# Newflow

# NÅNO

# Sampler System Verification (SSV)

# Quick Start Manual

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| R2 | | | | | |
| R3 | | | | | |
| | | | | | |

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MMXXI

| | | |
|---|---|---|
| Water Flow Rate<br>90.10 bbls/hr | Oil GOV Flow Rate<br>3600.35 bbls/hr | Relative Flow Rates<br>2.502 % |
| **Water Temperature Override**<br>55 °F | Oil Temperature In Use<br>142.7 °F | **Required Relative Flow Rate**<br>2.500 % |
| Next Batch Number<br>5 | Oil Pressure In Use<br>136.55 psig | Pre-Injection Baseline Water<br>0.380 % |
| **Stop Water Injection** | **Start Accumulator/Start Batch** | |

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# 1 Introduction

This application will support a Crude Oil Meter run of one to six oil meters( the wild flow) and a Water Meter run, (the controlled flow). It will drive a valve to control the water flow or set a Variable Frequency Drive (VFD) motor & water pump. The operator can dial-in a required water content, and start the water flow. Instantaneous Oil & Water flow rates and the ratio between them will be displayed, and when the control loop has stabilised, and the desired ratio achieved, the operator can then start the test batch. The operator may swap sample cans manually, but a digital output will also be driven during the batch for automated sampler control.

A detailed Sampler Report will be generated during the test period (between the start & Stop triggers) as well as hourly reports

Historicals will log at five seconds to one minute intervals whilst water flow requested.

# 2 Features

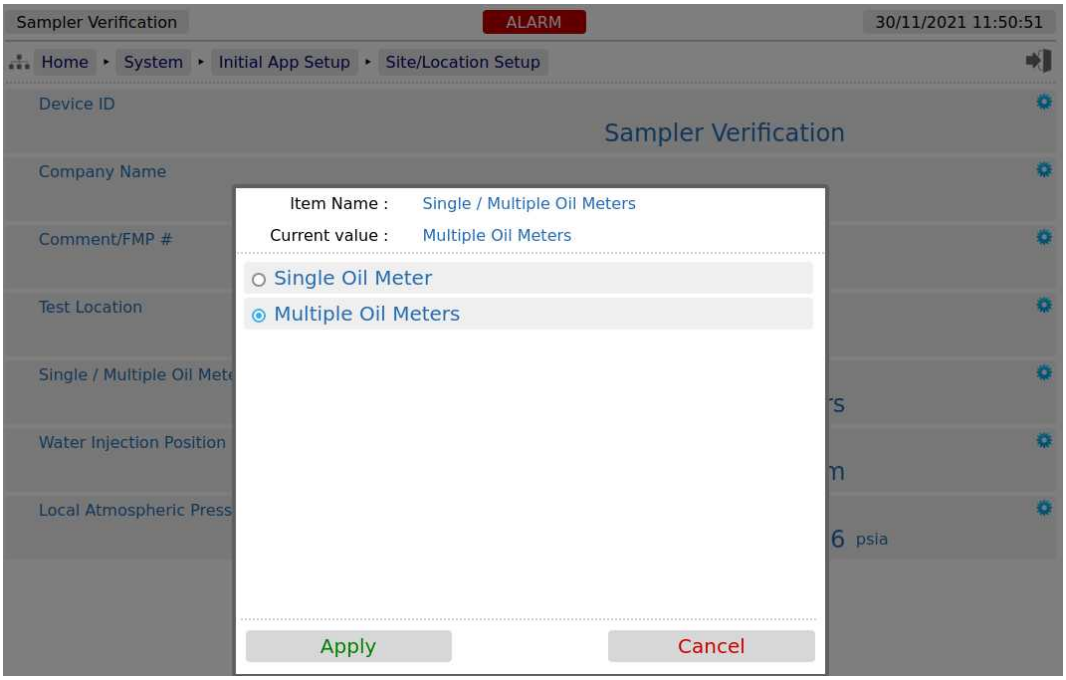
- Automate the sampler verification process
- Can be used with a single oil meter system, or a station with up to 6 oil meters (with P568 MPIM Module)
- Water Injection can be upstream or downstream of the oil meter(s)
- Optional Sampler Driving Output
- Local panel operation and configuration
- Transmitter Bias Adjustment from Local Panel
- PID Control of water injection flow rate
- Pre & Post Injection Baseline check
- Pre, Post & Average checks against Sampler titration results
- Detailed Sampler Test Report
- Hourly Oil & Water reports and on-demand snapshot report
- Independent Data logger
- AO screen for auditing

# 3 Does the Main line have one or up to six meters?

If only one meter only is in use, then select Single Oil Meter in the Initial App Setup Menu

If there is a station with between two and six meters, then a P568 MPIM Module will be required. Ideally in station installations, the P568 MPIM would be permanently wired to the meters, and only an Ethernet connection is needed between the MicroCube Flow Computer and the P568 MPIM Module. The P568 MPIM has four input channels with in-built signal conditioners giving a high impedance input which can be connected in parallel with the station flow computer. If five or six channels are needed, the external P542 Signal Conditioners can be used.

