will work for all browsers.

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

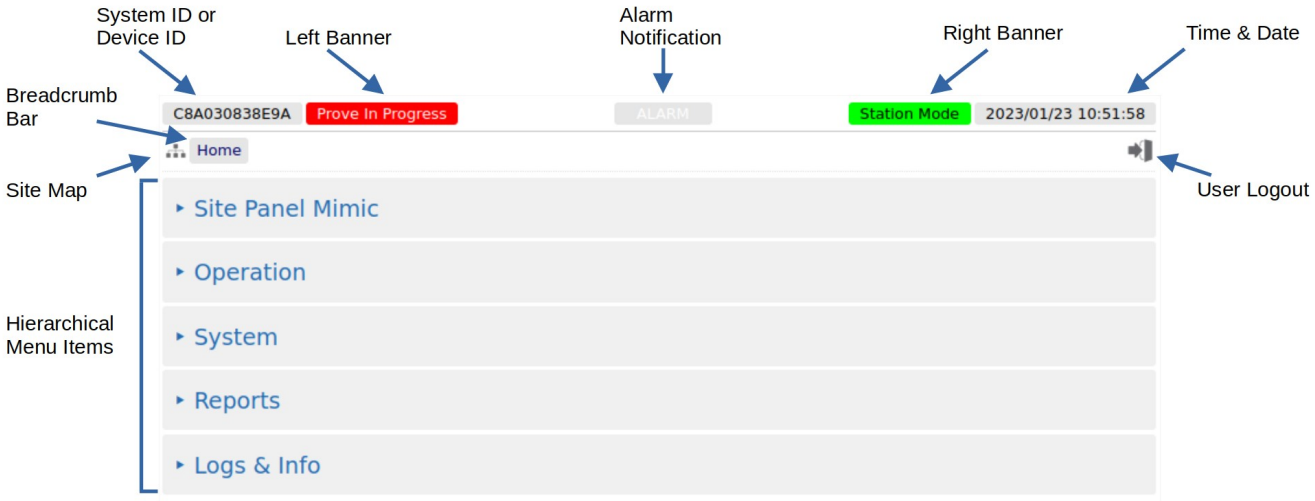


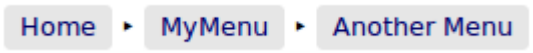
NOTE: If the Password & Username combination for the machine cannot be determined, there is no back-door method of logging into the NÅNO controller. The passwords cannot be recovered, but the machine can be reset to factory defaults but this will remove the application, and stored reports. The SD Card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

NOTE: The maximum number of concurrent web browser connections is 4. If this is exceeded, the 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, as shown below.



System ID / Device ID	The System ID / Device ID is configured in the application. The Prover Computer 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 / Right Banner	These are shown for information purposes. In the example above the ***Left Banner*** shows that a prove is in progress on this NÅNO, whereas the ***Right Banner*** shows that the NÅNO is in station mode and some of the settings may be controlled 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

NOTE: The Glossary (see Section 14 Glossary) shows all the icons used in the App.

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.

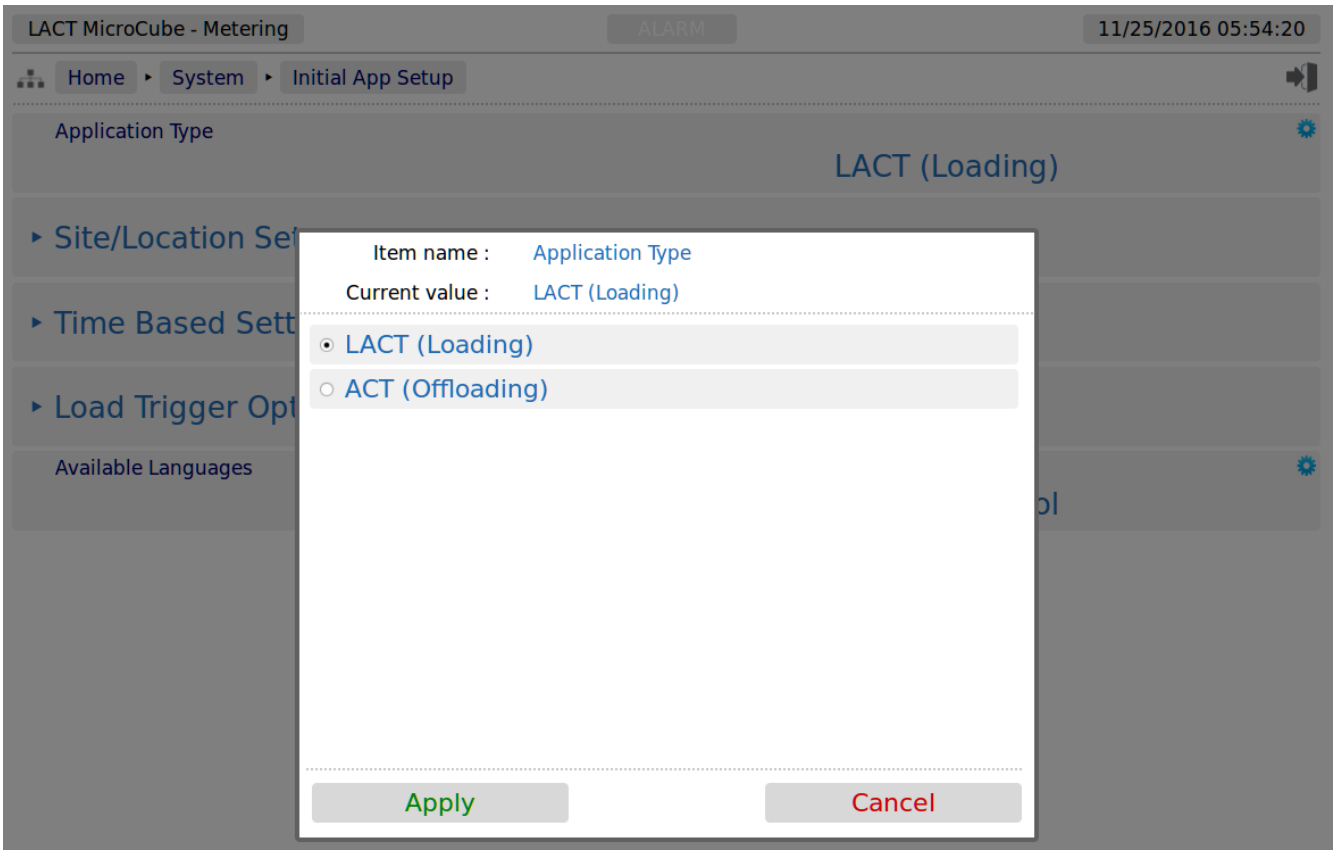
When a data point is being described in this manual, it will be shown in Bold Italics, as is ***Application Type*** in the next paragraph.

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. In the example below, If you navigate to Home ▸ System ▸ Initial App Setup and click the top line ***Application Type*** *it* 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, which shows "Old Company Name" being replaced with "New Corporation Name" in the screenshot below.

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.

4 Stage 1 of 6: Initial Application Setup

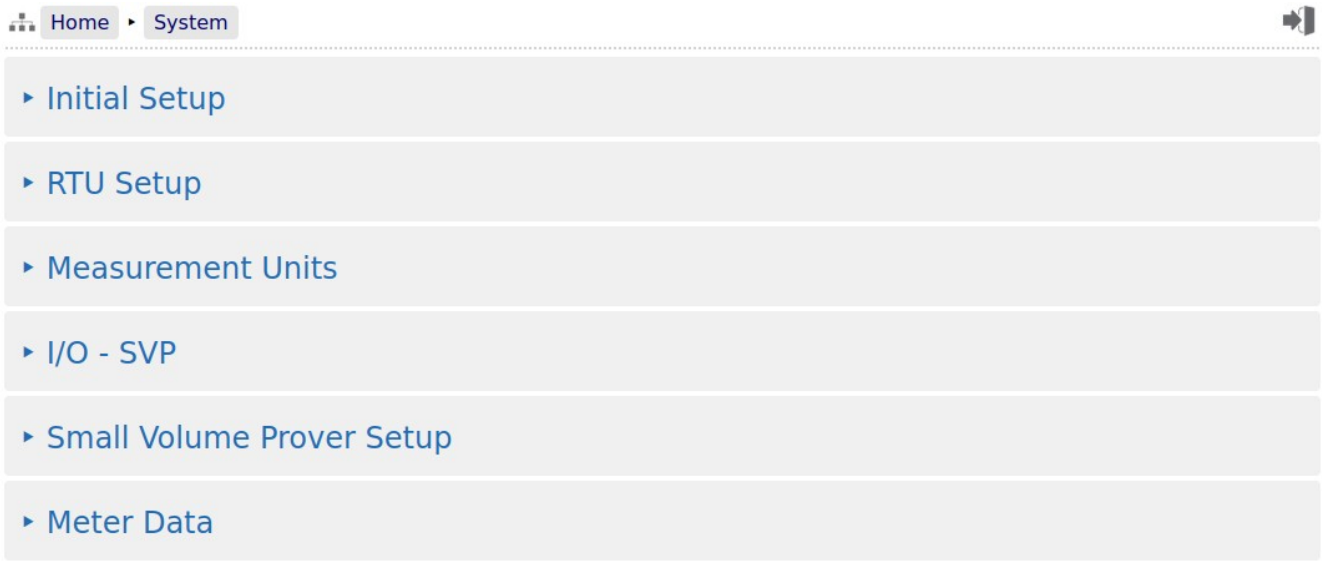
NOTE: The following configuration sequence is recommended, but not mandatory. The menu structure is dynamic, and as items are selected or deselected, associated information may appear or be hidden. The Initial Setup screen is sub-menu of the System screen.

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 instead of a local panel, to support operators or as a training aid.
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.

The mode the NÅNO controller is currently in will determine what is shown. The options are between the unit being set for a Small Volume Prover (SVP) or a Ball Prover. For an SVP, the menu is shown on the next page.



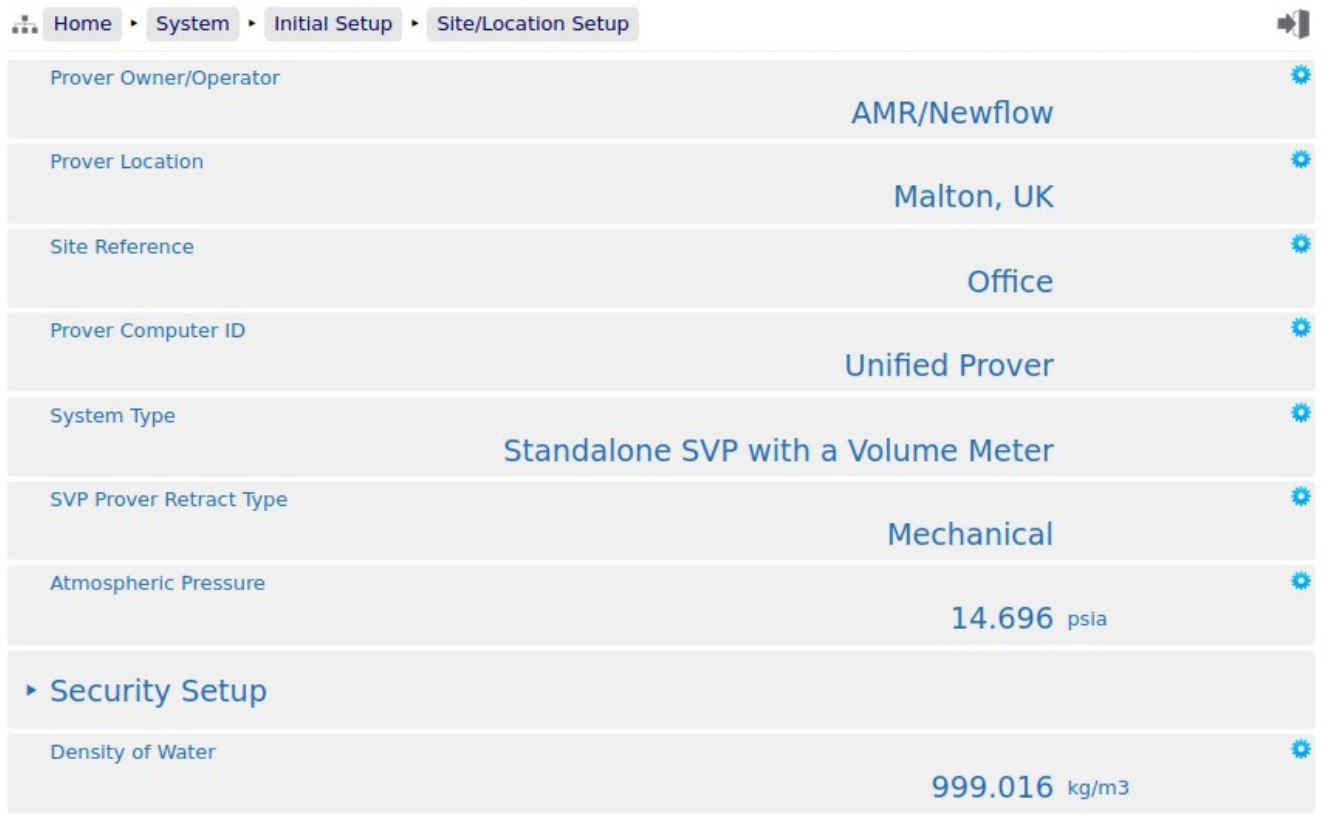
For a Ball Prover the menu is shown below;

On these menus, click the top line, **Initial Setup** to start the configuration process.

4.1 Initial Setup

Click the top line, **Site/Location Setup** to continue the configuration process.

4.2 Site/Location Setup



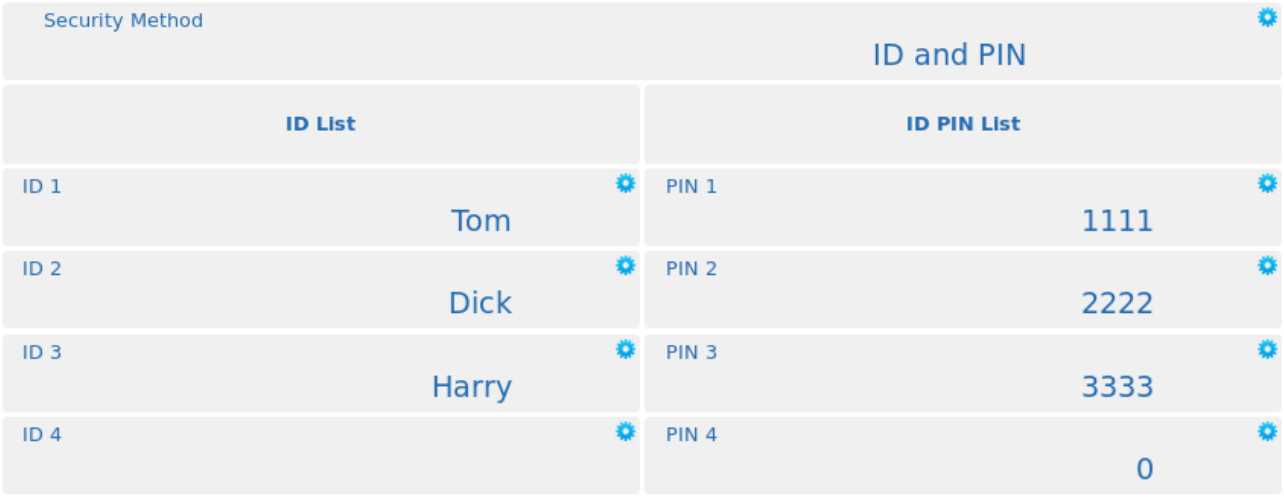
Prover Owner/ Operator	This is an alphanumeric text field of up to 32 ASCII characters. Unicode characters can be used, but this will reduce the total number of characters supported. The Site Owner/Operator is printed on all reports.
Prover Location	This is an alphanumeric text field of up to 32 ASCII characters. Unicode characters can be used, but this will reduce the total number of characters supported. The Prover Location is printed on all reports.
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.
Prover Computer ID	This is a text field, like the Company Name 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 Master Meter Micro ID name is set then the hardware unique System ID will be used instead.
System Type	There are three choices for the System Type: **Standalone SVP with a Volume Meter**: This sets the controller up to interface to a Small Volume Prover (SVP) and a Volume Meter Under Test. **Standalone SVP with a Mass Meter**: This sets the controller up to interface to a Small Volume Prover (SVP) and a Mass Meter Under Test. **Standalone BiDi Prover with a Volume Meter**: This sets the controller up to interface to a Bi-Directional Prover and a Volume Meter Under Test. Currently this application relies on a supervisory/HMI system to pass the meter data to/from the Meter Under Test and the Prover. The mode is therefore always defined as Standalone.
SVP Prover Retract Type	There are two choices for the Retract Type and is only shown if the System Type is set to SVP: **Mechanical**: In this mode, the launch command is pulsed at the start of the pass, as the piston is parked downstream, this allows the piston to be retracted to the upstream position and then released. **Hydraulic**: In this mode, the launch command is kept energized throughout the pass. As the piston is parked upstream, when the signal is de-energized, the piston will retract to the upstream position.
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.
Security Setup	This is a sub menu, described below. 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
Density of Water	This data point allows the user to set the default Density of Water @ 60°F. The density units are permanently set to kg/m^3.

4.2.1 Security Modes

Security Mode	There are four choices for the security mode:	
	None:	There are no checks on the user of the Local Panel.
	Single PIN Only:	If this option is selected, the user will have to enter the PIN number, specified in the PIN Code Value field which will appear below, before the operator can operate the Unified Prover controller. The PIN code can be any positive number between 1 and 999,999,999. The Pin Code Value can also be downloaded via XML Communications.
	ID Only:	If this option is selected, the operator must match one of the IDs on the ID List which appears when this option is selected.
	ID & PIN:	If this option is selected, the operator must firstly match one of the IDs in the ID List on the ID Setup sub-menu, which appears when this option is selected, and secondly, must supply the matching PIN code associated with the ID from the ID PIN List.

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

If ID Only or ID & 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 LACT-Pro using XML Communications.

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

4.3 Time Based Settings

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.
Trend Sample Period - When Proving	This sets the interval between trend data points being recorded in the Proving Trends - Raw Data and Proving Trends - Calculated data. The period can be set to 1, 5, 10, 15, 20, 30 seconds, or once every minute. This data is only recorded when a prove cycle is active.

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

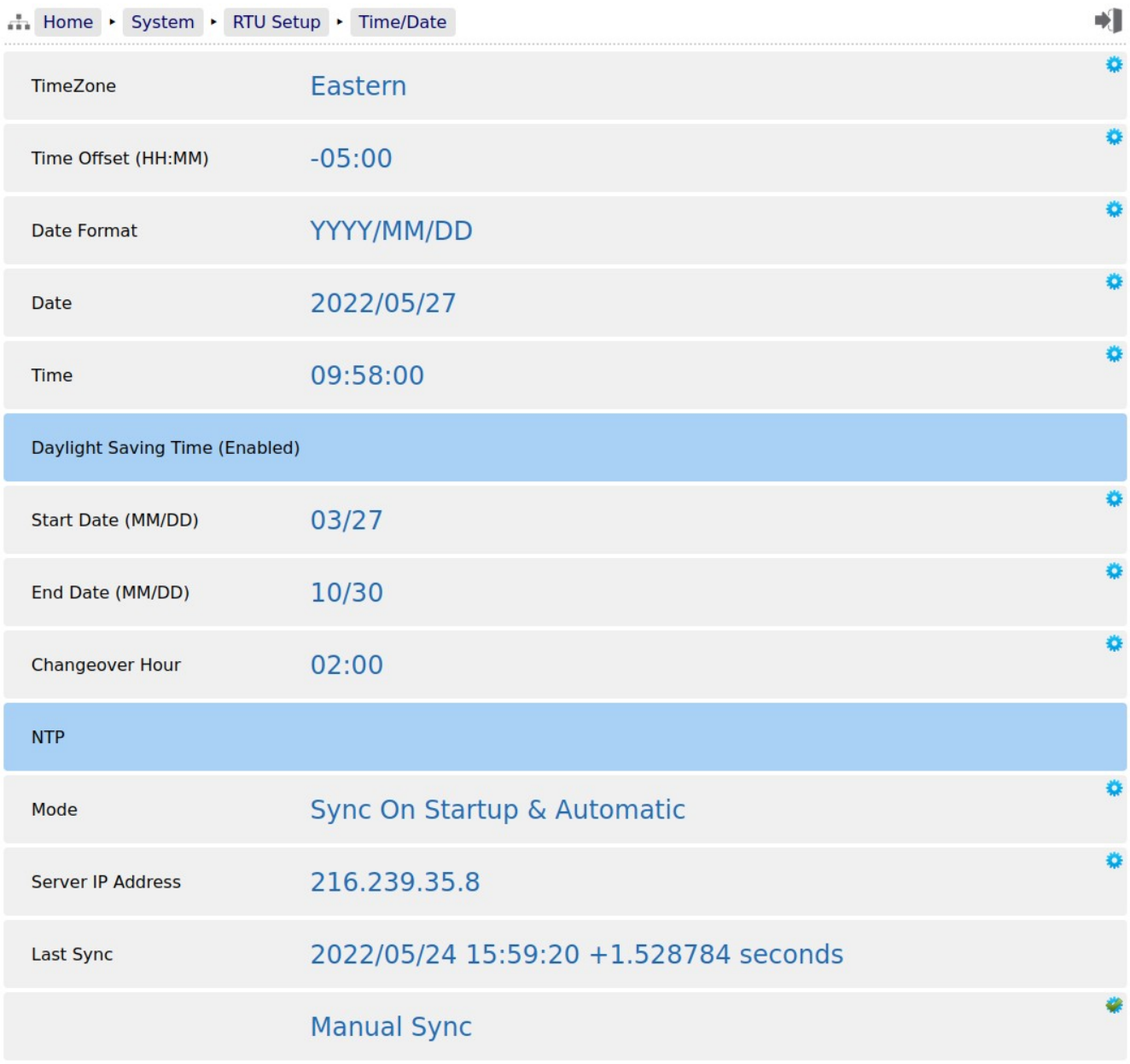
5 Stage 2 of 6: RTU Setup

The RTU setup configures the computer aspects of the NÅNO controller. 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 controller 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 controller 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.

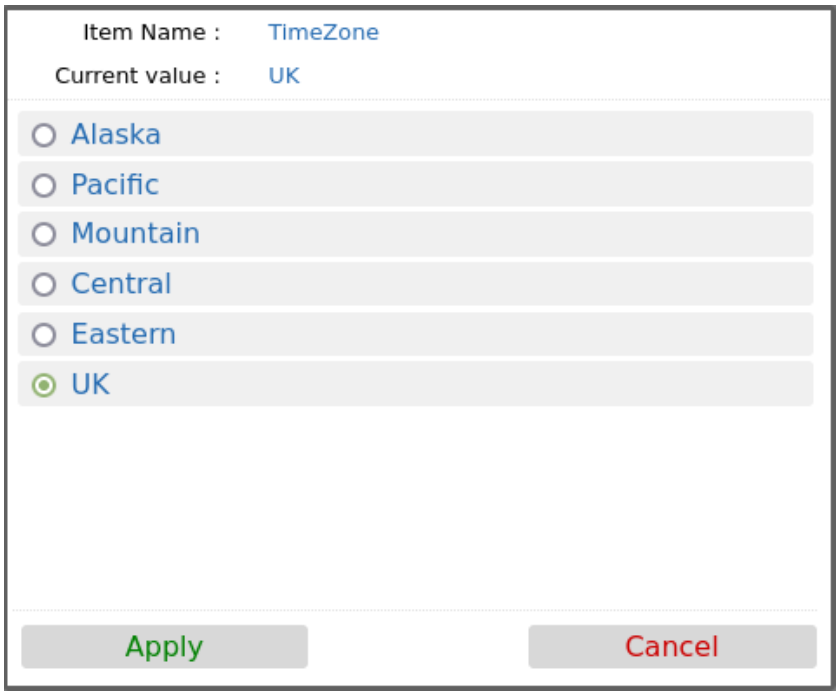
The Date and Time fields should then be set to the local time.

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 controller 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 14 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, Eastern is -5 Hours and UK is no offset from UTC. 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, then 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 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 controller 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 ***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 controller 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.

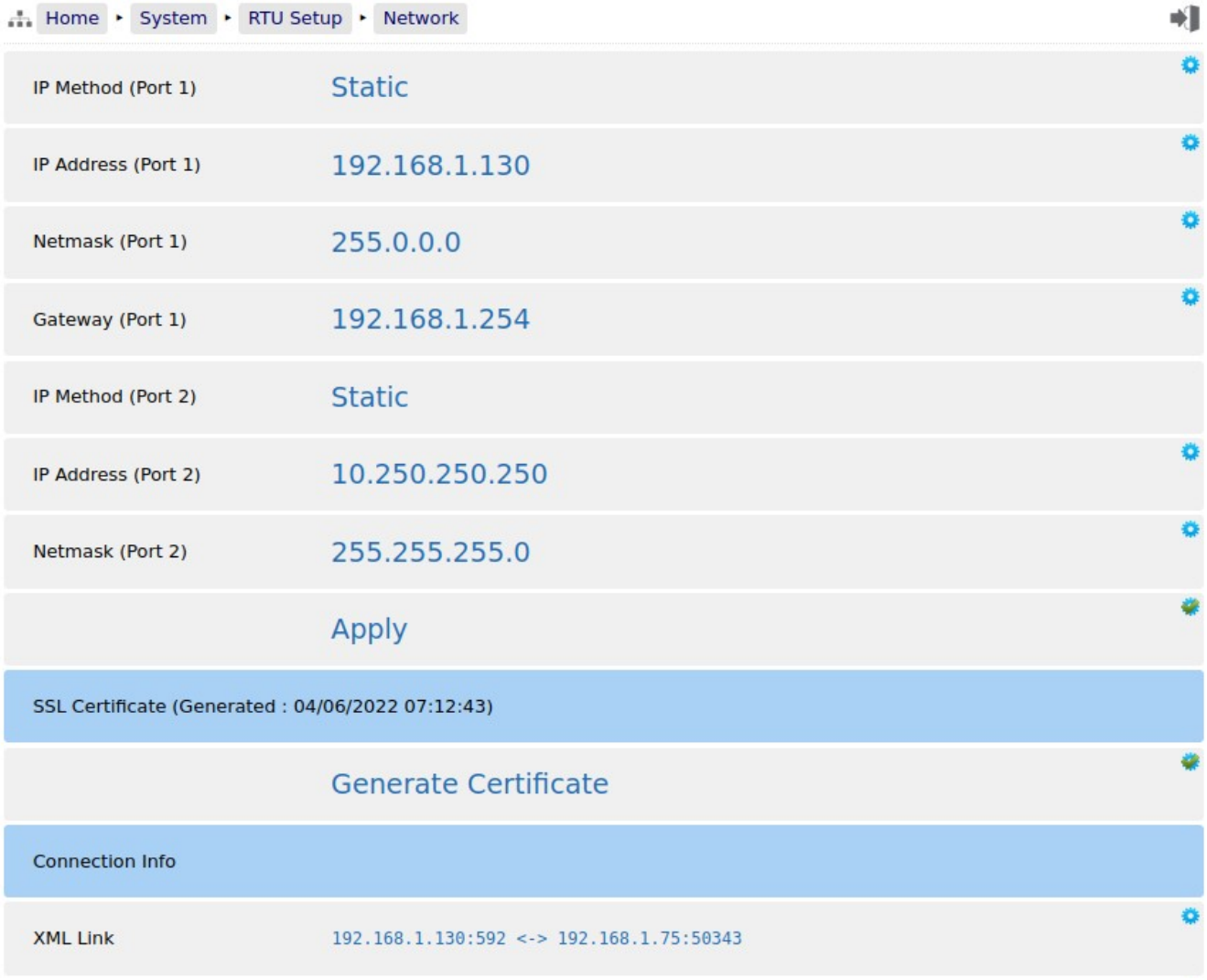
If you wish to cancel a setting before the ***Apply*** is clicked, simply change page by clicking on the breadcrumb bar.

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.

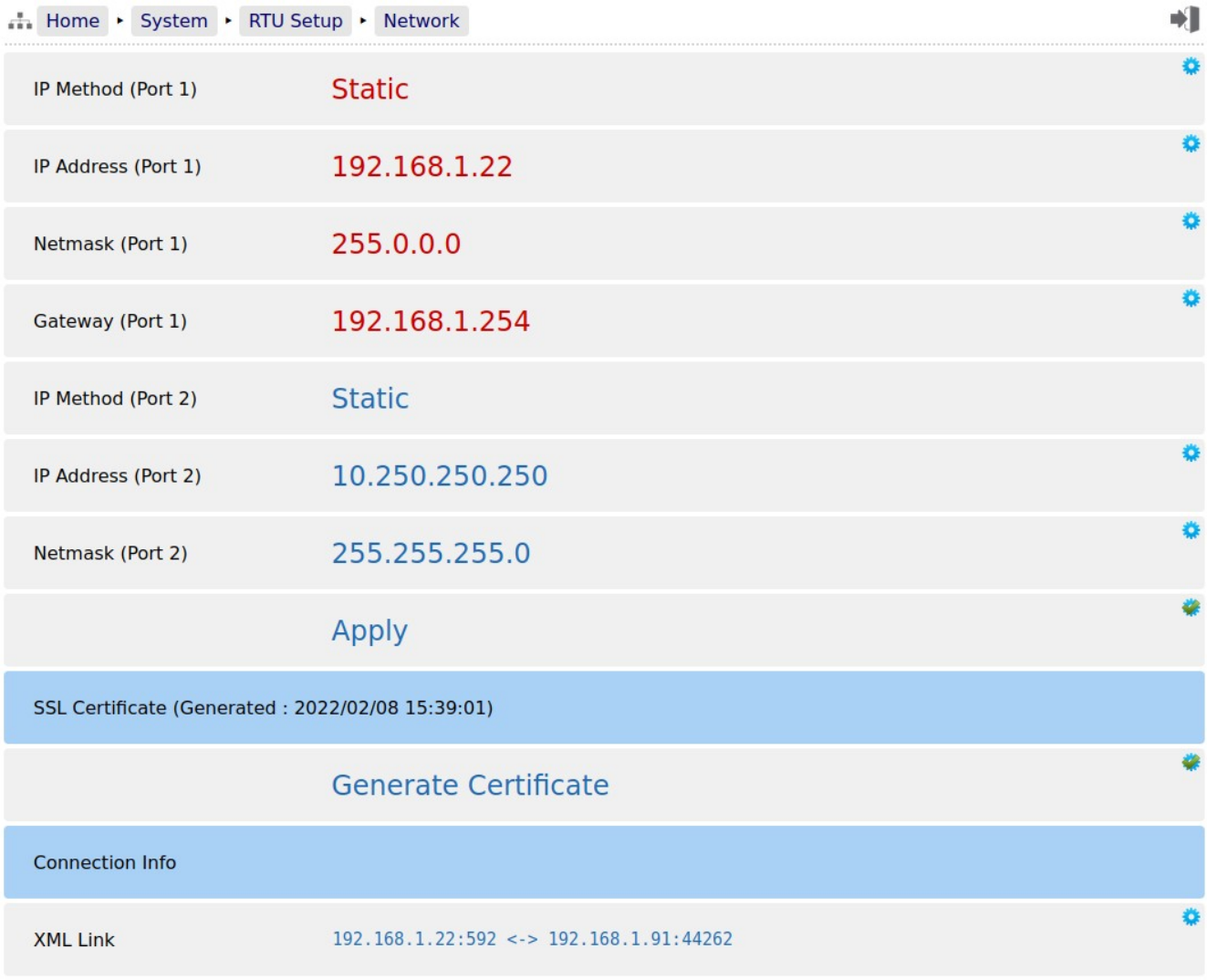

Home
System
RTU Setup
Network
IP Method (Port 1)
Static
IP Address (Port 1)
192.168.1.130
Netmask (Port 1)
255.0.0.0
Gateway (Port 1)
192.168.1.254
IP Method (Port 2)
Static
IP Address (Port 2)
10.250.250.250
Netmask (Port 2)
255.255.255.0
Apply
SSL Certificate (Generated : 04/06/2022 07:12:43)
Generate Certificate
Connection Info
XML Link
192.168.1.130:592 <-> 192.168.1.75:50343

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 controller to generate a new Self Certified SSL Certificate. Once generated, the controller 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 MicroCube 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.