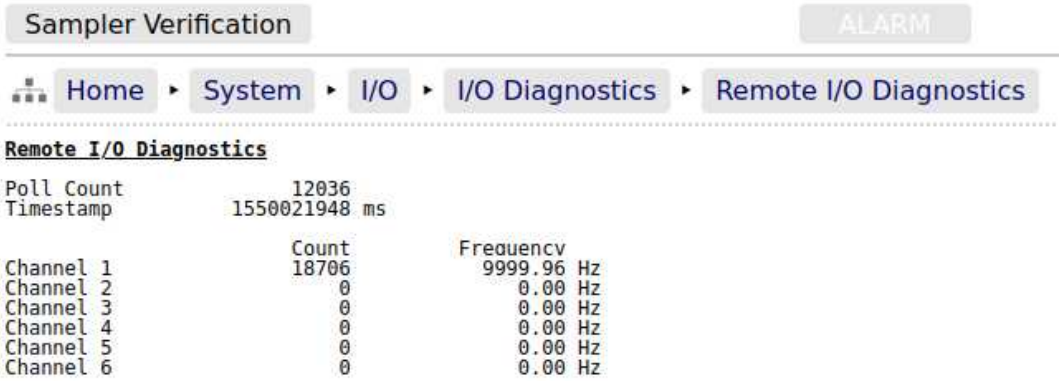
If this is a multiple meter station, select the multiple Oil Meters radio button, as shown on the screenshot below.




If multiple meters are selected the IP address of the P568 MPIM must be configured

Navigate to the menu location shown in the screenshot below, and type in the IP address of the P568 MPIM in quad dotted notation as illustrated

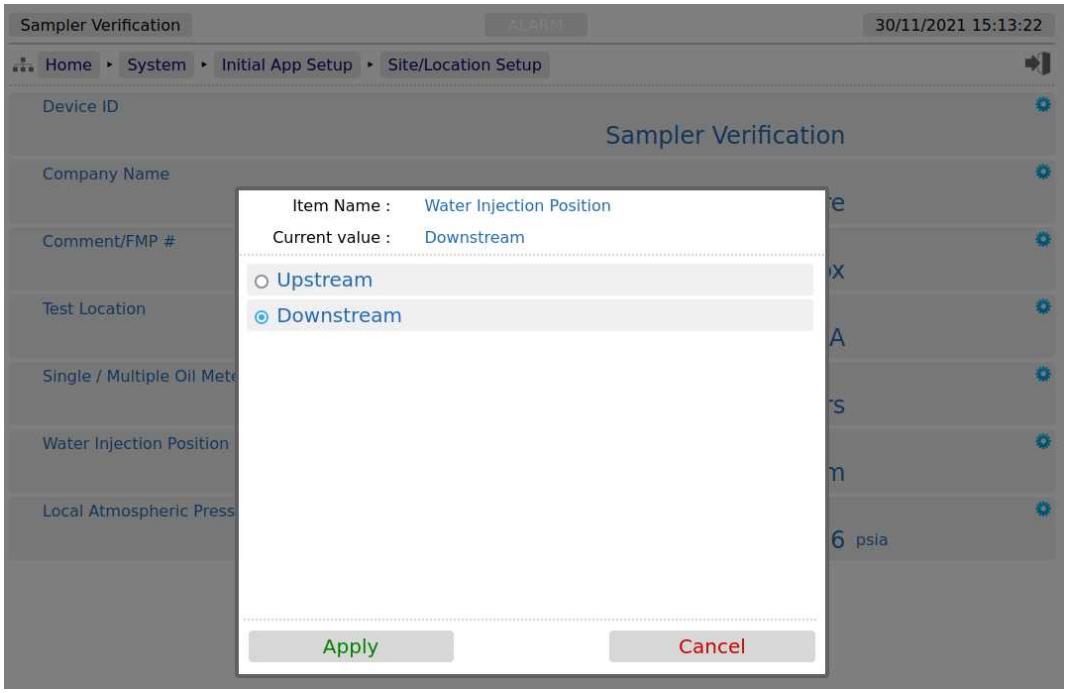
To check that communications has been established with the P568 MPIM, navigate to the Remote I/O Diagnostics page and check that Poll count and timestamp fields are incrementing, and the six inputs channels are showing the expected pulse frequency. See the screenshot below.



# 4 Is the water injected downstream of the mainline flow meter(s) or upstream

The injection position alters the mainline flow rate, so this must be configured correctly.

Navigate to the Site/Location setup and select the appropriate Water Injection Position.



# 5 Configuring the Inbuilt PID controller

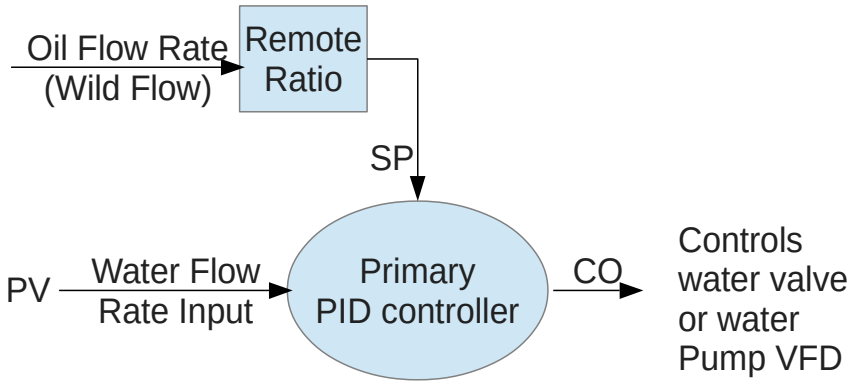
The first data points to be configured are the scaling values for the water meter flow rate. The flow rate used for control is the GOV flow rate and the units are in bbls per hour.

The Water Flow Rate Low Scale is defaulted to 0 bbls/hr and should normally be kept at this default value.

The Water Flow Rate High Scale should be set to the absolute maximum flow rate, rounded up.

The PID Loop Gain and the Repeats Per Minute can be set on the settings page, as shown above or changed via the Home > System >PID Setup > Debug/Tuning menu.