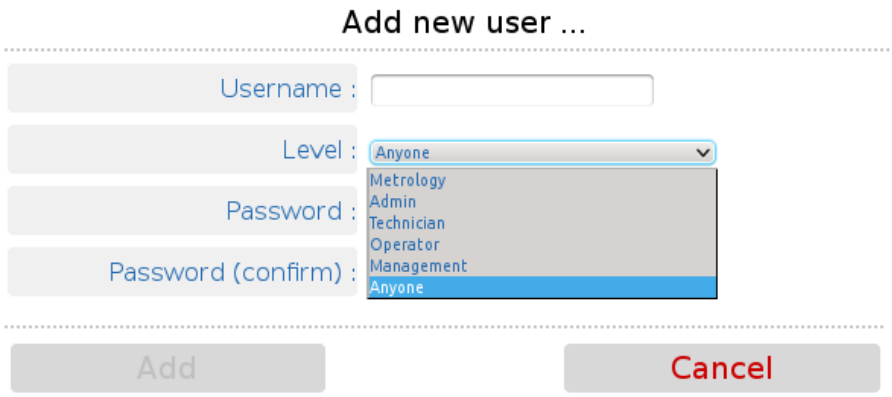
This completes the ▸ **Network**. settings.

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.



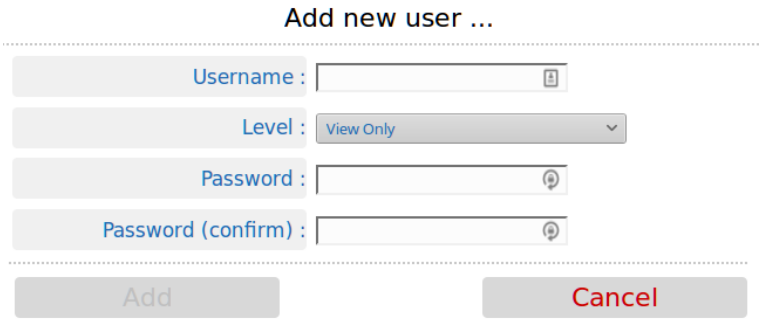
The second line in the example above has the user details for a manually added ‘met’ user and the third line for a manually added 'tech' user. The fourth line in the example only shows if you are logged in at admin or metrology level and is called “Add new user ...”. Clicking on the text opens the Add 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** TBC **Admin** Can change all parameters except those designated 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** TBC
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. The menu is shown below.

5.5.1 Printers / SD Card / FTP

The Unified Prover 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.
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. Baud rate is only shown for Serial printing.
Serial Port	The Serial printer can be connected to Serial Port 1 or 3.
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.
Printer 2	
Name	Clicking on the line opens the Edit dialog box, and default printer name can be changed.
Type	This printer has been configured as Network (Postscript) printer 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 controller is turned off, SD Cards may be inserted or removed at any time. When power is applied, the controller 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 Controller. 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.

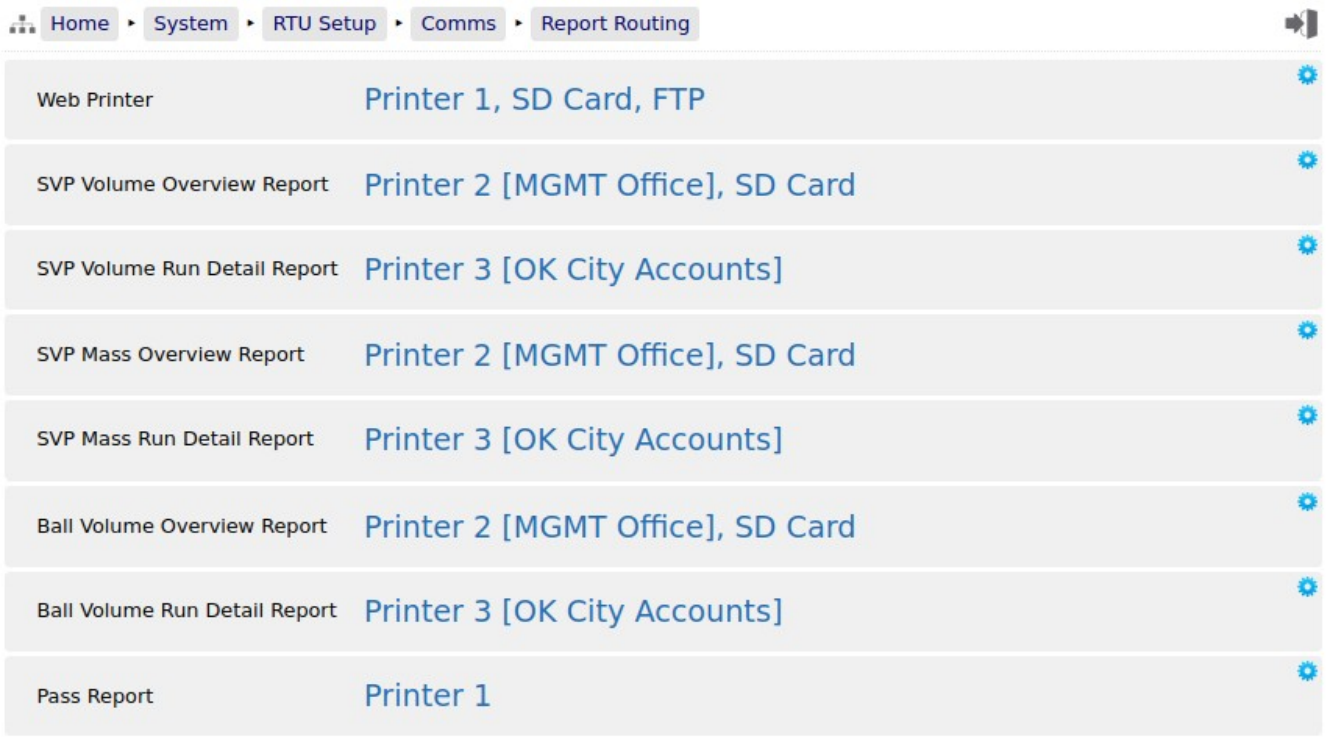
Upload Format	Clicking this line gives the choice of one of two options selected with a radio button. The two options are: **Plain Text** If this Option is selected all reports are transferred to the FTP server as text formatted documents. **TSV** If this Option is selected all reports are transferred 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.

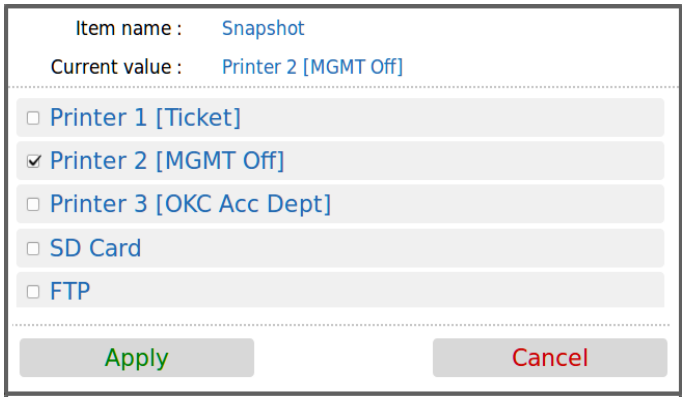
For the next phase, click RTU Setup on the breadcrumb bar to go back (or the browser back button) and select ▸ **Report Routing**.

5.5.2 Report & Printer Routing

The Unified Prover 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.

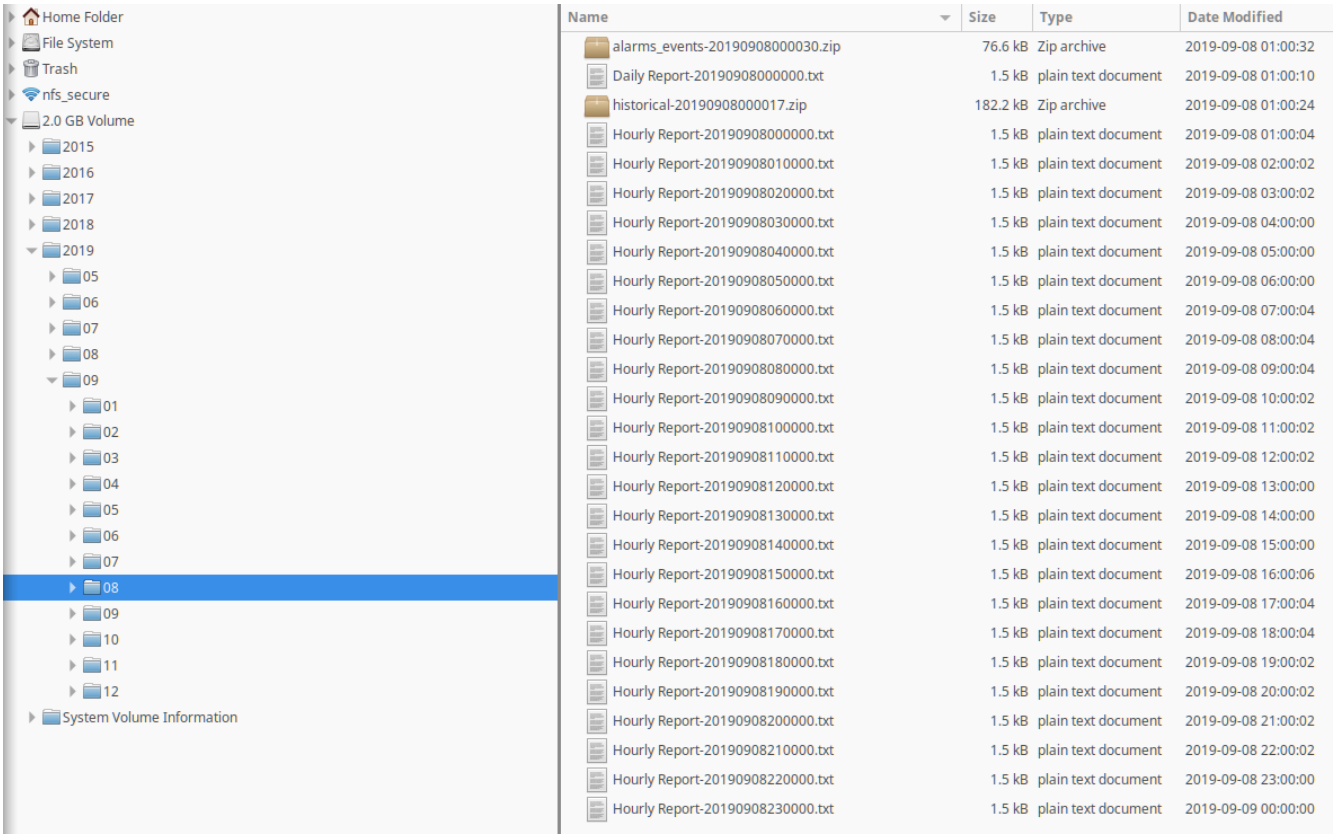
5.5.2.1 Reports Archive

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.

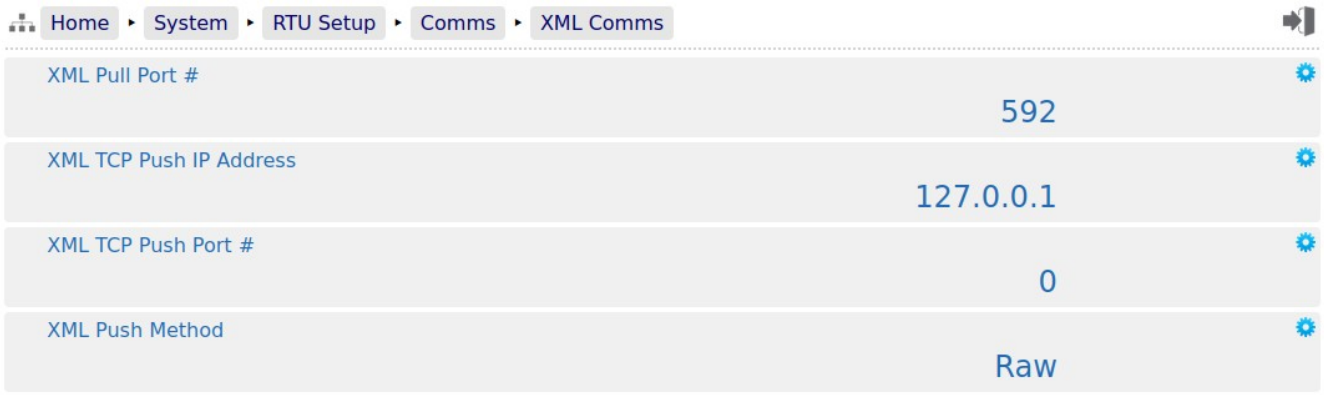
For the next phase, click RTU Setup on the breadcrumb bar to go back (or the browser back button) and select ▸ **XML Comms**.

5.5.3 XML Comms

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

The NÅNO controller 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 TCP Pull Port #	In XML TCP Pull mode, the NÅNO controller 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 TCP Push IP Address	This is the IP address of the remote server which will receive the push notifications from the NÅNO controller.
XML TCP Push Port #	This is the TCP port number of the remote server which will receive the push notifications from the NÅNO controller. Setting the port number to zero will disable the Push notification.
XML Push Method	This is where the NÅNO controller 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`.

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

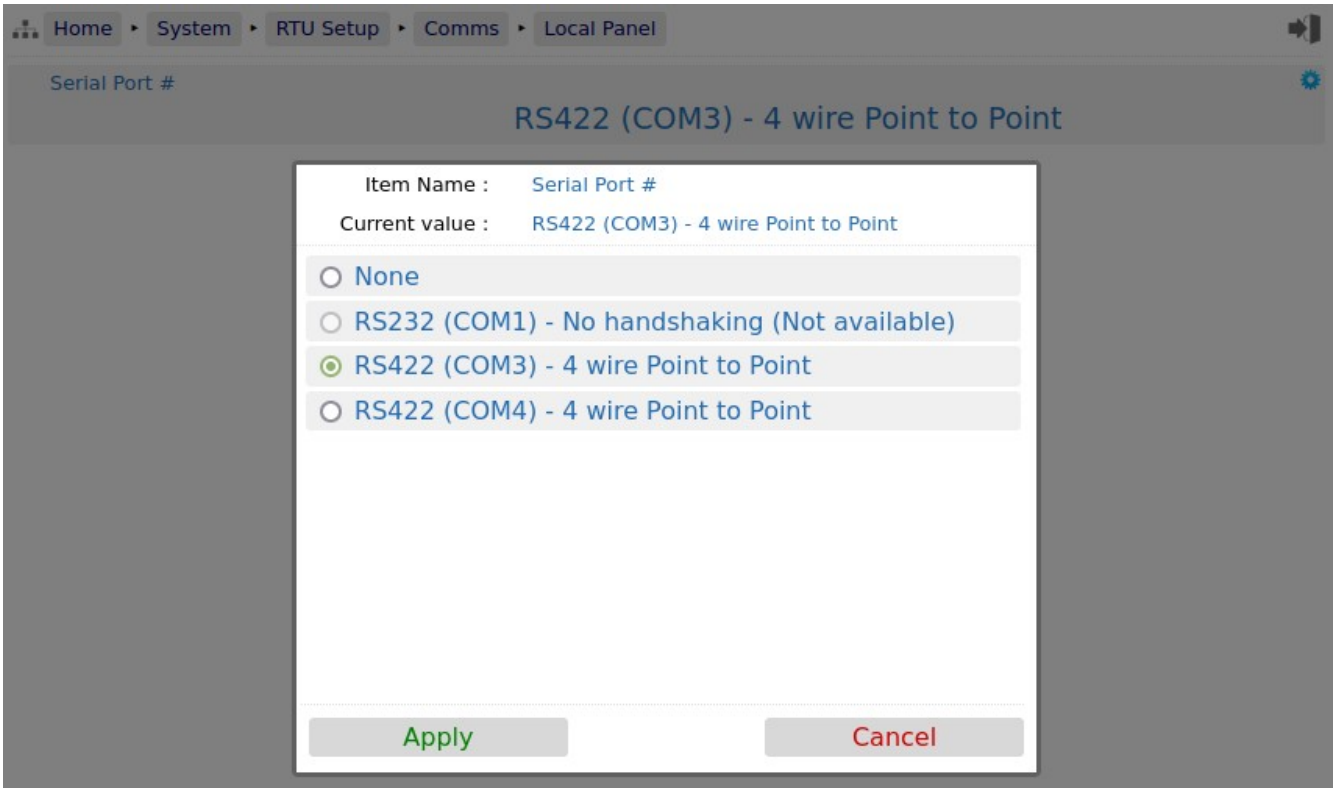
For the next phase, click RTU Setup on the breadcrumb bar to go back (or the browser back button) and select ▸ **Local Panel**.

5.5.4 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.



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 above, a serial printer is in use on COM1.

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

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

5.5.5 OPC-UA Comms

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

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

The following details can be changed:-

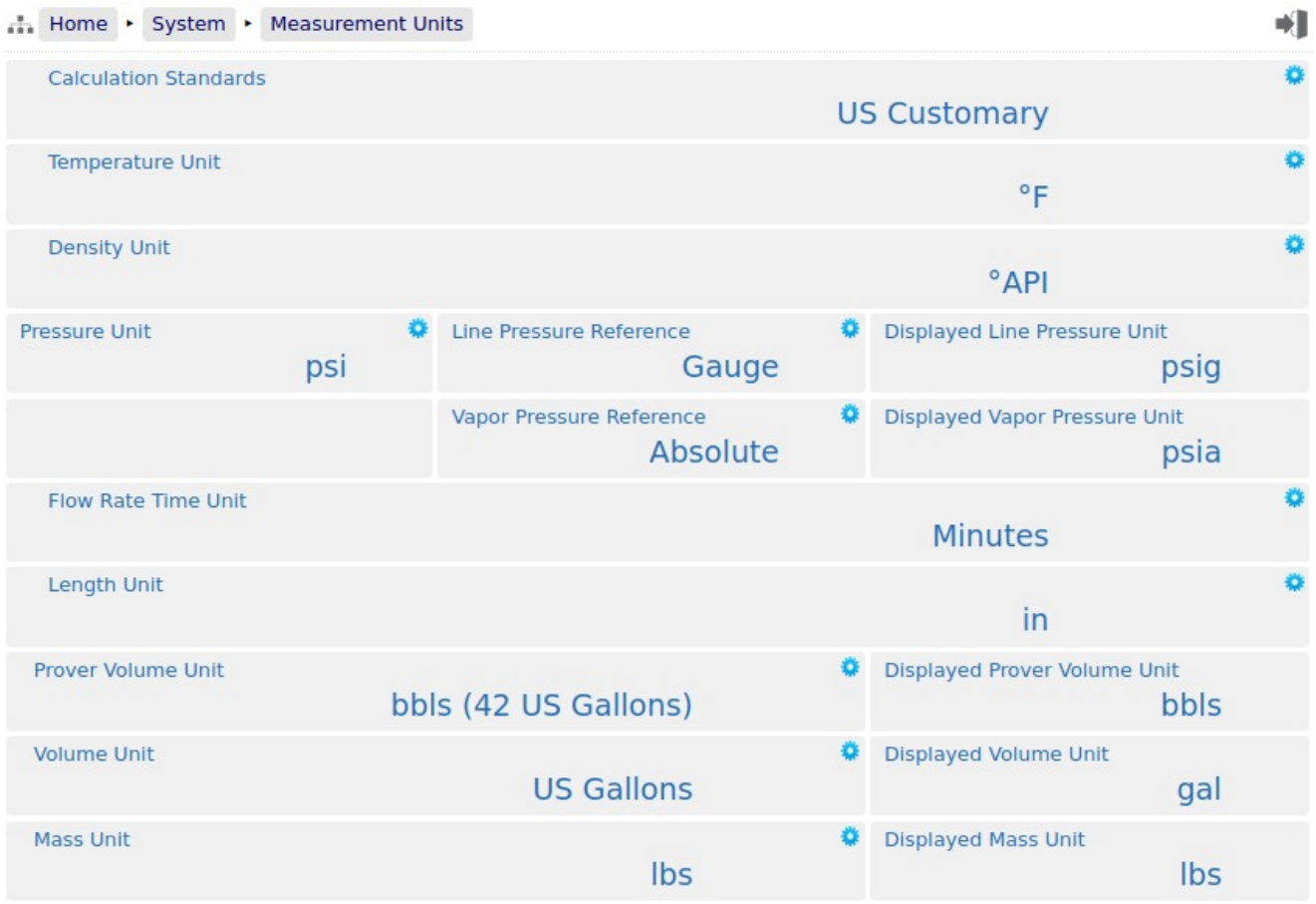
OPC-UA Port	The port number is hard-coded to 4840 so is provided for information purposes only.
ControlWeb Compatibility Mode	Although the OPC-UA interface is defined, we have found that some implementations differ from the standard. Due to differences found with the ControlWeb PC Application, we added this compatibility mode switch to allow ControlWeb to interface and interact with the NÅNO controller correctly.

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

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

6 Stage 3 of 6: Configuring the Measurement Units

The units available in the Unified Prover Application are highly configurable. The screenshot below shows the unit selection screen:



Calculation Standards	This is used to define the base conditions in the NÅNO controller: **US Customary** Expects the base conditions to be 60°F and 0psig. **Metric** Expects the base conditions to be 15°C or 20°C and 0kPa.
Temperature Unit	Select degrees Celsius (°C) or degrees Fahrenheit (°F).
Density Unit	There are 6 choices of Density Unit. 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.
Pressure Unit	There are three options: psi, bar or kPa on radio buttons. Select the appropriate one.
Line Pressure Reference	This selection determines if the measured (line) pressures are Absolute or Gauge pressures. **NOTE:** The atmospheric pressure at the location in use is set here: Home ▸ System ▸ Initial Setup ▸ Site/Location Setup
Displayed Line Pressure Unit	From the Pressure Unit and the Line Pressure Reference selection this shows the unit that will be used and displayed. As an example, if the Pressure Unit was set to psi and the Line Pressure Reference Selection is Gauge, then psig will be used and displayed. Valid units are: psia, psig, kPaa, kPag, bara & barg.
Vapor Pressure Reference	The vapor pressure and the line pressure will be in the same unit. This selection determines if the vapor pressure is Absolute or Gauge. **NOTE:** The atmospheric pressure at the location in use is set here: Home ▸ System ▸ Initial Setup ▸ Site/Location Setup
Displayed Vapor Pressure Unit	From the Pressure Unit and the Vapor Pressure Reference selection, this shows the unit that will be used and displayed. As an example, if the Pressure Unit was set to psi and the Vapor Pressure Reference selection is Absolute, then psia will be used and displayed. Valid units are: psia, psig, kPaa, kPag, bara & barg.
Flow Rate Time Unit	This can be set to Seconds (s), Minutes (min), Hours (hr) or Days (d).
Length Unit	This is a radio button with five options: Inches(in) Feet (ft) Meters (m) centimeters (cm) millimeters (mm) Choose a unit that best matches the prover internal diameter and wall thickness.

Prover Volume Unit	This shows a more descriptive list of available units for the prover, such as the base volume. The volume units of the prover are normally a lot smaller than the totalized units of a connected meter run, therefore they are separated out. It would not be practical to use these on reports, displays, etc as they are too long. However, the unit is set with this entry and the ***Displayed Prover Volume Unit*** below is then used as a more concise form for the application. Valid options are: Liters, m3, US Gallons & bbls (42 US Gallons).
Displayed Prover Volume Unit	A concise form of the entry above. Used on displays, reports, etc. Displayed values are: Liters — Liters m3 — m3 US Gallons — gal bbls (42 US Gallons) — bbls
Volume Unit	This shows a more descriptive list of available units. It would not be practical to use these on reports, displays, etc as they are too long. However, the unit is set with this entry and the ***Displayed Volume Unit*** below is then used as a more concise form for the application. Valid options are: Liters, m3, US Gallons & bbls (42 US Gallons).
Displayed Volume Unit	A concise form of the entry above. Used on displays, reports, etc. Displayed values are: Liters — Liters m3 — m3 US Gallons — gal bbls (42 US Gallons) — bbls
Mass Unit	This shows a more descriptive list of available units. It would not be practical to use these on reports, displays, etc as they are too long. However, the unit is set with this entry and the ***Displayed Mass Unit*** below is then used as a more concise form for the application. Valid options are: kilograms, tonnes (1000 kg), tons (2000 lbs), lbs & Mlbs (1000 lbs).
Displayed Mass Unit	A concise form of the entry above. Used on displays, reports, etc. Displayed values are: kilograms — kg tonnes (1000 kg) — tonnes tons (2000 lbs) — tons lbs — lbs Mlbs (1000 lbs) — Mlbs

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 either ▸ **I/O - SVP** or ▸ **I/O - BiDi** as appropriate.

7 Stage 4 of 6: Matching the I/O to the P&ID

The display tree splits at this point as there are settings which are specific to either Small Volume or Ball Provers.

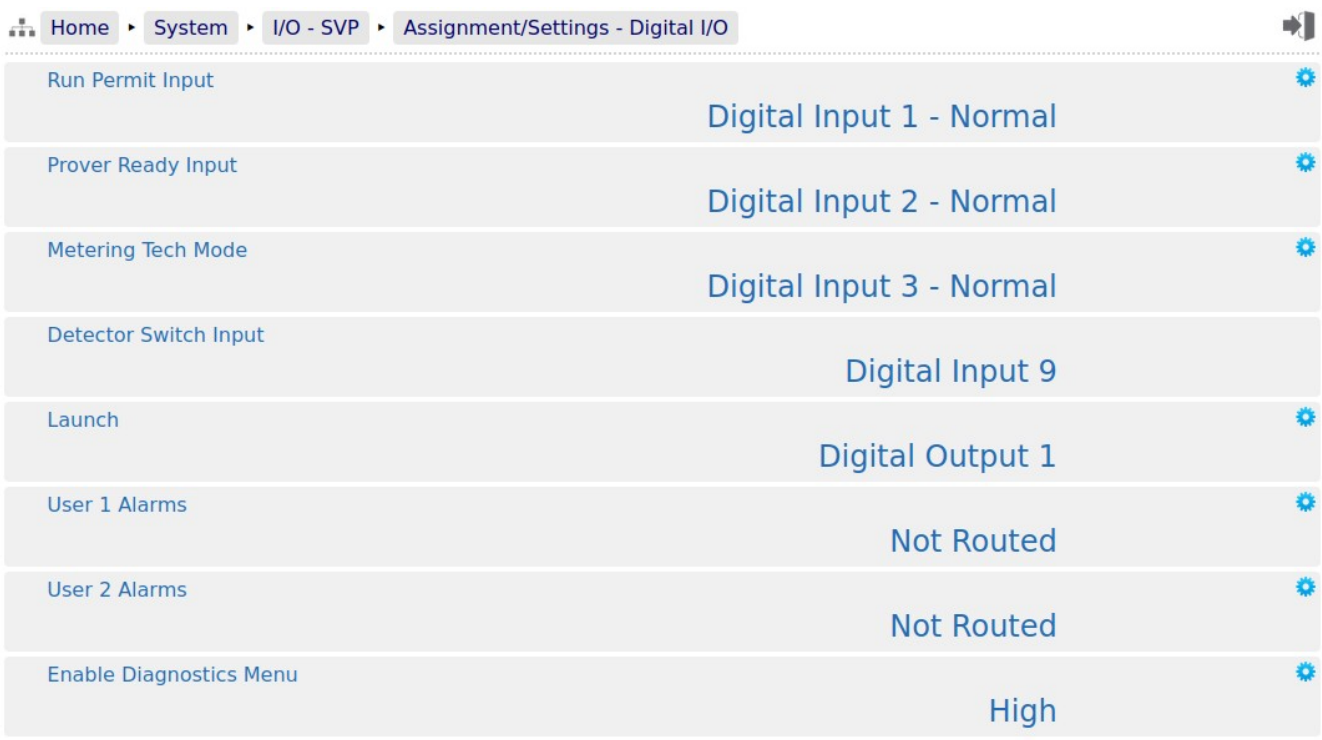
If configured as a Small Volume Prover, jump to Section 7.1 I/O - SVP.

If configured as a Bi-Directional Prover, jump to Section 7.2 I/O - BiDi.

7.1 I/O - SVP

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

7.1.1 I/O Assignments – Digital Inputs & Outputs (SVP Mode)



NOTE: The application does 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 15 I/O Schedules.

Digital Inputs	
Run Permit Input	This digital input must be made active to allow the Proving screen to be displayed and a prove started. If the Run Permit input is made inactive during a prove cycle, the prove will be aborted. If the Run Permit is not required, click on the line and select "High" as the input selection, so the input is always active.
Prover Ready Input	The ready signal is expected to be generated by the prover when it is ready to start a prove cycle. Once the cycle has started, the Ready Input is ignored.
Metering Tech Mode	If this input is active, the Metering Technician screen will be shown on the Local Panel Display. This display takes precedence over the proving display and is used to change the bias values for the process inputs. These can also be changed on the individual inputs setup screens.
Detector Switch Input	This field is just for information, and shows that the Detector Switches must be connected to Digital Input 9.
Digital Outputs	
Launch	This input is used to control the prover during a prove cycle. Depending on the setting of the SVP Prover Retract Type, it will either be active for 500mSec (Mechanical) or for the duration of the stroke of the piston (Hydraulic). **NOTE:** The SVP Prover Retract Type is set here: Home ▸ System ▸ Initial Setup ▸ Site/Location Setup
User 1 Alarms	If any User 1 High alarms are exceeded or the value is lower than the User 1 Low alarms, then this Digital Output will become active.
User 2 Alarms	As for User 1 Alarms, but for the second user alarm group, User 2 Alarms.
Enable Diagnostics Menu	This input allows extra diagnostics to be displayed on the website. When this input is active the extra menu can be found at Home ▸ Logs & Info ▸ Diagnostics

7.1.2 I/O Assignments – Process Inputs (SVP Mode)

NOTE: The application does 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 15 I/O Schedules.

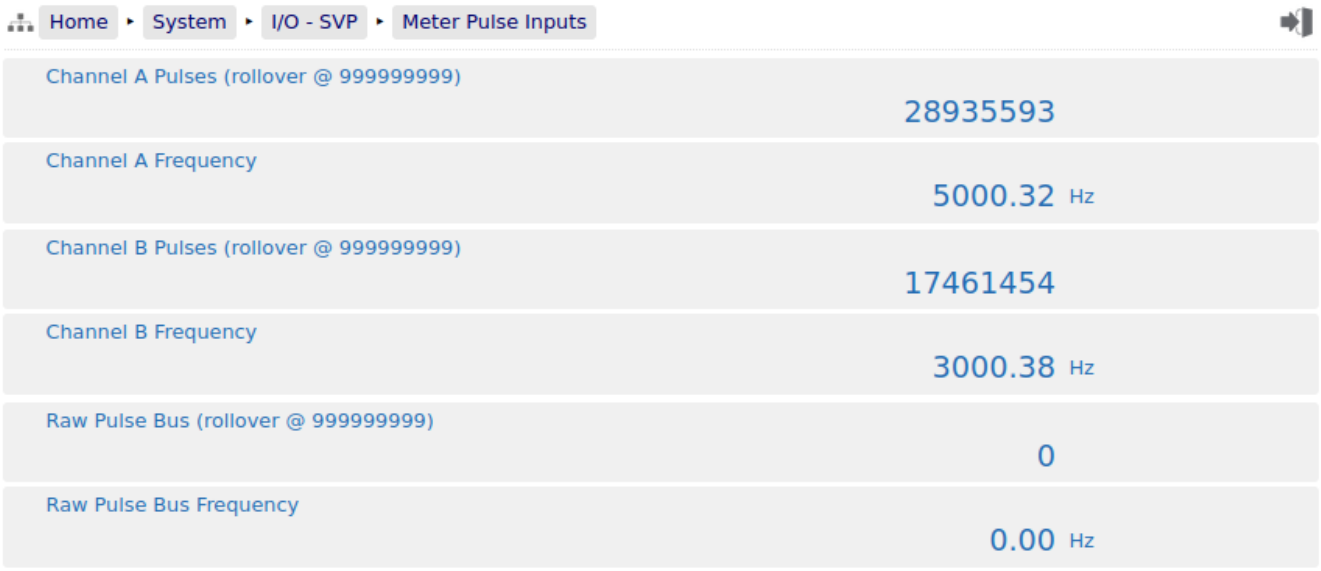
Prover Temperature Source	The Unified Prover application can use a live prover temperature with an optional Default (fail-over) value (in the case of a transmitter failure) or a user (manual) Override value. In this example, the unit is configured assuming that the prover temperature is being measured using a 4-20mA transmitter connected to Analog Input 1. Clicking this line allows the user to assign different Analog Inputs or to Disable the Prover Temperature Source, if an alternative method is being used.
Prover Temperature Type	Once the appropriate Prover Temperature Source has been chosen then the Type of Temperature needs to be selected. A 4-20mA transmitter or 1-5 Volt device can be used directly with any of the Analog Inputs. With the addition of an external P554 Thermistor Interface Module, a Thermistor can be used with Analog Input channels 5 & 6. Alternatively a 4-wire RTD to be directly connected to either Analog Input 5 or Analog Input 6, but this is not supported by Analog Input channels 1 through 4. If a Prover Temperature Source has been selected as 4-20mA then the Prover Temperature parameters will also need to be set. See Section 8.1.4 Prover Temperature (SVP Mode). If the Prover Temperature Source is disabled, then the Prover Temperature menu will only allow an override value to be entered. **NOTE:** Hardware jumper settings need to be configured to match this selection. **NOTE:** RTD mode can only operate with Analog Input 5 or 6
Prover Pressure Source	The Unified Prover application can use either a live Pressure Source, with an optional default (fail-over) value in the case of a transmitter failure or a user entered Override value. The default has a live measured pressure and Analog Input 1 is assigned to measure this input. Clicking this line the assignment can be changed to another Analog Input channel or Disabled if a measured value is not used. If a Prover Pressure Source has been selected then the Pressure parameters will also need to be set. See Section 8.1.5 Prover Pressure (SVP Mode).
Prover Pressure Type	The Unified Prover Pressure Transmitter can be a 4-20mA device or 1-5V. **NOTE:** Hardware jumper settings need to be configured to match this selection.
Switchbar Temperature Source	When configured as a SVP prover, the Unified Prover application can use a live switchbar temperature. Clicking this line allows the user to assign different Analog Inputs or to Disable the Measured Temperature Source, if an alternative method is being used. **NOTE:** RTD mode can only operate with Analog Input 5 or 6
Switchbar Temperature Type	Choices are as the Prover Temperature Type, shown above.