**The Debug/Tuning page.**

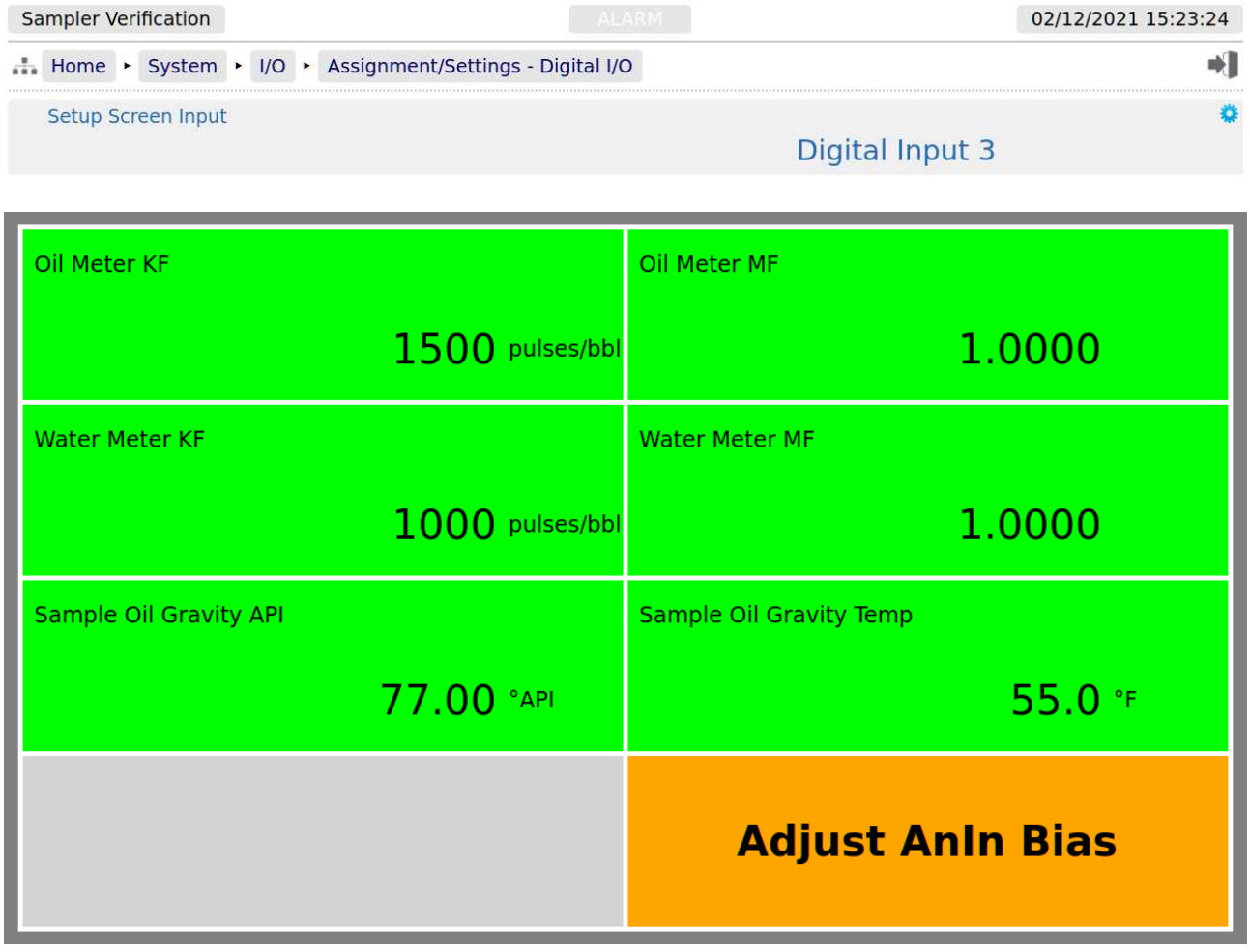


# 6 Setting the K-Factors and Meter Factors

The Water meter is connected to the Pulse Input B channel and the Oil meter is connected to the Pulse Input A channel, unless there are multiple meters, in which case the Station meters are connected to the P568 MPIM.

If there is only one oil meter in the system:

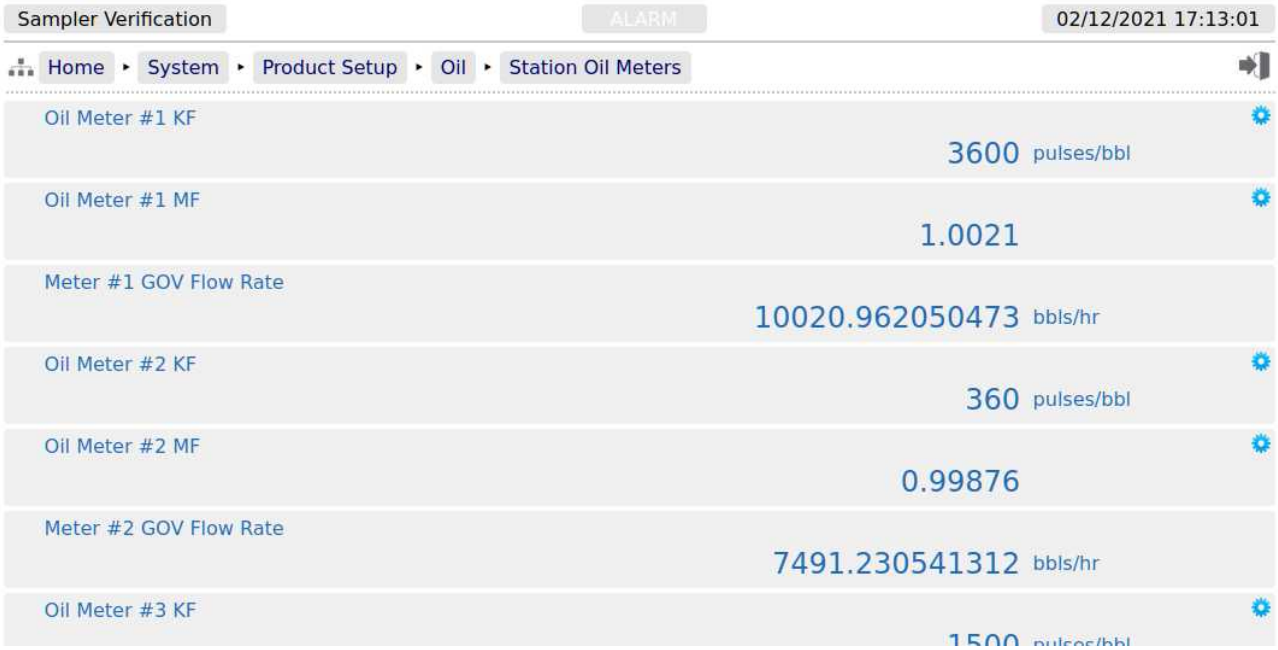
Then the K-Factor and Meter Factor for both the single oil meter and the water meter can be set using the Local Panel when the Setup Screen Input Digital Input is active, or using the MicroCube Website. The display shown below is from the Local Panel



If however there is a oil metering station with up to six meters, then the P568 MPIM will be needed. Each of the six oil meters can have its own K-Factor and Meter Factor, but these will need to be entered using a web browser to configure the MicroConf Flow Computer.

The Water Meter can still be configured using the local panel. or the website.