Densitometer Input Source	This input is only available if the System Type under: Home ▸ System ▸ Initial Setup ▸ Site/Location Setup is set to ***Standalone SVP with a Mass Meter*** The Densitometer can be a scaled Analog output type or a periodic/frequency output type of meter. Select which input the Densitometer is connected to.
Densitometer Type	This option will be shown if the densitometer is configured as an Analog signal. The Densitometer Transmitter can be a 4-20mA device or 1-5V. **NOTE:** Hardware jumper settings need to be configured to match this selection.

7.1.3 Meter Pulse Inputs (SVP Mode)

This menu is for information only.

This display relates to the Meter Pulses received on the configured meter pulse input channel. The configuration of the channel is set under Home ▸ System ▸ Small Volume Prover Setup ▸ Operational Setup, ***Meter Under Test Pulse Source.*** and is described under Section 8.1.3 Operational Setup (SVP Mode).

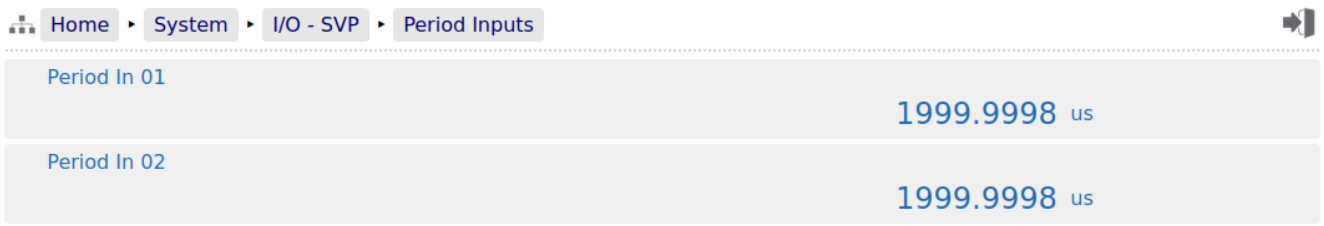


NOTE: Only Channel A, Channel B or Raw Pulse Bus will be shown, not all three, as in the illustration shown above.

Channel A Pulses (rollover @ 999999999)	If the Meter Under Test source is set as ***Channel A Pulses***, this channel will be shown. This is not configurable but shows the count to assist with diagnostics/fault finding.
Channel A Frequency	If the Meter Under Test source is set as ***Channel A Pulses***, this channel will be shown. This is not configurable but indicates the incoming frequency of Channel A to assist with diagnostics/fault finding.
Channel B Pulses (rollover @ 999999999)	If the Meter Under Test source is set as ***Channel B Pulses***, this channel will be shown. This is not configurable but shows the count to assist with diagnostics/fault finding.
Channel B Frequency	If the Meter Under Test source is set as ***Channel B Pulses***, this channel will be shown. This is not configurable but indicates the incoming frequency of Channel B to assist with diagnostics/fault finding.
Raw Pulse Bus (rollover @ 999999999)	If the Meter Under Test source is set as ***Raw Pulse Bus***, this channel will be shown. This is not configurable but shows the count to assist with diagnostics/fault finding.
Raw Pulse Bus Frequency	If the Meter Under Test source is set as ***Raw Pulse Bus***, this channel will be shown. This is not configurable but indicates the incoming frequency of the Raw Pulse Bus to assist with diagnostics/fault finding.

7.1.4 Period Inputs (SVP Mode)

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



The two lines show the period in microseconds of Period In 1 (Pulse In Ch.C) and Period In 2 (Pulse In Ch.D).

These are always shown regardless of whether anything is configured to use them.

7.1.5 Field Calibration (SVP Mode)

The NÅNO controller 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.

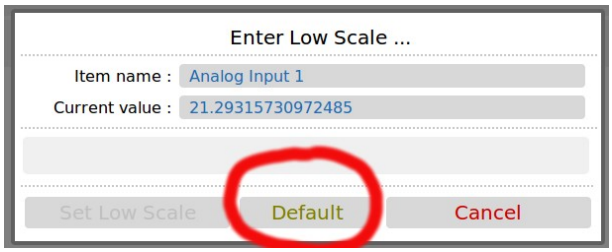
To start the calibration process, navigate to Home ▸ System ▸ I/O - SVP ▸ Field Calibration as shown below. This page shows all 6 Analog Inputs. In this example, we are calibrating the loop for 0 to 250 PSI.

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

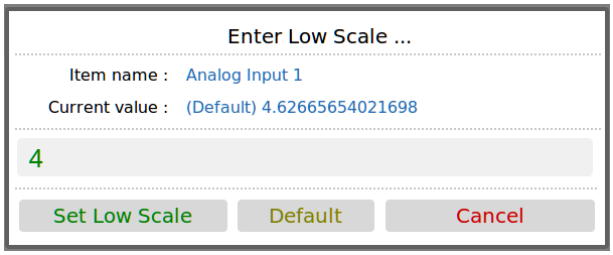
The replacement values must be cleared and set back to default. Click the line associated with the relevant input which will open the Enter Low Scale dialog box. Then click the button named Default. You will be asked to Reset Scale to Default and click the Confirm button.



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.

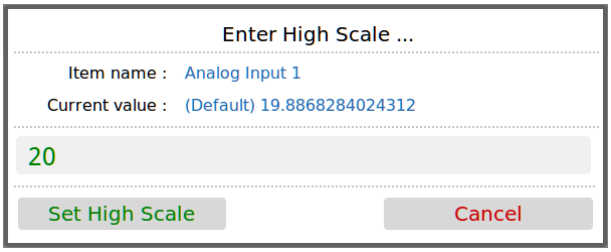
This has pre-loaded 4.0mA into the low scale field. It is not yet being used and will not become active unless confirmed at the end of the process.

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

Step 3

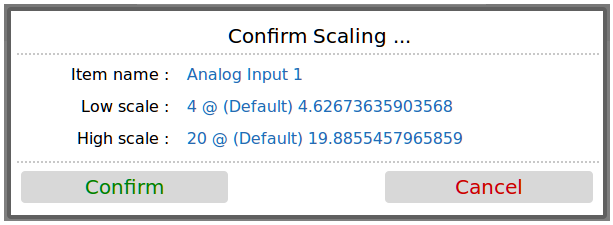
Now load the dead weight tester until pressure is at the full scale value of 250 PSI in this example.

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

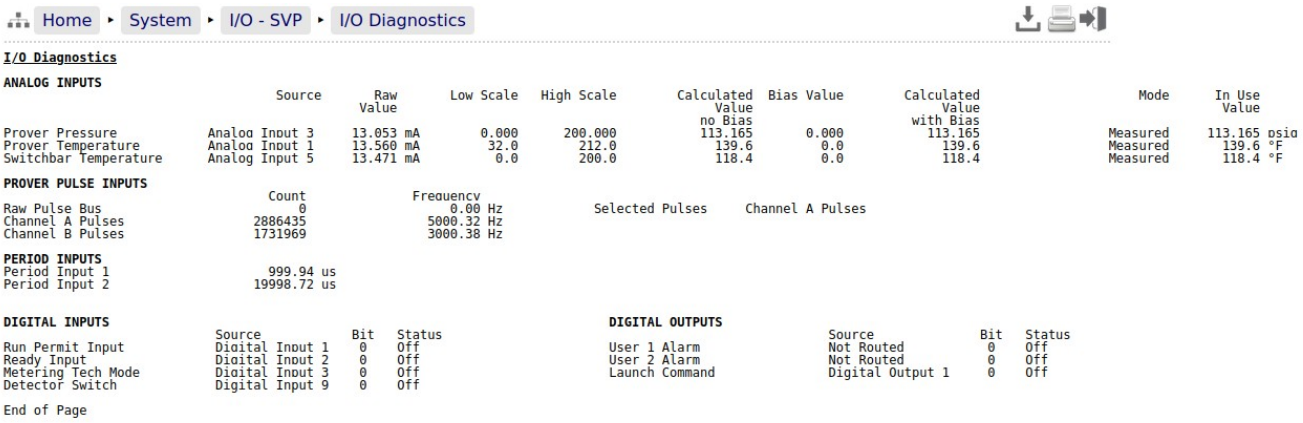
The dialog box now changes to "confirm scaling" as shown. The confirm scaling dialog box shows both the low scale and high scale before and after values. If these values appear to be reasonable then pressing the confirm button will accept the field calibration replacement values.



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.

7.1.6 I/O Diagnostics (SVP Mode)



Home ▸ System ▸ I/O - SVP ▸ 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
Prover Pressure	Analog Input 3	13.053 mA	0.000	200.000	113.165	0.000	113.165	Measured	113.165 psia
Prover Temperature	Analog Input 1	13.560 mA	32.0	212.0	139.6	0.0	139.6	Measured	139.6 °F
Switchbar Temperature	Analog Input 5	13.471 mA	0.0	200.0	118.4	0.0	118.4	Measured	118.4 °F

PROVER PULSE INPUTS

	Count	Frequency		
Raw Pulse Bus	0	0.00 Hz	Selected Pulses	Channel A Pulses
Channel A Pulses	2886435	5000.32 Hz		
Channel B Pulses	1731969	3000.38 Hz		

PERIOD INPUTS

Period Input 1	999.94 us
Period Input 2	19998.72 us

DIGITAL INPUTS

	Source	Bit	Status
Run Permit Input	Digital Input 1	0	Off
Ready Input	Digital Input 2	0	Off
Metering Tech Mode	Digital Input 3	0	Off
Detector Switch	Digital Input 9	0	Off

DIGITAL OUTPUTS

	Source	Bit	Status
User 1 Alarm	Not Routed	0	Off
User 2 Alarm	Not Routed	0	Off
Launch Command	Digital Output 1	0	Off

End of 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 controller 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.

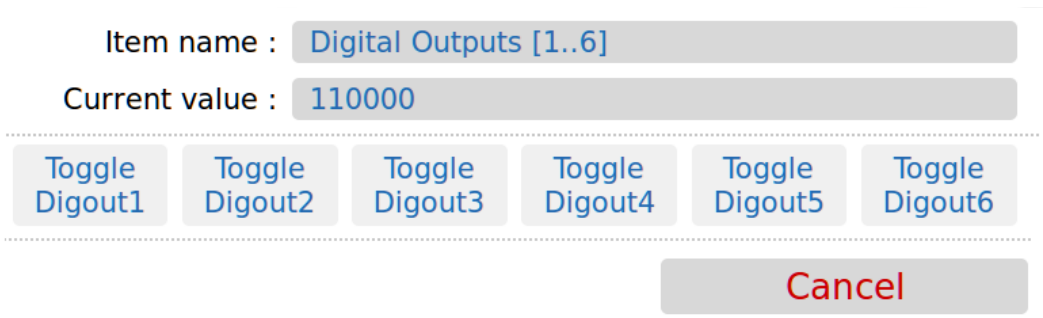
The Print icon indicates that the data on the screen can be printed, via the web printer configured on via Home ▸ System ▸ RTU Setup ▸ Comms ▸ Report/Printer Routing.

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.

7.1.7 Digital I/O Debug (SVP Mode)

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. **<u>Do NOT use or disclose Technician Level passwords without careful consideration</u>** 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.

This completes the ▸ **I/O - SVP**. Settings.

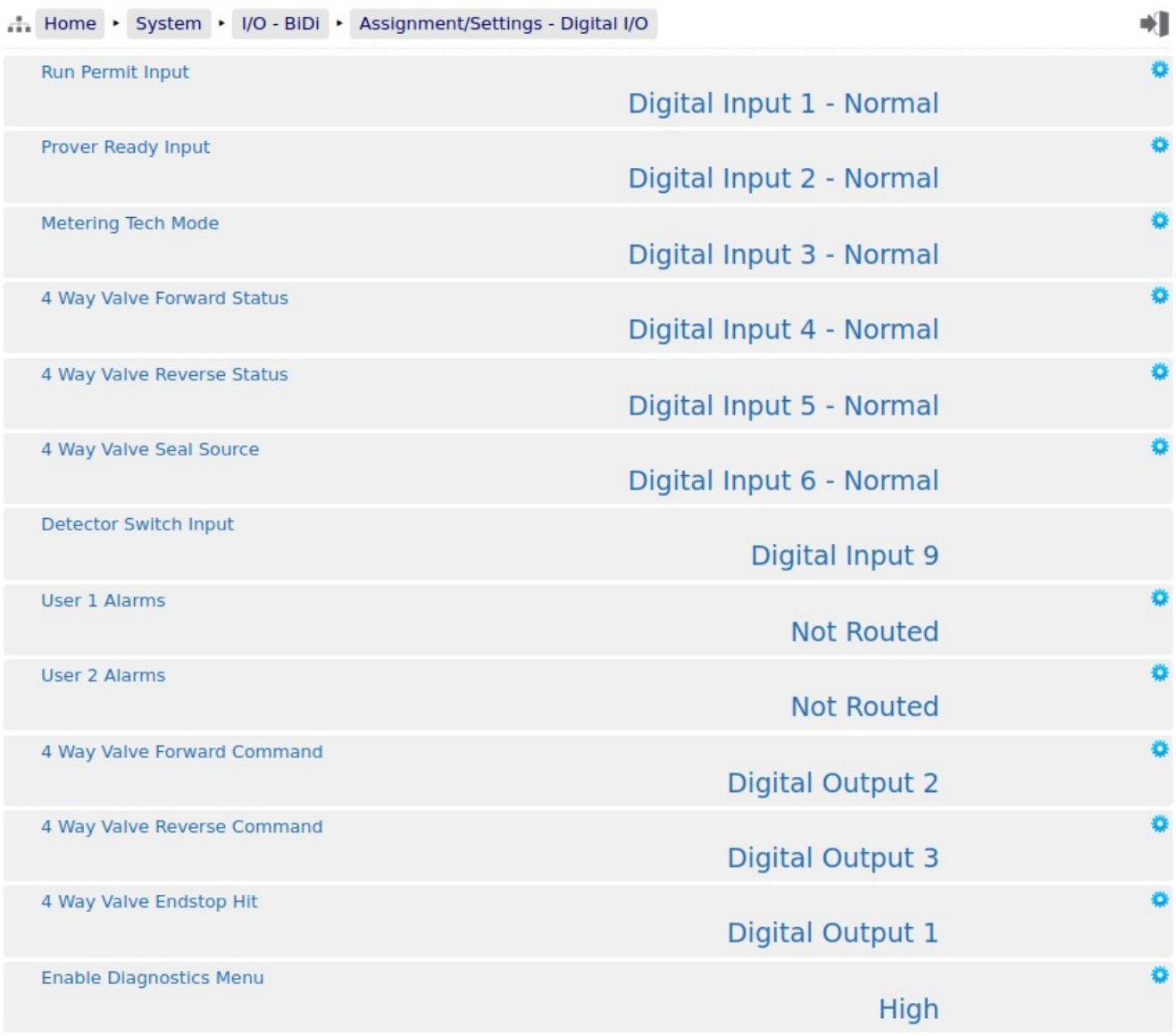
For the next phase, click System on the breadcrumb bar to go back (or the browser back button) and select ▸ **Small Volume Prover Setup**.

In the this manual jump to Section 8 Stage 5 of 6: Prover Setup.

7.2 I/O - BiDi

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

7.2.1 I/O Assignments – Digital Inputs & Outputs (BiDi Mode)

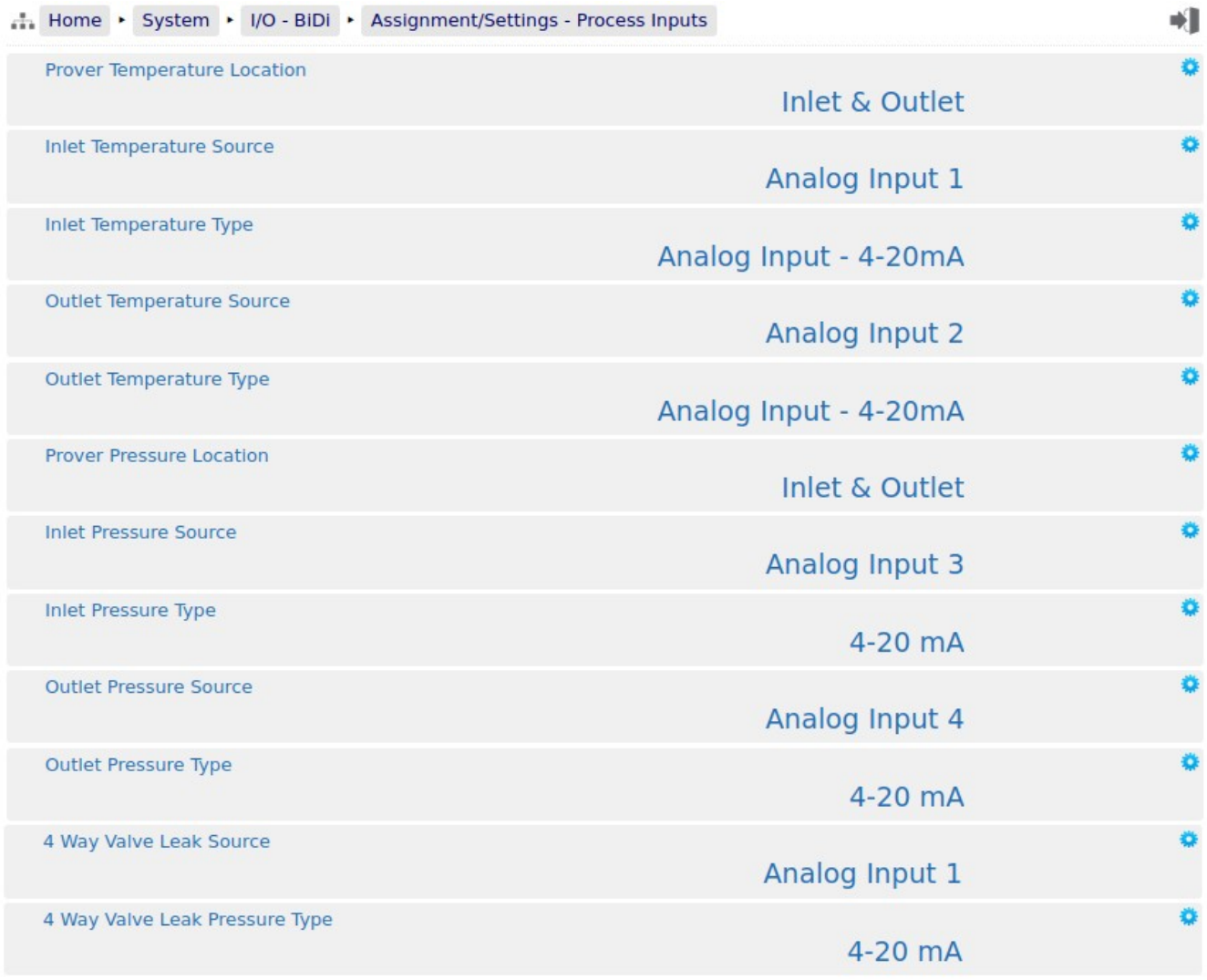


NOTE: The application does not check for exclusive assignment of any I/O points. It is recommended to record any changes to the I/O using the I/O schedule drawings available in Section 15 I/O Schedules.

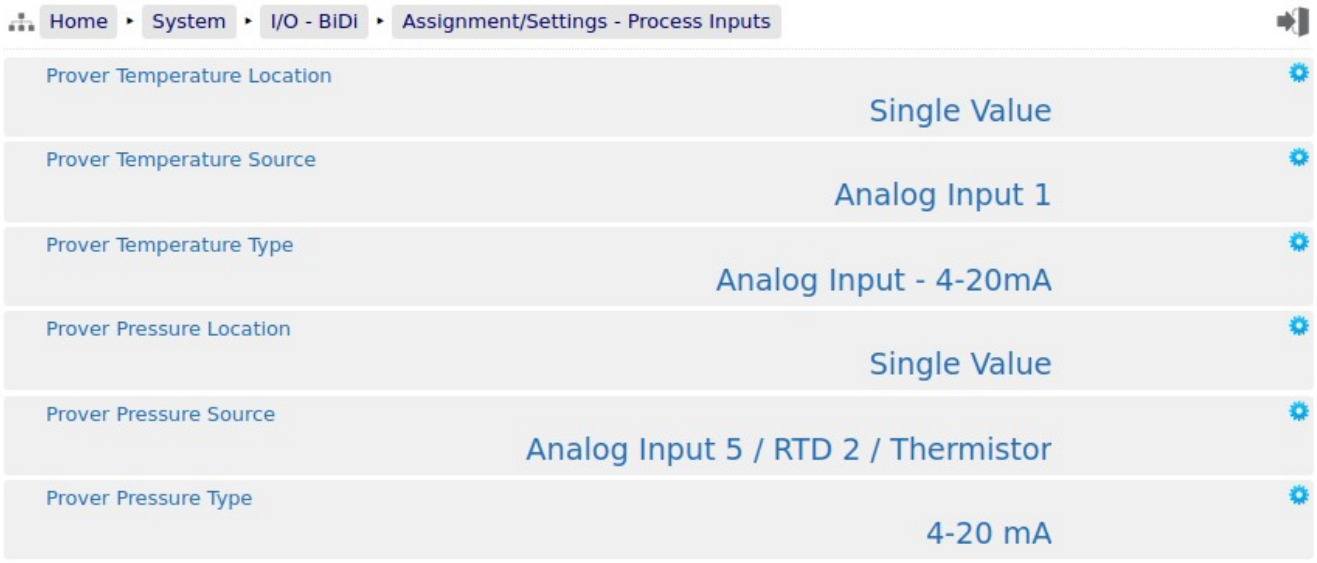
Digital Inputs	
Run Permit Input	This digital input must be made active to allow the Proving screen to be displayed and a prove started. If the Run Permit input is made inactive during a prove cycle, the prove will be aborted. If the Run Permit is not required, click on the line and select "High" as the input selection, so the input is always active.
Prover Ready Input	The ready signal is expected to be generated by the prover when it is ready to start a prove cycle. Once the cycle has started, the Ready Input is ignored.
Metering Tech Mode	If this input is active, the Metering Technician screen will be shown on the Local Panel Display. This display takes precedence over the proving display and is used to change the bias values for the process inputs. These can also be changed on the individual inputs setup screens.
4 Way Valve Forward Status	This input should be wired to the Forward contact of the 4 way valve. Valve specific settings are made under Home ▸ System ▸ BiDi Prover Setup ▸ 4 Way Valve Setup including if the contacts make or break on reaching position.
4 Way Valve Reverse Status	This input should be wired to the Reverse contact of the 4 way valve. Valve specific settings are made under Home ▸ System ▸ BiDi Prover Setup ▸ 4 Way Valve Setup including if the contacts make or break on reaching position.
4 Way Valve Seal Source	If the Seal Source is set to ***Digital*** under Home ▸ System ▸ BiDi Prover Setup ▸ 4 Way Valve Setup this option is shown. An active signal signifies that the valve is sealed.
Detector Switch Input	This field is just for information, and shows that the Detector Switches must be connected to Digital Input 9.
Digital Outputs	
User 1 Alarms	If any User 1 High alarms are exceeded or the value is lower than the User 1 Low alarms, then this Digital Output will become active.
User 2 Alarms	As for User 1 Alarms, but for the second user alarm group, User 2 Alarms.
4 Way Valve Forward Command	This output is used to command the valve to move. It should be wired to the Forward actuator input of the 4 way valve. Valve specific settings are made under Home ▸ System ▸ BiDi Prover Setup ▸ 4 Way Valve Setup including the length of time the commands are energized.
4 Way Valve Reverse Command	This output is used to command the valve to move. It should be wired to the Reverse actuator input of the 4 way valve. Valve specific settings are made under Home ▸ System ▸ BiDi Prover Setup ▸ 4 Way Valve Setup including the length of time the commands are energized.
4 Way Valve Endstop Hit	This output is used for indication only and signifies that the valve has successfully reached it's end-stop. However, as the adjustment of the end-stops is performed in the head itself, the controller cannot guarantee that when the valve is indicated forward or reversed, that it is fully in position.
Enable Diagnostics Menu	This input allows extra diagnostics to be displayed on the website. When this input is active the extra menu can be found at Home ▸ Logs & Info ▸ Diagnostics

7.2.2 I/O Assignments – Process Inputs (BiDi Mode)

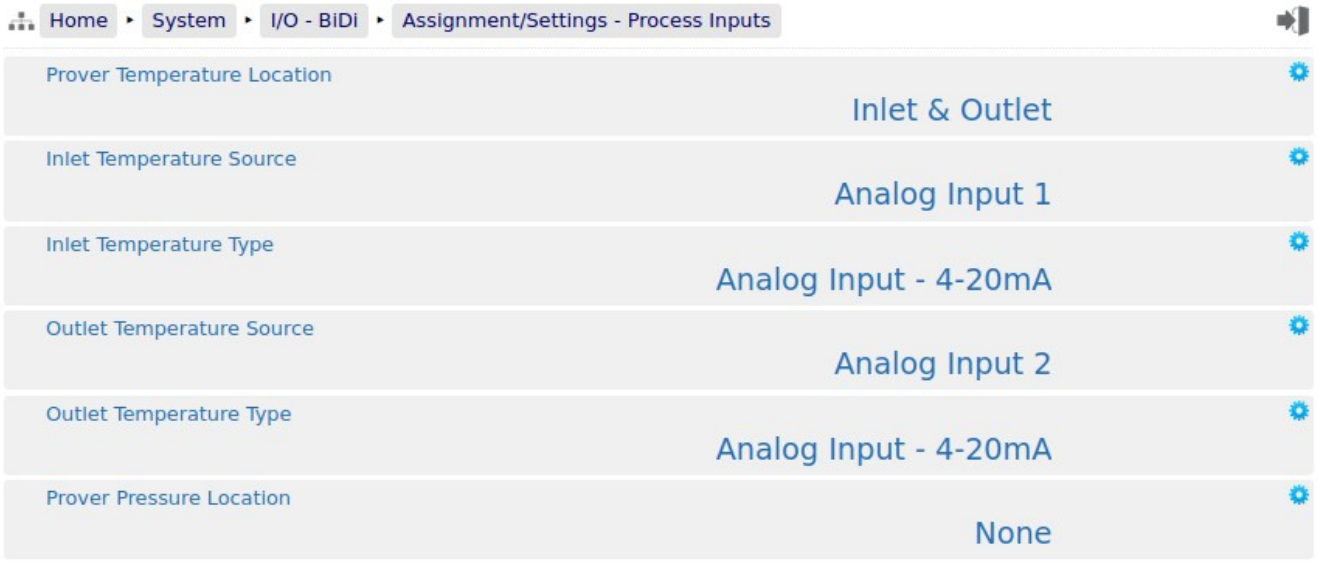
An example shown below of temperature and pressure being configured as both on the inlet and outlet of the prover pipework;



An example shown below of temperature and pressure being configured as single transmitters on the prover pipework;



An example shown below of temperature being configured as both on the inlet and outlet of the prover pipework and no measured pressure being considered;



NOTE: The application does 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 15 I/O Schedules.

Prover Temperature Location	The Unified Prover application can use a live prover temperature with an optional Default (fail-over) value (in the case of a transmitter failure) or a user (manual) Override value. This is used to define the locations of the temperature transmitters associated with the prover. Each of these have their own Default and Override values: **Single Value** — Expects a single temperature transmitter to be associated with the prover. This will be referred to as ***Prover Temperature*** in the application and manual. **Inlet & Outlet** — Expects temperature transmitters to be installed at the inlet and outlet locations on the prover. These will be referred to as ***Inlet Temperature*** and ***Outlet Temperature*** in the application and manual. **None** — Expects no temperature transmitter to be associated with the prover. No other settings for temperature transmitters will be displayed on this screen.
Prover Temperature Source	This option will only be shown if ***Single Value*** has been selected above. Clicking this line allows the user to assign different Analog Inputs or to Disable the Prover Temperature Source, if an alternative method is being used.
Prover Temperature Type	Once the appropriate Prover Temperature Source has been chosen then the Type of Temperature needs to be selected. A 4-20mA transmitter or 1-5 Volt device can be used directly with any of the Analog Inputs. With the addition of an external P554 Thermistor Interface Module, a Thermistor can be used with Analog Input channels 5 & 6. Alternatively a 4-wire RTD to be directly connected to either Analog Input 5 or Analog Input 6, but this is not supported by Analog Input channels 1 through 4. If the Prover Temperature Source has been selected as 4-20mA or 1-5 Volts, the Prover Temperature parameters will also need to be set. See Section 8.2.5 Prover/Inlet/Outlet Temperature (BiDi Mode). If the Prover Temperature Source is disabled, the Prover Temperature menu will only allow an override value to be entered. **NOTE:** Hardware jumper settings need to be configured to match this selection. **NOTE:** RTD and Thermistor Modes can only operate with Analog Input 5 or 6
Inlet Temperature Source	This option will only be shown if ***Inlet & Outlet*** has been selected above. Clicking this line allows the user to assign different Analog Inputs or to Disable the Inlet Temperature Source, if an alternative method is being used.

Inlet Temperature Type	Once the appropriate Inlet Temperature Source has been chosen then the Type of Temperature needs to be selected. A 4-20mA transmitter or 1-5 Volt device can be used directly with any of the Analog Inputs. With the addition of an external P554 Thermistor Interface Module, a Thermistor can be used with Analog Input channels 5 & 6. Alternatively a 4-wire RTD to be directly connected to either Analog Input 5 or Analog Input 6, but this is not supported by Analog Input channels 1 through 4. If the Inlet Temperature Source has been selected as 4-20mA or 1-5 Volts, the Inlet Temperature parameters will also need to be set. See Section 8.2.5 Prover/Inlet/Outlet Temperature (BiDi Mode). If the Inlet Temperature Source is disabled, the Inlet Temperature menu will only allow an override value to be entered. **NOTE:** Hardware jumper settings need to be configured to match this selection. **NOTE:** RTD and Thermistor Modes can only operate with Analog Input 5 or 6
Outlet Temperature Source	Setup as ***Inlet Temperature Source*** (above).
Outlet Temperature Type	Setup as ***Inlet Temperature Type*** (above).
Prover Pressure Location	The Unified Prover application can use a live prover pressure with an optional Default (fail-over) value (in the case of a transmitter failure) or a user (manual) Override value. This is used to define the locations of the pressure transmitters associated with the prover. Each of these have their own Default and Override values: **Single Value** — Expects a single pressure transmitter to be associated with the prover. This will be referred to as ***Prover Pressure*** in the application and manual. **Inlet & Outlet** — Expects pressure transmitters to be installed at the inlet and outlet locations on the prover. These will be referred to as ***Inlet Pressure*** and ***Outlet Pressure*** in the application and manual. **None** — Expects no pressure transmitter to be associated with the prover. No other settings for pressure transmitters will be displayed on this screen.
Prover Pressure Source	This option will only be shown if ***Single Value*** has been selected above. Clicking this line allows the user to assign different Analog Inputs or to Disable the Prover Pressure Source, if an alternative method is being used.

Prover Pressure Type	Once the appropriate Prover Pressure Source has been chosen then the Type of Pressure needs to be selected. A 4-20mA transmitter or 1-5 Volt device can be used directly with any of the Analog Inputs. If the Prover Pressure Source has been selected as 4-20mA or 1-5 Volts, the Prover Pressure parameters will also need to be set. See Section 8.2.6 Prover/Inlet/Outlet Pressure (BiDi Mode). If the Prover Pressure Source is disabled, the Prover Pressure menu will only allow an override value to be entered. **NOTE:** Hardware jumper settings need to be configured to match this selection.
Inlet Pressure Source	This option will only be shown if ***Inlet & Outlet*** has been selected above. Clicking this line allows the user to assign different Analog Inputs or to Disable the Inlet Pressure Source, if an alternative method is being used.
Inlet Pressure Type	Once the appropriate Inlet Pressure Source has been chosen then the Type of Pressure needs to be selected. A 4-20mA transmitter or 1-5 Volt device can be used directly with any of the Analog Inputs. If the Inlet Pressure Source has been selected as 4-20mA or 1-5 Volts, the Inlet Pressure parameters will also need to be set. See Section 8.2.6 Prover/Inlet/Outlet Pressure (BiDi Mode). If the Inlet Pressure Source is disabled, the Input Pressure menu will only allow an override value to be entered. **NOTE:** Hardware jumper settings need to be configured to match this selection.
Outlet Pressure Source	Setup as ***Inlet Pressure Source*** (above).
Outlet Pressure Type	Setup as ***Inlet Pressure Type*** (above).
4 Way Valve Leak Source	This input is only available if the System Type under: Home ▸ System ▸ Initial Setup ▸ Site/Location Setup is set to ***Standalone BiDi Prover with a Volume Meter*** and the 4 Way Valve Leak Check Method under: Home ▸ System ▸ BiDi Prover Setup ▸ 4 Way Valve Setup is set to ***Analog***.
4 Way Valve Leak Pressure Type	The Unified Prover 4 Way Valve Leak Pressure Transmitter can be a 4-20mA device or 1-5V. **NOTE:** Hardware jumper settings need to be configured to match this selection.

7.2.3 Meter Pulse Inputs (BiDi Mode)

This is identical to ***Meter Pulse Inputs (SVP Mode)*** therefore please refer to that section for more information.

Link to Section 7.1.3 Meter Pulse Inputs (SVP Mode).

7.2.4 Period Inputs (BiDi Mode)

This is identical to ***Period Inputs (SVP Mode)*** therefore please refer to that section for more information.

Link to Section 7.1.4 Period Inputs (SVP Mode).

7.2.5 Field Calibration (BiDi Mode)

This is almost identical to ***Field Calibration (SVP Mode)*** with the exception that any references will be to Home ▸ System ▸ I/O - BiDi ▸ Field Calibration instead of I/O - SVP , therefore please refer to that section for more information.

Link to Section 7.1.5 Field Calibration (SVP Mode).

7.2.6 I/O Diagnostics (BiDi Mode)

This is identical to ***I/O Diagnostics (SVP Mode)*** therefore please refer to that section for more information.

Link to Section 7.1.6 I/O Diagnostics (SVP Mode).

7.2.7 Digital I/O Debug (BiDi Mode)

This is identical to ***Digital I/O Debug (SVP Mode)*** therefore please refer to that section for more information.

Link to Section 7.1.7 Digital I/O Debug (SVP Mode).

This completes the ▸ **I/O - BiDi**. Settings.

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

In the this manual jump to Section 8 Stage 5 of 6: Prover Setup.

8 Stage 5 of 6: Prover Setup

The display tree splits again as there are settings which are specific to either Small Volume or Ball Provers.

If configured as a Small Volume Prover, jump to Section 8.1 Small Volume Prover Setup.

If configured as a Bi-Directional Prover, jump to Section 8.2 BiDi Prover Setup.

8.1 Small Volume Prover Setup

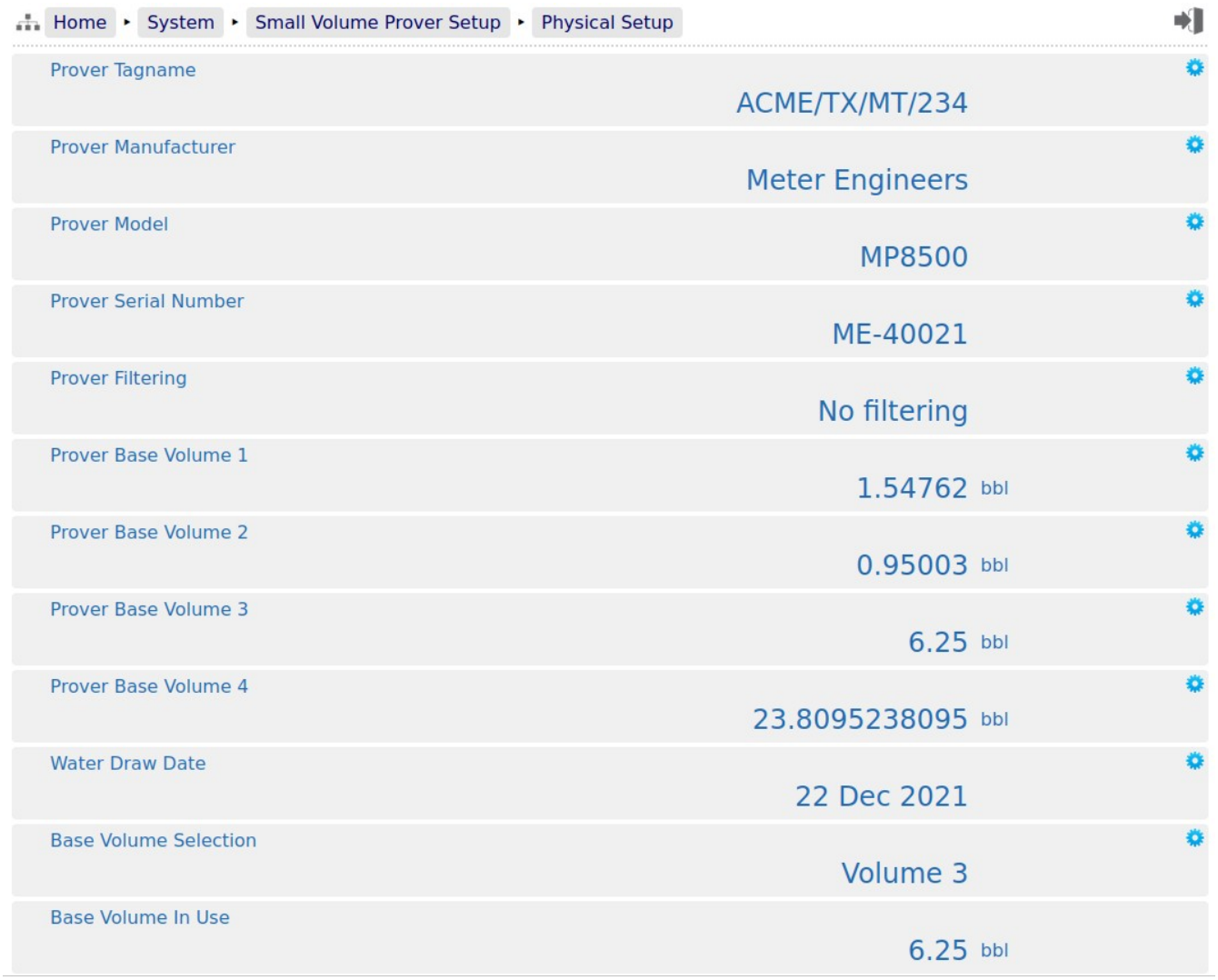
This section has seven sub-menus needed to configure the parameters needed to operate the prover application.

NOTE: When performing a mass based prove, a live density measurement is required, check in Section 7.1.2 I/O Assignments – Process Inputs (SVP Mode), ensure the Densitometer Source is assigned.

In the screenshot above, a Densitometer Source has been assigned, hence the sub-menu for configuring the Densitometer is being shown.

If not assigned or in ***Standalone SVP with a Volume Meter*** mode (set under Home ▸ System ▸ Initial Setup ▸ Site/Location Setup), the ***Densitometer*** menu will not be shown.

8.1.1 Physical Setup (SVP Mode)



As this is a long display, it is split over two pages

Prover Tagname	This is free text for information. It is shown on the relevant reports and can be written or read-back via communications.	
Prover Manufacturer	As per ***Prover Tagname***.	
Prover Model	As per ***Prover Tagname***.	
Prover Serial Number	As per ***Prover Tagname***.	
Prover Filtering	This is a patent-pending method of reducing the apparent jitter from the meter pulses and gives a higher stability dual chronometry figure, and can reduce the number of runs needed to reach acceptable uncertainty values. For more information, contact the factory.	
Prover Base Volume 1	Enter the calibrated Base Prover Volume (BPV) figure into this field.	
Prover Base Volume 2	If the prover supports a secondary BPV, it should be entered here. It should then be selected from the ***Base Volume Selection*** entry.	
Prover Base Volume 3	If the prover supports a third BPV, it should be entered here. It should then be selected from the ***Base Volume Selection*** entry.	
Prover Base Volume 4	If the prover supports a fourth BPV, it should be entered here. It should then be selected from the ***Base Volume Selection*** entry.	

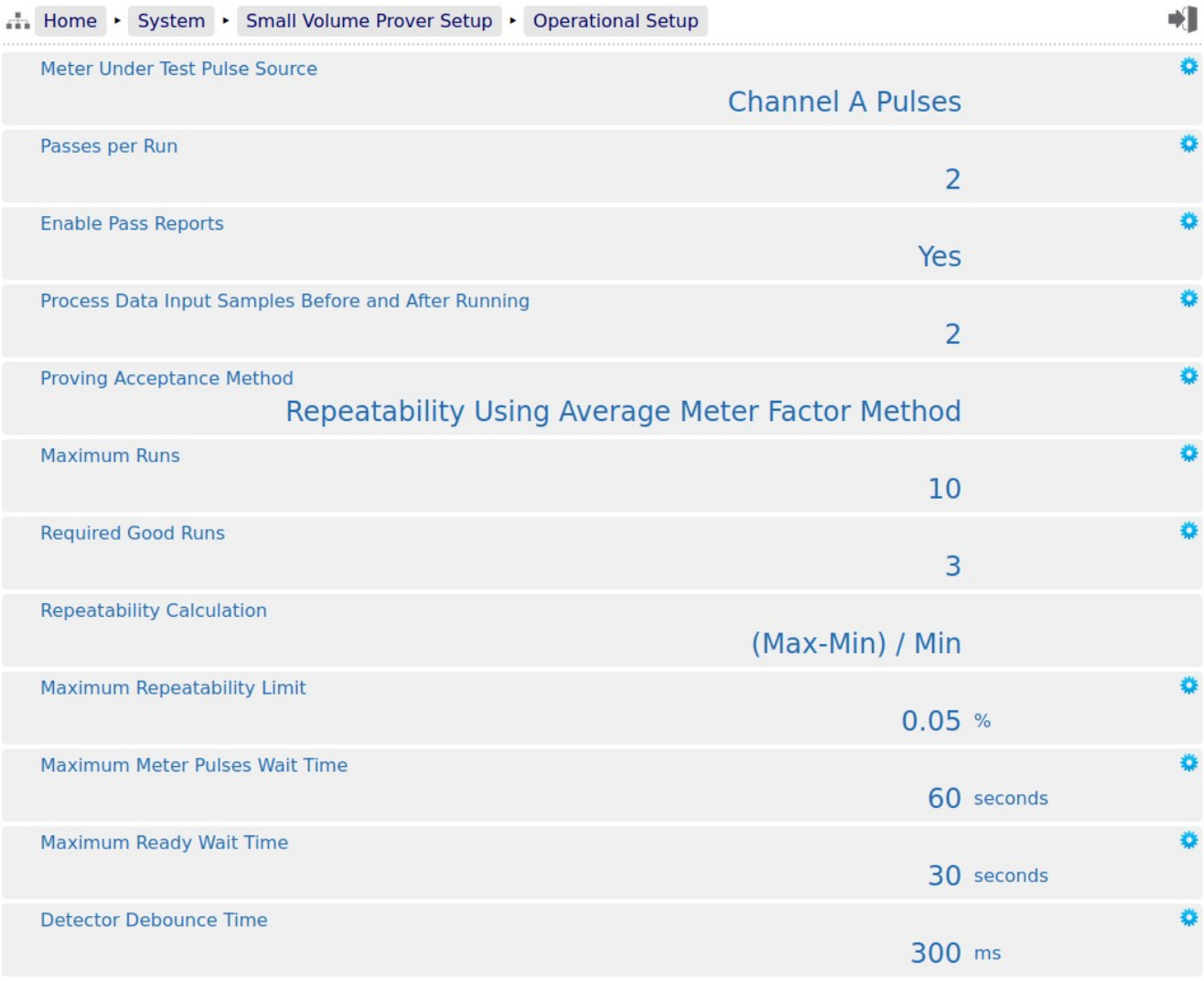
Water Draw Date	This is free text for information. It is shown on the relevant reports and can be written or read-back via communications.	
Base Volume Selection	This is a radio button to select which BPV should be used by the prover calculations.	
Base Volume In Use	This field is read-only and confirms the BPV used by the prover calculations.	
Piston Retract Time	This is the time allowed for the piston to retract.	
Maximum Flight Time	This is the maximum time allowed between the detectors. As the SVP is inherently quick in its proving sequence, it is a fixed value more than calculated.	
Maximum Detector Wait Time	This is the maximum time allowed between the launch command being issued and the first detector being hit. If the piston rests in the downstream position, the retract time can be accounted for in this value.	
Prover Internal Diameter	The prover internal diameter should be entered here. This figure is used in conjunction with the prover temperature to compensate the prover volume for the effects of temperature.	
Prover Wall Thickness	The prover wall thickness should be entered here. This figure is used in conjunction with the prover temperature to compensate the prover volume for the effects of temperature.	
Prover Base Temperature	Enter the Base (Reference) temperature given for the prover coefficients .	
Prover Base Pressure	Enter the Base (Reference) pressure given for the prover coefficients.	
Prover Elasticity Coefficent	The Prover Elasticity should be entered here, and this is used in conjunction with the measured pressure to compensate the prover volume for the effects of pressure. Ensure the coefficient units entered match those selected.	
Prover Body Temperature Coefficient (Glp)	The Prover Body Temperature Coefficient should be entered here, and this is used in conjunction with the measured temperature to compensate the prover volume for the effects of Temperature. Ensure the coefficient units entered match those selected.	
Switchbar Temperature Coefficient (Gld)	The Switchbar Temperature Coefficient should be entered here, and this is used in conjunction with the measured temperature to compensate the length of the switchbar due to the effects of Temperature. Ensure the coefficient units entered match those selected.	

8.1.2 Stability Checking (SVP Mode)

Stability Checking	This is a radio button selection, controlling the Stability function; **Disabled** This forces the NÅNO controller to skip over the Stability checking at the start of a prove. **Enabled** At the start of a prove, the NÅNO controller will check that the difference between the prover and meter temperature is within the tolerances set. It will then check that the Prover Temperature and Flow Rate does not deviate more than the entered preset limit. Finally it will check they do not exceed the Rate Of Change limits.
Stability Check Time	This is the time set in seconds that the stability checks should be run for (if the ***Stability Checking*** is ***Enabled***).
Maximum Meter vs Prover Temperature Difference	This is the maximum difference allowed between the Meter Temperature and Prover Temperature during the Stability Check Time. **NOTE:** This limit is only checked during the Stability stage of proving and not at other times.

Prover Temperature	This is the In Use Prover Temperature value. **NOTE:** If the Prover Temperature is either in Override mode or has failed to a Default reading, this value will indicate that Override or Default value, not necessarily the transmitter value.
Meter Temperature	This is the In Use Meter Temperature value. **NOTE:** If the Meter Temperature is updated by comms or is a fixed value, this value will indicate the fixed or comms value, not necessarily the transmitter value.
Maximum Prover Temperature Deviation	At the start of the stability checking, the Prover Temperature is snapshot, then checked that it does not deviate more than this limit during the ***Check Stability*** stage. This is a +/- check, so as an example if the snapshot value was 60°F and the deviation was 5°F, it would not fail the test as long as the temperature was within 55°F to 65°F. If the temperature does deviate more than the limit, the Stability Checking is immediately terminated and the prove aborted.
Maximum Prover Temperature Rate Of Change	At the start of the stability checking, the Prover Temperature is snapshot, then checked that it does not change more than this limit per second, during the ***Check Stability*** stage. If the temperature does change quicker than the limit, the Stability Checking is immediately terminated and the prove aborted.
Flow Rate	This is the live flow rate calculated from the incoming pulses. These are selected in the Section 8.1.3 Operational Setup (SVP Mode) screen below.
Maximum Flow Rate Deviation	This limit is handled the same as the ***Maximum Prover Temperature Deviation*** limit but tests against the flow rate.
Maximum Flow Rate Rate Of Change	This limit is handled the same as the ***Maximum Prover Temperature Rate Of Change*** limit but tests against the flow rate.

8.1.3 Operational Setup (SVP Mode)



Meter under Test Pulse Source	This defines the pulse source to use for the prove: **Raw Pulse Bus** Takes the pulses and rate from the Raw Pulse Bus input. **Channel A Pulses** Takes the pulses and rate from the Channel A pulse input. **Channel B Pulses** Takes the pulses and rate from the Channel B pulse input.
Passes Per Run	This is a radio button selection, allowing between one and ten passes per run.
Enable Pass Reports	This is mainly used for debugging purposes and generates a report at the end of every pass.
Process Data Input Samples Before and After Running	The Meter Temperature & Pressure, Prover Temperature & Pressure and the Switchbar Temperature are sampled both at the beginning of the each pass and at the end of each pass. This is a radio button allowing 1 to 10 samples. The default is 1 set of samples taken, but if between 2 and 10 is selected, these additional data points are all averaged, and used in the calculations for each pass. **NOTE:** each additional sample takes 500msec at both the start and end, so if 10 samples was selected, this would add an additional 9 seconds to each pass.
Proving Acceptance Method	There are 3 methods available. These are: 1) Repeatability Using Average Meter Factor Method 2) Repeatability Using Average Data Method 3) Uncertainty If options 1 or 2 have been selected, the prover will be launched to provide a set of consecutive prove runs that meet the requested repeatability limit. The number of prove runs required is configured using the Required Good Runs field shown below. If option 3 has been selected (Uncertainty), a minimum of 3 prove runs will be generated, these results will be tested against the uncertainty limit. If the match fails, then another prove run will be commanded. The uncertainly will then be calculated & checked for both the last 3 runs and all four runs. Again if this fails then this repeats with the last 3, 4 and 5 runs checked, and so on.
Maximum Runs	This is a radio button selection, allowing between one and thirty runs maximum. Even if repeatability isn't reached, the prover will not exceed this number of runs
Required Good Runs	This is only shown if a repeatability mode has been selected. This is a radio button selection, allowing between one and ten runs maximum.
Repeatability Calculation	This is only shown if a repeatability mode has been selected. In the Unified Prover application, the (Max-Min) / Min method is always utilized.
Maximum Repeatability Limit	This is only shown if a repeatability mode has been selected. The required maximum repeatability figure, in percentage, should be entered here. The prover will continue to run passes until either the desired repeatability is achieved or the number of prove runs reaches the ***Maximum Runs*** limit.
Maximum Uncertainty Limit	This is only shown if the uncertainty mode has been selected. The required maximum uncertainty value should be entered here as a percentage.
Maximum Meter Pulse Wait Time	This is the maximum time allowed for the NÅNO controller to register pulses are present on ***Meter under Test Pulse Source***. If a flow rate not registered within this time, the prove will abort.

Maximum Ready Wait Time	This is the maximum time allowed from the start of a prove for the ready signal to be seen from the prover. If the ***Prover Ready*** is not seen within this time, the prove will abort.
Detector Debounce Time	This inhibits multiple detector 'hits' from being registered on the NÅNO controller due to noisy detector contacts. After recording the first detector, the input is ignored for this time.

8.1.4 Prover Temperature (SVP Mode)

If the system has a measured Prover Temperature configured and has been set to 4-20mA, the Prover Temperature menu will be similar to that shown below.

Prover Temperature In Use	This display point shows the temperature being used in the calculations & reports. This may be a live value, a manual override value or a (fail-over) default, depending upon the Operating Status in use.
Prover Temperature 4mA Scale Value	This point indicates the temperature represented by 4mA. Clicking this line opens the dialog box allowing an alternative temperature to be input. **NOTE:** If the ***Prover Temperature Type*** was set as RTD or Thermistor, the point will not appear since the RTD & Thermistor give a direct temperature reading.
Prover Temperature 20mA Scale Value	This point indicates the temperature represented by 20mA. Clicking the line opens the dialog box allowing an alternative temperature to be input. **NOTE:** If the ***Prover Temperature Type*** was set as RTD or Thermistor, the point will not appear since the RTD & Thermistor give a direct temperature reading.
Prover Temperature Operating Status	This point indicates the current operating mode. Clicking the line opens the dialog box allowing the user to choose 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 ***Prover Temperature Default Value.***
Prover Temperature Automatically Recover to Measured	If Yes is selected, once the measured value is 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, an extra line is shown when a valid reading is available - it is not shown if no valid reading is available.  At this point the fail-over default value will continue to be used until the user presses the Recover button. Once the Recover button has been pressed, it will disappear, the ***Prover Temperature Operating Status*** will revert to ***Measured*** and the In Use value will also now be the live value.
Prover Temperature Override Value	This is the value used when the ***Prover Temperature Operating Status*** has been set to Always Override. If no transmitter has been assigned to the Prover Temperature, this override value is always used.

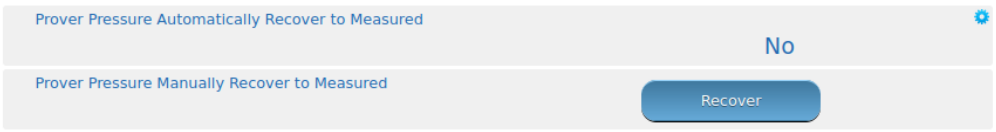
Prover Temperature Default Value	This is the value used when the ***Prover Temperature Operating Status*** has been set to Use Default on Failure, and the measured value is NOT between the low and high Input Fail Points.
Prover Temperature Transmitter Value with Bias	This is the sum of the ***Prover Temperature Transmitter Value no Bias*** and the ***Prover Temperature Bias Value***.
Prover 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.
Prover Temperature Transmitter Value no Bias	This point displays the live measured temperature value. This item is for information only and cannot be edited.
Prover Temperature - Raw Transmitter Value	This shows the instantaneous current flow from the 4-20mA Transmitter or from the Thermistor circuit. In RTD mode the Ohms value is shown.
Prover Temperature Low Alarm Limit	This point shows the currently configured Low Alarm limit. If the ***Prover 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.
Prover Temperature High Alarm Limit	This point shows the currently configured High Alarm limit. If the ***Prover Temperature In Use*** goes above the configured value, the High Temperature 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 High Temperature Alarm will ever be raised.
Prover Temperature User 1 Low Alarm Limit	If the ***Prover Temperature In Use*** goes below the User 1 Low Alarm Limit the User 1 Alarm will be set.
Prover Temperature User 1 High Alarm Limit	If the ***Prover Temperature In Use*** goes above the User 1 High Alarm Limit the User 1 Alarm will be set.
Prover Temperature User 2 Low Alarm Limit	If the ***Prover Temperature In Use*** goes below the User 2 Low Alarm Limit the User 2 Alarm will be set.
Prover Temperature User 2 High Alarm Limit	If the ***Prover Temperature In Use*** goes above the User 2 High Alarm Limit the User 2 Alarm will be set.

Low Input Fail Point	If the ***Prover Temperature - Raw Transmitter Value*** goes below the ***Low Input Fail Point*** and the ***Prover Temperature Operating Status*** is set to Use Default on Failure then the ***Prover Temperature In Use*** will be the fail-over ***Prover Temperature Default Value***. In 4-20mA mode this value will be 3.5mA by default. If the Measured Temperature Type was set as RTD then this will be 60 Ohms, as standard and in Thermistor mode it will 3.5mA as standard. Clicking the line opens the Edit Value dialog box, allowing the user to input a different value.
High Input Fail Point	If the ***Prover Temperature - Raw Transmitter Value*** goes above the ***High Input Fail Point*** and the ***Prover Temperature Operating Status*** is set to Use Default on Failure, then the ***Prover Temperature In Use*** will be the fail-over ***Prover Temperature Default Value***. In 4-20mA 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 and 18mA in Thermistor mode. Clicking the line opens the Edit Value dialog box, allowing the user to input a different value.

8.1.5 Prover Pressure (SVP Mode)

If the system has a measured Prover Pressure configured (see Section 7.1.2 I/O Assignments – Process Inputs (SVP Mode)) the display points associated with the Prover Pressure are shown on the previous page.

If no Prover Pressure is configured a menu showing only the override value will be displayed.

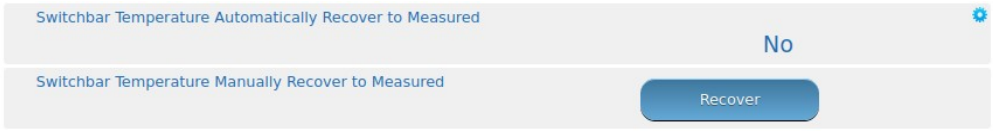
Prover Pressure In Use	This display point shows the pressure being used in the calculations & reports. This may be a live value, a manual override value or a (fail-over) default, depending upon the Operating Status in use.
Prover Pressure 4mA Scale Value	This point indicates the pressure represented by 4mA. Clicking this line opens the dialog box allowing an alternative pressure to be input.
Prover Pressure 20mA Scale Value	This point indicates the pressure represented by 20mA. Clicking this line opens the dialog box allowing an alternative pressure to be input.
Prover Pressure Operating Status	This point indicates the current operating mode. Clicking the line opens the dialog box allowing the user to choose 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 ***Prover Pressure Default Value***.
Prover Pressure Automatically Recover to Measured	If Yes is selected, once the measured value is 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, an extra line is shown when a valid reading is available - it is not shown if no valid reading is available.  At this point the fail-over default value will continue to be used until the user presses the Recover button. Once the Recover button has been pressed, it will disappear, the ***Prover Pressure Operating Status*** will revert to ***Measured*** and the In Use value will also now be the live value.
Prover Pressure Override Value	This is the value used when the ***Prover Pressure Operating Status*** has been set to Always Override. If no transmitter has been assigned to the Prover Pressure, this override value is always used.
Prover Pressure Default Value	This is the value used when the ***Prover 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.

Prover Pressure Transmitter Value with Bias	This is the sum of the ***Prover Pressure Transmitter Value no Bias*** and the ***Prover Pressure Bias Value***.
Prover 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.
Prover Pressure Transmitter Value no Bias	This point displays the live measured Pressure value. This item is for information only and cannot be edited.
Prover Pressure - Raw Transmitter Value	This shows the instantaneous current flow from the 4-20mA Transmitter.
Prover Pressure Low Alarm Limit	This point shows the currently configured Low Alarm limit. If the ***Prover 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.
Prover Pressure High Alarm Limit	This point shows the currently configured High Alarm limit. If the ***Prover Pressure In Use*** goes above the configured value, the High Pressure 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 High Pressure Alarm will ever be raised.
Prover Pressure User 1 Low Alarm Limit	If the ***Prover Pressure In Use*** goes below the User 1 Low Alarm Limit, the User 1 Alarm will be set.
Prover Pressure User 1 High Alarm Limit	If the ***Prover Pressure In Use*** goes above the User 1 High Alarm Limit, the User 1 Alarm will be set.
Prover Pressure User 2 Low Alarm Limit	If the ***Prover Pressure In Use*** goes below the User 2 Low Alarm Limit, the User 2 Alarm will be set.
Prover Pressure User 2 High Alarm Limit	If the ***Prover Pressure In Use*** goes above the User 2 High Alarm Limit, the User 2 Alarm will be set.

Low Input Fail Point	If the ***Prover Pressure - Raw Transmitter Value*** goes below the ***Low Input Fail Point*** and the ***Prover Pressure Operating Status*** is set to Use Default on Failure then the ***Prover Pressure In Use*** will be the fail-over ***Prover Pressure Default Value***. As standard this value will be 3.5mA. Clicking the line opens the Edit Value dialog box, allowing the user to input a different value.
High Input Fail Point	If the ***Prover Pressure - Raw Transmitter Value*** goes above the ***High Input Fail Point*** and the ***Prover Pressure Operating Status*** is set to Use Default on Failure then the ***Prover Pressure In Use*** will be the fail-over ***Prover Pressure Default Value***. As standard this value will be 20.5mA. Clicking the line opens the Edit Value dialog box, allowing the user to input a different value.

8.1.6 Switchbar Temperature (SVP Mode)

If the system has a measured Switchbar Temperature configured and has been set to RTD, the Switchbar Temperature menu will be similar to that shown below.

Switchbar Temperature In Use	This display point shows the temperature being used in the calculations & reports. This may be a live value, a manual override value or a (fail-over) default, depending upon the Operating Status in use.
Switchbar Temperature 4mA Scale Value	This point indicates the temperature represented by 4mA. Clicking this line opens the dialog box allowing an alternative temperature to be input. **NOTE:** If the ***Switchbar Temperature Type*** was set as RTD or Thermistor, the point will not appear since the RTD & Thermistor give a direct temperature reading.
Switchbar Temperature 20mA Scale Value	This point indicates the temperature represented by 20mA. Clicking the line opens the dialog box allowing an alternative temperature to be input. **NOTE:** If the ***Switchbar Temperature Type*** was set as RTD or Thermistor, the point will not appear since the RTD & Thermistor give a direct temperature reading.
Switchbar Temperature Operating Status	This point indicates the current operating mode. Clicking the line opens the dialog box allowing the user to choose 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 ***Switchbar Temperature Default Value*.**
Switchbar Temperature Automatically Recover to Measured	If Yes is selected, once the measured value is 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, an extra line is shown when a valid reading is available - it is not shown if no valid reading is available.  At this point the fail-over default value will continue to be used until the user presses the Recover button. Once the Recover button has been pressed, it will disappear, the ***Switchbar Temperature Operating Status*** will revert to ***Measured*** and the In Use value will also now be the live value.
Switchbar Temperature Override Value	This is the value used when the ***Switchbar Temperature Operating Status*** has been set to Always Override. If no transmitter has been assigned to the Switchbar Temperature, this override value is always used.

Switchbar Temperature Default Value	This is the value used when the ***Switchbar 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.
Switchbar Temperature Transmitter Value with Bias	This is the sum of the ***Switchbar Temperature Transmitter Value no Bias*** and the ***Switchbar Temperature Bias Value***.
Switchbar 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.
Switchbar Temperature Transmitter Value no Bias	This point displays the live measured temperature value. This item is for information only and cannot be edited.
Switchbar Temperature - Raw Transmitter Value	This shows the instantaneous current flow from the 4-20mA Transmitter or from the Thermistor circuit. In RTD mode the Ohms value is shown.
Switchbar Temperature Low Alarm Limit	This point shows the currently configured Low Alarm limit. If the ***Switchbar 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.
Switchbar Temperature High Alarm Limit	This point shows the currently configured High Alarm limit. If the ***Switchbar Temperature In Use*** goes above the configured value, the High Temperature 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 High Temperature Alarm will ever be raised.
Switchbar Temperature User 1 Low Alarm Limit	If the ***Switchbar Temperature In Use*** goes below the User 1 Low Alarm Limit the User 1 Alarm will be set.
Switchbar Temperature User 1 High Alarm Limit	If the ***Switchbar Temperature In Use*** goes above the User 1 High Alarm Limit the User 1 Alarm will be set.
Switchbar Temperature User 2 Low Alarm Limit	If the ***Switchbar Temperature In Use*** goes below the User 2 Low Alarm Limit the User 2 Alarm will be set.
Switchbar Temperature User 2 High Alarm Limit	If the ***Switchbar Temperature In Use*** goes above the User 2 High Alarm Limit the User 2 Alarm will be set.