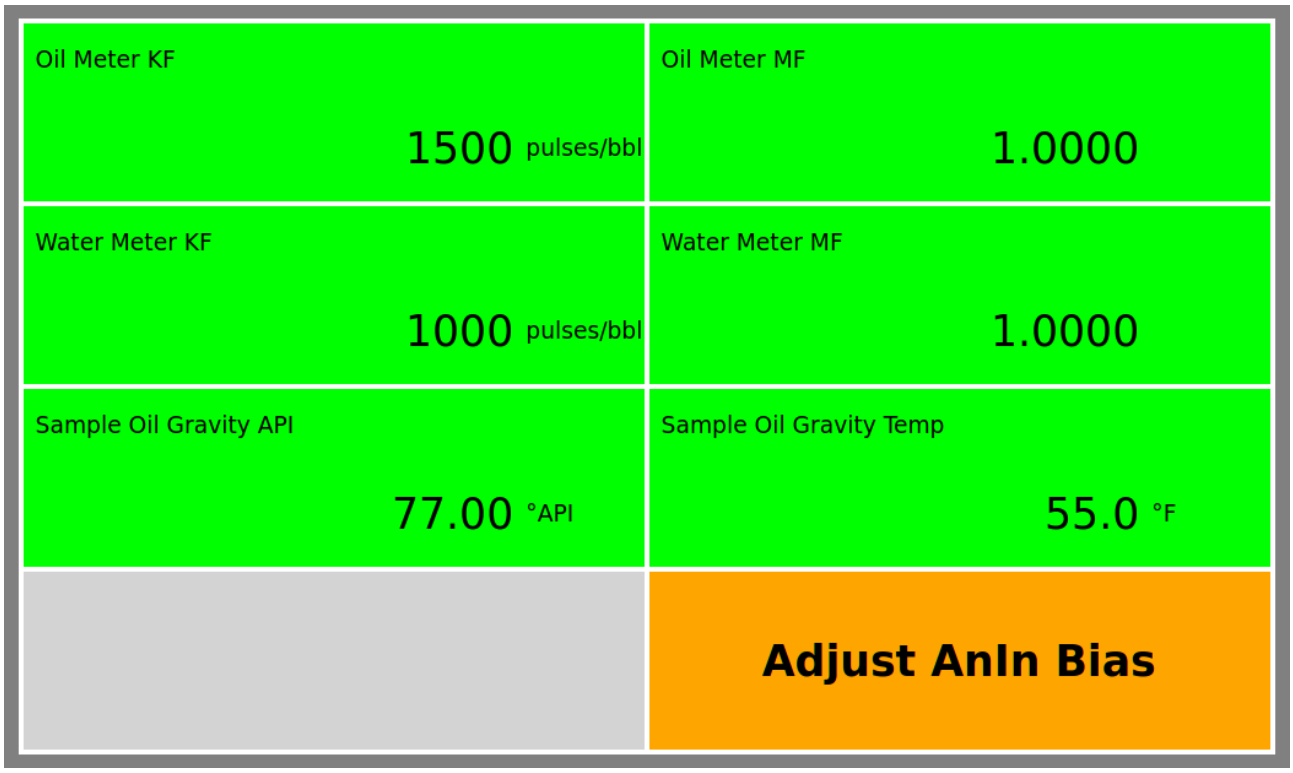
The screenshot below shows the location of the configuration page, and an example of the settings for the first two meters.



# 7 Live Temperatures & Pressure or Override Value?

The Liquid Volume Correction calculations for the oil utilize API 11.1 A tables, using a base density derived from the user entered Sample Oil Gravity (in °API) and the associated Sample temperature. These values are entered on the local panel when the Setup Screen Input Digital Input is active

When the input is active, the local panel will display the Setup Screen, as shown below.




**NOTE:**

The GSV is only generated for reporting purposes. The oil to water ratio and all the calculations are based on the OBSERVED volume, so for normal operation, there is no need to enter a Sample Oil Gravity and Temperature, nor is there any requirement to measure the oil temperature and pressure.

The Water Net value is based upon the ITS-90 water density calculation, using the water temperature, but again, only the observed volume is used in the Oi/Water ration calculations, so again, in normal operation there is no need to measure the water temperature