Low Input Fail Point	If the ***Switchbar Temperature - Raw Transmitter Value*** goes below the ***Low Input Fail Point*** and the ***Switchbar Temperature Operating Status*** is set to Use Default on Failure then the ***Switchbar Temperature In Use*** will be the fail-over ***Switchbar Temperature Default Value***. In 4-20mA mode this value will be 3.5mA by default. If the Measured Temperature Type was set as RTD then this will be 60 Ohms, as standard and in Thermistor mode it will 3.5mA as standard. Clicking the line opens the Edit Value dialog box, allowing the user to input a different value.
High Input Fail Point	If the ***Switchbar Temperature - Raw Transmitter Value*** goes above the ***High Input Fail Point*** and the ***Switchbar Temperature Operating Status*** is set to Use Default on Failure, then the ***Switchbar Temperature In Use*** will be the fail-over ***Switchbar Temperature Default Value***. In 4-20mA 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 and 18mA in Thermistor mode. Clicking the line opens the Edit Value dialog box, allowing the user to input a different value.

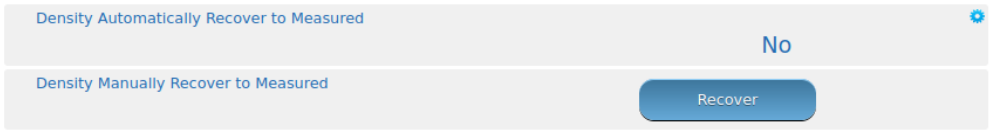
If a Switchbar Temperature is not available, the user can select to use the Prover Temperature with an option offset if they wish. This mode is set under Section 7.1.2 I/O Assignments – Process Inputs (SVP Mode).

The screen will then look like the example below;

Switchbar Temperature In Use	This display point shows the temperature being used in the calculations & reports. In this mode it will be the sum of the ***Prover Temperature In Use*** value and the ***Switchbar Temperature Offset***. The ***Prover Temperature In Use*** may be a live value, a manual override value or a (fail-over) default.
Switchbar Temperature Source	This is shown for indication only, to confirm that the Prover Temperature is being used with an offset and can not be edited.
Prover Temperature In Use	This display point shows the Prover Temperature being used in the calculations & reports. This may be a live value, a manual override value or a (fail-over) default.
Switchbar Temperature Offset	This point shows the offset to be applied to the ***Prover Temperature In Use*** before it is published as the ***Switchbar Temperature In Use***.

8.1.7 Densitometer

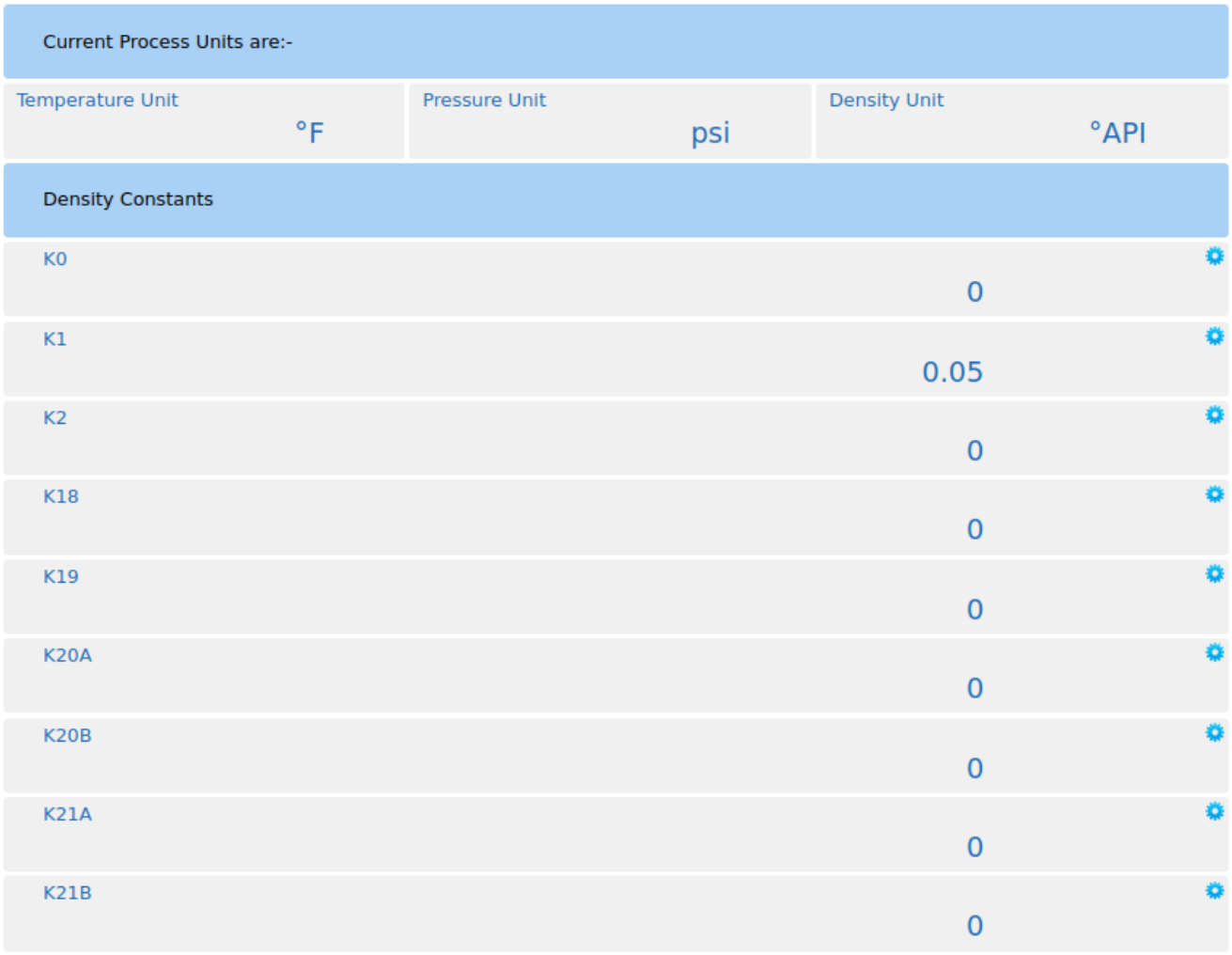
Prover Density In Use	This display point shows the density being used in the calculations & reports. This may be a live value, a manual override value or a (fail-over) default, depending upon the Operating Status in use.
Densitometer Pressure Compensation	This point indicates the pressure compensation being used in the densitometer head. It does not change any calculations but is used on the reports to indicate which correction has been applied. Clicking the line opens the dialog box allowing the user to choose which of the 3 modes are being used: **No Compensation** The density being provided to the NÅNO controller has not been pressure compensated by the density transmitter. **E+H Densitometer Compensation** Communications to the E+H density transmitter will be enabled and the NÅNO controller will write the Prover Pressure to it. The density being provided to the NÅNO controller will then be pressure compensated by the density transmitter. **Micromotion Densitometer Compensation** Communications to the Micromotion density transmitter will be enabled and the NÅNO controller will write the Prover Pressure to it. The density being provided to the NÅNO controller will then be pressure compensated by the density transmitter.
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.
Density 4mA Scale Value	This point indicates the density represented by 4mA. Clicking this line opens the dialog box allowing an alternative density to be input. **NOTE**: This line is only displayed if the Densitometer source is an analog.
Density 20mA Scale Value	This point indicates the density represented by 20mA. Clicking the line opens the dialog box allowing a different density to be input. **NOTE**: This line is only displayed if the Densitometer source is an analog.
Density 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 ***Density Default Value***.
Density Automatically Recover to Measured	If Yes is selected, once the measured value is 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, an extra line is shown when a valid reading is available - it is not shown if no valid reading is available.  At this point the fail-over default value will continue to be used until the user presses the Recover button. Once the Recover button has been pressed, it will disappear, the ***Density Operating Status*** will revert to ***Measured*** and the In Use value will also now be the live value. **NOTE:** This menu item is only visible if an analog Densitometer is in use.
Density Override Value	This is the value used when the ***Density Operating Status*** has been set to ***Always Override***.
Density 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 low and high Input Fail Points.
Density - Raw Transmitter Value	In period mode, this field will show the period of the selected input in microseconds. If Density Source was selected as an Analog Input it will show the equivalent current scaled 4-20mA.
Prover Density Low Alarm Limit	If the ***Prover Density In Use*** goes below the configured value, the Prover 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 Prover Density Low Alarm will ever be raised.
Prover Density High Alarm Limit	If the ***Prover Density In Use*** goes above the configured value, the Prover 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 Prover Density High Alarm will ever be raised.
Prover Density User 1 Low Alarm Limit	If the ***Prover Density In Use*** goes below the User 1 Low Alarm Limit, the User 1 Alarm will be set.
Prover Density User 1 High Alarm Limit	If the ***Prover Density In Use*** goes above the User 1 High Alarm Limit, the User 1 Alarm will be set.
Prover Density User 2 Low Alarm Limit	If the ***Prover Density In Use*** goes below the User 2 Low Alarm Limit, the User 2 Alarm will be set.
Prover Density User 2 High Alarm Limit	If the ***Prover Density In Use*** goes above the User 2 High Alarm Limit, the User 2 Alarm will be set.
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 source is an analog.
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 source is an analog.
Clamp Low Value	This is the lowest Density value that will be passed forward when Period mode has been selected as the Density Source.
Clamp High Value	This is the highest Density value that will be passed forward when Period mode has been selected as the Density Source.

This completes the top-half of the Prover Densitometer menu. The bottom-half is shown on the following page.

8.1.8 The Bottom - Densitometer Coefficient Configuration

This section only shows if the Prover Density is configured as a Period Input. It is also only shown if the System Type is ***Standalone SVP with a Mass Meter*** in the initial setup menu.



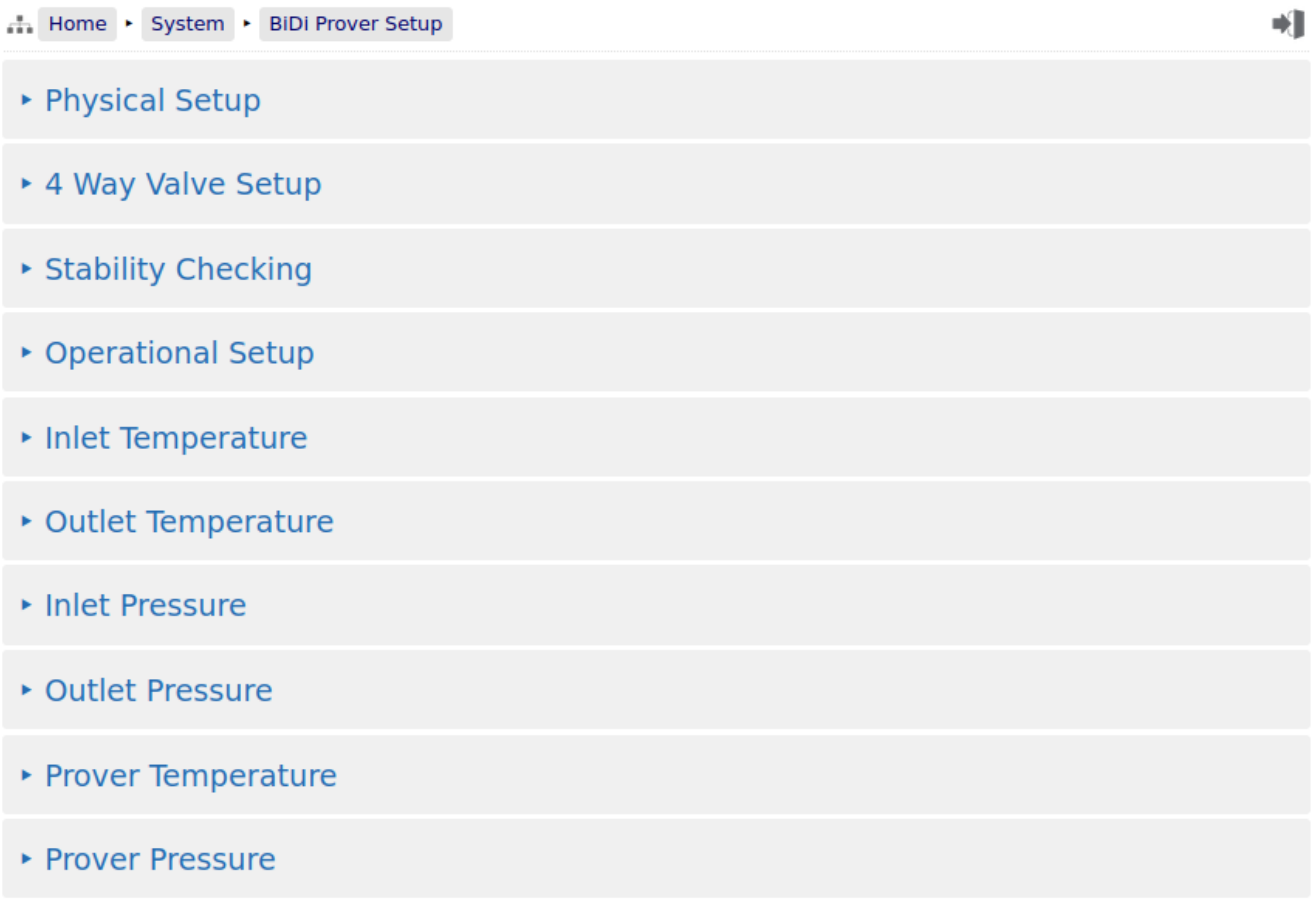
Current Process Units are:- [This is just a heading]	
Temperature Unit	This is for information only, to ensure the appropriate Densitometer calibration constants consistent with the chosen temperature unit are entered.
Pressure Unit	This is for information only, to ensure the appropriate Densitometer calibration constants consistent with the chosen pressure unit are entered.
Density Unit	This is for information only, to ensure the appropriate Densitometer calibration constants consistent with the chosen density unit are entered.
Duty Meter Density Constants [This is just a heading]	
K0 ***K1*** ***K2***	These are the Solatron style calibration constants. Frequently more than one set of K0, K1 & K2 are provided for different ranges of density. **NOTE:** Check the measurement units are consistent with the calibration data.
K18 ***K19***	These are the temperature coefficients used to compensate for the effects of temperature on the Densitometer body.
K20A ***K20B*** ***K21A*** ***K21B***	These are the pressure coefficients used to compensate for the effects of pressure on the Densitometer body.

This ends the setup of the Unified Prover 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 controllers. Additionally, printing a constants log will generate a list of configured data points.

NOTE2: For more information on operating the NÅNO controller, the Reports generated and the Logs and trending data provided as well as the diagnostic information available in the Controller. Go to Section 10 Operating the Unified Prover with the Local Panel.

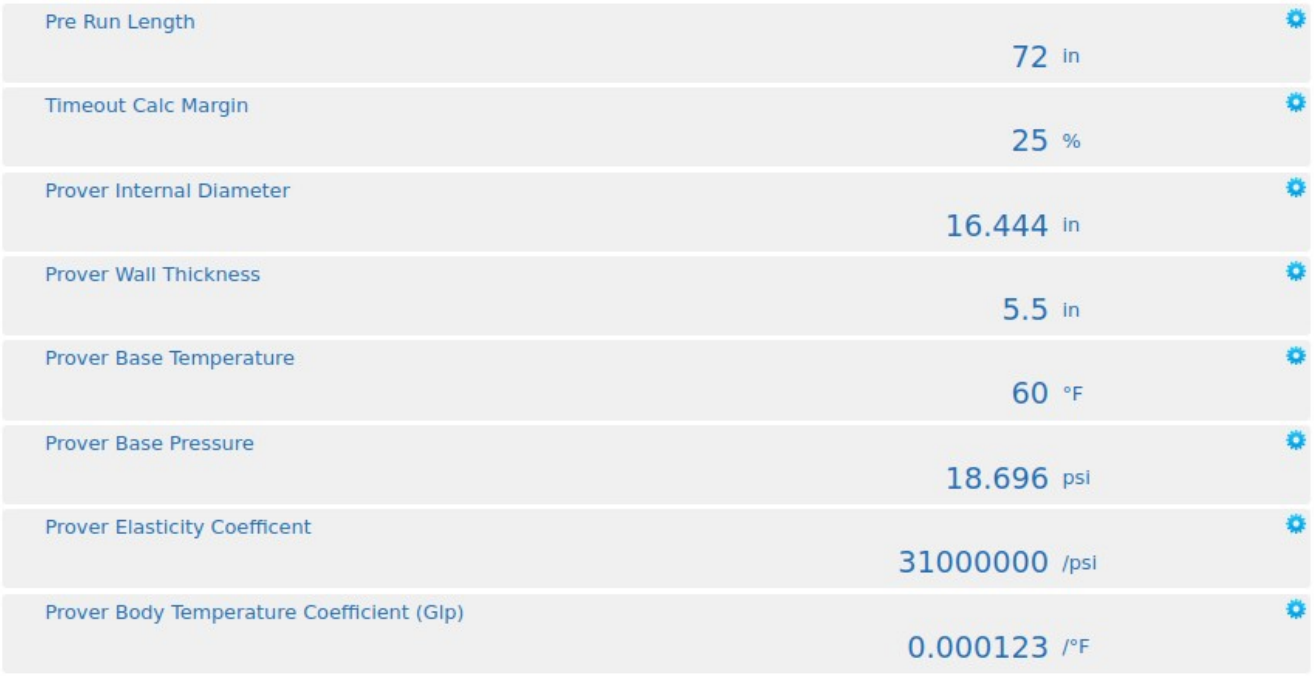
8.2 BiDi Prover Setup



This section has four sub-menus that are always shown and need configuring for the parameters needed to operate the prover application. It also has a further two to four sub-menus for Temperature and Pressure that are visible depending on the configuration made under Section 7.2.2 I/O Assignments – Process Inputs (BiDi Mode)

8.2.1 Physical Setup (BiDi Mode)

As this is a long display, it is split over two pages



Prover Tagname	This is free text for information. It is shown on the relevant reports and can be written or read-back via communications.
Prover Manufacturer	As per ***Prover Tagname***.
Prover Model	As per ***Prover Tagname***.
Prover Serial Number	As per ***Prover Tagname***.
Prover Filtering	This is a patent-pending method of reducing the apparent jitter from the meter pulses and gives a higher stability dual chronometry figure, and can reduce the number of runs needed to reach acceptable uncertainty values. For more information, contact the factory.
Prover Base Volume 1	Enter the calibrated Base Prover Volume (BPV) figure into this field
Prover Base Volume 2	If the prover supports a secondary BPV, it should be entered here. It should then be selected from the ***Base Volume Selection*** entry.
Prover Base Volume 3	If the prover supports a third BPV, it should be entered here. It should then be selected from the ***Base Volume Selection*** entry.
Prover Base Volume 4	If the prover supports a fourth BPV, it should be entered here. It should then be selected from the ***Base Volume Selection*** entry.
Water Draw Date	This is free text for information. It is shown on the relevant reports and can be written or read-back via communications.
Base Volume Selection	This is a radio button to select which BPV should be used by the prover calculations.
Base Volume In Use	This field is read-only and confirms the BPV used by the prover calculations.

Pre Run Length	This is the length of pipework between the launch chamber and the detector. This value is used in conjunction with the calculated flow rate and the pipe diameter to calculate the time it should take for the sphere to reach the detector from leaving the launch chamber. A tolerance can be added to this time by entering a percentage value in the ***Timeout Calc Margin*** entry.
Timeout Calc Margin	This is used to add a tolerance to the calculated time it should take for the sphere to reach the detector after leaving the launch chamber and also the calculated time between the detectors. Calculating these times saves having to adjust them based on the flow rate at the time of proving.
Prover Internal Diameter	The prover internal diameter should be entered here. This figure is used in conjunction with the prover temperature to compensate the prover volume for the effects of temperature.
Prover Wall Thickness	The prover wall thickness should be entered here. This figure is used in conjunction with the prover temperature to compensate the prover volume for the effects of temperature.
Prover Base Temperature	Enter the Base (Reference) temperature given for the prover coefficients.
Prover Base Pressure	Enter the Base (Reference) pressure given for the prover coefficients.
Prover Elasticity Coefficent	The Prover Elasticity should be entered here, and this is used in conjunction with the measured pressure to compensate the prover volume for the effects of pressure. Ensure the coefficient units entered match those selected.
Prover Body Temperature Coefficient (Glp)	The Prover Body Temperature Coefficient should be entered here, and this is used in conjunction with the measured temperature to compensate the prover volume for the effects of Temperature. Ensure the coefficient units entered match those selected.

8.2.2 4 Way Valve Setup (BiDi Mode)

<table>
<tr><td>State</td><td>This point indicates the current valve position. Clicking the line opens the dialog box allowing the user to select which way to drive the valve:

Drive Forward

This will set the 4 Way Valve Forward Command digital output. This will remain active until either the valve position is achieved or the Motor On Timeout Period has expired.

Drive Reverse

This will set the 4 Way Valve Reverse Command digital output. This will remain active until either the valve position is achieved or the Motor On Timeout Period has expired.

Valid State values are:

COMMAND FORWARD The Valve has been commanded to move into the Forward position.

COMMAND REVERSE The Valve has been commanded to move into the Reverse position.

MOVING FORWARD The Valve has been commanded to move into the Forward position and the status inputs indicate that it is moving.

MOVING REVERSE The Valve has been commanded to move into the Reverse position and the status inputs indicate that it is moving.

FORWARD The Valve indicates that it is in the Forward position.

FORWARD - LEAKING Between the start and end detectors, if the 4 Way Valve Leak Status reports as Not Sealed and the valve is in the Forward position, the valve state will change from FORWARD to FORWARD - LEAKING.

REVERSE The Valve indicates that it is in the Reverse position.

REVERSE - LEAKING Between the start and end detectors, if the 4 Way Valve Leak Status reports as Not Sealed and the valve is in the Reverse position, the valve state will change from REVERSE to REVERSE - LEAKING.

ILLEGAL The Valve indicates that it is not in either the Forward or Reverse position and the status inputs are giving an invalid position. If the valve is currently being driven into the Forward or Reverse position, the ILLEGAL state will be shown once the Motor On Timeout Period has expired.

MOVING The Valve indicates that it is moving but it has not been commanded to.</td></tr>
<tr><td>Motor On Timeout Period</td><td>This is the maximum time set in seconds that the valve command output will be energized for. If the valve achieves position before this timeout, the output will be de-energized.</td></tr>
</table>

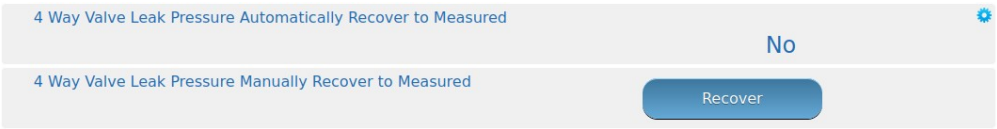
<table>
<tr><td>Sensing</td><td>This point allows configuration of the valve inputs. There are two modes:
Break on Position In this mode, the valve status is failsafe as while the valve is moving both the forward and reverse status are energized. With both inputs de-energized, the valve will show an Illegal position and an alarm raised. See below.
Make on Position In this mode, the valve status is signified when the limit switch is made. While the valve is moving both the forward and reverse status are de-energized. With both inputs energized, the valve will show an Illegal position and an alarm raised. See below.
<table><tr><th colspan="3">Break on Position</th></tr><tr><th>Position</th><th>Forward Status</th><th>Reverse Status</th></tr><tr><td>Forward</td><td>0</td><td>1</td></tr><tr><td>Moving</td><td>1</td><td>1</td></tr><tr><td>Reverse</td><td>1</td><td>0</td></tr><tr><td>Illegal</td><td>0</td><td>0</td></tr></table><table><tr><th colspan="3">Make on Position</th></tr><tr><th>Position</th><th>Forward Status</th><th>Reverse Status</th></tr><tr><td>Forward</td><td>1</td><td>0</td></tr><tr><td>Moving</td><td>0</td><td>0</td></tr><tr><td>Reverse</td><td>0</td><td>1</td></tr><tr><td>Illegal</td><td>1</td><td>1</td></tr></table></td></tr>
<tr><td>4 Way Valve Leak Check Method</td><td>This point allows configuration of how valve leak checking is performed. There are three options:
Digital In this mode, the valve seal is reported using a digital status. an active signal signified that the valve is not leaking.
Analog In this mode, the valve seal is checked against the differential pressure and a rate of change of that pressure. If the pressure changes by more than the 4 Way Valve Leak Maximum Rate Of Change Limit, the valve will report as leaking.
Not Checked In this mode, the valve seal will not be checked and it is assumed to seal every time.</td></tr>
<tr><td>4 Way Valve Leak Status</td><td>This point shows if the valve is sealed or not (only between the detector switches).
Not Sealed If the valve is seen as leaking, it will be shown as Not Sealed and depending on the Abort on Valve Leak setting may cause the prove to abort.
Sealed This is the normal operation and seen as a pass for the prove sequence.</td></tr>
<tr><td>Abort on Valve Leak</td><td>If the 4 Way Valve Leak Check Method is set to anything other than Not Checked, this point sets if the prove will abort if a leak is observed between the start and end detectors.
Simple option of No or Yes.
NOTE: An alarm is always raised regardless of this setting.</td></tr>
</table>

4 Way Valve Leak Maximum Rate Of Change	At the start of the valve seal checking, the ***4 Way Valve Analog Leak Pressure*** is snapshot, then checked that it does not change more than this limit per second, between the start and end detectors. If the pressure does change quicker than the limit, the ***4 Way Valve Leak Status*** will report as ***Not Sealed***.
4 Way Valve Analog Leak Pressure	This is a menu showing the settings and status of the leak pressure.

8.2.2.1 4 Way Valve Leak Pressure (BiDi Mode)

If the system has a measured 4 Way Valve Leak Pressure configured (see Section 8.2.2 4 Way Valve Setup (BiDi Mode)) the display points associated with the 4 Way Valve Leak Pressure will be shown below.

If no Pressure is configured this menu is completely removed.

4 Way Valve Leak Pressure In Use	This display point shows the pressure being used for the leak checking. This may be a live value, a manual override value or a (fail-over) default, depending upon the Operating Status in use.
4 Way Valve Leak Pressure 4mA Scale Value	This point indicates the pressure represented by 4mA. Clicking this line opens the dialog box allowing an alternative pressure to be input.
4 Way Valve Leak Pressure 20mA Scale Value	This point indicates the pressure represented by 20mA. Clicking this line opens the dialog box allowing an alternative pressure to be input.
4 Way Valve Leak Pressure Operating Status	This point indicates the current operating mode. Clicking the line opens the dialog box allowing the user to choose 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 ***4 Way Valve Leak Pressure Default Value***.
4 Way Valve Leak Pressure Automatically Recover to Measured	If Yes is selected, once the measured value is 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, an extra line is shown when a valid reading is available - it is not shown if no valid reading is available.  At this point the fail-over default value will continue to be used until the user presses the Recover button. Once the Recover button has been pressed, it will disappear, the ***4 Way Valve Leak Pressure Operating Status*** will revert to ***Measured*** and the In Use value will also now be the live value.
4 Way Valve Leak Pressure Override Value	This is the value used when the ***4 Way Valve Leak Pressure Operating Status*** has been set to Always Override.
4 Way Valve Leak Pressure Default Value	This is the value used when the ***4 Way Valve Leak 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.
4 Way Valve Leak Pressure Transmitter Value with Bias	This is the sum of the ***4 Way Valve Leak Pressure Transmitter Value no Bias*** and the ***4 Way Valve Leak Pressure Bias Value***.

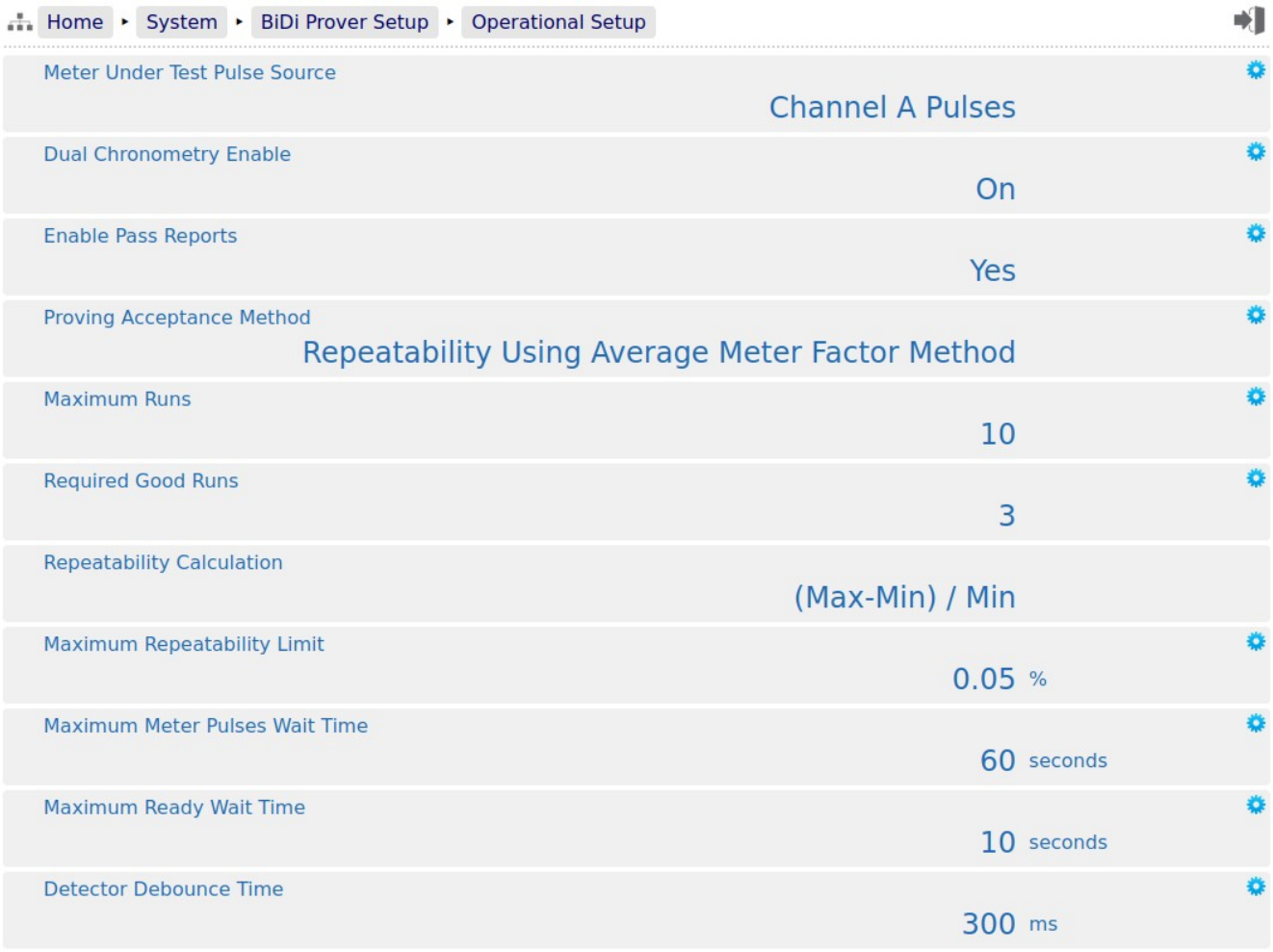
4 Way Valve Leak Pressure Bias Value	This is the Bias or Offset value that is being applied to the measured value. If logged in at Technician level, this value can be viewed and edited. It can also be set by the Technician Menu using the Local Panel. If logged in at Admin level, this is a read-only status display.
4 Way Valve Leak Pressure Transmitter Value no Bias	This point displays the live measured Pressure value. This item is for information only and cannot be edited.
4 Way Valve Leak Pressure - Raw Transmitter Value	This shows the instantaneous current flow from the 4-20mA Transmitter.
4 Way Valve Leak Pressure Low Alarm Limit	This point shows the currently configured Low Alarm limit. If the ***4 Way Valve Leak 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.
4 Way Valve Leak Pressure High Alarm Limit	This point shows the currently configured High Alarm limit. If the ***4 Way Valve Leak Pressure In Use*** goes above the configured value, the High Pressure 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 High Pressure Alarm will ever be raised.
4 Way Valve Leak Pressure User 1 Low Alarm Limit	If the ***4 Way Valve Leak Pressure In Use*** goes below the User 1 Low Alarm Limit, the User 1 Alarm will be set.
4 Way Valve Leak Pressure User 1 High Alarm Limit	If the ***4 Way Valve Leak Pressure In Use*** goes above the User 1 High Alarm Limit, the User 1 Alarm will be set.
4 Way Valve Leak Pressure User 2 Low Alarm Limit	If the ***4 Way Valve Leak Pressure In Use*** goes below the User 2 Low Alarm Limit, the User 2 Alarm will be set.
4 Way Valve Leak Pressure User 2 High Alarm Limit	If the ***4 Way Valve Leak Pressure In Use*** goes above the User 2 High Alarm Limit, the User 2 Alarm will be set.

Low Input Fail Point	If the ***4 Way Valve Leak Pressure - Raw Transmitter Value*** goes below the ***Low Input Fail Point*** and the ***4 Way Valve Leak Pressure Operating Status*** is set to Use Default on Failure then the ***4 Way Valve Leak Pressure In Use*** will be the fail-over ***4 Way Valve Leak Pressure Default Value***. As standard this value will be 3.5mA. Clicking the line opens the Edit Value dialog box, allowing the user to input a different value.
High Input Fail Point	If the ***4 Way Valve Leak Pressure - Raw Transmitter Value*** goes above the ***High Input Fail Point*** and the ***4 Way Valve Leak Pressure Operating Status*** is set to Use Default on Failure then the ***4 Way Valve Leak Pressure In Use*** will be the fail-over ***4 Way Valve Leak Pressure Default Value***. As standard this value will be 20.5mA. Clicking the line opens the Edit Value dialog box, allowing the user to input a different value.

8.2.3 Stability Checking (BiDi Mode)

See Section 8.1.2 Stability Checking (SVP Mode) as the operation/settings are identical.

8.2.4 Operational Setup (BiDi Mode)



Meter under Test Pulse Source	This defines the pulse source to use for the prove: **Raw Pulse Bus** Takes the pulses and rate from the Raw Pulse Bus inputs. **Channel A Pulses** Takes the pulses and rate from the Channel A pulse inputs. **Channel B Pulses** Takes the pulses and rate from the Channel B pulse inputs.
Dual Chronometry Enable	Enabling Dual Chronometry enables the NÅNO controller to publish fractional pulse information for between the detectors. With the Dual Chronometry turned OFF, the pulse count only reports the whole pulses received. For further information on this topic, please refer to the factory.
Enable Pass Reports	This is mainly used for debugging purposes and generates a report at the end of every run. As the unit is configured as a BiDi Prover, the report will contain two passes. Pass 1 is the Forward pass and Pass 2 the Reverse pass.
Proving Acceptance Method	There are 3 methods available. These are: 1) Repeatability Using Average Meter Factor Method 2) Repeatability Using Average Data Method 3) Uncertainty If options 1 or 2 have been selected, the prover will be launched to provide a set of consecutive prove runs that meet the requested repeatability limit. The number of prove runs required is configured using the Required Good Runs field shown below. If option 3 has been selected (Uncertainty), a minimum of 3 prove runs will be generated, these results will be tested against the uncertainty limit. If the match fails, then another prove run will be commanded. The uncertainly will then be calculated & checked for both the last 3 runs and all four runs. Again if this fails then this repeats with the last 3, 4 and 5 runs checked, and so on.
Maximum Runs	This is a radio button selection, allowing between one and thirty runs maximum. Even if repeatability isn't reached, the prover will not exceed this number of runs
Required Good Runs	This is only shown if a repeatability mode has been selected. This is a radio button selection, allowing between one and ten runs maximum.
Repeatability Calculation	This is only shown if a repeatability mode has been selected. In the Unified Prover application, the (Max-Min) / Min method is always utilized.
Maximum Repeatability Limit	This is only shown if a repeatability mode has been selected. The required maximum repeatability figure, in percentage, should be entered here. The prover will continue to run passes until either the desired repeatability is achieved or the number of prove runs reaches the ***Maximum Runs*** limit.
Maximum Uncertainty Limit	This is only shown if the uncertainty mode has been selected. The required maximum uncertainty value should be entered here as a percentage.
Maximum Meter Pulse Wait Time	This is the maximum time allowed for the NÅNO controller to register pulses are present on ***Meter under Test Pulse Source***. If a flow rate not registered within this time, the prove will abort.
Maximum Ready Wait Time	This is the maximum time allowed from the start of a prove for the ready signal to be seen from the prover. If the ***Prover Ready*** is not seen within this time, the prove will abort.

Detector Debounce Time	This inhibits multiple detector 'hits' from being registered on the NÅNO controller due to noisy detector contacts. After recording the first detector, the input is ignored for this time.

8.2.5 Prover/Inlet/Outlet Temperature (BiDi Mode)

The option of whether you see Prover Temperature or Inlet & Outlet Temperature is controlled by the Prover Temperature Location input under Section 7.2.2 I/O Assignments – Process Inputs (BiDi Mode).

Single Value: Prover Temperature

Inlet & Outlet: Inlet Temperature & Outlet Temperature

See Section 8.1.4 Prover Temperature (SVP Mode) as the operation/settings are identical.

8.2.6 Prover/Inlet/Outlet Pressure (BiDi Mode)

The option of whether you see Prover Pressure or Inlet & Outlet Pressure is controlled by the Prover Pressure Location input under Section 7.2.2 I/O Assignments – Process Inputs (BiDi Mode)

Single Value: Prover Pressure

Inlet & Outlet: Inlet Pressure & Outlet Pressure

See Section 8.1.5 Prover Pressure (SVP Mode) as the operation/settings are identical.

9 Stage 6 of 6: Inputting Meter Data

The display tree allows for manual input of the Meter Data or this can be sent from a Supervisory Computer to the unit using the OPC-UA communications link.

The required information is common regardless of the prover type.

Below is an example of the portion of the menu if the ***Meter Temperature Source*** and ***Meter Pressure Source*** are set to ***Use Fixed Value***;

Calculation Type	This allows the user to enter which Liquid Volume Correction Calculation is being performed. The choices allow for a wide variety of 2012 API CH11.1 and 2019 API Ch11.2.4 (2007 GPA TP27) options to be selected, along with a Water option.
Rounding	This allows the results to be rounded to the appropriate level. There are three options: **None** — Produces results to the highest resolution possible. **API Standard** — Produces results to conform to the API Standards. **Calculation Standard** — Produces results to conform to the specific Calculation Standard.
Manually Entered Meter Density	This is the manually entered density from a sample.
Manually Entered Meter Density Temperature	This is the manually entered temperature of the product when sampled.
Apply Hydrometer Correction?	This allows a user to decide whether or not to apply the hydrometer correction to the entered sample density.
Meter Temperature Source	This allows the source of the Meter Temperature to be selected. There are two options: **Use Fixed Value** — Use the fixed value entered into the ***Meter Temperature*** field. **Use Prover Value With a Fixed Offset** — Use the ***Selected Meter Temperature*** below calculated using the ***Prover Temperature*** value along with the ***Temperature Offset*** values also below.

Prover Temperature	This is provided for information purposes only and shows the In Use Prover Temperature. If using an Inlet and Outlet Temperature, this will be the average of the two. This is only shown when the ***Meter Temperature Source*** field is set to ***Use Prover Value With a Fixed Offset***.
Temperature Offset	This is the offset to apply to the Prover Temperature to calculate a pseudo Meter Temperature for the calculations and reports. This is only shown when the ***Meter Temperature Source*** field is set to ***Use Prover Value With a Fixed Offset***.
Selected Meter Temperature	This is the pseudo Meter Temperature calculated from the Prover Temperature and entered offset. This is only shown when the ***Meter Temperature Source*** field is set to ***Use Prover Value With a Fixed Offset***.
Meter Temperature	This is only shown when the ***Meter Temperature Source*** field is set to ***Use Fixed Value*** and is the fixed value to use.
Meter Pressure Source	This allows the source of the Meter Pressure to be selected. There are two options: **Use Fixed Value** — Use the fixed value entered into the ***Meter Pressure*** field. **Use Prover Value With a Fixed Offset** — Use the ***Selected Meter Pressure*** below calculated using the ***Prover Pressure*** value along with the ***Pressure Offset*** values also below.
Prover Pressure	This is provided for information purposes only and shows the In Use Prover Pressure. If using an Inlet and Outlet Pressure, this will be the average of the two. This is only shown when the ***Meter Pressure Source*** field is set to ***Use Prover Value With a Fixed Offset***.
Pressure Offset	This is the offset to apply to the Prover Pressure to calculate a pseudo Meter Pressure for the calculations and reports. This is only shown when the ***Meter Pressure Source*** field is set to ***Use Prover Value With a Fixed Offset***.
Selected Meter Pressure	This is the pseudo Meter Pressure calculated from the Prover Pressure and entered offset. This is only shown when the ***Meter Pressure Source*** field is set to ***Use Prover Value With a Fixed Offset***.
Meter Pressure	This is only shown when the ***Meter Pressure Source*** field is set to ***Use Fixed Value*** and is the fixed value to use.

<table>
<tr><td>Vapor Pressure Calculation Mode</td><td>This allows either a fixed or calculated vapor pressure to be used. There are three options:
Use Product Table Vapor Pressure — Use the Vapor Pressure (Pe) entered below.
Calculate Vapor Pressure — Use the Vapor Pressure calculated from API TP15.
Calculate Vapor Pressure (Extended Limits) — Use the Vapor Pressure calculated from API TP15 but allow a wider temperature range than the standard.</td></tr>
<tr><td>Vapor Pressure (Pe)</td><td>Manually entered Vapor Pressure value to be used in the calculations when the Vapor Pressure Calculation Mode is set to Use Product Table Vapor Pressure.</td></tr>
<tr><td>Reference Temp</td><td>The Reference Temperature to be used. Typically 60°F, 15°C or 20°C.</td></tr>
<tr><td>Product Name</td><td>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 Product Name is printed onto the reports.</td></tr>
<tr><td>Volume K Factor Unit
or
Mass K Factor Unit</td><td>Depending on the setting of System Type (see Section 4.2 Site/Location Setup) This sets the expected unit for the K Factor. Options are:
<table><tr><th>Volume K Factor Unit</th></tr><tr><td>pulses/litre</td></tr><tr><td>pulses/m3</td></tr><tr><td>pulses/bbl</td></tr><tr><td>pulses/US Gallon</td></tr></table><table><tr><th>Mass K Factor Unit</th></tr><tr><td>pulses/kg</td></tr><tr><td>pulses/tonne</td></tr><tr><td>pulses/ton</td></tr><tr><td>pulses/lb</td></tr><tr><td>pulses/1000 lbs</td></tr></table></td></tr>
<tr><td>K Factor Type</td><td>This is provided for information purposes only. It is set by the choice of System Type (see Section 4.2 Site/Location Setup).</td></tr>
<tr><td>K Factor</td><td>This allows the in use K Factor value to be entered from the Meter Under Test.</td></tr>
<tr><td>Meter Serial Number</td><td>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 Meter Serial Number is printed onto the reports.</td></tr>
<tr><td>Meter Manufacturer</td><td>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 Meter Manufacturer is printed onto the reports.</td></tr>
<tr><td>Meter Model</td><td>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 Meter Model is printed onto the reports.</td></tr>
<tr><td>Meter Size</td><td>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 Meter Size is printed onto the reports.</td></tr>
</table>

Meter Tagname	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 Meter Tagname is printed onto the reports.
Meter 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 Meter Owner/Operator is printed onto the reports.
Meter 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 Meter Location is printed onto the reports.
Meter Location 2	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. Meter Location 2 is printed onto the reports.

This ends the setup of the Unified Prover 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 controllers. Additionally, printing a constants log will generate a list of configured data points.

NOTE2: For more information on operating the NÅNO controller, the Reports generated and the Logs and trending data provided as well as the diagnostic information available in the Controller. Go to Section 10 Operating the Unified Prover with the Local Panel

10 Operating the Unified Prover with the Local Panel

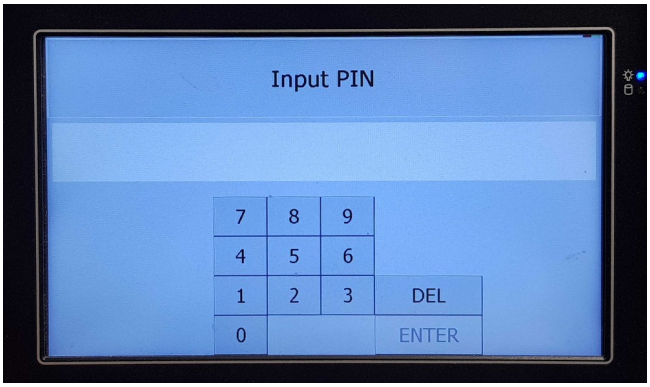
The Unified Prover application can be driven from the local panel interface or from the web interface.

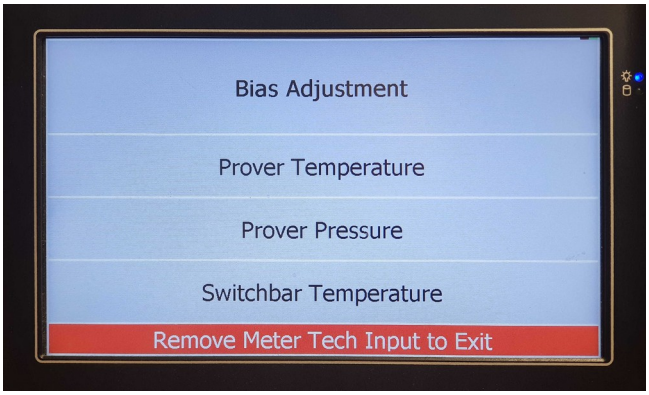
The web interface is a mimic of the local panel, therefore the same details apply.

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.

The Local Panel can be used in technician mode to set the analog bias values. To enter technician mode, the Metering Tech Mode Digital Input must be active. To determine which Digital Input is assigned, see Home ▸ System ▸ I/O - SVP ▸ Assignment/Settings - Digital I/O or Home ▸ System ▸ I/O - SVP ▸ Assignment/Settings - Digital I/O depending on prover type configured.

If security has been configured in Home ▸ System ▸ Initial Setup ▸ Site/Location Setup ▸ Security Setup then the operator will have to provide the correct credentials to get to the Technician menu. In the screenshot below on the left, the Single Pin security option has been selected, and the application is waiting for the correct pin to be entered. Once the credentials have been satisfied, the technician menu is displayed as shown below on the right hand side.



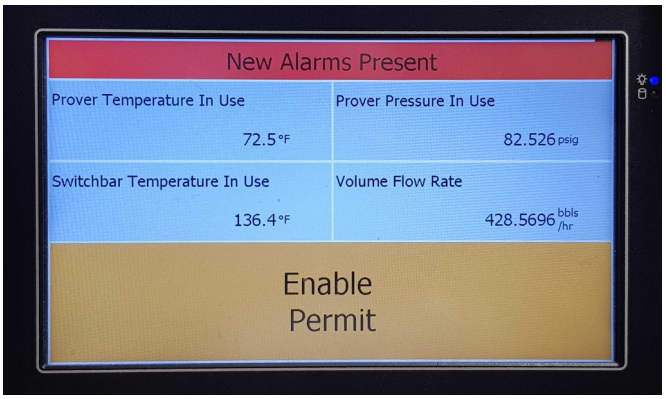


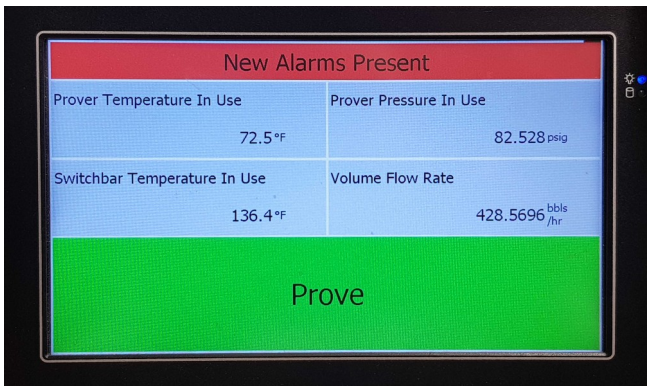
If the Meter Tech Mode Digital Input is *NOT* active, then the default screen will be displayed which shows the prover temperature and pressure, and the current flow rate.

The prover has a global interlock which will prevent a prove cycle being started from the Local Panel, the website or the Meter Run (In an integrated XML-Link system).

The Run Permit Input is configured here:

Home ▸ System ▸ I/O - SVP ▸ Assignment/Settings - Digital I/O or Home ▸ System ▸ I/O - BiDi ▸ Assignment/Settings - Digital I/O depending on prover type.





Once the Permit is given, proves are enabled.

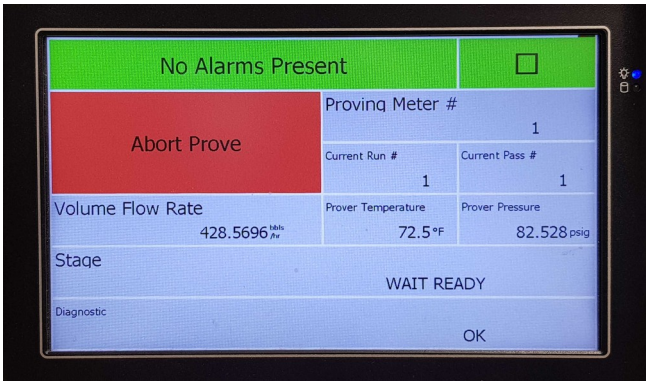
The operator may well want to view and accept alarms before starting a proved, and clicking the top line of the display will shown the alarms currently active.

The operator can accept any alarm by clicking on the individual line, or can accept all alarms by clicking the Accept All line.

When the operator is satisfied all is well, the prove can be started by clicking the large green Start Prove button.

Once the prove has commenced, the previous prove information will be cleared and the Start Prove button changes to Abort Prove

The screenshot below shows the Local Panel as the prove commences, and it indicates the Pass and Run number, as well as the Prover temperatures and pressure.



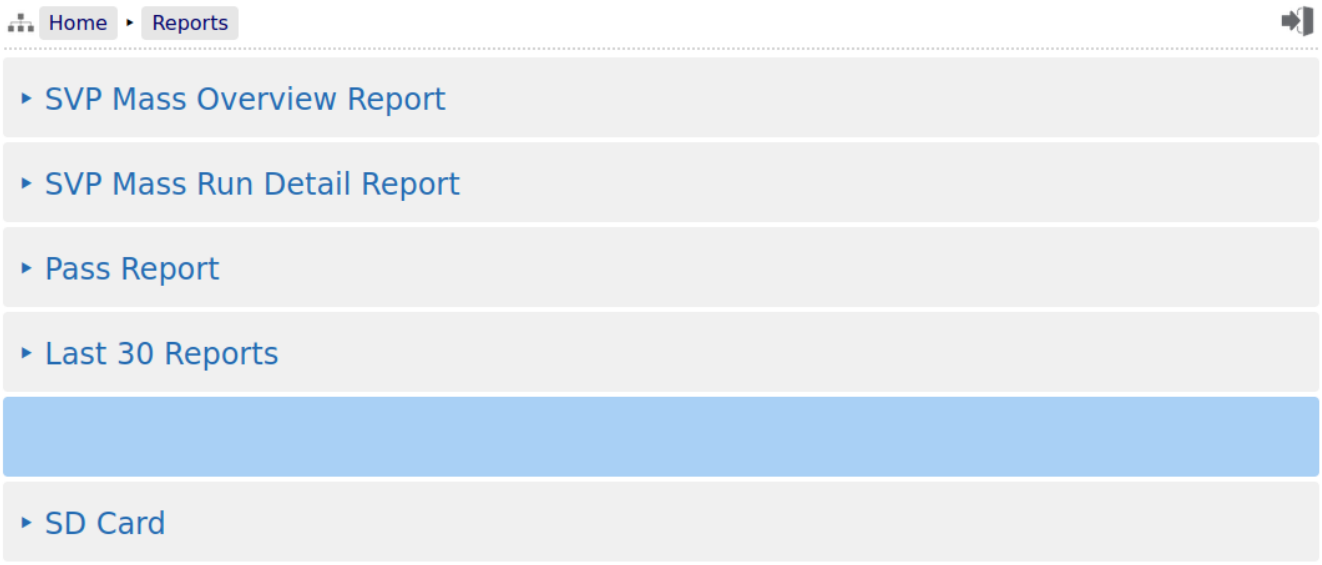
Once the prove cycle has completed, the box will return to a green box and the next prove can be requested.

11 Reports

There are three different sets of reports depending upon the prover and meter types selected. The three different modes are SVP Volumetric, SVP Mass or BiDi Volume. These settings are made here:

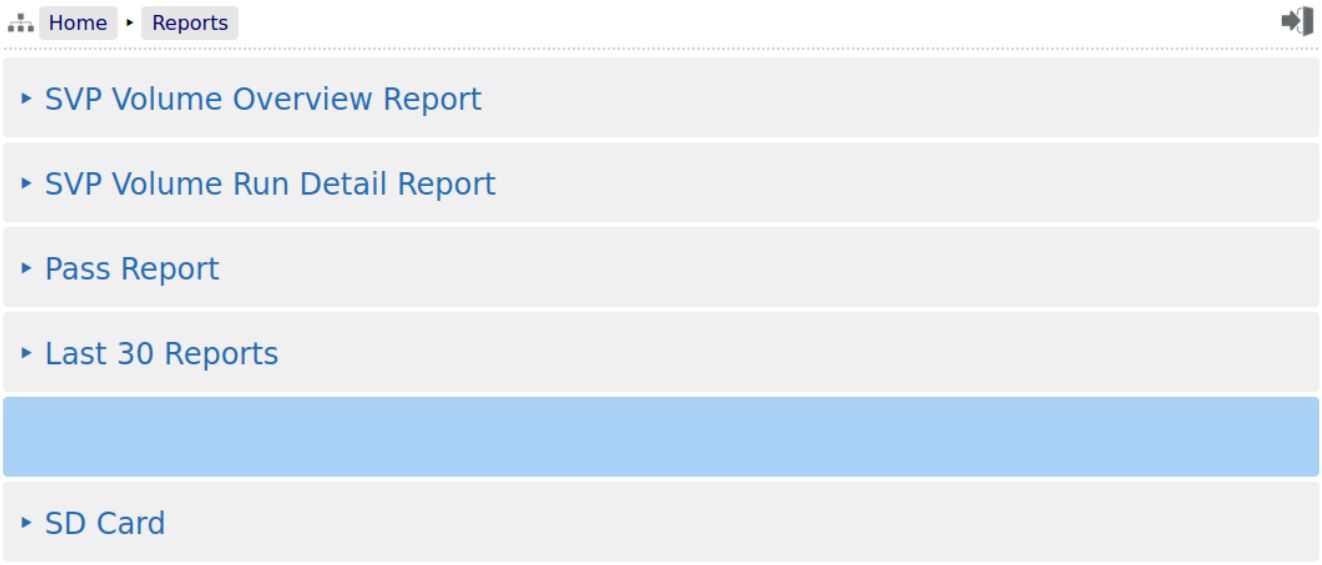
Home ▸ System ▸ Initial Setup ▸ Site/Location Setup ▸ System Type

The screenshot below shows the reports when the Prover is set to SVP and the K Factor is set to Mass.

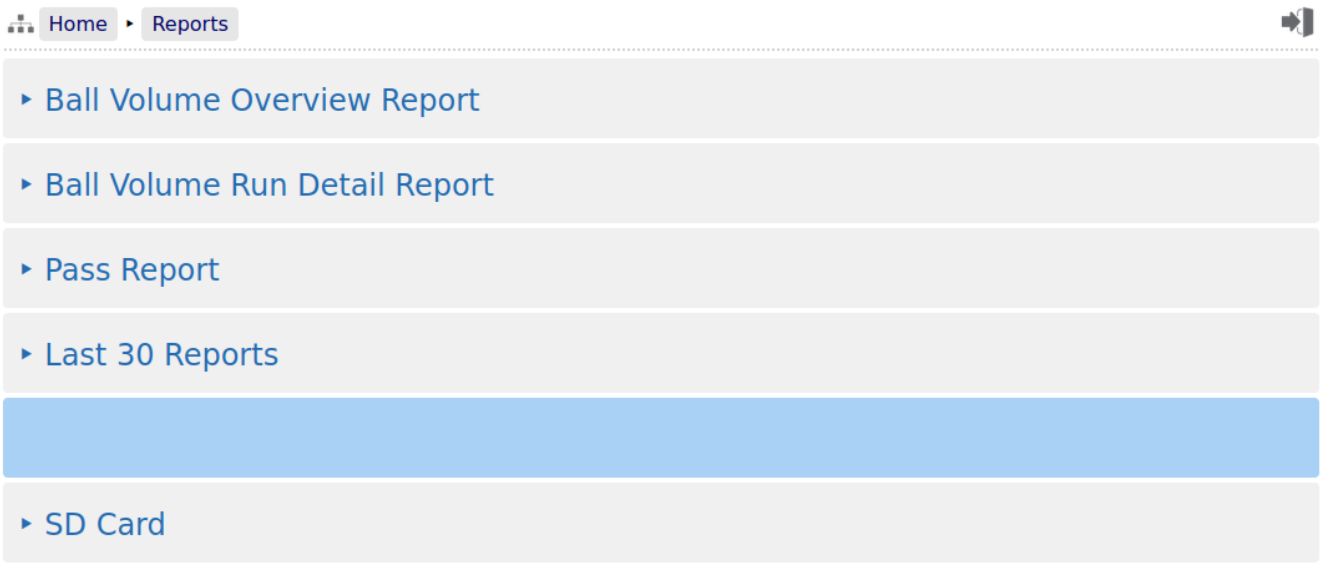


The Unified Prover application generates two reports per prove cycle, the Overview Report and the Run Detail report, which can show all 30 runs.

If the Prover is set to SVP and the K Factor is set to Volumetric, then Volume reports will be generated.



Finally, if the Prover is set to BiDi and the K Factor is set to Volumetric, again the Volume reports will also be generated.



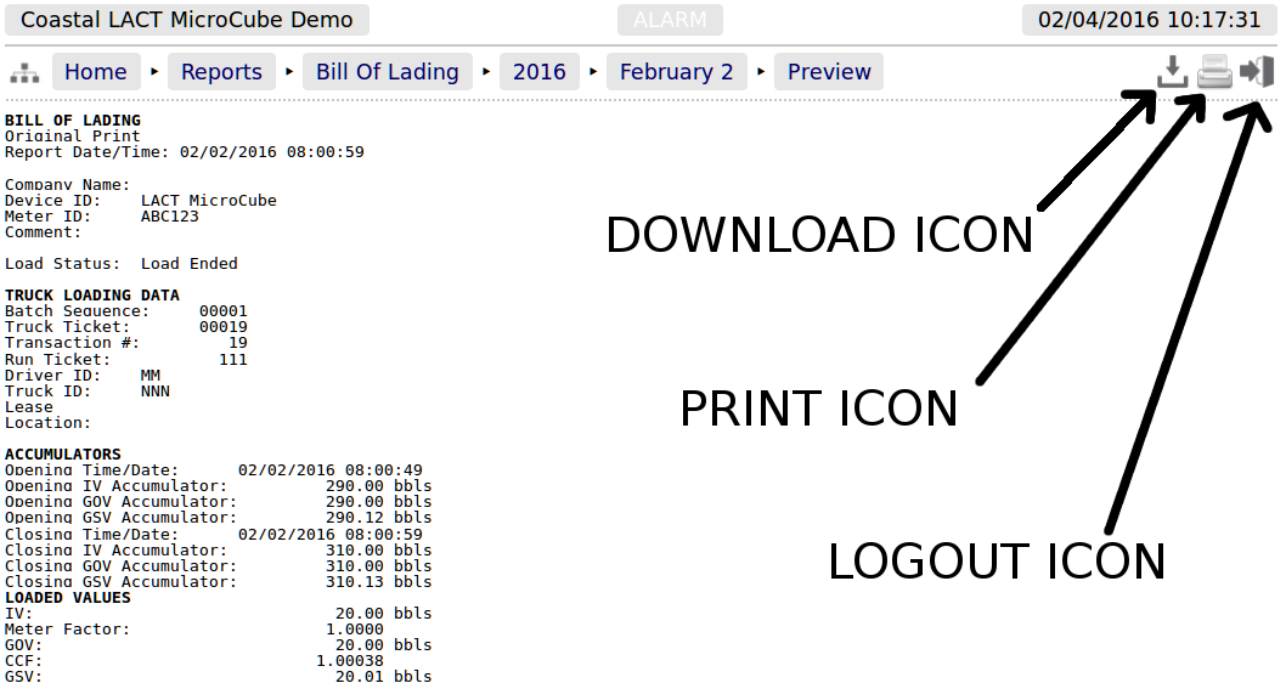
SVP Volume Overview Report	If the K Factor is set to Volumetric, the SVP Volume Overview report will be generated at the end of the proving cycle.
SVP Volume Run Report	If the K Factor is set to Volumetric, the SVP Volume Run report will be generated at the end of the proving cycle.
SVP Mass Overview Report	When the K Factor is set to Mass, the SVP Mass Overview report will be generated at the end of the proving cycle.
SVP Mass Run Detail Report	When K Factor is set to Mass, the SVP Mass run report will be generated at the end of the proving cycle.
Ball Volume Overview Report	If the K Factor is set to Volumetric, the Ball Volume Overview report will be generated at the end of the proving cycle.
Ball Volume Run Report	If the K Factor is set to Volumetric, the Ball Volume Run report will be generated at the end of the proving cycle.
Pass Report	If enabled, at the end of a pass (in SVP mode) and at the end of a run (in BiDi mode) a report will be printed. This is mainly used for debugging purposes however can be used all the time if wished.
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.

11.1 Last 30 Reports

The last 30 Reports view shows either the Mass or Volumetric 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. Download formats include Plain Text and PDF.

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.



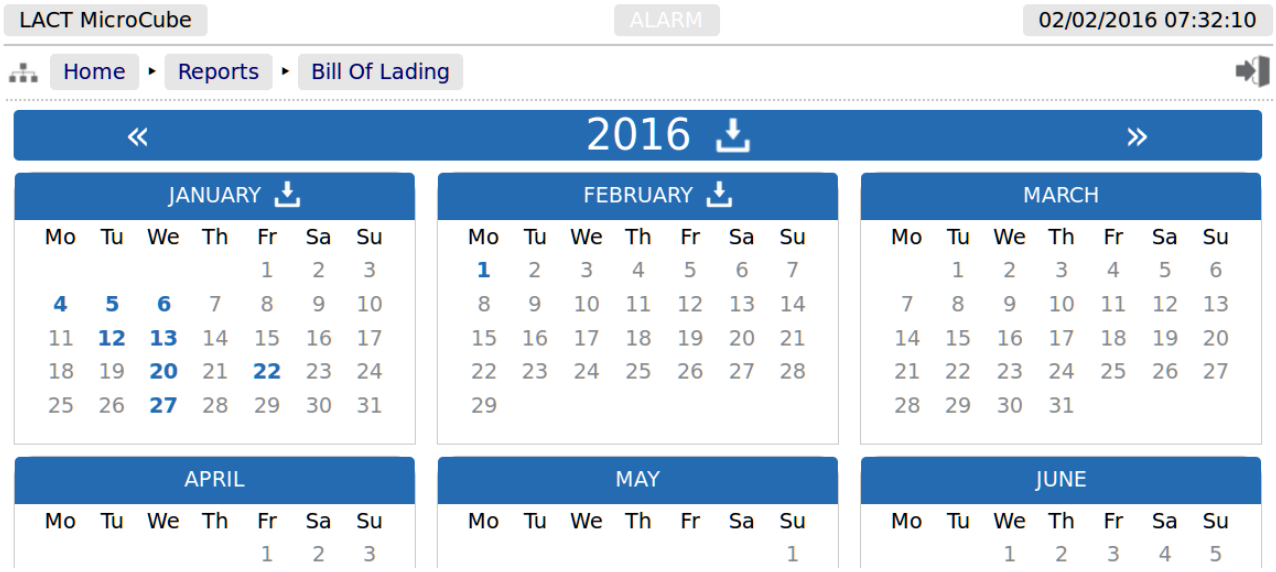
If reports are downloaded to the PC as plain text files, the text attributes will be shown in the downloaded text, for example <b> for bold and <u> for underline.

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.

11.2 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.