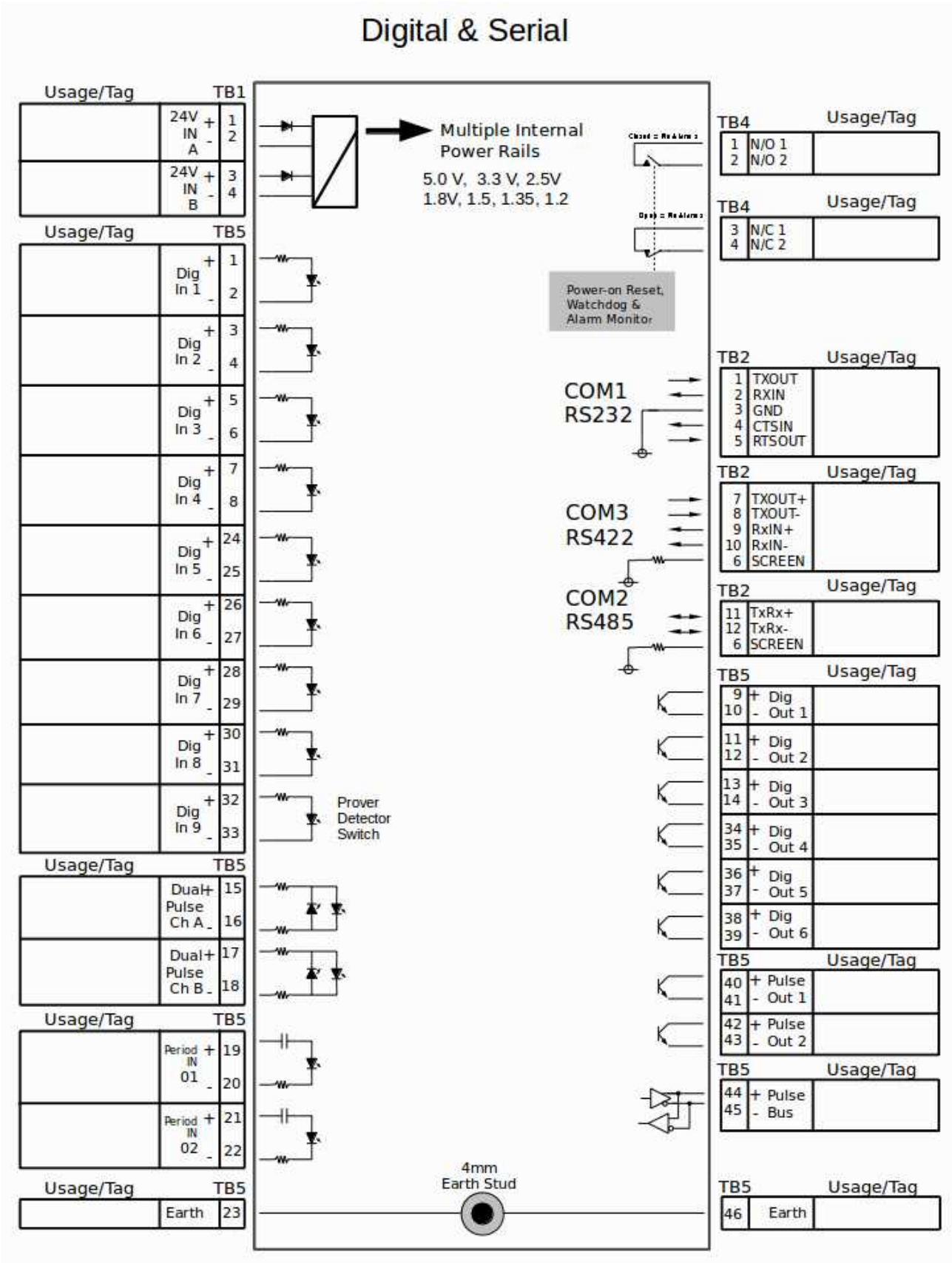
# 8 Report Layout

```
1       SAMPLER VERIFICATION REPORT

2       Report Date/Time: 30/07/2021 14:02:15  Batch Sequence:     11

3       Company Name:                          Test Location:
4       Device ID:        Sampler System Verif Water Inj Position: Downstream
5       ** Multiple Meter / Station Mode **    Water Meter ID:     Water#1
6       Station ID:                            Water Meter Size:   2"
7       Station Description:                   Water Meter Model:  Smiths Ultra
8       [                                    ] Water Meter KF:     20000.00 pulses/bbl
9                                              Water Meter MF:     1.0000
10      Required Relative Flow Rate %   2.0000 %

11      ACCUMULATORS
12      Opening Time/Date: 30/07/2021 14:00:35
13      Oil Meter IV:     687758.40 bbls       Water Meter IV:       1178.42 bbls
14      Oil Meter GOV:    687758.40 bbls       Water Meter GOV:      1178.42 bbls
15      Oil Meter GSV:    690677.21 bbls       Water Meter NSV:      1178.88 bbls
16      Closing Time/Date:  30/07/2021 14:01:47
17      Oil Meter IV:     688240.08 bbls       Water Meter IV:       1188.08 bbls
18      Oil Meter GOV:    688240.08 bbls       Water Meter GOV:      1188.08 bbls
19      Oil Meter GSV:    691161.31 bbls       Water Meter NSV:      1188.55 bbls

20      BATCH QUANTITIES   Run time:00:01:12
21      Oil Meter IV:       481.68 bbls        Water Meter IV:          9.66 bbls
22      Oil Meter GOV:      481.68 bbls        Water Meter GOV:         9.66 bbls
23      Oil Meter GSV:      484.10 bbls        Water Meter NSV:         9.67 bbls
24      FLOW WEIGHTED AVERAGES
25      Average Oil F/R:   24084.00 bbls/hr    Average Water F/R:     483.00 bbls/hr
26                                             Average Water F/R:     338.10 Gall/min