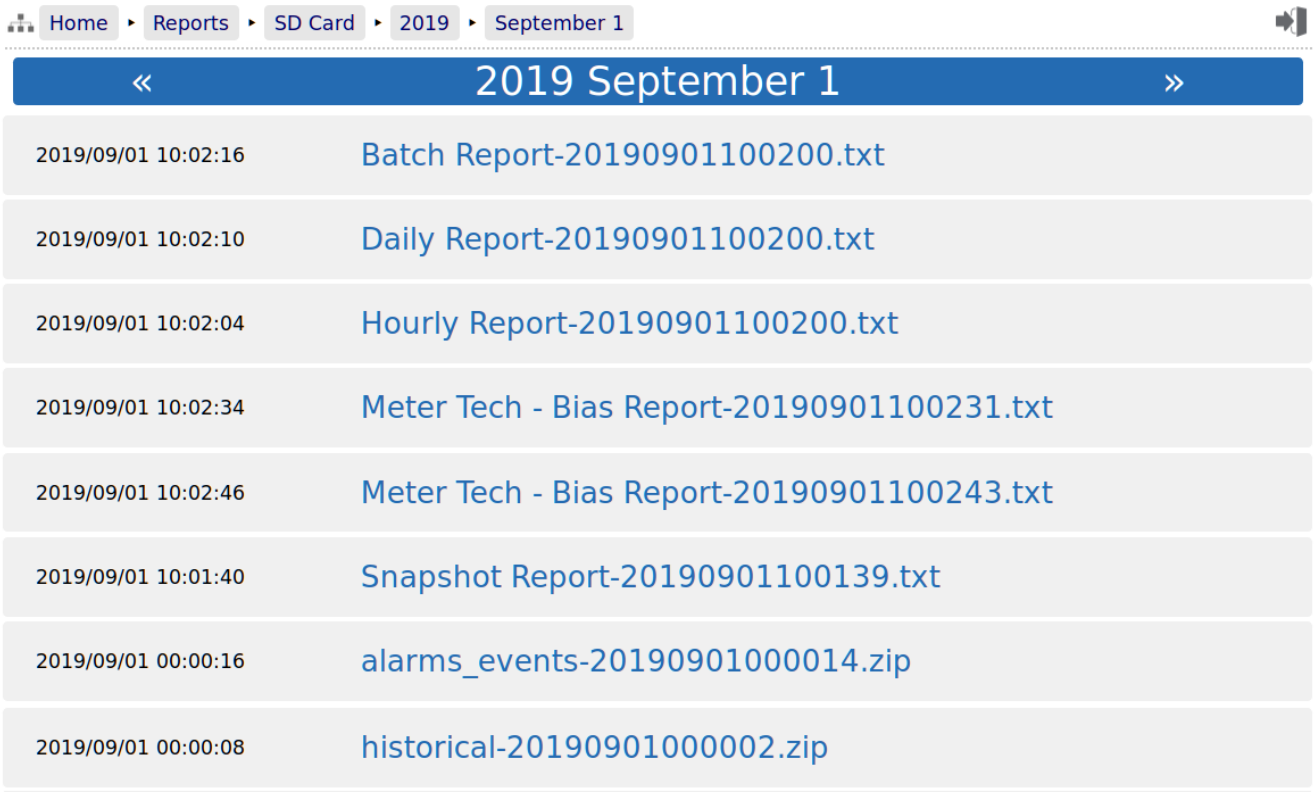
Each year is split into months and, by default, each day of the month is shown in a light gray typeface. If there any reports associated with the day, then the day will be shown in a bold blue typeface. If there are any reports in the month, then the download icon will be shown in Month header. Clicking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

11.3 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:

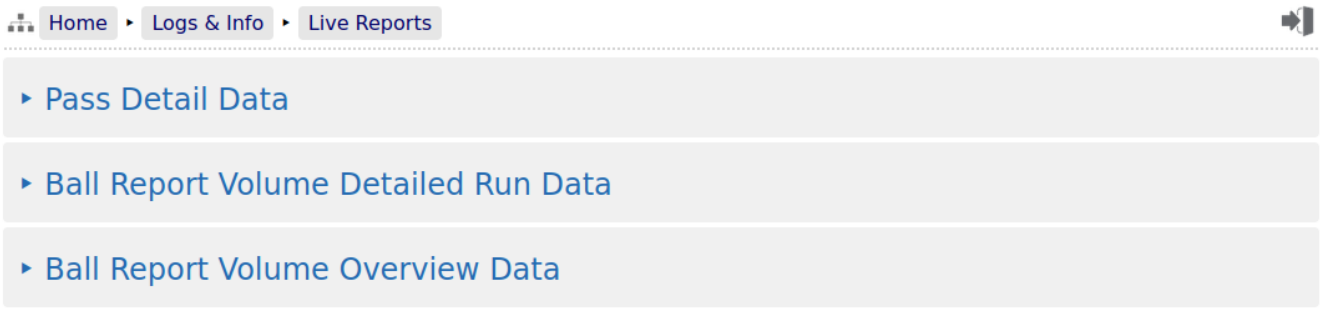


12 Logs and Info

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

Live Reports	This submenu shows the live pass, run and overview reports
System Information	Low level information regarding the hardware and software in use, as explained in Section 12.2 System Information.
Alarm Logs	The comprehensive Alarm Logs are explained in Section 12.3 Alarm Logs.
Events Logs	There are 5 categories of events, detailed in Section 12.4 Event Logs.
Constants Log	The constant log is detailed in Section 12.5 Constants Log.
Trending	The Unified Prover application has an in-built data logger, which runs independently from the Unified Prover. The historical data from the logger can be downloaded for analysis, or the trends can be viewed graphically via the embedded web-server. See below in Section 12.6 Trending for more details.
Diagnostics	This submenu shows the status of the calculations and any other diagnostic information. See below in Section 12.7 Diagnostics for more details.

12.1 Live Reports

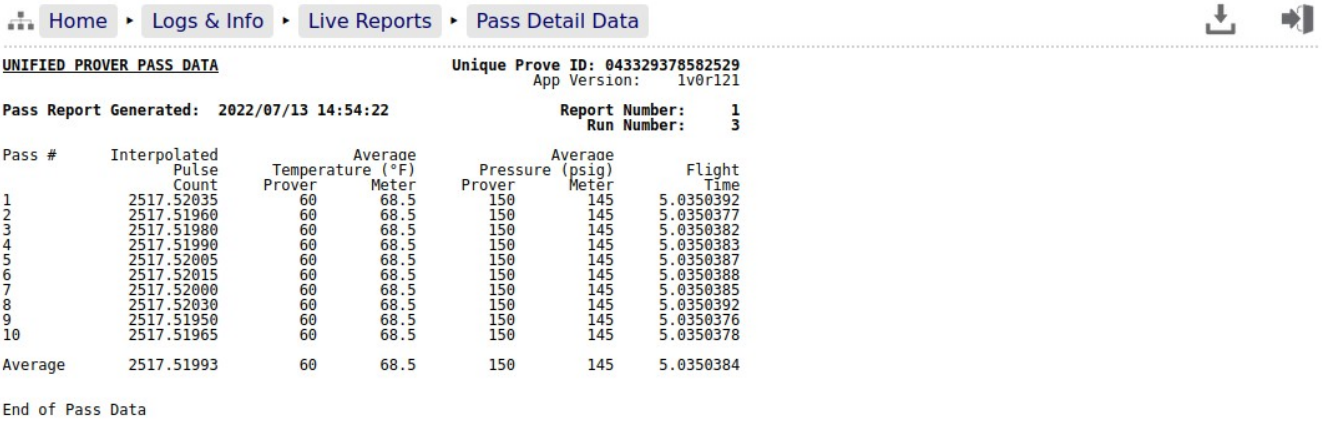


These are the live versions of the physical reports and entries are made as each run is completed

Pass Detail Data	This is always shown but the generation of each report has to be enabled in Home ▸ System ▸ Small Volume Prover Setup ▸ Operational Setup ▸ Enable Pass Reports or Home ▸ System ▸ BiDi Prover Setup ▸ Operational Setup ▸ Enable Pass Reports depending on prover type.
SVP Report Volume Detailed Run Data	This is only shown when the meter being proved is a Volumetric meter and therefore the K Factor mode is set to Volumetric. This is set under Home ▸ System ▸ Initial Setup ▸ Site/Location Setup ▸ System Type
SVP Report Volume Overview Data	This is only shown when the meter being proved is a Volumetric meter and therefore the K Factor mode is set to Volumetric. This is set under Home ▸ System ▸ Initial Setup ▸ Site/Location Setup ▸ System Type
SVP Report Mass Detailed Run Data	This is only shown when the meter being proved is a Mass meter and therefore the K Factor mode is set to Mass. This is set under Home ▸ System ▸ Initial Setup ▸ Site/Location Setup ▸ System Type
SVP Report Mass Overview Data	This is only shown when the meter being proved is a Mass meter and therefore the K Factor mode is set to Mass. This is set under Home ▸ System ▸ Initial Setup ▸ Site/Location Setup ▸ System Type
Ball Report Volume Detailed Run Data	This is only shown when the meter being proved is a Volumetric meter and therefore the K Factor mode is set to Volumetric. This is set under Home ▸ System ▸ Initial Setup ▸ Site/Location Setup ▸ System Type
Ball Report Volume Overview Data	This is only shown when the meter being proved is a Volumetric meter and therefore the K Factor mode is set to Volumetric. This is set under Home ▸ System ▸ Initial Setup ▸ Site/Location Setup ▸ System Type

12.1.1 Pass Detail Report

The screenshot below shows an example of the pass report.



Home ▸ Logs & Info ▸ Live Reports ▸ Pass Detail Data

UNIFIED PROVER PASS DATA **Unique Prove ID: 043329378582529**
App Version: 1v0r121

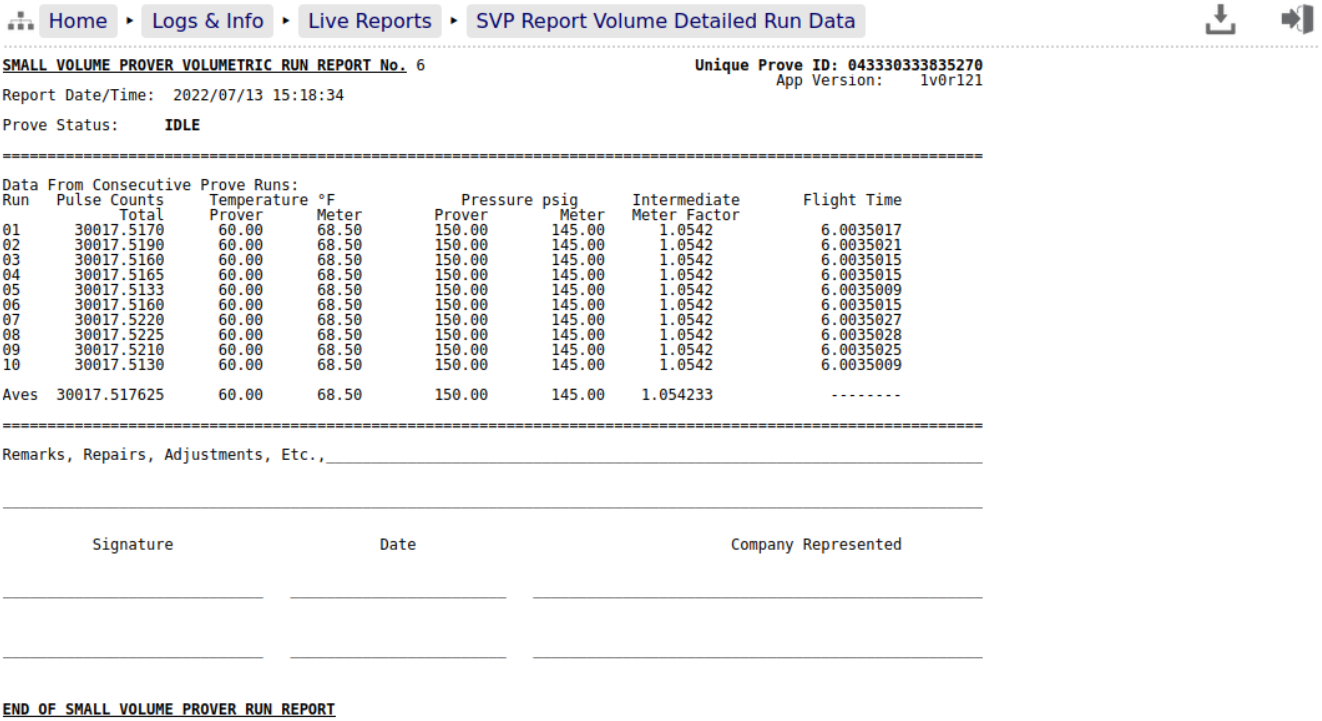
Pass Report Generated: 2022/07/13 14:54:22 **Report Number: 1**
Run Number: 3

Pass #	Interpolated Pulse Count	Average Temperature (°F) Prover	Average Temperature (°F) Meter	Average Pressure (psig) Prover	Average Pressure (psig) Meter	Flight Time
1	2517.52035	60	68.5	150	145	5.0350392
2	2517.51960	60	68.5	150	145	5.0350377
3	2517.51980	60	68.5	150	145	5.0350382
4	2517.51990	60	68.5	150	145	5.0350383
5	2517.52005	60	68.5	150	145	5.0350387
6	2517.52015	60	68.5	150	145	5.0350388
7	2517.52000	60	68.5	150	145	5.0350385
8	2517.52030	60	68.5	150	145	5.0350392
9	2517.51950	60	68.5	150	145	5.0350376
10	2517.51965	60	68.5	150	145	5.0350378
Average	2517.51993	60	68.5	150	145	5.0350384

End of Pass Data

12.1.2 Small Volume Run Report

The screenshot below shows an example that required 10 runs.



Home ▸ Logs & Info ▸ Live Reports ▸ SVP Report Volume Detailed Run Data

SMALL VOLUME PROVER VOLUMETRIC RUN REPORT No. 6 **Unique Prove ID: 043330333835270**
App Version: 1v0r121

Report Date/Time: 2022/07/13 15:18:34

Prove Status: **IDLE**

Data From Consecutive Prove Runs:

Run	Pulse Counts Total	Temperature °F Prover	Temperature °F Meter	Pressure psig Prover	Pressure psig Meter	Intermediate Meter Factor	Flight Time
01	30017.5170	60.00	68.50	150.00	145.00	1.0542	6.0035017
02	30017.5190	60.00	68.50	150.00	145.00	1.0542	6.0035021
03	30017.5160	60.00	68.50	150.00	145.00	1.0542	6.0035015
04	30017.5165	60.00	68.50	150.00	145.00	1.0542	6.0035015
05	30017.5133	60.00	68.50	150.00	145.00	1.0542	6.0035009
06	30017.5160	60.00	68.50	150.00	145.00	1.0542	6.0035015
07	30017.5220	60.00	68.50	150.00	145.00	1.0542	6.0035027
08	30017.5225	60.00	68.50	150.00	145.00	1.0542	6.0035028
09	30017.5210	60.00	68.50	150.00	145.00	1.0542	6.0035025
10	30017.5130	60.00	68.50	150.00	145.00	1.0542	6.0035009
Aves	30017.517625	60.00	68.50	150.00	145.00	1.054233	--------

Remarks, Repairs, Adjustments, Etc.,_____

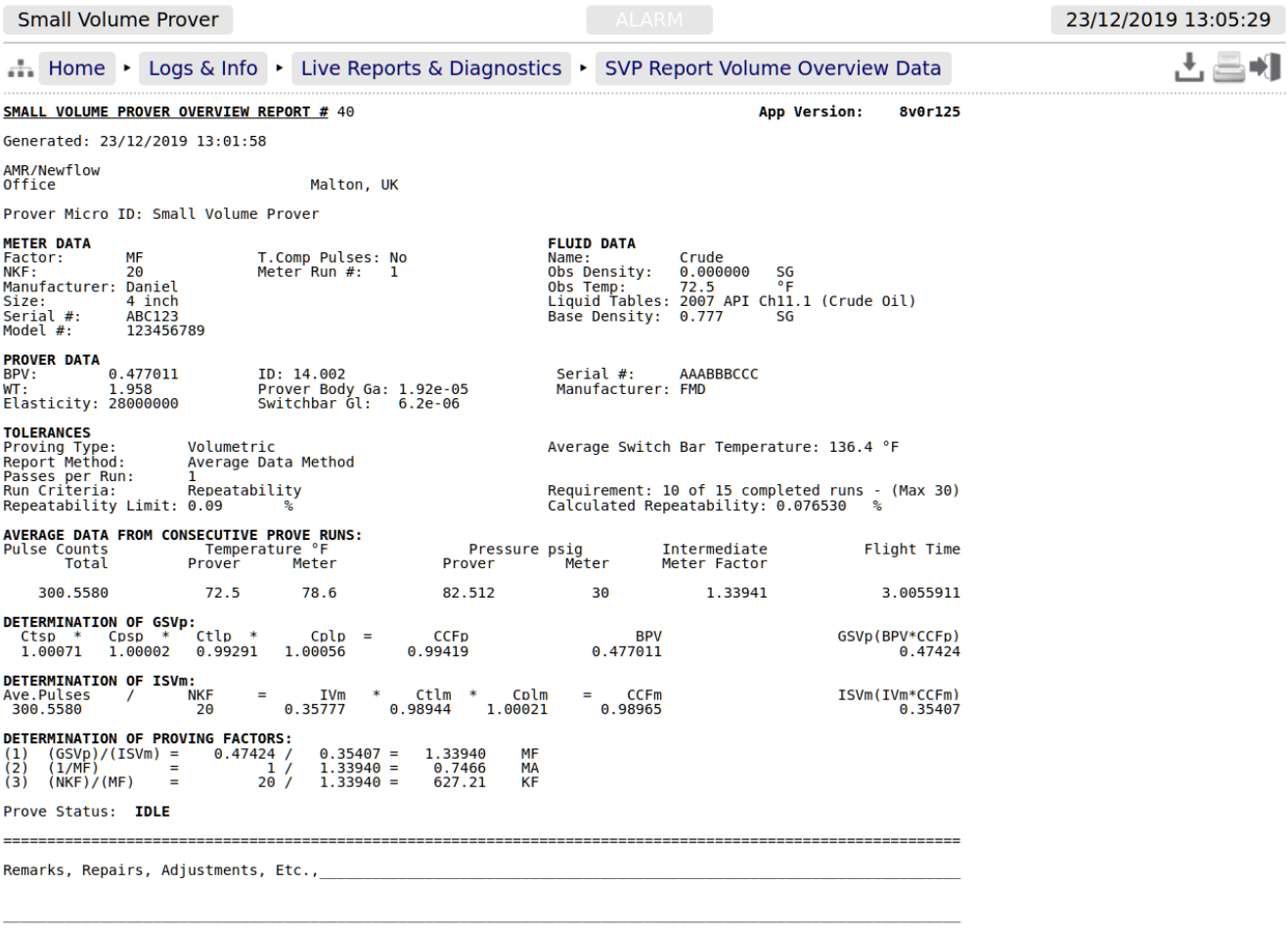
Signature Date Company Represented

END OF SMALL VOLUME PROVER RUN REPORT

12.1.3 Live Overview Report

There are different reports depending upon the prover and meter types selected.

The overview report below is an example of an SVP prover with a Volume meter attached.



Small Volume Prover ALARM 23/12/2019 13:05:29

Home ▸ Logs & Info ▸ Live Reports & Diagnostics ▸ SVP Report Volume Overview Data

SMALL VOLUME PROVER OVERVIEW REPORT # 40 **App Version: 8v0r125**

Generated: 23/12/2019 13:01:58

AMR/Newflow
Office Malton, UK

Prover Micro ID: Small Volume Prover

METER DATA
Factor: MF T.Comp Pulses: No
NKF: 20 Meter Run #: 1
Manufacturer: Daniel
Size: 4 inch
Serial #: ABC123
Model #: 123456789

FLUID DATA
Name: Crude
Obs Density: 0.000000 SG
Obs Temp: 72.5 °F
Liquid Tables: 2007 API Ch11.1 (Crude Oil)
Base Density: 0.777 SG

PROVER DATA
BPV: 0.477011 ID: 14.002 Serial #: AAABBBCCC
WT: 1.958 Prover Body Ga: 1.92e-05 Manufacturer: FMD
Elasticity: 28000000 Switchbar Gl: 6.2e-06

TOLERANCES
Proving Type: Volumetric Average Switch Bar Temperature: 136.4 °F
Report Method: Average Data Method
Passes per Run: 1
Run Criteria: Repeatability Requirement: 10 of 15 completed runs - (Max 30)
Repeatability Limit: 0.09 % Calculated Repeatability: 0.076530 %

AVERAGE DATA FROM CONSECUTIVE PROVE RUNS:

Pulse Counts	Temperature °F		Pressure psig		Intermediate	Flight Time
Total	Prover	Meter	Prover	Meter	Meter Factor	
300.5580	72.5	78.6	82.512	30	1.33941	3.0055911

DETERMINATION OF GSVp:

Ctsp *	Cpsp *	Ctlp *	Cplp =	CCFp	BPV	GSVp(BPV*CCFp)
1.00071	1.00002	0.99291	1.00056	0.99419	0.477011	0.47424

DETERMINATION OF ISVm:

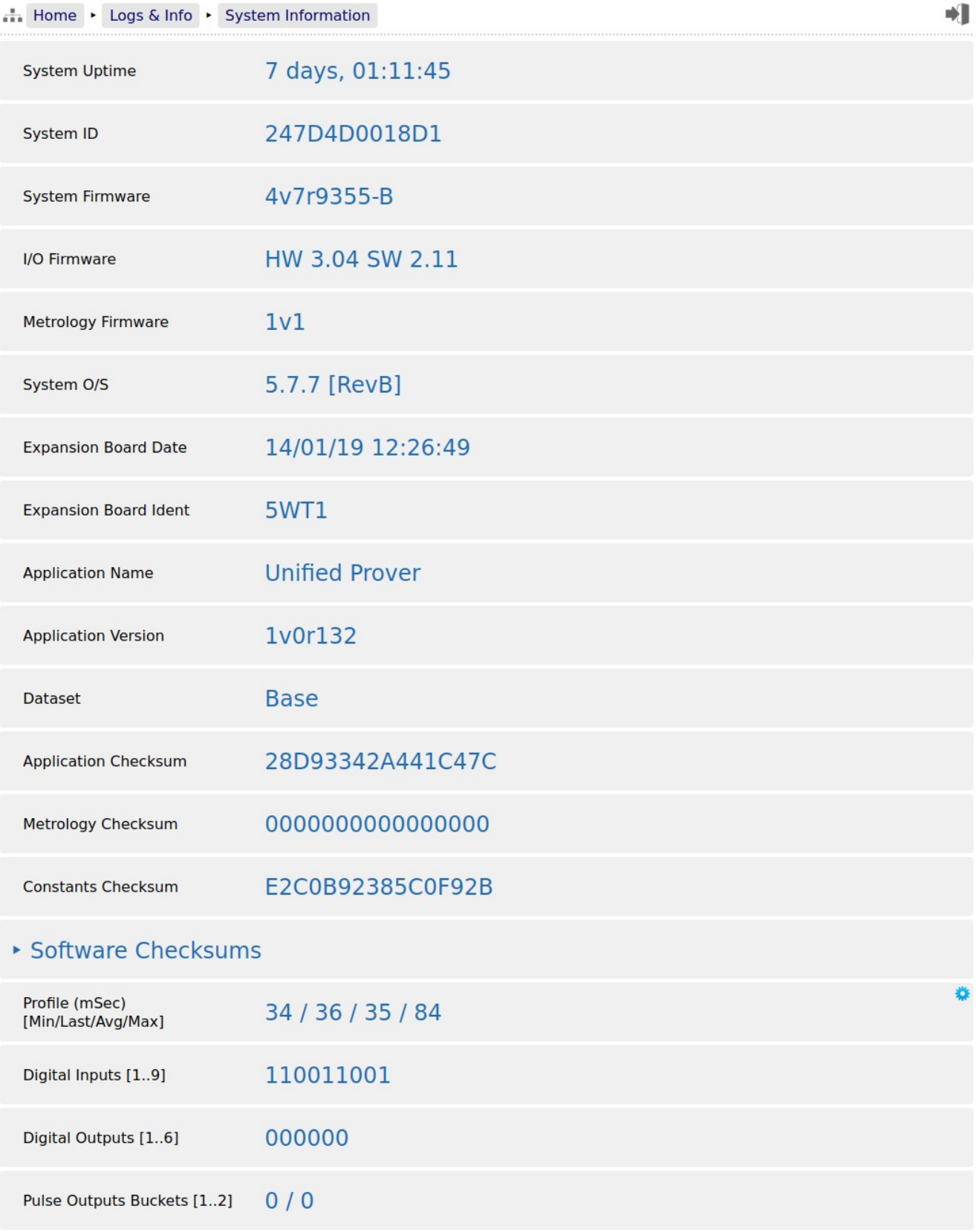
Ave.Pulses /	NKF =	IVm *	Ctlm *	Cplm =	CCFm	ISVm(IVm*CCFm)
300.5580	20	0.35777	0.98944	1.00021	0.98965	0.35407

DETERMINATION OF PROVING FACTORS:
(1) (GSVp)/(ISVm) = 0.47424 / 0.35407 = 1.33940 MF
(2) (1/MF) = 1 / 1.33940 = 0.7466 MA
(3) (NKF)/(MF) = 20 / 1.33940 = 627.21 KF

Prove Status: **IDLE**

Remarks, Repairs, Adjustments, Etc.,_____

12.2 System Information



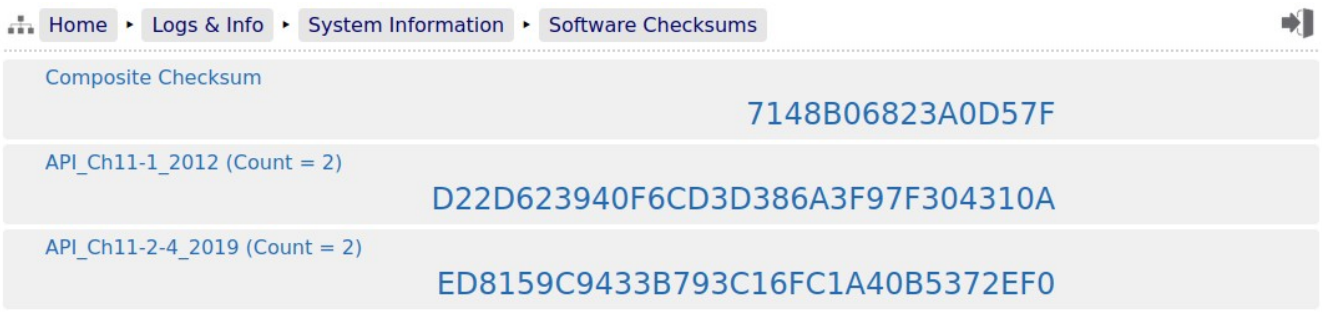
System Uptime	This shows how long the unit has been running since the last restart.
System ID	The System ID is a unique hardware number for every device.
System Firmware	This is the runtime firmware version and represents the firmware held in the CPU card.
I/O Firmware	This information refers to the 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 controller 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 12.2.1 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.

Clicking the Software Checksums link, will open a menu which lists the checksum for every C||Cure®

12.2.1 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 below shows the page for the Unified Prover application.



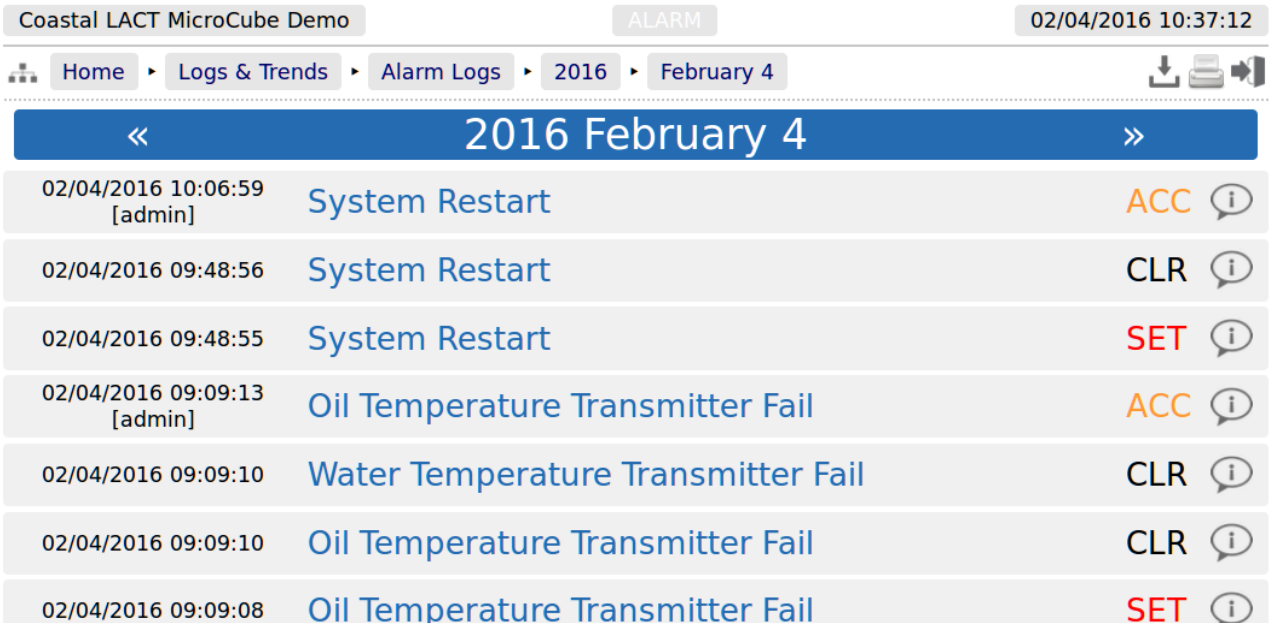
12.3 Alarm Logs

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 11.2 Reports Calendar View for more details. Drilling down to each day shows all of the Alarms stored in sequential time order. The controller 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.

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 cumulative totals for the Oil Indicated Volume (IV) and Oil Gross Observed Volume (GOV) together with the Water IV, GOV and NSV at the time the Alarm was recorded.



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 controller 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 Value (.TSV) format and can be opened and manipulated in LibreOffice, Excel or other spreadsheet programs.

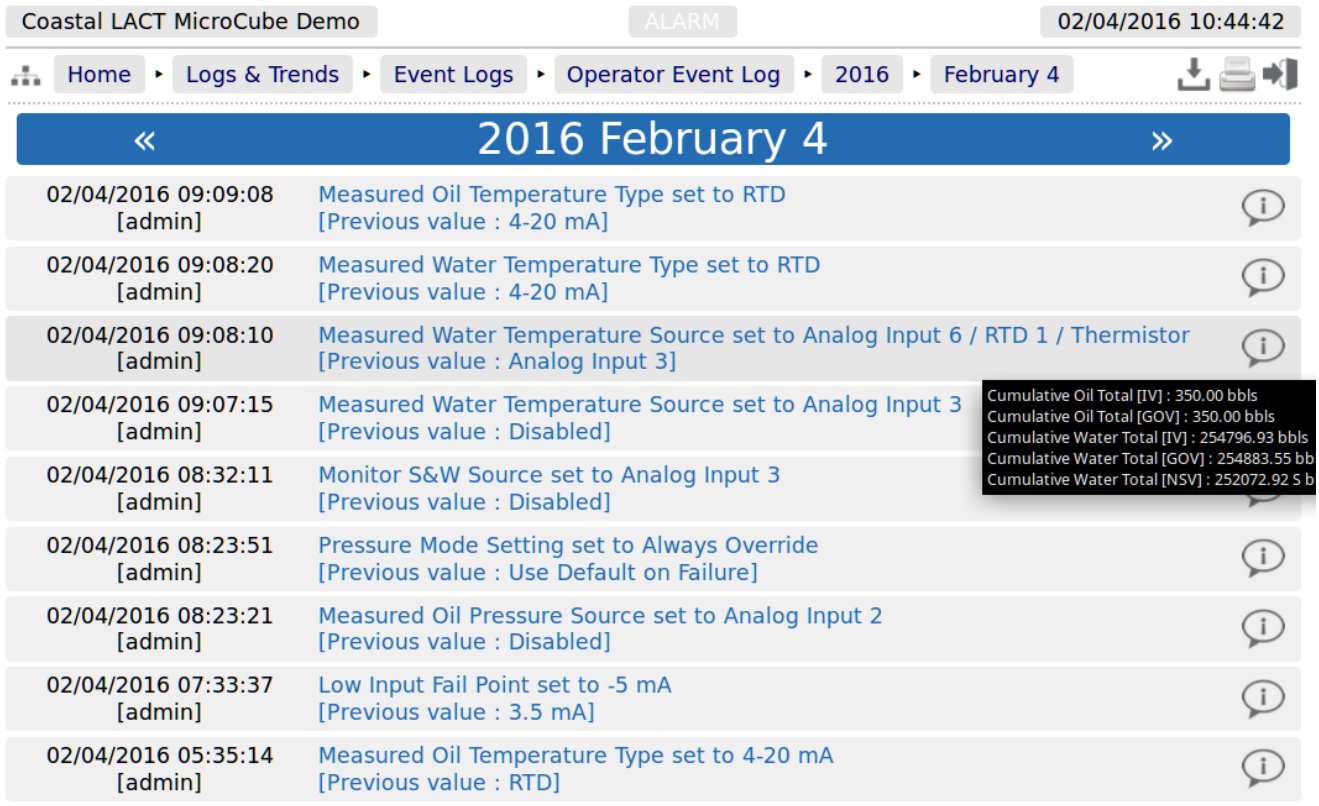
12.4 Event Logs

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 driver 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 Unified Prover application, this log is used to record when the Maximum Volume Load interrupt has occurred.
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.