27      Oil Temperature:       55.0 °F         Water Temperature:       55.0 °F
28      Oil Pressure:        122.70 psig
29      Local Atmospheric Pressure:    14.696 psia

30      RESULTS
31      Pre-Injection Baseline water %    0.2500 % @ Mainline F/R:  24000.00 bbls/hr
32      Post-Injection Baseline water %   0.3100 % @ Mainline F/R:  24000.00 bbls/hr
33      Average Baseline water %        0.280000 %
34      Metered Water Injected             9.66 bbls
35      Metered Oil                      481.68 bbls
36      Total (Oil & water)              491.34 bbls
37      Titration Analysis % Water        2.235 %
38      Calculated Water % Injected      1.9661 %
39      Calculated Allowable Deviation %  0.1348 %

40      Calculations Using Pre-Injection Baseline Water %
41      Pre-Inj Baseline water % (adjusted)                0.2451 %
42      Pre-Inj Baseline water % (adjusted) + Injected     2.2111 %
43      Pre-Inj Calculated Deviation %                     0.0239 %
44      Pre-Inj Baseline Pass/Fail                           PASS

45      Calculations Using Pre-Injection Baseline Water %
46      Post-Inj Baseline water % (adjusted)               0.3039 %
47      Post-Inj Baseline water % (adjusted) + Injected    2.2700 %
48      Post-Inj Calculated Deviation %                   -0.0349 %
49      Post-Inj Baseline Pass/Fail                          PASS

50      Calculations Using Average Baseline Water %
51      Average Baseline water % (adjusted)                0.2745 %
52      Average Baseline water % (adjusted) + Injected     2.2405 %
53      Average Calculated Deviation %                    -0.0055 %
54      Average Baseline Pass/Fail                         >  PASS

55      Pre to Post Baseline Difference             -0.0600
56      Pre to Post Baseline values within 0.1         PASS

57      OVERALL RESULT:   PASS


END OF SAMPLER VERIFICATION REPORT
```

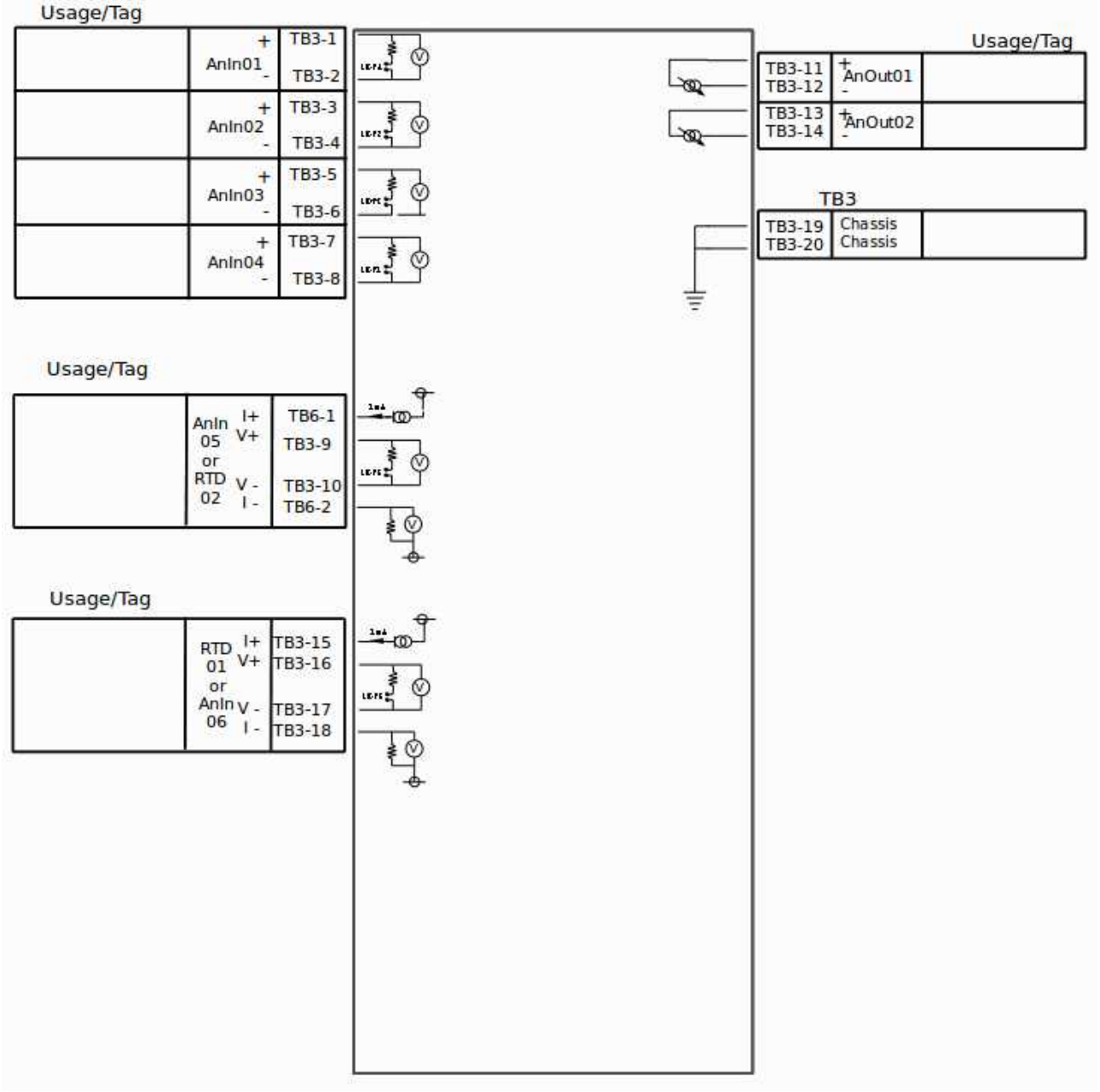
# 9 Glossary

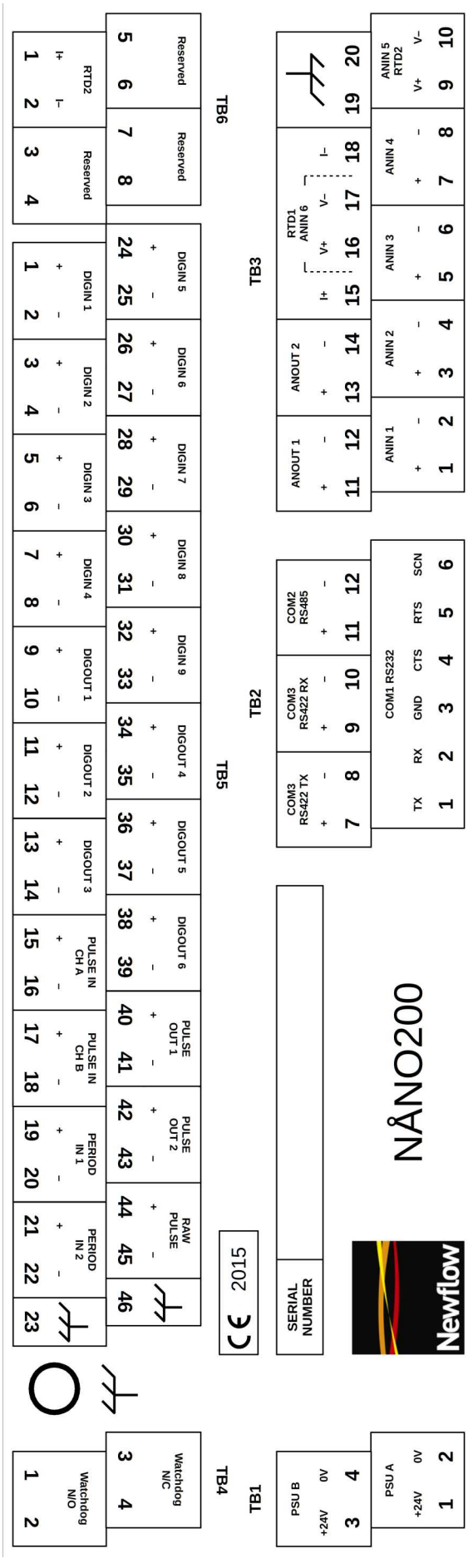
| Icon | Description |
|---|---|
| | If a line contains the blue "gear" icon, this indicates that the line can be edited. Click the line to open the edit dialog. |
| | If a line contains a gray colored "gear" icon, this indicates that the line has editable data, but the current user does NOT have the 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. |

# 10 I/O Schedules



# Analog Expansion




TB6
TB5
TB3
TB2
TB4
TB1
RTD2
Reserved
DIGIN 1
DIGIN 2
DIGIN 3
DIGIN 4
DIGOUT 1
DIGOUT 2
DIGOUT 3
PULSE IN CH A
PULSE IN CH B
PERIOD IN 1
PERIOD IN 2
DIGIN 5
DIGIN 6
DIGIN 7
DIGIN 8
DIGIN 9
DIGOUT 4
DIGOUT 5
DIGOUT 6
PULSE OUT 1
PULSE OUT 2
RAW PULSE
ANOUT 1
ANOUT 2
ANIN 1
ANIN 2
ANIN 3
ANIN 4
RTD1 ANIN 6
ANIN 5 RTD2
COM3 RS422 TX
COM3 RS422 RX
COM2 RS485
COM1 RS232
TX
RX
GND
CTS
RTS
SCN
SERIAL NUMBER
CE 2015
NÅNO200
Newflow
PSU B
+24V
0V
PSU A
Watchdog N/C
Watchdog N/O