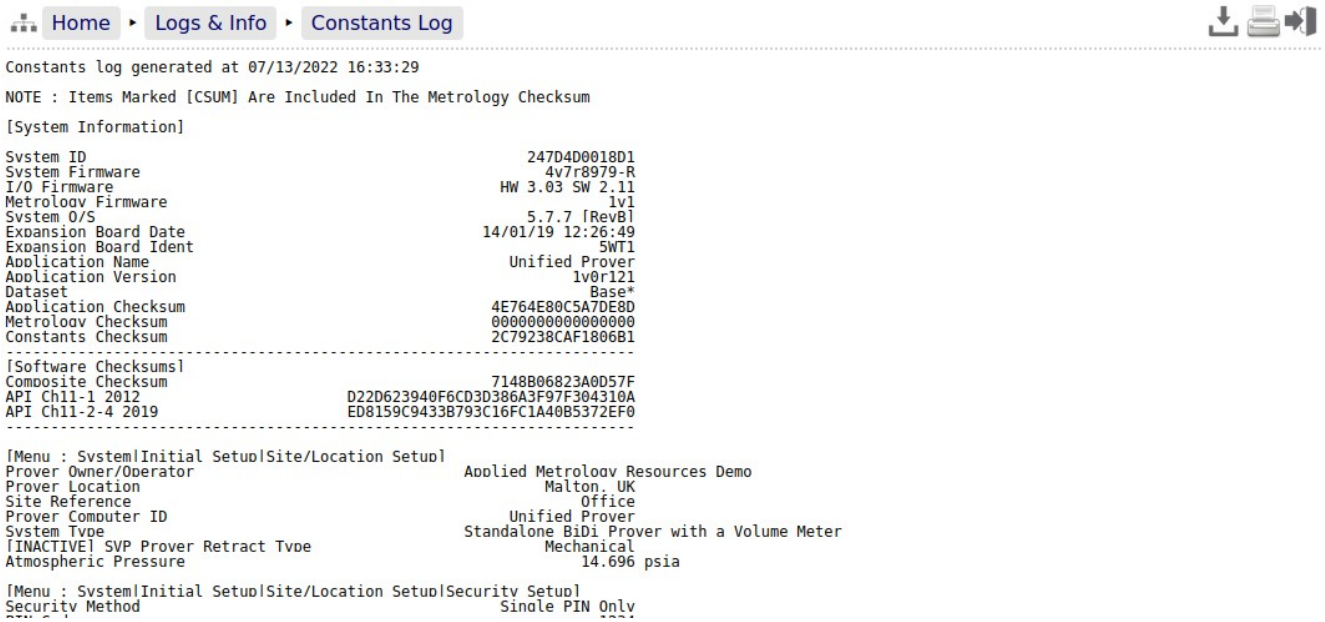
The Event log is similar to the Alarm log, in that only a single day's events are displayed at a time on the website, but all the data can be collected using the XML communications, or downloaded from the website as a Tab Separated Value document.

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 cumulative totals for Oil IV & GOV and the Water IV, GOV & NSV snapshot values.

12.5 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: The screenshot below is just the first 38 lines of the Constant Log, the whole document is too long to display in this manual

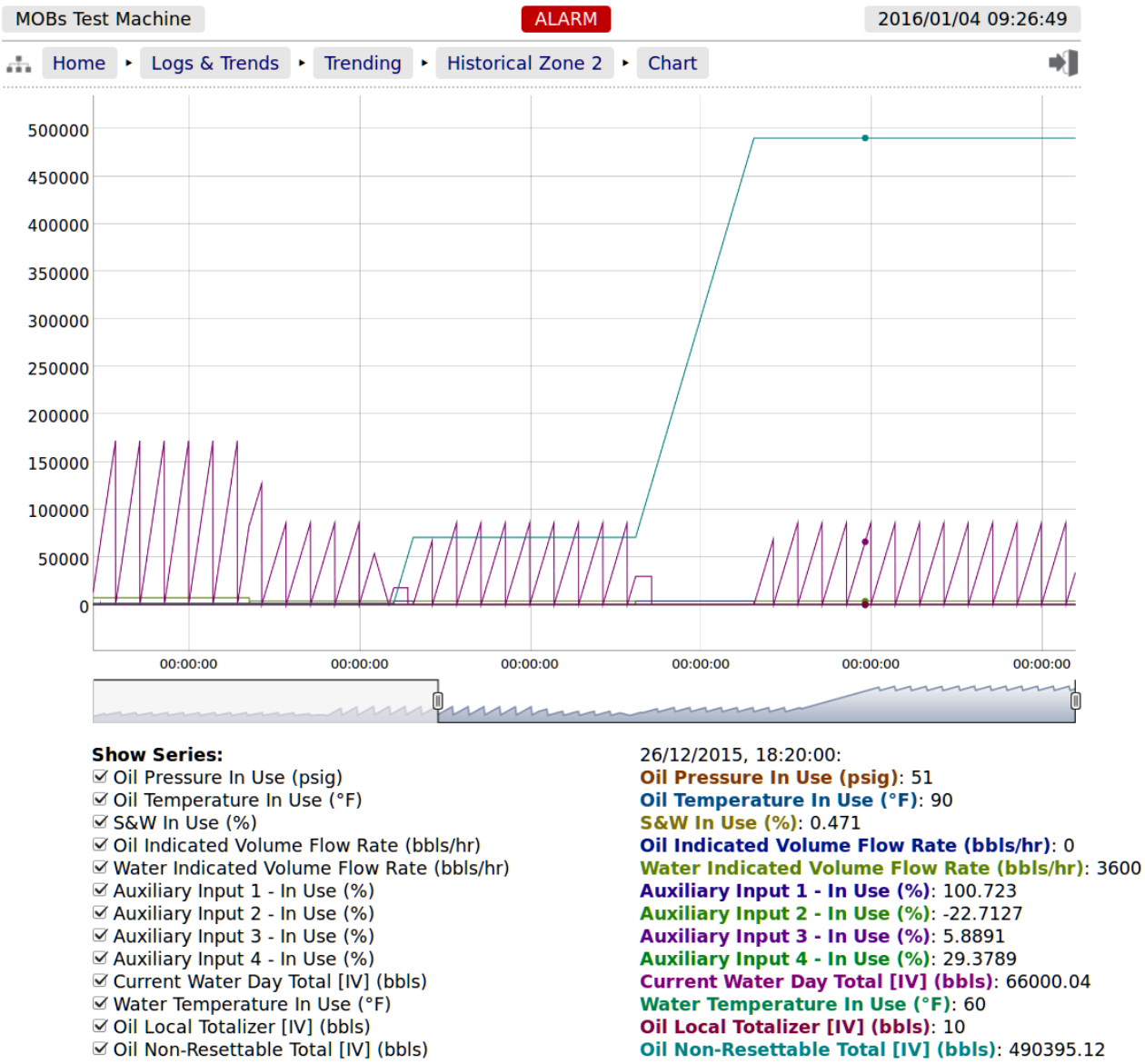


12.6 Trending

The NÅNO controller 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.

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.

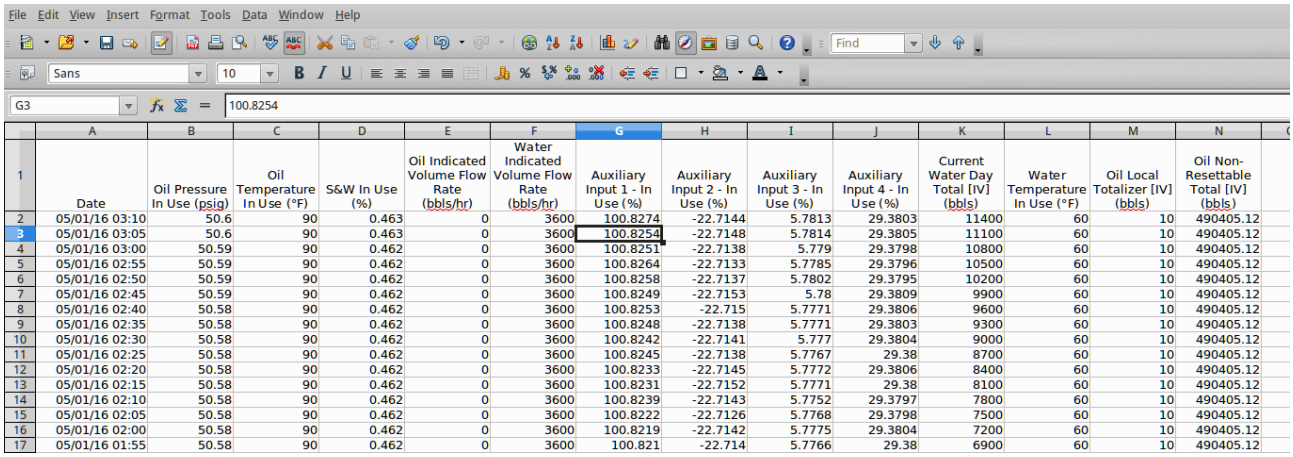


Under the **Show Series** title, there is a list of each data slot with an associated tick box. If the larger value item, in this example "Oil Non-Resettable Total [IV] (bbls)", checkbox is clicked to toggle the tick to "off", then this slot will no longer be displayed and the display will re-scale.

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.

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.



File Edit View Insert Format Tools Data Window Help

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	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.

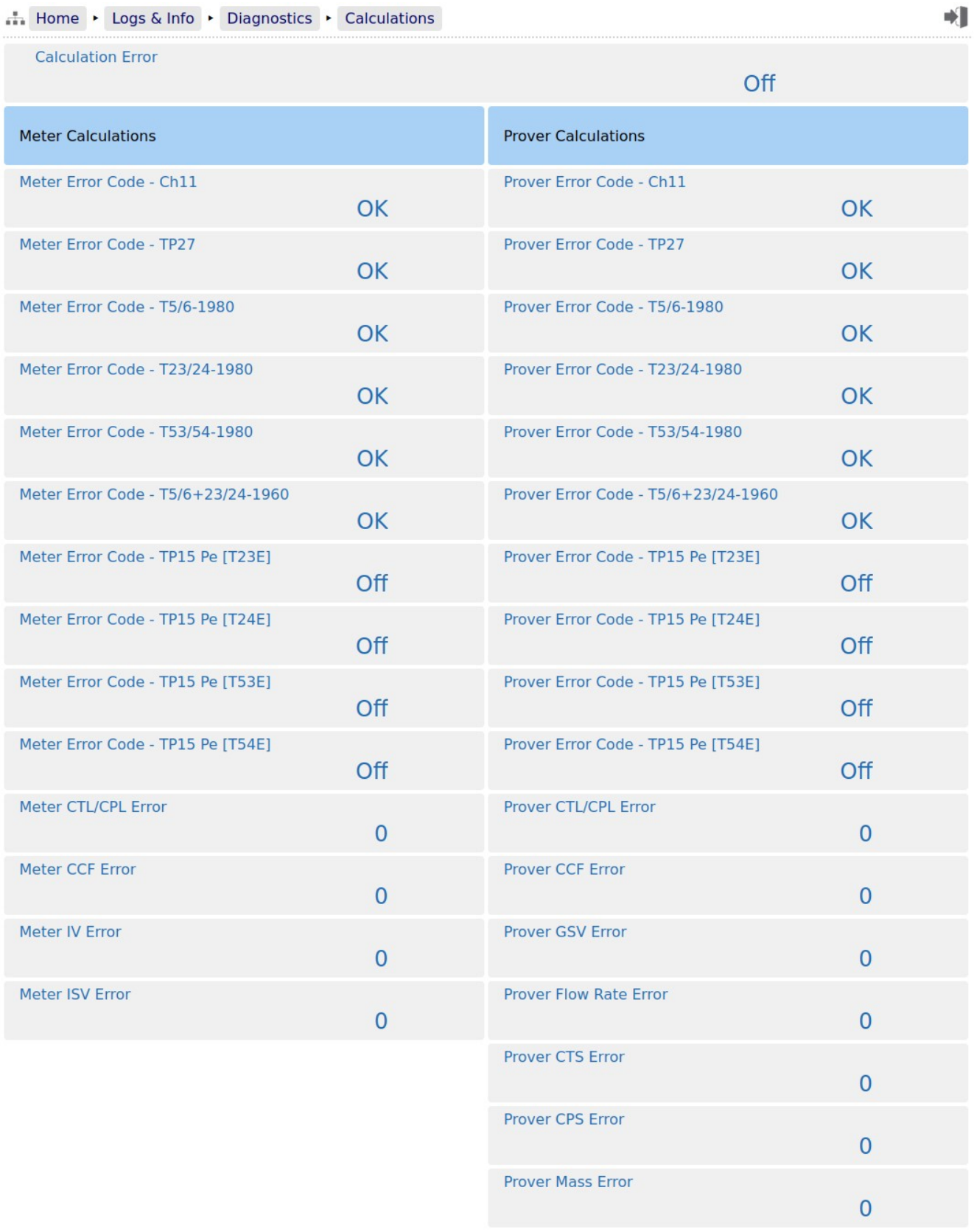
12.7 Diagnostics

This optional menu is enabled/disabled under Home ▸ System ▸ I/O - SVP ▸ Assignments/Settings - Digital I/O. The ***Enable Diagnostics Menu*** input allows either a remote input to be used, or by forcing the input to **High** or **Low** allow the menu to be either shown or hidden permanently.

Calculations	Meter and Prover Calculation information.
Stability	Diagnostic information when the stability checking is being performed.
Time-Outs	Various timer information when the prove is running.

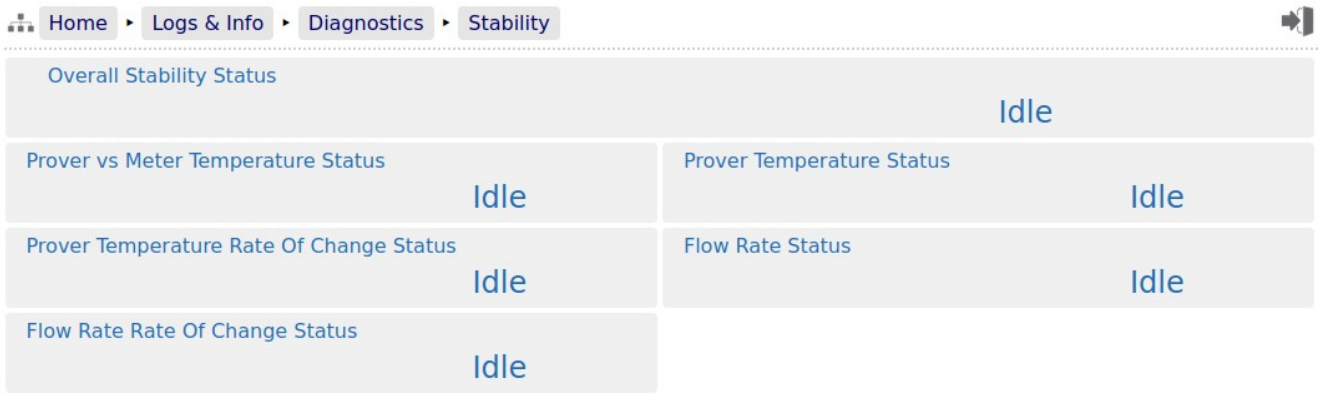
12.7.1 Calculations

Information on errors in the prover and meter calculation s while the prove is running.



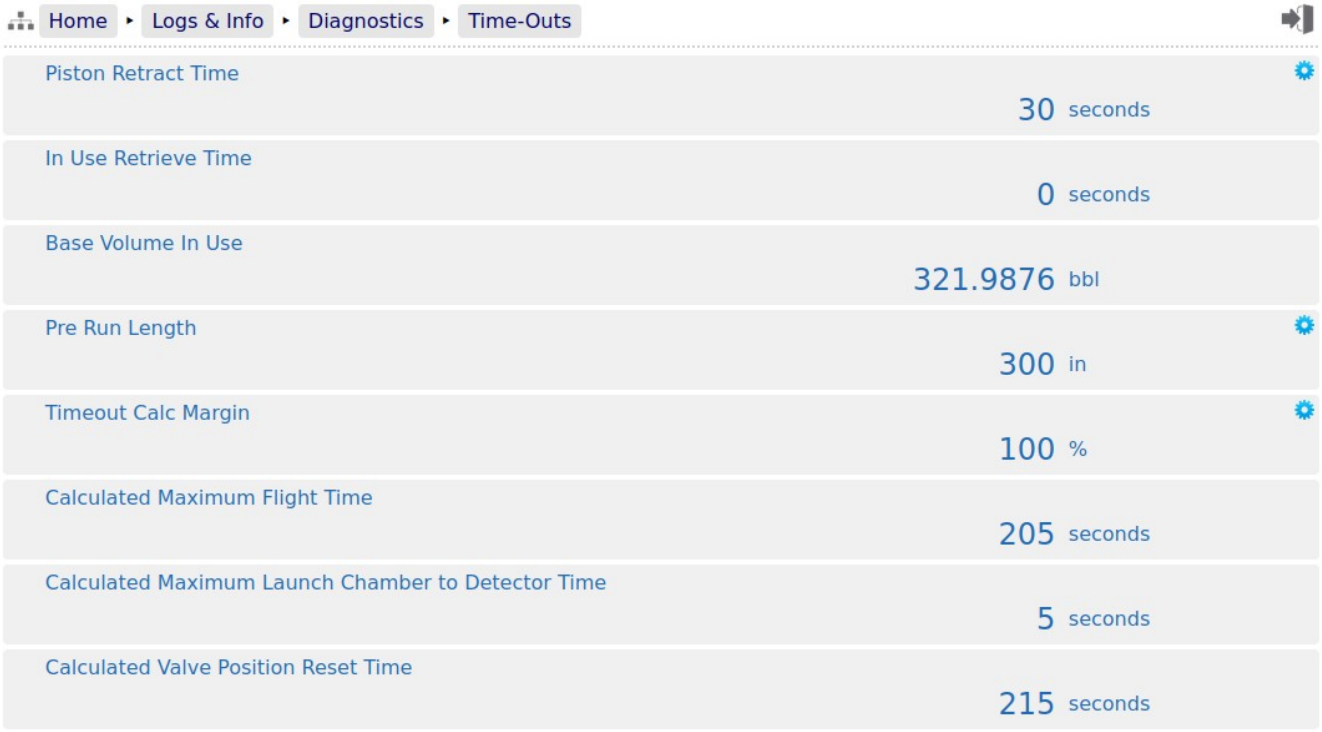
12.7.2 Stability

Information on the various stability tests during that stage of the proving sequence.



12.7.3 Time-Outs

Information on the time-outs used. In SVP mode, these are fixed values however in BiDi mode, these are calculated from the flow rate, the diameter of the pipe and the distances between the launch chamber and detectors.



12.8 Diagnostic Information

The Unified Prover 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 three main areas of information:

Live Run & Overview reports	Home ▸ Logs & Info ▸ Live Reports This allows an operator to see all the prover information as it is gathered pass by pass and run by run.
System Information	Home ▸ Logs & Info ▸ System Information This shows the System Information for the NÅNO controller. See Section 12.2 System Information for more details.
Trending	Home ▸ Logs & Info ▸ Trending The historical data logging and trending displays are a powerful tool for investigating process issues.

13 Liquid Volume Correction Calculations

The Unified Prover Application has a range of hydrocarbon calculations. However only the later calculations are made accessible on the general release version of the application:

- API Ch11.1, 2012 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.
- API Ch11.2.4, 2019 (GPA TP27, 2007 together with API Ch11.2.2 (0.35 to 0.637 SG) and an option with a wider density range). It is available for both USC and Metric units. TP15 or an entered Vapor Pressure (Pe) can be selected.
- The API rounding can be disabled for higher resolution calculations.
- Density can be entered as a reference density, taken either from a Densitometer or from an E+H Promass Coriolis Meter.

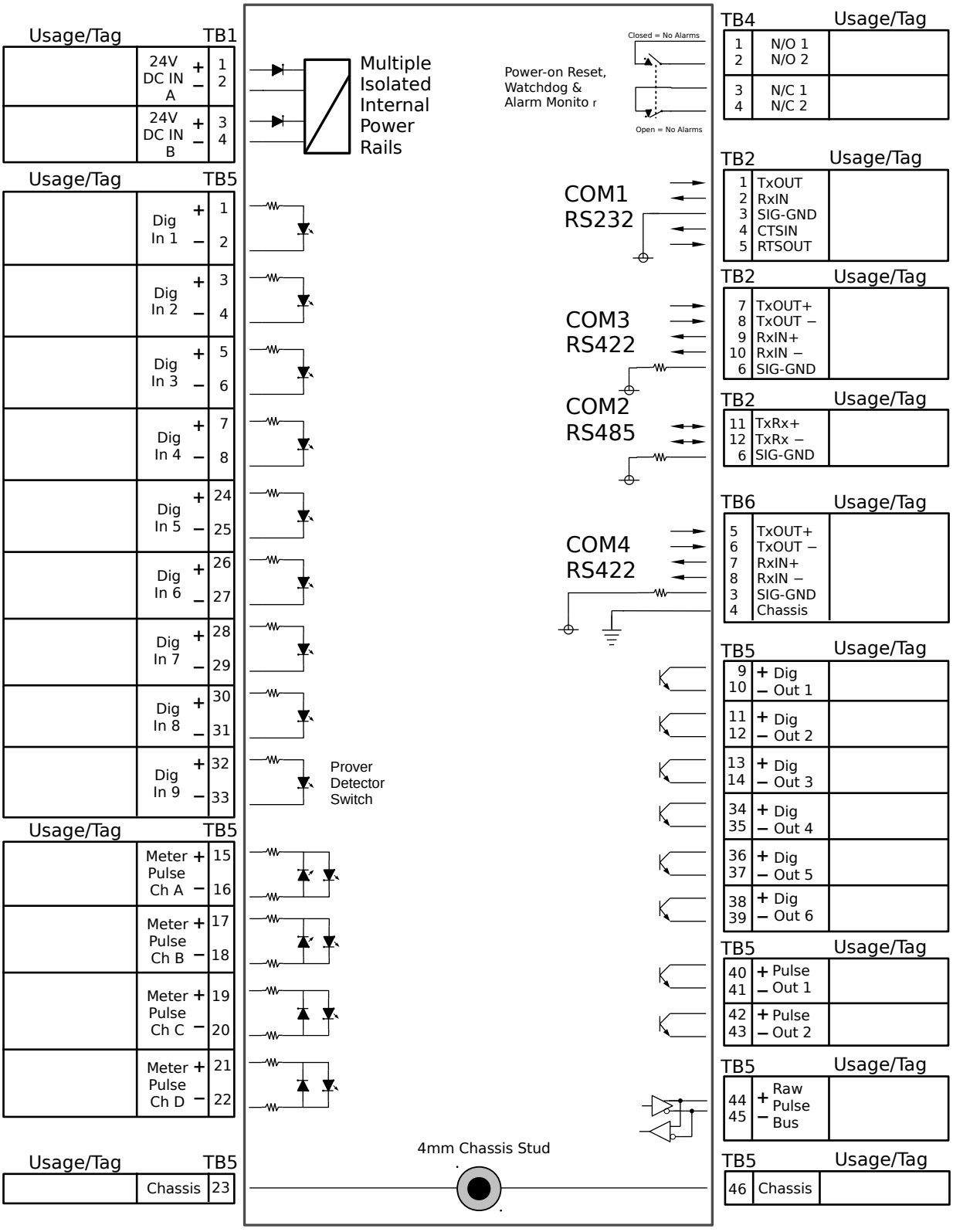
14 Glossary

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.

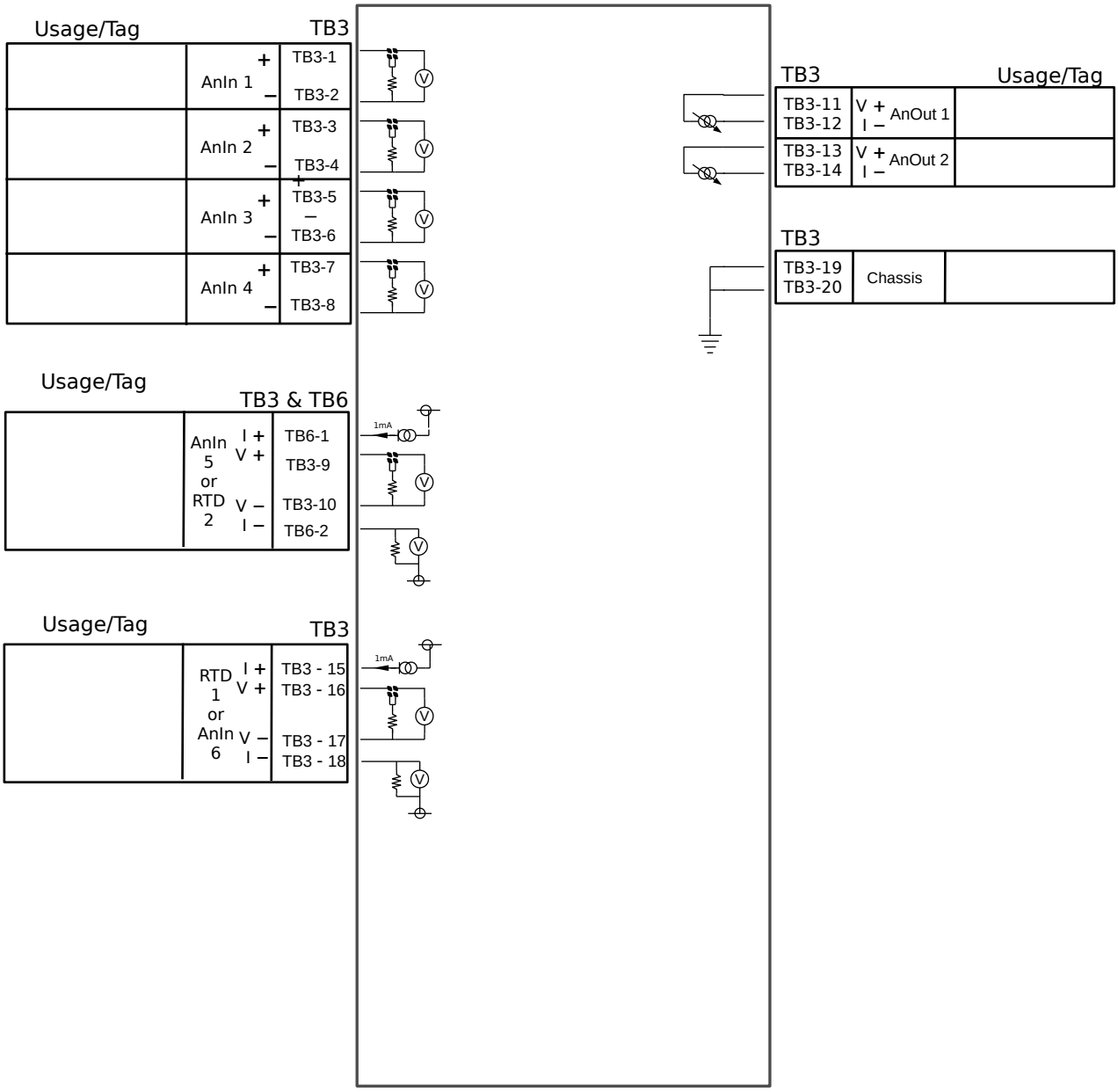
Term	Description
ADC	Analog to Digital Converter
ALVs	Additional Log Values - data that is snapshot when an Alarm or Event occurs.
AO	BLM Authorized Officer
APP	A configuration file for the NÅNO where all hard coded calculation routing has been finalized. Field settings may or may not have been entered.
BLM	Bureau of Land Management
BPV	Base Prover Volume
CONSTANTS	Numbers which are only infrequently changed.
ConstED	An off-line configuration program for NÅNO applications.
CPU	Central Processor Unit
CSV	Comma Separated Values (a spreadsheet format)
DCS	Distributed Control System

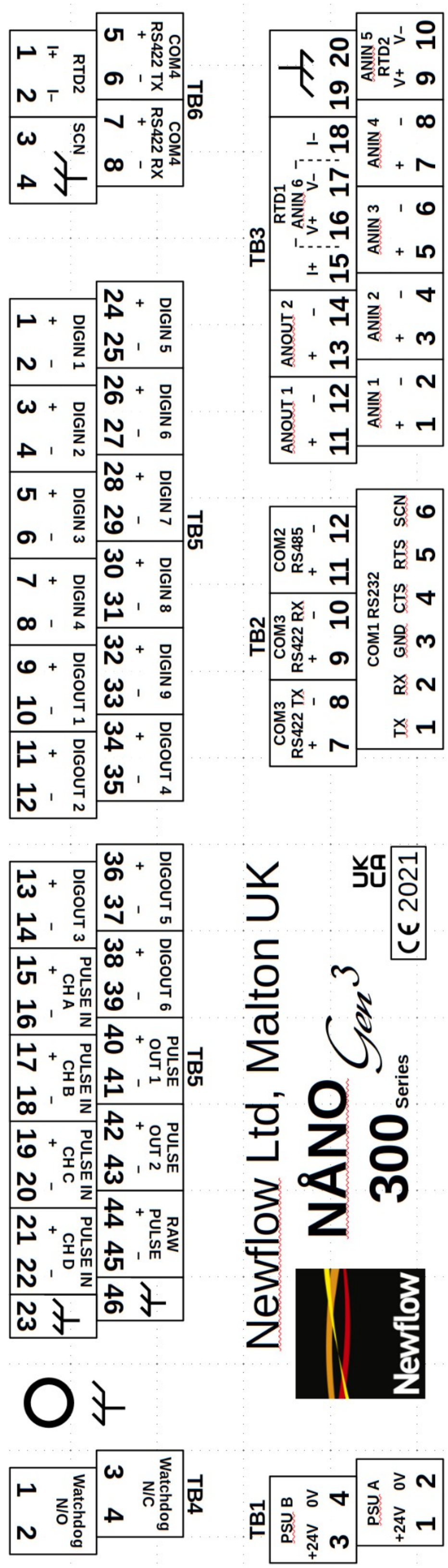
DEFAULT VALUE	A fallback value that the input 'defaults' to if measurement is not possible due to the input from the transmitter being determined BAD.
FIELD SETTINGS	Constants, Limits, Scalings for a specific Meter Run. This does not relate to specific calculations as these will be defined in the Application.
FWA	Flow Weighted Average
HMI	Human Machine Interface
LACT	Lease Automated Custody Transfer
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 Values (a variant of CSV)
TX	Transmitted information
UTC	"Coordinated Universal Time" or UTC is the primary time standard by which the world regulates clocks and time
VARIABLES	Changeable values

Digital & Serial



Analog Expansion




Newflow Ltd, Malton UK
NANO Gen 3
300 Series
Newflow
UK CA
CE 2021
TB1
PSU A +24V 0V
PSU B +24V 0V
TB2
COM1 RS232 TX RX GND CTS RTS SCN
COM2 RS485
COM3 RS422 TX
COM3 RS422 RX
TB3
ANIN 1
ANIN 2
ANIN 3
ANIN 4
ANIN 5 RTD2 V+ V–
RTD1 ANIN 6 I+ V+ V– I–
ANOUT 1
ANOUT 2
TB4
Watchdog N/O
Watchdog N/C
TB5
DIGIN 1
DIGIN 2
DIGIN 3
DIGIN 4
DIGIN 5
DIGIN 6
DIGIN 7
DIGIN 8
DIGIN 9
DIGOUT 1
DIGOUT 2
DIGOUT 3
DIGOUT 4
DIGOUT 5
DIGOUT 6
PULSE IN CH A
PULSE IN CH B
PULSE IN CH C
PULSE IN CH D
PULSE OUT 1
PULSE OUT 2
RAW PULSE
TB6
RTD2 I+ I–
SCN
COM4 RS422 TX
COM4 RS422 RX

16 Revision History

Rev	Date	Changes	Prepared	Checked	Authorized
0	6 Nov 2019	Initial pass	MOB	DGS	GPL
1	5 Aug 2022	Application Ref: 1v0r121	GPL	MPFJ	MOB
2	14 Nov 2023	Application Ref: 1v0r132	GPL	MOB	GPL
3	22 Jan 2024	Application Ref: 1v0r134 No Functionality Changes Bugfixes in App only.	GPL	MOB	MOB
4	5 Apr 2024	Application Ref: 1v1r0 No Functionality Changes Wording improved in Sec 4.2 Added ‘US SVP’ Dataset in the application.	GPL	MOB	GPL